

## **Biological and Water Quality Study of Two streams in the Moxahala Creek Watershed**



Division of Surface Water  
Ecological Assessment Section  
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## Recommendations

Streams in the Moxahala Creek watershed currently listed in Ohio's water quality standards (Table 1) are assigned one or more of the following aquatic life use designations: Warmwater Habitat (WWH), Exceptional Warmwater Habitat (EWH), Modified Warmwater Habitat – Mine Affected (MWH-MA), Modified Warmwater Habitat-Channel Modification (MWH-CM) Coldwater Habitat (CWH), Limited Warmwater Habitat (LWH) and Limited Resource Water – Acid Mine Drainage (LRW-AMD). The aquatic life use designations for the majority of larger streams in the Moxahala Creek drainage basin have been previously verified based upon biological and habitat assessments. Two streams within the watershed carry the relict LWH designation and were assessed for the purpose of assigning a new aquatic life use designation. These surveys used biological data to assess the current condition to recommend new designations for these water bodies and the attainment status is summarized in Table 2. A narrative summary of the findings includes the following:

- Two streams within the Moxahala Creek drainage basin currently have a LWH use designation: Twomile Run and Dry Run.
  - Twomile Run is a tributary to Buckeye Fork, entering at river mile 2.98 in Muskingum County, Ohio and draining about 0.65 square miles. A biological assessment and habitat evaluation was conducted in 2008 near the mouth of the stream at State Route 345. The qualitative macroinvertebrate sample rated was evaluated as good, meeting WWH expectations and consisted of forty total taxa, including 12 EPT<sup>1</sup> taxa and three coldwater taxa. The fish community was dominated by the warmwater creek chub with an IBI score of 20; not unexpected for a stream of its size and high gradient. The QHEI scored a 50 (Table 3). Twomile Run is recommended for the WWH use designation.
  - Dry Run is a tributary to the Black Fork of Moxahala Creek, entering at river mile 1.27 in Perry County near the Morgan County line and draining an area of 3.1 square miles. A biological and habitat assessment was conducted in 2014 near the mouth at Rosefarm Road. The qualitative macroinvertebrate sampled rated very poor and consisted of just eight taxa, seven of which were pollution tolerant and none of which were sensitive, coldwater or EPT. The stream was found to be completely devoid of fish. Despite a QHEI score of 74.5 (Table 3), this stream is afflicted by acid mine drainage from abandoned underground mine discharges and surface coal mines resulting in low pH and high conductivities that are incompatible with the attainment of the applicable WWH biocriteria. Field pH measurements of less than 2-4 have been documented. As such, the LRW-AMD designation is recommended for Dry Run.

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<sup>1</sup> EPT refers to Ephemeroptera, Plecoptera, and Trichoptera, the orders of insects commonly known as mayflies, stoneflies, and caddisflies, respectively. High taxa richness of this group is generally considered an indicator of high resource quality in aquatic ecosystems.

Table 1 - Use designations for water bodies in the Moxahala Creek 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		S C R
Moxahala creek - headwaters to Jonathan creek (RM 4.54)						+		+	+		+			Acid mine drainage.
- Jonathan creek to the mouth		+						+	+		+			
Shawnee run		+						+	+		+			
Jonathan creek – State Route 204 (RM 27.08) to the mouth		+						+	+		+			
- headwaters to State Route 204						+		+	+		+			
Thompson run - headwaters to Coopermill Road (RM 4.73)						+		+	+		+			
- Coopermill Road to the mouth		+						+	+		+			
Hibbs run			+			+		+	+		+			
Kent run - at RM 1.3		+						o	+	+	+			PWS intake - Maysville
- all other segments		+							+	+	+			
Salt run						+		+	+		+			
Buckeye fork							+	+	+		+			Acid mine drainage.

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
Bush creek		+							+	+		+		
Twomile run		Δ							+	+		+		
Butcherknife creek						+			+	+		+	Acid mine drainage.	
Turkey run		+							+	+		+		
Painter run				+					+	+		+	WAP ecoregion - channel modification	
Unnamed tributary (Jonathan creek RM 13.74)		+							+	+		+		
Painter creek (Jonathan creek RM 16.88)		+							+	+		+		
Unnamed tributary (Jonathan creek RM 19.47)		+							+	+		+		
Valley run	*		+						+	+		+		
Berry run	*		*						*	*		*		
Bowling Green creek		+							+	+		+		
Morrison run						o			+	+		+	Acid mine drainage.	
Porter run						o			+	+		+	Acid mine drainage.	

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	
Elk run							o	+	+		+		Acid mine drainage.
Riders run							o	+	+		+		Acid mine drainage.
Burley run							o	+	+		+		Acid mine drainage.
Snake run							o	+	+		+		Acid mine drainage.
Black fork - headwaters to south Morgan county line (RM 2.8)		+							+	+		+	
- at RM 4.69		+						o	+	+		+	PWS intake - Crooksville
- RM 2.8 to mouth							+		+	+		+	Acid mine drainage.
Dry run - at RM 2.23							Δ	o	*	*		*	Acid mine drainage. PWS intake - Crooksville.
- all other segments							Δ		*	*		*	Acid mine drainage.
Ogg creek - headwaters to former Jones lake outlet (RM 1.4)		+							+	+		+	
- RM 1.4 to mouth				+					+	+		+	WAP ecoregion - mine affected
McLuney creek							o	+	+		+		Acid mine drainage.
Bear creek							o	+	+		+		Acid mine drainage.

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
  Unnamed tributary (Moxahala creek RM 22.56)  Andrews run (Moxahala creek RM 24.79)				+						+	+		+	WAP ecoregion - mine affected
							+		+	+			+	Acid mine drainage.

SRW = state resource water; WWH = warmwater habitat; EWH = exceptional warmwater habitat; MWH = modified warmwater habitat; SSH = seasonal salmonid habitat; CWH = coldwater habitat; LRW = limited resource water; PWS = public water supply; AWS = agricultural water supply; IWS = industrial water supply; BW = bathing water; PCR = primary contact recreation; SCR = secondary contact recreation.

\* Unverified beneficial use designation based on 1978 Water Quality Standards (WQS).

+ Verified beneficial use designation based on the results of a biological field assessment performed by the Ohio EPA.

Δ - Recommended beneficial use designation based on the results of these investigations.

Table 2. Aquatic life use attainment status for stations sampled in the Moxahala Creek watershed. 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 biological communities. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat of the stream to support a biotic community. The Moxahala Creek watershed is located within the Western Allegheny Plateau (WAP) ecoregion. If biological impairment has occurred, the cause(s) and source(s) of the impairment are noted.

Location	Station (RM) <sup>a</sup>	DRAIN. (mi <sup>2</sup> )	IBI	MIwb <sup>b</sup>	ICI <sup>c</sup>	QHEI	Status <sup>d</sup>	Causes	Sources
<b>Twomile Run (17-317-000) (2008) WWH (Existing)</b>									
State Route 345	300567 (0.1)	0.65 <sup>H</sup>	<u>20</u> *	N/A	G	50.0	<b>NON</b>		
<b>Dry Run (17-309-000) (2014) LWH (Existing)/LRW Recommended</b>									
Rosefarm Road	302602 (0.14)	3.0 <sup>H</sup>	<u>12</u> *	N/A	<u>VP</u> *	74.5	<b>NON</b>	Bottom Deposits	Acid Mine Drainage

Biological Criteria Western Allegheny Plateau Ecoregion			
Index – Site Type	EWH	WWH	LRW
IBI – Headwaters	50	44	18
ICI	46	36	8

a - River Mile (RM) represents the Point of Record (POR) for the station, not the actual sampling RM.

B - MIwb is not applicable to headwater streams with drainage areas  $\leq 20$  mi<sup>2</sup>.

c - A narrative 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

d - Attainment is given for the recommended status when a change is recommended.

ns - Nonsignificant departure from biocriteria ( $\leq 4$  IBI or ICI units, or  $\leq 0.5$  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 and would automatically place a site into non-attainment.

H - Headwater site; NA -not applicable.

