Use Attainability Analysis of the Opossum Creek Watershed - 2015

Monroe County

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Prepared by
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Introduction

Opossum Creek is located in Monroe County, in southeastern Ohio, and is a direct tributary to the Ohio River. Opossum Creek drains 25.4 square miles and is 12.3 miles in length. The average fall of the stream is 51.4 ft/mi. Wells for oil and gas production in the area are extensive. A fire, and subsequent explosions, occurred at the Eisenbarth (API Well Number 34111242850000) pad on June 28, 2014. The fire, igniting the area, was the result of a ruptured hydraulic line spraying hydraulic fluid onto hot equipment. Flowback water was released from the site until a berm could be safely built around the well pad to contain the flow. The pad is operated by Statoil USA Onshore Prop, Inc. A fish kill resulted following the onset of the fire, killing in excess of 60,000 fish over the days following the event. Drainage from the pad entered an unnamed tributary to Opossum Creek, and then into Opossum Creek at RM 4.05. Biological sampling occurred at five sites (Figure 1) in September 2014, and June – September 2015, to determine if any changes to aquatic life occurred due to the spill.

Attainment and Recommendations

Consistent with the 2009 survey, the Warmwater Habitat (WWH) aquatic life use designation has been verified for the lower 3.1 RMs of Opossum Creek (Table 1). The upstream section of Opossum Creek—not sampled prior to 2014—consisted of an exceptional fish and macroinvertebrate community (Table 1), including three coldwater fish taxa and coldwater macroinvertebrate taxa. Thus, Opossum Creek upstream from RM 3.1 is recommended the dual Exceptional Warmwater Habitat (EWH) and Coldwater Habitat (CWH) aquatic life use designation (Table 2).

The unnamed tributary to Opossum Creek at RM 4.05, a small (1.4 mi^2) interstitial stream, contained a headwater, predominately pioneering, fish assemblage where 37% of the assemblage consisted of the coldwater redside dace. The site also harbors a macroinvertebrate assemblage with seven coldwater taxa, and thus, is recommended CWH.

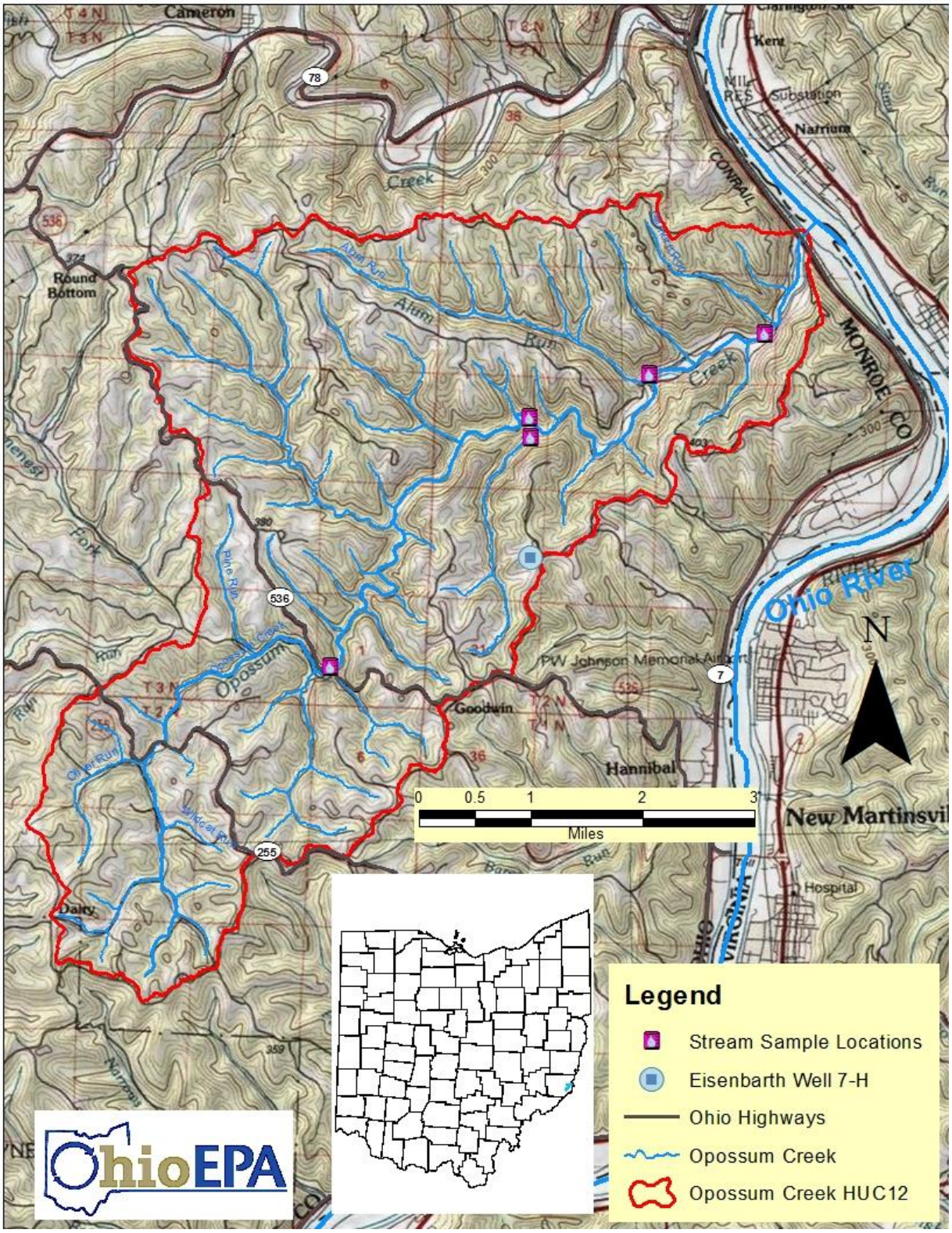

Figure 1. Map of Opossum Creek drainage area and sampling locations, 2014-2015.

Table 1. Aquatic life use attainment status for stations sampled in the Opossum Creek study area based on data collected September 2014 and June – September 2015. 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 of the stream to support a biotic community. The Opossum Creek watershed is located in the Western Allegheny Plateau (WAP) ecoregion. If biological impairment has occurred, the cause(s) and source(s) of the impairment are noted.

Location	STORET (RM)[a]	DRAIN. (Mi^2)	IBI (2014/2015)	MIwb[b] (2014/2015)	ICI[c] (2014/2015)	QHEI	Status[d] (2014/2015)	Cause(s)	Source(s)
Opossum Creek (06-033-000)			**WWH Existing (v)**						
Upstream Gilmore Run, adjacent Beautiful Ridge Rd.	300664 (1.1)	24.0	52/48	8.92/8.76	VG/E	73.25	**Full/Full**		
Downstream Alum Run, adjacent Beautiful Ridge Rd.	203415 (2.2)	22.2	40^{ns}/52	7.79*/8.50	E/E	76.0	**Partial/Full**	Fish kill (2014)	Petroleum/natural gas activities (2014)
Opossum Creek (06-033-000)			**EWH and CWH - Recommended**						
Immediately upstream tributary at RM 4.05	302783 (4.1)	16.6	54/54	-	E/E	77.5	**Full/Full**		
St. Rt. 536, downstream Pine Run	302782 (8.1)	8.2	54/58	-	E/E	67.0	**Full/Full**		
Tributary to Opossum Creek (RM 4.05) (17-001-014)			**CWH - Recommended**						
Near mouth	302784 (0.1)	1.4	-/48	-	E/E	64.25	**-/Full**		

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 ≤ 20 mi^2.

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 E=Exceptional, VG=Very Good, G=Good, MG=Marginally Good, HF=High Fair, F=Fair, LF=Low Fair, P=Poor, VP=Very Poor.

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

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

* - Significant departure from WAP biocriterion (≤ 39 IBI, ≤ 7.8 MIwb, or ≤ 30 ICI); underlined values indicate a narrative biocriterion score of poor or very poor.

Western Allegheny Plateau Minimum Biological Criteria					
IBI			MIwb		ICI
Headwater	Wading	Boat	Wading	Boat	All
EWH					
46	46	44	8.9	9.1	42
WWH					
40	40	36	7.9	8.1	32

Table 2. Waterbody use designation recommendations for the Opossum Creek watershed. Designations based on the 1978 and 1985 water quality standards appear as asterisks (*). A plus sign (+) 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	
Opossum Creek – RM 3.1 to mouth		+							*	*		*		
Opossum Creek – All other segments			▲			▲			*	*		*		
Tributary to Opossum Creek (RM 4.05)						▲			*	*		*		

Fish Community

Table 3. Opossum Creek fish summary, 2009, 2014, and 2015.

River Mile	Sampling Method	Fish Species(total)	Relative number	Relative Weight (kg)	QHEI	IBI	MIwb	Narrative Evaluation
Opossum Creek-2009								
1.1	Wading	24	1078	4.5	83	48	8.6	Good
2.2	Wading	28	1564	142.9	89	50	8.6	Good
Opossum Creek-2014								
1.1	Wading	29	1633.5	85.4	78.25	52	8.9	Very Good
2.2	Wading	23	799.2	84.0	77.25	40	7.8	Fair
4.1	Headwaters	17	2712.0	-	76.0	54	-	Exceptional
8.05	Headwaters	16	1608.0	-	63.5	54	-	Exceptional
Unnamed Tributary to Opossum Creek (RM 4.05)-2014								
0.05	Headwaters	-	-	-	-	-	-	-
Opossum Creek-2015								
1.1	Wading	34	879.5	74.5	73.3	48	8.76	Good
2.2	Wading	29	1131.75	62.0	77.25	48	8.76	Good
4.1	Headwaters	17	902.1	-	76.0	54	-	Exceptional
8.05	Headwaters	16	956	-	63.5	54	-	Exceptional
Unnamed Tributary to Opossum Creek (RM 4.05)-2015								
0.05	Headwaters	7	110.4	-	64.3	48	-	Very Good

Effects of Spill

Biological condition in Opossum Creek has rebounded from the effects of a spill from the Eisenbarth pad on June 28, 2014 (Table 3). Sampling in September 2014 showed a decline in fish community condition since sampling that occurred in 2009 (50 to 40 IBI, and 8.6 to 7.8 MIwb) at the near-field site at RM 2.2 (Figure 2). The fish assemblage at RM 1.1 was largely unaffected. Sampling in June and September 2015 has shown that the biological condition in Opossum Creek downstream from the spill has returned to historic conditions.

Simple lithophilic spawners, such as the golden redhorse, and insectivores were affected the most negatively by the spill, and as a result, pollution tolerant fishes and omnivores were more prominent in the fish assemblages downstream from the spill in 2014 (Figure 3). These changes in the fish assemblages negatively affected the 2014 IBI and MIwb scores at the downstream sites.

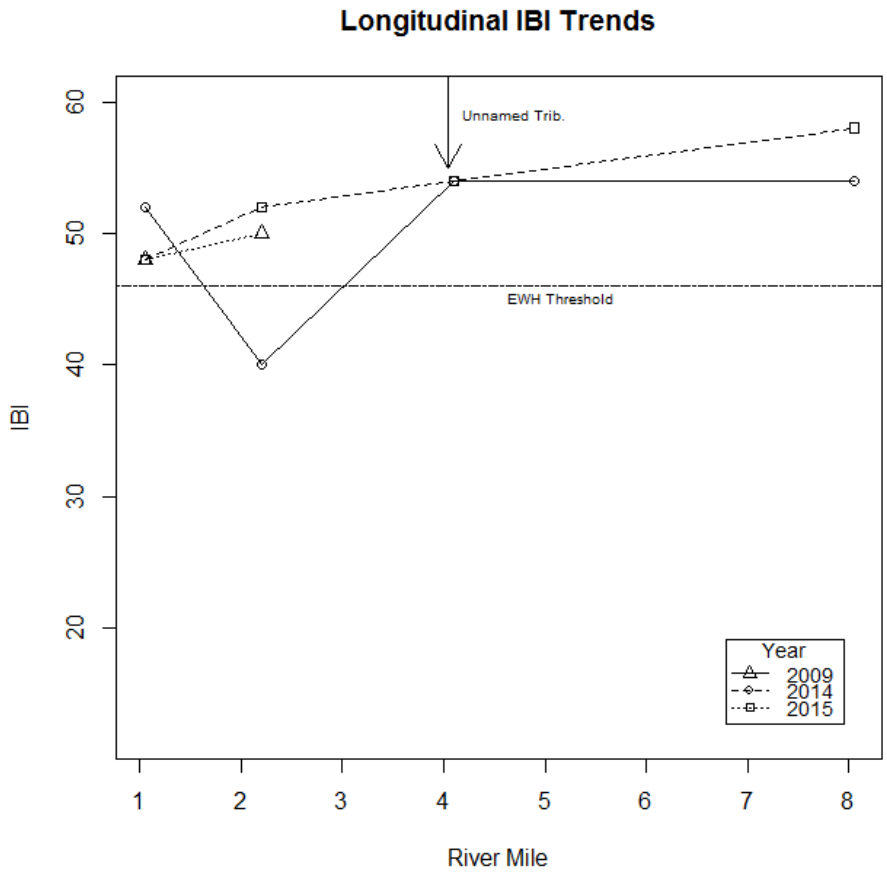

Figure 2. Index of Biotic Integrity scores at the near-field site (RM 2.2) has largely recovered to historic levels following June 28, 2014 Eisenbarth pad spill.

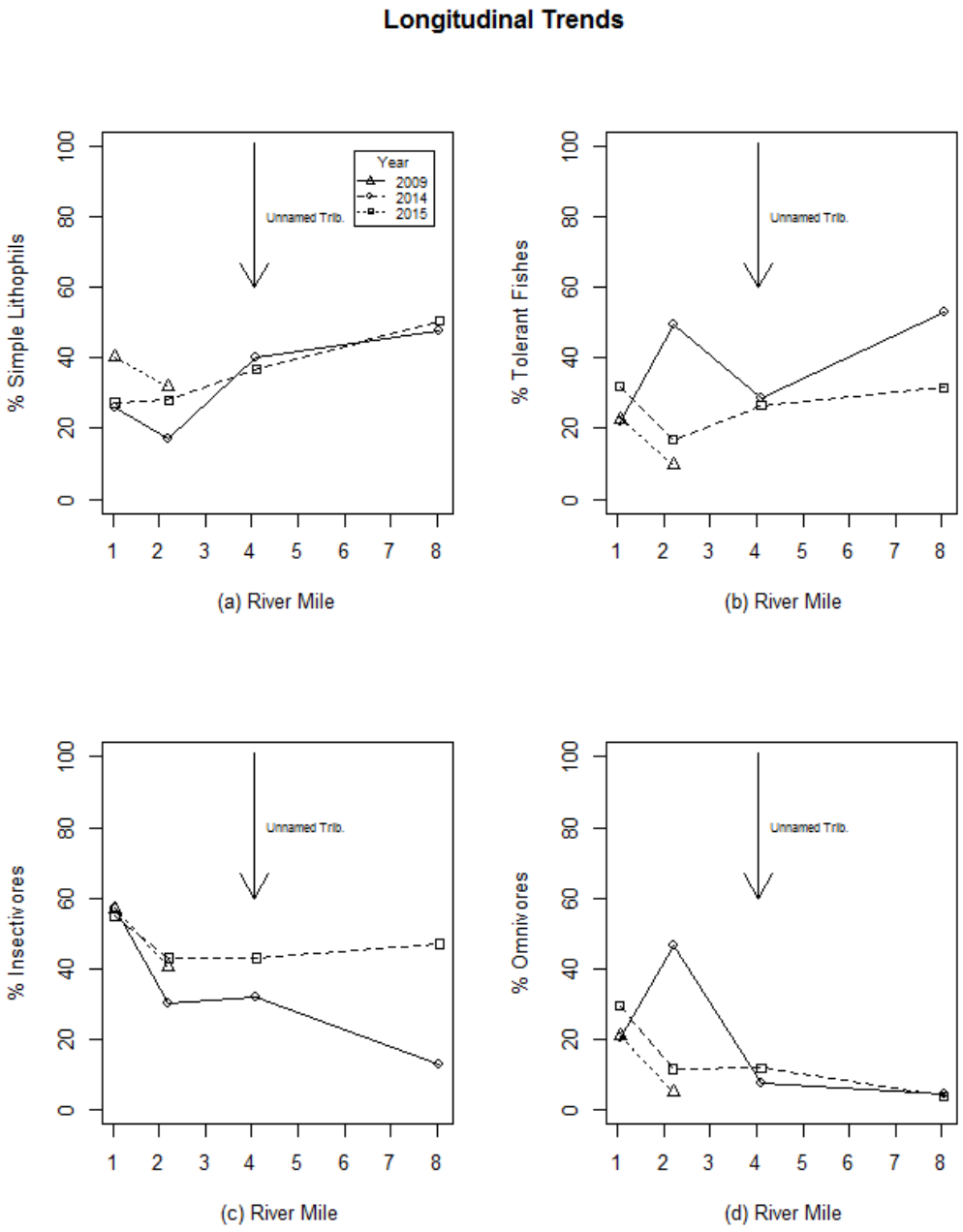

Figure 3. The negative effects of the Eisenbarth pad spill were most prominent at the near-field downstream site at RM 2.2. A decline in the proportion of (a) simple lithophilic spawners and (b) insectivores, such as *Moxostoma spp.*, and the subsequent rise in proportion of (b) tolerant fishes and (d) omnivores, negatively affected fish community performance. These effects were relatively short-term, community indicators largely returned to historic levels in 2015.

Macroinvertebrate Community

Macroinvertebrate communities did not appear to be affected from the spill from the Eisenbarth pad on June 28, 2014 (Table 3). Sampling in September 2014 and June 2015 showed no decline in the macroinvertebrate community compared with the sampling that occurred in 2009.

In both September 2014 and June 2015, a narrative evaluation of very good to exceptional at all five sites reflected a diverse macroinvertebrate community. Field observations noted predominate populations of hydropsychid caddisflies, heptageniid mayflies, and baetid mayflies at all of the sites.

Table 4. Opossum Creek macroinvertebrate summary 2009, 2014, and 2015.

River Mile	Density (Number/ft^2)	Qual. Taxa	Pollution Sensitive Taxa	Pollution Tolerant Taxa	Qual. EPT[a]	Coldwater Taxa	ICI	Narrative Evaluation
	Opossum Creek - 2009							
1.1	144	51	19	9	20	0	44	Very good
2.2	214	47	21	5	21	3	44	Very good
	Opossum Creek - 2014							
1.1	-	48	16	6	17	1	-	Very good
2.2	-	51	20	5	25	0	-	Exceptional
4.1	-	38	18	3	19	2	-	Exceptional
8.05	-	49	18	7	25	3	-	Exceptional
	Unnamed Tributary to Opossum Creek (RM 4.05)-2014							
0.05	-	36	15	3	17	5	-	Very good
	Opossum Creek – 2015							
1.1	-	55	18	6	25	1	-	Exceptional
2.2	-	58	20	7	24	1	-	Exceptional
4.1	-	51	18	6	22	2	-	Exceptional
8.05	-	61	29	5	27	3	-	Exceptional
	Unnamed Tributary to Opossum Creek (RM 4.05)-2015							
0.05	-	41	18	3	21	7	-	Exceptional

Aquatic Life Use

Sampling in 2014 and 2015 has confirmed the WWH aquatic life use for the lower 3.1 RMs of Opossum Creek. Upstream from RM 3.1, the Opossum Creek fish and macroinvertebrate communities are characteristic of an exceptional cold water habitat and has been recommended to be designated EWH and CWH. River mile 3.1 offers a logical breakpoint in aquatic life use. The near-stream land use downstream of this location is largely coal slurry ponds, while the upstream watershed is largely forested. The fish and macroinvertebrate community of the unnamed tributary that enters Opossum Creek at RM 4.05 exhibits qualities of a CWH stream, and is recommended thus.

Table 5. Opossum Creek upstream from RM 3.1 exhibited a fish and macroinvertebrate community that warranted the CWH designation.

Station	Stream	RM	Number Coldwater Fish Taxa (2014/2015)	Percent Coldwater Fish (2014/2015)	Number Coldwater Macroinvertebrate Taxa (2014/2015)
300664	Opossum Creek	1.1	0/3	0.0/0.2	1/1
203415	Opossum Creek	2.2	0/2	0.0/1.1	0/1
302783	Opossum Creek	4.1	3/3	11.2/6.4	2/2
302782	Opossum Creek	8.1	3/3	10.4/15.7	3/3
302784	Unnamed Tributary to Opossum Creek (RM 4.05)	0.1	-/1	-/37.0	5/7

Opossum Creek upstream from RM 3.1 supports populations of three coldwater fish taxa; the rare intolerant longnose dace (*Rhinichthys cataractae*), the intolerant redside dace (*Clinostomus elongatus*), and the southern redbelly dace (*Phoxinus erythogaster*) (Table 5). The unnamed tributary to Opossum Creek (RM 4.05) housed a population of redside dace. Coldwater fish in low numbers were collected in the downstream reach of Opossum Creek. These fish are likely coming from upstream, and are unlikely to survive perennially.

Opossum Creek upstream from RM 3.1 supports exceptional macroinvertebrate communites with two to three coldwater taxa which included coldwater stoneflies, caddisflies, and mayflies. The unnamed tributary to Opossum Creek (RM 4.05) had five coldwater taxa in 2014 and seven coldwater taxa in 2015 (Table 5).