



Biological and Water Quality Study of the Lower Mahoning River and Select Tributaries, 2011 and 2013



Division of Surface Water

Ecological Assessment Section

October 23, 2015

RECOMMENDATIONS

The streams in the lower Mahoning River study area currently listed in the Ohio Water Quality Standards (WQS) are assigned the Warmwater Habitat (WWH) aquatic life use. North Fork Creek, the unnamed tributary to Meander Creek at RM 16.15, the unnamed tributary to Mosquito Creek at RM 25.18, the unnamed tributary to Mud Creek at RM 0.84, the unnamed tributary to the Mahoning River at RM 40.89, and Youngs Run (unnamed tributary at RM 2.28 to unnamed tributary to the Mahoning River at RM 40.89) are not listed in the WQS. Burgess, Cranberry, Fourmile, and Morrison runs, in addition to West Branch Meander, Crab, Turkey, Squaw, Sawmill, Mud, and Duck creeks were originally assigned aquatic life uses in the 1978 WQS. The techniques used then did not include the standardized approaches to the collection of instream biological data or numerical biocriteria. All other streams in this survey have had their aquatic life uses previously verified. This study used biological data to evaluate and establish aquatic life uses for streams in the lower Mahoning River study area.

Twenty-seven streams in the lower Mahoning River study area were evaluated for aquatic life and recreation use potential in 2013 (Table 1). Significant findings include the following:

- Twelve streams have unverified WWH aquatic life uses in the WQS. Biological sampling conducted on Burgess, Cranberry, Fourmile, and Morrison runs, as well as West Branch Meander, Crab, Turkey, Squaw, Sawmill, Mud, and Duck creek verified that this aquatic life use is appropriate for these streams.
- North Fork Creek, the unnamed tributary to Meander Creek at RM 16.15, the unnamed tributary to Mosquito Creek at RM 25.18, the unnamed tributary to Mud Creek at RM 0.84, the unnamed tributary to the Mahoning River at RM 40.89, and Youngs Run (unnamed tributary at RM 2.28 to unnamed tributary to the Mahoning River at RM 40.89) are not listed in the WQS. Biological sampling on these streams indicated that the WWH aquatic life use is appropriate for these streams.
- Sampling conducted on Dry Run at RM 0.60 revealed a macroinvertebrate community that included ten coldwater taxa: the mayfly *Baetis tricaudatus*; the stonefly *Leutra sp.*; the caddisflies *Dolophiloides distinctus*, *Ceratopsyche slossonae*, and *Glossosoma sp.*; and the dipterans *Dicranota sp.*, *Trissopelopia ogemawi*, *Diamesa sp.*, *Parametriocnemus sp.*, and *Polypedilum aviceps*. In addition to these macroinvertebrate taxa, the coldwater mottled sculpin fish have also been collected historically at this location, though no individuals were captured in 2013. Based on these current and historical collections of coldwater macroinvertebrates and fish, it is recommended that the Coldwater Habitat (CWH) aquatic life use be assigned to Dry Run from RM 1.42 to RM 0.31. The WWH use should be retained on all other segments.
- The remaining streams from the 2013 study all have verified WWH aquatic life uses in the WQS. Biological sampling conducted on these streams verified that the WWH aquatic life use is still appropriate.

The lower Mahoning River should retain the Primary Contact Recreation Class A use for its entire length. All remaining streams or stream segments in the study area should retain or be assigned the Primary Contact Recreation Class B use. All streams in the study area should retain or be assigned the Agricultural Water Supply and Industrial Water Supply uses.

Table 1. . Use designations for water bodies in the lower Mahoning River drainage basin.

Water Body Segment	Use Designations												Comments
	Aquatic Life Habitat						Water Supply			Recreation			
	S R W	W W H	E W H	M W H	S S H	C W H	L R W	P W S	A W S	I W S	B W	P C R	
 Mahoning river - at RMs 56.47, 69.18, 83.55, and 91.50 - headwaters to King rd. (RM 102.41) - all other segments Hickory creek (formerly Hickory run) Coffee run Grays run Hines run Godward run Yellow creek - at RMs 2.0 and 8.40 - all other segments Burgess run - at RM 2.0 - all other segments Pine Hollow creek Dry run - at RM 2.86		+						o	+	+		+	PWS intakes - Newton Falls (RM 56.47), Mahoning valley sanitary district (emergency intake, RM 69.18), Alliance (emergency intake, RM 83.55) and Sebring (RM 91.50)
					+				+	+		+	
		+							+	+		+	
		*							*	*		*	
		*							*	*		*	
		*				+			+	+		+	
		*							*	*		*	
		+						o	+	+		+	PWS intakes - Campbell (RM 2.0) and Struthers (RM 8.40)
		+							+	+		+	
		*/+						o	*/+	*/+		*/+	PWS intake - Struthers
		*/+							*/+	*/+		*/+	
		*							*	*		*	
		+						o	+	+		+	PWS intake - Campbell

Water Body Segment	Use Designations												Comments
	Aquatic Life Habitat						Water Supply			Recreation			
	S R W	W W H	E W H	M W H	S S H	C W H	L R W	P W S	A W S	I W S	B W	P C R	
 - RM 1.42 to RM 0.31 - all other segments						Δ		+	+		+		
Crab creek		*/+						*/+	*/+		*/+		
Kimmel brook		*						*	*		*		
Mill creek		+						+	+		+		
Bears Den run		+						+	+		+		
Ax Factory run		+						+	+		+		
Andersons run		+						+	+		+		
Cranberry run		*/+						*/+	*/+		*/+		
Indian run		+						+	+		+		
Saw Mill run		*						*	*		*		
Turkey creek		*/+						*/+	*/+		*/+		
Fourmile run		*/+						*/+	*/+		*/+		
Little Squaw creek (Mahoning river RM 23.55)		+						+	+		+		
Squaw creek		*/+						*/+	*/+		*/+		
Meander creek - at RM 2.96		+					o	+	+		+		
- all other segments		+						+	+		+		
Morrison run		*/+						*/+	*/+		*/+		

Water Body Segment	Use Designations												Comments	
	Aquatic Life Habitat						Water Supply			Recreation				
	S R W	W W H	E W H	M W H	S S H	C W H	L R W	P W S	A W S	I W S	B W	P C R		S C R
Sawmill creek		*/+							*/+	*/+		*/+		
Unnamed tributary to Meander Creek RM 16.15		Δ							Δ	Δ		Δ		
North Fork creek		Δ							Δ	Δ		Δ		
West branch		*/+							*/+	*/+		*/+		
Mosquito creek - at RM 12.49		+						o	+	+		+		PWS intake - Warren
- all other segments		+							+	+		+		
Spring run		*							*	*		*		
Big run		*							*	*		*		
Confusion run		*							*	*		*		
Walnut creek		*/+							*/+	*/+		*/+		
Mud creek		*							*	*		*		
Smith run		*							*	*		*		
Unnamed tributary Mosquito Creek RM 25.18		Δ							Δ	Δ		Δ		
Mud creek		*/+							*/+	*/+		*/+		
Unnamed tributary Mud Creek RM 0.84		Δ							Δ	Δ		Δ		
Red run							o			*			o	Small drainageway maintenance
Unnamed tributary to the Mahoning River RM 40.89		Δ							Δ	Δ		Δ		
Youngs Run (unnamed tributary @RM 2.28 to unnamed tributary to Mahoning River at RM 40.89)		Δ							Δ	Δ		Δ		

Water Body Segment	Use Designations												Comments	
	S R W	Aquatic Life Habitat						Water Supply			Recreation			
		W H	E W H	M W H	S S H	C W H	L R W	P W S	A W S	I W S	B W	P C R		S C R
 Duck creek Little Duck creek East branch		*/+							*/+	*/+		*/+		

Table 2. Aquatic life use attainment status for stations sampled in the lower Mahoning River basin based on data collected June-October 2013 (Some data were collected in 2011 and noted after the sampling location in parentheses). The Index of Biotic Integrity (IBI), Modified Index of well-being (MIwb), and Invertebrate Community Index (ICI) are scores based on the performance of the biotic community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biotic community. All sites are located within the Erie Ontario Lake Plain (EOLP) ecoregion.

Location	River Mile	Drain Area ^A	ALU	IBI	MIwb ^a	QHEI	ICI ^b	Attain. Status ^c	Causes	Sources
Mahoning River at Leavittsburg, ust dam	45.73 (N03S64)	542.0 ^B	WWH	39 ^{NS}	8.6 ^{NS}	45.0	28*	PARTIAL	Direct habitat alterations Other flow regime alterations Sedimentation/ siltation	Dam or impoundment
Mahoning River near Leavittsburg, 1.0 mi ust US 422	44.30 (200419)	576.0 ^B	WWH	45	9.2	68.5	50	FULL		
Mahoning River at Warren @ 3rd island dst Summit Street	39.10 (200405)	594.0 ^B	WWH	--	--	--	46	(FULL)		
Mahoning River adj Perkins Park, Thomas Steel mixing zone	39.07 (N03Q01)	594.0 ^B	n/a	--	--	--	48	n/a	Mixing zone; biological criteria do not apply.	
Mahoning River at Warren at West Market Street	38.26 (N03S43)	594.0 ^B	WWH	45	9.2	72.5	44	FULL		
Mahoning River at LTV Warren, near substation	36.20 (N03K31)	605.0 ^B	WWH	41	7.7*	49.5	--	(PARTIAL)	Direct habitat alterations Other flow regime alterations Sedimentation/ siltation	Dam or impoundment
Mahoning River ust Warren WWTP, dst WC Industries	35.63 (N03S60)	608.0 ^B	WWH	36 ^{NS}	9.0	69.5	48	FULL		
Mahoning River dst Warren WWTP	35.03 (N03S59)	611.0 ^B	WWH	35*	8.4 ^{NS}	70.0	38	PARTIAL	Organic enrichment biological indicators	Combined sewer overflows Municipal point source dischargers
Mahoning River at Niles @ Belmont Avenue	29.98 (N03W18)	855.0 ^B	WWH	35*	7.0*	54.5	32 ^{NS}	PARTIAL	Direct habitat alterations Other flow regime alterations Sedimentation/ siltation	Dam or impoundment

Location	River Mile	Drain Area ^A	ALU	IBI	MIwb ^a	QHEI	ICI ^b	Attain. Status ^c	Causes	Sources
Mahoning River dst Niles WWTP, ust McDonald Steel	28.63 (N03S57)	857.0 ^B	WWH	28*	7.6*	55.5	10*	NON	Direct habitat alterations Other flow regime alterations Sedimentation/siltation	Dam or impoundment
Mahoning River at Girard, dst Liberty Street Dam	26.36 (N03S56)	881.0 ^B	WWH	38 ^{NS}	9.8	83.5	34	FULL		
Mahoning River at Youngstown @ Division Street	23.43 (602330)	892.0 ^B	WWH	34*	8.5 ^{NS}	53.5	34	PARTIAL	Direct habitat alterations Other flow regime alterations Sedimentation/siltation	Dam or impoundment
Mahoning River at Youngstown, ust Mill Creek	21.73 (N03S54)	899.0 ^B	WWH	40	9.7	81.5	34	FULL		
Mahoning River at Youngstown at West Avenue	21.14 (N03W20)	977.0 ^B	WWH	35*	8.4 ^{NS}	83.5	38	PARTIAL	Nutrient/eutrophication biological indicators Organic enrichment biological indicators	Combined sewer overflows
Mahoning River at Youngstown @ Marshall Street	20.45 (301178)	979.0 ^B	WWH	37 ^{NS}	8.8	75.5	--	(FULL)		
Mahoning River dst Youngstown WWTP	19.20 (N03K17)	1000.0 ^B	WWH	32*	8.3 ^{NS}	62.5	34	PARTIAL	Nutrient/eutrophication biological indicators Organic enrichment biological indicators	Combined sewer overflows Municipal point source dischargers
Mahoning River at Campbell, near RR	17.63 (N03W21)	1022.0 ^B	WWH	27*	8.2 ^{NS}	82.0	34	PARTIAL	Nutrient/eutrophication biological indicators Organic enrichment biological indicators	Combined sewer overflows Municipal point source dischargers
Mahoning River at Struthers @ Bridge Street	15.53 (602320)	1024.0 ^B	WWH	39 ^{NS}	9.2	82.5	30 ^{NS}	FULL		
Mahoning River 100 yards ust Struthers WWTP	14.38 (N03W28)	1067.0 ^B	WWH	36 ^{NS}	8.6 ^{NS}	88.0	30 ^{NS}	FULL		

Location	River Mile	Drain Area [^]	ALU	IBI	MIwb ^a	QHEI	ICI ^b	Attain. Status ^c	Causes	Sources
Mahoning River 0.6 miles dst Struthers WWTP	13.60 (N03K04)	1071.0 ^B	WWH	37 ^{NS}	8.8	86.5	32 ^{NS}	FULL		
Mahoning River at Lowellville, ust dam	12.70 (N03K03)	1072.0 ^B	WWH	33*	7.7*	86.0	28*	NON	Nutrient/ eutrophication biological indicators Organic enrichment biological indicators Other	Municipal point source dischargers Upstream sources
Mahoning River at Lowellville @ First Street	12.42 (602300)	1074.0 ^B	WWH	43	9.7	92.5	28*	PARTIAL	Other	Upstream sources
Mahoning River at Ohio/PA state line	11.43 (N03S51)	1074.0 ^B	WWH	42	9.6	91.0	28*	PARTIAL	Other	Upstream sources
Mahoning River dst Edinburg WWTP @ US 224/PA 551 (PA)	6.62 (301182)	1098.0 ^B	WWH	37 ^{NS}	8.6 ^{NS}	88.0	24*	PARTIAL	n/a (PA)	n/a (PA)
Mahoning River ust New Castle WWTP @ PA 108 (PA)	1.33 (301183)	1112.0 ^B	WWH	32*	8.4 ^{NS}	82.3	38	PARTIAL	n/a (PA)	n/a (PA)
Mahoning River dst New Castle WWTP @ PA 18 (PA)	0.33 (301184)	1113.0 ^B	WWH	41	9.7	82.0	44	FULL		
Duck Creek @ Hallock Young Road	8.45 (302296)	9.20 ^H	WWH	28*	n/a	68.0	VG	PARTIAL	Sedimentation/ siltation	Habitat modification (other than hydromodification)
Duck Creek @ Wood-Leinhart Road	4.20 (302300)	18.50 ^H	WWH	32*	n/a	47.0	G	PARTIAL	Direct habitat alterations Sedimentation/ siltation	Channelization
Duck Creek @ Risher Road	1.00 (302305)	32.52 ^W	WWH	30*	8.6	36.5	38	PARTIAL	Direct habitat alterations Sedimentation/ siltation	Channelization
Trib to Mahoning River (RM 40.89) @ SR 45	0.60 (302311)	11.25 ^H	WWH+	32*	n/a	74.5	F*	NON	Specific Conductance	Unpermitted discharge
Young's Run (RM 2.28 trib to Mahoning River trib RM 40.89) @ end of Shafer Road	0.40 (302314)	7.67 ^H	WWH+	30*	n/a	56.5	F*	NON	Organic enrichment biological indicators	On-site treatment systems (septic systems)
Mud Creek @ Carson-Salt Springs Road	2.30 (302303)	6.50 ^H	WWH	26*	n/a	62.5	G	PARTIAL	Direct habitat alterations Fish passage barrier	Dam or impoundment

Location	River Mile	Drain Area [^]	ALU	IBI	MIwb ^a	QHEI	ICI ^b	Attain. Status ^c	Causes	Sources
Mud Creek @ Austintown-Warren Road	0.70 (302308)	13.10 ^H	WWH	30*	n/a	75.0	MG ^{NS}	PARTIAL	Direct habitat alterations Fish passage barrier	Dam or impoundment
Trib to Mud Creek (RM 0.84) @ West Park Avenue	0.50 (302312)	4.94 ^H	WWH+	<u>24*</u>	n/a	48.0	F*	NON	Natural causes (flow or habitat)	Natural sources
Mosquito Creek SE of Colebrook @ Easton Road	29.40 (302289)	12.20 ^H	WWH	34 ^{NS}	n/a	83.5	E	FULL		
Mosquito Creek at Green Center @ SR 87	24.40 (N03W16)	26.35 ^H	WWH	38 ^{NS}	-	66.0	36	FULL		
Mosquito Creek dst reservoir @ USGS gage	12.45 (N03S24)	97.50 ^B	WWH	42	10.9	68.5	LF*	PARTIAL	Direct habitat alterations Other flow regime alterations	Dam or impoundment
Mosquito Creek ust Mosquito Creek WWTP	7.24 (N03W06)	123.00 ^B	WWH	38 ^{NS}	7.4*	52.0	22*	PARTIAL	Natural causes (flow or habitat)	Natural Sources
Mosquito Creek dst Mosquito Creek WWTP	7.0 (N03S22)	123.00 ^B	WWH	--	--	--	20*	(NON)	Natural causes (flow or habitat)	Natural Sources
Mosquito Creek N of Niles, 0.9 mi dst US 422	2.1 (N03K46)	135.00 ^B	WWH	31*	6.7*	56.0	--	(NON)	Natural causes (flow or habitat)	Natural Sources
Mosquito Creek at Niles @ McKinley High School	1.00 (N03K45)	137.00 ^B	WWH	31*	7.1*	50.0	--	(NON)	Natural causes (flow or habitat)	Natural Sources
Mosquito Creek at Niles @ Park Avenue	0.25 (N03S48)	138.00 ^B	WWH	--	--	--	26*	(NON)	Other Sedimentation/ siltation	Urban runoff/storm sewers
Trib to Mosquito Creek at RM 25.13 at SR 46	0.46 (302700)	3.7 ^H	WWH+	38 ^{NS}	--	56.0		(FULL)		
Walnut Creek @ Mecca Road (SR 46)	1.75 (302304)	9.51 ^H	WWH	--	--	--	F*	n/a		
Meander Creek @ Leffingwell Road (2011)	17.21 (301464)	7.30 ^H	WWH	34*		65.8	E	PARTIAL	Natural causes (flow or habitat)	Natural sources
Meander Creek W of Canfield @ Gault Road (2011)	14.45 (N03P01)	25.00 ^W	WWH	46	8.2	78.5	56	FULL		
Meander Creek NW of Canfield dst Palmyra Road	12.10 (N03K36)	28.20 ^W	WWH	46	8.5	70.0	48	FULL		
Meander Creek NW of Canfield @ Gibson Road (2011)	10.63 (N03W17)	39.90 ^W	WWH	34 ^{NS}	7.5 ^{NS}	65.0	54	FULL		

Location	River Mile	Drain Area [^]	ALU	IBI	MIwb ^a	QHEI	ICI ^b	Attain. Status ^c	Causes	Sources
Meander Creek ust Meander Creek WWTP	2.00 (N03W22)	84.00 ^B	WWH	29*	7.9	43.5	20*	PARTIAL	Direct habitat alterations Other flow regime alterations	Dam or impoundment
Meander Creek dst Meander Creek WWTP	1.80 (N03S68)	84.00 ^W	WWH	<u>24*</u>	<u>3.7*</u>	82.0	<u>8*</u>	NON	Nutrient/ eutrophication biological indicators Organic enrichment biological indicators Bottom deposits	Municipal point source discharges
Meander Creek near Niles @ Main Street (2011)	0.76 (602380)	85.6 ^W	WWH	37 ^{NS}	7.3*	62.0	18*	PARTIAL	Nutrient/ eutrophication biological indicators Organic enrichment biological indicators Bottom Deposits	Municipal point source discharges
West Branch Meander Creek @ SR 45	1.71 (301465)	7.23 ^H	WWH	54	n/a	73.0	G	FULL		
North Fork Creek @ Gault Road (2011)	1.17 (301463)	8.30 ^H	WWH+	32*	n/a	77.5	E	PARTIAL	Natural causes (flow or habitat)	Natural sources
Morrison Creek near mouth, west of Lipkey Road (2011)	0.12 (301404)	9.30 ^H	WWH	40	n/a	74.0	E	FULL		
Trib to Meander Creek (RM 16.15), dst gravel road near mouth	0.65 (302310)	6.00 ^H	WWH+	46	n/a	64.0	G	FULL		
Sawmill Creek @ Turner Road	0.90 (302306)	5.50 ^H	WWH	40	n/a	67.0	MG ^{NS}	FULL		
Squaw Creek near Girard, in former Liberty Lake impoundment	2.10 (302316)	14.70 ^H	WWH	<u>22*</u>	n/a	55.0	F*	NON	Sedimentation/ siltation Alteration in streamside or littoral vegetative covers Fish passage barrier	Dam or impoundment Loss of riparian habitat
Squaw Creek near Girard, at the end of Pittsburg Road	0.70 (302309)	17.46 ^H	WWH	<u>24*</u>	n/a	83.5	G	NON	Impairment unknown	Source unknown
Little Squaw Creek ust Girard WWTP	0.41 (301198)	5.30 ^H	WWH	28*	--	72.5	VG	PARTIAL	Fish passage barrier	Habitat alteration other than hydromodification Municipal point source discharge

Location	River Mile	Drain Area [^]	ALU	IBI	MIwb ^a	QHEI	ICI ^b	Attain. Status ^c	Causes	Sources
Little Squaw Creek dst Girard WWTP	0.37 (302315)	5.30 ^H	WWH	<u>26*</u>	--	58.0	F*	n/a	Mixing zone; biological criteria do not apply.	
Fourmile Run SW of Girard at Meridian Road	0.73 (N03P08)	5.18 ^H	WWH	50	n/a	58.0	G	FULL		
Mill Creek at Columbiana @ SR 164	19.68 (302291)	3.97 ^H	WWH	42	n/a	62.8	<u>P*</u>	NON	Other flow regime alterations	Urban runoff/storm sewers
Mill Creek at Columbiana @ old SR 14	18.73 (302292)	4.42 ^H	WWH	32*	n/a	68.8	<u>P*</u>	NON	Other flow regime alterations Nutrient/enrichment biological indicators	Urban runoff/storm sewers Municipal point source discharge
Mill Creek W of North Lima @ SR 165	14.93 (302294)	13.85 ^H	WWH	<u>24*</u>	n/a	61.0	LF*	NON	Natural conditions (flow or habitat) Fish passage barrier	Natural sources Dam or impoundment
Mill Creek S of Boardman at Western Reserve Road	11.30 (N03S67)	28.00 ^W	WWH	<u>23*</u>	5.2*	38.0	44	NON	Fish passage barrier	Dam or impoundment
Mill Creek 0.1 mi ust Boardman WWTP outfall	9.70 (N03S07)	34.00 ^W	WWH	<u>22*</u>	<u>3.2*</u>	61.5	32 ^{NS}	NON	Fish passage barrier	Dam or impoundment
Mill Creek 0.1 mi dst Boardman WWTP outfall	9.50 (N03S06)	34.00 ^W	WWH	<u>22*</u>	<u>3.9*</u>	58.0	34	NON	Fish passage barrier	Dam or impoundment
Mill Creek @ ford 0.75 mi dst US 224	6.99 (N03W24)	51.40 ^W	WWH	<u>24*</u>	<u>4.3*</u>	44.8	42	NON	Fish passage barrier	Dam or impoundment
Mill Creek at Youngstown dst Newport Lake @ USGS gage	2.59 (N03S03)	72.00 ^W	WWH	<u>22*</u>	<u>3.7*</u>	80.5	30 ^{NS}	NON	Organic enrichment biological indicators Fish passage barrier	Combined sewer overflows Dam or impoundment
Mill Creek at Youngstown @ Slippery Rock bridge	1.07 (N03S02)	76.80 ^W	WWH	<u>22*</u>	5.9*	83.5	34	NON	Organic enrichment biological indicators Fish passage barrier	Combined sewer overflows Dam or impoundment
Turkey Creek W of North Lima at Bassinger Road	0.49 (302313)	4.30 ^H	WWH	40	n/a	74.5	MG ^{NS}	FULL		
Indian Run @ Leffingwell Road	4.66 (302299)	7.58 ^H	WWH	36 ^{NS}	n/a	63.5	G	FULL		
Indian Run near Boardman @ US 224	0.33 (N03S11)	14.70 ^H	WWH	28*	n/a	71.5	F*	NON	Sedimentation/siltation	Urban runoff/storm sewers
Cranberry Run at Boardman @ mouth	0.10 (N03S16)	4.20 ^H	WWH	<u>22*</u>	n/a	81.0	F*	NON	Other flow regime alterations	Urban runoff/storm sewers

Location	River Mile	Drain Area [^]	ALU	IBI	MIwb ^a	QHEI	ICI ^b	Attain. Status ^c	Causes	Sources
Anderson Run near Boardman @ West Newport Drive	0.17 (N03S10)	6.20 ^H	WWH	36 ^{NS}	n/a	78.5	MG ^{NS}	FULL		
Crab Creek at Youngstown @ Logangate Road	4.05 (302301)	6.60 ^H	WWH	42	n/a	56.5	G	FULL		
Crab Creek at Youngstown @ McGuffey Avenue	1.16 (N03S25)	16.80 ^H	WWH	38 ^{NS}	n/a	63.0	G	FULL		
Dry Run @ US 422	4.80 (302298)	4.00 ^H	WWH	28*	n/a	52.0	MG ^{NS}	PARTIAL	Natural conditions (flow or habitat)	Natural sources
Dry Run at Youngstown @ Gladstone Street	0.60 (N03K34)	9.80 ^H	CWH+	34	n/a	48.5	E	FULL	Rec CWH due to presence of 10 coldwater macroinvertebrate taxa.	
Yellow Creek @ Heck Road (2011)	14.03 (301466)	3.7 ^H	WWH	34*	n/a	44.0	<u>P</u> *	NON	Direct habitat alterations Sedimentation/ siltation	Channelization Crop production with subsurface drainage
Yellow Creek @ SR 165 (2011)	11.40 (301407)	10.11 ^H	WWH	32*	n/a	40.5	F*	NON	Direct habitat alterations Sedimentation/ siltation	Channelization
Yellow Creek @ E. Western Reserve Road (2011)	7.75 (301468)	20.52 ^W	WWH	36 ^{NS}	6.3*	49.0	28*	PARTIAL	Other flow regime alterations Fish passage barrier Nutrient enrichment Organic enrichment Sedimentation/ siltation Total dissolved solids	Dam or impoundment Package plant/permitted small flow discharge Unrestricted cattle access
Yellow Creek @ Walker Mill Road (2011)	6.30 (301739)	23.20 ^W	WWH	32*	7.1*	77.0	--	(NON)	Nutrient/ eutrophication biological indicators Sedimentation/ Siltation	Upstream sources
Yellow Creek at Struthers @ Lowellville Road (2011)	0.40 (N03S18)	39.03 ^W	WWH	42	8.6	85.5	40	FULL		
Burgess Run S of Poland @ North Lima Road (2011)	1.05 (301469)	7.12 ^H	WWH	42	n/a	89.0	MG ^{NS}	FULL		

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

- b - An evaluation of the qualitative sample based on attributes such as EPT taxa richness, number of sensitive taxa, and community composition was used when quantitative data was not available or considered unreliable. VP=Very Poor, P=Poor, LF=Low Fair, F=Fair, MG=Marginally Good, G=Good, VG=Very Good, E=Exceptional
- c - Attainment is given for the proposed aquatic life use when a change is recommended. EWH = Exceptional Warmwater Habitat; WWH = Warmwater Habitat;
- ns - Nonsignificant departure from biocriteria (≤ 4 IBI or ICI units, or ≤ 0.5 MIwb units).
- * - Indicates significant departure from applicable biocriteria (> 4 IBI or ICI units, or > 0.5 MIwb units). Underlined scores are in the Poor or Very Poor range.
- ^ - Letters in superscript refer to the fish site type and associated biocriteria as indicated in the table below. B = boat; W = wading; and H = headwater.
- + - Recommended aquatic life use based on data from this survey.

Biological Criteria

Erie Ontario Lake Plain			
Index – Site Type	EWH	WWH	MWH
IBI – Headwaters	50	40	24
IBI – Wading	50	38	24
IBI – Boat	48	40	24
MIwb – Wading	9.4	7.9	6.2
MIwb – Boat	9.6	8.7	5.8
ICI	46	34	22

Key QHEI types	WWH Attributes									MWH Attributes																						
	No Channelization or Recovered Boulder/ Cobble/ Gravel Substrates	Silt Free Substrates	Good/ Excellent Development	Moderate/ High Sinuosity	Extensive/ Moderate Cover	Fast Current/ Eddies	Low Normal Overall Embeddedness	Maximum Depth > 40 cm	Low Normal Riffle Embeddedness	Total WWH Attributes	High Influence	Moderate Influence																				
RM QHEI										Channelized or No Recovery	Silt Muck Substrates	No Sinuosity	Sparse No Cover	Maximum Depth < 40 cm (Wade, HW)	Total High Influence MWH Attributes	Recovering Channel	Heavy/ Moderate Silt Cover	Sand Substrates (Boat)	Hardpan Substrate Origin	Fair Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current	High/ Moderate Overall Embeddedness	High/ Moderate Riffle Embeddedness	No Riffle	Total Moderate Influence MWH Attributes	(MWH High Influence+1)/ (WWH+1) Ratio	(MWH Mod. Influence+1)/ (WWH+1) Ratio		
Unnamed Tributary at RM 40.89																																
0.4	74.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6						0	<input type="radio"/>							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		4	0.14	0.71	
Youngs Run (Unnamed Tributary at RM 2.28 to Unnamed Tributary at RM 40.89)																																
0.4	56.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4		<input type="checkbox"/>				1	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7	0.60	1.60	
Mud Creek																																
2.3	62.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6						0	<input type="radio"/>	<input type="radio"/>						<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		5	0.14	0.86	
0.9	75.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6						0	<input type="radio"/>	<input type="radio"/>						<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		4	0.14	0.71	
Unnamed Tributary to Mud Creek at RM 0.84																																
0.5	48.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4		<input type="checkbox"/>				1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7	0.40	1.80	
Mosquito Creek																																
29.3	83.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7						0										<input type="radio"/>	<input type="radio"/>		2	0.13	0.38		
26.1	66.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6						0	<input type="radio"/>							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		4	0.14	0.71	
12.3	68.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5						0	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		5	0.17	1.00	
7.4	52.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4		<input type="checkbox"/>				1	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		5	0.40	1.40	
2.2	56.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3		<input type="checkbox"/>				1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		6	0.50	2.00	
1.1	50.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3		<input type="checkbox"/>				1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		6	0.50	2.00	
Unnamed Tributary to Mosquito Creek at RM 25.17																																
0.4	56.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5						0	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		5	0.17	1.00	
Meander Creek																																
12.1	70.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9			<input type="checkbox"/>			1			<input type="radio"/>				<input type="radio"/>						2	0.20	0.30		
2.0	43.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3		<input type="checkbox"/>	<input type="checkbox"/>			2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		6	1.00	1.75	
1.8	82.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8						0	<input type="radio"/>	<input type="radio"/>						<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		3	0.11	0.44	
Meander Creek 2011																																
17.2	65.8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7						0	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		6	0.13	1.00	
14.5	78.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9						0	<input type="radio"/>	<input type="radio"/>						<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		1	0.10	0.20	
10.6	65.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5			<input type="checkbox"/>			1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		5	0.33	1.17	
0.8	62.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4						0	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		7	0.20	1.80	
West Branch Meander Creek																																
1.7	73.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7						0			<input type="radio"/>					<input type="radio"/>						2	0.13	0.38	
North Fork Meander Creek 2011																																
1.2	77.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7			<input type="checkbox"/>			1								<input type="radio"/>						1	0.25	0.25	

Crab Creek

4.0	56.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	◇	◇	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	0.75	2.25	
1.2	63.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4		◇	◇	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5	1.00	3.00

Key QHEI types

WWH Attributes

MWH Attributes

RM	QHEI	WWH Attributes									High Influence	Moderate Influence									Total Moderate Influence MWH Attributes (MWH High Influence+1)/ (WWH+1) Ratio (MWH Mod. Influence+1)/ (WWH+1) Ratio						
		No Channelization or Recovered Boulder/ Cobble/ Gravel Substrates	Silt Free Substrates	Good/ Excellent Development	Moderate/ High Sinuosity	Extensive/ Moderate Cover	Fast Current/ Eddies	Low Normal Overall Embeddedness	Maximum Depth > 40 cm	Low Normal Riffle Embeddedness	Total WWH Attributes	Channelized or No Recovery	Silt Muck Substrates	No Sinuosity	Sparse No Cover	Maximum Depth < 40 cm (Wade, HW)	Total High Influence MWH Attributes	Recovering Channel	Heavy/ Moderate Silt Cover	Sand Substrates (Boat)		Hardpan Substrate Origin	Fair Poor Development	Low Sinuosity	Only 1-2 Cover Types	Intermittent and Poor Pools	No Fast Current

Dry Run

4.9	52.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3			◇	◇	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	0.75	1.75
0.3	48.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2			◇	◇	2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7	1.33	2.67

Yellow Creek 2011

14.0	44.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	◇	◇	◇		3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	2.00	4.00
11.4	40.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	◇	◇	◇	◇	4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7	2.50	4.00
7.8	49.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4		◇			1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5	0.40	1.40	
6.3	77.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8					0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	0.11	0.56	
0.4	85.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7					0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2	0.13	0.38	

Burgess Run 2011

1.1	89.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9					0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	0.10	0.10
-----	-------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	---	--	--	--	--	---	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	---	------	------