Wills Creek and selected tributaries Aquatic Life Use Designations

Guernsey, Coshocton, Muskingum, Noble and Monroe Counties, Ohio

Division of Surface Water
Ecological Assessment Section
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INTRODUCTION

In 2014 Ohio EPA evaluated water quality in the Wills Creek watershed at 82 stream locations where physical, chemical, and biological data was obtained. Wills Creek is haunted by a coal mining heritage that continues to preclude better water quality a century after those operations ceased. Geologically, Wills Creek is a mature low gradient stream which was inundated with lacustrine silt during glaciation. Three dams impound an extensive portion of the watershed. This hydrological alteration is detrimental to stream health. In compliance with the federal Clean Water Act (CWA), 9 of 13 (69%) Wills Creek mainstem and 42 of 69 (61%) tributary sample locations met the fishable goal (Figure 1, Tables 1-6).

AQUATIC LIFE USE DESIGNATIONS

The aquatic life use status of many streams in the Wills Creek watershed was evaluated by Ohio EPA in 1984, 1987, 1994, 1999. Warmwater habitat (WWH) was confirmed as the appropriate designation for Wills Creek, Buffalo Fork and tributaries, Chapman Run, Leatherwood Creek, Crooked Creek, and Salt Fork and tributaries (Table 3). Table 3 denotes these streams with a plus sign (+) in the WWH column of the Aquatic Life Habitat category of the beneficial use designations table.

Seneca Fork and tributaries, Sarchett Run, Indian Camp Run, Birds Run and tributaries, Twomile Run, Bacon Run and tributaries, and several small Wills Creek tributaries appear in Table 3 with an asterisk (*/+) in the WWH column. These streams were assigned the WWH aquatic life use in 1978 when Ohio's Water Quality Standards (WQS) were written. Lacking any contrary information, it was assumed these streams should be capable of sustaining typical biological conditions. The 2014 survey confirmed this assumption for most of the so listed streams in the Wills Creek watershed.

In addition to an asterisk, another group of Wills Creek basin streams were previously listed in the Ohio WQS as *L in the WWH column. Buffalo Creek and tributaries, Shannon Run, Crooked Creek tributaries, and White Eyes Creek with its Brush Run were previously designated as Limited Warmwater Habitat (LWH) in the 1978 WQS. Information available then suggested these streams were not capable of sustaining typical biological conditions. The 2014 survey specifically evaluated Wills Creek basin streams with the LWH designation to provide an appropriate aquatic life use recommendation.

RECOMMENDATIONS

Within a dendritic watershed, small tributaries form larger streams and aquatic life varies with stream size. Opportunities to migrate within the stream network are important for some species to reproduce, forage, avoid stress, etc. Impoundments in the Wills Creek basin isolate

Fair conditions are common in the Wills Creek watershed. Water flowing from old coal mines and spoil piles is polluted today. Many streams are choked with mining sediment. Unhealthy orange and red colored streams fail to meet Federal Clean Water Act goals.

Figure 1. The Wills Creek basin showing 2014 stream conditions.

Table 1. Attainment status of the existing or ***recommended*** aquatic life uses for the Wills Creek basin, Western Allegheny Plateau (WAP) ecoregion, 2014. See Ohio WQS Table 24-1 (http://www.epa.state.oh.us/dsw/rules/3745_1.aspx#use%20designations) for current beneficial use designations. Symbology and ecoregional biocriteria follow.

RM	IBI/ MIwb[a]	ICI[b]	Status	QHEI	Cause	Source	Location
Wills Creek WWH							
Trail Run-Wills Creek 05040005-02-07							
75.9	43/ 8.7	38	Full	47.5			Ust Byesville
68.1	37[ns]/ 8.3[ns]	14*	Partial	51.8	Sedimentation	Coal Mining	Dst Byesville
Sarchett Run-Wills Creek 05040005-05-04							
64.1	39[ns]/ 8.9	36	Full	63.0			Ust Cambridge
57.4	38[ns]/8.9	46	Full	69.0			Dst Cambridge
Wolf Run-Wills Creek 05040005-05-08							
46.6	30*/8.3[ns]	46	Partial	60.0	Sedimentation	Coal Mining	TR 365
37.7	35*/9.0	44	Partial	68.5	Sedimentation	Coal Mining	SR 541
31.6	43/ 9.6	42	Full	59.8			SR 658
Twomile Run-Wills Creek 05040005-06-02							
27.0	37[ns]/ 8.8	VG	Full	74.5			SR 541
23.2	33*/ 8.1[ns]	Good	Partial	49.5	Sedimentation	Coal Mining	CR 106
Wills Creek Dam-Wills Creek 05040005-06-04							
18.5	36[ns]/ 8.5[ns]	MG[ns]	Full	50.0			Plainfield
10.9	35/ 8.5	26	NA	56.0	Reservoir site		SR 83
Mouth Wills Creek 05040005-06-05							
7.0	38[ns]/ 11.1	34[ns]	Full	78.5			Dst Dam
5.3	45/ 10.9	38	Full	75.8			Wills Creek
3.1	42/ 10.0	VG	Full	59.3			Dst Coal Wash
Buffalo Creek *WWH recommended*							
South Fork Buffalo Creek 05040005-02-03							
11.0	36*	Except.	Partial	41.0	Sedimentation	Coal Mining	Sarahsville
North Fork Buffalo Creek 05040005-02-04							
9.2	44/ 9.0	48	Full	57.5			TR 134
5.4	38*/ 9.0	VG	Partial	56.5	Sedimentation	Coal Mining	TR 109
0.1	42[ns]/ 8.0[ns]	44	Full	49.0			SR 146
South Fork Buffalo Creek *WWH recommended*							
South Fork Buffalo Creek 05040005-02-03							
2.9	34*	VG	Partial	49.8	Sedimentation	Coal Mining	Adj SR 146
0.5	40[ns]	Good	Full	60.3			SR 285
Little Buffalo Creek *WWH recommended*							
0.1	42[ns]	MG[ns]	Full	50.0			Adj SR 147
North Fork Buffalo Creek *MWH mine affected recommended*							
North Fork Buffalo Creek 05040005-02-04							
0.7	30*	Good	Full	29.5			CR 37

Table 1 continued.

RM	IBI/ MIwb[a]	ICI[b]	Status	QHEI	Cause	Source	Location
Buffalo Fork WWH							
Headwaters Collins Fork 05040005-02-02							
6.1	44/ 7.5*	32[ns]	Partial	45.5	Conductivity TDS	Coal Mining	Cumberland
Crane Run-Buffalo Fork 05040005-02-05							
2.2	44/ 7.7*	MG[ns]	Partial	48.0	Conductivity TDS	Coal Mining	Adj SR 146
0.2	42[ns]/ 7.5*	34[ns]	Partial	49.0	Conductivity TDS	Coal Mining	Ust SR 821
Miller Creek WWH							
Headwaters Collins Fork 05040005-02-02							
0.2	40[ns]	MG[ns]	Full	47.0			From SR 146
Collins Fork WWH							
0.2	46/ 7.7*	34[ns]	Partial	58.0	Conductivity TDS	Coal Mining	SR 83
Rannells Creek WWH							
3.1	32*	Fair*	NON	40.0	Conductivity TDS	Coal Mining	From SR 83
Yoker Creek WWH							
Yoker Creek 05040005-02-01							
0.3	47/ 8.4	48	Full	63.0			TR 127
Seneca Fork WWH							
Headwaters Seneca Fork 05040005-01-01							
24.8	46	Except.	Full	75.5			SR 379
Opossum Run Seneca Fork 05040005-01-05							
7.4	32*/ 8.9	Except.	Partial	51.3	Flow alteration	Impoundment	Senecaville
2.1	35*/ 7.9[ns]	VG	Partial	49.0	Flow alteration	Impoundment	CR 25
South Fork Seneca Fork WWH							
Glady Run-Seneca Fork 05040005-01-03							
4.8	36*/ 8.3	Fair*	Partial	57.0	Sedimentation	Coal Mining	TR 199
Skin Creek (North Fork Seneca Fork) ***EWH recommended***							
Headwaters Seneca Fork 05040005-01-01							
1.6	48	Except.	Full	83.5			TR 636
Glady Run WWH							
Glady Run-Seneca Fork 05040005-01-03							
0.9	46	VG	Full	56.3			Adj CR 5A
Beaver Creek WWH							
Beaver Creek 05040005-01-02							
2.4	34*	Good	Partial	56.5	Altered habitat	Impoundment	TR 189
Opossum Run WWH							
Opossum Run Seneca Fork 05040005-01-05							
0.5	22*	MG[ns]	NON	44.0	Flow alteration	Unknown	CR 25
Chapman Run WWH							
Chapman Run 05040005-02-06							
5.7	40[ns]	Good	Full	73.5			From TR 3423
0.9	36*	MG[ns]	Partial	44.5	Sedimentation	Coal Mining	Dst Shieldalloy

Table 1 continued.

RM	IBI/ MIwb[a]	ICI[b]	Status	QHEI	Cause	Source	Location
Leatherwood Creek WWH							
Headwaters Leatherwood Creek 05040005-03-01							
23.8	48	Good	Full	66.5			TR 949
20.7	49/ 8.8	38	Full	52.8			Salesville
Hawkins Run-Leatherwood Creek 05040005-03-02							
9.8	51/ 9.5	VG	Full	64.0			CR 546
6.3	47/ 8.7	Good	Full	46.0			TR 452
3.4	46/ 9.3	MG[ns]	Full	40.5			Cambridge
Shannon Run *WWH recommended*							
Headwaters Leatherwood Creek 05040005-03-01							
0.1	38*	MG[ns]	Partial	68.0	Sedimentation	Cattle pasture	TR 497
Infirmary Run WWH							
Hawkins Run-Leatherwood Creek 05040005-03-02							
0.4	42[ns]	Good	Full	62.5			Lore City
Crooked Creek WWH							
Headwaters Crooked Creek 05040005-05-02							
13.3	46	Good	Full	60.3			CR 14
Peters Creek-Crooked Creek 05040005-05-03							
11.2	39*/ 8.0[ns]	48	Partial	49.0	Sedimentation	Coal Mining	CR 143
6.3	42[ns]/ 8.5	36	Full	62.5			CR 340
Dare Run (dry in 2014, fish sampled in 2015) *MWH channelized habitat recommended*							
Headwaters Crooked Creek 05040005-05-02							
0.7	32*	VP*	NON	38.0	Altered habitat	channelized	CR 44
North Crooked Creek *WWH recommended*							
North Crooked Creek 05040005-05-01							
3.7	48	VG	Full	63.5			New Concord
1.4	44	VG	Full	51.5			New Concord
Fox Creek *MWH mine affected recommended*							
0.96	34	Good	Full	53.3			US 40
Fox Creek *WWH recommended*							
0.70	48	V Good	Full	63.5			US 40
Peters Creek *WWH recommended*							
Peters Creek-Crooked Creek 05040005-05-03							
3.0	42[ns]	MG[ns]	Full	57.5			CR 416
0.3	48	VG	Full	65.3			US 40
Bobs Run *WWH recommended*							
0.2	44	VG	Full	55.0			CR 416
Jackson Run *MWH mine affected recommended*							
0.1	28*	MG[ns]	Full	45.5			US 40
Sarchett Run WWH							
Sarchett Run-Wills Creek 05040005-05-04							
1.6	40[ns]	VG	Full	59.0			TR 361

Table 1 continued.

RM	IBI/ MIwb[a]	ICI[b]	Status	QHEI	Cause	Source	Location
Salt Fork WWH							
Headwaters Salt Fork 05040005-04-02							
29.9	44	Except.	Full	65.0			CR 49
20.8	37*/ 7.6*	50	Partial	46.5	Altered habitat	Impoundment	CR 73
Beham Run-Salt Fork 05040005-04-06							
0.3	35*/ 8.6	VG	Partial	60.5	Ammonia	Impoundment	Adj CR 638
Brushy Fork WWH							
Brushy Fork 05040005-04-01							
3.4	40[ns]	Except.	Full	65.0			SR 285
Sugartree Fork WWH							
Salt Fork Lake-Sugartree Fork 05040005-04-05							
11.1	46	Except.	Full	77.0			TR 871
Turkey Run *EWH-CWH recommended*							
1.2	52	Except.	Full	75.5			TR 8730
Clear Fork WWH							
Clear Fork 05040005-04-03							
1.8	42[ns]	Except.	Full	74.5			TR 5880
Rocky Fork WWH							
Brushy Fork 05040005-04-01							
5.6	40[ns]	Except.	Full	59.0			TR 855
Indian Camp Run WWH							
Indian Camp Run 05040005-05-05							
3.9	44	VG	Full	74.5			SR 658
Wills Creek Tributary @ RM 34.43 *WWH recommended*							
Wolf Run-Wills Creek 05040005-05-08							
0.5	36*	MG[ns]	Partial	53.0	Sedimentation	Coal Mining	TR 820
Birds Run WWH							
Headwaters Birds Run 05040005-05-06							
4.3	46	VG	Full	57.8			CR 86
Johnson Fork-Birds Run 05040005-05-07							
0.2	32*/ 6.9*	46	Partial	47.5	Sedimentation	Coal Mining	SR 541
Johnson Fork WWH							
1.2	46	VG	Full	63.5			TR 385
Johnson Fork Tributary @ RM 1.04 *WWH recommended*							
0.2	38*	VG	Partial	51.5	Natural	Natural	TR 384
Twomile Run WWH							
Twomile Run-Wills Creek 05040005-06-02							
0.5	38*	VG	Partial	65.8	Sedimentation	Coal Mining	TR 108
Wills Creek Tributary @ RM 23.49 (Marlatt Run) *WWH recommended*							
0.4	42[ns]	Except.	Full	66.8			CR 106

Table 1 continued.

RM	IBI/ MIwb[a]	ICI[b]	Status	QHEI	Cause	Source	Location
			Bacon Run 05040005-06-01				
Center Creek WWH							
1.1	26*	Fair	NON	63.3	Sedimentation	Coal mining	SR 93
Bacon Run WWH							
0.1	36	Poor	NON	55.0	Sedimentation	Coal mining	CR 410
White Eyes Creek *WWH recommended*							
			White Eyes Creek 05040005-06-03				
11.9	50	Except.	Full	61.8			TR 103
10.1	42[ns]	MG[ns]	Full	44.8			TR 339
4.8	45/ 8.6	VG	Full	54.0			TR 173
0.1	42[ns]/ 8.4	Good	Full	58.5			TR 145
Brush Run *WWH recommended*							
0.4	34*	Good	Partial	61.0	Sedimentation	Coal Mining	TR 339
White Eyes Creek Tributary @ RM 4.50 *WWH recommended*							
0.4	40[ns]	MG[ns]	Full	53.5			TR 173

***** Significant departure from ecoregion biocriterion; poor and very poor results are underlined.

ns Nonsignificant departure from biocriterion (≤4 IBI or ICI units; ≤0.5 MIwb units).

a/[B] The MIwb (Modified Index of well-being) is not applicable to headwater sites (<20mi^2). Boat criteria *only* apply to Wills Creek.

b Narrative evaluation used in lieu of ICI (Excpt=Exceptional; Good; MG=Marginally Good; Fair; L Fair=Low Fair; Poor; VP=Very Poor).

Table 2 Narrative ranges, **WWH,** and MWH biocriteria for the Wills Creek study area, Western Allegheny Plateau (WAP) ecoregion. Exceptional (EWH biocriteria), very good (EWH nonsignificant departure), poor and very poor evaluations are common statewide.

Headwater	Wading		Boat		ICI	Narrative Evaluation
IBI	IBI	MIwb	IBI	MIwb		
50-60	50-60	≥9.4	48-60	≥9.6	46-60	Exceptional
46-49	46-49	8.9-9.3	44-47	9.1-9.5	42-44	Very Good
			Western Allegheny Plateau			
44-45	**44**-45	**40**-43	**8.4**-8.8	**8.6**-9.0	**36**-40	Good
40-43	40-43	36-39	7.9-8.3	8.1-8.5	32-34	Marginally Good
28-39	28-39	26-35	5.9-7.8	6.4-8.0	14-30	Fair
18-27	18-27	4.5-5.8	16-25	5.0-6.3	8-12	Poor
12-17	12-17	0-4.4	12-15	0-4.9	≤6	Very Poor
			Modified Warmwater Habitat (MWH)			
24	24	6.2	24	5.8	22	Channel Modified
24	24	6.2	24	5.5	30	Mine Affected

many tributary streams and the entire basin is isolated within the larger Muskingum River watershed. Circumspectly, Turkey Run and Skin Creek are unique streams in the Wills Creek basin. Redside dace inhabit streams with especially good water quality. The fish dominates others in the small, deep, perennial headwater stream pools where it typically resides. Such streams often have groundwater influences which help ameliorate external loading and are conducive to other cold water indicative species. Turkey Run was home to three cold water fish species and five cold water macroinvertebrate taxa in 2014. The presence of redside dace in Turkey Run has been known since at least 1992. It remains the only stream in the Wills Creek basin where this fish is known to exist.

Habitat qualities in Skin Creek (QHEI=82) were the best in the basin in the 2014 study. This headwater stream exhibits all the traits of a redside dace environment except the actual fish. Onecold water fish species and three cold water macroinvertebrate taxa were present. However, with 65 total taxa including 31 EPT taxa (these mayfly-Ephemeroptera, stonefly-Plecoptera, and caddisfly-Trichoptera insect orders are generally considered indicative of high quality resources) and 25 sensitive taxa, the Skin Creek macroinvertebrate community was notably diverse.

Turkey Run and Skin Creek exist upstream from Salt Fork and Seneca Fork lakes, respectively. These isolated streams warrant recognition for their uncommon biological communities. Turkey Run with both an abundance of cold water species and exceptional biological communities, is recommended for the Exceptional Warmwater (EWH) – Coldwater (CWH) aquatic habitat life use. Skin Creek, with an especially rich macroinvertebrate fauna, is recommended for the EWH aquatic life use.

Aside from Turkey Run and Skin Creek, the 2014 Wills Creek watershed survey reconfirmed the appropriateness of all previously assessed (+) WWH aquatic life use designated streams (Table 1). With exceptions for some small named streams that were beyond the scope of the 2014 study, all presently unverified (*) WWH aquatic life use designations in the Wills Creek basin are verified to be appropriate and resident aquatic communities should be capable of achieving relevant biocriteria. Among the subset of currently listed (*L) Limited WWH aquatic life use designated streams, North Fork Buffalo Creek, Fox Creek upstream from US 22 (RM 0.9), and Jackson Run are recommended for the mine affected Modified water habitat (MWH) while Dare Run is recommended for the channelized MWH use. All other presently denoted LWH streams or stream segments in the Wills Creek watershed are deemed capable of supporting WWH aquatic life use and should be designated accordingly.

Little Buffalo Creek, a tributary to the South Fork Buffalo Creek, Wills Creek tributaries with confluences at RM 34.43 and RM 23.49, a tributary to Johnson Fork at RM 1.04, and a tributary to White Eyes Creek at RM 4.5 were also evaluated in 2014. These Ohio WQS unlisted streams are all recommended for inclusion as WWH designated waters (Table 3).

All streams in the study area should retain or be assigned the Primary Contact Recreation (PCR), Agricultural Water Supply (AWS) and Industrial Water Supply (IWS) uses.

Physical Habitat for Aquatic Life

Stream habitat conditions were assessed at 82 Wills Creek basin fish sampling sites in 2014 (Table 4). Based on the functional ability to support fish, each site's substrate, instream cover, and channel characteristics were graded and composited using the Qualitative Habitat Evaluation Index (QHEI, Rankin 1989). Generally, good QHEI scores above 60 are typical of habitat conditions associated with WWH aquatic communities. Poor QHEI scores less than 45 are consistent with MWH aquatic life use, while very good QHEI values above 75 are correlated with EWH aquatic life use. QHEI scores are most meaningful when considered in aggregate groups. For instance, an average of several QHEI's from a river reach or the trend among many small streams in close proximity is more informative than relying on any single location QHEI score. It's unlikely for any site with particularly good or poor habitat to exert the same extreme influences on its resident aquatic community. Instead, aquatic assemblages at unique habitat locations tend to reflect the wider ambient condition.

Macroinvertebrate Community

Macroinvertebrate communities at 77 of 82 (94%) Wills Creek study area sites achieved the relevant biocriterion (Table 5). The community performance was evaluated as exceptional at 20 stations, very good at 23, good at 17, marginally good at 17, fair at 3, poor at 1, and very poor at 1 station. Twelve uncommonly collected sensitive taxa and 13 species of freshwater mussels, including one State listed threatened species, were collected in the Wills Creek watershed in 2014.

Fish Community

Fish communities in the Wills Creek watershed were evaluated at 82 sites in 2014 (Table 6). Marginally good fish assemblages were typical at 11 Wills Creek locations upstream from the USACE dam (IBI $\bar{x}$=37, MIwb $\bar{x}$=8.7,). Very good performance was recorded at three Wills Creek sites downstream from the dam (IBI $\bar{x}$=42, MIwb $\bar{x}$=10.7). The Leatherwood Creek fish assemblage was richer than other basin tributaries (32 species at RM 6.3).

Table 3. Waterbody use designation recommendations for the Wills Creek watershed. Designations based on the 1978 and 1985 water quality standards appear as asterisks (*). Streams **not** assessed during the 2014 survey are in light blue font. The following symbol: */+ indicates a confirmation of an existing use and a triangle (▲) denotes a new recommended use based on the findings of this report.

Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
| | | | | | | |														
Wills creek - at RM 66.7		+						o	+	+		+		PWS intake - Cambridge
- all other segments		+							+	+		+		
Big run		*							*	*		*		
Brelsford run		*							*	*		*		
White Eyes creek		▲							*/+	*/+		*/+		
Unnamed tributary (White eyes creek RM 4.50)		▲							▲	▲		▲		
Brush run		▲							*/+	*/+		*/+		
Bacon run		*/+							*/+	*/+		*/+		
Bone run		*							*	*		*		
Center creek		*/+							*/+	*/+		*/+		
Marlatt run (Wills creek RM 23.49)		▲							▲	▲		▲		
Twomile run		*/+							*/+	*/+		*/+		
Birds run		*/+							*/+	*/+		*/+		
Johnson fork		*/+							*/+	*/+		*/+		
Unnamed tributary (Johnson fork RM 1.04)		▲							▲	▲		▲		
Postboy creek		*							*	*		*		
Unnamed tributary (Wills creek RM 34.43)		▲							▲	▲		▲		

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Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
| | | | | | | |														
Indian Camp run		*/+							*/+	*/+		*/+		
Dry run		*							*	*		*		
Wolf run		*							*	*		*		
Brush run		*							*	*		*		
Salt fork		+							+	+		+		
Sugartree fork		+							+	+		+		
Rocky fork		+							+	+		+		
Yellow Water creek		+							+	+		+		
Clear fork		+							+	+		+		
Turkey run			▲			▲			+	+		+		
Beeham run		+							+	+		+		
Brushy fork		+							+	+		+		
Christian creek		+							+	+		+		
Coon run		+							+	+		+		
Sarchett run		*/+							*/+	*/+		*/+		
Crooked creek		+							+	+		*/+		
Jackson run				▲					*/+	*/+		*/+		WAP ecoregion – mine affected

Table 3. Waterbody use designation recommendations for the Wills Creek watershed. Designations based on the 1978 and 1985 water quality standards appear as asterisks (*). Streams **not** assessed during the 2014 survey are in light blue font. The following symbol: */+ indicates a confirmation of an existing use and a triangle (▲) denotes a new recommended use based on the findings of this report.

Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
| | | | | | | |														
Peters creek		▲							*/+	*/+		*/+		
Bobs run		▲							*/+	*/+		*/+		
North Crooked creek - at RM 4.46		▲						o	*/+	*/+		*/+		PWS intake - New Concord
- all other segments		▲							*/+	*/+		*/+		
Fox creek – headwaters to US route 22 (RM 0.9)				▲					*/+	*/+		*/+		WAP ecoregion – mine affected
- US route 22 (RM 0.9) to the mouth		▲							*/+	*/+		*/+		
Unnamed tributary (Fox creek RM 5.56)								o						PWS intake - New Concord
Dare run				▲					*/+	*/+		*/+		WAP ecoregion – channel modification
Leatherwood creek - at RM 22.36		+						o	+	+		*/+		PWS intake - Quaker city (formerly)
- all other segments		+							+	+		*/+		
Mud run		*							*	*		*		
Hawkins run		*							*	*		*		
Infirmary run		*/+							*/+	*/+		*/+		
Shannon run		▲							*/+	*/+		*/+		
Chapman run		+							+	+		+		
Trail run		*							*	*		*		

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Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
| | | | | | | |														
Seneca fork		*/+							*/+	*/+		*/+		
Soggy run		*							*	*		*		
Opossum run		*/+							*/+	*/+		*/+		
Crooked creek		*							*	*		*		
Mud run		*							*	*		*		
Depue run		*							*	*		*		
Beaver creek		*/+							*/+	*/+		*/+		
Yoker creek		*							*	*		*		
Glady run		*/+							*/+	*/+		*/+		
South fork		*/+							*/+	*/+		*/+		
North fork (Skin creek)			▲						*/+	*/+		*/+		
Mud run		*							*	*		*		
Bishop run		*							*	*		*		
Paynes fork		*							*	*		*		
Rock creek		*							*	*		*		
Buffalo fork		+							*/+	*/+		*/+		
Crane run		+							*	*		*		

Table 3. Waterbody use designation recommendations for the Wills Creek watershed. Designations based on the 1978 and 1985 water quality standards appear as asterisks (*). Streams **not** assessed during the 2014 survey are in light blue font. The following symbol: */+ indicates a confirmation of an existing use and a triangle (▲) denotes a new recommended use based on the findings of this report.

Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
| | | | | | | |														
Yoker creek		+							*/+	*/+		*/+		
Mannon run		+							*	*		*		
Flat run		+							*	*		*		
McKee run		+							*	*		*		
Bee run		+							*	*		*		
Sims run		+							*	*		*		
Cumberland tributary							+		+	+			+	Small drainageway maintenance
Collins fork		+							*/+	*/+		*/+		
Miller creek		+							*/+	*/+		*/+		
Mays fork		+							*	*		*		
Rannells creek		+							*/+	*/+		*/+		
Buffalo creek		▲							*/+	*/+		*/+		
North fork				▲					*/+	*/+		*/+		WAP ecoregion – mine affected
South fork		▲							*/+	*/+		*/+		
Little Buffalo creek		▲							*/+	*/+		*/+		

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.

Table 4. Qualitative Habitat Evaluation Index (QHEI) matrix with warmwater habitat (WWH) and modified warmwater habitat (MWH) attribute totals and ratios for the Wills Creek study area, 2014.

Key QHEI types		WWH Attributes											MWH Attributes																		
													High Influence						Moderate Influence												
RM	**QHEI**	No Channelization or Recovered	Boulder/ Cobble/ Gravel Substrates	Silt Free Substrates	Good/ Excellent Development	Moderate/ High Sinuousity	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	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
Wills Creek																																	
76.2	**47.5**	□	□				□			□		4				◊		1		○			○	○			○	○		○	6	0.40	1.60
69.3	**51.8**	□	□			□	□			□		5						0		○			○				○	○		○	5	0.17	1.17
63.5	**63.0**	□	□				□			□	□	5						0		○			○	○			○	○			5	0.17	1.17
57.3	**69.0**	□	□		□	□	□	□		□		7						0		○			○	○				○	○		5	0.13	0.88
46.6	**60.0**	□	□			□	□			□		4						0		○			○	○			○	○		○	6	0.20	1.60
37.8	**68.5**	□	□			□	□	□		□	□	7						0		○			○					○	○		4	0.13	0.75
31.6	**59.8**	□	□				□			□		4						0		○			○	○			○	○		○	6	0.20	1.60
27.0	**74.5**	□	□		□	□	□	□		□	□	8						0		○								○			2	0.11	0.44
23.2	**49.5**	□	□				□			□		4		◊				1		○			○	○			○	○		○	6	0.40	1.60
18.3	**50.0**	□	□				□			□		4		◊				1		○			○	○			○	○	○		6	0.40	1.60
10.9	**56.0**	□	□				□			□		4		◊				1		○			○	○			○	○		○	6	0.40	1.60
6.9	**78.5**	□	□		□		□	□	□	□	□	8						0		○				○				○			3	0.11	0.56
5.5	**75.8**	□	□		□	□	□	□		□	□	8						0		○								○			2	0.11	0.44
3.1	**59.3**	□	□				□			□		4						0		○			○	○			○	○		○	6	0.20	1.60
Buffalo Creek																																	
11.1	**41.0**						□			□		2			◊	◊		2	○	○			○				○	○		○	6	1.33	2.67
9.2	**57.5**	□	□				□			□		4						0		○			○	○			○	○		○	6	0.20	1.40
5.4	**56.5**	□	□		□	□	□			□		6						0		○			○				○	○	○		5	0.14	0.86
0.2	**49.0**	□	□			□	□			□		5						0		○			○				○	○	○		5	0.17	1.00
South Fork Buffalo Creek																																	
2.1	**49.8**	□					□			□		3				◊		1		○			○	○			○	○		○	6	0.50	2.00
0.5	**60.3**	□				□	□			□		4						0		○			○				○	○		○	5	0.20	1.40
Little Buffalo Creek																																	
0.3	**50.0**	□	□							□		3				◊		1		○			○	○			○	○		○	6	0.50	1.75
North Fork Buffalo Creek																																	
0.7	**29.5**											0				◊	◊	2	○	○			○	○			○	○		○	7	4.00	8.00
Buffalo Fork																																	
6.1	**45.5**									□		1	◊	◊	◊	◊		4		○			○				○	○	○		5	2.50	3.50
2.2	**48.0**	□					□			□		3		◊				1		○			○	○			○	○	○		6	0.50	2.00

Table 4 continued.

Key QHEI types		WWH Attributes											MWH Attributes																		
													High Influence						Moderate Influence												
RM	**QHEI**	No Channelization or Recovered	Boulder/ Cobble/ Gravel Substrates	Silt Free Substrates	Good/ Excellent Development	Moderate/ High Sinuousity	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	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
Buffalo Fork (continued)																																	
0.2	**49.0**	□	□		□	□	□	□		□		7		◊				1		○			○	○				○	○		5	0.25	0.75
Miller Creek																																	
0.2	**47.0**	□	□				□			□		4		◊				1		○			○	○		○	○	○	○		7	0.40	1.60
Collins Fork																																	
0.2	**58.0**						□			□		2		◊				1		○		○					○	○	○		5	0.14	0.86
Rannells Creek																																	
1.0	**40.0**	□					□			□		3		◊				1		○			○	○		○	○	○	○		7	0.50	2.00
Yorker Creek																																	
0.4	**63.0**	□	□		□		□			□	□	6						0		○				○				○	○		4	0.14	0.86
Seneca Fork																																	
24.8	**75.5**	□	□		□	□	□	□	□	□		8						0		○		○	○					○	○		5	0.11	0.78
7.3	**51.3**	□				□	□			□		4		◊				1		○			○				○	○		○	5	0.40	1.40
2.1	**49.0**	□				□	□			□		4						0		○			○				○	○	○		5	0.20	1.20
South Fork Seneca Fork																																	
3.3	**57.0**		□		□		□			□		4				◊		1	○	○			○	○			○	○	○		7	0.60	1.60
Skin Creek (North Fork Seneca Fork)																																	
1.7	**83.5**	□	□		□	□	□		□	□	□	8						0		○							○	○			3	0.11	0.44
Glady Run																																	
0.9	**56.3**	□				□	□			□		4				◊		1	○	○		○	○	○			○	○	○		8	0.60	2.00
Beaver Creek																																	
2.4	**56.5**		□				□			□		3						0	○	○			○	○			○	○	○		7	0.50	2.00
Opossum Run																																	
0.7	**44.0**	□				□				□		3		◊		◊		2		○			○				○	○		○	5	0.75	1.50
Chapman Run																																	
5.2	**73.5**	□	□		□	□	□			□	□	7						0		○							○	○	○		4	0.13	0.63
0.9	**44.5**						□			□		2		◊				1	○	○			○	○			○	○		○	7	1.00	2.67
Leatherwood Creek																																	
23.8	**66.5**	□	□		□		□			□		5						0		○				○			○	○	○		5	0.17	1.00
20.7	**52.8**	□			□	□	□			□		5						0		○			○	○			○	○	○	○	7	0.17	1.50
9.8	**64.0**		□		□		□	□		□		5						0	○	○				○				○	○		5	0.33	1.17
6.3	**46.0**	□				□	□			□		4		◊				1		○			○				○	○		○	5	0.40	1.20
3.3	**40.5**									□		1		◊	◊	◊		3	○	○			○				○	○		○	6	2.50	3.50

Table 4 continued.

Key QHEI types		WWH Attributes											MWH Attributes																		
													High Influence						Moderate Influence												
RM	**QHEI**	No Channelization or Recovered	Boulder/ Cobble/ Gravel Substrates	Silt Free Substrates	Good/ Excellent Development	Moderate/ High Sinuousity	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	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
Shannon Run																																	
0.1	**68.0**	□	□		□	□	□			□		6						0		○							○	○	○		4	0.14	0.71
Infirmary Run																																	
0.5	**44.3**	□				□	□			□		4		◊				1		○		○	○			○	○	○	○		7	0.40	1.60
Crooked Creek																																	
13.3	**60.3**	□					□			□		4						0		○		○	○	○			○	○	○		7	0.20	1.80
11.2	**49.0**	□								□		2				◊		1		○		○	○	○		○	○	○	○		8	0.67	3.33
6.3	**62.5**	□			□	□	□	□		□		6						0		○								○	○		3	0.14	0.71
Dare Run (dry in 2014, evaluated in 2015)																																	
0.7	**38.0**	□				□				□		3		◊		◊		2		○			○			○	○	○	○		6	0.75	1.75
North Crooked Creek																																	
1.3	**51.5**	□	□		□		□			□		5				◊		1		○			○	○			○	○	○		6	0.33	1.17
Fox Creek																																	
1.0	**53.3**	□	□			□	□			□		5						0		○		○	○			○	○	○	○	○	8	0.17	1.67
0.7	**63.5**	□				□	□		□	□	□	6						0		○			○				○	○	○		5	0.14	1.00
Peters Creek																																	
3.0	**57.5**	□	□			□	□			□	□	6				◊		1		○			○			○	○	○		○	6	0.29	1.14
0.3	**65.3**		□				□			□	□	4				◊		1	○	○			○	○			○	○			6	0.60	1.60
Bobs Run																																	
0.1	**55.0**	□				□			□	□	□	5				◊		1				○	○			○	○			○	5	0.33	1.17
Jackson Run																																	
0.1	**45.5**	□	□						□			3				◊	◊	2		○			○	○			○	○		○	6	0.75	1.75
Sarchett Run																																	
1.6	**59.0**	□				□	□			□	□	5				◊		1		○		○	○			○	○	○			6	0.33	1.33
Salt Fork																																	
32.4	**65.0**	□	□		□	□	□			□		6		◊				1		○							○	○	○		4	0.29	0.71
20.8	**46.5**	□								□		2		◊		◊		2		○			○	○			○	○		○	6	1.00	2.33
0.2	**60.5**	□	□		□	□	□			□		6						0		○			○				○	○	○		5	0.14	0.86
Brushy Fork																																	
3.4	**65.0**	□	□		□	□	□			□		6				◊		1	○	○		○	○				○	○	○		7	0.43	1.29
Turkey Run																																	
1.2	**75.5**	□	□		□	□	□		□	□	□	8						0								○					1	0.11	0.22
Sugartree Fork																																	
11.1	**77.0**	□	□		□	□	□	□		□	□	8						0		○								○			2	0.11	0.44

Table 4 continued.

Key QHEI types		WWH Attributes											MWH Attributes																		
													High Influence						Moderate Influence												
RM	**QHEI**	No Channelization or Recovered	Boulder/ Cobble/ Gravel Substrates	Silt Free Substrates	Good/ Excellent Development	Moderate/ High Sinuousity	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	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
Clear Fork																																	
3.0	**74.5**	□			□	□	□		□	□	□	7						0									○				1	0.13	0.38
Rocky Fork																																	
5.6	**59.0**	□				□	□		□	□		5						0				○	○				○		○		4	0.17	1.00
Indian Camp Run																																	
3.9	**74.5**	□			□	□	□		□	□	□	7						0									○				1	0.13	0.38
Wills Creek Tributary @ RM 34.43																																	
0.5	**53.0**	□				□	□					3				◊	◊	2		○			○				○	○		○	5	0.75	1.75
Birds Run																																	
4.3	**57.8**					□			□	□	□	4				◊		1	○				○				○				3	0.60	1.00
0.2	**47.5**								□			1	◊		◊	◊	◊	4	○				○	○			○		○		5	2.50	3.50
Johnson Fork																																	
1.2	**63.5**	□	□		□	□	□			□		6						0		○			○			○	○	○		○	6	0.14	1.14
Johnson Fork Tributary @ RM 1.04																																	
0.2	**51.5**	□				□			□	□	□	5				◊		1					○			○	○			○	4	0.33	1.00
Twomile Run																																	
0.5	**65.8**	□	□			□	□		□	□	□	7				◊		1		○			○				○	○			4	0.25	0.75
Wills Creek Tributary @ RM 23.49 (Marlatt Run)																																	
0.4	**66.8**	□	□		□	□	□		□	□	□	8						0					○				○	○			3	0.11	0.56
Bacon Run																																	
0.0	**63.3**					□	□			□	□	4				◊		1					○				○				6	0.60	1.60
0.1	**55.0**	□				□				□		3				◊		1					○				○				4	0.50	1.50
White Eyes Creek																																	
11.9	**61.8**	□	□			□	□		□	□	□	7						0					○			○	○				3	0.13	0.63
10.2	**44.8**									□		1				◊		1	○	○			○	○			○	○		○	7	1.50	4.50
4.6	**54.0**	□			□	□	□			□		5						0		○			○				○	○	○		5	0.17	1.17
0.7	**58.5**	□			□	□	□			□		5						0		○			○				○	○	○		5	0.17	1.17
Brush Run																																	
0.6	**61.0**	□	□			□	□			□		5						0		○			○			○	○	○	○		6	0.17	1.17
White Eyes Creek Tributary @ RM 4.50																																	
0.4	**53.5**	□				□	□					3					◊	1		○			○				○	○	○		5	0.50	1.75

Table 5. Summary of macroinvertebrate data collected in the Wills Creek study area, 2014. Explanation of terms and symbology follows. Taxa numbers are from natural substrate (qualitative) sampling. If applicable, the second EPT and sensitive taxa values include those from artificial substrates (quantitative sampling). Organism density is reported by natural (Qual. Density) and if applicable, artificial substrates (HD). Coldwater taxa (CW) were present at 33 locations. Biocriteria and narrative ranges are in Table 2.

Stream RM	mi^2	Taxa	EPT	Sensitive Taxa	Qual. Density	HD	CW	ICI[a]	Narrative
Predominant natural substrate organisms (tolerance)									
Wills Creek									
75.9	280.0	40	16/ 19	10/ 12	Moderate	269	-	38	Good
heptageniid mayflies (F), midges (F)									
68.1	293.0	31	7/ 8	4/ 4	Low	47	-	14	Fair
midges (F), isopods (F)									
64.1	406.0	41	16/ 21	11/ 14	Moderate	612	-	36	Good
heptageniid mayflies (F), baetid mayflies (F,MI)									
57.4	472.0	44	18/ 20	14/16	High	933	-	46	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F,MI), heptageniid mayflies (F,MI)									
46.6	659.0	53	23/ 24	15/16	High	497	-	46	Exceptional
baetid mayflies (F,MI), heptageniid mayflies (F,MI)									
37.7	672.0	43	18/ 19	14/ 15	Moderate	1293	-	44	V Good
hydropsychid caddisflies (F,MI), baetid mayflies (F,MI)									
31.6	699.0	61	20/ 21	18/ 19	Moderate	454	-	42	V Good
hydropsychid caddisflies (F,MI), baetid mayflies (F,MI), heptageniid mayflies (F,MI)									
27.0	738.0	46	17	12	High	-	-	-	V Good
baetid mayflies (F,MI), hydropsychid caddisflies (F,MI), heptageniid mayflies (F,MI)									
23.2	749.0	50	14	10	Low	-	-	-	Good
midges (F), *Polycentropus* caddisflies (F)									
18.5	770.5	41	10	6	Low	-	-	-	M Good
midges (F), heptageniid mayflies (F)									
7.0	842.0	57	17/ 18	15/ 17	High	9675	-	34[ns]	M Good
hydropsychid caddisflies (F,MI), midges (F)									
5.3	849.0	62	19	21/ 21	High	4938	-	38	Good
hydropsychid caddisflies (MI,F), baetid mayflies (F,MI), *Neuroclipsis* caddisfly (MI)									
3.1	851.0	56	18	21	Moderate	-	-	-	V Good
heptageniid mayflies (F,MI), amphipoda scuds (F)									
Buffalo Creek									
11.0	5.7	68	20	14	Moderate	-	1	-	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F)									
9.2	21.2	62	22/ 23	17/ 19	High	619	-	48	Exceptional
hydropsychid caddisflies (F), baetid mayflies (F,MI), heptageniid mayflies (F,MI)									

Table 5 continued.

Stream	mi^2	Taxa	EPT	Sensitive Taxa	Qual. Density	HD	CW	ICI[a]	Narrative
RM Predominant natural substrate organisms (tolerance)									
Buffalo Creek (continued)									
5.4	35.9	54	18	16	Moderate	-	-	-	V Good
hydropsychid caddisflies (F), baetid mayflies (F,MI)									
0.1	49.9	48	13/ 19	11/ 14	Moderate	400	-	44	V Good
heptageniid mayflies (F,MI), midges (F,MI)									
South Fork Buffalo Creek									
2.9	5.0	74	17	15	Moderate	-	2	-	V Good
baetid mayflies(F,MI), hydropsychid caddisflies(F), stoneflies(F,MI)									
0.5	12.4	45	14	9	Moderate	-	-	-	Good
baetid mayflies (F,MI), hydropsychid mayflies (F)									
Little Buffalo Creek									
0.1	3.8	35	10	7	Low	-	-	-	M Good
hydropsychid caddisflies (F), baetid mayflies (F,MI)									
North Fork Buffalo Creek									
0.7	6.7	36	14	5	Moderate	-	-	-	Good
stoneflies (I,F), baetid mayflies (F,MI)									
Buffalo Fork									
6.1	33.6	30	8/ 8	4/ 5	Low	307	-	32^{ns}	M Good
hydropsychid caddisflies (F), elmid beetles (F), midges (F)									
2.2	67.0	41	11	6	Moderate	-	-	-	M Good
hydropsychid caddisflies (F)									
0.2	71.6	41	14/ 16	10/ 13	Moderate	285	-	34^{ns}	M Good
hydropsychid caddisflies (F), *Corydalus cornutus* fishfly (MI)									
Miller Creek									
0.2	11.9	40	10	3	Low	-	-	-	M Good
hydropsychid caddisflies (F)									
Collins Fork									
0.2	22.6	44	14/ 15	9/ 10	Moderate	-	1	34^{ns}	M Good
hydropsychid caddisflies (F)									
Rannells Creek									
1.1	5.5	47	8	3	High	-	2	-	Fair
black flies (F)									
Yoker Creek									
0.3	23.1	55	20/ 23	12/ 14	Moderate	472	-	48	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F)									
Seneca Fork									
24.8	17.7	58	23	16	High	-	1	-	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F), *Isonychia* mayflies (MI)									
7.4	127.0	51	19/ 20	13/ 14	Moderate	580	-	50	Exceptional
hydropsychid caddisflies (F,MI), baetid mayflies (F,MI), midges (F,MI)									

Table 5 continued.

Stream RM	mi²	Taxa	EPT	Sensitive Taxa	Qual. Density	HD	CW	ICI[a]	Narrative
Predominant natural substrate organisms (tolerance)									
Seneca Fork(continued)									
2.1	150.0	44	16/ 19	11/ 13	Moderate	503	-	44	V Good
heptageniid mayflies (F,MI), baetid mayflies (F,MI)									
South Fork Seneca Fork									
3.3	27.6	55	23/ 24	21/ 24	Moderate	357	2	50	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F)									
Skin Creek (North Fork Seneca Fork)									
1.6	4.9	65	31	25	High	-	3	-	Exceptional
baetid mayflies(F,MI), hydropsychid caddisflies(MI,F), stoneflies(MI)									
Glady Run									
0.9	8.3	58	20	13	High	-	1	-	V Good
hydropsychid caddisflies (F,MI), baetid mayflies (F,MI)									
Beaver Creek									
2.4	17.0	46	13	8	Moderate	-	1	-	Good
hydropsychid caddisflies (F), baetid mayflies (F), elmid beetles (F)									
Opossum Run									
0.6	12.4	61	11	7	Moderate	-	-	-	M Good
flatworms (F), *Caenis* mayflies (F), midges (F)									
Chapman Run									
5.7	6.3	53	15	9	Moderate	-	-	-	Good
heptageniid mayflies (F,MI), baetid mayflies (F,MI)									
0.9	16.7	35	12	7	Moderate	-	1	-	M Good
heptageniid mayflies (F), hydropsychid caddisflies (F)									
Leatherwood Creek									
23.8	17.8	43	14	8	Low	-	-	-	Good
hydropsychid caddisflies (F)									
20.7	29.5	44	14/ 17	8/ 9	Moderate	371	-	38	Good
hydropsychid caddisflies (F)									
9.8	68.5	48	18	19	Moderate	-	-	-	V Good
baetid mayflies (F,MI), hydropsychid caddisflies (F)									
6.3	82.6	45	17	9	Low	-	-	-	Good
heptageniid mayflies (F,MI), baetid mayflies (F,MI), baetid mayflies (F,MI)									
3.4	90.0	31	12	6	Moderate	-	1	-	M Good
heptageniid mayflies (F,MI), leptophlebiid mayflies (F), hydropsychid caddisflies (F)									
Shannon Run									
0.1	4.4	32	11	5	Low	-	1	-	M Good
hydropsychid caddisflies (F,MI)									
Infirmary Run									
0.4	7.2	54	13	6	Moderate	-	2	-	Good
hydropsychid caddisflies (F), Heptageniid mayflies (F)									

Table 5 continued.

Stream RM	mi²	Taxa	EPT	Sensitive Taxa	Qual. Density	HD	CW	ICI[a]	Narrative
Predominant natural substrate organisms (tolerance)									
Crooked Creek									
13.3	11.7	52	14	10	Moderate	-	1	-	Good
hydropsychid caddisflies (F), baetid mayflies (F),									
11.2	33.9	59	14/ 15	9/ 11	Moderate	790	-	48	Exceptional
baetid mayflies (F,MI), midges (F,MI)									
6.3	55.0	36	15/ 17	10/ 13	Moderate	268	-	36	Good
heptageniid mayflies (F), baetid mayflies (F,MI)									
Dare Run									
0.7	1.6	31	1	0	Low	-	-	-	V Poor
midges (T,VT), beetles (F)									
North Crooked Creek									
1.4	16.3	52	19	12	Moderate	-	1	-	V Good
baetid mayflies (F,MI), hydropsychid caddisflies (F), heptageniid mayflies (F)									
Fox Creek									
1.0	3.8	57	15	9	Moderate	-	1	-	Good
hydropsychid caddisflies (F), midges (F,MI), baetid mayflies (F,MI)									
0.7	7.8	55	17	9	Moderate	-	2	-	V Good
baetid mayflies (F,MI), hydropsychid caddisflies (F)									
Peters Creek									
3.0	3.4	33	11	5	Moderate	-	-	-	M Good
midges (F,MI), hydropsychid caddisflies (F), stoneflies (MI)									
0.3	10.4	58	16	13	Moderate	-	3	-	V Good
baetid mayflies(F,MI), stoneflies (F,MI)									
Bobs Run									
0.2	2.6	49	18	17	Moderate	-	3	-	V Good
hydropsychid caddisflies (F), heptageniid mayflies (F,MI), baetid mayflies (F,MI)									
Jackson Run									
0.6	1.6	63	11	5	Moderate	-	-	-	M Good
baetid mayflies (F, MI), hydropsychid caddisflies (F), stoneflies (MI)									
Sarchett Run									
1.6	7.1	53	20	16	High	-	3	-	V Good
baetid mayflies (F,MI), hydropsychid caddisflies (F)									
Salt Fork									
32.3	17.8	58	21	13	High	-	-	-	Exceptional
hydropsychid caddisflies (F), baetid mayflies (F,MI)									
20.8	45.0	40	15/ 19	7/ 10	Moderate	304	-	50	Exceptional
baetid mayflies (F,MI), heptageniid mayflies (F,MI)									
0.3	158.3	50	17		Moderate	-	-	-	V good
baetid mayflies (F,MI), blackflies (F)									

Table 5 continued.

Stream RM	mi²	Taxa	EPT	Sensitive Taxa	Qual. Density	HD	CW	ICI[a]	Narrative
Brushy Fork									
3.4	13.6	79	28	18	High	-	1	-	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F), heptageniid mayflies (F)									
Turkey Run									
1.2	2.2	53	24	23	High	-	5	-	Exceptional
stoneflies (F,MI), Leptophlebiid mayflies (MI), Philopotamid caddisflies (MI)									
Sugartree Fork									
11.1	15.4	75	27	24	Moderate	-	-	-	Exceptional
hydropsychid caddisflies (F,MI), baetid mayflies (F,MI), heptageniid mayflies (F,MI)									
Clear Fork									
1.8	13.7	59	22	19	Moderate	-	-	-	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F), midges (F,MI)									
Rocky Fork									
5.6	12.2	57	21	17	Moderate	-	2	-	Exceptional
hydropsychid caddisflies (F,MI), baetid mayflies (F,MI), midges (F,MI)									
Indian Camp Run									
3.9	11.2	43	17	14	High	-	2	-	V Good
hydropsychid caddisflies (F), baetid mayflies (F,MI), heptageniid mayflies (F,MI)									
Wills Creek Tributary @ RM 34.43									
2.4	1.1	46	17	17	Moderate	-	9		V Good
philopotamid caddisflies (MI), leptophlebiid mayflies (F)									
0.2	3.3	41	10	7	Low-Moderate	-	1	-	M Good
heptageniid mayflies (MI), leptophlebiid mayflies (F), blackflies (F), midges (F)									
Birds Run									
4.3	14.3	44	18	15	Moderate	-	-	-	V Good
hydropsychid caddisflies (F, MI), baetid mayflies (F,MI), heptageniid mayflies (F,MI)									
0.2	31.1	42	21/ 23	14/ 19	High	711	-	46	Exceptional
blackflies (F), baetid mayflies (F,MI), hydropsychid caddisflies (F)									
Johnson Fork									
1.20	8.6	53	18	14	High	-	2	-	V Good
hydropsychid caddisflies (F), baetid mayflies (F,MI), *Isonychia* mayflies (MI)									
Johnson Fork Tributary @ RM 1.04									
0.2	0.7	54	19	21	Moderate	-	13	-	V Good
philopotamid caddisflies (MI), tipulid craneflies (MI), midges									
Twomile Run									
0.5	2.6	47	16	11	Moderate	-	1	-	V Good
baetid mayflies (F,MI), hydropsychid caddisflies (F)									
Wills Creek Tributary @ RM 23.49 (Marlatt Run)									
0.4	7.1	67	25	19	High	-	5	-	Exceptional
baetid mayflies (F,MI), hydropsychid caddisflies (F), heptageniid mayflies (F)									

Table 5 continued.

Stream	mi^2	Taxa	EPT	Sensitive Taxa	Qual. Density	HD	CW	ICI[a]	Narrative
RM	Predominant natural substrate organisms (tolerance)								
Bacon Run									
1.1	14.9	15	3	0	Low	-	-	-	Poor
	blackflies (F), baetid mayflies (F)								
Center Creek (Bone Run)									
0.1	6.8	29	7	5	Low	-	-	-	Fair
	midges (F), baetid mayflies (F), blackflies (F)								
White Eyes Creek									
11.9	4.2	54	18	17	Moderate	-	6	-	Exceptional
	baetid mayflies (F,MI), hydropsychid caddisflies (F), stoneflies (MI,F)								
10.1	16.2	37	12	7	Low	-	-	-	M Good
	baetid mayflies (F,MI), hydropsychid caddisflies (F)								
4.8	35.4	49	19/ 22	11/ 15	Moderate	-	-	42	V Good
	hydrospychid caddisflies (F), baetid mayflies (F,MI)								
0.1	43.8	38	13/ 16	9/ 10	Low	-	-	36	Good
	midges (F)								
Brush Run									
0.4	7.3	43	12	10	Moderate	-	1	-	Good
	baetid mayflies (F,MI), hydropsychid caddisflies (f)								
White Eyes Creek Tributary @ RM 4.50									
0.4	2.7	36	11	6	Moderate	-	2	-	M Good
	baetid mayflies (MI), hydropsychid caddisflies (F)								

RM: River mile.

mi^2: Drainage area in square miles

EPT: Mayfly (Ephemeroptera), stonefly (Plecoptera), and caddisfly (Trichoptera) taxa richness based on natural substrate qualitative sampling.

Sensitive Taxa: Those taxa regarded as MI (moderately intolerant) or I (intolerant) of pollution.

HD: Hester-Dendy artificial substrates are used for quantitative sampling where density is expressed in organisms per square foot.

[a]ICI: Invertebrate Community Index values in parentheses are invalid due to insufficient current speed over the artificial substrates. The station evaluation is based on the qualitative sample narrative evaluation.

Tolerance categories: VT=very tolerant, T=tolerant, MT=moderately tolerant, F=facultative, MI=moderately intolerant, I=intolerant

Table 6. Summary of fish community data based on pulsed D.C. electrofishing samples collected in the Wills Creek study area, 2014. Total including non-native species is cumulative where multiple samples were obtained. Relative number or weight (kg) is normalized to 300 meter sampling distances for wading or 1000 meters for boatB sites. Weights are not recorded and the Modified Index of well being is not applicable at headwater locations. Biocriteria and narrative ranges are in Table 2. Other descriptions follow.

Stream RM	mi^2	Total Species	Relative Number/ less tolerants	Relative Weight	QHEI	MIwb	IBI	Narrative Evalutation
	Predominant species (percent of catch)							
Wills Creek								
75.9^{B}	280.0	20	238/ 208	139.1	47.5	8.7	43	Good
	golden redhorse (33%), silver redhorse (14%), spotfin shiner (13%)							
68.1^{B}	293.0	17	168/ 138	116.6	51.8	8.3^{ns}	37^{ns}	M Good
	golden redhorse (27%), common carp (15%), quillback & channel catfish (11%)							
64.1^{B}	406.0	28	219/ 177	137.2	63.0	8.9	39^{ns}	Good-M Good
	silver redhorse (13%), common carp (12%), golden redhorse (10%)							
57.4^{B}	472.0	25	342/ 277	147.2	69.0	8.9	38^{ns}	Good-M Good
	spotfin shiner (22%), bluntnose minnow & golden redhorse (11%)							
46.6^{B}	659.0	18	330/ 269	155.7	60.0	8.3^{ns}	30*	M Good-Fair
	spotfin shiner (40%), bluntnose minnow (10%), common carp (9%)							
37.7^{B}	672.0	19	417/ 350	190.3	68.5	9.0	35*	Good-Fair
	spotfin shiner (27%), bluegill sunfish (13%), common carp (8%)							
31.6^{B}	699.0	24	444/ 408	218.8	59.8	9.6	43	Except.-Good
	spotfin shiner (18%), silver redhorse (13%), golden redhorse & gizzard shad (11%)							
27.0^{B}	738.0	22	460/ 400	223.1	74.5	8.8	37^{ns}	Good-M Good
	spotfin shiner (29%), bluegill sunfish (17%), gizzard shad (10%)							
23.2^{B}	749.0	20	378/ 324	173.4	49.5	8.1^{ns}	33*	M Good-Fair
	bluegill sunfish (32%), spotfin shiner (20%), common carp & gizzard shad (12%)							
18.5^{B}	770.0	22	484/ 398	211.0	50.0	8.5^{ns}	36^{ns}	M Good
	bluegill sunfish (30%), common carp (14%), gizzard shad (13%), spotfin shiner (11%)							
10.9^{B}	830.0	25	1061/ 939	216.3	56.0	8.5^{ns}	35*	M Good-Fair
	bluegill sunfish (42%), gizzard shad (22%), common carp (7%)							
7.0^{B}	842.0	37	1311/ 1141	420.1	78.5	11.1	38^{ns}	Except.-M Good
	gizzard shad (36%), bluegill sunfish (9%), bluntnose minnow (6%)							
5.3^{B}	849.0	42	691/ 600	339.0	75.8	10.9	45	Except.-V Good
	gizzard shad (16%), silver redhorse (9%), channel catfish & spotted bass (8%)							
3.1^{B}	851.0	28	556/ 505	262.2	59.3	10.0	42	Except.-Good
	gizzard shad (16%), silver redhorse (15%), golden redhorse (9%)							

Table 6 continued.

Stream RM	mi²	Total Species	Relative Number/ less tolerants	Relative Weight	QHEI	MIwb	IBI	Narrative Evalutation
	Predominant species (percent of catch)							
Buffalo Creek								
11.0	5.7	15	1518/ 738	-	41.0	-	36*	Fair
	bluntnose minnow (26%), striped shiner (19%), creek chub (9%)							
9.2	21.2	20	1634/ 856	30.8	57.5	9.0	44	V Good-Good
	fantail darter (20%), creek chub (17%), bluntnose minnow (14%)							
5.4	35.9	28	1864/ 790	19.5	56.5	9.0	38*	V Good-Fair
	bluntnose minnow (46%), green sunfish (8%), redfin & striped shiner (7%)							
0.1	49.9	23	531/ 387	4.1	49.0	8.0^{ns}	42^{ns}	M Good
	Johnny darter (21%), green sunfish (18%), fantail darter (15%), bluegill sunfish (13%)							
South Fork Buffalo Creek								
2.9	5.0	11	855/ 470	-	49.8	-	34*	Fair
	creek chub (27%), striped shiner (25%), silverjaw minnow (11%)							
0.5	12.4	18	1918/ 736	-	60.3	-	40^{ns}	M Good
	green sunfish (23%), striped shiner (18%), white sucker (16%)							
Little Buffalo Creek								
0.1	3.8	14	1063/ 333	-	50.0	-	42^{ns}	M Good
	creek chub (59%), central stoneroller (13%), fantail darter (7%)							
North Fork Buffalo Creek								
0.7	6.7	11	475/ 143	-	29.5	-	30*	Fair
	green sunfish (22%), striped shiner (18%), bluntnose minnow (17%)							
Buffalo Fork								
6.1	33.6	16	151/ 107	25.7	45.5	7.5*	44	Fair-Good
	golden redhorse (24%), green sunfish (29%), rock bass (16%)							
2.2	67.0	25	160/ 129	13.0	48.0	7.7*	44	Fair-Good
	golden redhorse (21%), bluegill sunfish (10%), Johnny darter & bluntnose minnow (8%)							
0.2	71.6	24	334/ 251	4.1	49.0	7.5*	42^{ns}	Fair-M Good
	greenside darter (23%), bluntnose minnow (13%), northern hogsucker (12)							
Miller Creek								
0.2	11.9	15	248/ 152	-	47.0	-	40^{ns}	M Good
	creek chub (25%), greenside darter (17%), bluegill sunfish (15%)							
Collins Fork								
0.2	22.6	19	226/ 173	12.8	58.0	7.7*	46	Fair-V Good
	bluegill sunfish (23%), northern hogsucker (21%), greenside darter (15%)							
Rannells Creek								
1.1	5.5	14	130/ 62	-	40.0	-	32*	Fair
	creek chub (27%), central stoneroller, green sunfish & white sucker (12%)							
Yorker Creek								
0.3	23.1	24	461/ 293	7.4	63.0	8.4	47	Good -V Good
	fantail darter (17%), creek chub (12%), bluntnose minnow (8%)							

Table 6 continued.

Stream RM	mi²	Total Species	Relative Number/ less tolerants	Relative Weight	QHEI	MIwb	IBI	Narrative Evalutation
	Predominant species (percent of catch)							
Seneca Fork								
24.8	17.7	19	416/ 958	-	75.5	-	46	V Good
	striped shiner (21%), bluntnose minnow, fantail darter & logperch (11%)							
7.4	125.0	25	1319/ 667	24.8	51.3	8.9	32*	V Good-Fair
	bluntnose minnow (42%), spotfin shiner (22%), bluegill sunfish (11%)							
2.1	150.0	21	178/ 128	25.1	49.0	7.9^{ns}	35*	M Good-Fair
	green sunfish (21%), spotfin shiner (19%), bluegill sunfish (10%)							
South Fork Seneca Fork								
3.3	27.6	24	763/ 383	13.9	57.0	8.3	36*	M Good-Fair
	bluntnose minnow (35%), gizzard shad (10%), spotfin shiner (9%)							
Skin Creek (North Fork Seneca Fork)								
1.6	4.9	13	2118/ 1283	-	83.5	-	48	V Good
	fantail darter (25%), creek chub (21%), central stoneroller (15%)							
Glady Run								
0.9	8.3	17	1290/ 658	-	56.3	-	46	V Good
	striped shiner (21%), creek chub (16%), bluntnose minnow (15%), white sucker (14%)							
Beaver Creek								
2.4	17.0	19	266/ 158	-	56.5	-	34*	Fair
	creek chub (21%), spotfin shiner (17%), bluegill sunfish (9%)							
Opossum Run								
0.6	12.4	12	384/ 174	-	44.0	-	22*	Poor
	bluntnose minnow (37%), Johnny darter (23%), fantail darter (15%), creek chub (13%)							
Chapman Run								
5.7	6.3	18	856/ 390	-	73.5	-	40^{ns}	M Good
	creek chub (32%), bluegill sunfish (15%), Johnny darter & bluntnose minnow (11%)							
0.9	16.7	15	216/ 184	-	44.5	-	36*	Fair
	Johnny darter (23%), bluegill sunfish (19%), brook silverside (18%)							
Leatherwood Creek								
23.8	17.8	16	861/ 699	-	66.5	-	48	V Good
	greenside darter (27%), northern hogsucker (12%), fantail d. & common shiner (10%)							
20.7	29.5	27	932/ 604	29.2	52.8	8.8	49	Good-V Good
	common shiner (25%), bluntnose minnow (14%), golden redhorse (9%)							
9.8	68.5	30	973/ 717	28.5	64.0	9.5	51	Except.
	bluntnose minnow (19%), greenside darter (15%), northern hogsucker (10%)							
6.3	82.6	32	435/ 327	24.6	46.0	8.7	47	Good-V Good
	bluegill sunfish (18%), green sunfish (12%), bluntnose minnow (11%), troutperch (8%)							
3.4	90.0	29	454/ 388	18.9	40.5	9.3	46	V Good
	bluegill sunfish (21%), spotfin shiner (14%), rock bass (10%)							

Table 6 continued.

Stream RM	mi^2	Total Species	Relative Number/ less tolerants	Relative Weight	QHEI	MIwb	IBI	Narrative Evalutation
	Predominant species (percent of catch)							
Shannon Run								
0.1	4.4	15	803/ 375	-	68.0	-	38*	Fair
	creek chub (26%), bluntnose minnow (22%), common shiner (13%)							
Infirmary Run								
0.4	7.2	18	612/ 382	-	44.3	-	42^{ns}	M Good
	bluegill sunfish (25%), fantail darter (16%), green sunfish (11%)							
Crooked Creek								
13.3	11.7	19	924/634	-	60.3	-	46	V Good
	common shiner (19%), greenside darter (15%), fantail darter (14%), creek chub (13%)							
11.2	33.9	21	674/ 374	6.3	49.0	8.0^{ns}	39*	M Good-Fair
	bluntnose minnow (23%), creek chub (16%), Johnny darter (15%)							
6.3	55.0	21	426/ 266	7.2	62.5	8.5	42^{ns}	Good-M Good
	bluntnose minnow (21%), greenside & Johnny darter (10%), creek chub (9%)							
Dare Run (dry in 2014, sampled in 2015)								
0.7	1.6	6	412/ 76	-	38.0	-	32*	Fair
	creek chub (78%), Johnny darter (13%)							
North Crooked Creek								
1.4	16.3	16	677/ 378	-	51.5	-	44	Good
	creek chub (39%), greenside darter (16%), fantail darter (15%), Johnny darter (12%)							
Fox Creek								
1.0	3.8	11	744/ 318	-	53.3	-	34*	Fair
	creek chub (32%), striped shiner (25%), white sucker (14%)							
0.7	7.8	18	834/ 560	-	63.5	-	48	V Good
	bluntnose minnow (21%), fantail darter (17%), Johnny darter (12%), bluegill sf. (10%)							
Peters Creek								
3.0	3.4	17	3518/ 1108	-	57.5	-	42^{ns}	M Good
	bluntnose minnow (51%), creek chub (13%), central stoneroller (8%)							
0.3	10.4	21	1220/ 776	-	65.3	-	48	V Good
	bluntnose minnow (18%), central stoneroller & fantail darter (13%), greenside d. (10%)							
Bobs Run								
0.2	2.6	14	1283/ 485	-	55.0	-	44	Good
	creek chub (45%), bluntnose minnow (12%), fantail darter (9%)							
Jackson Run								
0.6	1.6	6	292/ 36	-	45.5	-	28*	Fair
	creek chub (82%), fantail darter (8%)							
Sarchett Run								
1.6	7.1	22	1596/ 496	-	59.0	-	40^{ns}	M Good
	bluntnose minnow (41%), creek chub (18%), common shiner (9%)							

Table 6 continued.

Stream RM	mi²	Total Species	Relative Number/ less tolerants	Relative Weight	QHEI	MIwb	IBI	Narrative Evalutation
	Predominant species (percent of catch)							
Salt Fork								
32.3	17.8	19	314/ 179	-	65.0	-	44	Good
	creek chub (27%), common shiner (15%), Johnny & greenside darter (12%)							
20.8	45.0	22	328/ 264	60.7	46.5	7.6*	37*	Fair
	bluegill sunfish (40%), gizzard shad (18%), green sunfish (10%), common carp (7%)							
0.3	158.3	30	1328/ 722	8.3	60.5	8.6	35*	Good-Fair
	bluntnose minnow (40%), spotfin shiner (17%), sand shiner (14%), bluegill sf. (12%)							
Brushy Fork								
3.4	13.6	23	868/ 432	-	65.0	-	40^{ns}	M Good
	bluntnose minnow (40%), fantail darter (13%), greenside darter (11%)							
Turkey Run								
1.2	2.2	13	744/ 348	-	75.5	-	52	Exceptional
	creek chub (25%), blacknose dace (23%), fantail darter (21%)							
Sugartree Fork								
11.1	15.4	25	764/ 482	-	77.0	-	46	V Good
	creek chub (25%), greenside darter (12%), fantail darter (11%)							
Clear Fork								
1.8	13.7	26	2326/ 1108	-	74.5	-	42^{ns}	M Good
	bluntnose minnow (32%), silverjaw minnow (27%), creek chub (14%)							
Rocky Fork								
5.6	12.2	23	509/ 304	-	59.0	-	40^{ns}	M Good
	bluntnose minnow (24%), least brook lamprey (12%), bluegill sunfish (9%)							
Indian Camp Run								
3.9	11.2	23	1884/ 1050	-	74.5	-	44	Good
	bluntnose minnow (27%), silverjaw minnow (23%), creek chub (10%)							
Wills Creek Tributary @ RM 34.43								
0.5	3.3	13	920/ 298	-	53.0	-	36*	Fair
	bluntnose minnow (38%), creek chub (23%), silverjaw minnow (18%)							
Birds Run								
4.3	14.3	20	857/ 573	-	57.8	-	46	V Good
	silverjaw minnow & creek chub (16%), bluntnose minnow (11%), least brook l. (8%)							
0.2	31.1		1099/572	2.2	47.5	6.9*	32*	Fair
	bluntnose minnow (44%), sand shiner (17%), spotfin shiner (15%)							
Johnson Fork								
1.2	8.6	22	2025/1122	-	63.5	-	46	V Good
	bluntnose minnow (23%), creek chub (15%), Johnny darter & c. stoneroller (11%)							
Johnson Fork Tributary @ RM 1.04								
0.2	0.7	6	440/ 75	-	51.5	-	38*	Fair
	creek chub (68%), Johnny darter (10%), blacknose dace (8%)							

Table 6 continued.

Stream RM	mi^2	Total Species	Relative Number/ less tolerants	Relative Weight	QHEI	MIwb	IBI	Narrative Evalutation
	Predominant species (percent of catch)							
Twomile Run								
0.5	2.6	18	1416/ 400	-	65.8	-	38*	Fair
	bluntnose minnow (51%), creek chub (13%), spotfin shiner (7%)							
Wills Creek Tributary @ RM 23.49 (Marlatt Run)								
0.4	7.1	24	1836/ 758	-	66.8	-	42^{ns}	M Good
	bluntnose minnow (39%), creek chub & spotfin shiner (11%)							
Bacon Run								
1.1	14.9	13	1185/ 428	-	63.3	-	36	Fair
	blacknose dace (39%), silverjaw minnow (22%), creek chub (20%)							
Center Creek (Bone Run)								
0.1	6.8	11	498/ 106	-	55.0	-	26*	Poor
	creek chub (39%), bluntnose minnow (26%), spotfin shiner (11%)							
White Eyes Creek								
11.9	4.2	15	1228/ 560	-	61.8	-	50	Exceptional
	creek chub (28%), common shiner (24%), bluntnose minnow (13%)							
10.1	16.2	20	776/ 298	-	44.8	-	42^{ns}	M Good
	common shiner (31%), white sucker (21%), bluntnose minnow (11%)							
4.8	35.4	22	604/ 380	12.1	54.0	8.6	45	Good
	Johnny darter & bluntnose minnow (12%), n. hogsucker (11%), green sunfish (10%)							
0.1	43.8	24	448/371	8.8	58.5	8.4	42^{ns}	Good-M Good
	spotfin shiner (25%), bluegill sunfish (17%), bluntnose minnow (11%), Johnny d. (10%)							
Brush Run								
0.4	7.3	13	650/ 228	-	61.0	-	34*	Fair
	creek chub (41%), fantail darter (20%), bluntnose minnow (12%)							
White Eyes Creek Tributary @ RM 4.50								
0.4	2.7	6	135/ 73	-	53.5	-	40^{ns}	M Good
	Johnny darter (30%), blacknose dace, creek chub, & fantail darter (20%)							

RM: River mile.
75.9^{B}: the ^{B} superscript denotes a boat sample site.
8.7: the absence of a superscript denotes a wading sample site.
mi^2: Drainage area in square miles.
Relative Number less pollution tolerant fish is an IBI metric. MIwb calculations exclude these fish deemed tolerant by Ohio EPA: central mudminnow, white sucker, common carp, goldfish, golden shiner, blacknose dace, creek chub, bluntnose minnow, fathead minnow, green sunfish, yellow bullhead, brown bullhead, and eastern banded killifish.
QHEI: Qualitative Habitat Evaluation Index.
MIwb: Modified Index of well being.
IBI: Index of Biotic Integrity.