Pennsylvania Department of Environmental Protection
Bureau of Abandoned Mine Reclamation
Acid Mine Drainage Division
Cambria Office

Black Creek Biological Assessment
(USGS HUC 02050107000082)

Prepared by
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Date Sampled: December 2016

Introduction

Black Creek is a 36.5-kilometer (km) creek that flows from its source in north Hazleton, PA, Carbon County, west to its confluence with the Nescopeck Creek. Black Creek is a major tributary to the Nescopeck Creek. The watershed is 160.5 km^2 and land use is broken into Forested (40%), Abandoned Mine Lands (38%), Residential (9%) and Commercial (5%), Industrial (8%), visually estimated. Black Creek has two major tributaries, Cranberry Run and Derringer Run. Most of the land within the watershed is private with the majority of that land being open to public access. There are no special fishing regulations on Black Creek. Sections of Nescopeck Creek are stocked annually with trout by a local co-op hatchery.

The Pennsylvania Department of Environmental Protection (PA DEP) Chapter 93 designation for Black Creek is Cold Water Fishes (CWF) (PA DEP 1999). The watershed is in a heavily-mined anthracite coal region and is heavily impacted by Acid Mine Drainage (AMD) from anthracite mining. Three main discharge points are located on Black Creek: Tomhicken, Dainty and Derringer. A large amount of the watershed is heavily disturbed Abandoned Mine Lands (AML) with over 80 AML Problem Areas registered in the Black Creek Watershed. Other concerns within the watershed include: waste water, industrial effluent and urban conditions. All these conditions are localized within the Town of Hazleton.

The purpose of this survey was to: 1) compile a comprehensive water quality and biological data summary for the Black Creek Watershed, 2) assess water quality through the occurrence of macroinvertebrates for the Index of Biotic Integrity (IBI) and the relative abundance of Black Creek fishes, 3) use data to update ongoing management plans for AMD treatment on Black Creek, 4) collect and enumerate all fish species for the future developed IBI, and 5) provide the data to organizations involved with water quality and recreational improvement in the Black Creek Watershed.

Methods

Six (6) macroinvertebrate sites were surveyed in December 2016. Macroinvertebrate sites were chosen to represent upstream and downstream of AMD influences to help show the total effect to Black Creek and Nescopeck Creek. Site 1 - Stony Creek Upstream Confluence of Cranberry Run (SCUSCCR) was located at Latitude 40.9537, Longitude -76.0599. Site 2 - Black Creek Downstream Cranberry Creek (BCDSCR) was located at Latitude 40.9704, Longitude -76.0349. Site 3 - Black Creek Downstream Tomhicken Discharge (BCDSTD) was located at Latitude 40.9655, Longitude -76.0745. Site 4 - Black Creek Downstream of Dainty Discharge (BCDSDAD) was located at Latitude 40.9598, Longitude -76.1144. Site 5 - Black Creek Upstream Derringer Discharge (BCUSDD) was located at Latitude 40.9468, Longitude -76.1765. Site 6 - Black Creek Mouth (BCM) was located at Latitude, 41.0073 Longitude -76.1675.

Kick sampling was conducted in accordance with the protocols from *Standardized Biological Field Collection and Laboratory Methods* (PA DEP 2003). Samples were then processed for identification using the protocol from the *Instream Comprehensive Evaluation Surveys (ICE)* adopted by PA DEP (PA DEP 2013). ICE uses several macroinvertebrate Indices of Biotic Integrity (IBI); such as Taxa Richness, EPT Taxa Richness, Becks Index, Hilsenhoff Biotic Index, Shannon Diversity Index and Percent Sensitive Individuals. Each index represents the relative health of the stream by measuring different aspects of biotic health. They are then standardized to compute the Aquatic Life Use (ALU) IBI scores. The ALU is used to rate streams as impaired or unimpaired (PA DEP 2013). The unimpaired benchmark must be equal to or greater than 63 to qualify as attaining ALU. This is a useful tool when describing AMD affected waters in the recovery process. ALU is also computed two ways: Small Freestone Stream (SFS) and Large Freestone Stream (LFS). Each tests the ALU standardizations in a way that represents the change in macroinvertebrate communities between small streams and larger streams/small rivers. This is a useful tool when describing AMD affected waters in the recovery process. Habitat assessments were conducted at each site in accordance with PA DEP ICE procedures (PA DEP 2013), which are similar to *Procedures for Stream and River Inventory Information Input* (Marcinko, et al. [1986]).

Two (2) electrofishing sites were surveyed in December 2016. Site 1 - Stony Creek Upstream Confluence of Cranberry Run (SCUSCCR) was located at Latitude 40.9537, Longitude -76.0599. Site 2 - Black Creek Mouth (BCM) was located at Latitude, 41.0073 Longitude -76.1675.

Electrofishing was conducted using the protocols from *Standardized Biological Field Collection and Laboratory Methods* (PA DEP 2013, re. 2013). Each site was surveyed with an Aqua Shock Solutions B-1-L unit, which utilizes a two-active probe system. This unit does not record amps or watts and current ranged from 75 - 150 volts AC at all sites. All sites were conducted with AC current to maximize fish capture. The lowest possible voltage was used to ensure fish survival.

Results

SCUSCCR was located at river kilometer (RK) 4.3 km and was sampled for macroinvertebrates on December 12, 2016. Habitat was optimal with a total score of 202 (Table 12). Field chemistry conditions of the water were: 9.4° C, Dissolved Oxygen 6.30 mg/L, pH was 6.1, Specific Conductance was 36.5 umho/cm, and Alkalinity was 0.0 mg/L. Macroinvertebrates assemblage for SCUSCCR is located on Table 2. Taxa Richness was 18 and EPT Taxa Richness was 11. Becks Index was 15 and the Percent Sensitive Individuals was 54.07 percent. Hilsenhoff Biotic Index was 2.84, while the Shannon Diversity Index was 1.64.

BCDSCR was located at RK 22.9 km and was sampled for macroinvertebrates on December 12, 2016. Habitat was suboptimal with a total score of 155 (Table 12). Field chemistry conditions of the water were: 11.6° C, Dissolved Oxygen 6.90 mg/L, pH was 7.4, Specific Conductance was 436.3 umho/cm, and Alkalinity was 1.0 mg/L. Macroinvertebrates assemblage for BCDSCR is located on Table 3. Taxa Richness was 12 and EPT Taxa Richness was 3. Becks Index was 3 and the Percent Sensitive Individuals was 5.84 percent. Hilsenhoff Biotic Index was 1.30, while the Shannon Diversity Index was 5.42.

BCDSTD was located at RK 19.3 km and was sampled for macroinvertebrates on December 12, 2016. Habitat was suboptimal with a total score of 180 (Table 12). Field chemistry conditions of the water were: 10.2° C, Dissolved Oxygen 7.40 mg/L, pH was 7.3, Specific Conductance was 411.2 umho/cm, and Alkalinity was 2.0 mg/L. Macroinvertebrates assemblage for BCDSTD is located on Table 4. Taxa Richness was 10 and EPT Taxa Richness was 4. Becks Index was 0 and the Percent Sensitive Individuals was 0.99 percent. Hilsenhoff Biotic Index was 5.55, while the Shannon Diversity Index was 1.39.

BCDSDAD was located at RK 15.2 km and was sampled for macroinvertebrates on December 12, 2016. Habitat was suboptimal with a total score of 180 (Table 12). Field chemistry conditions of the water were: 9.7° C, Dissolved Oxygen 8.50 mg/L, pH was 7.7, Specific Conductance 403.0 umho/cm, and Alkalinity was 1.0 mg/L. Macroinvertebrates assemblage for BCDSDAD is located on Table 5. Taxa Richness was 9 and EPT Taxa Richness was 3. Becks Index was 0 and the Percent Sensitive Individuals was 14.29 percent. Hilsenhoff Biotic Index was 4.75, while the Shannon Diversity Index was 1.45.

BCUSDD was located at RK 9.6 km and was sampled for macroinvertebrates on December 12, 2016. Habitat was suboptimal with a total score of 187 (Table 12). Field chemistry conditions of the water were: 9.7° C, Dissolved Oxygen 9.40 mg/L, pH was 8.0, Specific Conductance 365.3 umho/cm, and Alkalinity was 3.0 mg/L. Macroinvertebrates assemblage for BCDSDD is located on Table 6. Taxa Richness was 10 and EPT Taxa Richness was 7. Becks Index was 5 and the Percent Sensitive Individuals was 9.39 percent. Hilsenhoff Biotic Index was 5.42, while the Shannon Diversity Index was 1.58.

BCM was located at RK 0.06 km and was sampled for macroinvertebrates on December 12, 2016. Habitat was optimal with a total score of 191 (Table 12). Field chemistry conditions of the water were: 10.1° C, Dissolved Oxygen 7.30 mg/L, pH was 7.1, Specific Conductance 365.0 umho/cm, and Alkalinity was 1.0 mg/L. Macroinvertebrates assemblage for

BCM is located on Table 7. Taxa Richness was 18 and EPT Taxa Richness was 10. Becks Index was 7 and the Percent Sensitive Individuals was 8.96 percent. Hilsenhoff Biotic Index was 5.63, while the Shannon Diversity Index was 1.94.

Electrofishing of SCUSCCR was conducted on December 12, 2016. Brook trout (Salvelinus fontinalis) was the only species collected during the survey (Table 8). Size distribution of brook trout is located on Table 9.

Electrofishing of BCM was conducted on December 12, 2016. Ten (10) species were collected during the event (Table 10) along with wild brook trout. The fish community had good diversity all in low population numbers. The size distribution of brook trout is located on Table 11.

Discussion

SCUSCCR site does not attain ALU with a score of 60.26 SFS ALU (Table 15). Stony Creek has the highest ALU of all sites sampled in the watershed. BCDSCR site does not attain ALU with a score of 27.19 SFS ALU. BCDSTD site does not attain ALU with a score of 25.99 SFS ALU. BCDSDAD site does not attain ALU with a score of 29.24 SFS ALU. BCUSDD site does not attain ALU with a score of 33.86 SFS ALU. The latter four Black Creek Sites all share the same scenario for low ALU scoring. While there were plenty of macroinvertebrates present, Taxa Richness scores were very low because very few pollution sensitive bugs were present. BCM site does not attain ALU with a score of 43.00 SFS ALU, however improves from previous sites with the addition of several tributaries with good water quality.

Fish surveys at Stony Creek and Black Creek mouth both yielded wild trout. During observations of other areas, while collecting macroinvertebrates, the survey team observed fish present throughout the main stem of Black Creek downstream of Cranberry Run.

Stony Creek was chosen as the best possible habitat to represent the lowest human influenced portion of the watershed. While the area had bizarre terrain and an atypical ecosystem of low brush and sparse oak that suggests mining may have occurred decades ago, the stream proved to be good quality and had both trout and pollution intolerant bugs. In contrast, no mainstem site on Black Creek attained SFS ALU. All the sites were affected by periodic AMD discharges and AML issues. Some areas, like BCM, were also supplemented by positive water influences. The result is that the stream improved enough to look like a fair fishery. The DEP BAMR Wilkes-Barre office is considering extensive rehabilitation of the mid to lower watershed. A second survey will be required to collect baseline data and expand electrofishing sites prior to rehabilitation efforts.

Appendix

Table 1. Social Data for Black Creek Watershed.

USGS Watershed Code	02050107
USGS Stream Code at Mouth	000082
PA DEP Chapter 93 Code	Cold Water Fishery
Counties	Columbia, Luzerne, Schuylkill
Municipalities	Beaver Township, Black Creek Township, East Union Township, North Union Township, Sugarloaf Township, Hazle Township, Hazleton City, West Hazleton Borough
7.5 Minute Topo Quad	Hazleton, Conyngham, Nuremberg

Table 2. Raw Macroinvertebrate Data for Stony Creek Upstream Confluence with Cranberry Run (SCUSCCR) Sampled December 12, 2016.

Taxa Group	Taxa ID Level	Number of Individuals
Ephemeroptera	Maccaffertium	3
	Baetis	4
Plecoptera	Acroneuria	3
	Leuctra	89
	Paracapnia	5
	Taeniopteryx	6
Trichoptera	Diplectrona	4
	Lepidostoma	2
	Mystacides	3
	Hydropsyche	3
	Polycentropus	1
Diptera	Tipula	4
	Ceratopogon	1
	Chironomidae	74
	Probezzia	4
Coleoptera	Optioservus	1
Megaloptera	Nigronia	1
Oligocheata	Oligocheata	1
Sum of all Individuals		209
Number sub-samples picked out of 24		6

Table 3. Raw Macroinvertebrate Data for Black Creek Downstream Cranberry Run (BCDSCR) Sampled December 12, 2016.

Taxa Group	Taxa ID Level	Number of Individuals
Trichoptera	Lepidostoma	2
	Cheumatopsyche	6
	Hydropsyche	27
Diptera	Prosimulium	3
	Antocha	6
	Tipula	4
	Chironomidae	135
	Hemerodromia	3
	Simulium	2
Grammaridae	Gammarus	7
Hirudinea	Piscicolaria	1
Oligocheata	Oligocheata	7
Sum of all Individuals		203
Number sub-samples picked out of 24		4

Table 4. Raw Macroinvertebrate Data for Black Creek Downstream Tomhicken Discharge (BCDSTD) Sampled December 12, 2016.

Taxa Group	Taxa ID Level	Number of Individuals
Ephemeroptera	Baetis	2
Trichoptera	Chimarra	38
	Cheumatopsyche	11
	Hydropsyche	107
Diptera	Antocha	2
	Tipula	4
	Chironomidae	33
	Hemerodromia	3
	Simulium	1
Asellidae	Caecidotea	1
Sum of all Individuals		202
Number sub-samples picked out of 24		4

Table 5. Raw Macroinvertebrate Data for Black Creek Downstream Dainty Discharge (BCDSDAD) Sampled December 12, 2016.

Taxa Group	Taxa ID Level	Number of Individuals
Trichoptera	Chimarra	102
	Hydropsyche	53
	Polycentropus	1
Diptera	Antocha	32
	Tipula	2
	Chironomidae	25
	Hemerodromia	2
	Simulium	1
Oligocheata	Oligocheata	6
Sum of all Individuals		224
Number sub-samples picked out of 24		6

Table 6. Raw Macroinvertebrate Data for Black Creek Upstream Derringer Discharge (BCUSDD) Sampled December 12, 2016.

Taxa Group	Taxa ID Level	Number of Individuals
Ephemeroptera	Baetis	7
Trichoptera	Glossosoma	1
	Lepidostoma	3
	Chimarra	41
	Cheumatopsyche	3
	Hydropsyche	94
	Polycentropus	1
Diptera	Antocha	16
	Chironomidae	40
Oligocheata	Oligocheata	7
Sum of all Individuals		213
Number sub-samples picked out of 24		4

Table 7. Raw Macroinvertebrate Data for Black Creek Mouth (BCM)
Sampled December 12, 2016.

Taxa Group	Taxa ID Level	Number of Individuals
Ephemeroptera	Maccaffertium	1
	Eurylophella	1
	Baetis	1
Trichoptera	Glossosoma	1
	Lepidostoma	8
	Rhyacophila	2
	Chimarra	78
	Cheumatopsyche	10
	Hydropsyche	28
	Polycentropus	1
Diptera	Antocha	6
	Tipula	1
	Chironomidae	10
	Hemerodromia	1
Coleoptera	Oulimnius	1
Asellidae	Caecidotea	10
Nematoda	Nematoda	2
Oligocheata	Oligocheata	39
Sum of all Individuals		201
Number sub-samples picked out of 24		5

Table 8. Stony Creek Upstream Confluence with Cranberry Run (SCUSCCR)
Sampled December 12, 2016.

Common Name	Number
Brook Trout	3

Table 9. Size Distribution of Brook Trout for Stony Creek Upstream Confluence with Cranberry Run (SCUSCCR) Sampled December 12, 2016.

Size Distribution of Brook Trout by 25 mm group	
125	2
150	1

Table 10. Raw Fish Data for Black Creek Mouth (BCM)
Sampled December 12, 2016.

Common Name	Number
Brook Trout	4
Hatchery Brook Trout	1
Hatchery Brown Trout	2
Largemouth Bass	1
Bluegill	1
Pumpkinseed	1
Green Sunfish	1
White Sucker	10
Creek Chub	1
Blacknose Dace	12
Fallfish	13

Table 11. Size Distribution of Brook Trout for Black Creek Mouth (BCM)
Sampled December 12, 2016.

Size Distribution of Brook Trout by 25 mm group	
100	1
125	1
150	1
225	1

Table 12. Habitat Assessment Parameters and Scores, Arranged from Headwaters (Left) to Mouth (Right) for Black Creek Watershed Sampled December 12, 2016.

Habitat Assessment Parameters	SCUSCCR	BCDSCR	BCDSTD	BCDSDAD	BCUSDD	BCM
Instream Cover	16	13	12	16	18	13
Epifaunal Substrate	13	15	15	13	14	16
Embeddedness	14	7	14	12	13	14
Velocity/Depth Regimes	19	15	18	15	19	18
Channel Alterations	19	15	15	14	15	15
Sediment Deposition	17	14	16	16	17	16
Frequency of Riffles	12	11	16	17	18	19
Channel Flow Status	19	19	19	19	19	19
Condition of Banks	16	16	16	18	15	16
Bank Vegetative Protection	19	10	13	13	13	16
Grazing or Other Disruptive Pressures	19	10	13	13	13	15
Riparian Vegetative Zone Width	19	10	13	14	13	14
Total	202	155	180	180	187	191

Table 13. Field Water Quality Measurements During Macroinvetebrate Surveys, Arranged from Headwaters (Left) to Mouth (Right) for Black Creek Watershed.

	SCUSCCR	BCDSCR	BCDSTD	BCDSDAD	BCUSDD	BCM
Water Quality	Macro/Fish	Macro	Macro	Macro	Macro	Macro/Fish
Temperature (° C)	9.4	11.6	10.2	9.7	9.7	10.1
Dissolved Oxygen (mg/L)	6.30	6.90	7.40	8.50	9.40	7.30
pH	6.1	7.4	7.3	7.7	8.0	7.1
Conductance (umho/cm)	36.5	436.3	411.2	403.0	365.3	365.0
Alkalinity (mg/L)	0.0	1.0	2.0	1.0	3.0	1.0

Table 14. Macroinvertebrate Raw IBI Scores, Arranged from Headwaters (Left) to Mouth (Right) for Black Creek Watershed.

Macroinvertebrate IBI scores	SCUSCCR	BCDSCR	BCDSTD	BCDSDAD	BCUSDD	BCM
Taxa Richness	18	12	10	9	10	18
EPT Taxa Richness	11	3	4	3	7	10
Becks Index	15	3	0	0	5	7
Hilsenhoff Biotic Index	2.84	5.84	5.55	4.75	5.42	5.63
Shannon Diversity Index	1.64	1.3	1.39	1.45	1.58	1.94
Percent Sensitive PTV 0-3 Individuals	54.07	5.42	0.99	14.29	9.39	8.96

Table 15. IBI Standardization and Aquatic Life Use Benchmark; Arranged from Headwaters (Left) to Mouth (Right) for Black Creek Watershed.

	SCUSCCR		BCDSCR		BCDSTD		BCDSDAD		BCUSDD		BCM	
IBI Standardization and Aquatic Life Use Benchmark	SFS	LFS	SFS	LFS	SFS	LFS	SFS	LFS	SFS	LFS	SFS	LFS
Taxa Richness	0.55	0.58	0.36	0.39	0.3	0.32	0.27	0.29	0.3	0.32	0.55	0.58
EPT Taxa Richness	0.58	0.69	0.16	0.19	0.21	0.25	0.16	0.19	0.37	0.44	0.53	0.63
Becks Index	0.39	0.68	0.08	0.14	0.00	0.00	0.00	0.00	0.13	0.23	0.18	0.32
Hilsenhoff Biotic Index	0.88	1.00	0.51	0.60	0.55	0.64	0.65	0.76	0.56	0.66	0.54	0.63
Shannon Diversity Index	0.57	0.57	0.45	0.45	0.49	0.49	0.51	0.51	0.55	0.55	0.68	0.68
Percent Sensitive PTV 0-3 Individuals (**PSI**)	0.64	0.81	0.06	0.08	0.01	0.01	0.17	0.21	0.11	0.14	0.11	0.13
ALU Benchmark	60.26	72.24	27.19	30.74	25.99	28.55	29.24	32.58	33.86	39.00	43.00	49.44

Table 16. Sampling Point Name, Abbreviation and Type of Sampling Completed at Each Point with Longitude and Latitude.

Sample Point Name	ID	Macro	Fish	Longitude	Latitude	River Kilometer
Stony Creek Upstream Confluence with Cranberry Run	SCUSCCR	X	X	-76.0599	40.9537	4.3
Black Creek Downstream Cranberry Run	BCDSCR	X	-	-76.0349	40.9704	22.9
Black Creek Downstream Tomhicken Discharge	BCDSTD	X	-	-76.0745	40.9655	19.3
Black Creek Downstream Dainty Discharge	BCDSDAD	X	-	-76.1144	40.9598	15.2
Black Creek Upstream Derringer Discharge	BCUSDD	X	-	-76.1765	40.9468	9.6
Black Creek Mouth	BCM	X	X	-76.1675	41.0073	0.6

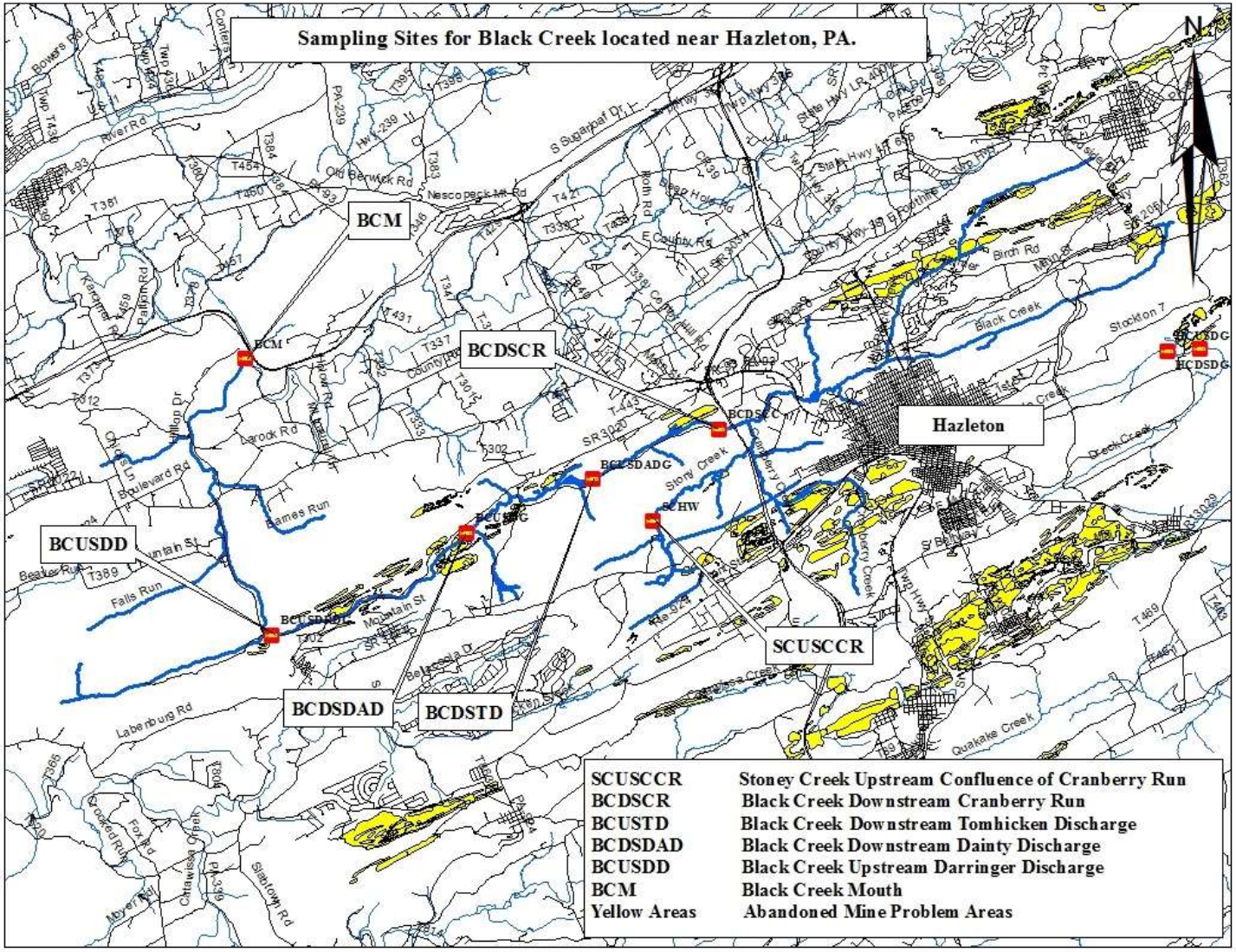

Figure 1. Map of Black Creek Sampling Points

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