SANDY LICK CREEK HEADWATERS COLDWATER CONSERVATION PLAN

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INTRODUCTION AND BACKGROUND

The Sandy Lick Creek originates in Sandy Township in Clearfield County and flows west through the City of DuBois, Falls Creek Borough, and finally Reynoldsville Borough to its confluence with the Redbank Creek in Brookville, Jefferson County. As one of the primary tributaries to the Redbank, the Sandy Lick Creek has a drainage area of more than 200 square miles. This Coldwater Conservation Plan is focused on the headwaters area of the Sandy Lick Creek in Sandy Twp. upstream of Sabula Lake. In this area, the mainstem of the Sandy Lick Creek is listed as a Trout Stocked Fishery (TSF) with each of the smaller tributaries listed as Cold Water Fisheries (CWF) according to the PA Code, Title 25, Chapter 93 Water Quality Standards. According to PA Fish and Boat Commission most recent list of PA Stream Sections that Support Natural Reproduction of Trout (January 2015) this section of the Sandy Lick also contains native brook trout.

Figure 1: Assessment location in Clearfield Co.

Figure 2: Assessment area

Water quality concerns within this watershed are primarily related to human encroachment. In particular the existence of perched culverts and the affect they have on aquatic organism passage. Additionally, there are several ponds constructed on several tributaries that may cause thermal and sedimentation impacts. During the course of this study impacts from agricultural runoff and roadways was also considered.

PROJECT GOALS

- Identify current and potential sources of pollution within this watershed
- Collect baseline water quality and macroinvertebrate data
- Identify extent of native brook trout population in the tributaries
- Develop a list of recommendations to improve current problems and protect the stream from future problems

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DESCRIPTION OF STUDY

This project started with a reconnaissance of the watershed, looking for any current pollution sources or impact as well as locating areas where sampling should occur. The streams and tributaries were walked and a driving tour of the watershed was conducted where appropriate. Based on observations 6 sampling locations were chosen: SL1, SL2, SL3, SL4, SL5, and SL6. Water samples were collected at these location 4 times during the project. At each location, as identified in Figure 3 below, the pH, conductivity, temperature, alkalinity, and flow were taken. See Appendix D for pictures of these locations.

Sample Locations

Sample site SL1 is upstream of the SR 255 Bridge which is upstream of Sabula Lake. This site was influenced by the impounded water at Sabula Lake during each sampling event. Flow was almost always very slow and the water was deeper than one would expect for the size of stream. This site was specifically chosen for its location just upstream of the lake to determine how much of an influence the impoundment has on the Sandy Lick Creek headwaters.

Site SL2 is at the mouth of tributary #2 to the Sandy Lick Creek headwaters. The entirety of this tributary flows through forested land and there are no road crossings. The only way to access this site was through a backyard and by crossing the main stem of the Sandy Lick Creek.

Sample site SL3 is on the main stem of the Sandy Lick Creek downstream of the unnamed tributary #2 adjacent to Paul Short Road. This site was chosen to determine the extent of the thermal pollution on the main stem of the Sandy Lick Creek due to the ponds found on the unnamed tributary.

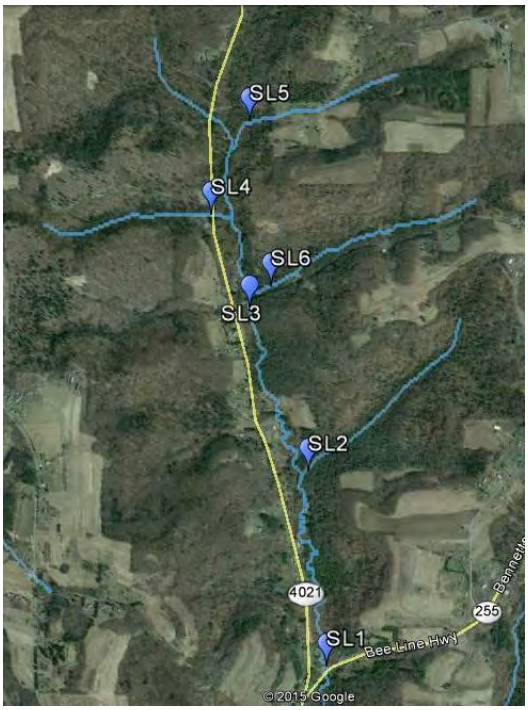

Figure 3: Sampling locations

Site SL4 is at the mouth of unnamed tributary #3, adjacent to Brown School Road. The entirety of this tributary flows through forested land although there is an area near the mouth where the riparian area has narrowed due to Brown School Road on one side and a yard on the other. Additionally, in this same area there is some trash including an old wringer washer and tires among other things.

Sample site SL5 was located on the main branch of the Sandy Lick Creek in the very headwaters of the study area. The branch of the headwaters flows through forestland as well as some agricultural land. There are also some ponds that influence it as well.

Site SL6 is just upstream from the mouth of unnamed tributary #2. This tributary flows through primarily forested land although there are several private ponds situated on this tributary making thermal pollution the primary area of concern at this location.

All chemical samples were collected as grab samples utilizing new polyethylene bottles provided by Mahaffey Laboratory. Bottles were rinsed 3 times with the sample water before the final sample was collected. Each sample was taken at mid-stream and at mid-depth. Smaller sample bottles were fixed with nitric acid following sample collection. All water quality samples were analyzed for pH, acidity, alkalinity, nitrates, sulfates, total

dissolved solids (TDS), total suspended solids (TSS), specific conductance, total phosphorus, aluminum, iron, and manganese.

A fishery survey was completed on June 30, 2014 by Trout Unlimited. Surveys were conducted at 7 locations within the study area and done according to Pennsylvania Fish and Boat Commission Unassessed Waters protocol. According to the Trout Unlimited Sandy Lick Fishery Data Report 2014, "data was collected using battery powered backpack electrofishing gear using pulsed direct current. All fish were identified, counted, and recorded. All trout were collected and measured to the nearest millimeter and assigned to a 25mm size class determined by the PFBC. Trout were then returned, unharmed, to the stream section they were captured from. Total length of each site was measured in meters using a hip chain. Five widths were taken at approximately 20 meter intervals. Stream widths were measured in meters using a meter tape. Effort time was recorded in seconds by the Smith-Root LR 24 backpack shocker and later converted to minutes. Voltage was determined by the backpack shocker based on conductivity at each site." For a more detailed description of survey methods and results, see Appendix A.

Macroinvertebrates were sampled using a kick net according to DEP Instream Comprehensive Protocol (ICE). Six kicks were conducted at each site and were identified to the family level. Our results were only compared to each other and not to a reference stream. Unfortunately, there was no suitable location to collect macroinvertebrates at the SL 1 site just upstream of Sabula Lake. This site was influenced by Sabula Lake so the water was deep enough that there was no riffle habitat to kick for bugs. Results can be found in Appendix B.

Lastly, Stream Habitat Assessments were completed at the same points that macroinvertebrates were collected utilizing assessment forms found in the DEP ICE Protocol. Completed assessment sheets can be found in Appendix C. The habitat scores range from 0 to 240, with 240 indicating the best possible habitat. It was used to gauge the suitability of the habitat for the biological community as well as the integrity of the riparian zones in each watershed.

WATERSHED DESCRIPTION

Land Use

Approximately 80% of the headwaters of the Sandy Lick Creek watershed is forested. Homes and accompanying yards account for approximately 10%. Agriculture accounts for 6% while roads account for the remaining 4%.

Geography and Physiography

The Sandy Lick Creek watershed lies within the Appalachian Plateaus Province in the Pittsburgh Low Plateau Section. The entirety of the study section is within Sandy Township. (Pennsylvania GEODE Data Exploration Online Mapping Tool, DCNR)

According to USGS Topographic maps, elevations in the study area range from 1560 feet to 1800 feet.

Geology

Rock formations in this watershed are listed in the Pennsylvania Series in the Glenshaw and, to a much smaller degree in the very headwaters, the Allegheny formation. The Glenshaw Formation is composed of sandstone, siltstone, shale, claystone, limestone and coal while the Allegheny Formation is composed of clay shale, claystone, siltstone, sandstone, limestone, and coal. (Pennsylvania GEODE Data Exploration Online Mapping Tool, DCNR)

Soils

Soils in the area consist primarily of the Wharton silt loam association which is deep and very deep, moderately well drained soils found on uplands. It consists of residuum from interbedded clay shale, siltstone, and fine-grained sandstone.

Other soils within the watershed include the Ernest silt loam, Binkerton soils, and Rayne-Gilpin complex. (NRCS Custom Soil Report)

PREVIOUS STUDIES/ANALYSIS OF WATERSHED

There have been several studies conducted in the Sandy Lick Creek and surrounding areas including:

- Redbank Creek Watershed Conservation Plan
- SLCI Visual Assessment

AREAS OF CONCERN AND POTENTIAL CONFLICTS

Human Encroachment is the primary area of concern in the headwaters of the Sandy Lick Creek watershed. The stream and its tributaries in this area are in some cases running through backyards and in close proximity to several roads. It is because of this that perched culverts and impaired fish passage as well as thermal pollution from ponds is at the top of the list of potential problems identified within the watershed.

Culverts & Fish Passage

There are five road crossings on the headwaters of the Sandy Lick Creek. Of these, two are bridges while the remaining three are culverts. The bridges are located where SR255 crosses the Sandy Lick just upstream of Sabula Lake and where Paul Short Road crosses the Sandy Lick. Both bridges appear to be constructed in a manner that does not visually appear to hamper fish passage. The culvert installed where UNT #3 crosses Mountain Run Road is severely perched and impedes aquatic organism passage. The downstream end of the culvert sits two feet above the top of bank and causes a waterfall into a small pool.

As detailed in the results below, there were brook trout discovered upstream of the culvert but not downstream. There was however one occasion during the water sample collection that a single native brook trout was discovered below the culvert. Due to water levels and the height of the culvert from the pool, it was not able to go upstream or downstream. Given the results of the fishery survey, it is believed that this trout was swept through the culvert from the upstream population.

At Site SL 6 there is a private drive used for past logging. The culvert at this location though not perched, may be undersized and is misaligned causing some erosion issues on the upstream end.

Thermal Pollution

Particularly on the tributary adjacent to Paul Short Road, associated with SL3, there are several private ponds that seem to be increasing the water temperature in this particular tributary. Both the water quality and fishery survey results indicated that this was the case

Additional Impacts Considered

Prior to the study, there were several less obvious potential impacts that were also considered including agricultural runoff, oil and gas impacts, and possibly abandoned mine drainage pollution but water quality results ruled out impacts from these sources.

STUDY RESULTS

Water Quality

The following tables (Tables 2 to 7) outline the water quality at the 6 sampling locations. All the sample locations met Chapter 93 water quality criteria throughout the course of the study for aluminum, iron, manganese, pH, sulfate, and total dissolved solids. These results indicate minimal water quality degradation overall from any of the previously considered potential impacts. Chapter 93 water quality criteria can be found in Table 1 with project sampling results in Tables 2 - 7.

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

Table 1. Chapter 93 Water Quality Criteria

Table 2. Site SL1

Date	Flow	pH	Temp	Alkalinity	Acidity	Sp. Cond.	SO4	TSS	TDS	Al	Fe	Mn	Nitrate	Total Phosphorus
	GPM		°C	mg CaCO3/L	mg CaCO3/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/26/13	545.29	7	10.2	48	-32	190	11	<5	101	0.08	0.74	0.1	<0.5	0.1
11/21/13	2090.29	7.2	3.2	29	-14	107	12	6	57	0.08	0.3	0.05	0.61	0.03
03/31/14	2806.80	6.9	7.6	22	-8	98	12	13	59	0.53	0.68	0.04	0.69	<0.03
09/25/14	566.61	6.8	12.9	54	-27	176	10	<5	100	0.06	0.62	0.09	<0.5	0.1
Average	1502.2	7.0	8.5	38.25	-20.25	142.75	11.25	9.50	79.25	0.19	0.59	0.07	0.65	0.08

Table 3. Site SL2

Date	Flow	pH	Temp	Alkalinity	Acidity	Sp. Cond.	SO4	TSS	TDS	Al	Fe	Mn	Nitrate	Total Phosphorus
	GPM		°C	mg CaCO3/L	mg CaCO3/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/26/13	39.05	7.4	10	54	-38	155	15	<5	89	0.06	0.17	0.02	0.58	0.03
11/21/13	482.91	7.2	3.6	31	-17	102	13	5	76	0.07	0.13	<0.02	0.97	<0.03
03/31/14	496.82	6.9	6.7	22	-9	88	13	<5	49	0.21	0.23	<0.02	0.84	<0.03
09/25/14	50.27	6.9	11.9	54	-29	165	14	<5	97	<0.05	0.09	<0.02	<0.5	0.03
Average	267.26	7.1	8.1	40.25	-23.25	127.50	13.75	5	77.75	0.11	0.16	0.02	0.80	0.03

Table 4. Site SL3

Date	Flow	pH	Temp	Alkalinity	Acidity	Sp. Cond.	SO4	TSS	TDS	Al	Fe	Mn	Nitrate	Total Phosphorus
	GPM		°C	mg CaCO3/L	mg CaCO3/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/26/13	181.76	6.8	10	42	-27	150	11	<5	90	0.27	1.02	0.12	<0.5	0.03
11/21/13	1157.90	7.1	3.6	25	-10	96	11	<5	67	0.08	0.24	0.04	<0.5	0.03
03/31/14	3769.25	6.8	7	18	-2	96	12	7	57	0.38	0.48	0.03	0.65	0.03
09/25/14	112.20	6.7	12.3	45	-20	145	8	<5	82	0.08	0.55	0.07	<0.5	0.03
Average	1305.28	6.9	8.2	32.5	-14.75	121.75	10.5	7	74	0.20	0.57	0.07	0.65	0.03

Table 5. Site SL4

Date	Flow	pH	Temp	Alkalinity	Acidity	Sp. Cond.	SO4	TSS	TDS	Al	Fe	Mn	Nitrate	Total Phosphorus
	GPM		°C	mg CaCO3/L	mg CaCO3/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/26/13	21.32	7.1	10.6	26	-11	117	<5	6	67	0.14	0.48	0.07	<0.5	0.08
11/21/13	269.73	6.9	4.5	17	-2	111	13	8	73	0.16	0.38	0.05	<0.5	0.06
03/31/14	197.47	6.6	6.1	14	1	86	13	10	52	0.45	0.62	0.05	0.62	<0.03
09/25/14		6.5	12.8	24	-1	113	10	<5	65	0.06	0.24	0.06	<0.5	0.09
Average	162.84	6.8	8.5	20.25	-3.25	106.75	12	8	64.25	0.20	0.43	0.06	0.62	0.08

Table 6. Site SL5

Date	Flow	pH	Temp	Alkalinity	Acidity	Sp. Cond.	SO4	TSS	TDS	Al	Fe	Mn	Nitrate	Total Phosphorus
	GPM		°C	mg CaCO3/L	mg CaCO3/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/26/13	8.53	7.2	12.4	48	-33	119	8	<5	67	0.27	0.76	0.14	<0.5	0.03
11/21/13	129.25	7.2	4.2	29	-12	90	10	8	65	0.21	0.47	0.05	<0.5	0.04
03/31/14	203.31	6.7	6.1	19	-2	67	10	<5	50	0.6	0.61	0.04	0.56	0.1
09/25/14	13.46	6.7	15.2	38	-4	111	6	7	62	0.06	0.43	0.06	<0.5	0.1
Average	88.64	6.95	9.48	33.50	-12.75	96.75	8.50	7.50	61.00	0.29	0.57	0.07	0.56	0.07

Table 7. Site S 6

Date	Flow	pH	Temp	Alkalinity	Acidity	Sp. Cond.	SO4	TSS	TDS	Al	Fe	Mn	Nitrate	Total Phosphorus
	GPM		°C	mg CaCO3/L	mg CaCO3/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11/21/13	245.94	7.3	3.4	39	-24	109	13	7	71	0.09	0.25	0.03	<0.5	<0.03
03/31/14	421.87	6.9	4.4	25	-10	87	12	<5	52	0.37	0.36	0.03	0.6	0.03
09/25/14	46.68	6.9	13.8	54	-30	148	10	11	82	<0.05	0.22	0.04	<0.5	0.03
Average	238.16	7.0	7.2	39.33	-21.33	114.67	11.7	9.00	68.33	0.23	0.28	0.03	0.60	0.03

Fishery Survey

Fishery surveys were completed at all 6 sample locations. There was also an additional site completed further upstream of site SL6 on the unnamed tributary adjacent to Paul Short Road. This was done upstream of the largest pond on this tributary to see if trout could be found in this area.

Brook trout were found at only 2 of the 7 sample locations, at SL2 and SL4. The greatest numbers of trout (26 brook trout) were found at SL2. Warmer water species such as creek chub, blacknose dace, white suckers, and green sunfish were found at all of the other sample locations. Additional fishery data can be found in Appendix A.

Table 8 Brook Trout at SL2														
Size Class (mm)	25-49	50-74	75-99	100-124	125-149	150-174	175-199	200-224	225-249	250-274	275-299	300-324	> 325	TOTAL
Quantity	7	8	1	6	1		2		1					26

At SL2, a total of 26 brook trout were found throughout 7 size classes as seen in Table 8 above. The presence of the trout from the smaller size classes indicates natural reproduction is likely occurring in this tributary. There were also white suckers and blacknose dace found during the survey.

Table 9 Brook Trout at SL4														
Size Class (mm)	25-49	50-74	75-99	100-124	125-149	150-174	175-199	200-224	225-249	250-274	275-299	300-324	> 325	TOTAL
Quantity		8				2	1		1					12

At SL4, a total of 12 brook trout were found throughout 4 age classes as seen in Table 9 above. Though there were fewer trout here, the majority of trout were in the smaller age class of 50-74 mm long indicating natural reproduction is likely occurring in this tributary. Only brook trout were found at this site.

Macroinvertebrates

Table 10 outlines the biological metrics used to analyze macroinvertebrate numbers as used in DEP's ICE Protocol. Macroinvertebrates were not collected at the most downstream location, SL 1, due to the lack of suitable riffle habitat within 200 yards upstream or downstream of the sampling location. The overall IBI Score could not be calculated for any of the sample sites because none of the sites contained 200 organisms +/- 40.

Total taxa richness is the count of the total number of taxa collected. It is expected to decrease with increasing anthropogenic stress to the stream reflecting loss of taxa and increasing dominance of pollution tolerant taxa.

Given the poor habitat conditions at all of our sampling locations, there are fewer taxa collected at each site. Taxa richness is highest at SL 3, SL 5, and SL 6.

EPT Taxa Richness is the count of the number of taxa belonging to the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT) in a sub-sample with pollution tolerance values of 0 – 4. This metric decreases in value with increasing anthropogenic stress to a stream ecosystem, reflecting the loss of taxa from these largely pollution-sensitive orders. Site SL 4 has the lowest EPT score in this metric and the highest impact by human encroachment.

Beck's Index is a weighted count of taxa with Pollution Tolerance Values of 0, 1, or 2. As with the EPT Richness metric, the Beck's Index value is expected to decrease in response to increasing pollution levels.

The Hilsenhoff Biotic Index is a community composition and tolerance metric that is calculated as an average of the number of individuals in a samply, weighted by their PTVs. This value generally increases with increasing ecosystem stress showing an increase in the pollution tolerant organisms.

The Shannon Diversity index is a community composition metric that measures taxonomic richness and evenness of individuals across taxa of a sample. It decreases with increasing anthropogenic stress to the ecosystem.

The Percent of Sensitive Individuals is the percentage of individuals with PTVs of 0-3 in a sample and is expected to decrease with increasing anthropogenic stress.

Additional macroinvertebrate data can be found in Appendix B.

Table 10 Macroinvertebrate metrics. IBI could not be calculated for any sites as there were not 200 +/- 40 organisms collected at any site.

	SL 2	SL 3	SL 4	SL 5	SL 6
Total Abundance	43	60	45	100	73
Total Taxa Richness	5	6	4	6	6
EPT Taxa Richness (PTV 0 – 4)	2	2	1	2	2
Beck's Index, version 3	3	3	3	3	3
Hilsenhoff Biotic Index	1.65	0.88	2.00	2.08	1.32
Shannon Diversity	1.23	0.88	1.14	1.63	1.16
Percent Sensitive Individuals (PTV 0 – 3)	76.7	83.33	53.3	67.0	76.7

Habitat Assessments

Table 11 outlines the habitat assessment scores. Overall, each site scored in the suboptimal range, none scored in the optimal range. According to the DEP ICE Protocol, the most critical of these elements are instream cover, epifaunal substrate, embeddedness, sediment deposition, and condition of the banks as these have the most affect on the benthic macroinvertebrates. Only site SL 3 scored in the optimal range for instreamm cover and epifaunal substrate. SL 3 and SL 5 scored in the optimal range for embeddedness while both SL 2 and SL 4 scored as poor. All of the sites scored below the optimal range for sediment deposition with both SL 2 and SL 4 scoring in the poor range. For condition of banks, only site SL 5 scored in the optimal range. Overall the highest habitat score in the Sandy Lick Creek headwaters can be found at Site SL 5, the most upstream of all sample points. While the lowest habitat score can be found at SL 4, on unnamed tributary #3.

Table 11. Results from DEP Habitat Asssessments. Scores are color coded: green = optimal, yellow = suboptimal, orange = marginal, and red = poor.

Parameter	SL 2	SL 3	SL 4	SL 5	SL 6
Instream Cover (fish)*	10	16	15	15	10
Epifaunal Substrate*	10	17	14	15	10
Embeddedness*	5	17	5	16	13
Velocity/Depth Regimes	15	15	11	8	15
Channel Alterations	19	13	15	11	11
Sediment Deposition*	4	11	5	14	11
Frequency of Riffles	10	15	12	18	16
Channel Flow Status	17	15	18	18	15
Condition of Banks*	10	11	11	18	11
Bank Vegetative Protection	15	15	18	19	10
Grazing or Other Disruptive Pressure	20	11	15	19	18
Riparian Vegetative Zone Width	20	11	10	18	11
Total	155	167	149	189	151

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RECOMMENDATIONS AND NEXT STEPS

1. A more in depth culvert inventory and aquatic organism passage study should be conducted on the culverts in the watershed. The culvert on the unnamed tributary #3 is the primary area of concern as it prevents fish passage freely through this tributary. Efforts should be made to work with Sandy Township to pursue proper replacement of this culvert.

2. There are additional culverts on drainage ditches in the watershed that warrant closer inspection as they may be a source of the increased sedimentation in the Sandy Lick Creek. It's possible they may need proper maintenance and should also be discussed with Sandy Township.

3. Interestingly the two tributaries with confirmed native brook trout, SL 2 (UNT #1) and SL 4 (UNT #3) also had the lowest habitat scores and the highest sediment levels of all sample sites. Further efforts should be made to find sources for the excessive sedimentation and possible solutions. This may be an opportunity to install habitat improvement and bank stabilization projects to improve sedimentation.

4. There are larger trash items such as a wringer washer and car parts located within the first 100 yards upstream of the previously mentioned culvert on unnamed tributary #3. A trash clean up at this site is recommended.

5. Given the concentration of homes adjacent to the Sandy Lick Creek, there are opportunities for educating landowners about watershed conservation practices including buffers and pond management.

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APPENDIX A
FISHERY SURVEY RESULTS

Sandy Lick Fishery Data

Trout Unlimited 2014

On June 30, 2014, Trout Unlimited completed fishery surveys at 7 sites on Sandy Lick. Surveys were completed according to Pennsylvania Fish and Boat Commission's (PFBC) Unassessed Waters protocol. Fishery data was collected using battery powered backpack electrofishing gear using pulsed direct current. A Smith-Root LR-24 backpack electrofisher was used for these surveys. Electrofishing proceeded straight upstream from the beginning of each sample site. All fish observed by the field crew were identified, counted, and recorded. Trout were collected during electrofishing surveys and measured to the nearest millimeter (total length) and assigned to a 25mm size class determined by PFBC. After all fish were counted and measured they were returned, unharmed, to the section of stream they were captured from.

Site information was recorded at each site. Total length of each site was measured in meters using a hip chain. Five widths were taken at approximately 20 meter intervals. Stream widths were measured in meters using a meter tape. Effort time was recorded in seconds by the Smith-Root LR 24 backpack shocker and later converted to minutes. Voltage was determined by the backpack shocker based on conductivity at each site.

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

Site SL1: RT 255 above bridge along Mountain Run Road. There were no trout found at this site.

SL1 Site Info	
Site Length (m)	100
Average Width (m)	5.5
Effort Time (min)	12
Volts	250
SL1 Field Chemistry	
pH	100
Conductivity µ	5.5
Temperature C°	12

SL1 Fishery Data	
Species	**Abundance**
Pumpkinseed	6
Green Sunfish	2
Tessellated Darter	2
Largemouth Bass	1

Site SL2: Pulled off of Mtn Run Rd. A total of 26 brook trout were found at this site throughout 7 size classes. The representation of the smaller size classes indicates natural reproduction could be present.

SL2 Site Info	
Site Length (m)	100
Average Width (m)	5.5
Effort Time (min)	12
Volts	250
Field Chemistry	
pH	7.8
Conductivity µ	107
Temperature C°	14.8

SL2 Fishery Data	
Species	**Abundance**
White Sucker	1
Blacknose Dace	14
Brook Trout	26

SL2 Brook Trout	
Size Class	**Quantity**
25-49	7
50-74	8
75-99	1
100-124	6
125-149	1
150-174	
175-199	2
200-224	
225-249	1
250-274	
275-299	
300-324	
≥ 325	
TOTAL	**26**

SL3: Pulled onto Paul Short Road- began site upstream of bridge. No trout were found at this site.

SL3 Site Info	
Site Length (m)	105
Average Width (m)	3.04
Effort Time (min)	15
Volts	300
SL3 Field Chemistry	
pH	8.1
Conductivity µ	105
Temperature C°	18.8

SL3 Fishery Data	
Species	**Abundance**
Blacknose Dace	8
Green Sunfish	2
White sucker	6
Tessellated Darter	3
Redside Dace	2

SL4: Brown School Road- began site at pool below culvert. Heavy vegetation in spots made it difficult to shock and capture. The only fish species found was brook trout. A total of 12 brook trout were caught throughout four size classes. The smallest of these size classes, 50-74mm, signifies potential naturally reproducing brook trout.

SL4 Site Info	
Site Length (m)	101
Average Width (m)	1.104
Effort Time (min)	14
Volts	270
SL4 Field Chemistry	
pH	7.8
Conductivity µ	117
Temperature C°	16.8

SL4 Brook Trout	
Size Class	**Quantity**
25-49	
50-74	8
75-99	
100-124	
125-149	
150-174	2
175-199	1
200-224	
225-249	1
250-274	
275-299	
300-324	
≥ 325	
TOTAL	**12**

SL5: Pulled off of Mtn. Dodd Rd. Good instream habitat with some sedimentation. Stream crosses over dirt road on surface 60m into site. No trout were found at this site.

SL5 Site Info	
Site Length (m)	96
Average Width (m)	1.2
Effort Time (min)	18
Volts	500
SL5 Field Chemistry	
pH	7.7
Conductivity µ	130
Temperature C°	23

SL5 Fishery Data	
Species	**Abundance**
Creek Chub	>30
White Sucker	2
Blacknose Dace	12
Tessellated Darter	3
Fall Fish	1

SL6A: Downstream of dam- Paul Short Rd. No trout were found at this site.

SL6A Site Info	
Site Length (m)	45
Average Width (m)	1.7
Effort Time (min)	8
Volts	270
SL6A Field Chemistry	
pH	7.8
Conductivity µ	120
Temperature C°	21.8

SL6A Fishery Data	
Species	**Abundance**
White Sucker	1
Blacknose Dace	3
Tessellated Darter	3
Largemouth Bass	1
Fall Fish	4

SL6B: Upstream of pond- Paul Short Rd. No trout were found at this site.

SL6B Site Info	
Site Length (m)	90.7
Average Width (m)	1.74
Effort Time (min)	15
Volts	270
SL6B Field Chemistry	
pH	7.8
Conductivity µ	132
Temperature C°	18.3

SL6B Fishery Data	
Species	**Abundance**
Blacknose dace	>30
Creek Chub	1

Largemouth bass caught at site SL1.

2 brook trout caught at site SL2

Sandy Lick passes over dirt road on surface at site SL5.

APPENDIX B
MACROINVERTEBRATE SAMPLE RESULTS

Order	Family	Taxa PTV	SL2	SL3	SL4	SL5	SL6
Ephemeroptera	Maccaffertium	3	10	4		30	10
Odonata	Gomphidae	4	4	1	12	8	2
Plecoptera	Haploperla	0	23	46	24	30	46
Trichoptera	Hydropsychidae	6	5	5	6	13	10
	Decapoda		1	1		12	3
Diptera	Tipulidae	4		3	3		2
Megaloptera	Corydalidae	3				7	
Total			43	60	45	100	73

APPENDIX C
HABITAT ASSESSMENTS

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

WATER QUALITY NETWORK
HABITAT ASSESSMENT

WATERBODY NAME Sandy Lick Creek STR CODE/RMI _____

STATION NUMBER SL2 LOCATION mouth of unnamed tributary #1

DATE 5/29/14 TIME 9AM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Scott Williams

FORM COMPLETED BY Scott Williams ***RIFFLE/RUN PREVALENCE***

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Instream Cover (Fish)	Greater than 50% mix of boulder, cobble, sub-merged logs, undercut banks, or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat avail-ability less than desirable.	Less than 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
SCORE 10	20 19 18 17 16	15 14 13 12 11	**10** 9 8 7 6	5 4 3 2 1
2. Epifaunal Substrate	Well developed riffle and run, riffle is as wide as stream and length extends two times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.	Run area may be lack-ing; riffle not as wide as stream and its length is less than two times the stream width; gravel or large boulders and bed-rock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
SCORE 10	20 19 18 17 16	15 14 13 12 11	**10** 9 8 7 6	5 4 3 2 1
3. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1
4. Velocity/Depth Regimes	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score lower than if missing other regimes).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Alteration	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE 19	20 **19** 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Total Side 1 59

RIFFLE/RUN PREVALENCE

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 4	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 **4** 3 2 1
7. Frequency of Riffles	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is between ratio >25.
SCORE 10	20 19 18 17 16	15 14 13 12 11	**10** 9 8 7 6	5 4 3 2 1
8. Channel Flow Status	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 17	20 19 18 **17** 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
9. Condition of Banks	Banks stable; no evidence of erosion or bank failure.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; up to 60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; on side slopes, 60-100% of bank has erosional scars.
SCORE 10	20 19 18 17 16	15 14 13 12 11	**10** 9 8 7 6	5 4 3 2 1
10. Bank Vegetative Protection	More than 90% of the streambank surface covered by vegetation.	70-90% of the stream-bank surface covered by vegetation.	50-70% of the stream-bank surfaces covered by vegetation.	Less than 50% of the streambank surface covered by vegetation.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
11. Grazing or Other Disruptive Pressure	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Disruption of vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
SCORE 20	**20** 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
12. Riparian Vegetative Zone Width	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE	**20** 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Total Side 2 96

Total Score 155

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WATER QUALITY NETWORK
HABITAT ASSESSMENT

WATERBODY NAME Sandy Lick Creek STR CODE/RMI _____

STATION NUMBER SL3 LOCATION Mainstem of Sandy Lick Creek below unnamed trib #2

DATE 5/29/14 TIME 9:45AM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Scott Williams

FORM COMPLETED BY Scott Williams ***RIFFLE/RUN PREVALENCE***

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Instream Cover (Fish)	Greater than 50% mix of boulder, cobble, sub-merged logs, undercut banks, or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat avail-ability less than desirable.	Less than 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
SCORE 16	20 19 18 17 **16**	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Epifaunal Substrate	Well developed riffle and run, riffle is as wide as stream and length extends two times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.	Run area may be lack-ing; riffle not as wide as stream and its length is less than two times the stream width; gravel or large boulders and bed-rock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
SCORE 17	20 19 18 **17** 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 17	20 19 18 **17** 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
4. Velocity/Depth Regimes	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score lower than if missing other regimes).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Alteration	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE 13	20 19 18 17 16	15 14 **13** 12 11	10 9 8 7 6	5 4 3 2 1

Total Side 1 78

RIFFLE/RUN PREVALENCE

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1
7. Frequency of Riffles	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is between ratio >25.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Channel Flow Status	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
9. Condition of Banks	Banks stable; no evidence of erosion or bank failure.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; up to 60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; on side slopes, 60-100% of bank has erosional scars.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1
10. Bank Vegetative Protection	More than 90% of the streambank surface covered by vegetation.	70-90% of the stream-bank surface covered by vegetation.	50-70% of the stream-bank surfaces covered by vegetation.	Less than 50% of the streambank surface covered by vegetation.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
11. Grazing or Other Disruptive Pressure	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Disruption of vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1
12. Riparian Vegetative Zone Width	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1
Total Side 2 89				
Total Score 167				

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WATER QUALITY NETWORK
HABITAT ASSESSMENT

WATERBODY NAME Sandy Lick Creek STR CODE/RMI _____

STATION NUMBER SL4 LOCATION mouth of unnamed tributary 3

DATE 5/29/14 TIME 11:30AM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Scott Williams

FORM COMPLETED BY Scott Williams ***RIFFLE/RUN PREVALENCE***

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Instream Cover (Fish)	Greater than 50% mix of boulder, cobble, sub-merged logs, undercut banks, or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat avail-ability less than desirable.	Less than 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Epifaunal Substrate	Well developed riffle and run, riffle is as wide as stream and length extends two times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.	Run area may be lack-ing; riffle not as wide as stream and its length is less than two times the stream width; gravel or large boulders and bed-rock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
SCORE 14	20 19 18 17 16	15 **14** 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1
4. Velocity/Depth Regimes	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score lower than if missing other regimes).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1
5. Channel Alteration	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Total Side 1 60

RIFFLE/RUN PREVALENCE

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	**5** 4 3 2 1
7. Frequency of Riffles	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is between ratio >25.
SCORE 12	20 19 18 17 16	15 14 13 **12** 11	10 9 8 7 6	5 4 3 2 1
8. Channel Flow Status	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 18	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
9. Condition of Banks	Banks stable; no evidence of erosion or bank failure.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; up to 60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; on side slopes, 60-100% of bank has erosional scars.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1
10. Bank Vegetative Protection	More than 90% of the streambank surface covered by vegetation.	70-90% of the stream-bank surface covered by vegetation.	50-70% of the stream-bank surfaces covered by vegetation.	Less than 50% of the streambank surface covered by vegetation.
SCORE 18	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
11. Grazing or Other Disruptive Pressure	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Disruption of vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
12. Riparian Vegetative Zone Width	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 10	20 19 18 17 16	15 14 13 12 11	**10** 9 8 7 6	5 4 3 2 1
Total Side 2 89				
Total Score 149				

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WATER QUALITY NETWORK
HABITAT ASSESSMENT

WATERBODY NAME Sandy Lick Creek STR CODE/RMI _____

STATION NUMBER SL5 LOCATION headwaters upstream of all other sample points

DATE 5/29/14 TIME 12:30AM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Scott Williams

FORM COMPLETED BY Scott Williams ***RIFFLE/RUN PREVALENCE***

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Instream Cover (Fish)	Greater than 50% mix of boulder, cobble, sub-merged logs, undercut banks, or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat avail-ability less than desirable.	Less than 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Epifaunal Substrate	Well developed riffle and run, riffle is as wide as stream and length extends two times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.	Run area may be lack-ing; riffle not as wide as stream and its length is less than two times the stream width; gravel or large boulders and bed-rock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
SCORE 15	20 19 18 17 16	**15** 14 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 16	20 19 18 17 **16**	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
4. Velocity/Depth Regimes	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score lower than if missing other regimes).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 **8** 7 6	5 4 3 2 1
5. Channel Alteration	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE 11	20 19 18 17 16	15 14 13 12 **11**	10 9 8 7 6	5 4 3 2 1

Total Side 1 65

RIFFLE/RUN PREVALENCE

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 14	20 19 18 17 16	15 **14** 13 12 11	10 9 8 7 6	5 4 3 2 1
7. Frequency of Riffles	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is between ratio >25.
SCORE 18	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Channel Flow Status	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 18	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
9. Condition of Banks	Banks stable; no evidence of erosion or bank failure.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; up to 60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; on side slopes, 60-100% of bank has erosional scars.
SCORE 18	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
10. Bank Vegetative Protection	More than 90% of the streambank surface covered by vegetation.	70-90% of the stream-bank surface covered by vegetation.	50-70% of the stream-bank surfaces covered by vegetation.	Less than 50% of the streambank surface covered by vegetation.
SCORE 19	20 **19** 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
11. Grazing or Other Disruptive Pressure	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Disruption of vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
SCORE 19	20 **19** 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
12. Riparian Vegetative Zone Width	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 18	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Total Side 2 124				
Total Score 189				

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER STANDARDS AND FACILITY REGULATION

WATER QUALITY NETWORK
HABITAT ASSESSMENT

WATERBODY NAME Sandy Lick Creek STR CODE/RMI _____

STATION NUMBER SL6 LOCATION just upstream of mouth of UNT #2

DATE 5/29/14 TIME 10:30AM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Scott Williams

FORM COMPLETED BY Scott Williams ***RIFFLE/RUN PREVALENCE***

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Instream Cover (Fish)	Greater than 50% mix of boulder, cobble, sub-merged logs, undercut banks, or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat avail-ability less than desirable.	Less than 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
SCORE 10	**20 19 18 17 16**	**15 14 13 12 11**	**10** **9 8 7 6**	**5 4 3 2 1**
2. Epifaunal Substrate	Well developed riffle and run, riffle is as wide as stream and length extends two times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.	Run area may be lack-ing; riffle not as wide as stream and its length is less than two times the stream width; gravel or large boulders and bed-rock prevalent; some cobble present.	Riffles or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
SCORE 10	**20 19 18 17 16**	**15 14 13 12 11**	**10** **9 8 7 6**	**5 4 3 2 1**
3. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE 13	**20 19 18 17 16**	**15 14** **13** **12 11**	**10 9 8 7 6**	**5 4 3 2 1**
4. Velocity/Depth Regimes	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score lower than if missing other regimes).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE 15	**20 19 18 17 16**	**15** **14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1**
5. Channel Alteration	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE 11	**20 19 18 17 16**	**15 14 13 12** **11**	**10 9 8 7 6**	**5 4 3 2 1**

Total Side 1 59

RIFFLE/RUN PREVALENCE

Habitat Parameter	Category																			
	Optimal					Suboptimal					Marginal					Poor				
6. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
SCORE 11	20	19	18	17	16	15	14	13	12	**11**	10	9	8	7	6	5	4	3	2	1
7. Frequency of Riffles	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is between ratio >25.				
SCORE 16	20	19	18	17	**16**	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
8. Channel Flow Status	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
SCORE 15	20	19	18	17	16	**15**	14	13	12	11	10	9	8	7	6	5	4	3	2	1
9. Condition of Banks	Banks stable; no evidence of erosion or bank failure.					Moderately stable; infrequent, small areas of erosion mostly healed over.					Moderately unstable; up to 60% of banks in reach have areas of erosion.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; on side slopes, 60-100% of bank has erosional scars.				
SCORE 11	20	19	18	17	16	15	14	13	12	**11**	10	9	8	7	6	5	4	3	2	1
10. Bank Vegetative Protection	More than 90% of the streambank surface covered by vegetation.					70-90% of the stream-bank surface covered by vegetation.					50-70% of the stream-bank surfaces covered by vegetation.					Less than 50% of the streambank surface covered by vegetation.				
SCORE 10	20	19	18	17	16	15	14	13	12	11	**10**	9	8	7	6	5	4	3	2	1
11. Grazing or Other Disruptive Pressure	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.					Disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					Disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Disruption of vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.				
SCORE 18	20	19	**18**	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
12. Riparian Vegetative Zone Width	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.				
SCORE 11	20	19	18	17	16	15	14	13	12	**11**	10	9	8	7	6	5	4	3	2	1

Total Side 2 92

Total Score 151

APPENDIX D
PICTURES

Figure D-1: SL1 looking upstream from SR 255 Bridge

Figure D-2: SL1 looking downstream at SR 255 Bridge

Figure D-3: Site SL2

Figure D-4: Site SL3

Figure D-5: Culvert at SL4

Figure D-6: SL4 upstream of culvert

Figure D-7: SL5

Figure D-8: Site SL6