

Abraham's Creek Biological Assessment



Report Provided by Trout Unlimited

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Background

Eastern Pennsylvania Coalition of Abandoned Mine Reclamation (EPCAMR) requested technical assistance from Trout Unlimited (TU) to assess fishery populations in a tributary (unnamed tributary 28363) to Abraham's Creek in West Wyoming, Luzerne County Pennsylvania. Anthracite coal was extensively mined in the Scranton/Wilkes-Barre Valley for over a century resulting in corridors and mineshafts that, without constant pumping, fill with water. The water then comes in contact with the remaining geology, enabling the leaching of toxic metals from the rock, and becoming abandoned mine drainage (AMD), a pollutant that impairs and degrades aquatic environments. The tributary in this study is not polluted by AMD, but is instead experiencing stream water loss to the mine complexes below causing a dry channel at the confluence with Abrahams Creek.

The purpose of this study was to determine the location of water loss and to identify the downstream extent of brook trout (*salvelinus fontinalis*) in the watershed. Tributary 28363 is the only part of the Abraham's Creek watershed listed as Naturally Reproducing Wild Trout by the Pennsylvania Fish and Boat Commission (PFBC) and as such is of great concern for protection.

Table 1. Sample locations and descriptions in the Abraham's Creek watershed.

Site ID	Site Description	Latitude	Longitude
Headwaters	Upstream of known water loss and mined areas	41.321594	-75.86401
Shoemaker Avenue	Downstream of Shoemaker Avenue road crossing where channel is frequently dry	41.31391	-75.85656



Figure 1. Sample site locations within the Abraham’s Creek watershed.

Methods

Fisheries data were collected using battery powered backpack electrofishing gear using pulsed direct current. A Smith-Root model LR-24 backpack electrofisher was used for each of the surveys. At the headwaters site, electrofishing proceeded straight upstream from the beginning of the site for 100 meters. Blocking nets or natural stream breaks were used to reduce migration of fish out of the survey section. Removal depletion (two pass) methods were used at the headwaters site. Trout were kept in live wells until all passes were completed and could be measured for total length (millimeter) and weight (grams). Survey length and five representative stream widths were measured in tenths of meters. A single pass fishery survey was also completed beginning at the crossing at Shoemaker Avenue progressing upstream to determine the lowest extent of trout in the watershed. This was a single pass effort and ended when sufficient trout were found to determine the lowest extent of trout populations in the watershed.

Flows were measured using a Swoffer 3000 model flow meter and a Hach 9530 unit following DEP Instream Comprehensive Evaluation (ICE) protocols.

Results

The summer of 2018 was an exceptionally wet year in Northeast Pennsylvania. According to Weather.gov, Scranton received 46.4” of rain from January 2018 - September 2018, a 17.3”

increase in average rainfall from the same period over a 30-year range (Weather.gov). Constant high flows due to frequent rain events made fishery surveys and measuring stream loss difficult. At no time during this project was the stream channel dry at the Shoemaker Avenue crossing, which is known to be dry frequently by locals and EPCAMR staff.

In August of 2018, TU staff, landowners, and EPCAMR staff hiked up the pipeline adjacent to the stream from Shoemaker Avenue in West Wyoming to the top of the tributary and the landowner's property boundary. A fishery survey and flow data were collected at the headwaters site (Figure 2). Brook trout and blacknose dace (*Rhinichthys atratulus*) were found in the 100m reach that was surveyed, size class distribution of brook trout is found in table 2. The site at Shoemaker Avenue is frequently dry therefore, no fishery survey was completed at that site.



Figure 2. EPCAMR staff, TU staff, and property owners survey fishery communities in the headwaters of tributary 28363 in August 2018.

Table 2. Size class distribution of brook trout caught at the headwaters site in August 2018.

Size Class (mm)	Number of Brook Trout	Pass
50-74	1	1
75-99	0	
100-124	0	
125-149	0	
150-174	0	
175-199	3	1
200-224	1	2

On 11 October 2018 TU, EPCAMR staff and the landowner of the headwaters site returned but rainfall that day made fishery surveys impossible, therefore only flow measurements were taken (Table 3). TU and EPCAMR staff were able to make contact with the landowner at the Shoemaker Avenue crossing, who was previously not able to be located. The landowner gave permission for investigators to return and access her property on a drier day to determine the location of the water loss.

TU and EPCAMR staff investigated the habitat downstream of the Shoemaker Avenue crossing where the unnamed tributary enters a large wetland that used to be a drive in movie theatre. A rail line that runs parallel to Shoemaker Avenue causes the water to backup into the wetland. The wetland is believed to drain under Swetland Lane and then the railroad before entering Abrahams Creek, but those crossings were dry at the time of the surveys.

On 15 October 2018, flows from the previous weeks rain had receded and TU and EPCAMR staff returned to determine the lowest extent of trout in the watershed. The fishery survey began 200m upstream of Shoemaker Avenue and proceeded upstream. One small sunfish (too small to identify) and two small margined madtoms (*Noturus insignis*) were found in a pool 400m upstream of Shoemaker Avenue but likely washed down from a small impoundment in the headwaters and do not represent a resident fishery community.

Table 3. Flow data from both sites and the percent of streamflow loss between sites for each sampling event.

Site	Date	Flow (cfs)	% Loss
Shoemaker Avenue	8/1/2018	0.792	60%
Headwaters	8/1/2018	1.97	
Shoemaker Avenue	10/11/2018	17.65	22.1%
Headwaters	10/11/2018	22.36	
Shoemaker Avenue	10/15/2018	2.38	15%
Headwaters	10/15/2018	2.8	

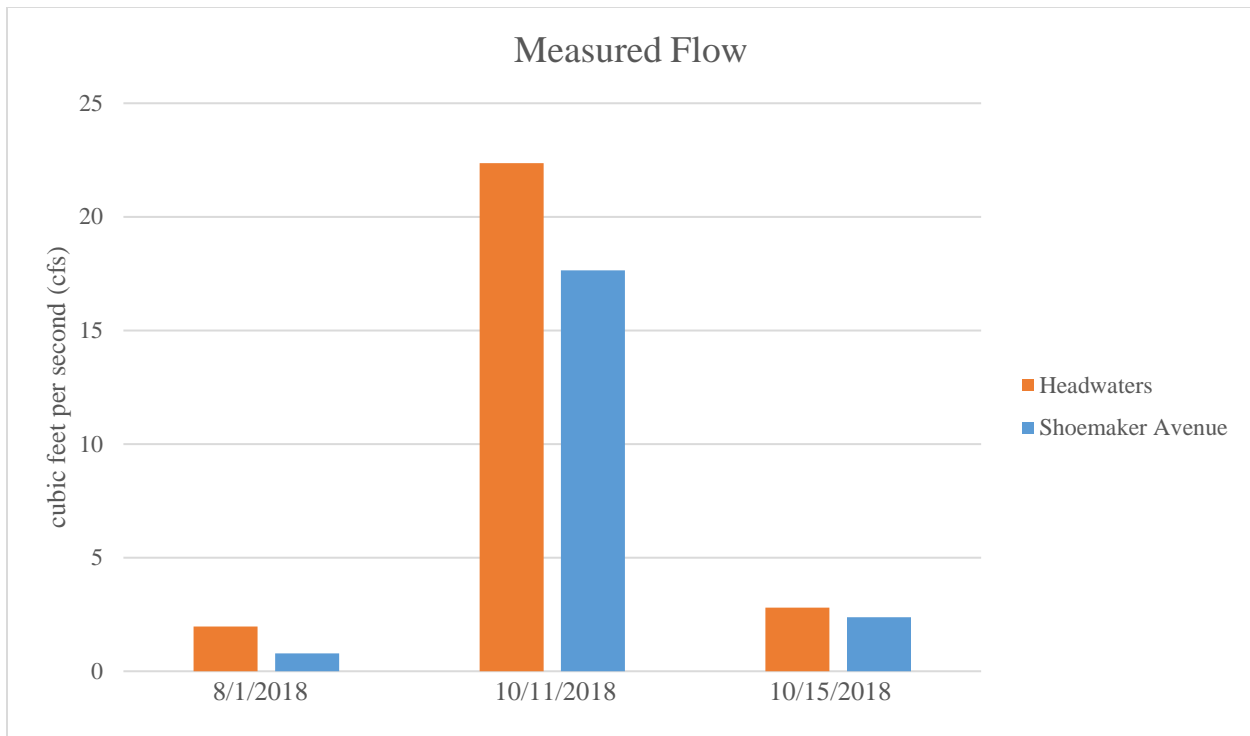


Figure 3. Flow measurements and difference between flows at the headwaters and Shoemaker Avenue sites on all sampling dates.

In the 0.5 mile reach upstream of Shoemaker Avenue, the channel becomes narrow and appears to be heavily manipulated with steep unstable banks and a steep grade (Figure 4). Landowners from this part of the watershed said that in heavy rainfall from previous storms, substrate material has washed down filling the channel up, eventually resulting in government agencies coming to dredge out the material. Topographic imagery of the watershed suggests the stream may have been relocated from its original channel. TU and ECAMR staff observed a large pile of coal refuse and related material on the left bank (left side looking down gradient) that appears to have been placed in what was the original stream channel. Historical mining records indicate there was a ‘barrel sluice’ made of wooden barrels attached end-to-end to relocate the stream water in order to wash coal. When investigators requested permission of the landowner at Shoemaker Avenue to investigate the property, the landowner confirmed there was once a barrel sluice but stated the wood had been reclaimed to construct a barn on the property decades ago.



Figure 4. Steep grade with weak\unnatural banks upstream of Shoemaker Avenue and downstream of trout populations.

At approximately 0.5 mile upstream of the residence on Shoemaker Avenue there is a manmade structure resembling a stone wall, causing an approximately 12 foot cascade waterfall (Figure 5). The height and grade of this structure would be a barrier to aquatic organism passage upstream. The first brook trout, measuring 159mm, was documented 5m upstream of the stone structure (Figure 6). The fishery survey continued upstream to be certain there was a population of trout in the reach and not just one individual. The very next pool held three more adult brook trout, measuring 190mm, 238mm, and 245mm, affirming the downstream extent of brook trout in the watershed. When overlaying the watershed with the digitized mine areas (PASDA.psu.edu), the lowest extent of trout in the watershed is just upstream of the mined areas and the stone structure (Figure 7.)



Figure 5. EPCAMR staff Michael Hewitt stands next to a structure of hand laid stone that creates a large cascade waterfall. Approximately 0.5 miles upstream from Shoemaker Avenue.



Figure 6. Brook trout captured at the lowest extent in the watershed.

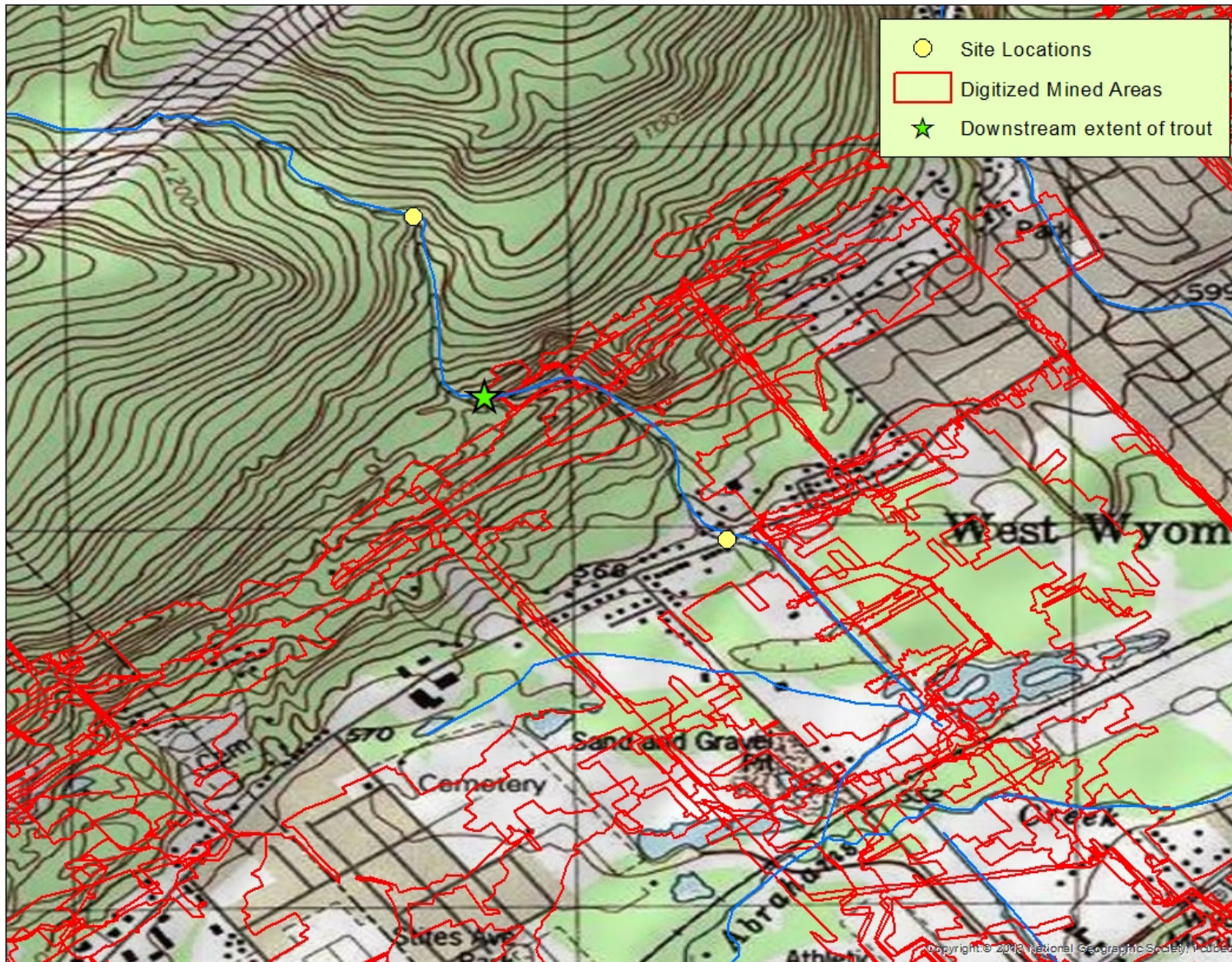


Figure 7. Location of sample sites in relationship to the mined areas and lowest extent of brook trout in the watershed.

Summary

2018 was a difficult year to measure streamflow loss into the mine complexes below due to higher than average rainfall in the later part of the summer. Flow measurements from the headwaters and Shoemaker Avenue demonstrated varying percentages of streamflow loss during all sampling events. Brook trout representing multiple age classes were found in the headwaters, upstream of historical mining. The lowest extent of brook trout in the watershed was found to be just upstream of a manmade stone structure and mapped mine areas. Historical records show the stream channel being relocated to be used in the process of washing the coal extracted from nearby mines. The channel downstream of the stone structure supported this assertion and looks to be heavily altered revealing unstable banks, loose material, and a steep grade with multiple waterfalls >5ft.

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