SPRING RUN AND SNYDER RUN COLDWATER CONSERVATION PLAN

Clearfield County Conservation District
511 Spruce Street, Suite 6
Clearfield, PA 16830

SPRING AND SNYDER RUNS COLDWATER CONSERVATION PLAN

INTRODUCTION AND BACKGROUND

Spring Run is a 1,209 acre watershed that flows into Chest Creek 2.0 miles north of Westover Borough in Clearfield County, Pennsylvania. From its headwaters in Burnside Township, the stream flows east through Chest Township before flowing into Chest Creek. Chest Creek is designated as a Cold Water Fishery and is a tributary to the Upper West Branch of the Susquehanna River. Spring Run is designated as a Cold Water Fishery and is not yet on the PA Fish and Boat Commission List of Naturally Reproducing Trout Streams.

There are several water quality concerns within the Snyder Run watershed. First is human encroachment. There are numerous areas where the stream flows through backyards and in close proximity to homes which has greatly cut down on the stream side riparian buffer in areas. Additionally, there are several man made ponds in the watershed that create the potential for a thermal impact on Snyder Run. Near the mouth of the stream there is a large spoil pile adjacent to Hugill Sanitation. This spoil has gradually washed into the stream and is coating the bottom of Snyder Run in this section. Lastly there is the potential for increased gas well drilling with the Marcellus Shale play.

Nearby Spring Run is a 1,375 acre watershed that flows into Chest Creek 2.5 miles north of Westover Borough in Clearfield County, Pennsylvania. From its headwaters in Burnside Township, the stream flows east through Chest Township before flowing into Chest Creek. Currently the stream is designated as a Cold Water Fishery and is already listed on the PA Fish and Boat Commission List of Naturally Reproducing Trout Streams.

Water quality concerns in this watershed include potential impacts from the Rosebud Mining Harmony Deep Mine. Not only does this include potential ground or surface water contamination but also increased sedimentation. Owens Road runs adjacent to Spring Run throughout much of its length and the constant heavy truck traffic pummels the road and greatly increases sediment runoff to the stream. Additionally, as Spring and Snyder Runs are so close, there is also the potential for increased Marcellus Shale gas well drilling.

PROJECT GOALS

- Identify current and potential sources of pollution within these watersheds
- Collect baseline water quality and macroinvertebrate data
- Develop a list of recommendations to improve current problems and protect the stream from future problems

DESCRIPTION OF STUDY

We started by conducting a reconnaissance of both watersheds, looking for any current pollution sources or impact as well as locating areas where sampling should occur. We walked the streams and tributaries and conducted a driving tour of the watershed where appropriate. Based on our observations in each watershed and the need to collect useful baseline water quality throughout the Spring and Snyder Runs, we chose 4 sampling locations throughout the two watersheds. We collected water samples at these location 3 times during the project. At each location, as identified in Appendix A, the pH, conductivity, temperature, dissolved oxygen, and flow were taken. See Appendix E for pictures of these locations.

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. The bottle specifically for the methane test had been pre filled with acid to fix the sample. To

fill the bottle, water was poured from the large bottle (after rinsing), until the water was completely to the top of the bottle. Once the cap fit on, it was necessary for us to make sure there were no air bubbles in the sample bottle or the sample had to be retaken with a fresh bottle. All water quality samples were analyzed for acidity, alkalinity, chlorides, sulfates, total dissolved solids (TDS), total suspended solids (TSS), methane, total hardness, aluminum, iron, manganese, barium, and calcium. Water quality results can be found in Appendix B.

Macroinvertebrates were sampled using a kick net. Two kicks were conducted at each site and organisms were identified to the Order level stream side. The benthic metric used was the total number of taxa to measure overall variety of the macroinvertebrates which would decrease with increased pollution. We also used the EPT taxa or the number of taxa in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Tricoptera (caddisflies). The EPT Taxa are considered more sensitive to pollution and so this number would also decrease with increased pollution. Our results were only compared to each other and not to a reference stream. The results of the macroinvertebrate sampling can be found in Appendix C.

Lastly, Stream Habitat Assessments were completed at the same points that macroinvertebrates were collected. We utilized the assessment forms found in the DEP ICE Protocol which can be found in Appendix D. 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 90% of the Snyder Run watershed is forested. Agriculture accounts for approx. 3% of the land use and is found mostly in the headwaters of Snyder Run. Another 5% of the land use is accounted for by roads and utility right of ways with the last 2% being composed of commercial/industrial usage at the Hugill Sanitation location.

Spring Run is also mostly forested, approximately 92%. Roads and utility rights of way account for approximately 5% of the watershed with the remaining 3% being commercial/industrial use at the Rosebud Harmony Deep Mine.

Geography and Physiography

Both Spring Run and Snyder Run are in the Appalachian Plateaus Province in the Pittsburgh Low Plateau Section. Both streams start out in Burnside Township just north of Harmony and flow east through Chest Township before entering Chest Creek in the Five Points area.

According to USGS Topographic maps, elevations in the Snyder Run watershed range from 1810 feet to 1314 feet and elevations in the Spring Run watershed range from 1800 feet to 1334 feet.

Geology

Rock formations in both of these watersheds are listed in the Pennsylvania Series. From this series, the Allegheny and Glenshaw formations can be found in the Spring and Snyder Run watersheds. The Allegheny formation is composed of clay shale, claystone, siltstone, sandstone, limestone, and coal while the Glenshaw Formation is composed of sandstone, siltstone, shale, claystone, limestone and coal.

Both watersheds also sit in the Main Bituminous Coal Field of Pennsylvania and include the Upper and Lower Freeport and the Upper, Middle, and Lower Kittanning coal seams.

Soils

Soils in the Spring and Snyder Run watersheds consist primarily of the Rayne channery silt loam association which are deep well drained soils found in the upland areas of both watersheds. It consists of residuum weathered from shale and siltstone and is considered well drained. To a smaller extent, the watersheds also contain Ernest silt loam and Rayne-Gilpin complex. The Ernest silt loam consists of very deep, moderately well drained soils formed from shale, siltstone, and some sandstone. The Rayne-Gilpin complex consists of well drained soils that are moderate to very deep.

PREVIOUS STUDIES/ANALYSIS OF WATERSHED

As identified in the Operation Scar Lift report of the 1960's, there are several abandoned mine land features in both watersheds. In Snyder Run there are spoil piles near the mouth of the stream, as noted previously in this report. In the Spring Run watershed there are more features including spoil piles and a dry strip mines. Since 2008, Rosebud Mining's Harmony Deep Mine, Permit # 17071301 has been an active underground mine complex that extends throughout most of the headwaters of Spring Run and even a small portion of the very headwaters of Snyder Run.

The Pennsylvania Fish and Boat Commission has already evaluated Snyder and has classified it as having a population of native brook trout. In 2013, the CCCD will be working with Trout Unlimited to conduct the Unassessed Waters survey of Chest Creek and its tributaries to identify additional tributaries that support native trout, including Spring Run.

AREAS OF CONCERN AND POTENTIAL CONFLICTS

Human Encroachment/Sedimentation: Snyder and Spring Run

There are numerous areas within the Snyder Run watershed where the stream is flowing through backyards which have greatly impacted the riparian buffer in certain areas. This is leading to increased run off potential, trash in the stream, and increased stream bank erosion.

In Spring Run, there is a dirt road that runs the length of the creek. There is very heavy truck traffic on this road travelling to and from the Rosebud Harmony Deep Mine which is greatly increasing runoff of sedimentation. This sedimentation can coat the bottom of Spring Run and degrade macroinvertebrate habitat and destroy spawning areas for fish.

Thermal Pollution: Snyder Run

There are several man made ponds along Snyder Run that, coupled with the lack of trees in the riparian area, could possibly increase the temperature in Snyder Run making it less suitable as a brook trout fishery.

Abandoned Mine Drainage (AMD) and Spoil Piles: Snyder and Spring Run

Mine drainage is formed when pyrite found in and around coal, coal refuse, and overburden is exposed to oxygen and water during the mining process. This results in water that is high in acidity and metal concentrations (including iron, aluminum, and manganese) and low pH. Iron and aluminum are the most lethal as they can coat the gills of fish and aquatic insects and can coat the substrate which is the habitat for macroinvertebrates and spawning ground for fish. AMD is the primary water quality concern in Clearfield County as we contribute more than 51% of all the AMD pollution to the West Branch of the Susquehanna River. More than 630 of the counties 700 stream/river miles are impacted in some way by AMD and many of them are devoid of life.

The Rosebud Harmony Deep Mine in the Spring Run watershed has the potential to impact the stream. Water flowing out of the mine must be treated with care by the Operator in order to prevent mine discharges to Spring Run. Any overburden brought out of the mine with coal refuse in it has the potential to create acidic runoff as well.

Near the mouth of the Snyder Run is a large spoil pile adjacent to Hugill Sanitation which has gradually washed into the stream and is coating the bottom of Snyder Run in this section virtually destroying the habitat in the last half mile of Snyder Run.

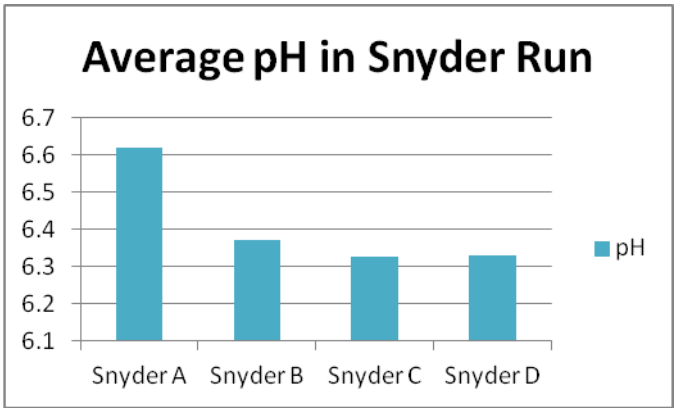
Oil and Gas: Snyder and Spring Run

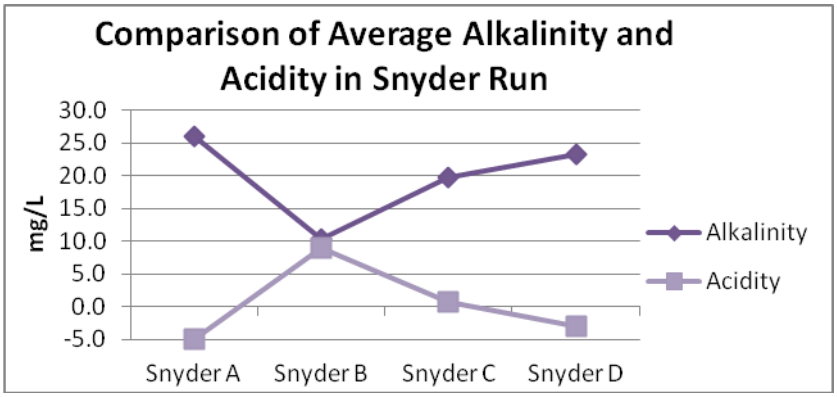
Conventional gas well drilling is present in a few locations in both the Spring and Snyder Run watersheds. However, the concern here is more with unconventional drilling into the Marcellus Shale (and possibly other shale layers in the future). Concerns related to unconventional gas well drilling include road and pad construction meaning increased sedimentation potential; stream pollution by "flow back" water containing salts, chemicals used in the fracking process, and heavy metals that could have a devastating impact to the fishery in both of these streams; and diesel fuel and other possible leakages from the pad site. Nearby areas are seeing Marcellus Shale which will eventually come to the Chest Creek watershed and ultimately to Spring and Snyder Runs.

STUDY RESULTS

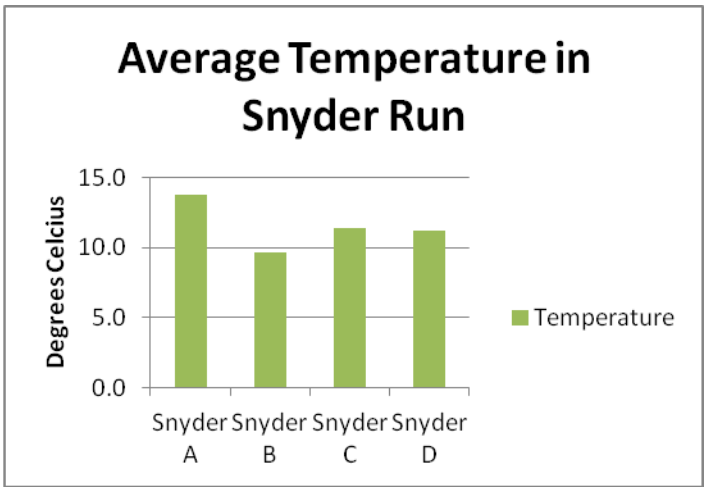
Snyder Run: Water Quality

As shown in the chart below the average pH values at the four sample locations are between 6.0 and 7.0 which is ideal for aquatic life. Additionally, a comparison of the alkalinity vs. acidity shows that at each sampling location, we saw more alkalinity than acidity meaning Snyder Run is alkaline in nature and is capable of neutralizing any acidic pollution flowing into the stream.

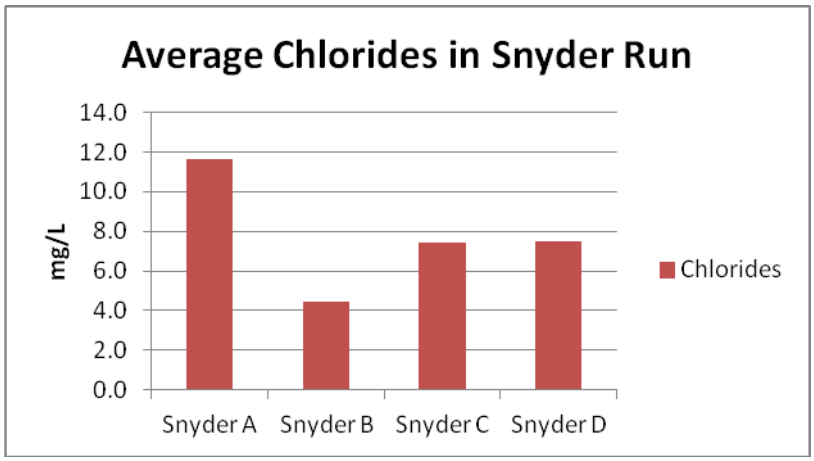




As thermal impacts were a concern in Snyder Run, you will see a chart outlining the average temperatures measured throughout the stream below. According to the Pennsylvania Fish and Boat Commission, the brook trout prefers water that is below 65° F or 18.3° C. The chart below shows that the temperature at each sampling location averages less than 15° C and would be tolerable to our native brook trout. This also shows us that the ponds on Snyder Run do not increase the temperature of the stream significantly and therefore do not have as great an impact on Snyder Run as was thought.



Drilling impacts, primarily future impacts, were a big concern in the watershed as well. Below you will see a chart detailing the average chloride levels at our sampling locations. According to the State Drinking Water Standards, 250 mg/L is the highest allowable value for chlorides in drinking water. Higher concentrations can indicate problems such as road runoff or sewage input. Gas waste fluids contain extremely high levels such as 100,000 mg/L. Our results show that we did register some chlorides at each sampling point but the averages were all well below 250 mg/L. This baseline water quality data will be important should unconventional gas well drilling ever occur in this watershed.



On average at Snyder A, dissolved oxygen was 10.7 mg/L, conductivity was 142.7uS/cm, sulfate levels were 11.3 mg/L, total dissolved solids were 66.7 mg/L, total suspended solids were <5.0 mg/L, total hardness was 2.2 mg/L, barium was 0.1 mg/L, calcium was 9.5 mg/L, aluminum was 0.1 mg/L, iron was 0.2 mg/L, manganese was 0.02 mg/L, methane was <0.3 mg/L, and magnesium was 3.4 mg/L.

On average at Snyder B, dissolved oxygen was 10.06 mg/L, conductivity was 74.67 uS/cm, sulfate levels were 10.0 mg/L, total dissolved solids were 44.0 mg/L, total suspended solids were <5.0 mg/L, total hardness was 1.3 mg/L, barium was <0.5 mg/L, calcium was 5.85 mg/L, aluminum was 0.09 mg/L, iron was 0.11 mg/L, manganese was 0.02 mg/L, methane was < 0.3 mg/L, and magnesium was 1.93 mg/L.

On average at Snyder C, dissolved oxygen was 11.09 mg/L, conductivity was 106.0 uS/cm, sulfate levels were 13.0 mg/L, total dissolved solids were 60.0 mg/L, total suspended solids were <5.0 mg/L, total hardness was 1.9 mg/L, barium was <0.5 mg/L, calcium was 8.45 mg/L, aluminum was 0.11 mg/L, iron was 0.29 mg/L, manganese was 0.04 mg/L, methane was < 0.3 mg/L, and magnesium was 2.84 mg/L.

And on average at Snyder D, dissolved oxygen was 10.85 mg/L, conductivity was 118.00 uS/cm, sulfate levels were 14.0 mg/L, total dissolved solids were 64.33 mg/L, total suspended solids were <5.0 mg/L, total hardness was 2.23 mg/L, barium was <0.5 mg/L, calcium was 9.98 mg/L, aluminum was 0.07 mg/L, iron was 0.30 mg/L, manganese was 0.08 mg/L, methane was < 0.3 mg/L, and magnesium was 3.22 mg/L.

Overall, total dissolved solids values at each location stayed well below the state drinking water standard of 500 mg/L. Methane, which could result from natural conditions or from gas well drilling were not detected in Snyder Run at any of our sampling locations. Iron, aluminum, and manganese were also shown to not be concerning as the average for each metal at each sampling point was shown to be less than their respective drinking water standards (0.3 mg/L iron, 0.2 mg/L aluminum, and 0.05 mg/L of manganese).
The complete results can be found in Appendix B.

Snyder Run: Macroinvertebrate Study

We encountered just 4 individuals at Snyder A with just 1 individual in the EPT taxa. This site was highly impacted by human encroachment and the habitat was just not suitable for macroinvertebrate life.

At Snyder we encountered a total of 17 individuals from 5 different taxa. The number of EPT taxa was 11, which was more than half of the total number of individuals observed.

We encountered 76 individuals at Snyder C with 65 individuals in the EPT taxa, nearly 86% of the observed macroinvertebrates. This site had more flow and suitable habitat for macroinvertebrates as well as less human encroachment.

We were not able to collect macroinvertebrates at Snyder D because we were not able to locate suitable riffles to conduct the kick survey. Further explanation of the habitat can be found further on in the Habitat Assessment section of this narrative.

Snyder Run: Habitat Assessments

Sample point Snyder A at the mouth of northern branch of Snyder Run scored 130 out of 240. Snyder A was highly impacted by human encroachment in the form of hand placed dams, weirs, and bridges. It scored very low in Riparian Vegetative Zone Width, Channel Alterations, Velocity & Depth Regimes, Epifaunal Substrate, and Instream Cover.

Sample point Snyder B at the mouth of the southern branch of Snyder Run scored 204, the highest of the three Snyder Run points. There is some but much less human encroachment to this branch so it scored high in Instream Cover, Epifaunal Substrate, Frequency of Riffles, Channel Flow Status, and Bank Vegetative Protection.

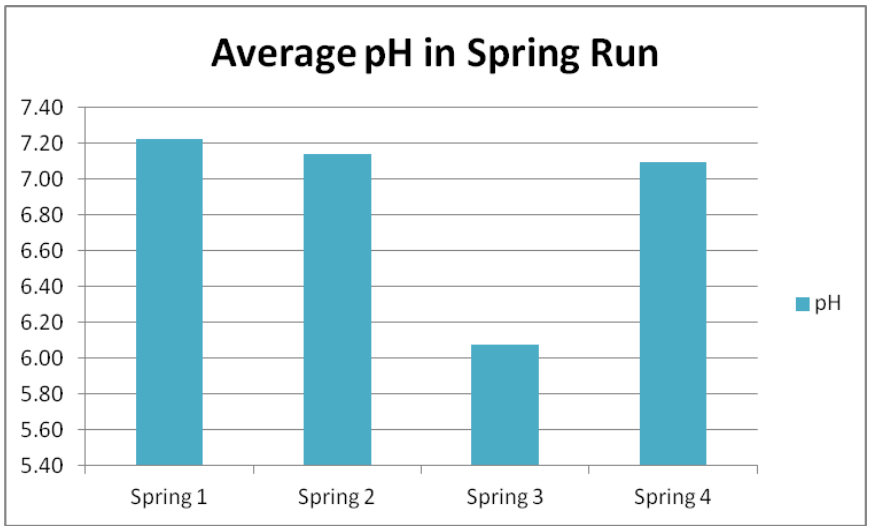
Sample point Snyder C was located just upstream of the first bridge crossing Snyder Run on Five Points Road and scored 197 out of 240. Due to its proximity to the road the habitat was somewhat degraded but not as bad

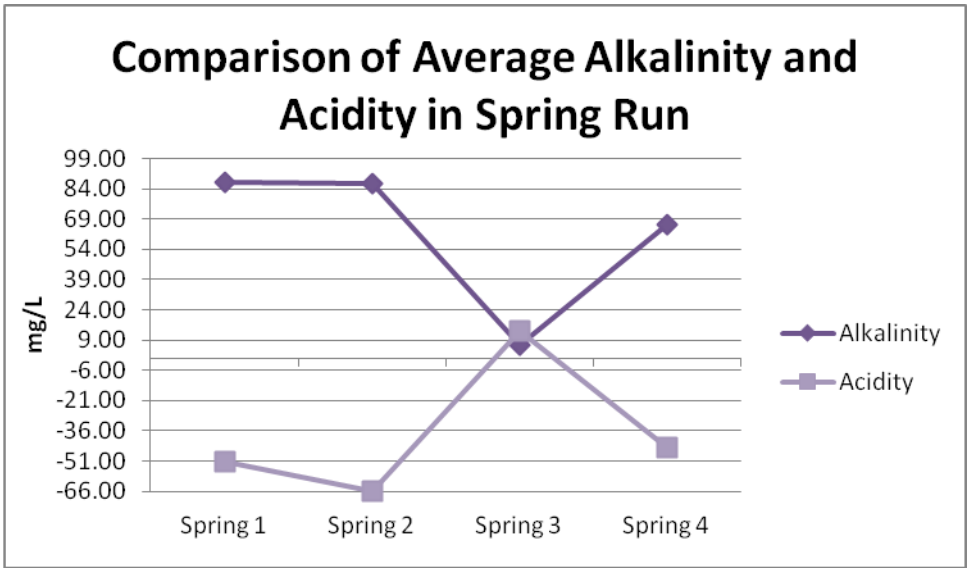
as other locations on the stream. This location scored high in Epifaunal Substrate, Embeddedness, and Frequency of Riffles but scored low in the Riparian Vegetative Zone Width and Channel Alteration.

Sample point Snyder D was a very degraded site. There were immeasurable amounts of "red dog" in the stream and there were no larger stones present, everything was approximately 3" in diameter or smaller. We were not able to locate suitable riffle locations to sample for macroinvertebrates but did conduct a habitat assessment to document the conditions we encountered. Snyder D scored just 117 out 240. This location scored low in every category except Bank Vegetative Protection.

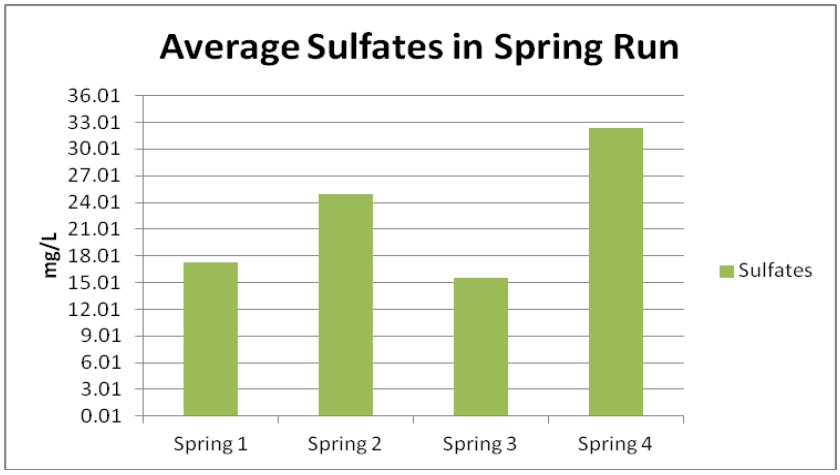
Snyder Run: Water Quality

As shown in the chart below the average pH values at the four sample locations are between 6.0 and 7.2 which is ideal for aquatic life. Additionally, a comparison of the alkalinity vs. acidity shows that at Spring 1, 2, and 4 we saw more alkalinity than acidity meaning these locations in Spring Run are alkaline in nature and capable of neutralizing any acidic pollution flowing into the stream. As you can see, acidity was actually higher than alkalinity at Spring 3 which is a small trib that flows into Spring Run from the north. As there are no high metals or total dissolved solids readings, this may potentially be occurring from acid deposition to this tributary.

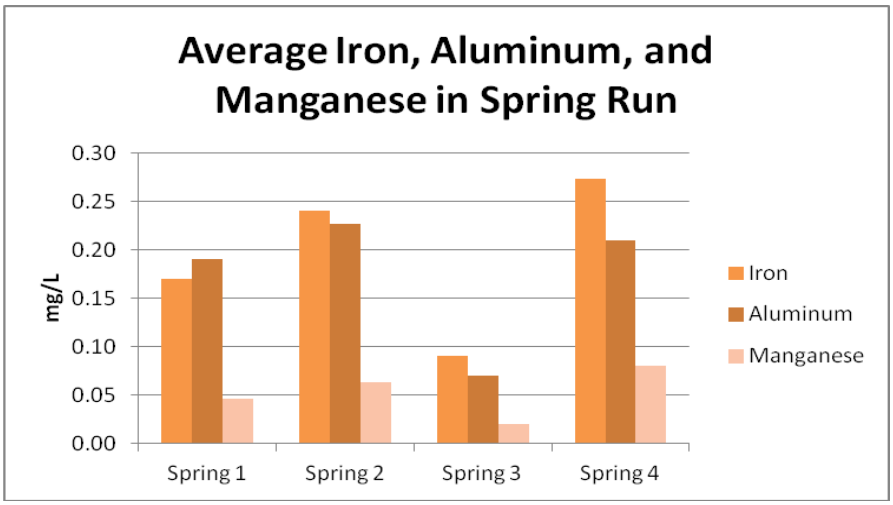




One of the primary concerns in Spring Run is impacts from mining practices and so below you will see a chart comparing the levels of iron, aluminum, and manganese in the stream as well as a chart outlining the average sulfate levels. EXPLAIN SULFATES

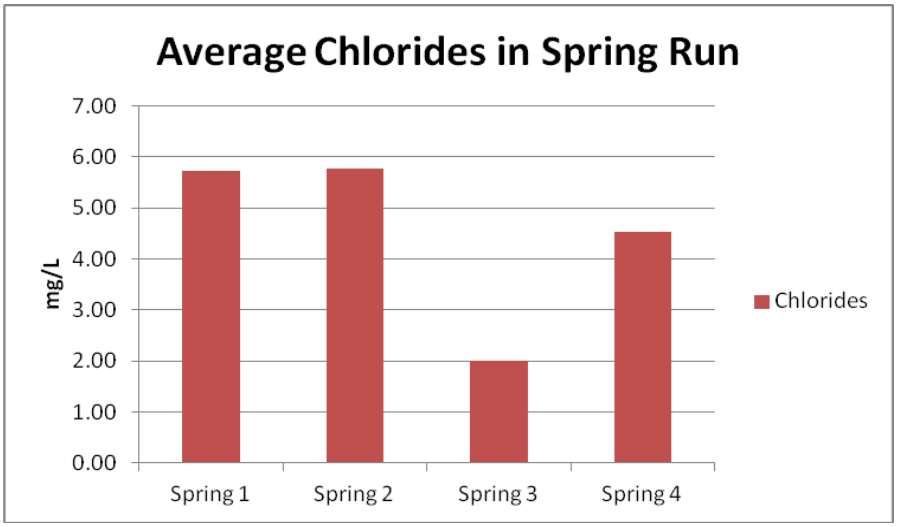


As you can see in the chart below, iron levels were 0.17 mg/L. 0.24 mg/L, 0.09 mg/L, and 0.27 mg/L. These levels were all below the State Drinking Water Standard level of 0.3 mg/L. Aluminum, which is much more toxic to fish, exceed the State Drinking Water Standard of 0.2 mg/L at Spring 2 just below the Harmony Deep Mine with a level of 0.23 mg/L and again at the mouth at Spring 4 with a level of 0.21 mg/L. It is possible that the aluminum being detected is coming from the Harmony Deep Mine but it is also just as likely that this can be a legacy aluminum in the watershed from the identified AML features noted earlier. Further investigation will have to take place to determine the exact cause. Lastly, the State Drinking Water Standards for Manganese (0.05 mg/L were also exceed at Spring 2 and 4 with levels of 0.06 mg/L and 0.08 mg/L, respectively. Again, this could be a product of the Harmony Deep Mine but it could also be legacy mining issues in the watershed and further investigation would be needed to confirm the source.



Potential impacts from any future development of the Marcellus Shale are a big concern in the watershed as well. Below you will see a chart detailing the average chloride levels at our sampling locations. According to the State Drinking Water Standards, 250 mg/L is the highest allowable value for chlorides in drinking water. The Alliance for Aquatic Resource Monitoring, who were involved in training numerous Trout Unlimited Chapters around the state to monitor in areas with Marcellus Shale drilling states uses 25 mg/L as a check point. Higher

concentrations can indicate problems such as road runoff or sewage input. Gas waste fluids contain extremely high levels such as 100,000 mg/L. Our results show that we did register some chlorides at each sampling point but the averages were all well below both the 250 mg/L and 25 mg/L levels indicated by the above agencies. This baseline water quality data will be important should unconventional gas well drilling ever occur in this watershed.



Overall, on average at Spring 1 dissolved oxygen was 11.24 mg/L, conductivity was 283.33 uS/cm, sulfate levels were 17.3 mg/L, total dissolved solids were 133.33 mg/L, total suspended solids were <5.0 mg/L, total hardness was 3.33 mg/L, barium was 0.09 mg/L, calcium was 15.9 mg/L, aluminum was 0.91 mg/L, iron was 0.17 mg/L, manganese was 0.05 mg/L, methane was <0.3 mg/L, and magnesium was 4.21 mg/L.

On average at Spring 2 dissolved oxygen was 11.72 mg/L, conductivity was 259.33 uS/cm, sulfate levels were 25.0 mg/L, total dissolved solids were 146.67 mg/L, total suspended solids were <5.0 mg/L, total hardness was 3.87 mg/L, barium was 0.08 mg/L, calcium was 18.3 mg/L, aluminum was 0.23 mg/L, iron was 0.24 mg/L, manganese was 0.06 mg/L, methane was <0.3 mg/L, and magnesium was 4.93 mg/L.

At Spring 3 dissolved oxygen was 12.56 mg/L, conductivity was 57.50 uS/cm, sulfate levels were 15.5 mg/L, total dissolved solids were 34.0 mg/L, total suspended solids were <5.0 mg/L, total hardness was 1.15 mg/L, barium was < 0.05 mg/L, calcium was 4.56 mg/L, aluminum was 0.07 mg/L, iron was 0.09 mg/L, manganese was 0.02 mg/L, methane was <0.3 mg/L, and magnesium was 1.96 mg/L.

Lastly, at Spring 4 dissolved oxygen was 11.74 mg/L, conductivity was 231.33 uS/cm, sulfate levels were 32.33 mg/L, total dissolved solids were 127.67 mg/L, total suspended solids were 5.67 mg/L, total hardness was 3.90 mg/L, barium was 0.06 mg/L, calcium was 17.77 mg/L, aluminum was 0.21 mg/L, iron was 0.27 mg/L, manganese was 0.08 mg/L, methane was <0.3 mg/L, and magnesium was 5.58 mg/L.

Overall, total dissolved solids values at each location stayed well below the state drinking water standard of 500 mg/L. Methane, which could result from natural conditions or from gas well drilling were not detected in Spring Run at any of our sampling locations. And levels of iron, aluminum, and manganese showed impacts from mining from either the Harmony Deep Mine or legacy mining in the area.

The complete results can be found in Appendix B.

Spring Run: Macroinvertebrate Study

We encountered 65 individuals from 5 different taxa at Spring 1 with 32 individuals (nearly 50%) in the EPT taxa.

At Spring 2 we encountered a total of 35 individuals from 4 different taxa. The number of EPT taxa was 21, which was approximately 60% of the total number of individuals observed.

Spring 3 was dry on the date macroinvertebrates were collected so were not able to collect any at this site.

At Spring 4 we encountered 122 individuals from 6 different taxa. This was the highest overall count from any location in the study. The number of EPT taxa was 117 or 96% of the total number of individuals observed, this was also the highest EPT count observed during the study. This value was composed of more than 100 individuals in the Plecoptera Family (caddisflies) which are not as sensitive as either mayflies (Ephemeroptera) or stoneflies (Tricoptera) so this value, though great, would be even better if members of the Ephe meroptera and Tricoptera families were the primary constituents.

Snyder Run: Habitat Assessments

Sample point Spring 1 upstream of the Harmony Deep Mine scored 201 out of 240. Spring 1 was slightly impacted due to its proximity to Owens Road and as such it scored lower in the Condition of Banks and Riparian Vegetative Zone Width. It scored higher in every other category.

Sample point Spring 2 downstream of the Harmony Deep Mine but upstream of a beaver dam area mid way through the watershed 204 with its highest marks in Channel Alteration, Instream Cover, Epifaunal Substrate, and Sediment Deposition. This is the highest score for any of the Spring Run locations.

As Spring Run 3, the only tributary to Spring Run, was dry when we were conducting the habitat assessment we did not complete one as it would be difficult to rate the tributary on many of the categories listed on the assessment sheet.

Lastly sample point Spring 4 was located just near the mouth of Spring Run and scored 163 out of 240. There was a man made bridge crossing Spring Run and a mowed field within the study stretch that impacted the habitat on this stretch of Spring Run. This location scored lower in Instream Cover, Embeddedness, Sediment Deposition, and Riparian Vegetative Zone Width. It scored higher in Bank Vegetative Protection and Epifaunal Substrate.

RECOMMENDATIONS AND NEXT STEPS

Spring Run:

1) Sedimentation is one of the largest problems with Spring Run. Owens Road, which runs within 60 feet of Spring Run throughout most of its length, is heavily travelled by heavy truck traffic from the Rosebud Mining Harmony Deep Mine. Although they appear to have maintained the road since their permit was issued in January 2008, it is clear that a lot of sediment is getting into Spring Run and is having a negative impact on both the habitat in the stream and macroinvertebrate population. We recommend continued maintenance of this road throughout the life of the mine as well Rosebud Mining investigating ways to better keep the sediment from the road from getting into the stream. This road may possibly someday be a candidate for a Dirt and Gravel Road project which would help with the sediment issues.

2) Water quality and macroinvertebrate populations indicate that the Rosebud Mining Harmony Deep Mine or legacy mining in the watershed may be having a slightly negative impact on the water quality of Spring Run.

With only 3 samples analyzed during the life of this project we recommend more intense sampling by either the local watershed group or Rosebud Mining to get a better sense of the water quality above and below the Mine to ensure the water quality does not continue to degrade.

3) Water quality showed that the trib containing Spring 3 may be experiencing impacts from acid deposition, this should be investigated further.

Snyder Run:

1) As seen on aerial photos, there is a large boney pile just west of Hugill Sanitation at the mouth of Snyder Run. Judging by the incredible amount of boney in the last quarter mile of Snyder Run, this pile is definitely impacting the stream. There is no real bed or habitat in the stream and there is no macroinvertebrate life. We recommend that the landowners, including Hugill Sanitation, investigate the removal or reclamation of this boney pile.

2) Human encroachment is a problem on Snyder Run. There are numerous homes within 60 feet of the stream, numerous ponds that could cause thermal pollution to Snyder Run, some perched culverts, and human manipulation of the stream bed (such as hand placed dams). Efforts could be made to educate the landowners on the importance of floodplains, stream bank maintenance, pond management, and in stream habitat. Improvement of some of these conditions should also be priority such as proper in stream habitat construction per PA Fish and Boat Commission recommendations and repair of perched culverts.

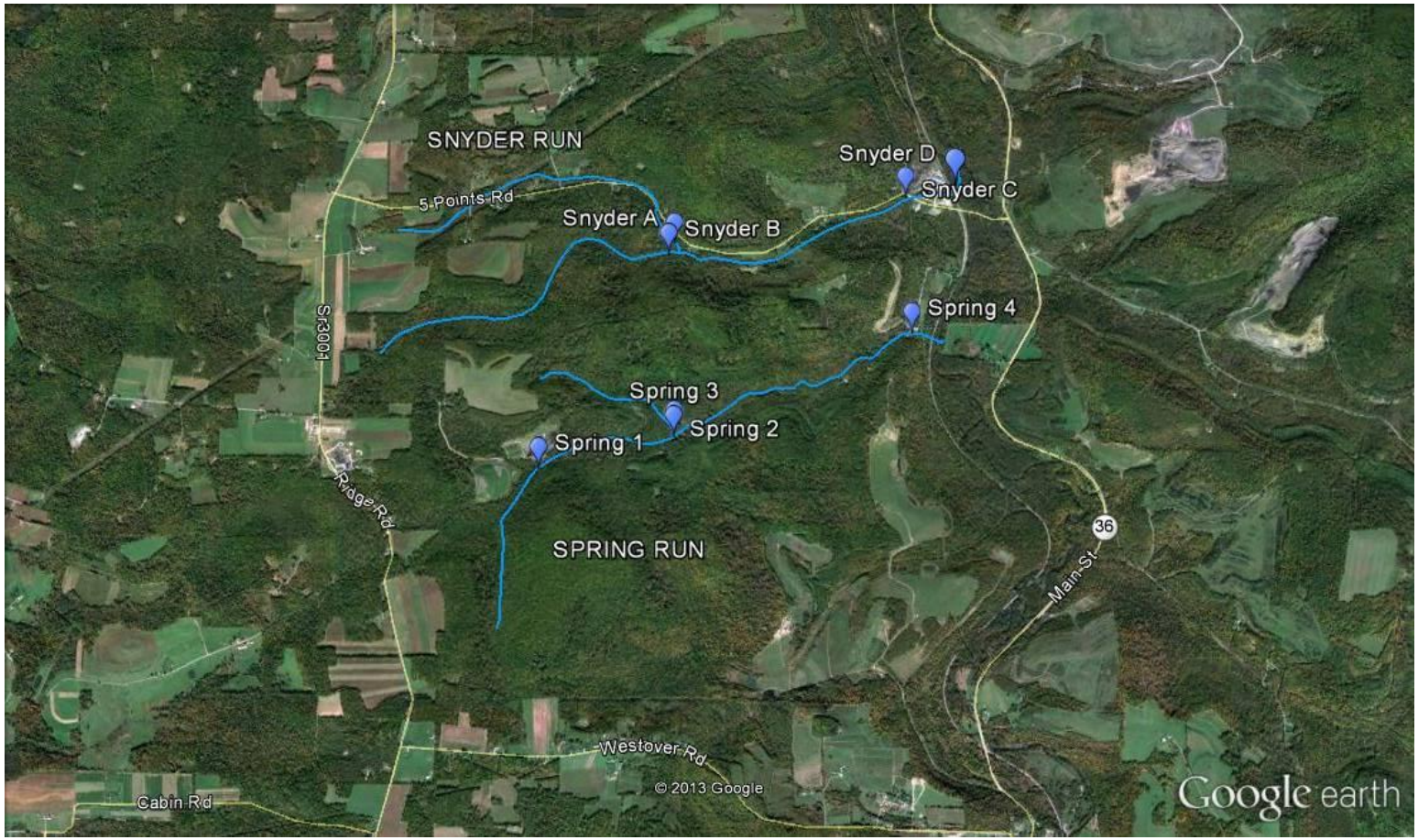
Overall:

1) Since one of the goals of this project was to collect baseline water quality data in the event that unconventional gas well drilling occurs in these watersheds, every effort should be made to publicize the existence of this report. Both Burnside and Chest Townships will be provided with copies of the report and will be asked to share it with companies that are interested in doing work in these watersheds.

2) Continued monitoring should be done by the watershed group to maintain up to date water quality information on these streams. Should drilling or mining activity increase, the watershed group should intensify their monitoring efforts and focus them on extreme changes in either metals and pH (for mining impacts) or TDS, specific conductance, and chlorides for gas well drilling impacts.

3) We were not able to get these streams surveyed for fish populations in 2012. It was indicated that in 2013 Trout Unlimited will likely be spearheading an effort to survey the entire Chest Creek watershed as part of the PA Fish and Boat Commission Unassessed Waters Program. At that time, both Spring and Snyder Runs will be surveyed.

APPENDIX A
MAP


SNYDER RUN
Snyder D
Snyder C
5 Points Rd
Snyder A
Snyder B
Spring 4
SR3001
Spring 3
Spring 2
Spring 1
Ridge Rd
SPRING RUN
36
Main St
Westover Rd
Cabin Rd
© 2013 Google
Google earth

APPENDIX B
WATER QUALITY RESULTS

Snyder A

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride	Lab pH	Specific Cond.	Sulfate	TDS	TSS	
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L		uS/cm	mg/L	mg/L	mg/L	
10/20/2011	6.2	110	11.49	10.4	-1	25	9.9	6.6	151	11	65	<	5
3/6/2012	6.5	110	13.86	12.9	10	10	10.3	6.5	104	12	57	<	5
7/3/2012	7.16	180	6.74	17.9	-24	43	14.7	7	173	11	78	<	5
Average	6.6	133.3	10.7	13.7	-5.0	26.0	11.6	6.7	142.7	11.3	66.7	<	5.0
Min	6.2	110	6.74	10.4	-24	10	9.9	6.5	104	11	57	<	5
Max	7.16	180	13.86	17.9	10	43	14.7	7	173	12	78	<	5

Date Sampled	Methane		Total Hardness	Aluminum	Barium		Calcium	Iron	Magnesium	Manganese	
	mg/L		gpg	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	
10/20/2011	<	0.3	1.9	0.24	<	0.05	8.3	0.48	2.91		0.03
3/6/2012	<	0.3	1.5	0.05	<	0.05	6.22	0.07	2.28	<	0.02
7/3/2012	<	0.3	3.3	0.09		0.05	14.1	0.09	4.99	<	0.02
Average		0.3	2.2	0.1		0.1	9.5	0.2	3.4		0.02
Min		0.3	1.5	0.05	<	0.05	6.22	0.07	2.28	<	0.02
Max		0.3	3.3	0.24		0.05	14.1	0.48	4.99		0.03

Snyder B

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride	Lab pH	Specific Cond.	Sulfate	TDS	TSS	
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L		uS/cm	mg/L	mg/L	mg/L	
10/20/2011	6	70	11.3	10.2	9	12	4.1	6.1	79	10	42	<	5
3/6/2012	6.45	70	13.88	2.2	12	6	3.2	6.3	65	11	39	<	5
7/3/2012	6.67	80	5.01	16.5	6	13	6.1	6.5	80	9	51	<	5
Average	6.37	73.33	10.06	9.63	9.00	10.33	4.47	6.30	74.67	10.00	44.00	<	5.00
Min	6.00	70.00	5.01	2.20	6.00	6.00	3.20	6.10	65.00	9.00	39.00	<	5.00
Max	6.67	80.00	13.88	16.50	12.00	13.00	6.10	6.50	80.00	11.00	51.00	<	5.00

Date Sampled	Methane		Total Hardness	Aluminum		Barium		Calcium	Iron		Magnesium	Manganese	
	mg/L		gpg	mg/L		mg/L		mg/L	mg/L		mg/L	mg/L	
10/20/2011	<	0.3	1.3		0.13	<	0.05	5.62		0.2	1.92		0.03
3/6/2012	<	0.3	1.1	<	0.05	<	0.05	5.05	<	0.05	1.7	<	0.02
7/3/2012	<	0.3	1.5		0.08	<	0.05	6.87		0.09	2.17		0.02
Average	<	0.30	1.30		0.09	<	0.05	5.85		0.11	1.93		0.02
Min	<	0.30	1.10	<	0.05	<	0.05	5.05	<	0.05	1.70	<	0.02
Max	<	0.30	1.50		0.13	<	0.05	6.87		0.20	2.17		0.03

Snyder C

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride	Lab pH	Specific Cond.	Sulfate	TDS	TSS	
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L		uS/cm	mg/L	mg/L	mg/L	
10/20/2011	5.9	90	11.44	10.6	2	21	6.7	6.4	102	12	54	<	5
3/6/2012	6.42	100	14.26	3.2	8	10	6.4	6.5	88	14	52	<	5
7/3/2012	6.66	140	7.57	20.4	-8	28	9.1	6.8	128	13	74	<	5
Average	6.33	110.00	11.09	11.40	0.67	19.67	7.40	6.57	106.00	13.00	60.00	<	5.00
Min	5.90	90.00	7.57	3.20	-8.00	10.00	6.40	6.40	88.00	12.00	52.00	<	5.00
Max	6.66	140.00	14.26	20.40	8.00	28.00	9.10	6.80	128.00	14.00	74.00	<	5.00

Date Sampled	Methane		Total Hardness	Aluminum	Barium		Calcium	Iron	Magnesium	Manganese	
	mg/L		gpg	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	
10/20/2011	<	0.3	1.8	0.07	<	0.05	7.76	0.14	2.69		0.03
3/6/2012	<	0.3	1.4	0.05	<	0.05	6.3	0.08	2.17	<	0.02
7/3/2012	<	0.3	2.5	0.22		0.05	11.3	0.64	3.65		0.06
Average	<	0.30	1.90	0.11		0.05	8.45	0.29	2.84		0.04
Min	<	0.30	1.40	0.05	<	0.05	6.30	0.08	2.17	<	0.02
Max	<	0.30	2.50	0.22		0.05	11.30	0.64	3.65		0.06

Snyder D

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride	Lab pH	Specific Cond.	Sulfate	TDS	TSS	
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L		uS/cm	mg/L	mg/L	mg/L	
10/20/2011	6.0	90	11.14	10.5	0	22	6.8	7	107	12	55		5
3/6/2012	6.3	100	14.06	3.1	8	12	5.8	7	92	14	55	<	5
7/3/2012	6.69	170	7.34	20.0	-17	36	9.8	7	155	16	83	<	5
Average	6.33	120.00	10.85	11.20	-3.00	23.33	7.47	6.63	118.00	14.00	64.33		5.00
Min	6.00	90.00	7.34	3.10	-17.00	12.00	5.80	6.50	92.00	12.00	55.00	<	5.00
Max	6.69	170.00	14.06	20.00	8.00	36.00	9.80	6.80	155.00	16.00	83.00		5.00

Date Sampled	Methane		Total Hardness	Aluminum	Barium		Calcium	Iron	Magnesium	Manganese	
	mg/L		gpg	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	
10/20/2011	<	0.3	1.9	0.09	<	0.05	8.12	0.31	2.77		0.06
3/6/2012	<	0.3	1.5	0.06	<	0.05	6.71	0.13	2.25		0.02
7/3/2012	<	0.3	3.3	0.05		0.05	15.10	0.46	4.64		0.15
Average	<	0.30	2.23	0.07		0.05	9.98	0.30	3.22		0.08
Min	<	0.30	1.50	0.05	<	0.05	6.71	0.13	2.25		0.02
Max	<	0.30	3.30	0.09		0.05	15.10	0.46	4.64		0.15

SPRING 1

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride	Lab pH	Sp. Cond.	Sulfate	TDS	TSS	
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L		uS/cm	mg/L	mg/L	mg/L	
1/6/2012	7.5	230	11.95	3.9	0.46	70	4.5	7	213	21	125		5
3/6/2012	6.4	190	13.4	3.9	-38	57	3.8	7.5	177	18	93	<	5
7/3/2012	7.77	350	8.36	17.7	-117	135	8.9	8.1	325	13	182	<	5
Average	7.22	256.67	11.24	8.50	-51.51	87.33	5.73	7.53	238.33	17.33	133.33		5.00
Min	6.40	190.00	8.36	3.90	-117.00	57.00	3.80	7.00	177.00	13.00	93.00	<	5.00
Max	7.77	350.00	13.40	17.70	0.46	135.00	8.90	8.10	325.00	21.00	182.00		5.00

Date Sampled	Methane		Total Hardne	Aluminum	Barium	Calcium	Iron	Magnesium	Manganese
	mg/L		gpg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/6/2012	<	0.3	3.1	0.19	0.08	14.3	0.16	4.29	0.05
3/6/2012	<	0.3	2.6	0.12	0.06	12.1	0.13	3.29	0.04
7/3/2012	<	0.3	4.3	0.26	0.13	21.3	0.22	5.06	0.05
Average		0.30	3.33	0.19	0.09	15.90	0.17	4.21	0.05
Min	<	0.30	2.60	0.12	0.06	12.10	0.13	3.29	0.04
Max		0.30	4.30	0.26	0.13	21.30	0.22	5.06	0.05

Spring 2

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride	Lab pH	Sp. Cond.	Sulfate	TDS	TSS	
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L		uS/cm	mg/L	mg/L	mg/L	
1/6/2012	7.5	270	12.46	3.1	-57	79	5.3	7.2	265	34	156		6
3/6/2012	6.37	190	14.13	2.4	-27	46	3.2	7.3	167	22	92	<	5
7/3/2012	7.55	360	8.56	16.8	-114	135	8.8	8.1	346	19	192	<	5
Average	7.14	273.33	11.72	7.43	-66.00	86.67	5.77	7.53	259.33	25.00	146.67		5.33
Min	6.37	190.00	8.56	2.40	-114.00	46.00	3.20	7.20	167.00	19.00	92.00	<	5.00
Max	7.55	360.00	14.13	16.80	-27.00	135.00	8.80	8.10	346.00	34.00	192.00		6.00

Date Sampled	Methane		Total Hardne	Aluminum	Barium	Calcium	Iron	Magnesium	Manganese
	mg/L		gpg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/6/2012	<	0.3	4.3	0.33	0.08	19.8	0.34	5.75	0.09
3/6/2012	<	0.3	2.7	0.09	0.05	12.6	0.12	3.58	0.05
7/3/2012	<	0.3	4.6	0.26	0.11	22.5	0.26	5.46	0.05
Average	<	0.30	3.87	0.23	0.08	18.30	0.24	4.93	0.06
Min	<	0.30	2.70	0.09	0.05	12.60	0.12	3.58	0.05
Max	<	0.30	4.60	0.33	0.11	22.50	0.34	5.75	0.09

Spring 3

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride		Lab pH	Sp. Cond.	Sulfate	TDS
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L			uS/cm	mg/L	mg/L
1/6/2012	6	60	11.72	2.6	13	7		2	6.1	60	16	46
3/6/2012	6.15	50	13.4	3.3	14	6	<	2	6.3	55	15	22
7/3/2012	DRY											
Average	6.08	55.00	12.56	2.95	13.50	6.50		2.00	6.20	57.50	15.50	34.00
Min	6.00	50.00	11.72	2.60	13.00	6.00	<	2.00	6.10	55.00	15.00	22.00
Max	6.15	60.00	13.40	3.30	14.00	7.00		2.00	6.30	60.00	16.00	46.00

Date Sampled	TSS		Methane		Total Hardness	Aluminum	Barium		Calcium	Iron	Magnesium	Manganese	
	mg/L		mg/L		gpg	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	
1/6/2012	<	5	<	0.3	1.2	0.09	<	0.05	4.77	0.11	2.15	<	0.02
3/6/2012	<	5	<	0.3	1.1	0.05	<	0.05	4.35	0.07	1.76	<	0.02
7/3/2012													
Average		5.00	<	0.30	1.15	0.07	<	0.05	4.56	0.09	1.96	<	0.02
Min	<	5.00	<	0.30	1.10	0.05	<	0.05	4.35	0.07	1.76	<	0.02
Max		5.00	<	0.30	1.20	0.09	<	0.05	4.77	0.11	2.15	<	0.02

Spring 4

Date Sampled	Field pH	Field Cond.	DO	Field Temp	Acidity	Alkalinity	Chloride	Lab pH	Sp. Cond.	Sulfate	TDS	TSS	
		uS/cm	mg/L	Celsius	mg/L	mg/L	mg/L		uS/cm	mg/L	mg/L	mg/L	
1/6/2012	7.5	210	12.22	2.6	-17	42	3.6	6.8	204	42	124		7
3/6/2012	6.42	170	14.44	1.9	-12	32	2.3	7.3	155	30	86	<	5
7/3/2012	7.36	350	8.56	17.6	-104	124	7.7	8.0	335	25	173	<	5
Average	7.09	243.33	11.74	7.37	-44.33	66.00	4.53	7.37	231.33	32.33	127.67		5.67
Min	6.42	170.00	8.56	1.90	-104.00	32.00	2.30	6.80	155.00	25.00	86.00	<	5.00
Max	7.50	350.00	14.44	17.60	-12.00	124.00	7.70	8.00	335.00	42.00	173.00		7.00

Date Sampled	Methane		Total Hardn	Aluminum	Barium		Calcium	Iron	Magnesium	Manganese
	mg/L		gpg	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L
1/6/2012	<	0.30	4.0	0.25		0.05	17.5	0.28	6.16	0.11
3/6/2012	<	0.30	2.7	0.14	<	0.05	12.0	0.14	4.14	0.06
7/3/2012	<	0.30	5.0	0.24		0.07	23.8	0.40	6.45	0.07
Average	<	0.30	3.90	0.21		0.06	17.77	0.27	5.58	0.08
Min	<	0.30	2.70	0.14	<	0.05	12.00	0.14	4.14	0.06
Max	<	0.30	5.00	0.25		0.07	23.80	0.40	6.45	0.11

APPENDIX C
MACROINVERTEBRATE SAMPLING

Macroinvertebrate Sampling in Snyder Run			
	Snyder A	Snyder B	Snyder C
Ephemeroptera	1	7	4
Plecoptera		4	1
Tricoptera			60
Diptera	1	2	2
Odonata	2	2	1
Megaloptera			8
Crayfish		2	
Total Indiv.	**4**	**17**	**76**
Number of EPT	**1**	**11**	**65**

Macroinvertebrate Sampling in Spring Run			
	Spring 1	Spring 2	Spring 4
Ephemeroptera	5	6	3
Plecoptera	22	12	4
Tricoptera	5	3	110
Diptera	12	15	
Odonata	1		3
Megaloptera			1
Crayfish			1
Total	**65**	**36**	**122**
Number of EPT	**32**	**21**	**117**

APPENDIX D
HABITAT ASSESSMENTS

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 Snyder Run STR CODE/RMI

STATION NUMBER Snyder A LOCATION Mouth of northern trib to Snyder south of Five Pts Rd

DATE 11/6/12 TIME 11:50AM

AQUATIC ECOREGION COUNTY Clearfield

INVESTIGATORS Kelly Williams, Carl Undercofler

FORM COMPLETED BY Kelly 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 18	**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 8	**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 9	**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 7	**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 6	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1**

Total Side 1 39

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 15	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 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 16	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 13	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 6	20	19	18	17	16	15	14	13	12	11	10	9	8	7	**6**	5	4	3	2	1
Total Side 2 91																				
Total Score 130																				

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 Snyder Run STR CODE/RMI _____

STATION NUMBER Snyder B LOCATION Mouth of southern trib to Snyder south of Five Pts Rd

DATE 11/6/12 TIME 12PM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Carl Undercofler

FORM COMPLETED BY Kelly 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 19	**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 19	**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 16	**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 86

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 16	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 19	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 19	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 16	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 16	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 13	20	19	18	17	16	15	14	**13**	12	11	10	9	8	7	6	5	4	3	2	1
Total Side 2 118																				
Total Score 204																				

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 Snyder Run STR CODE/RMI _____

STATION NUMBER Snyder C LOCATION Snyder u/s of Five Points Road bridge near Hugill San.

DATE 11/6/12 TIME 1PM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Carl Undercofler

FORM COMPLETED BY Kelly 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 19	**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 18	**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 18	**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 12	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1**

Total Side 1 83

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 16	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 20	**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 16	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 17	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 16	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 2 114																				
Total Score 197																				

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 Snyder Run STR CODE/RMI _____

STATION NUMBER Snyder D LOCATION Mouth of Snyder Run near Hugill Sanitation

DATE 11/6/12 TIME 1:30PM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Carl Undercofler

FORM COMPLETED BY Kelly 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 8	**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 6	**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 6	**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 6	**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 17	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1**

Total Side 1 43

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 7	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 5	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 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 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 16	20	19	18	17	**16**	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Total Side 2 74																				
Total Score 117																				

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 Spring Run STR CODE/RMI

STATION NUMBER Spring 1 LOCATION U/S of Harmony Mine on south side of road

DATE 11/6/12 TIME 10:10AM

AQUATIC ECOREGION COUNTY Clearfield

INVESTIGATORS Kelly Williams, Carl Undercofler

FORM COMPLETED BY Kelly 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 19	**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 12	**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 19	**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 85

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 16	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 14	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 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 11	20	19	18	17	16	15	14	13	12	**11**	10	9	8	7	6	5	4	3	2	1
Total Side 2 116																				
Total Score 201																				

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 Spring Run STR CODE/RMI _____

STATION NUMBER Spring 2 LOCATION Few miles D/S of Harmony Mine north of road

DATE 11/6/12 TIME 10:45AM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Carl Undercofler

FORM COMPLETED BY Kelly 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 18	**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 18	**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 12	**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 16	**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 20	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1**

Total Side 1 84

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 19	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 16	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 13	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 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 15	20	19	18	17	16	**15**	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Total Side 2 120																				
Total Score 204																				

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 Spring Run STR CODE/RMI _____

STATION NUMBER Spring 4 LOCATION Near the mouth of Spring Run

DATE 11/6/12 TIME 11:20AM

AQUATIC ECOREGION _____ COUNTY Clearfield

INVESTIGATORS Kelly Williams, Carl Undercofler

FORM COMPLETED BY Kelly 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 11	**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 19	**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 10	**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 68

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 10	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 16	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 15	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 20	**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 7	20	19	18	17	16	15	14	13	12	11	10	9	8	**7**	6	5	4	3	2	1
Total Side 2 95																				
Total Score 163																				

APPENDIX E
PICTURES

Snyder A: N 40.791772°, W -78.699858°

Snyder B: N 40.791094°, W -78.700351°

Snyder C: N 40.794764°, W -78.680705°

Snyder D: N 40.795608°, W -78.676560°

Spring 1: N 40.777749°, W -78.710914°

Spring 2: N 40.779725°, W -78.699918°

Spring 3: N 40.780046°, W -78.699861°

Spring 4: N 40.786189°, W -78.680294°