Bullion Run Conservation Plan



Plan was prepared by the Venango Conservation District

December 2020



This plan was made possible to the Scrubgrass Creek Watershed Association by the Coldwater Heritage Partnership on behalf of the Department of Conservation Natural Resource, Pennsylvania Fish and Boat Commission, the Foundation for Pennsylvania Watersheds, and the Pennsylvania Council of Trout Unlimited











INTRODUCTION / BACKGROUND:

The Scrubgrass Creek watershed has experienced many resource explorations which includes heavy oil/gas activities, as well as historic strip mining. Bullion Run, a tributary to Scrubgrass Creek, was identified for this conservation plan because currently this is the only known sub-watershed that sustains wild trout within the Scrubgrass Creek watershed basin.

Bullion Run, as well as its tributaries, comprises a drainage area of approximately 7.43 square mileage and a total length of all delineated streams of 13 miles to Scrubgrass Creek near the village of Kennerdell, Venango County, Pennsylvania (find attached United States Geological Survey – Stream Stat Report in appendix). Approximately 25-30% of the surrounding landscape is publicly open by State Game Lands #39 and the Clear Creek State Forest-Kennerdell Tract.

The Bullion Run basin landscape is predominantly forested (83%), while only a small portion (approximately 1.6%) urban development within the basin. The remainder of the development includes post-strip mining and agriculture use. The current 25 PA Code Chapter 93



Water Quality Standard for Bullion Run is Coldwater Fisheries (CWF).



The purpose of this study was to develop a comprehensive plan for Bullion Run due to the fact it is the only know trout stream within the Scrubgrass Creek basin. Since Scrubgrass Creek is listed as impaired by the Department of Environmental Protection, understanding the dynamics of Bullion Run and maintaining its environmental integrity is essential to both the Scrubgrass Creek Watershed Association and the Venango Conservation District.

The established goals and accomplishments include: conducting fisheries and macroinvertebrate collections for assessment of the biological integrity; conduct habitat assessments to determine viabilities; and to use current known data to determine any potential impacts to Bullion Run. Overall goal is to develop a complete conservation plan of Bullion Run for future grant funding's.

METHODS:

Sampling locations were determined by using ArcGIS 10.2 by randomization within the watershed. Additionally, sampling locations downstream of tributaries entering Bullion Run were plotted for tributary influence on species composition of the mainstream.

After sampling locations were determine, field visits were completed prior to electroshocking, macroinvertebrate and habitat collection completion. Any tributaries that were determined to be intermittent and non-flowing during time of field collection were excluded.





Fisheries

The Venango Conservation District, with assistance from Scrubgrass Creek Watershed Association, conducted and completed the fisheries samples within Bullion Run and its tributaries.

A battery back-pack electro-shocker (Smith-Root LR-24) was used to capture individuals. Sampling procedures were followed by the Pennsylvania Department of Environmental Protection semi-quantitative fish protocol.

Sampling locations were determined based on habitat characteristics that would encompass variable types of habitat (pool, riffle, and run). Once determined, field GPS was taken and 100meter length of stream was delineated for each collection station. Trout species were individually measured by length in millimeters and quantified; determining the mass was not applicable for this project. All other individual fish species collected were identified and quantified. Once fish collection was completed and all individuals returned to water, habitat evaluation was completed for each site. A total of 8 collection sites were completed for fisheries and habitat assessment.

Aquatic Macroinvertebrates

The Department of Environmental Protection (Northwest Regional Office) collected macroinvertebrate samples prior to the start of the fisheries collection. Semi-quantitative benthic macroinvertebrate samples were collected by using the Department of Environmental Protection – Instream Comprehensive Evaluation (ICE) protocol. Individuals collected by the Department of Environmental Protection were identified to the genus.

The Venango Conservation District collected samples in July of 2019 for family identification. A total of 2 locations were identified for sample collection. Using a D-net, approximately 2-meters upstream, the substrate from stream bottom was disturbed until arriving to net. Individuals captured in net were identified to family level.

Habitat and Land-Use Assessment

At each sampling location for fisheries, as well at the two macroinvertebrate collection sites, habitat assessment was completed. Following the Department of Environmental Protections – Assessment Methods for Rivers and Streams, a total 10 sites were assessed. A total of 12 parameters were assessed: instream cover, epifaunal substrate, embeddedness, velocity/depth regimes, sediment deposition, frequency of riffles, channel flow status, channel alteration, condition of banks, bank vegetation, disruptive pressure, and riparian zone. Each habitat parameter was given a score between 0 and 20. A total score of 240 can be achieved. "Optimal" category is considered a score between 240-192; "sub-optimal" from 180-132; "marginal" from 120-72; and "poor" from 60 or less.

Additionally, aerial imagery and information from United States Department of Agriculture (USDA) Geoportal Gateway and Pennsylvania Spatial Data Access (PASDA) was used to determine current land-use.

RESULTS:

Fisheries

A total of 283 individuals were collected, identified, and released during the electroshocking field samples. Mottled Sculpin comprised of 40% of the total individuals captured, while Blacknose Dace comprised of 29%. Of the trout species, Brown Trout was slightly more prevalent than Brook Trout across all sites. Brown Trout was comprised of 10%, with Brook Trout at 6%. Additionally, there were other species collected during collection, which includes: Creek Chub (9%), Pumpkin Seed (1%), Longnose Dace (1%), White Sucker (3%) and Blue Gill (1%) (see Table 1 and Figure 1, 2.). Additionally, station #7 did not contained any species, and Station #8 contained no trout species.

BULLION RUN, VENANGO COUNTY

Table 1. Species composition and their percentage of overall samples.

Brook Trout	Brown Trout	Blue Gill	Pumpkin Seed	Creek Chub	Blacknose Dace	Longnose Dace	Mottled Sculpin	White Sucker
18	28	4	2	24	83	4	112	8
6%	10%	1%	1%	9%	29%	1%	40%	3%



Figure 1. Percentage of individuals caught per species.

The size class for trout species varied, however, Brown Trout had more individuals within the 50-74 mm class size, while Brook Trout size class favored in the 125-149 mm class. Brown Trout did have more representatives in the larger size classes than Brook Trout. See Table 2 and Figure 3.

Size Class (mm)	Brook Trout	Brown Trout
25 - 49	1	0
50 - 74	1	12
75 - 99	1	2
100 - 124	2	4
125 - 149	6	2
150 - 174	4	1
175 - 199	2	1
200 - 224	1	1
225 - 249	0	1
250 - 274	0	1
275 - 299	0	0
300 - 324	0	2
325+	0	1
	18	28

Table 2. Brook and Brown Trout size class ranges.



Figure 2. Percentage of trout species collected.



Figure 3. Size classes across both trout species.

Aquatic Macroinvertebrates

The Department of Environmental Protection collected 26 total taxa, of which 21 were within the EPT and six mayfly (see report/table 3.) The most predominant taxas collected by the Department were Spring Stonefly (Amphinemura) (N=48); Midges (Chironomidae) (N=26); Mayfly (Baetis) (N=18); Caddisfly (Hydropysche) (N=17); and Flatheaded Mayflies (Cinymula) (N=15). The total richness was 26, with an EPT richness of 21. The percentage of sensitive individuals was 57.70%. Additionally, the Index of Biotic Integrity value for this station was determined to be 83.8 (see table 3.)

The Venango Conservation District collected two samples within the mainstem of Bullion Run. One near mouth and the other located mid-stretch of mainstem. A total of 4 families were collected. Those families included Hydropsychidae (N=31); Leuctridae (N=4); Nemouridae (N=82); and Chironomidae (N=101).



BUREAU OF CLEAN WATER MACROINVERTEBRATE SAMPLE SUMMARY

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Export Data to Excel

SAMPLE SUMMARY									
STATION ID: 20160426-0900-jaygerber	SECONDARY STATION ID: 20160426-0900-jaygerber	LATITUDE: 41.255396	LONGITUDE: -79.84324670						
STREAM NAME: Bullion Run (01170658)		HUC8 05010003 Middle Allegheny-Tionesta. Pennsylvania.							
SURVEY ID: 68774		METHOD: 6-Dframe Composite, 200 subsample							
SUBSAMPLED BY:	IDENTIFIED BY: Joseph Brancato	QUALITY ASSURED: N	QUALITY ASSURED BY:	PASSED QUALITY ASSURANCE: N					

STATION LOCATION COMMENT:

Bullion Run, Clinton Township, Venango County, Kennerdell Quad. Trib to Scrubgrass Creek. Sampled ~150 meters upstream of mouth.

BIOLOGY / HABITAT COMMENT:

Good macroinvertebrate community. Twenty-six total taxa including 21 EPT and six mayfly taxa. Most common benthos were Amphinemura, midges, Baetis, Hydropsyche, and Cinygmula. Habitat scored in the suboptimal category (179). Mostly cobble and gravel substrate. Some boulders. Heavy embeddedness and sand. Riffles were good. Pools partially filled in. Banks with some scour. Forested riparian cover.

LAND USE COMMENT:

Mostly forested. Some residences. Heavy oil/gas activity, historic strip mining in headwaters.

IMPAIRMENT COMMENT:

Stream does not appear to be impaired.

	ТАХА				
# grids from first pan = 4	# grids from sec	ond pan =	=	Subsample Size =	189
ΤΑΧΑ ΝΑΜΕ	INDIVIDUALS	ΡΤΥ	FFG	BCG COLD	BCG WARM
Acentrella	1	4	SC	3	3
Baetis	18	6	CG	4	5
Epeorus	5	0	SC	2	2
Cinygmula	15	1	CG	1	1
Ephemerella	5	1	CG	3	2
Paraleptophlebia	3	1	CG	2	2
Pteronarcys	1	0	SH	1	2
Amphinemura	48	3	SH	3	3
Leuctra	11	0	SH	2	2
Acroneuria	3	0	PR	3	3
Isoperla	2	2	PR	2	2
Alloperla	1	0	CG	1	1
Haploperla	6	0	PR	3	3
Dolophilodes	1	0	FC	2	2
Polycentropus	1	6	FC	4	4
Diplectrona	2	0	FC	2	2
Cheumatopsyche	3	6	FC	5	5
Hydropsyche	17	5	FC	5	5
Rhyacophila	2	1	PR	2	2
Lepidostoma	1	1	SH	2	. 2
Neophylax	1	3	SC	3	3

	TAXA NAME	INDIVIDUALS	ΡΤΥ	FFG	BCG COLD	BCG WARM
Oulimnius		11	5	SC	3	2
Chelifera		2	6	PR	4	4
Molophilus		1	4	SH	3	3
Prosimulium		2	2	FC	3	3
Chironomidae		26	6	CG	5	5

					ME	TRICS						
					1	Freestone Riffle- 6D200	Run					
METRIC			RAW VALUE	2013	SMA	2013 LL LARGE	2D100	N	ULTIHA POOL	ABITAT GLIDE	LIMESTONE 2	2009
Total Richness			26		78.8	83.9			83	.9	144.4	
Ephemeroptera Richr	ness		6						100).0		
Trichoptera Richness			8						72	.7		
EPT Richness			21				137.3		123	3.5	262.5	
Trichoptera Richness	(PTV 0-4	4)	5				138.9					
EPT Richness (PTV 0	-4)		17		89.5	106.3						
Becks Index (version	3)		36		94.7	163.6						
Becks Index (version	4)		32				160.8		145	5.5	266.7	
FC + PR + SH Richnes	SS		16				137.9					
Hilsenhoff Biotic Inde	x		3.33	82.2		96.0	99.0				108.3	
% Sensitive Individua	ls (PTV ()-3)	57.70		68.3	86.5						
% Tolerant Individuals (PTV 7-10) 0		0								101.5		
Shannon Diversity			2.56		89.5	89.5			105	05.3 120.2		
			IBI SCORE		83.8	92.6	99.8		92	.8	100.0	
% Ephemeroptera	24.9	% Eph	emeroptera (PTV 0-4)		15.3	% Dominant Ta	ixon	25.4	BCG F	Richness F	Ratio	3.33
% Plecoptera	38.1	Ephen 4)	neroptera Richness (P	TV 0-	5	% Chironomida	ae	13.8	BCG I	ndividuals	Ratio	1.82
% Trichoptera	14.8	Pleco	otera Richness		7	% Simulidae		1.1				
					MPA	RMENT						
Not Impaired	Y	Insuff	icient Data		N							
					HAE	BITAT						
Instrea	am Cove	r 16	Substrate	/ Cove	er	Free	quency of F	Riffles	17	В	ank Vegetation	16
Epifaunal Substrate 18 Velocity/D		Velocity/Depth R	egime	s 17	Cha	nnel Flow S	tatus	14	Disru	uptive Pressure	17	
Embeddedness 9 Poo		Pool Va	riabilit	ty	Cł	nannel Alter	ation	16		Riparian Zone	17	
Pools	Substrate	e	Sediment Dep	ositio	n 11	Co	ndition of E	Banks	11			
Pool-Glide Assessme	ent? N		Instream	Score	e = 54		Riparian	Score	= 44		Total Score	= 179
			F	IELD	MEA	SUREMENTS						
Temperature (°C)	1	1.2	Dissolved Oxygen ((mg/L)				Flow (CFS)			

STATION ID: 20160426-0900-jaygerber

рН	7.58	Total Alkalinity (mg/L as CaCO3)	12	Conductivity (uS/cm)	233
		WATER CHE	EMISTRY		
Collector ID		S	equence Number		

Habitat Assessment / Land-Use

Both the Department of Environmental Protection and the Venango Conservation District collected habitat assessments scores. The Department collected one assessment where they collected aquatic macroinvertebrates. That assessment score was determined to be within the "suboptimal" category with a score of 179.

The Venango Conservation District conducted 8 assessments where fisheries data was collected. At station #1, the stream section was in the "marginal" category at a score of 115. Station #2 - #8 average score of 155 which averaged to be in the "suboptimal" category.

Reviewing existing data using United States Department of Agriculture (USDA) and Pennsylvania Spatial Data Access (PASDA) information on land-use, the predominant resource extraction within Bullion Run almost exclusively is oil wells (N=27). Only one gas well and combination of gas and oil well was identified based on the information provided by the Department of Environmental Protection data on PASDA (see figure 4.)



Figure 4. Resource drilling within Bullion Run watershed.

Using USDA landuse coverage, the Bullion Run watershed is predominantly forested covered. According to the USGS Stream Stat analysis (see in appendix) approximately 83% is covered by forest. In the headwaters, approximately 17% is comprised of cultivated crops, hay/pasture, and developed open spaces (see figure 5.)



Figure 5. Land-use coverage within Bullion Run.

Lastly, using data information from the Department of Environmental Protection spatial data of listed impaired streams. There was were two small sub-watersheds located in Bullion Run that considered to be impaired by metals. The total stream miles impaired in the overall watershed is approximately 2.5 miles (see figure 6.)



Figure 6. Listed impaired streams within Bullion Run Watershed.

DISCUSSION:

Fisheries

The overall fisheries composition collected across all 8 stations were generally uniform in comparison. Being as Bullion Run is listed as a Coldwater Fisheries, it was not surprising the most common species collected were Molted Sculpin and Blacknose Dace. The trout species collected within multiple class size ranges is a promising feature of the overall water condition of Bullion Run. Even though there were relatively small numbers collected overall for both trout species, the number of missed individuals due to human error must be taken into account for. Even if possible, to determine the species of trout, individuals were not counted if not measured and positively identified.

Lastly, Station #7, which contained no species of fish can believed to be the result of the data collected on the impaired streams in Bullion. Station #7 stream section is considered to be impaired by heavy metals, which was evident during sampling of severe iron deposition. Station #8 did contain fish species, but no trout. This was in the headwaters of Bullion and was severely filled with sediment and little habitat. Most of surrounding landscape is agriculture and also road stormwater run-off is common in this stretch from both local and state highways. Even though these two stations lack trout and fish species, at Station #6, we documented a very healthy population of trout species, predominantly Brook Trout, which was never documented by Pennsylvania Fish and Boat Commission. That stream section is now considered a reproductive trout stream section.

Aquatic Macroinvertebrates

The IBI score that the Department of Environmental Protection produced suggests that the overall macroinvertebrate community is healthy. With IBI scores ranging from 0-100, the score of 83.8 can be interpreted as a diverse community of macroinvertebrates. The number of individuals collected for the three stations collected by the Department and the District. Even though the District was only able to identify to family level, the number of individuals collected within those families reported above, confirms the results from the Departments summary.

Habitat Assessment / Land-Use

The habitat scores documented by both the Department and the District concluded that sections where biological studies were completed were categorized within the sub-optimal range. According to the Departments report, the section of stream where macroinvertebrates were collected had most cobble and gravel substrate and some boulders. This was also experienced by the District. However, both the Department and District did note there were heavy embeddedness and sand, as well as severe bank scouring. In 2018, there was a catastrophic rain fall event in Venango County. During electroshocking collection, post-rainfall, the District documented severe bank erosion from the mouth to mid-length of Bullion Run (see pictures in appendix). Even though Bullion Run experienced severe excess depositional material, habitat evaluation by the District the following year still suggest sub-optimal habitat.

RECOMMENDATIONS:

- Further fish habitat enhancement/streambank stabilization devices should be implemented throughout watershed. This will address the habitat assessment reported by offering additional habitat while destressing scoured banks documented throughout watershed.
- Detailed chemical sampling throughout the watershed, but specifically at Station #7 where the Department of Environmental Protection has listed as impaired by heavy metals.

2.1) Possibly try to determine source of pollution and seek grant funding to potentially correct impairment. This could allow for fish and macroinvertebrate communities to re-establish in this section.

3) Work with and provide educational material to landowners in the headwaters of Bullion Run that are heavily focused on agriculture practices. Education and potential projects should be heavily implemented on agricultural best management practices.

APPENDIX / PHOTOS:

Bullion Run Conservation Plan



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	7.43	square miles
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	0.11	percent
ELEV	Mean Basin Elevation	1421	feet
PRECIP	Mean Annual Precipitation	43	inches
FOREST	Percentage of area covered by forest	83.3979	percent

Parameter Code	Parameter Description	Value	Unit
URBAN	Percentage of basin with urban development	1.6884	percent
CARBON	Percentage of area of carbonate rock	0	percent
DRN	Drainage quality index from STATSGO	3.7	dimensionless
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	6.9105	percent
STRDEN	Stream Density total length of streams divided by drainage area	1.75	miles per square mile
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	13	miles

Peak-Flow Statistics Parameters[Peak Flow Region 2 SIR 2019 5094]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.43	square miles	0.92	1160
STORAGE	Percent Storage	0.11	percent	0	8.9

Peak-Flow Statistics Flow Report[Peak Flow Region 2 SIR 2019 5094]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
2 Year Peak Flood	344	ft^3/s	26.1
5 Year Peak Flood	558	ft^3/s	27
10 Year Peak Flood	728	ft^3/s	28.9
25 Year Peak Flood	977	ft^3/s	31.6
50 Year Peak Flood	1180	ft^3/s	34.8
100 Year Peak Flood	1410	ft^3/s	37.8
200 Year Peak Flood	1660	ft^3/s	41.6
500 Year Peak Flood	2030	ft^3/s	46.1

Peak-Flow Statistics Citations

Roland, M.A., and Stuckey, M.H.,2019, Development of regression equations for the estimation of flood flows at ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2019–5094, 36 p. (https:// doi.org/10.3133/sir20195094)

Low-Flow Statistics Parameters[Low Flow Region 3]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.43	square miles	2.33	1720
ELEV	Mean Basin Elevation	1421	feet	898	2700
PRECIP	Mean Annual Precipitation	43	inches	38.7	47.9

Low-Flow Statistics Flow Report[Low Flow Region 3]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
7 Day 2 Year Low Flow	0.725	ft^3/s	43	43
30 Day 2 Year Low Flow	1.05	ft^3/s	38	38
7 Day 10 Year Low Flow	0.312	ft^3/s	54	54
30 Day 10 Year Low Flow	0.446	ft^3/s	49	49
90 Day 10 Year Low Flow	0.659	ft^3/s	41	41

Low-Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (http://pubs.usgs.gov/sir/2006/5130/)

Annual Flow Statistics Parameters[Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.43	square miles	2.26	1720
ELEV	Mean Basin Elevation	1421	feet	130	2700
PRECIP	Mean Annual Precipitation	43	inches	33.1	50.4
FOREST	Percent Forest	83.3979	percent	5.1	100
URBAN	Percent Urban	1.6884	percent	0	89
CARBON	Percent Carbonate	0	percent	0	99

Annual Flow Statistics Flow Report[Statewide Mean and Base Flow]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Mean Annual Flow	12.3	ft^3/s	12	12
Harmonic Mean Streamflow	2.67	ft^3/s	38	38

Annual Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (http://pubs.usgs.gov/sir/2006/5130/)

Base Flow Statistics Parameters[Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.43	square miles	2.26	1720
PRECIP	Mean Annual Precipitation	43	inches	33.1	50.4
CARBON	Percent Carbonate	0	percent	0	99
FOREST	Percent Forest	83.3979	percent	5.1	100

Parameter	Min	Max			
Code	Parameter Name	Value	Units	Limit	Limit
URBAN	Percent Urban	1.6884	percent	0	89

Base Flow Statistics Flow Report[Statewide Mean and Base Flow]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Base Flow 10 Year Recurrence Interval	4.98	ft^3/s	21	21
Base Flow 25 Year Recurrence Interval	4.44	ft^3/s	21	21
Base Flow 50 Year Recurrence Interval	4.14	ft^3/s	23	23

Base Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (http://pubs.usgs.gov/sir/2006/5130/)

Bankfull Statistics Parameters[Statewide Bankfull Noncarbonate 2018 5066]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	7.43	square miles	2.62	207
CARBON	Percent Carbonate	0	percent		

Bankfull Statistics Flow Report[Statewide Bankfull Noncarbonate 2018 5066]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE
Bankfull Area	60.8	ft^2	64
Bankfull Streamflow	261	ft^3/s	74
Bankfull Width	35.9	ft	59
Bankfull Depth	1.73	ft	56

Bankfull Statistics Citations

Clune, J.W., Chaplin, J.J., and White, K.E.,2018, Comparison of regression relations of bankfull discharge and channel geometry for the glaciated and nonglaciated settings of Pennsylvania and southern New York: U.S. Geological Survey Scientific Investigations Report 2018–5066, 20 p. (https://doi.org/10.3133/sir20185066)

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Application Version: 4.4.0



Picture 1. Young-of-the-Year Brown Trout collected at Station #3.



Picture 2. Brown Trout (and deceased Blacknose Dace) collected at Station #2.



Picture 3. Brook Trout collected at Station #6.



Picture 4. Iron deposition at Station #7.



Picture 5. Bedrock substrate noted during habitat assessment.



Picture 6. Severe embeddedness during habitat assessment. This was after major rainfall event noted.



Picture 7. Large amount of debris from severe flooding during rainfall of 2017.

Addendum to Coldwater Heritage Partnership Planning Grant

Bullion Run, Venango County



September 2021

The purpose of this addendum is to supplement the Bullion Run Coldwater Conservation Plan (December 2020). Bullion Run is a tributary to Scrubgrass Creek in Venango County. The addendum includes additional water quality monitoring that was originally detailed in the Bullion Run Coldwater Heritage Partnership Planning Grant.

In addition to the water quality data collected by TU and the biological data collected by VCCD, TU has completed additional biological monitoring and habitat improvement projects on Bullion Run during the time the original plan was being developed. Relevant data to this project has been included within this addendum.

Additional Sampling of Bullion Run

In 2019, technical assistance was provided by TU to SCWA through TU's Technical Assistance Grant (TAG) program to study biological communities in Scrubgrass Creek and its tributaries, including two sites on Bullion Run. Biological sampling completed on Bullion Run is summarized at the end of this 2021 addendum.

TU has continued to partner with SCWA, VCCD, and landowners to complete habitat improvements on Bullion Run. This work has been focused near the mouth of Bullion Run, near the confluence with Scrubgrass Creek, and has progressed upstream to stabilize banks and add instream habitat for trout and other aquatic life. This on-going work is summarized at the end of this 2021 addendum.

Methods

Water quality was measured at eight sites (Table 1, Figure 1) at two water level conditions (high and low flow). Sample locations were determined by the Venango County Conservation District. A Hach FH950 flow meter was used to measure stream flow during each sampling event. High flow samples were taken on 12 May 2021 and low flow samples were taken on 2 and 3

September 2021. Department of Environmental Protection (DEP) Instream Comprehensive Evaluation (ICE) protocols were followed for water quality monitoring. Samples were kept on ice and delivered to a DEP approved laboratory (Fairway Laboratories) for analysis. Laboratory analyses included the following parameters: laboratory pH, acidity, alkalinity, conductance, total dissolved solids, total suspended solids, sulfate, total aluminum, total iron, total manganese. Loading rates for the applicable parameters were also calculated based on the measured stream flows at the sample sites.

Basic field chemistry was collected at each site using an Apera multiple parameter meter designed to measure conductivity, temperature, and pH. The meter was calibrated daily to manufacturers' specifications.

Site			
ID	Latitude	Longitude	Site Description
BR1	41.255097	-79.841166	Near the confluence of Bullion Run and Scrubgrass Creek
BR2	41.257515	-79.848896	Upstream of cabins, road access
BR3	41.257337	-79.860225	Upstream of the remains of the iron furnace and small tributary
BR4	41.253524	-79.871728	PA State Gameland 039
BR5	41.26094	-79.894187	Downstream of Bullion Run Road
BR6	41.2614	-79.898167	Small tributary currently listed as Wild Trout
BR7	41.260634	-79.900087	Small swampy tributary currently listed as Wild Trout
BR8	41.260342	-79.924818	Headwaters of Bullion Run near Whieldon Rd

Table 1. Sample locations and descriptions.



Figure 1. Sample locations in Bullion Run.

Results

Water samples were taken at two different flow regimes, a high flow and low flow event. Flows were higher during the May sampling event (20.22 cfs⁻¹ at BR1), which serves as the high flow monitoring event. The samples collected in September were during lower flow conditions (5.44 cfs⁻¹ at BR1). Variation in streamflow throughout the watershed in September is a result of decreasing stream flows throughout the day of sampling from precipitation earlier in the week.

Site BR1 is located near the confluence of Bullion Run and Scrubgrass Creek. There was measurable alkalinity at this site during the lower flow event (September) and no available alkalinity during the higher flow event (May) (Tables 2 and 3 respectively).

Site BR2 is located upstream of site BR1 on Bullion Run and upstream of a small tributary that is not listed as impaired by DEP. BR2 had adequate instream habitat (Figure 2). Chemical conditions here were similar to that at site BR1, having low or non-measurable concentrations of metals at these sites.

Site BR3 is located upstream of the remains of the Bullion Run Iron Furnace Ruins (Figure 3) and a small tributary that is not listed by DEP as impaired.

Site BR4 is located in the state Gamelands 039 in the middle section of Bullion Run downstream of the section listed as impaired by metals by DEP. Metals were present at this site during both sampling events, but in small concentrations not exceeding water quality standards.

Site BR5 is located just downstream of Bullion Run Road and two tributaries assessed for this project (BR6 and BR7) which both are currently listed as Wild Trout by PFBC. Areas of active stream bank erosion and sedimentation were evident throughout this site during both sampling events (Figure 4).

Site BR6 is the larger of two tributaries that enter Bullion Run across from one another upstream of where Bullion Run crosses under Bullion Run Road. This site had the lowest specific conductance measurement of all sites during both flow events. BR6 also had the lowest concentrations of aluminum, iron and manganese during both sampling events than all other sites (Tables 2 and 3).

Site BR7 is located on the smaller of the two tributaries that enter Bullion Run across from one another upstream of the Bullion Run Road crossing. The habitat at this site is wetland near the confluence with Bullion Run and there is no defined channel in some places. This site had the lowest pH during both sampling events and strong concentrations of metals despite contributing a low amount of flow to Bullion Run. This site was the only one contributing aluminum to Bullion Run during both sampling events.

BR8 is located in the headwaters of Bullion Run just downstream of Weildon Road (Figure 5). This site had the highest concentrations of alkalinity during both sampling events.

Overall, only sample site BR7 water chemistry was observed to violate Chapter 93 water quality standards. Violations were observed for pH, sulfate, and iron. Water chemistry was generally poorer under low streamflow conditions, which is typical of AMD impacted areas. However, the majority of sites had water chemistry adequate to support biological communities.

Site ID	Flow (Cfs)	GPM	Field Temp °C	рН	Acidity (mg/L)	Acidity (lb/yr)	Alkalinity (mg/L)	Alkalinity (lb/yr)
BD 8	0.09	39.95	12.10	7.44	-8.83	-4.23	34.60	16.59
DKO	0.13	58.80	18.90	7.79	-33.59	-23.70	67.70	47.77
DD7	0.93	417.41	74.20	5.10	13.77	68.97	<20.0	-
DK/	0.08	35.91	18.00	5.30	9.02	3.89	<20	-
DDC	2.36	1059.24	11.00	7.70	6.70	85.16	<20.0	-
DKO	0.97	435.37	16.70	7.37	0.34	1.78	<20	-
DD 7	8.79	3945.23	11.80	7.39	-2.75	-130.19	23.30	1103.09
DK5	6.72	3016.15	19.40	7.81	-31.38	-1135.76	63.60	2301.92
DD4	11.34	5089.75	10.00	7.54	7.51	458.69	<20.0	-
DK4	4.21	1889.58	17.00	7.75	-28.37	-643.29	58.80	1333.29
DD2	12.58	5646.30	9.90	7.55	3.24	219.53	<20.0	-
DKJ	4.86	2181.32	15.40	7.55	-16.15	-422.74	40.80	1067.97
DD1	16.81	7544.85	9.80	7.51	5.06	458.12	<20.0	-
DK2	3.73	1674.14	16.10	7.68	-11.91	-239.27	38.80	779.48
DD1	20.22	9075.37	11.00	7.35	5.24	570.66	<20.0	-
DKI	5.44	2441.64	17.60	7.74	-18.07	-529.45	37.50	1098.74

Table 2a. Water quality results during both flow events. Chapter 93 water quality violations are highlighted in red text.

Site ID	Flow (Cfs)	GPM	Conductance (µ)	TDS (mg/L)	TSS (mg/L)	Sulfate (mg/L)	Sulfate (lb/yr)
рро	0.09	39.95	196.00	58.00	4.00	42.70	20.47
БКО	0.13	58.80	240.00	94.00	2.40	33.80	23.85
DD7	0.93	417.41	87.50	34.00	5.20	24.50	122.72
DK/	0.08	35.91	294.00	134.00	18.80	116.00	49.98
RD6	2.36	1059.24	52.80	<20.0	4.80	7.32	93.04
DKU	0.97	435.37	82.20	<20	3.60	7.73	40.38
BD5	8.79	3945.23	200.00	100.00	6.00	54.50	2580.18
DKS	6.72	3016.15	341.00	168.00	10.00	75.00	2714.53
BD4	11.34	5089.75	84.10	<20.0	11.60	18.90	1154.36
DN4	4.21	1889.58	390.00	188.00	<4.00	109.00	2471.57
BD3	12.58	5646.30	126.00	38.00	3.60	31.00	2100.42
DKJ	4.86	2181.32	286.00	160.00	7.20	74.90	1960.57
BD)	16.81	7544.85	120.00	60.00	5.20	28.60	2589.39
DR2	3.73	1674.14	271.00	136.00	5.20	69.90	1404.27
BD1	20.22	9075.37	154.00	<20.0	9.20	32.00	3484.94
BKI	5.44	2441.64	263.00	122.00	8.40	67.40	1974.80

Table 2b. Water quality results during both flow events (cont. from Table 2a). Chapter 93 water quality violations are highlighted in red text.

Site ID	Flow (Cfs)	GPM	Aluminum (mg/L)	Aluminum (lb/yr)	Iron (mg/L)	Iron (lb/yr)	Manganese (mg/L)	Manganese (lb/yr)
DDQ	0.09	39.95	< 0.100	-	0.29	0.14	0.08	0.04
DNO	0.13	58.80	0.11	0.08	0.69	0.49	0.08	0.06
DD7	0.93	417.41	0.23	1.16	1.07	5.36	0.41	2.05
DK/	0.08	35.91	0.40	0.17	2.74	1.18	3.04	1.31
DDC	2.36	1059.24	< 0.100	-	< 0.200	-	< 0.0200	-
BKO	0.97	435.37	< 0.100	-	< 0.200	-	0.03	0.13
DD5	8.79	3945.23	< 0.100	-	0.54	25.52	0.17	8.24
DK3	6.72	3016.15	0.17	6.19	1.14	41.26	0.24	8.61
DD4	11.34	5089.75	< 0.100	-	0.42	25.35	0.05	3.09
DR4	4.21	1889.58	< 0.100	-	1.13	25.62	0.38	8.68
DD2	12.58	5646.30	< 0.100	-	< 0.200	-	0.05	3.41
DKJ	4.86	2181.32	< 0.100	-	0.34	8.85	0.04	0.97
001	16.81	7544.85	< 0.1	-	< 0.200	-	0.03	3.10
BK2	3.73	1674.14	< 0.100	-	0.23	4.62	0.02	0.50
DD1	20.22	9075.37	< 0.1	-	< 0.2	-	0.03	
DKI	5.44	2441.64	<0.100	-	0.20	5.89	< 0.0200	-

Table 2c. Water quality results during both flow events (cont. from Table 2a, 2b). Chapter 93 water quality violations are highlighted in red text.



Figure 2. Example of good instream habitat at site BR2.



Figure 3. Bullion Run Iron Furnace Ruins located immediately downstream of site BR3. Bank erosion evident in photo is prevalent in this reach.



Figure 4. Eroding banks at site BR5.



Figure 5. Bullion Run in the headwaters, site BR8.

Summary and Additional Recommendations

Water quality was generally adequate to support biological communities throughout the watershed during the two sampling events. Sample site BR7 was the only site with Chapter 93 water quality violations. Therefore, a more detailed evaluation of water quality at and around this site, may be warranted to determine if remediation efforts are feasible to improve water quality in this area of the watershed.

Bank erosion and sediment loss were noted at multiple sites during this study in addition to the fish habitat and bank stabilization work already being completed. Bullion Run would benefit from additional bank stabilization. The section downstream of site BR5 had notable barren banks that would benefit from bank stabilization (Figure 4).

Summary of 2019 Technical Assistance Grant

During the 2018-2019 Technical Assistance TU provided to SCWA, Bullion Run was studied in two areas to assess biological communities as part of a larger study of the receiving stream, Scrubgrass Creek. During this study, site BR01 (identified as BR6 in the 2021 CHP) had the most diverse and sensitive population of benthic macroinvertebrates of any site studied for the 2019 TAG project. The This site had an IBI score of 84.69, the highest IBI score of all sites surveyed for that study. This site also had the highest Total Taxa Richness and EPT Taxa Richness scores and the third highest Percent Sensitive Individuals score (30 and 19 respectively).

Fishery surveys were conducted in the same reach as macroinvertebrate sampling. Three brook trout (*Salvelinus fontinalis*) measuring 74mm, 135mm, and 169mm were documented at this site. This was the only site surveyed for this study where brook trout were documented. Creek chub (*Semotilus atromaculatus*) were also present at this site and sculpin species (*Cottoidea*) and blacknose dace (*Rhinichthys atratulus*) were abundant.

The habitat at this site was optimal with a score of 192 according to the DEP Rapid Habitat Assessment. The areas that scored the lowest were embeddedness, sediment deposition, and condition of banks, which all scored in the sub-optimal range. While there were some areas of erosion and exposed banks, resulting in sediment deposition in the form of point bars, overall, this site had optimal habitat.

Site BR02 from the 2019 TAG study correlates with site BR1 for the 2021 CHP study and is located near the confluence with Scrubgrass Creek. During the 2019 study, the benthic macroinvertebrate community received an IBI score, 58.90, was found to be attaining its ALU. The most dominant taxa at this site was the Mayfly *Baetis*. This site had the second highest EPT taxa richness score (12) of all sites.

Fishery surveys at this site documented six brown trout (*Salmo Trutta*), the most at any site, ranging in size from 70mm to 385mm. While the largest trout may have been stocked, the presence of various age classes represent a naturally reproducing population of brown trout. Brown trout, creek chub, and sculpin were present at this site, and blacknose dace and longnose dace (*Rhinichthys cataractae*) were common.

According to watershed members and local landowners, this site had been experiencing bank loss during high flow or rain events over decades that had recently increased in severity. Heavy rain events over a short duration prior to macroinvertebrate sampling caused the movement of many tons of material and the stream channel to move roughly 60 feet from its original channel, taking with it the bank and much of the adjacent property (Figure 6a and 6b). Because of the stream channel movement and weak banks, this site received a marginal habitat score of 107, the lowest habitat score of all sites assessed for this report. Nearly all parameters were negatively affected by the habitat impairments and channel movement. The parameters that received the lowest scores were condition of banks, bank vegetative protection, and disruptive pressure which all scored poor.

Summary of Habitat Improvements

Following documentation of the stream impairments and sediment movement near the mouth of Bullion Run (BR02/2019, BR1/2021) TU coordinated with SCWA, PennDOT, and landowners to facilitate restoration of this site by moving the stream back into it's channel, protecting the banks and road, and adding instream fish habitat (Figure 7a and 7b).

In 2020 and 2021, additional instream habitat was completed by TU and the SCWA moving upstream from the site near the mouth that was initially restored. Bullion Run flows past a small neighborhood of homes on the left bank and erosion was evident throughout. Figures and show before (Figure 8) and after (Figure 9) the most recent habitat work was completed to stabilize banks and create instream fish habitat.



Figure 6a. Bullion Run near mouth pre-construction with fresh flood damage.



Figure 6b. Bullion Run near mouth pre-construction with fresh flood damage.



Figure 7a. Bullion Run near mouth post construction (looking downstream).



Figure 7b. Bullion Run near mouth post construction (looking upstream).



Figure 8. 2021 Habitat site pre-construction.



Figure 9. 2021 Habitat site post construction.