WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER AND WASTE MANAGEMENT (DWWM)
WATERSHED ASSESSMENT BRANCH (WAB)
FISH COMMUNITY ASSESSMENT REPORT

Streams: Buckeye Creek (WVOMI-47)
Survey Location: Doddridge County near Smithburg, WV
Survey Date: May 24-26, 2010
Report Date: June 15, 2010

INTRODUCTION

On May 24-26, 2010, personnel with WV DEP's Watershed Assessment Branch (WAB) conducted a fish community assessment on Buckeye Creek (WVOMI-47) near Smithburg, West Virginia. The assessment was conducted in response to a petroleum/wastewater spill into Buckeye Creek from a TAPO Energy well site located about 2.8 stream miles above the Meathouse Fork (WVOMI-46) confluence. The spill was reported to WV DEP's Office of Oil and Gas on August 25, 2009.

In order to determine the potential negative impacts to the aquatic life of Buckeye Creek shortly after the spill and cleanup, a benthic macroinvertebrate assessment was conducted by WAB on November 23, 2009. As a follow-up to the benthic macroinvertebrate study, the current assessment was conducted with the objective to determine the health and condition of the fish community of Buckeye Creek post spill and compare conditions upstream and downstream of where the spill occurred. This report focuses primarily on the results of the fish community assessment with associated habitat and water quality findings. WAB personnel included Jeffrey Bailey (Environmental Resource Specialist Supervisor), Jason Morgan (Wildlife Biologist II), and Ryan Pack (Environmental Resource Specialist I).

SURVEY AREA

The survey area encompassed about 5.5 miles of Buckeye Creek from its confluence with Meathouse Fork at the mouth to an upstream station located about 0.5 miles downstream of Long Run (Figure 1a and 1b). Five assessment stations were established within the 5.5 mile stretch of Buckeye Creek (Table 1).

Station OMI-47-(0.0) was located at the mouth of Buckeye Creek where water quality samples were collected and the presence or absence of petroleum and metals precipitates was investigated. No fish or habitat information was collected at this station.

Station OMI-47-(0.7) was located about 0.7 miles upstream from the mouth of Buckeye Creek and approximately 2.0 miles downstream of where the petroleum/wastewater spill entered the creek at the well site. This station is also described as the Fatora Property in this report and served as one of two test stations for assessing the health of the fish community downstream of the spill. A full assessment was conducted at this station including a fish survey, habitat assessment, water quality collection, and thorough investigation into the presence or absence of petroleum and metals precipitates.

Station OMI-47-(2.7) was located approximately 2.7 miles upstream from the mouth of Buckeye Creek and about 640 meters downstream of the well site. This station served as the second test station for assessing the health of the fish community downstream of the spill. A full assessment was

conducted including a fish survey, habitat assessment, water quality collection, and thorough investigation into the presence or absence of petroleum and metals precipitates.

Station OMI-47-(3.1) was located about 3.1 miles above the mouth of Buckeye Creek and approximately 320 meters upstream of the well site. This station served as an upstream control location and was used to make comparisons of assessment data with the stations located downstream of the spill area. A full assessment was conducted including a fish survey, habitat assessment, water quality collection, and thorough investigation into the presence or absence of petroleum and metals precipitates.

Station OMI47-(5.5) was located about 2.6 miles above the well site and spill area. This location served as an upstream control station for water quality and the presence or absence of petroleum and metals precipitates. No fish or habitat information was collected at this station.

METHODS

General Layout

Before samples were collected or assessments conducted, a standardized 160 meter stream reach was established at each fish assessment station. Field water quality readings and water samples were collected at the downstream terminus of the 160 meter reach. Habitat assessments, fish collections, and other evaluations were made throughout the entire 160 meter reach.

Habitat Evaluation

A habitat evaluation was conducted utilizing a modified version of U.S. Environmental Protection Agency's Rapid Bioassessment technique. A detailed description of the protocol is given in EPA 841-B-99-002 Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (RBP). The approach focuses on integrating information from specific parameters on the structure of the physical habitat that are important to the survival and maintenance of fish populations and communities. Ten parameters were evaluated and given a score on a scale of 0 to 20. The scoring is broken down into four categories: 1) 0 to 5 = Poor, 2) 6 to 10 = Marginal, 3) 11 to 15 = Suboptimal, 4) 16 to 20 = Optimal. The ten scores were summed to provide a total habitat score for each station (maximum score = 200). Total score condition categories are: 1) 0 to 59 = Poor, 2) 60 to 109 = Marginal, 3) 110 to 159 = Suboptimal, 4) 160 to 200 = Optimal.

Physico-chemical Sampling

AYSI multi-probe was used to determine field measurements of dissolved oxygen (mg/L), water temperature (°C), pH (Std. Units), and conductivity (μmhos/cm). Water samples were collected at each assessment station and returned to Biochem Testing Laboratory for analysis of total metals (Aluminum, Calcium, Iron, Magnesium, Manganese, Potassium, Selenium, Sodium), dissolved metals (Aluminum, Copper, Iron, Zinc), and other constituents (acidity, alkalinity, chloride, sulfate, Total Dissolved Solids, Total Suspended Solids).

Fish Sampling

The community of fish species residing at each station was sampled by using a standardized WAB wadeable stream electro-shocking technique. A Smith-Root, Inc., backpack electrofishing unit was used to collect fish by beginning at the downstream end of the 160 meter reach and slowly proceeding

in an upstream direction alternating bank to bank, including all side channels and backwater pools. The technique involves a thorough sampling of all available habitats and netting all fish observed for placement into a temporary holding bucket for identification and enumeration. Fish health anomalies such as sores, lesions, and parasites were noted if they were observed during the sorting and identification of collected specimens. The health of the fish community at each station was evaluated and compared by examining species composition, species diversity (number of different kinds – generally increases as water quality improves), and overall abundances.

Other Observations (Algae, Metal Precipitates, and Petroleum)

A visual estimate of the abundance of algae within the assessment reach was rated as 0-None, 1- Low, 2- Moderate, 3-High, 4-Extreme. The intensity of metal hydroxide deposits (Fe-Iron, Mn-Manganese) was evaluated within the assessment reach by visually rating them as 0-None, 1- Low, 2- Moderate, 3-High, 4-Extreme. A thorough investigation was conducted for the presence of petroleum or spill related substances by actively digging into the sediments of depositional areas, dislodging embedded large woody debris, and by sloughing bank particles into the stream. This also included an inspection of the stream surface for the presence of petroleum as well as assessing the sediments and water for odors related to a petroleum spill.

RESULTS SUMMARY

Results of field water quality readings and laboratory analyzed samples are presented in Tables 2 and 3, respectively. Results of algae, metal precipitates, and petroleum are presented in Table 4. Table 5 provides the results of RBP habitat assessments and Table 6 presents the results of fish surveys for each station.

Station OMI-47-(0.0) was located at the mouth of Buckeye Creek and downstream of the well site spill area. There were no violations of surface water quality standards for field readings or laboratory analyzed samples from this station. Two small Fe/Mn seeps were leaching precipitates into the stream on the left descending bank and a small growth of Fe oxidizing bacteria was noted on the right descending side. No evidence of petroleum was found in sediment deposition areas, in the stream banks, or on the water's surface. Habitat and fish assessment data were not collected at this location. In summary, there was no evidence of the petroleum/wastewater spill documented by the assessment crew at this station.

Station OMI-47-(0.7) was located approximately 2.0 miles downstream of the petroleum/wastewater spill (described as the Fatora Property in this report). There were no violations of surface water quality standards for field readings or laboratory analyzed samples from this station. The field crew did not observe any Fe or Mn precipitates within the 160 meter assessment reach. However, a thorough investigation downstream of the reach (still on Fatora property) in a deep section with a significant bend and heavy sediment deposits, revealed some Fe precipitates, particularly along the left descending bank. A small growth of Fe oxidizing bacteria was observed immediately below the bend on the right descending bank. The field crew did not consider either of these observations to be excessive or unusual for Buckeye Creek. No petroleum odors or surface sheens/flecks were discovered following an active search in the 160 meter assessment reach. Additionally, no evidence of petroleum was found in the section of Buckeye Creek immediately downstream of the reach (Fatora property). The abundance of algae was rated as low within the 160 meter assessment reach. Algae growth was observed downstream of the reach as well but not in an abundance above a low rating. The total RBP habitat score was in the suboptimal category (score = 132), and more specifically the station was given a suboptimal score for the fish cover parameter (12). Excessive sedimentation

appeared to be the most significant problem associated with habitat at this site as both the embeddedness and sediment deposition parameters were given scores in the marginal category (10 and 10, respectively). Results of the backpack electrofishing survey indicated that the fish community at this station was healthy. The individual species collected and their abundances were expected for a stream the size of Buckeye Creek and its geographic location. Species diversity (27 species) was good and the highest for the three fish collection stations with minnows, darters, and sunfishes all well represented. Fish health anomalies (sores, lesions, etc.) were not observed during sorting and identification of the specimens and thus individual fish health was considered good. In summary, the overall condition of Buckeye Creek at this station appeared good and there was no evidence to suggest that any potential lingering effects of the petroleum/wastewater spill were present.

Station OMI-47-(2.7) was located about 640 meters downstream of the spill area. This station served as a test station for assessing the health of the fish community immediately downstream of the spill. Similar to all assessment stations, there were no violations of surface water quality standards for field readings or laboratory analyzed samples. The field crew observed some slight Mn flecks on the surface and small deposits of Fe along the right descending bank. The field crew did not consider either of these observations to be excessive or unusual for Buckeye Creek. No petroleum odors or surface sheens/flecks were discovered following an active (digging into sediments) search within the assessment reach. The abundance of algae was rated low for this station. The total RBP habitat score was in the suboptimal category (score = 128). Fish cover was the same as OMI-47-(0.7) with a suboptimal score (score = 12). Sediment deposition was also similar to OMI-47-(0.7) with a marginal score (score = 9). A poorly vegetated bank resulted in a marginal score (score = 3) on the right descending bank as well as a poor score (score = 2) for riparian zone vegetation. Results of the backpack electrofishing survey indicated that the fish community at this station was healthy. Diversity was good and the species collected were similar to those from OMI-47-(0.7). Fish abundance (574 individuals) was the highest at this station with minnows and darters well represented. Fish health appeared to be good as there were no anomalies documented. In summary, the overall condition of Buckeye Creek at this station appeared good and there was no evidence to suggest that any potential lingering effects of the petroleum/wastewater spill were present.

Station OMI-47-(3.1) was located approximately 320 meters upstream of the well site. This station served as an upstream control location and was used to make comparisons of assessment data with the stations located downstream of the spill area. There were no violations of surface water quality standards for field readings or laboratory analyzed samples. The field crew observed a small deposit of Fe along the right descending bank. No petroleum odors or surface sheens/flecks were discovered and algal growth was rated as low. The total RBP habitat score was lower than the two downstream stations with a score in the marginal category (score = 109). The most significant habitat problems were associated with sediment deposition (score = 10), bank stability (score = 7), bank vegetation (score = 6), and riparian vegetation (score = 4). The fish cover parameter (score =13) was similar to downstream stations and rated as suboptimal. Fish species diversity (22) was lowest at this station, however, it was still comparable to stations located downstream of the spill area. As with the other stations, the individual species collected were expected for a stream the size of Buckeye Creek and its geographic location. Populations of minnows, darters, and sunfishes were good and indicative of a healthy fish community. Fish health anomalies (sores, lesions, etc.) were not observed during sorting and identification of the specimens and thus individual fish health was considered good.

Station OMI47-(5.5) was located about 2.6 miles above the well site and spill area. This location served as an upstream control station for water quality and the presence or absence of petroleum and metals precipitates. There were no violations of surface water quality standards for field readings or laboratory analyzed samples. A small quantity of Fe precipitate was observed leaching from the left

descending bank. Additionally, a small growth of Fe oxidizing bacteria was noted on the left descending side. No evidence of petroleum was found in sediment deposition areas, in the stream banks, or on the water's surface. Habitat and fish assessment data were not at collected this location.

CONCLUSIONS

The primary objective of this study was to assess the health of the fish community downstream of a TAPO Energy well site where petroleum/wastewater was spilled into Buckeye Creek (OMI-47) in August 2009. This was accomplished by examining fish communities at two stations located downstream of the spill and comparing the data to a control station located above the spill. Based on fish community data, the two stations located downstream of the spill were comparable to the control station located above the spill area. Fish species diversity was good at all three stations and was highest at the most downstream location (below the spill - described as Fatora property) where diverse populations of minnows, darters, and sunfishes indicated a healthy fish community. Additionally, the composition of fish species present at all stations was expected for a stream the size of Buckeye Creek and its geographic location. Fish abundance was also good at all stations and not uncharacteristic when considering stream size and the collection techniques employed. Fish health anomalies (sores, lesions, etc.) were not observed during sorting and identification of the specimens and thus individual fish health was considered good at all three stations.

In addition to the three fish survey locations, two additional stations were assessed for water quality, metals precipitates, petroleum, and algae. Although there were some slight differences in a few of the water chemistry parameters, none of the five stations had values violating surface water quality standards. Metal precipitates were observed at upstream and downstream locations mostly in the form of Fe that was present along the banks. Fe oxidizing bacteria was noted at two stations downstream of the spill area and at the uppermost control station. The field crew did not consider these observations to be excessive or unusual for Buckeye Creek. Algae was not observed in significant quantities at any of the assessment locations.

A thorough investigation was conducted within each assessment reach for the presence of petroleum or spill related substances by actively digging into the sediments of depositional areas, dislodging embedded large woody debris, by sloughing bank particles into the stream, inspecting the stream surface for sheens/flecks, and assessing for odors. No evidence of petroleum was found at any of the five stations.

In summary, the results of this study do not indicate that the petroleum/wastewater spill from the TAPO Energy well site that occurred in August 2009 is negatively affecting the fish community in Buckeye Creek.

Report Prepared By: Jeffrey Bailey - ERS Supervisor

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Report Reviewed By: John Wirts – ER Program Manager II

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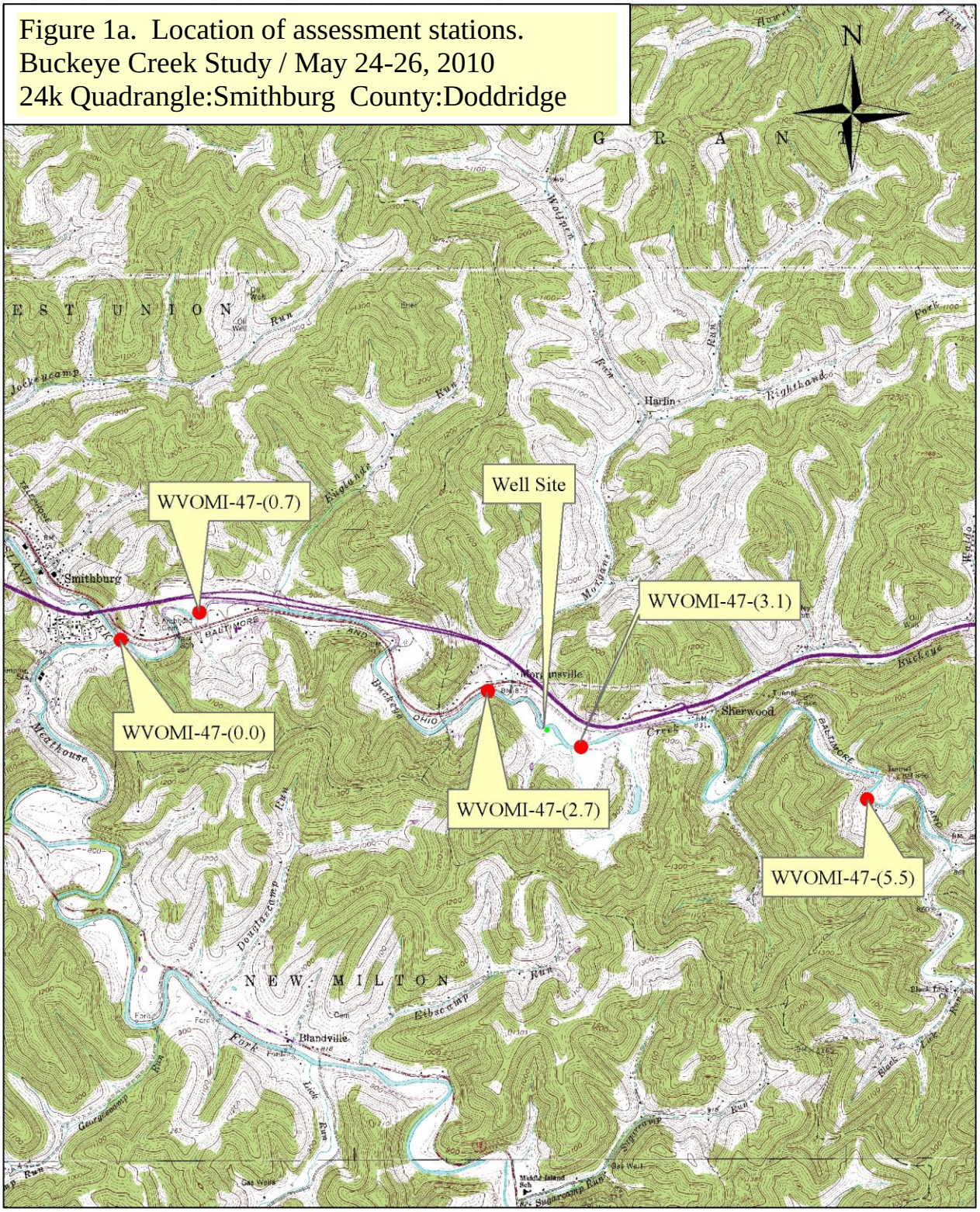
Table 1. Sample site locations. *Buckeye Creek Survey on May 24-26, 2010.*					
Station	**Date**	**Location**	**Collected**	**Latitude**	**Longitude**
OMI-47-(0.0)	5-24-10	At mouth	wq	39 17 04.2	80 43 40.3
OMI-47-(0.7)	5-26-10	Fatora property	fish,wq,hab	39 17 11.4	80 43 15.7
OMI-47-(2.7)	5-25-10	Approx. 640 meters downstream of well site	fish,wq,hab	39 16 51.8	80 41 48.2
OMI-47-(3.1)	5-25-10	Approx. 320 meters upstream of well site	fish,wq,hab	39 16 38.4	80 41 19.8
OMI-47-(5.5)	5-24-10	Approx. 2.6 miles upstream of well site	wq	39 16 25.7	80 39 52.6
wq= water quality; fish=fish survey ; hab=EPA RBP habitat assessment.					

Figure 1a. Location of assessment stations.
Buckeye Creek Study / May 24-26, 2010
24k Quadrangle:Smithburg County:Doddridge



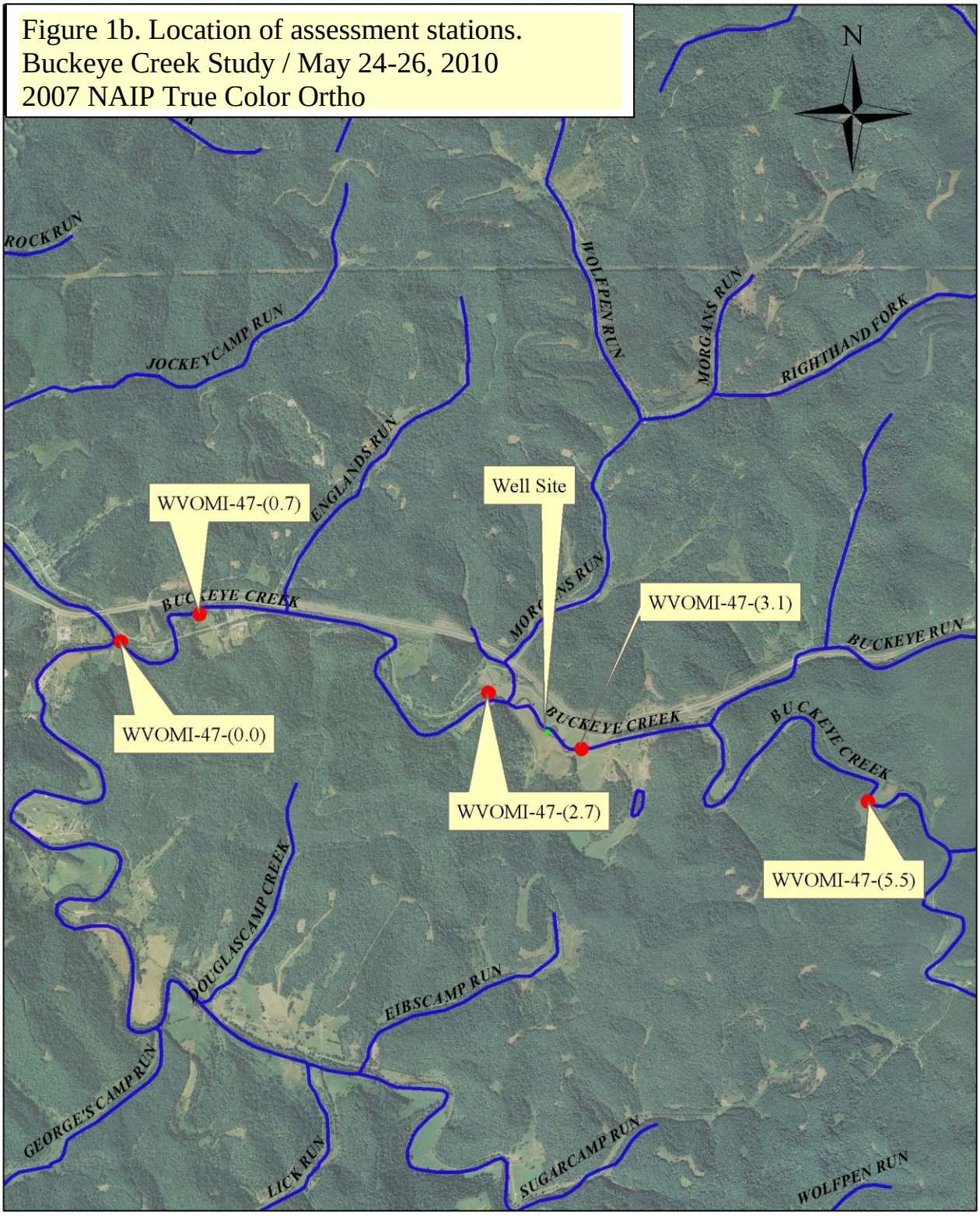


Figure 1b. Location of assessment stations.
Buckeye Creek Study / May 24-26, 2010
2007 NAIP True Color Ortho
N
ROCK RUN
JOCKEYCAMP RUN
ENGLANDS RUN
WOLFPEN RUN
MORGANS RUN
RIGHTHAND FORK
WVOMI-47-(0.7)
Well Site
BUCKEYE CREEK
WVOMI-47-(3.1)
BUCKEYE RUN
WVOMI-47-(0.0)
BUCKEYE CREEK
BUCKEYE CREEK
WVOMI-47-(2.7)
WVOMI-47-(5.5)
DOUGLASCAMP CREEK
EIBSCAMP RUN
GEORGE'S CAMP RUN
LICK RUN
SUGARCAMP RUN
WOLFPEN RUN

Table 2. Results of field water quality readings. *Buckeye Creek Study May 24-26, 2010*

Station	OMI-47-(0.0)	OMI-47-(0.7)	OMI-47-(2.7)	OMI-47-(3.1)	OMI-47-(5.5)
Temperature (°C)	20.84	20.68	21.88	18.58	20.65
Dissolved Oxygen (mg/L)	9.07	9.36	9.41	9.30	8.15
pH (S.U.)	7.54	7.54	7.43	7.32	7.02
Conductivity (µmhos/cm)	239	266	233	223	150

Table 3. Results of laboratory analysis for water samples. *Buckeye Creek Survey May 24, 25-26, 2010.*

Station	OMI-47-(0.0)	OMI-47-(0.7)	OMI-47-(2.7)	OMI-47-(3.1)	OMI-47-(5.5)	*mdl*
Metals (Tot) mg/L						
Aluminum	0.10	0.08	0.14	0.09	0.09	*0.02*
Calcium	28.9	31.9	28.1	26.8	19.3	*0.2*
Iron	0.22	0.22	0.33	0.70	0.31	*0.02*
Magnesium	6.10	6.5	5.9	5.5	4.2	*0.2*
Manganese	0.032	0.040	0.058	0.038	0.041	*0.003*
Potassium	1.3	1.4	1.3	1.3	1.1	*0.5*
Selenium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	*0.0010*
Sodium	10.8	12.7	10.9	11.1	5.9	*0.5*
Metals (Dis) mg/L						
Aluminum	0.02	<0.02	<0.02	<0.02	0.02	*0.02*
Copper	<0.003	<0.003	<0.003	<0.003	<0.003	*0.003*
Iron	0.08	0.08	0.07	0.08	0.12	*0.02*
Zinc	<0.005	<0.005	<0.005	<0.005	<0.005	*0.005*
Other mg/L						
Acidity (hot)	<5	<5	<5	<5	<5	*5*
Alkalinity	44	70	64	58	64	*5*
Chloride	20	25	20	21	9	*1*
Sulfate	19	20	19	17	13	*5*
TD Solids	123	148	124	108	85	*5*
TS Solids	3	<2	5	4	<2	*2*

OMI-47-(0.0	*Buckeye Creek at mouth*
OMI-47-(0.7)	*Buckeye Creek at Fatora property*
OMI-47-(2.7)	*Buckeye Creek approximately 640 meters downstream of well site*
OMI-47-(3.1)	*Buckeye Creek approximately 320 meters upstream well site*
OMI-47-(5.5)	*Buckeye Creek approximately 2.6 miles upstream of well site*
mdl	*Method detection limit.*

Table 4. Results of observations for algae, metal precipitates, and petroleum. *Buckeye Creek Study May 24-26, 2010*

Station	OMI-47-(0.0)	OMI-47-(0.7)	OMI-47-(2.7)	OMI-47-(3.1)	OMI-47-(5.5)
Algae	NA	low	low	low	NA
Metal Precipitates (Fe/Mn)	low	none	low	low	low
Petroleum	none	none	none	none	none

NA= Not Assessed

OMI-47-(0.0)	*Buckeye Creek at mouth*
OMI-47-(0.7)	*Buckeye Creek at Fatora property*
OMI-47-(2.7)	*Buckeye Creek approx. 640 meters downstream of well site*
OMI-47-(3.1)	*Buckeye Creek approx. 320 meters upstream well site*
OMI-47-(5.5)	*Buckeye Creek approx. 2.6 miles upstream of well site*

Table 5. Results of RBP habitat assessment. *Buckeye Creek Survey May 24, 25-26, 2010.*

Habitat Parameter (20 points possible per Parameter)		**Station Number**		
		OMI-47-(0.7)	OMI-47-(2.7)	OMI-47-(3.1)
Available Fish Cover		12	12	13
Embeddedness		10	13	13
Velocity/Depth Regimes		16	16	13
Channel Alteration		14	15	12
Sediment Deposition		10	9	10
Riffle Frequency		14	16	12
Channel Flow Status		18	17	17
Bank Stability	Left	7	8	4
	Right	6	3	3
Bank Vegetative Protection	Left	7	7	3
	Right	7	3	3
Riparian Vegetative Zone	Left	6	7	2
	Right	5	2	2
Total Score (out of 200)		132	128	107
Score Category		sub-optimal	sub-optimal	marginal

OMI-47-(0.7)	*Buckeye Creek at Fatora property*.
OMI-47-(2.7)	*Buckeye Creek approximately 640 meters downstream of well site*.
OMI-47-(3.1)	*Buckeye Creek approximately 320 meters upstream well site*.

Table 6. Fish species collected at each site. *Buckeye Creek Survey May 24, 25-26, 2010.*

Station	OMI-47-(0.7)	OMI-47-(2.7)	OMI-47-(3.1)
Minnows			
Blacknose Dace		1	
Bluntnose Minnow	140	148	78
Central Stoneroller	4	75	14
Creek Chub	7	5	5
Redfin Shiner	4		2
Sand Shiner	39	49	25
Silver Shiner	5		
Silverjaw Minnow	16	11	
Striped Shiner	24	164	28
Suckers			
Black Redhorse	7	3	5
Golden Redhorse	24	9	20
Northern Hog Sucker	10	15	7
White Sucker	1		
Darters			
Banded Darter	4	8	2
Blackside Darter	3		
Fantail Darter	15	16	24
Greenside Darter	4	10	3
Johnny Darter	45	22	3
Logperch	6	7	3
Sunfish			
Bluegill	4	1	
Green Sunfish	24	4	33
Hybrid Sunfish			1
Longear Sunfish	16	11	50
Rock Bass	4	5	10
Smallmouth Bass	6	3	1
Spotted bass	2	1	
Trout Perches			
Trout Perch	1		1
Catfish			
Yellow Bullhead	3	3	6
Lampreys			
Least Brook Lamprey	4	3	1
Total Number Fish	**422**	**574**	**322**
Total Fish Diversity	**27**	**23**	**22**

OMI-47-(0.7)	*Buckeye Creek at Fatora property*
OMI-47-(2.7)	*Buckeye Creek approx. 640 meters downstream of well site*
OMI-47-(3.1)	*Buckeye Creek approx. 320 meters upstream of well site*

Station OMI-47-(0.0) – Upstream view from mouth.

Station OMI-47-(0.0) – Iron and Manganese precipitates on left descending bank.

Station OMI-47-(0.7) - Upstream view from lower end of assessment reach.

Station OMI-47 – Iron precipitates on left side looking downstream from assessment reach (on Fatora Property).

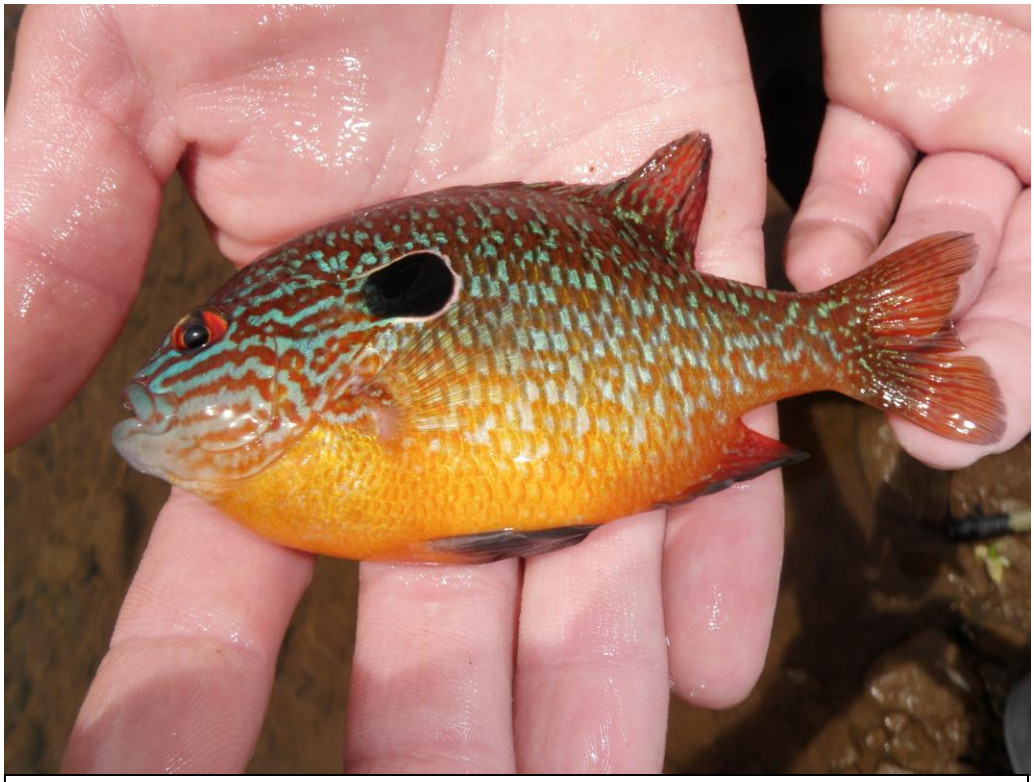
Station OMI-47 – Downstream view of bend on Fatora Property.

Station OMI-47- Upstream view of bend and sediment deposits on Fatora Property.

Station OMI-47-(2.7) – Upstream view of assessment reach from downstream terminus.

Station OMI-47-(2.7) – Iron precipitates on right descending side.

Station OMI-47-(3.1) – Downstream view of assessment reach.



Station OMI-47-(3.1) – Longear Sunfish collected at site.

Station OMI-47-(3.1) – View of upstream end of assessment reach.

Station OMI-47-(5.5) – Upstream view of assessment reach.

Station OMI-47-(5.5) – Iron precipitates on left descending side.

REFERENCES

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

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