



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF POINT & NON-POINT SOURCE MANAGEMENT

Continuous Instream Monitoring Report (CIMR)

Most recent revision: 6/10/2014

Revised by: A. Williams

STATION DESCRIPTION:

STREAM CODE: 43979

STREAM NAME: Blacklick Creek

SITE NAME: Old Indiana Road bridge at Josephine

COUNTY: Indiana

LATITUDE: N40°28'37.125" **LONGITUDE:** W79°11'12.401"

LOCATION DESCRIPTION: Approximately 30 feet upstream of the Old Indiana Road bridge.

HUC: 05010007

DRAINAGE AREA: 193.113 sq. miles

BACKGROUND AND HISTORY: Blacklick Creek is a freestone tributary to the Ohio River. The Continuous instream monitoring site was within Burrell Township, Indiana County (Figure 1). The basin is characterized by relatively steep topography with land use consisting mostly of forested land (76.96%). The reach is designated Trout Stocking (TSF). The reach is also aquatic-life impaired for abandoned mine drainage (metals). The site itself is downstream of the Josephine Wastewater Treatment Facility discharge. The purpose of this survey was to collect data on a stream affected by abandoned mine drainage and the above-mentioned wastewater treatment facility. This report is a continuation of data collected during 2011, 2012, and early 2013.

The primary objectives of the assessment were to:

1. Characterize water temperature, specific conductance, and pH using 24-hour monitoring.
2. Characterize biological communities.

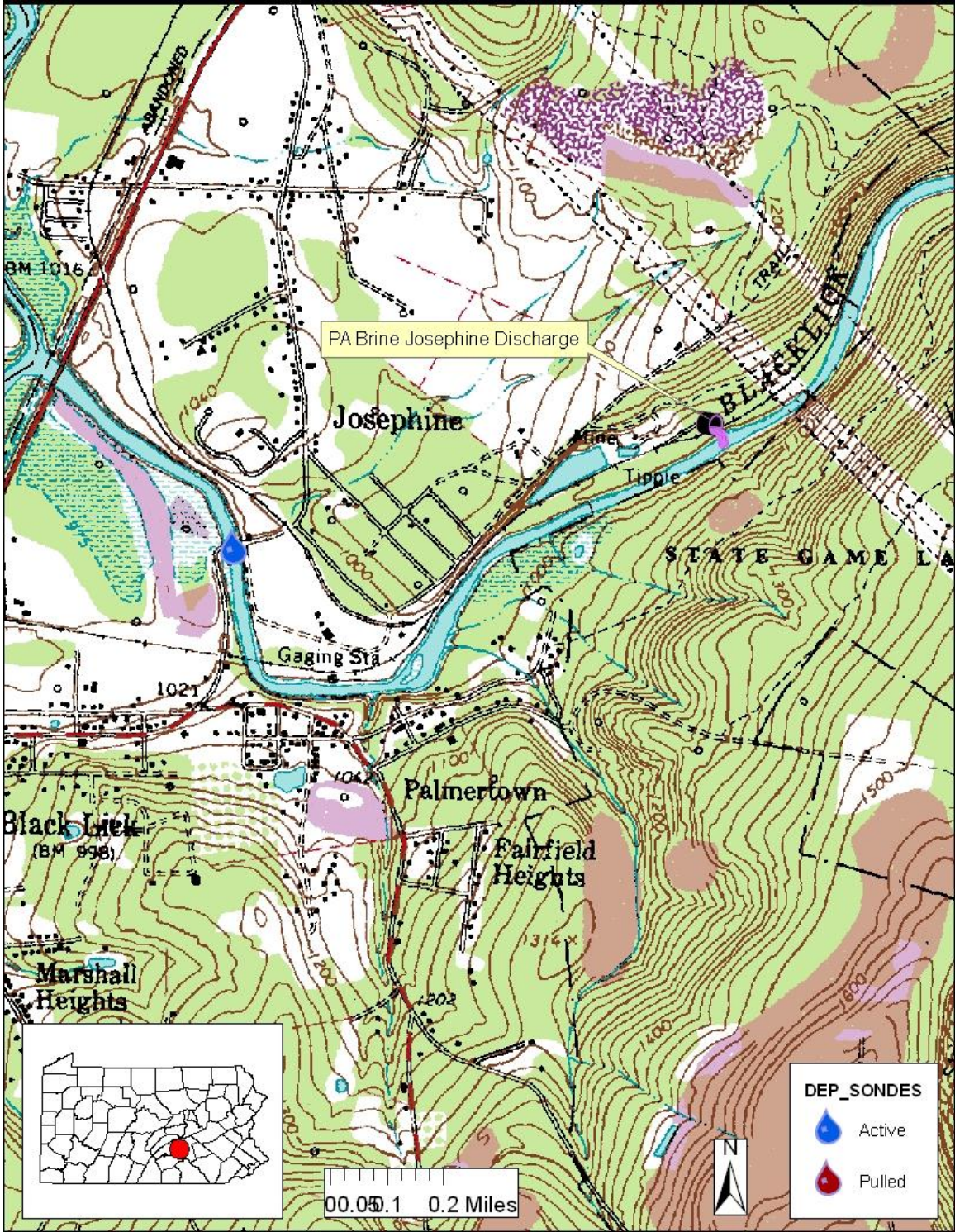


Figure 1. Location of the Blacklick Creek continuous instream monitoring site.



Figure 2. Site location. Picture taken from the bank.

WATER QUALITY PARAMETERS:

Parameter	Units
Temperature	°C
Specific Conductance (@25°C)	µS/cm ^c
pH	standard units

EQUIPMENT:

Five sondes were used at this location. A YSI 6920v2 water quality sonde, serial #10B100976, was installed on August 25, 2010 and pulled May 3, 2011. Another YSI 6920 water quality sonde (no serial number) was installed June 2, 2011 and pulled September 20, 2011. A HOBO Conductivity Logger, serial #9896845, was installed February 28, 2012 and pulled April 10, 2012. A YSI 600 XLM water quality sonde, serial #000150CB, was installed on April 10, 2012 and pulled November 14, 2012. Because the pH appeared erratic when calibrating, even when the pH probe was changed, a second sonde was deployed in September. A YSI 600 XLM water quality sonde, serial #0001400A, was installed September 20, 2012 and pulled January 9, 2013. The sondes recorded side-by-side in the stream from September 20, 2012 to November 14, 2012. Due to an unknown failure with the sonde, there is a data gap from November 14, 2012 to December 4, 2012.

The sondes were housed in 24-inch length of 4-inch diameter schedule 80 PVC pipes with holes drilled in them to allow for flow through. One end of the pipes were capped, and notches were cut to accommodate the metal attachment bars on the top of the sondes. The attachment bars were clipped to eye-bolts attached to rebar driven into the stream bed. The attachment bar was also clipped to a cable attached to a second piece of rebar located just upstream of the first. The sondes recorded water quality parameters every 60 minutes.

PERIOD OF RECORD: August 25, 2010 through January 9, 2013

The station was revisited eight times over the period above for the purpose of downloading data, checking calibration, and cleaning.

DATA:

Water chemistry grabs were collected 10 times during the sampling period. Benthic macroinvertebrates were collected August 18, 2010 and January 9, 2013. Continuous data are graded based on a combination of fouling and calibration error (PA DEP, 2013). Some periods of data were graded unusable and deleted from the final dataset.

Water Temperature: Average: 13.84 °C; Maximum: -0.09 °C; Minimum: 32.89 °C.

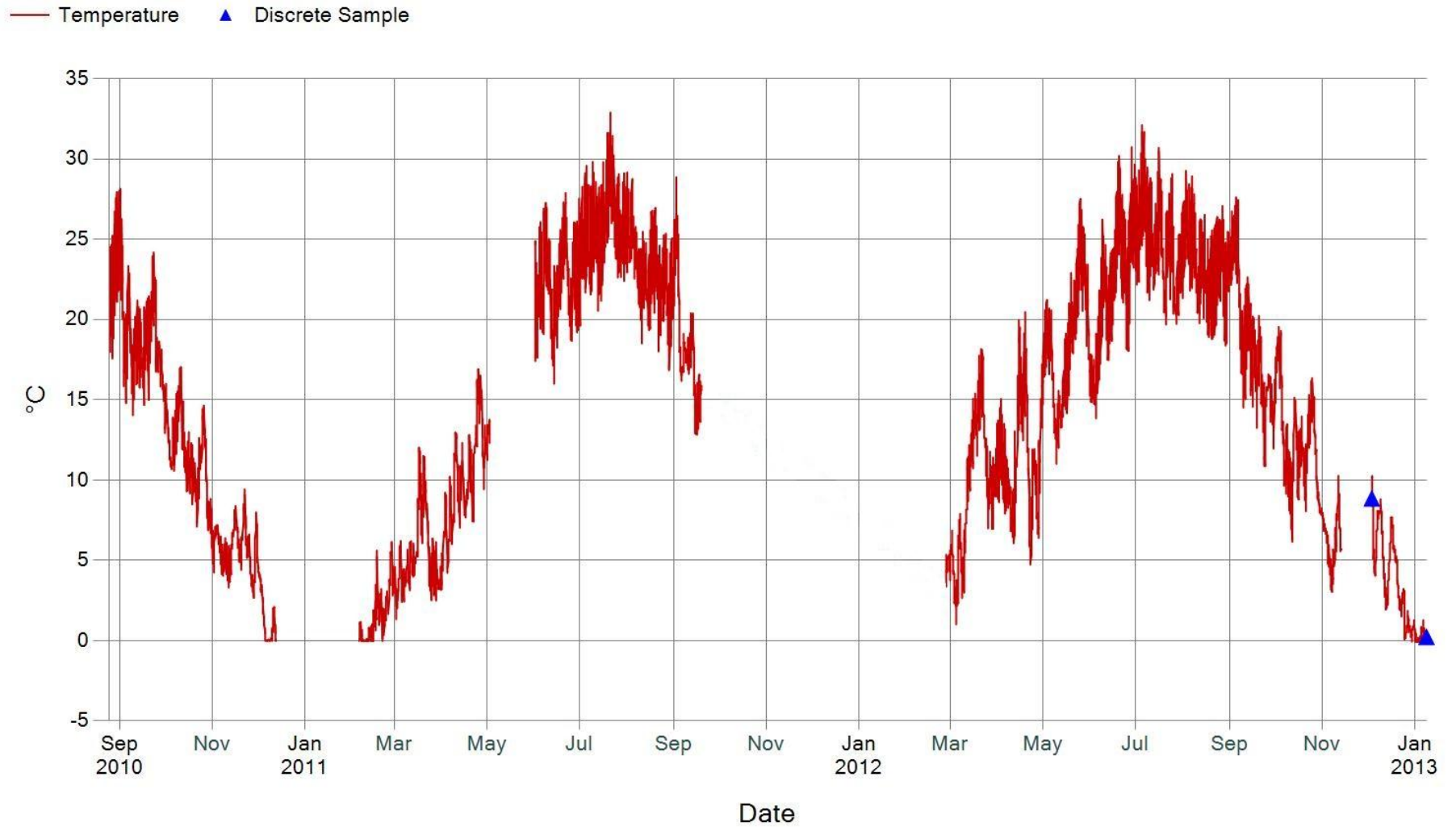


Figure 3. Continuous temperature and discrete samples from August 25, 2010 to January 9, 2013.

Specific Conductance: Average: 711.6 $\mu\text{S}/\text{cm}$; Maximum: 3,717.2 $\mu\text{S}/\text{cm}$; Minimum: 101.7 $\mu\text{S}/\text{cm}$.

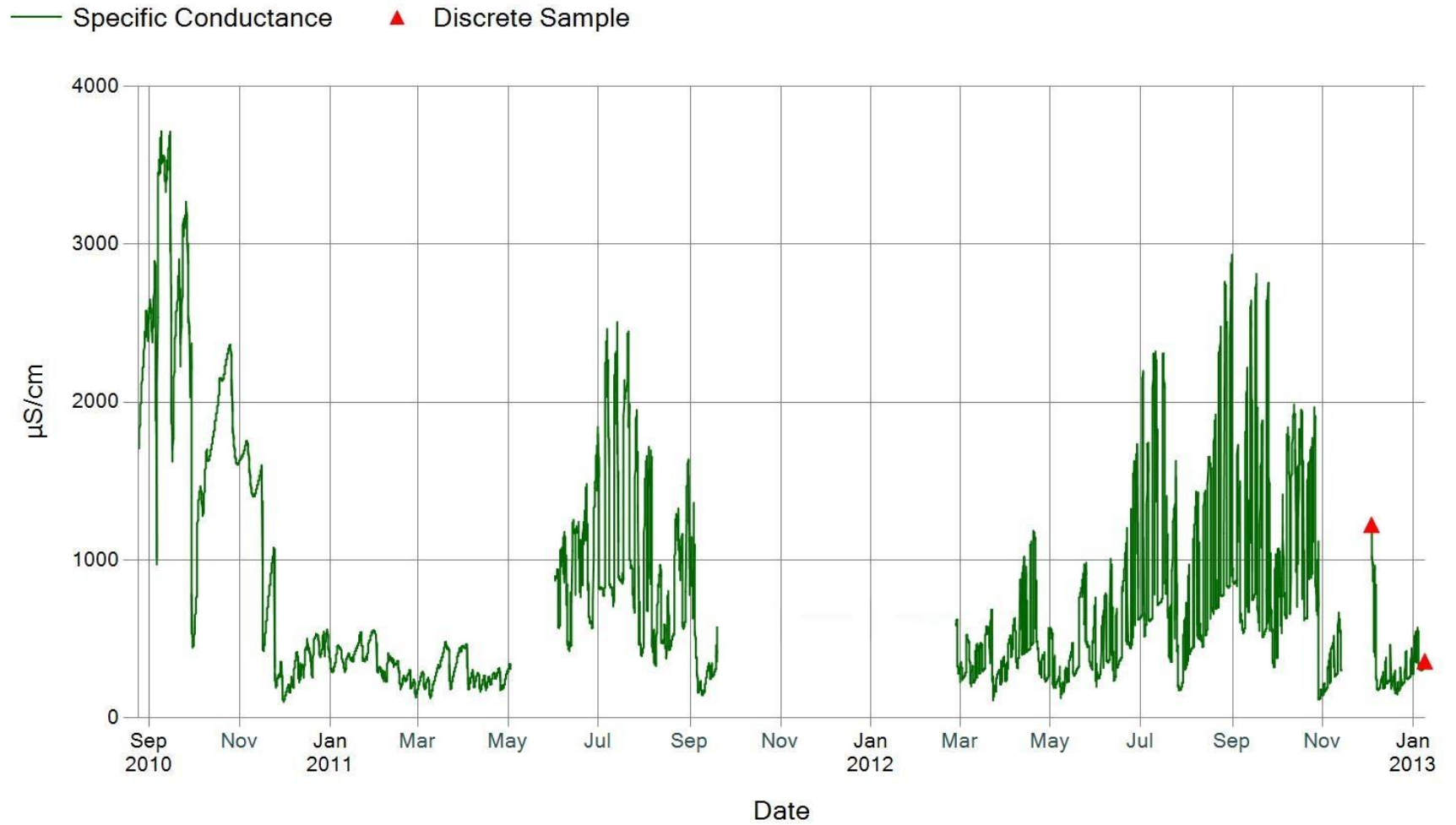


Figure 4. Continuous specific conductance and discrete samples from August 25, 2010 to January 9, 2013).

pH: Average: 6.33; Maximum: 7.85; Minimum: 3.95.

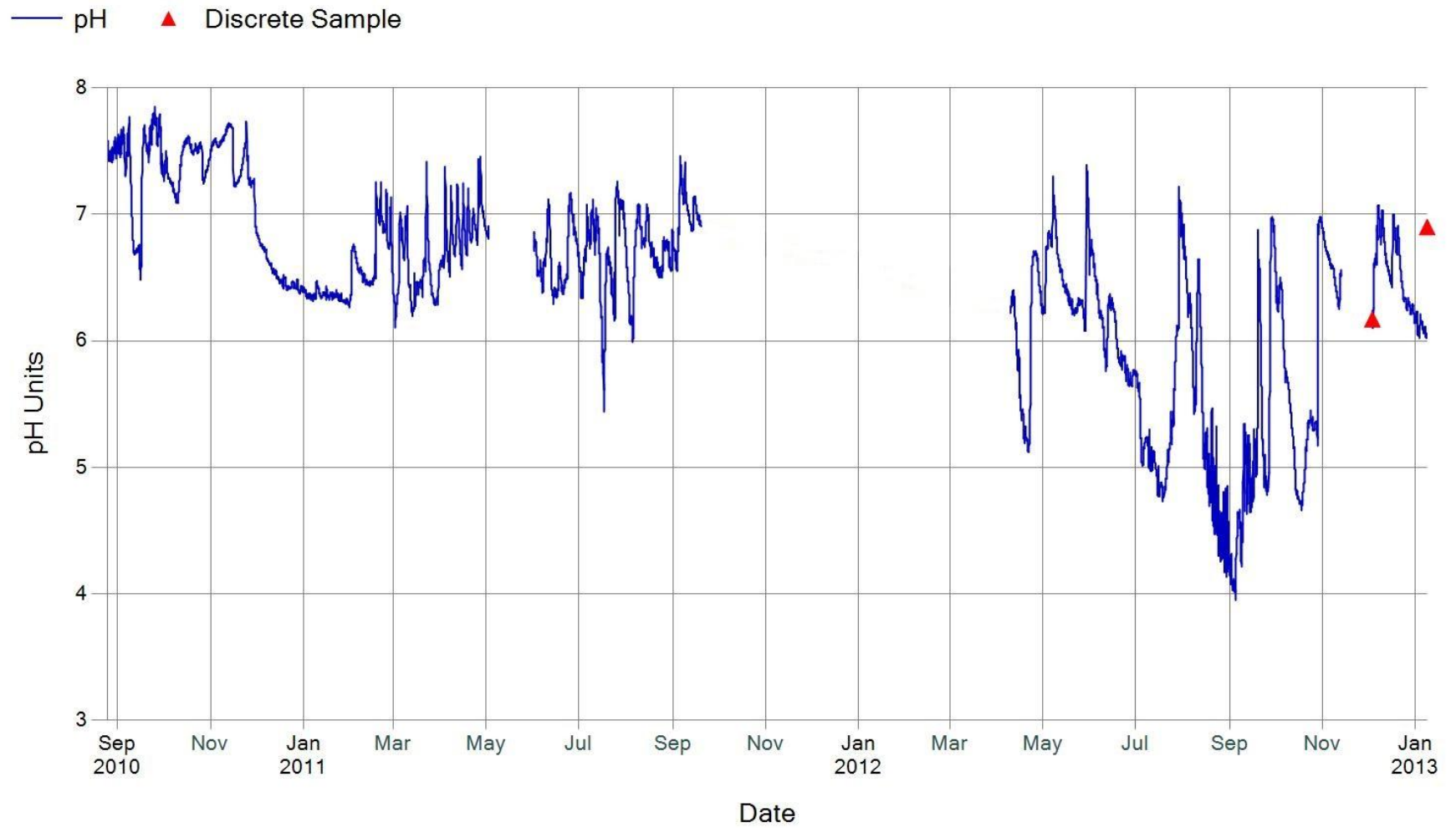


Figure 5. Continuous pH and discrete samples from August 25, 2010 to January 9, 2013.

Discrete Water Chemistry: Samples were collected 10 times during the sampling period, one time in 2010 prior to the sampling period, and one time in 2012 prior to the sampling period. Measurements with "<" indicate concentrations below the reporting limit. Measurements with (U) indicate analysis performed but compound not detected; sample quantitation limit is reported.

Table 1. Chemical grab sample results.

Parameter	Units	6/24/10 13:10	6/2/11 11:50	7/13/11 10:15	2/28/12 9:00	4/11/12 10:20	5/30/12 10:50	7/30/12 12:00	9/12/12 11:00	9/20/12 13:00	11/14/12 11:00	12/4/12 12:00	1/9/13 12:15
1,2-ETHANEDIOL	MG/L					2 (U)							
2-BUTOXYETHANOL	MG/L					0.5 (U)							
2-PROPANOL	MG/L					0.5 (U)							
DIETHYLENE GLYCOL	MG/L					2 (U)							
ETHANOL	MG/L					0.5 (U)							
METHANOL	MG/L					0.5 (U)							
PROPYLENE GLYCOL	MG/L					2 (U)							
TRIETHYLENE GLYCOL	MG/L					2 (U)							
ALKALINITY, TOTAL	MG/L	9.2	5.6	6.4	5	2.8	8.4	10.8	0	3.6	5.4	1.8	4.6
ALUMINUM, TOTAL	UG/L	200	484	200	1383	1076	2982	621	352	<200	1179	1180	1576
AMMONIA, TOTAL	MG/L	0.36	0.16	0.57	0.15	0.22	0.07	0.03	<0.02	0.16	0.05	0.25	0.08
ARSENIC, TOTAL	UG/L	<3	<3	3.63	<3	7.1	<3	<3	<3	<3	<3	<3	<3
BARIUM, TOTAL	UG/L	219	83	182	63	65	73	44	51	100	45	139	44
BIOCHEMICAL OXYGEN DEMAND	MG/L	0.9	1.2	2.9	0.82	2.1	1.3	1.2	0.4	2.9	1.2	2.3	1.4
BORON, TOTAL	UG/L	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
BROMIDE	UG/L	2.1			560	1224	443.37	33.72	141.4	2194	47.63	2120	46.31

Parameter	Units	6/24/10 13:10	6/2/11 11:50	7/13/11 10:15	2/28/12 9:00	4/11/12 10:20	5/30/12 10:50	7/30/12 12:00	9/12/12 11:00	9/20/12 13:00	11/14/12 11:00	12/4/12 12:00	1/9/13 12:15
CALCIUM, TOTAL	MG/L	82.4	61.5	157	39.3	56.2	37.6	22.6	69.7	93.5	26.2	76.6	32.1
CHLORIDE	MG/L	256	123	489	83.7	146.68	62.6	11.63	28.38	275	12.98	263	15.26
DISSOLVED OXYGEN	MG/L	7.61			14.05								
HARDNESS, TOTAL (CALCULATED)	MG/L	268	209	484	137	192	131	83	254	304	99	253	122
IRON, TOTAL	UG/L	205	1408	144	4130	4785	8760	2090	1431	823	2800	4322	5062
LITHIUM, TOTAL	UG/L				51	158	50	<25	45	261	<25	147	<25
MAGNESIUM, TOTAL	MG/L	15.1	13.4	22.1	9.34	12.4	9.04	6.45	19.4	17	8.027	14.9	10.1
MANGANESE, TOTAL	UG/L	422	541	517	445	535	471	333	721	642	406	604	514
NITRATE & NITRITE, TOTAL	MG/L	0.47	0.56	0.33	0.76	0.5	0.54	0.87	0.34	0.49	0.78		0.75
OSMOTIC PRESSURE	MOSM	18	12	28	6	19	2	<1	3	14	1	13	3
pH - LAB	pH units	7.1	6.8	6.8	6.5	6.4	7.2	7.4	5.4	6.7	6.7	6.2	6.4
PHOSPHORUS, TOTAL	MG/L	<0.01	<0.01	<0.01	0.01	<0.01	0.065	0.01	<0.01	<0.01	0.014	<0.01	<0.01
SELENIUM, TOTAL	UG/L	<7	<7	12.67	<7	12.3	<7	<35	<7	<7	<7	<7	<7
SODIUM, TOTAL	MG/L	134	68.4	252	44.5	74.4	37.6	10.5	35.8	137	11	112	14.5
SPECIFIC CONDUCTANCE - LAB	umhos/cm	1249	824	2060	565	871	485	241	663	1334	306	1221	352
STRONTIUM, TOTAL	UG/L	6830	2661	13600	895	1886	845	118	464	3081	162	3139	178
SULFATE	MG/L	198	196	391	112	232.7	108	76.38	278	201	114	190	136
TOTAL DISSOLVED SOLIDS @ 180C	MG/L	798	386	1510	326	522	316	288	466	868	216	800	236
TOTAL SUSPENDED SOLIDS	MG/L	<5	18	6	10	<5	96	10	<5	<5	18	<5	8
ZINC, TOTAL	UG/L	10	20	20	35	38	35	16	34	17	27	37	36

Biology: The indigenous aquatic community is an excellent indicator of long-term conditions and is used as a measure of water quality. Macroinvertebrates (Table 2) were collected on August 18, 2010 using the Department’s ICE protocol (PA DEP, 2013). Results are highly indicative of an impaired waterway.

Table 2. Taxa list for macroinvertebrate survey conducted on August 18, 2010.

Group	Scientific Name	August 18, 2010
Hydropsyche	<i>Ceratopsyche</i>	6

Macroinvertebrates (Table 3) were also collected on January 9, 2013 using the Department’s ICE protocol (PA DEP, 2013).

Table 2. Taxa list for macroinvertebrate survey conducted on January 9, 2013.

Group	Scientific Name	January 9, 2013
Coleoptera	<i>Oulimnius</i>	1
Diptera	<i>Chironomidae</i>	3
	<i>Tipula</i>	1
Plecoptera	<i>Allocapnia</i>	1
Trichoptera	<i>Cheumatopsyche</i>	3
	<i>Neophylax</i>	1

ASSESSMENT:

Continuous: Continuous water quality data suggests poor water quality in this area of Blacklick Creek. Water temperatures followed seasonal changes, as expected. Specific conductance was very inconsistent and ranged from rather low (~100 uS/cm) to extremely elevated (nearly 4,000 uS/cm). The specific conductance fluctuations in this stream were most likely due to the Pennsylvania Brine Treatment Facility located at Josephine (permit number PA0095273) and, to a lesser extent, acid mine drainage (AMD) coming into the stream. Specific conductance was very irregular with no apparent seasonal pattern. pH appeared to fluctuate between 5.5 and 8.5 during the first round of deployments and averaged quite a bit lower during the last deployments, with some dips below 4.0. The treatment plant, mentioned above, and the acid mine drainage both probably contributed to these fluctuations. Separate grab samples at the treatment plant indicated the plant produced high pH water, which could help explain the large fluctuations. The pH probe had to be replaced several times and was often difficult to clean, indicating that this parameter may be difficult to measure with instream water quality sondes in poor quality water containing high amounts of AMD. Blacklick Creek is already aquatic life impaired at this location for abandoned mine drainage (metals).

Grab: Grab samples are indicative of poor instream water quality. A striking characteristic of the grab samples is the presence of elevated levels of strontium. This can be found in AMD, but not normally in such high amounts. On July 13, 2011, strontium was measured to be 13,600 ug/L, which is quite high. This was accompanied by elevated levels of chloride, barium, and specific conductance. This is suggestive of an influence of the brine treatment plant mentioned above. In

addition, while iron, aluminum, and manganese were generally elevated in the stream (indicative of AMD drainage), they were not any higher than in other samples during this particular grab sample. A grab sample of typical organic compounds that could be in natural gas wastewater was collected on April 11, 2012. All of these compounds were non-detect.

Biological: The surveys conducted on August 18, 2010 and January 9, 2013 indicated that the macroinvertebrate community is severely impaired. Very few individuals were collected.

SUMMARY:

Continuous monitoring, discrete lab chemistries, and biological data all suggest that Blacklick Creek has poor water quality conditions. This had been confirmed in the past via aquatic life assessments. Therefore, this study reaffirms that Blacklick Creek is in poor condition.

LITERATURE CITED

PA DEP. 2013. Instream Comprehensive Evaluations (ICE).
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