Coldwater Conservation Plan for the Potts Run Watershed, Jordan & Knox Townships, Clearfield County, PA

Fall 2013

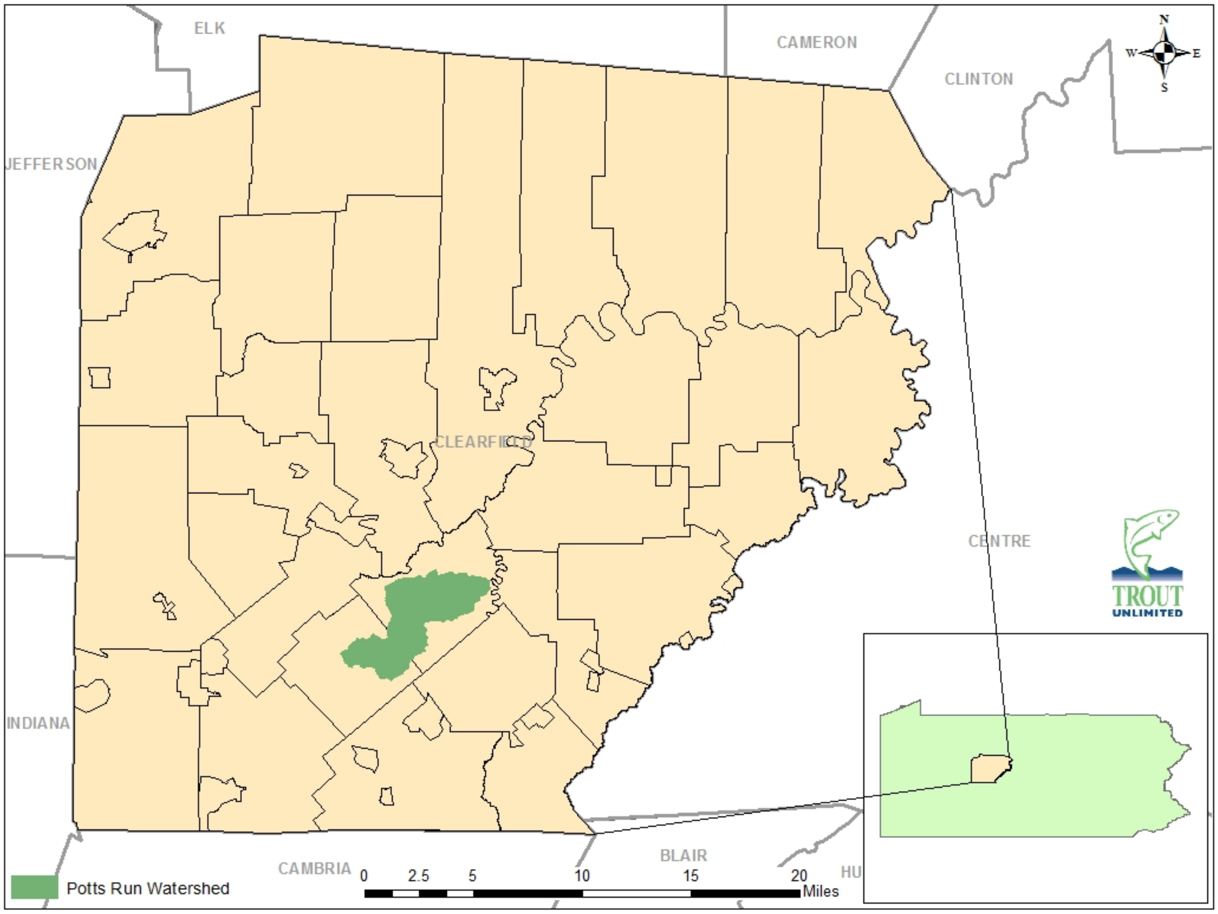
PROJECT OVERVIEW

Trout Unlimited's (TU) Eastern Abandoned Mine Program received a Coldwater Heritage Partnership (CHP) planning grant in 2012 to complete an assessment of the coldwater resources of the Potts Run watershed as part of a larger effort to assess the entire watershed and develop a restoration plan. At the time this grant was awarded, funding from the Foundation for Pennsylvania Watersheds had been secured to assess the abandoned mine drainage (AMD) impacts in the lower reaches of the Potts Run watershed. Despite the AMD impacts in the lower watershed, anecdotal evidence suggested that eastern brook trout (*Salvelinus fontinalis*) are present in the watershed. Therefore, the main objective of the CHP-funded portion of this project was to determine the potential of the Potts Run watershed to support native trout. The results of this investigation and recommendations for improving the coldwater resources found within the watershed are contained herein. Additional information will be available as part of the *Potts Run Watershed Assessment Report and Restoration Plan* that is slated to be released in the spring of 2014.

BACKGROUND

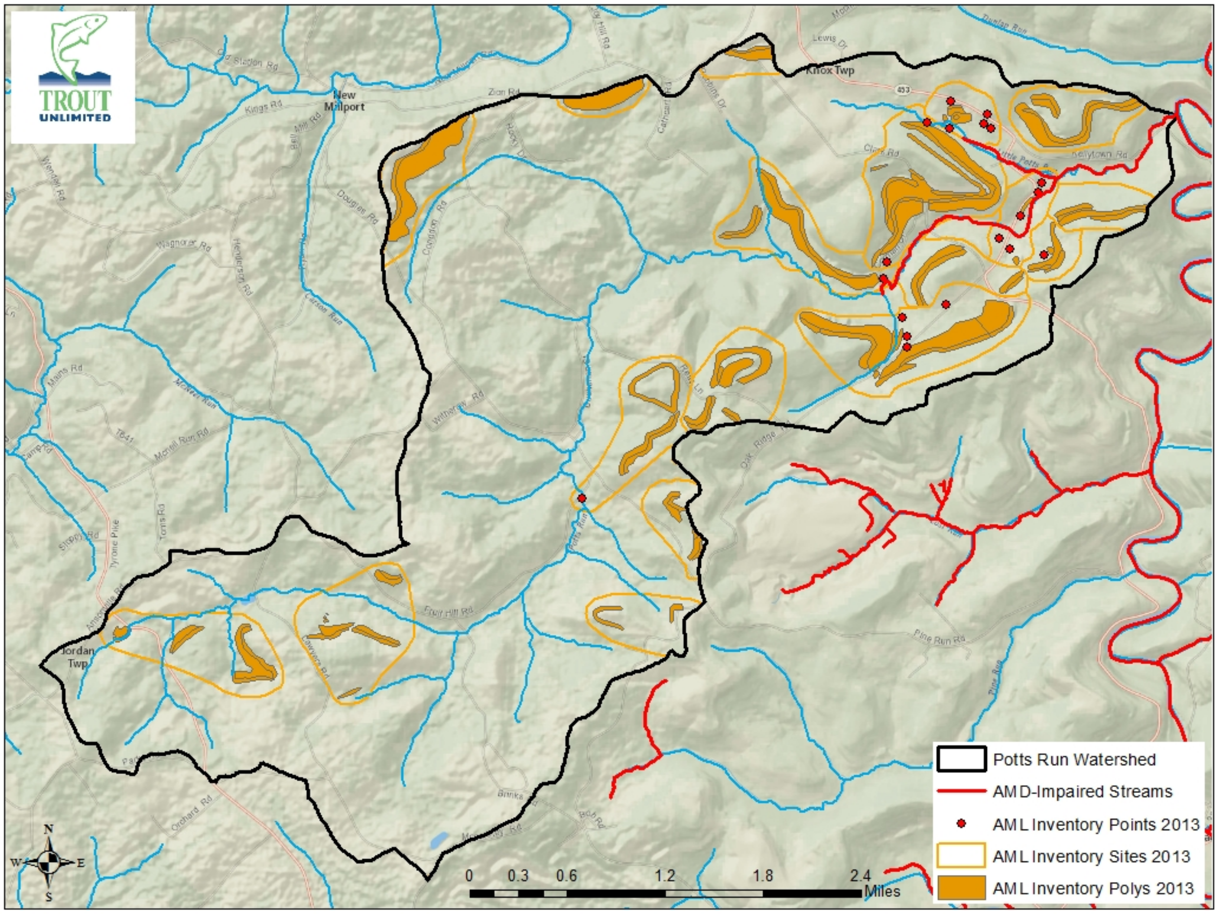
The Potts Run watershed is located in Clearfield County in northcentral Pennsylvania (Figure 1). Potts Run begins near the village of Ansonsville in Jordan Township and flows northeast to its confluence with Clearfield Creek, approximately one mile east of the village of Kellytown in Knox Township. The main stem of Potts Run is approximately 10.7 miles long with another 15 miles of tributaries feeding the stream. The watershed encompasses 14.5 square miles, much of which has been impacted by mining activities, beginning with the deep mining of coal in the late 1800s followed by surface mining that continues today. All of the streams within the Potts Run watershed are designated as coldwater fisheries (CWF) according to the PA Code, Title 25, Chapter 93 Water Quality Standards. This designation indicates that these streams support the "maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat".

Figure 1: Potts Run Watershed Location Map



While remining and surface reclamation in the upper portion of the watershed have led to improved water quality in the past couple of decades (Alan Bigatel, Pennsylvania Department of Environmental Protection (DEP), personal communication), the lower 2.7 miles of Potts Run and 0.7 miles of Little Potts Run remain impaired by AMD according to the DEP's *2012 Pennsylvania Integrated Water Quality Monitoring and Assessment Report*. In addition, the DEP Bureau of Abandoned Mine Reclamation's (BAMR) Abandoned Mine Land (AML) Inventory describes 18 AML problem areas within the Potts Run watershed. These problem areas contain 125 AML features, including many acres of coal refuse, abandoned highwalls, water-filled pits, and subsidence areas, along with shafts, derelict structures, and AMD discharges (Figure 2).

Figure 2: Abandoned mine features of the Potts Run watershed.



The Potts Run watershed is rural and sparsely populated. The majority of the population is concentrated in and around the villages of Ansonville, Carnwath, Boardman, and Kellytown. Land use in the watershed is primarily forested, with areas of agriculture and reclaimed and abandoned mined areas. There are currently no public lands located in the watershed. Stream access is contingent upon agreements with private landowners.

In the 1980s, a group of local sportsmen stocked the main stem of Potts Run with both brook and brown trout (*Salmo trutta*) near the village of Carnwath and held fishing derbies in this area. The group has since disbanded and stocking has not taken place on the stream in recent years. Many of the locals are still interested in improving fishing opportunities in the watershed, which will be further discussed in the recommendations section.

METHODS

Sample Sites

Potts Run has fourteen tributaries, of which only Little Potts Run is officially named. Two other tributaries have local names (in quotation marks). The DEP has assigned numbers to aid in the identification of all streams, both named and unnamed. The tributaries to Potts Run are numbered as follows, from the mouth to the headwaters: 26196 (Little Potts Run), 26197, 26198 (“Robbins Run”), 26199 (“Carson Run”), 26200, 26201, 26202, 26203, 26204, 26206, 26207, 26209, 26210, and 26212 (Figure 3). For the purposes of this study, sampling points were located near the mouth of each tributary and assigned a Sample ID number. Six monitoring points were also established along the main stem of Potts Run near the major road crossings (Figure 3). Table 1 provides a description of each sampling location and the types of monitoring that were completed at each site.

Figure 3: Potts Run sampling locations and DEP tributary numbers.

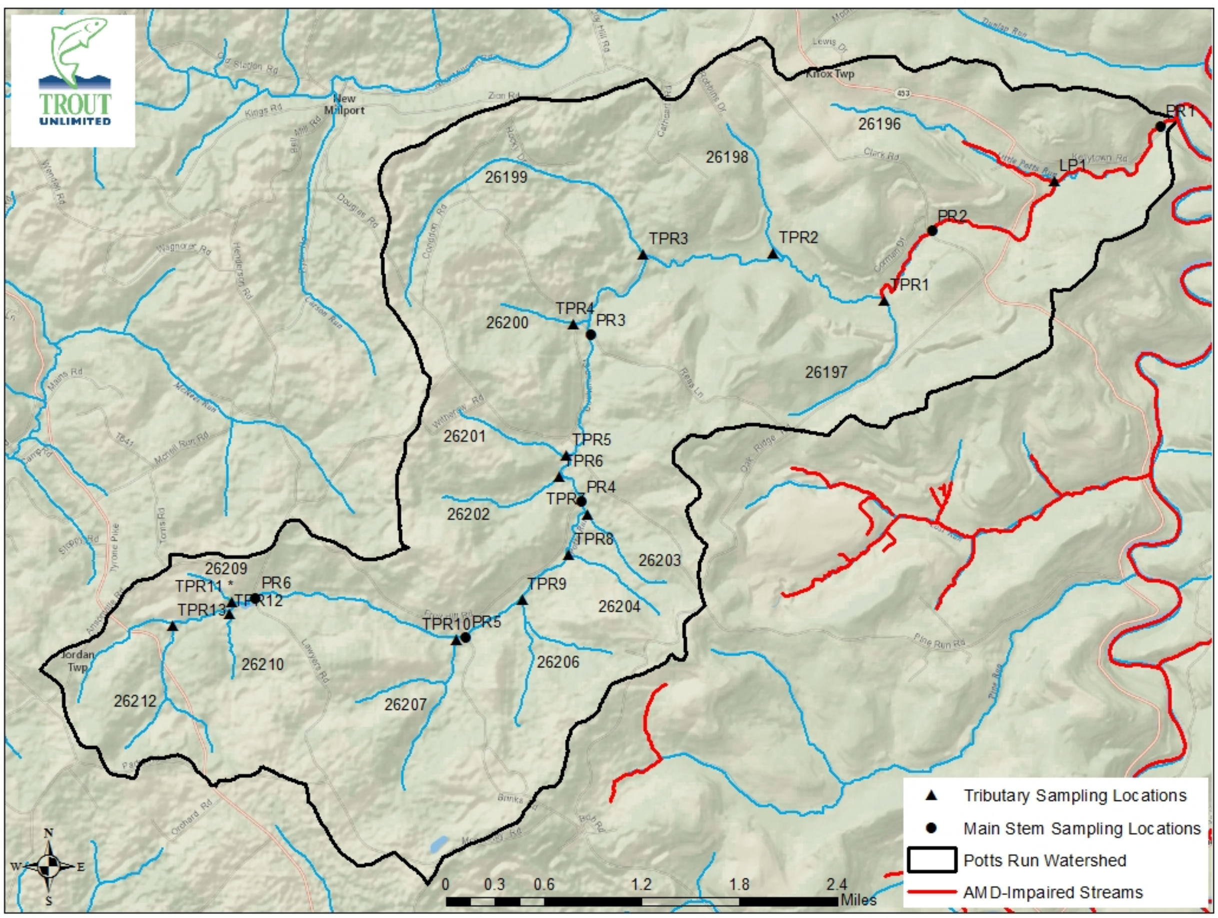


Table 1: Potts Run monitoring points.

Sample ID	Description	Latitude	Longitude	Chem	Flow	Fish	Benthics
PR1	Potts Run - mouth	40.89152	-78.44282	X	X	X	
LP1	Little Potts Run - 26196	40.88669	-78.45527	X	X	X	X
PR2	Potts Run - below Clark Rd bridge	40.88215	-78.46947	X	X		
TPR1	UNT - 26197	40.87597	-78.47506	X	X	X	X
TPR2	UNT - 26198 ("Robbins Run")	40.88011	-78.48812	X	X	X	X
TPR3	UNT - 26199 ("Carson Run")	40.8799	-78.50335	X	X	X	X
TPR4	UNT - 26200	40.87373	-78.51143	X	X	X	X
PR3	Potts Run - above Rea's lane bridge	40.87273	-78.50942	X	X		
TPR5	UNT - 26201	40.86205	-78.51219	X	X	X	X
TPR6	UNT - 26202	40.86017	-78.51305	X	X	X	X
PR4	Potts Run - above Fruit Hill Rd bridge	40.85795	-78.51041	X	X		
TPR7	UNT - 26203	40.85684	-78.50974	X	X	X	X
TPR8	UNT - 26204	40.85318	-78.51184	X	X	X	X
TPR9	UNT - 26206	40.84921	-78.51725	X	X	X	X
PR5	Potts Run - below Brink Rd bridge	40.84585	-78.52377	X	X		
TPR10	UNT - 26207	40.84556	-78.52488	X	X	X	X
PR6	Potts Run - below Lawyer Rd culvert	40.84919	-78.54844	X	X		
TPR11 *	UNT - 26209	40.84886	-78.55121	DRY			
TPR12	UNT - 26210	40.84776	-78.55158	X	X	X	X
TPR13	UNT - 26212	40.84672	-78.55818	X	X	X	X

Sample locations highlighted in gray are located on the main stem.
*Stream was dry – unable to sample

Water Quality

Conductivity (umhos), pH (standard units), and water temperature (degrees Celcius) were measured in the field during all sampling activities using an Oakton multi-parameter PCS Testr 35. The meter was calibrated for each parameter and rinsed with distilled water prior to all measurements.

Grab samples were collected according to PA DEP protocols at each of the 14 tributary locations during both high and low flow conditions during the spring and summer of 2013. Main stem samples were collected in spring and summer as well, with additional samples at varying times of the year. Grab samples consisted of a 500 mL bottle of raw water, one 250 mL bottle of water for metal analyses, and one 250 ml bottle of water for dissolved metal analyses. The samples for metals analyses were acidified to pH 2 or less with trace metal grade 1 N nitric acid. The samples for dissolved metals analyses were filtered through a 0.45 micrometer membrane using a Nalgene Mityvac hand-operated vacuum pump. These samples were submitted to Mahaffey Laboratory, LLC located in Curwensville, PA for further analysis. Mahaffey Laboratory, LLC is a DEP-certified laboratory and analyzed the grab samples for pH (standard units), conductivity (umhos), alkalinity (mg/L), acidity (mg/L), total and dissolved iron (mg/L), total and dissolved manganese (mg/L), total and dissolved aluminum (mg/L), sulfates (mg/L), total dissolved solids (mg/L), total suspended solids (mg/L), chloride (mg/L), calcium (mg/L), and magnesium (mg/L) using PA DEP standard methods.

A Swoffer Current Velocity Meter was used to measure stream flow according to DEP's *Standardized Biological Field Collection and Laboratory Methods*. Width, velocity at 6/10 depth of the water column, and depth of water were measured at intervals across the stream so that not more than 1/10 of the stream velocity was captured per interval. Stream discharge was later calculated by summing the volume of water moving through each interval.

In-Stream Habitat Evaluation

Habitat was evaluated for 100 meters at each sample site using DEP's *Water Quality Network Habitat Assessment* form, which considers the following twelve parameters: instream cover, epifaunal substrate, embeddedness, velocity/depth regimes, channel alteration, sediment deposition, frequency of riffles, channel flow status, condition of banks, bank vegetative protection, grazing or other disruptive pressure, and riparian vegetation zone width. These parameters are explained in Appendix 1. Each parameter is given a score (from 0 – 20) based on a visual survey of the sample site. The scores from each parameter are summed to obtain an overall habitat score. The habitat scoring system is as follows: the "optimal" category scores from 240 to 192, "suboptimal" from 180-132, "marginal" from 120 – 72, and "poor" is a site with a combined score less than 60. The gaps between these categories are left to the discretion of the investigator's best professional judgment. Habitat surveys completed with this method are subjective to the observer. This bias was overcome by having the same person perform all of the surveys. Therefore, the results of this study are comparable to one another, but not necessarily comparable to other habitat surveys completed by different observers.

Temperature

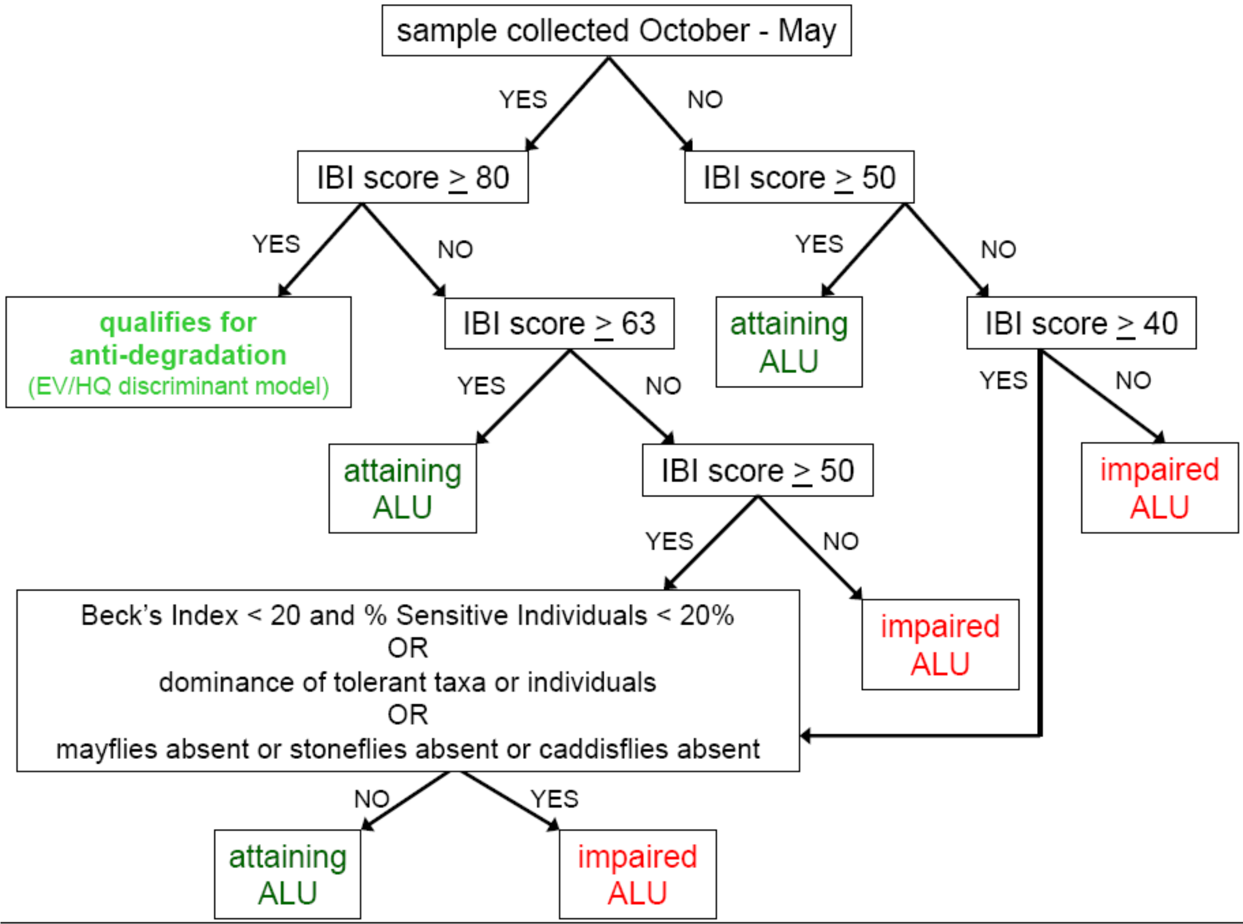
In-stream water temperatures were measured from 27 June 2012 to 18 October 2012 and again from 6 June 2013 to 15 October 2013 using a Hobo TidBit data logger. One logger was placed at each of the main stem sampling locations and set to record a temperature (^oC) at two-hour intervals. These data were downloaded periodically throughout the project and imported into an Excel spreadsheet.

Benthic Macroinvertebrates

Benthic macroinvertebrates were collected at each of the tributary sampling sites in April 2013. Benthic macroinvertebrate collections were performed according to the DEP's Instream Comprehensive Evaluation (ICE) protocol (specifically section C.1.b. Antidegradation Surveys). In short, benthic macroinvertebrate samples consisted of a combination of six D-frame efforts in a 100-meter stream section. These efforts were spread out so as to select the best riffle habitat areas with varying depths. Each effort consisted of an area of one square meter to a depth of at least four inches as substrate allowed and was conducted with a 500 micron mesh 12-inch diameter D-frame kick net. The six individual efforts were composited and preserved with ethanol for processing in the laboratory. In samples with greater than 200 individuals, subsamples were taken. Individuals were identified by taxonomists certified by the North American Benthological

Society to genus or the next highest possible taxonomic level. Samples containing 160 to 240 individuals were evaluated according to the six metrics comprising the DEP's Index of Biological Integrity (IBI) (Total Taxa Richness, EPT Taxa Richness, Beck's Index V.3, Shannon Diversity, Hilsenhoff Biotic Index, and Percent Sensitive Individuals. Appendix 2 contains a description of each of these six metrics. These metrics were standardized and used to determine if the stream met the Aquatic Life Use (ALU) threshold for coldwater fishes, warmwater fishes, and trout stocked fishes (Figure 4).

Figure 4: The aquatic life use assessment decision process for smaller wadeable freestone riffle-run type streams in Pennsylvania (Chalfant, 2009).



Fishery Surveys

Fishery surveys were completed at each of the tributary sampling sites and one main stem location during summer low-flow conditions to minimize sampling bias and allow for the capture of young-of-year-fish. A sampling site approximately 100 meters in length was selected that included the benthic macroinvertebrate collection site and contained habitat that was representative to the stream. Each sample site ended at a natural impediment to upstream movement to minimize sampling bias. A Smith-Root Model LR-24 backpack electrofisher was used to conduct each survey. Proper current and voltage settings were determined on-site following an evaluation of conductivity.

Single pass electrofishing surveys were completed at each site. All fish captured during the electrofishing surveys were identified to species. Each species present for the sample site was given an abundance rating according to the PFBC (< 2 individuals = rare; 2 – 8 individuals = present; 9 – 33 individuals = common; > 33 individuals = abundant). All salmonid species collected were held until the survey was complete and then measured to the nearest millimeter (total length). Brook trout were also categorized by size into 25 mm size classes.

RESULTS

Water Quality

A summary of the water quality results for the tributary sampling locations can be found in Table 2. TPR11 (UNT 26209) was not sampled during the high flow sampling event because landowner permission had not been granted. During low flow conditions, the stream was dry and no sample could be obtained. Overall, all thirteen sampled tributaries were net alkaline and fell within acceptable limits to meet Chapter 93 Water Quality Standards (Table 3) during both low and high flow conditions with the following exceptions: TPR1 (UNT 26197) fell outside of acceptable limits for pH, iron, manganese, and aluminum during the high and low flow sampling, and also exceeded the limits for sulfate and total dissolved solids during the low flow sampling event; Sulfate and total dissolved solids limits were also exceeded at sampling locations TPR4 (UNT 26200), TPR10 (UNT 26207), and TPR12 (UNT 26210) during low flow, and at TPR12 during high flow as well. A known AMD discharge from the Potts Run No. 3 deep mine enters UNT 26197 upstream of the TPR1 sampling point and accounts for the majority of the pollution observed at this sampling location.

Table 2: Summary of water quality results during high and low flow conditions for the Potts Run tributary sampling locations. Results are in mg/L except for pH (Standard Units) and specific conductance (µs/cm).

Sample ID	Date	pH	Cond	Alk	Acid	Fe	Mn	Al	SO4	TDS	Chloride
LP1	4/3/2013	6.34	274	23	5	0.12	0.40	0.11	74	163	15.20
	8/15/2013	6.90	478	34	-11	0.26	0.25	0.10	172	347	11.90
TPR1	4/3/2013	3.07	466	0	74	2.40	2.05	5.17	146	234	10.60
	8/15/2013	2.41	824	0	103	3.86	4.69	9.44	291	508	5.00
TPR2	4/3/2013	6.15	98	12	14	0.14	0.05	0.08	17	56	7.50
	8/15/2013	6.60	151	33	-9	0.72	0.21	0.19	19	80	8.10
TPR3	4/3/2013	6.26	173	23	4	0.09	0.04	0.08	39	104	9.20
	8/15/2013	6.98	429	76	-53	0.21	0.07	0.06	116	296	11.00
TPR4	4/3/2013	6.03	430	49	-18	0.06	0.02	0.07	147	279	8.40
	8/15/2013	6.62	839	109	-89	0.06	<0.02	0.07	313	617	13.20
TPR5	4/3/2013	6.31	127	15	10	0.53	0.06	0.22	19	68	14.50
	8/15/2013	7.16	234	25	-9	0.28	0.07	0.08	28	128	24.70
TPR6	4/3/2013	6.39	148	15	9	<0.05	<0.02	<0.05	47	99	2.20
	8/15/2013	7.02	379	47	-29	0.07	0.02	0.07	129	238	2.40
TPR7	4/3/2013	6.56	176	15	12	0.16	0.03	0.12	40	97	15.30
	8/15/2013	6.68	242	31	-11	0.08	<0.02	0.06	47	141	18.70
TPR8	4/3/2013	6.49	229	18	3	<0.05	0.03	<0.05	72	141	9.90
	8/15/2013	6.81	311	34	-12	0.15	0.03	0.06	88	199	13.0
TPR9	4/3/2013	6.06	270	29	1	<0.05	<0.02	0.05	86	164	5.90
	8/15/2013	7.34	578	81	-63	<0.05	0.03	<0.05	207	390	2.90
TPR10	4/3/2013	6.84	604	91	-60	<0.05	0.02	<0.05	218	417	5.50
	8/15/2013	7.23	1020	146	-128	0.07	0.08	<0.05	399	744	5.20
TPR11	4/3/2013	Not Sampled									
	8/15/2013										
TPR12	4/3/2013	7.68	890	248	-214	0.07	0.04	0.07	251	623	5.70
	9/9/2013	7.42	1010	272	-244	0.22	0.11	0.07	296	841	8.30
TPR13	4/3/2013	7.72	247	37	-11	0.23	0.04	0.13	33	136	22.40
	8/15/2013	7.08	519	81	-65	0.16	0.03	0.07	88	294	44.80

Results highlighted in yellow do not meet Chapter 93 water quality criteria.

Table 3: Chapter 93 Water Quality Standards

Parameter	Criteria Value (mg/L)	Total Recoverable/Dissolved
Aluminum (Al)	0.75	Total Recoverable
Iron (Fe)	1.50	Total Recoverable
Manganese (Mn)	1.00	Total Recoverable
pH	6.0-9.0	N/A
Sulfate	250	N/A
Total Dissolved Solids	500	N/A
Chloride	250	N/A

A summary of the water quality results for the main stem sampling locations can be found in Table 4. Sampling locations PR5 and PR6 were added later in the study; therefore, they have not yet been sampled during high flow conditions. They will be included in future sampling efforts, the results of which will be included in the *Potts Run Watershed Assessment Report and Restoration Plan* to be completed in spring 2014.

Each of the main stem sampling locations met Chapter 93 water quality criteria (Table 3) during both high and low flow conditions for specific conductance, alkalinity, acidity, and iron, manganese, aluminum and chloride concentrations. The following sampling locations exceeded Chapter 93 water quality criteria: PR1 did not fall within the limits for pH during the high flow sampling event; PR3, PR4, and PR5 exceeded the limits set for sulfate and total dissolved solids during the low flow sampling event, and PR6 exceeded the limit for total dissolved solids during low flow conditions.

Table 4: Summary of water quality results during high and low flow conditions for the Potts Run main stem sampling locations. Results are in mg/L except for pH (Standard Units) and specific conductance (µs/cm).

Sample ID	Date	pH	Cond	Alk	Acid	Fe	Mn	Al	SO4	TDS	Chloride
PR1	3/27/2013	5.91	349	28	-4	0.38	0.46	0.58	108	198	13.5
	8/13/2013	6.91	489	48	-25	0.66	0.61	0.57	181	357	9.7
PR2	3/27/2013	6.15	346	32	-7	0.41	0.39	0.61	110	198	11.6
	8/13/2013	7.60	581	66	-48	0.47	0.77	0.69	205	378	7.6
PR3	3/27/2013	6.63	396	49	-20	0.15	0.06	0.06	122	224	12.3
	8/13/2013	7.72	762	120	-104	0.32	0.10	0.08	255	515	7.7
PR4	3/27/2013	6.69	435	51	-30	0.14	0.06	0.05	133	260	13.2
	8/13/2013	7.75	843	138	-124	0.24	0.05	<0.05	288	570	7.1
PR5	3/27/2013	Not Sampled									
	8/13/2013	7.60	927	148	-132	0.18	0.08	<0.05	328	642	7.0
PR6	3/27/2013	Not Sampled									
	8/13/2013	7.29	784	185	-169	0.35	0.09	<0.05	204	509	10.1

Results highlighted in yellow do not meet Chapter 93 water quality criteria.

In-Stream Habitat

The results from the habitat assessments are provided in Table 5. Eight of the thirteen streams that were evaluated for habitat received scores in the optimal range. The TPR10 (UNT 26207) sampling location received the highest habitat score, with each parameter scoring in the optimal range. The TPR13 (UNT 26212) sampling location received the lowest habitat score, due to poor scores for the instream cover, epifaunal substrate, and sediment deposition parameters. Only two streams received poor scores for any parameter: TPR1 (UNT 26197) for sediment deposition and TPR2 (UNT 26198) for instream cover and embeddedness. Ten streams scored below optimal in the embeddedness parameter, while nine streams scored below optimal in the sediment deposition parameter. Poor scores for these two parameters are of greater concern because of their ability to influence instream benthic macroinvertebrate habitat. See Appendix 1 for a more thorough explanation of these parameters.

Table 5: Results from the DEP habitat assessment survey. Scores from the assessment have been color-coded according to the key below the table.

Parameter	LP1	TPR1	TPR2	TPR3	TPR4	TPR5	TPR6	TPR7	TPR8	TPR9	TPR10	TPR12	TPR13
Instream Cover (Fish)*	20	20	4	16	12	14	20	17	17	12	18	8	7
Epifaunal Substrate*	17	20	16	17	19	20	20	13	16	15	19	11	7
Embeddedness*	13	8	3	10	18	8	14	14	19	12	17	8	13
Velocity/Depth Regimes	17	20	19	20	13	17	17	15	20	14	20	10	11
Channel Alteration	20	20	20	20	20	18	20	20	16	20	20	20	16
Sediment Deposition*	12	5	10	9	19	12	18	13	14	12	19	13	10
Frequency of Riffles	18	20	18	20	20	20	18	20	10	16	20	10	15
Channel Flow Status	17	20	20	20	20	17	9	9	18	14	20	15	13
Condition of Banks	18	18	16	18	20	16	20	8	15	17	16	18	17
Bank Vegetative Protection	20	20	20	20	20	17	20	20	20	20	20	20	20
Grazing or Other Disruptive Pressure	20	20	20	20	20	20	20	20	20	20	20	20	20
Riparian Vegetative Zone Width	20	20	20	20	20	8	20	20	20	20	20	20	20
Total Score	**212**	**211**	**186**	**210**	**221**	**187**	**216**	**189**	**205**	**192**	**229**	**173**	**169**

*Scores in the "marginal" (6 -10) or "poor" (0- 5) categories for these parameters are of greater concern than for those of the other parameters due to their ability to influence in-stream benthic macroinvertebrate habitat.

Optimal
Suboptimal
Marginal
Poor

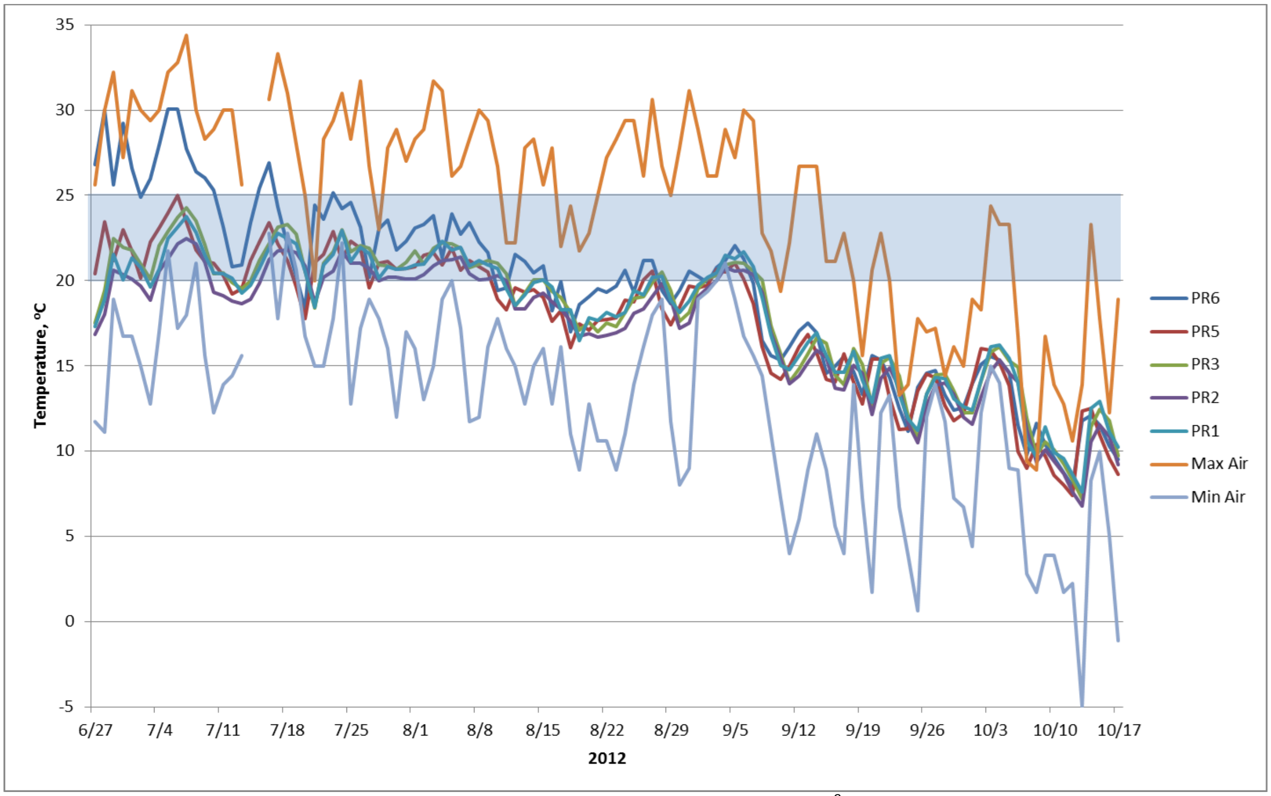
Water Temperature

Over the two-year period in which summer water temperature was monitored at the six main stem sampling locations, stream temperatures were greatest during late June through early August, finally dropping below levels that are considered stressful to trout (20^{o}C) (Kratzer & Warren 2013) in early September (Figures 5 and 6). During both years, the highest maximum stream temperatures were recorded at PR6, which is the most upstream sampling point on the main stem of Potts Run and is located just downstream of an abandoned beaver impoundment. Maximum water temperatures recorded at this site were 30.0^{o}C and 29.4^{o}C in 2012 and 2013, respectively. These water temperatures are only about two degrees less than maximum air temperatures recorded during the same two days and are well above the maximum thermal tolerance limit for trout (25^{o}C) (Wehrly *et al*. 2007).

In 2012, each site reached temperatures above 20^{o}C between 38 and 56 times during the 112-day monitoring period. Temperatures above this threshold were maintained between 12 and 22 days at the various sampling locations (Table 6), which is sufficient to induce voluntary movement of trout from these locations (Wehrly *et al*. 2007).

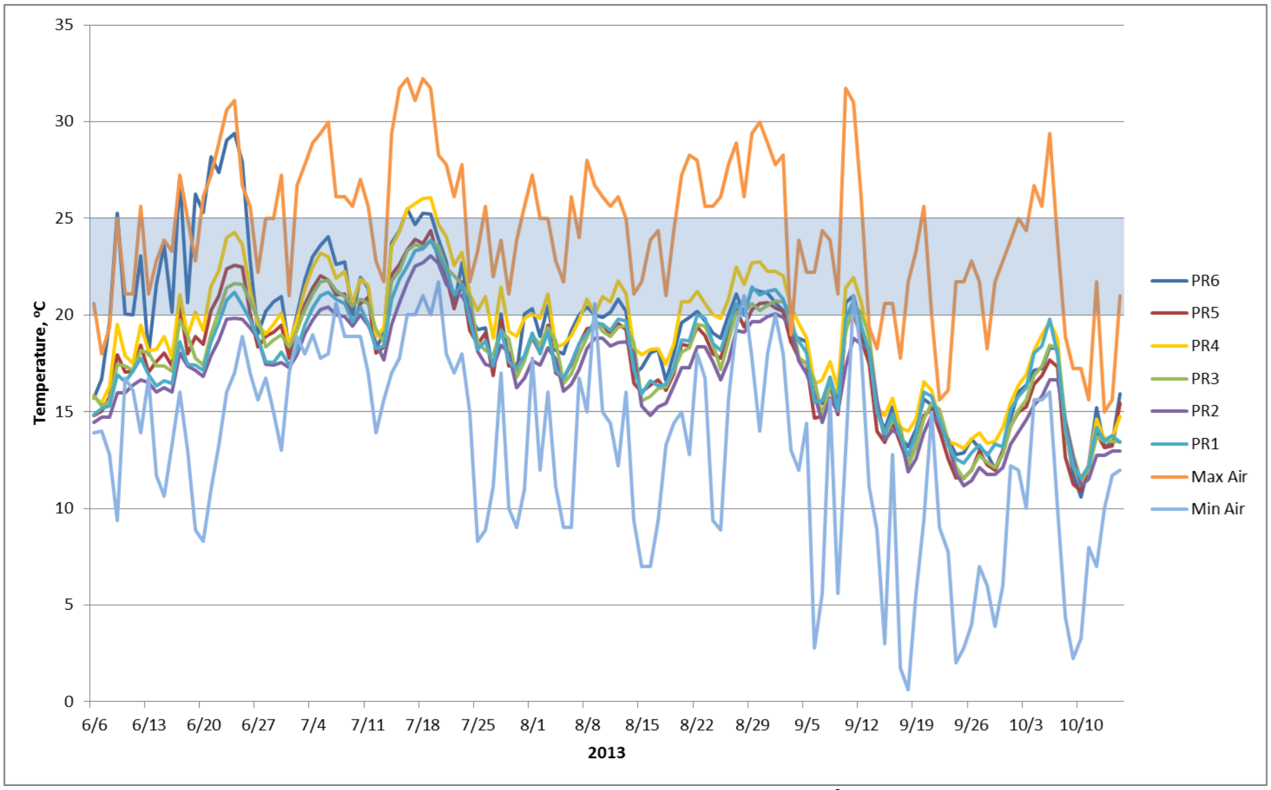
In 2013, each site reached temperatures above 20^{o}C between15 and 61 times during the 131-day monitoring period. Temperatures above this threshold were maintained between 10 and 13 days at the various sampling locations (Table 6), which is sufficient to induce voluntary movement of trout from these locations.

Figure 5: Maximum daily temperatures at the Potts Run main stem sampling locations between 27 June and 18 October 2012.



Blue bar indicates the water temperature range at which trout experience stress, with 25°C indicating the maximum thermal tolerance limit.

Figure 6: Maximum daily temperatures at the Potts Run main stem sampling locations between 6 June and 15 October 2013.



Blue bar indicates the water temperature range at which trout experience stress, with 25°C indicating the maximum thermal tolerance limit.

Table 6: Total and maximum consecutive days above 20°C at the Potts Run main stem sampling sites.

		PR1	PR2	PR3	PR4	PR5	PR6
2012	Total # days above 20°C	27	15	35	57	32	61
	Max # consecutive days above 20°C	10	10	11	13	10	13
2013	Total # days above 20°C	48	38	50	ND	45	56
	Max # consecutive days above 20°C	19	12	20	ND	14	22

Benthic Macroinvertebrates

Benthic macroinvertebrates were collected at each of the fourteen tributary sampling sites (except for TPR11) as outlined in the methods. A full list of the taxa collected, their abundance, and the pollution tolerance value (PTV) (based on PA DEP data) for each site is provided in Appendix 3. Pollution tolerance of the taxa increases as the PTV increases. For example, taxa with a PTV of 6 are more tolerant to anthropogenic pollution than taxa with a PTV of 2. PTV values were developed by DEP using primarily organic sources of pollution and do not reflect the tolerance of the organism to acid derived pollution. (I.e. in acidified streams, the IBI score may be inflated due to the presence of acid tolerant genera that have a low PTV for organic pollution.)

Overall, the most abundant families in these samples were Chironomidae (Order Diptera), Nemouridae (Order Plecoptera), and Simuliidae (Order Diptera) (Appendix 3). The Chironomidae are relatively tolerant to anthropogenic pollution (PTV = 6). Nemouridae (specific taxon Amphinemura) has a PTV of 3; however, this family is known to be moderately tolerant to acidic conditions. While the Family Simuliidae (Blackflies) are known for being pollution tolerant, the particular taxon (Prosimulium) found in the Potts Run watershed has a PTV of 2.

The biological metrics calculated for each sample site are provided in Table 7. Detailed descriptions of these metrics are provided in Appendix 2. The TPR2, TPR4, TPR6, TPR7, TPR8, TPR10 and TPR13 sampling locations all met attaining life use criteria (IBI scores greater than 63). The TPR9 site was extremely close to meeting these criteria (IBI = 62.3) and should be further evaluated. One site (LP1) did not contain enough individuals in order for the IBI to be calculated, and the remaining sites, TPR1, TPR3, TPR5, and TPR12, had IBI scores that indicate they are not meeting their designated aquatic life use of CWF. Taxa richness varied among sites, ranging between 6 and 32 taxa. The TPR4 sample site contained the greatest number of taxa (32 taxa), followed by TPR8 (28 taxa). The TPR1 site had the fewest number of taxa observed (6 taxa). The number of taxa belonging to the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT taxa) accounted for nearly half (47%) of the total number of individual organisms collected (Appendix 3). The presence of EPT taxa in samples is generally an indicator of adequate water chemistry and habitat availability for these organisms.

Table 7: Benthic macroinvertebrate biometric results. A detailed description of each parameter is given in Appendix 2.

	LP1	**TPR1**	**TPR2**	**TPR3**	**TPR4**	**TPR5**	**TPR6**	**TPR7**	**TPR8**	**TPR9**	**TPR10**	**TPR12**	**TPR13**
Total Taxa Richness	15	6	24	13	32	16	20	24	28	24	19	22	24
EPT Taxa Richness	5	1	11	5	11	7	11	13	14	9	9	8	11
Beck's Index V.3	13	4	22	5	27	10	17	29	24	19	18	18	19
Shannon Diversity Index	2.02	0.24	2.09	1.42	2.48	1.92	2.04	2.48	2.53	2.29	2.12	1.90	2.19
Hilsenhoff Biotic Index	3.49	5.92	3.31	2.78	4.15	4.00	3.45	3.39	3.17	3.92	3.24	4.83	3.80
Percent Sensitive Individuals	47.4	1.9	64.5	75.5	44.7	66.5	70.8	59.6	66.8	41.3	66.5	46.3	60.2
IBI Score	**N/A**	**15.8**	**70.1**	**51.1**	**73.0**	**55.2**	**66.5**	**76.0**	**78.9**	**62.3**	**64.8**	**56.8**	**67.5**

Note: N/A indicates that the IBI could not be calculated because the sample contained fewer than 200 +/- 40 individuals; therefore, the stream at this location does not meet the criteria for aquatic life use attainment as set forth by the PA DEP.

Fishery Survey

Fishery surveys were completed on thirteen of the fourteen tributaries to Potts Run during the summers of 2012 and 2013. TPR11 was dry during the summer of 2013, thus was precluded from the surveys. Brook trout and/or brown trout were collected at eight of the thirteen sites during electrofishing surveys. The size distribution of brook trout is shown in Figure 7. The greatest numbers of trout (19 brook trout) were found at sampling location TPR4, during one 100-m pass. Two additional passes were completed on that stream, yielding a total of 32 brook trout; however, in order to compare those results to the results in other tributaries, only the first pass is included in Figure 7. At sampling location LP1, a total of 6 brook trout were collected. At site TPR2, 11 brook trout were collected. At TPR5, a total of 13 brook trout were collected. At TPR6 a total of 5 trout were collected (4 brook, 1 brown). At TPR7, at total of 2 trout were collected (1 brook, 1 brown). At TPR9, a total of 3 brook trout were collected and at TPR10, a total of 6 brook trout were collected. Young-of-year brook trout were collected at LP1, TPR2, TPR4, TPR5, TPR6 and TPR10, confirming that reproduction is occurring in the watershed.

Two additional fishery surveys were completed on the main stem of Potts Run. The first was at sampling site PR1, near the mouth. Trout were not collected at this site. The other additional survey was completed on the main stem of Potts Run between UNT 26198 – “Robbins Run” (TPR2) and UNT 26199 – “Carson Run” (TPR3). One brook trout was collected at this location. It should be noted, however, that brook trout have been visually observed near sampling locations PR1, PR2, and PR3 during spring and fall after water temperatures cool. These trout are thought to be native, but the proximity of these sampling locations to bridges cannot preclude the possibility that they were transported to the stream by local anglers. Brook trout have also been caught by anglers between PR1 and PR2 (downstream of Little Potts Run), as recently as 2 June 2013 (Photo 1). These trout do not appear to have been stocked as they were only 5-6 inches in length and stream access is more difficult in this location. It is possible that these fish are inhabitants of Little Potts Run that move into the main stem of Potts Run as temperatures allow.

Figure 7: Size class distribution of brook trout in the Potts Run tributaries.

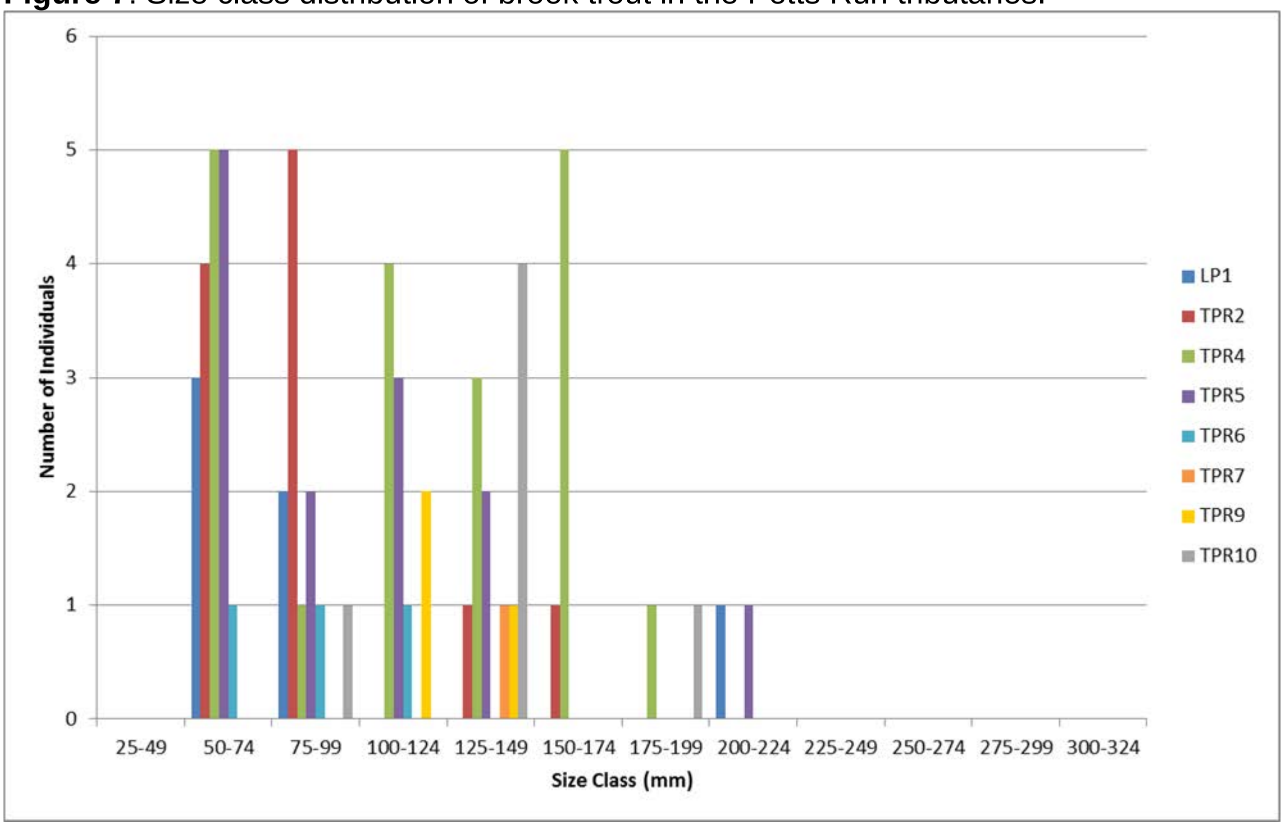


Photo 1: Brook trout caught on main stem of Potts Run, 2 June 2013.

Additional species found during fishery surveys along with their relative abundance can be found in Appendix 4.

CONCLUSIONS/RECOMMENDATIONS

In keeping with TU's four-tiered conservation strategy and science-based approach to conservation, the conclusions and recommendations of this study have been organized into the following categories: Protect, Reconnect, Restore, Sustain and Science/Research.

Protect

The 2012 fishery surveys resulted in four of the tributaries (Little Potts Run, UNT 26198 – "Robbins Run", UNT 26200, and UNT 26207) being added to the PFBC's "wild trout" list. It is anticipated that three additional tributaries will be added to the list based on results of the 2013 fishery surveys. Inclusion on the wild trout list means that all wetlands surrounding a stream are afforded Exceptional Value (EV) status and granted additional protections from development.

At this time, there are no public or conserved lands within the Potts Run watershed and stream access is limited to areas where private landowners have chosen to permit public access for fishing. Given the amount of private land in the watershed, much of which is owned by “absentee” landowners, the opportunity exists to work with land trusts, local and state agencies, and private landowners to protect important conservation areas and increase public recreation in the watershed.

Recommendations:

1. Identify additional areas for public access and seek formal fishing easements through partnerships with private landowners, PFBC, etc.

2. Identify and implement land protection projects that will protect critical habitat, assist with restoration/conservation efforts, and provide for public lands within the Potts Run watershed. Special emphasis should be placed on protecting tributaries supporting the natural reproduction of brook trout (LP1, TPR2, TPR4, TPR5, TPR6, and TPR10).

Reconnect

Fortunately, there are relatively few road crossings in the Potts Run watershed that have the potential to limit fish passage, however, a few problem areas (TPR4 and TPR5) were noted during this assessment which if addressed could improve connectivity in the watershed. Aside from the physical barriers to fish movement, there are also chemical (AMD) and thermal barriers which may be causing isolation of brook trout populations in the watershed. Addressing these non-physical barriers in the watershed will also help improve connectivity. These areas of concern will be addressed below in the restoration recommendations.

Recommendations:

1. Perform a culvert assessment and create a prioritized list of culverts that pose fish passage issues or are contributing to erosion and sedimentation issues. Two areas of concern noted during this assessment that should be further investigated are located at TPR4 and TPR5.

2. Seek funding to perform culvert removal/replacement activities.

Restore

Despite AMD influences in the watershed, water quality in Potts Run and its tributaries remains relatively good, with the exception of UNT 26197, which failed to meet Chapter 93 water quality standards during both sampling events. Several other tributaries exceeded limits for sulfate and total dissolved solids during one or more sampling rounds and the main stem of Potts Run at PR1 fell below the acceptable pH range during the high flow sampling event. Based on visual observations, habitat assessment scores, and macroinvertebrate data, it appears that erosion and sedimentation are also having deleterious effects in Potts Run and several of its tributaries. Summer water temperatures are also a limiting factor for trout populations in the main stem of Potts Run. All of these factors should be addressed in order to restore Potts Run to a viable brook trout fishery.

Recommendations:

1. Complete AMD assessment as part of the *Potts Run Assessment and Restoration Plan* development project and implement recommendations from the plan to address AMD impacts in the lower Potts Run watershed. One focus area should be UNT 26197 (TPR1) since it the greatest contributor of AMD pollution to Potts Run.

2. Identify sources of sediment in the watershed and work with project partners including municipalities, industry (timber, gas, mining), and private landowners to implement streambank stabilization projects, dirt and gravel roads projects, and other best management practices that will reduce sources of sediment in the watershed.

3. Seek funding for and implement riparian buffer plantings and other temperature mitigation projects and habitat improvement projects to reduce thermal impacts and create thermal refugia in the watershed. One focus area should be on the main stem between PR4 and PR6 and upstream of PR6 (abandoned beaver impoundment), where forest buffers are lacking and temperatures commonly reach limits that are detrimental to trout growth and survival during summer low-flow conditions.

Sustain

An important part of every restoration/conservation effort is to engage local citizens, municipal officials, and youth in conservation activities. At one time, there was a local sportsman's organization that stocked trout in Potts Run and organized fishing derbies. While stocking of this stream is no longer advocated, it may be possible to engage these local sportsmen and women and other outdoor-minded individuals in watershed restoration and enhancement projects. It is of particular importance to engage youth in watershed activities through hands-on learning activities that will inspire them to be good stream stewards.

Recommendations:

1. Work with the Clearfield Creek Watershed Association, Clearfield County Conservation District and other conservation organizations to provide watershed education and outreach to local citizens and municipal officials and encourage their participation in watershed conservation activities.

2. Engage local sportsmen and women in planning and implementing watershed conservation activities using an ecosystem based approach that underscores how improved water quality, forested buffers, etc. can positively impact both the terrestrial and aquatic communities within the watershed, increasing hunting, fishing and other outdoor recreation opportunities.

3. Partner with local schools, clubs, and youth groups to increase youth involvement in the watershed through presentations, field trips, and activities (tree plantings, habitat improvements, biological and water quality monitoring, etc.) that allow youth to interact with the stream.

Science/Research

Although this study provides an initial attempt to characterize Potts Run and its tributaries and to identify coldwater conservation priorities, it is only cursory in nature and additional studies are needed to fully understand the problems and opportunities within the Potts Run watershed. In addition to the AMD assessment being conducted in the lower watershed, there are several other areas of interest that should be studied in more detail. For instance, many of the tributaries in the Potts Run watershed had lower habitat scores in the embeddedness and sediment deposition categories even though the sampling locations were within stable, forested stream reaches. It is hypothesized that reclaimed surface mining in the headwaters of these tributaries are contributing excess sediment to these tributaries and Potts Run; however, more detailed studies are needed to determine the source(s) of sedimentation.

Recommendations:

1. Investigate the effects reclaimed and abandoned mine areas are having on stream velocity, temperature, and sediment load to Potts Run and its tributaries and identify ways to mitigate any detrimental effects on coldwater communities.

2. Complete a more in-depth assessment of Little Potts Run to determine what impacts can be attributed to AMD (appears minimal) and what other factors (agriculture, lack of sewage treatment facilities, etc.) may be resulting in depressed macroinvertebrate and fish populations.

3. Complete additional studies to help determine how brook trout are utilizing Potts Run and its tributaries (i.e. additional fishery surveys, redd counts, etc.) and develop brook trout management recommendations for the watershed.

ACKNOWLEDGEMENTS

This project could not have been completed without funding from the Coldwater Heritage Partnership or the many hours of assistance provided by Kelly Williams and Carl Undercofler of the Clearfield County Conservation District and TU summer interns: Zeb Buck, Nicole Lundberg, Melissa Tesauro, Lauren McGarvey, Kathleen LaForce, and Brendan Donaghy. Many thanks! A special thanks to Officer Vance Dunbar of the PFBC for his assistance with water sampling and fishery surveys. Also, thank you to the many private landowners that granted access to the stream for the completion of this study.

REFERENCES

Bigatel, A. 2012. Personal communication. Pennsylvania Department of Environmental Protection.

Chalfant, B. 2007. A Benthic Index of Biotic Integrity for Wadeable Freestone Streams in Pennsylvania. Pennsylvania Department of Environmental Protection.

Kratzer, J.F. and D.R. Warren. 2013. Factors limiting brook trout biomass in northeastern Vermont streams. North American Journal of Fisheries Management 33(1).

Wehrly, K.E., L.Z. Wang, and M. Mitro. 2007. Field-based estimates of thermal tolerance limits for trout: Incorporating exposure time and temperature fluctuation. Transactions of the American Fisheries Society 136(2).

APPENDIX 1: Description of habitat parameters.

Instream Fish Cover
Evaluates the percent makeup of the substrate (boulders, cobble, other rock material) and submerged objects (logs, undercut banks) that provide refuge for fish.

Epifaunal Substrate
Evaluates riffle quality, i.e., areal extent relative to stream width and dominant substrate materials that are present. (In the absence of well-defined riffles, this parameter evaluates whatever substrate is available for aquatic invertebrate colonization.)

Embeddedness
Estimates the percent (vertical depth) of the substrate interstitial spaces filled with fine sediments. (Pool substrate characterization: evaluates the dominant type of substrate materials, i.e., gravel, mud, root mats, etc. that are more commonly found in glide/pool habitats.)

Velocity/Depth Regime
Evaluates the presence/absence of four velocity/depth regimes - fast-deep, fast-shallow, slow-deep and slow-shallow. (Generally, shallow is <0.5m and slow is <0.3m/sec. (Pool variability: describes the presence and dominance of several pool depth regimes.)

The next four parameters evaluate a larger area surrounding the sampled riffle. As a rule of thumb, this expanded area is the stream length defined by how far upstream and downstream the investigator can see from the sample point.

Channel Alteration
Primarily evaluates the extent of channelization or dredging but can include any other forms of channel disruptions that would be detrimental to the habitat.

Sediment Deposition
Estimates the extent of sediment effects in the formation of islands, point bars and pool deposition.

Riffle Frequency (pool/riffle or run/bend ratio)
Estimates the frequency of riffle occurrence based on stream width. (Channel sinuosity: the degree of sinuosity to total length of the study segment.)

Channel Flow Status
Estimates the areal extent of exposed substrates due to water level or flow conditions.

The next four parameters evaluate an even greater area. This area is usually defined as the length of stream that was electroshocked for fish (or an approximate 100-meter stream reach when no fish were sampled). It can also take into consideration upstream land-use activities in the watershed.

Condition of Banks
Evaluates the extent of bank failure or signs of erosion.

Bank Vegetative Protection
Estimates the extent of stream bank that is covered by plant growth providing stability through well-developed root systems.

Grazing or Other Disruptive Pressures
Evaluates disruptions to surrounding land vegetation due to common human activities, such as crop harvesting, lawn care, excavations, fill, construction projects and other intrusive activities.

Riparian Vegetative Zone Width
Estimates the width of protective buffer strips or riparian zones. This is a rating of the buffer strip with the least width.

APPENDIX 2: Description of biological metrics that were used in this project.

Total Abundance
The total abundance is the total number of organisms collected in a sample or sub-sample.

Dominant Taxa Abundance
This metric is the total number of individual organisms collected in a sample or sub-subsample that belong to the taxa containing the greatest numbers of individuals.

Taxa Richness
This is a count of the total number of taxa in a sample or sub-sample. This metric is expected to decrease with increasing anthropogenic stress to a stream ecosystem, reflecting loss of taxa and increasing dominance of a few pollution-tolerant taxa.

% EPT Taxa
This metric is the percentage of the sample that is comprised of the number of taxa belonging to the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT). Common names for these orders are mayflies, stoneflies, and caddisflies, respectively. The aquatic life stages of these three insect orders are generally considered sensitive to, or intolerant of, pollution (Lenat and Penrose 1996). This metric is expected to decrease in value with increasing anthropogenic stress to a stream ecosystem, reflecting the loss of taxa from these largely pollution-sensitive orders.

Shannon Diversity Index
The Shannon Diversity Index is a community composition metric that takes into account both taxonomic richness and evenness of individuals across taxa of a sample or sub-sample. In general, this metric is expected to decrease in value with increasing anthropogenic stress to a stream ecosystem, reflecting loss of pollution-sensitive taxa and increasing dominance of a few pollution-tolerant taxa.

Hilsenhoff Biotic Index
This community composition and tolerance metric is calculated as an average of the number of individuals in a sample or sub-sample, weighted by pollution tolerance values. The Hilsenhoff Biotic Index was developed by William Hilsenhoff (Hilsenhoff 1977, 1987; Klemm et al. 1990) and generally increases with increasing ecosystem stress, reflecting dominance of pollution-tolerant organisms. Pollution tolerance values used to calculate this metric are largely based on organic nutrient pollution. Therefore, care should be given when interpreting this metric for stream ecosystems that are largely impacted by acidic pollution from abandoned mine drainage or acid deposition.

Beck's Biotic Index
This metric combines taxonomic richness and pollution tolerance. It is a weighted count of taxa with PTVs of 0, 1, or 2. It is based on the work of William H. Beck in 1955. The metric is expected to decrease in value with increasing anthropogenic stress to a stream ecosystem, reflecting the loss of pollution-sensitive taxa.

Percent (%) Sensitive Individuals

This community composition and tolerance metric is the percentage of individuals with PTVs of 0 to 3 in a sample or sub-sample and is expected to decrease in value with increasing anthropogenic stress to a stream ecosystem, reflecting the loss of pollution-sensitive organisms.

APPENDIX 3: Benthic macroinvertebrate taxa for each of the sampling locations.

Order	**Family**	**PA Taxon**	**PA PTV**	**LP1**	**TPR1**	**TPR2**	**TPR3**	**TPR4**	**TPR5**	**TPR6**
		Hydracarina	7				1	2	3	1
		Nematoda	9		1					
		Oligochaeta	10	3	2	6	1		21	4
		Turbellaria	9	1						
	Tetrastemmatidae	*Prostoma*	6						1	
Coleoptera	Elmidae	*Optioservus*	4				23			
		Oulimnius	5			6	1		5	31
		Promoresia	2							
	Psephenidae	*Ectopria*	5					2		1
Diptera	Ceratopogonidae	*Atrichopogon*	2					1		
		Ceratopogonidae	6	4		2		2		
	Chironomidae	*Chironomidae*	6	25	199	61	20	36	17	20
	Empididae	*Chelifera*	6	1		1		5	8	11
		Clinocera	6					1		
		Hemerodromia	6							
		Neoplasta	6	2						
	Psychodidae	*Pericoma*	4							
	Simuliidae	*Prosimulium*	2			15	145		48	44
		Stegopterna	6						12	
	Tabanidae	*Tabanidae*	6			2				
	Tipulidae	*Dicranota*	3	4		1		1		
		Hexatoma	2			5		1		
		Limnophila	3							
		Molophilus	4	1						
		Pilaria	7							
		Pseudolimnophila	2			1		5		5
Ephemeroptera	Ameletidae	*Ameletus*	0			1				
	Baetidae	*Diphetor*	6			1		28		
	Ephemerellidae	*Ephemerella*	1							
		Eurylophella	4						2	
	Heptageniidae	*Cinygmula*	1							1
		Epeorus	0							1
		Maccaffertium	3			1				
	Leptophlebiidae	*Leptophlebiidae*	4							1
		Paraleptophlebia	1			59				
Megaloptera	Corydalidae	*Nigronia*	2		3					
	Sialidae	*Sialis*	6	1	2					
Odonata	Cordulegastridae	*Cordulegaster*	3					1		

	Gomphidae	*Gomphidae*	4			1				
		Lanthus	5						1	
Ostracoda		*Ostracoda*	8							
Plecoptera	Capniidae	*Allocapnia*	3							
	Chloroperlidae	*Alloperla*	0	1						
		Chloroperlidae	0	16						
		Haploperla	0		1			1		
		Sweltsa	0			1				
	Leuctridae	*Leuctra*	0	1		11	8		3	3
	Nemouridae	*Amphinemura*	3			44	16	60	79	89
		Nemouridae	2							10
		Ostrocerca	2			1				1
		Prostoia	2				3	9	1	9
	Perlidae	*Acroneuria*	0					3		
	Perlodidae	*Clioperla*	2							1
		Isoperla	2					1		
Trichoptera	Hydropsychidae	*Ceratopsyche*	5							
		Cheumatopsyche	6				6			
		Diplectrona	0	13				3		
		Hydropsyche	5	2			1			
	Lepidostomatidae	*Lepidostoma*	1			2				
	Limnephilidae	*Goera*	0					1		
		Pycnopsyche	4							
	Philopotamidae	*Chimarra*	4				4			
		Wormaldia	0			1		1	1	1
	Polycentropodidae	*Polycentropus*	6							
	Psychomyiidae	*Lype*	2	1						
	Rhyacophilidae	*Rhyacophila*	1			2			5	
	Uenoidae	*Neophylax*	3			2	4		2	5
Veneroida	Sphaeriidae	*Sphaeriidae*	8			1		1		1
		TOTALS	243	76	208	228	233	165	209	240

Order	**Family**	**PA Taxon**	**PA PTV**	**TPR7**	**TPR8**	**TPR9**	**TPR10**	**TPR11**	**TPR12**	**TPR13**
		Hydracarina	7					NOT SAMPLED		
		Nematoda	9						1	
		Oligochaeta	10	7	4	1	1		20	6
		Turbellaria	9						1	2
	Tetrastemmatidae	*Prostoma*	6							
Coleoptera	Elmidae	*Optioservus*	4	1		2	10		1	
		Oulimnius	5	50	4	56	16		1	4
		Promoresia	2							

	Psephenidae	*Ectopria*	5	2						
Diptera	Ceratopogonidae	*Atrichopogon*	2							
		Ceratopogonidae	6	2	4				3	2
	Chironomidae	*Chironomidae*	6	23	35	36	37		60	51
	Empididae	*Chelifera*	6						11	
		Clinocera	6			1				
		Hemerodromia	6						1	
		Neoplasta	6		1					
	Psychodidae	*Pericoma*	4							1
	Simuliidae	*Prosimulium*	2	21	20	1	2		2	2
		Stegopterna	6	1	2					
	Tabanidae	*Tabanidae*	6						8	2
	Tipulidae	*Dicranota*	3			1	3			
		Hexatoma	2	3						1
		Limnophila	3		2	1				
		Molophilus	4		1	1				
		Pilaria	7						1	
		Pseudolimnophila	2		1	1			3	6
Ephemeroptera	Ameletidae	*Ameletus*	0	3	1	1	1		1	2
	Baetidae	*Diphetor*	6		1	10	1			6
	Ephemerellidae	*Ephemerella*	1	1						
		Eurylophella	4							
	Heptageniidae	*Cinygmula*	1							
		Epeorus	0		1					
		Maccaffertium	3							
	Leptophlebiidae	*Leptophlebiidae*	4		13					8
		Paraleptophlebia	1	3						
Megaloptera	Corydalidae	*Nigronia*	2	1	1	1				
	Sialidae	*Sialis*	6							1
Odonata	Cordulegastridae	*Cordulegaster*	3							
	Gomphidae	*Gomphidae*	4		1					
		Lanthus	5	2		11				
Ostracoda		*Ostracoda*	8							
Plecoptera	Capniidae	*Allocapnia*	3							1
	Chloroperlidae	*Alloperla*	0							
		Chloroperlidae	0	1	12	1	5		1	
		Haploperla	0							2
		Sweltsa	0							3
	Leuctridae	*Leuctra*	0	19	10	19	1		3	13
	Nemouridae	*Amphinemura*	3	33	50	15	27		75	77
		Nemouridae	2							

		Ostrocerca	2	2	3					3
		Prostoia	2	19	20	29	52		2	5
	Perlidae	*Acroneuria*	0	2			2			
	Perlodidae	*Clioperla*	2							
		Isoperla	2		1	3	42		5	
Trichoptera	Hydropsychidae	*Ceratopsyche*	5				2			
		Cheumatopsyche	6			2	1			
		Diplectrona	0	2	8	1	1		1	
		Hydropsyche	5							
	Lepidostomatidae	*Lepidostoma*	1							
	Limnephilidae	*Goera*	0							
		Pycnopsyche	4		1					
	Philopotamidae	*Chimarra*	4							
		Wormaldia	0	2						
	Polycentropodidae	*Polycentropus*	6		1	1	2			1
	Psychomyiidae	*Lype*	2		1					
	Rhyacophilidae	*Rhyacophila*	1	5	3	2			1	7
	Uenoidae	*Neophylax*	3	13	3	9	3			5
Veneroida	Sphaeriidae	*Sphaeriidae*	8						1	
		TOTALS	243	218	205	206	209	0	203	211

APPENDIX 4: Results of fishery surveys in the Potts Run watershed.

Site ID	Date	Common Name	Scientific Name	# of Individuals
LP1	6/27/2012	Blacknose Dace	*Rhinichthys atratulus*	6
		Brook Trout	*Salvelinus fontinalis*	6
		Creek Chub	*Semotilus atromaculatus*	7
		Green Sunfish	*Lepomis cyanellus*	4
		Fallfish	*Semotilus corporalis*	2
		Longose Dace	*Rhinichthys cataractae*	3
TPR1	6/18/2013	Blacknose Dace	*Rhinichthys atratulus*	10
TPR2	8/9/2012	Blacknose Dace	*Rhinichthys atratulus*	25
		Brook Trout	*Salvelinus fontinalis*	11
		Creek Chub	*Semotilus atromaculatus*	4
		Longnose Dace	*Rhinichthys cataractae*	7
		White Sucker	*Catostomus commersonii*	9
TPR3	8/13/2013	Blacknose Dace	*Rhinichthys atratulus*	>33
		Creek Chub	*Semotilus atromaculatus*	>33
		White Sucker	*Catostomus commersonii*	6
TPR4	6/27/2012	Blacknose Dace	*Rhinichthys atratulus*	6
		Brook Trout	*Salvelinus fontinalis*	32*
		Longnose Dace	*Rhinichthys cataractae*	1
TPR5	8/14/2013	Blacknose Dace	*Rhinichthys atratulus*	>33
		Brook Trout	*Salvelinus fontinalis*	13
		Creek Chub	*Semotilus atromaculatus*	3
TPR6	8/14/2013	Blacknose Dace	*Rhinichthys atratulus*	18
		Brook Trout	*Salvelinus fontinalis*	4
		Brown Trout	*Salmo trutta*	1
		Creek Chub	*Semotilus atromaculatus*	>33
		White Sucker	*Catostomus commersonii*	1
TPR7	8/13/2013	Blacknose Dace	*Rhinichthys atratulus*	22
		Brook Trout	*Salvelinus fontinalis*	1
		Brown Trout	*Salmo trutta*	1
		Creek Chub	*Semotilus*	10

			atromaculatus	
TPR8	8/13/2013	Blacknose Dace	*Rhinichthys atratulus*	20
		Creek Chub	*Semotilus atromaculatus*	27
TPR9	8/14/2013	Blacknose Dace	*Rhinichthys atratulus*	>33
		Brook Trout	*Salvelinus fontinalis*	3
		Creek Chub	*Semotilus atromaculatus*	>33
		White Sucker	*Catostomus commersonii*	2
TPR10	6/28/2012	Blacknose Dace	*Rhinichthys atratulus*	15
		Brook Trout	*Salvelinus fontinalis*	6
		Creek Chub	*Semotilus atromaculatus*	34
		Fallfish	*Semotilus corporalis*	1
		Green Sunfish	*Lepomis cyanellus*	4
		Longnose Dace	*Rhinichthys cataractae*	3
		Northern Hogsucker	*Hypentelium nigricans*	6
		Tesselated Darter	*Etheostoma olmstedi*	2
		White Sucker	*Catostomus commersonii*	3
TPR12	9/9/2013	Blacknose Dace	*Rhinichthys atratulus*	17
		Creek Chub	*Semotilus atromaculatus*	14
TPR13	6/28/2012	Blacknose Dace	*Rhinichthys atratulus*	>33
		Creek Chub	*Semotilus atromaculatus*	>33
		Longnose Dace	*Rhinichthys cataractae*	>33
		Sucker spp.		>33
PR1	8/13/2013	Margined Madtom	*Noturus insignis*	2
		Rock Bass	*Ambloplites rupestris*	2
PR between TPR2 & TPR3	8/9/2012	Blacknose Dace	*Rhinichthys atratulus*	9
		Brook Trout	*Salvelinus fontinalis*	1
		Creek Chub	*Semotilus atromaculatus*	12
		Green Sunfish	*Lepomis cyanellus*	1
		Northern Hogsucker	*Hypentelium nigricans*	1
		White Sucker	*Catostomus commersonii*	7

*Three 100-m passes