Copy

A Summary Report to the Buffalo Creek Watershed Alliance

and to

Merrill Linn Land and Water Conservancy

Prepared by:

Lycoming College Clean Water Institute

January 2006

Index

A Physical, Chemical, and Biological Summary of Buffalo Creek and its Tributaries:

Beaver Run, Little Buffalo, North Branch, Rapid Run, and Spruce Run

By:
Lycoming College Buffalo Creek Clean Water Institute Interns
Brad Musser & Katie Swanson
Under Supervision of Dr. Mel Zimmerman
(Biology Department, Lycoming College, and Director of Clean Water Institute
www.lycoming.edu/biology/CWI)
January 2006

During the summer of 2005, Lycoming College Buffalo Creek interns Brad Musser and Katie Swanson continued work on a two-year project aimed at identifying and monitoring the condition of Buffalo Creek and its five major tributaries, under a Pennsylvania DEP Growing Greener Grant to the Merrill W. Linn land and water conservancy and the Buffalo Creek Watershed Alliance (BCWA). The main branch of Buffalo Creek stretches a total of 28 miles and drains a watershed of almost 134 square miles (Versar Inc., Report 1998). The creek begins along Kessler Trail in the heart of Bald Eagle State Forest, passes through the outskirts of Mifflinburg until finally converging with the West Branch of the Susquehanna River at Lewisburg. While the 2004 interns, Brad Musser and Laura Lockard focused on the main branch of Buffalo Creek, the second year (2005) of this project was predominantly devoted to documenting the frequency and severity of erosion along the banks of the five main tributaries of Buffalo Creek, which include Beaver Run, Little Buffalo, Rapid Run, North Branch, and Spruce Run. Preliminary water chemistry data and macroinvertebrates were also collected from the tributaries of Buffalo Creek during the summer of 2005.

Buffalo Creek was at one time considered an exceptional trout stream, however, the combined pressures of increased development, mixed or poor BMP, and airborne acid deposition have perhaps contributed the most to the degradation of the creek's aquatic habitat (Versar Inc.,

Report 1998 & Watershed Plan for Buffalo Creek Watershed 1985). In 1996, Pa-DEP listed stream segments in the Buffalo Creek watershed under section 303(d) of the Clean Water Act as impaired due to low pH from atmospheric deposition. The latest assessment indicated that 8.8 miles of Buffalo Creek are impaired. In 2004, a TMD2 was assigned to Buffalo Creek based on low pH, due to atmospheric deposition.

In an effort to at least quantify the degree of chemical impairment of Buffalo Creek, water samples were collected and analyzed for the months of June and July from six sites along the length of the water body, in both 2004 and in 2005. These sampling sites were chosen based on their proximity to possible sources of chemical influx and the ease at which they could be accessed by car. Figure 1 shows the location of each water chemistry testing site. Similarly, sites were chosen along Buffalo Creek's five tributaries, near the head and mouths of each stream, where car access was available. Table 5 shows the GPS coordinates for these water-chemistry testing sites along the 5 tributaries.

Two 1000mL plastic bottles were filled with water at each site. Each bottle was rinsed twice with creek water before being filled a third time to ensure that no residue would remain in the container and possibly impact the results of any chemical analyses. Dissolved oxygen readings were recorded, as well as site length, width, depth, and stream velocity using a current meter. The concentration of nitrates, nitrites, phosphates and orthophosphates in each sample were determined using spectrophotometric techniques within the lab. The pH and alkalinity of each sample were also ascertained using an in-lab pH meter. Standard methods outlined in the HACH instrumental manuals were followed with standards verified by Seawald Labs located in Williamsport, PA.

Tables 1, 2, 3, and 4 along with Figures 2, 3, 4, and 5 focus on pH, alkalinity, nitrates, and total phosphorus values for the main stem. As seen in Table 1 and Figure 2, as the site of water testing progresses, from headwaters to the mouth of the stream, the pH increases, due to increased

buffering capacity, possibly due to increased agriculture liming. Table 2 and Figure 3 show that alkalinity generally increases with pH, but at site 3, alkalinity was much higher than the rest of the sites. This indicates a high agricultural area. During the spring of 2005, the alkalinity was very low. This may be in part due to low pH of spring run-off, coupled with the fact that the land area is highly agricultural, and also the fact that added fertilizers and lime hadn't leached into streams at a high amount, yet. With the case of the nitrates as seen in Table 3 and Figure 4, a severe jump is also noticed at site 3, possibly due to agricultural run-off. The major agricultural lands began in between sites 2 and 3. This also indicates that nitrates, which may be from fertilizers, farm animals, or septic systems, are being deposited into the stream mostly around site 3. Nitrates gradually increase as the stream progresses downstream. Similarly, Table 4 and Figure 5 shows how total phosphorus levels are following the same trend, and the same assumptions for total phosphorus can be made as for nitrates.

Figure 6 is a map of the erosion sites along Buffalo Creek and the tributaries. When compared to Figure 7, which is a map of land use in the same area, one can see that generally, where there is forest, there is little erosion. Where there are pastures, there are more erosion sites, and where there are row crop areas, the erosion incidences increase dramatically. This comparison may show some how much fertilizers and farm animals' waste affects the stream negatively.

Macroinvertebrates were collected in July at each of the water chemistry testing sites. Samples were collected using the kick-net technique, in which a flat seining net is held at an incline facing upstream. The substrate one square-meter directly upstream from the net was kicked or disturbed in some manner so the dislodged organisms would wash into the net. The contents of each kick-net (debris and macroinvertebrates) were placed in plastic, screw-cap jars and preserved in dilute 70% ethanol. Once in the lab, all macroinvertebrates were separated from debris collected with the original samples and stored in 25mL glass vials of 70% ethanol. A random sample of 200

macroinvertebrates will be identified from each site at a later date. The results are tabulated using an EPA Rapid Bioassessment Protocol and the prevalence of certain indicator species will help estimate the pollution level of Buffalo Creek.

The majority of work during the two summers of this study, focused on evaluation of potential erosion sites along Buffalo Creek, Beaver Run, Little Buffalo, North Branch, Rapid Run, and Spruce Run. Erosion assessment data sheets (NRCS standard forms) as seen in Figure 8, show the parameters, which are used to assess an erosion site. Each time a site of erosion is discovered, the GPS coordinates are recorded, pictures are taken to document the finding, and the site is assessed using the appropriate data sheets.

The potential for bank erosion was determined by a combination of bank height, bank angle, the density of roots present, and the particle size of the bank substrate. Each of these factors was rated for high, moderate, or low erosion potential. Banks less than 6-feet high were considered to have low erosion potential. Banks between 6 and 9-feet high were considered to have moderate erosion potential, and banks over 9-feet high had high erosion potential. Bank angles of less than 45 degrees were said to present low erosion potential, bank angles of 45 to 90 degrees presented moderate erosion potential, and bank angles greater than 90 degrees (undercut banks) presented high erosion potential. The concentration of roots throughout a bank is also a prime indicator of the erosion potential of that bank. Roots fortify the bank substrate, preventing erosion. Bank surfaces more than 60% covered with well-rooted vegetation are considered to have low erosion potential based on root density. Bank surfaces 30% to 60% covered by well-rooted vegetation were considered to have moderate erosion potential, while banks less than 30% covered by well-rooted vegetation had high erosion potential. The particle size of bank substrate also helps determine erosion potential. Large particles, such as bedrock or boulders, were considered to present low bank erosion potential, while basketball-size rocks to pebbles created moderate bank erosion

potential, and fine particles like sand and clay produced a high potential for bank erosion. Appendix A shows the Highs of Buffalo Creek. Appendix B shows the highs of the 5 tributaries. As shown in Figure 9, erosion made up 34% of the total disturbances along the tributaries.

Utilizing average rainfall, land acres, stream flow, and erosion potential, Table 6 shows watershed soil loss in tons/acre/year as determined by a USDA soil loss index model. The forested acres with the watershed had the lowest amount of soil loss with 1.67×10^{-4} tons/acre/year. Pastures were next with 1.25×10^{-2} tons/acre/year and row crops had the most soil loss with 8.33 tons/acre/year.

Conclusion and Recomendations:

With this knowledge, and the information learned from this study of Buffalo Creek and its 5 tributaries, it should be possible for the watershed group to prioritize which areas need the most improvement. A priority project should be to address the low pH/acid deposition problem at the headwaters of Buffalo Creek. A second priority project should look at the "high" and "medium" erosion sites, and to encourage stream bank fencing and riparian buffer projects in the Buffalo Creek watershed. Finally, the watershed group should continue to monitor the water quality, point and non-point discharges, and stream cleanup projects should also continue. It should also help to educate people on stream well being, and how their activities negatively affect our watershed. Hopefully, it will lead to stream and habitat restoration, which will benefit not only man, but the stream and its biota as well.

Works Cited:

Buffalo Creek TMDL Draft Report by Pa-DEP. 2004

Versar Inc., Biological and Hydraulic & Hydrological Investigations of Buffalo Creek Watershed, PA. 1998.

Watershed Plan for Buffalo Creek Watershed, Union County, PA. 1985. Union County Conservation District and USDA Soil Conservation Service Report.

Figures and Tables

Figure 1.

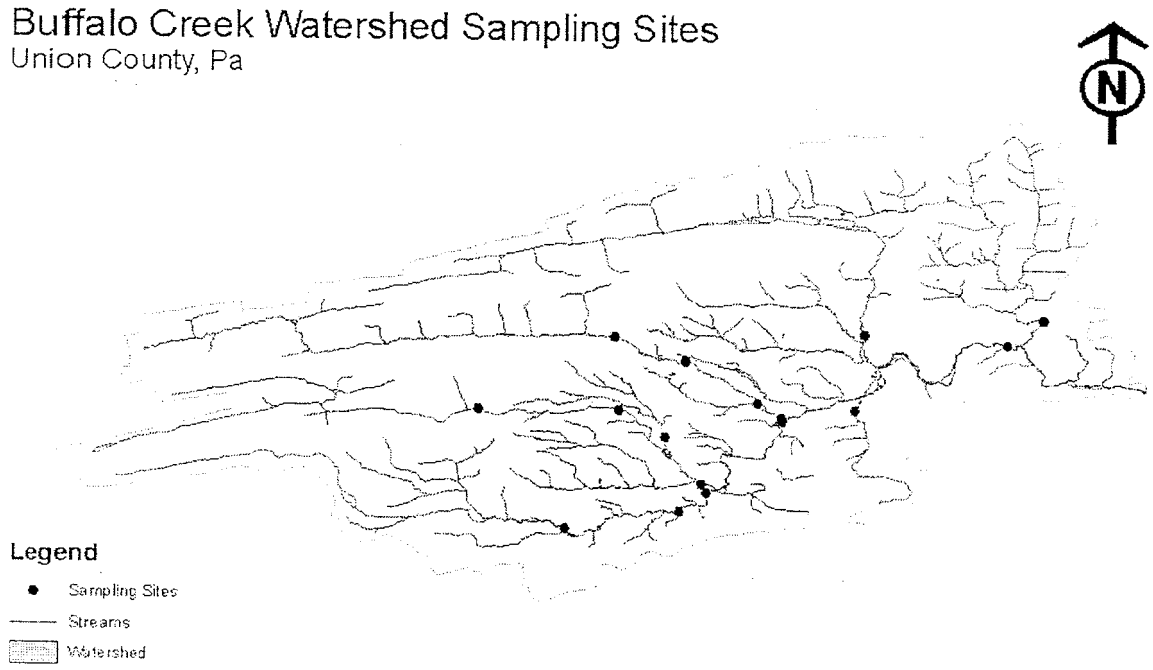


Figure 2.

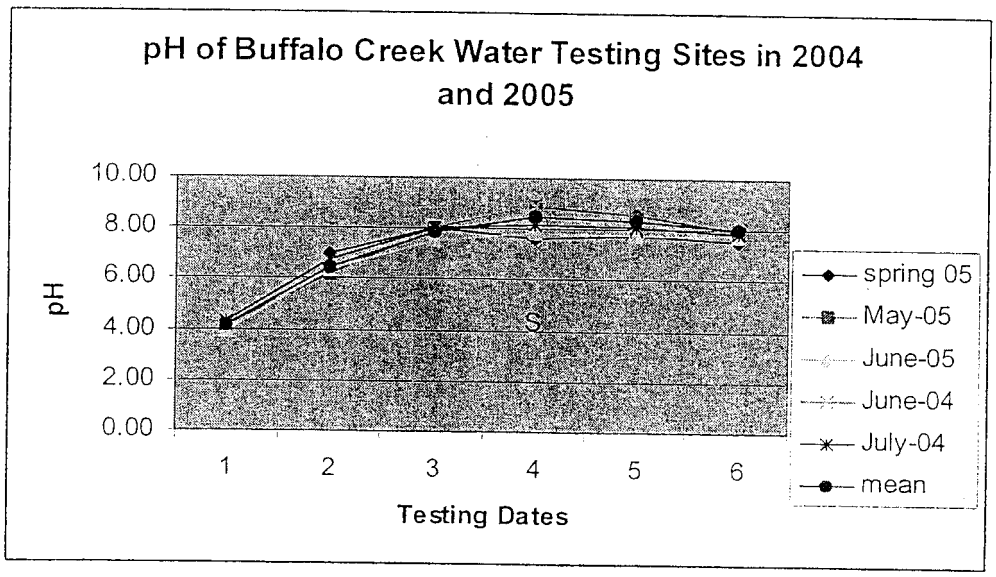


Table 1. pH of Buffalo Creek Water Testing Sites in 2004 and 2005

Sites	1	2	3	4	5	6
Spring 05		6.98	8.01	7.58	7.75	7.56
May-05	4.09	6.19	8.01	8.90	8.60	7.92
June-05	3.87	6.35	7.53	7.89	7.76	7.74
June-04	4.38	6.45	7.91	8.91	8.98	8.72
July-04	4.26	6.76	7.99	8.16	8.06	7.84
Mean	4.15	6.44	7.86	8.47	8.35	8.06
SD	0.22	0.24	0.22	0.52	0.55	0.45

Figure 3.

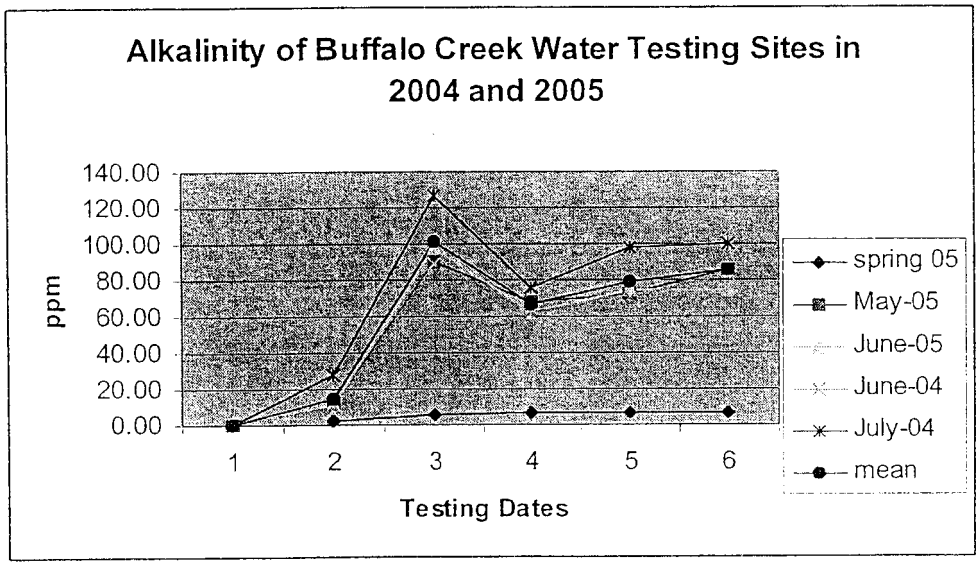


Table 2. Alkalinity of Buffalo Creek Water Testing Sites in 2004 and 2005

Sites	1	2	3	4	5	6
Spring 05		1.75	5.50	6.65	6.85	7.05
May-05	0	11.00	90.00	68.00	72.00	85.50
June-05	0	11.00	98.00	62.00	74.00	75.00
June-04	0	10.00	89.00	61.80	69.80	83.80
July-04	0	28.00	126.50	75.75	98.00	100.00
Mean	0	15.00	100.88	66.89	78.45	86.08
SD	0	8.68	17.55	6.57	13.15	10.36

Figure 4.

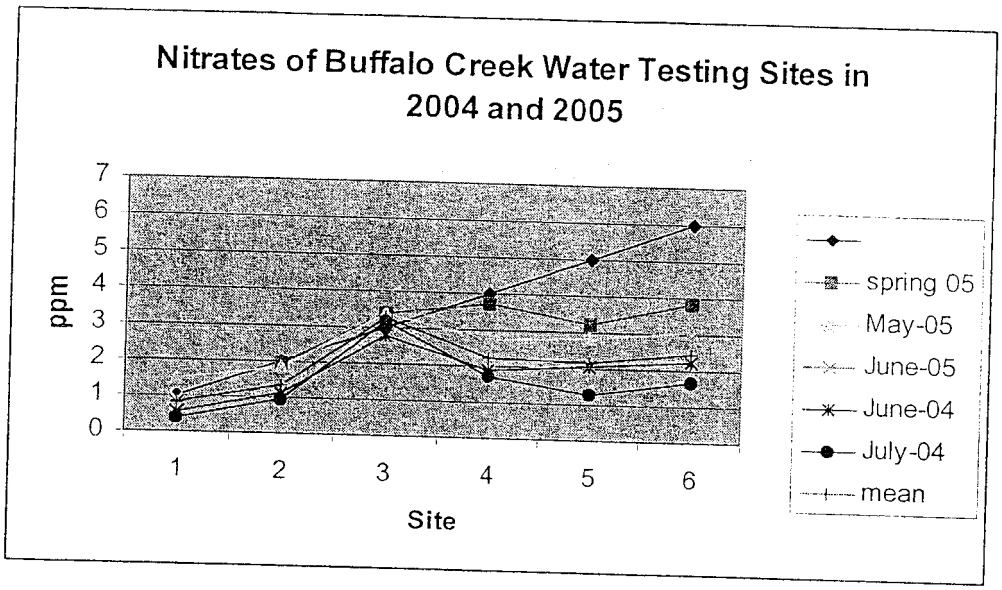


Table 3. Nitrates of Buffalo Creek Water Testing Sites in 2004 and 2005

Sites	1	2	3	4	5	6
Spring 05		1.95	3.40	3.75	3.25	3.85
May-05	1.53	1.83	3.40	2.70	2.83	3.08
June-05	0.88	1.53	3.86	2.63	2.40	2.87
June-04	0.55	1.13	2.80	1.88	2.08	2.23
July-04	0.40	0.95	3.15	1.70	1.30	1.65
Mean	0.84	1.36	3.30	2.23	2.15	2.46
SD	0.50	0.39	0.45	0.51	0.64	0.65

Figure 5.

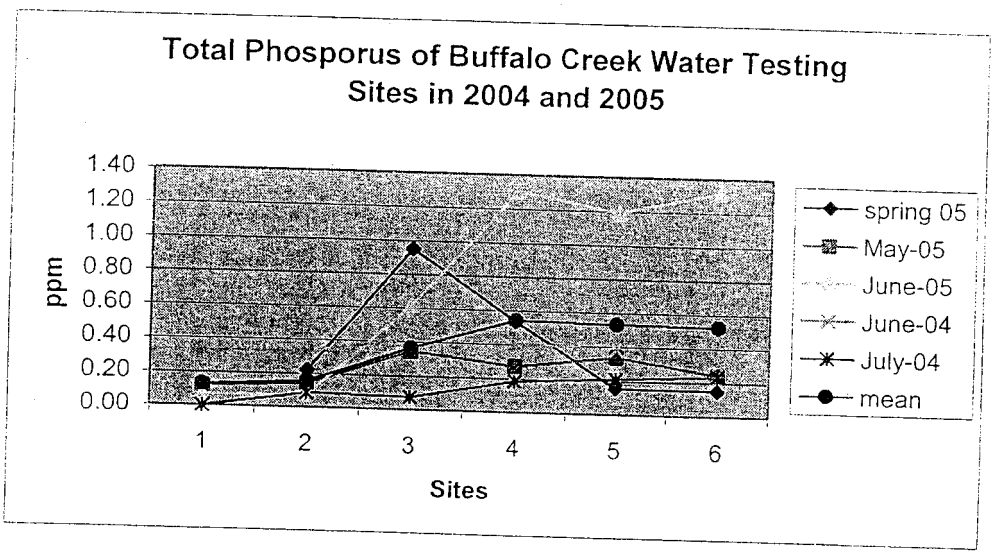
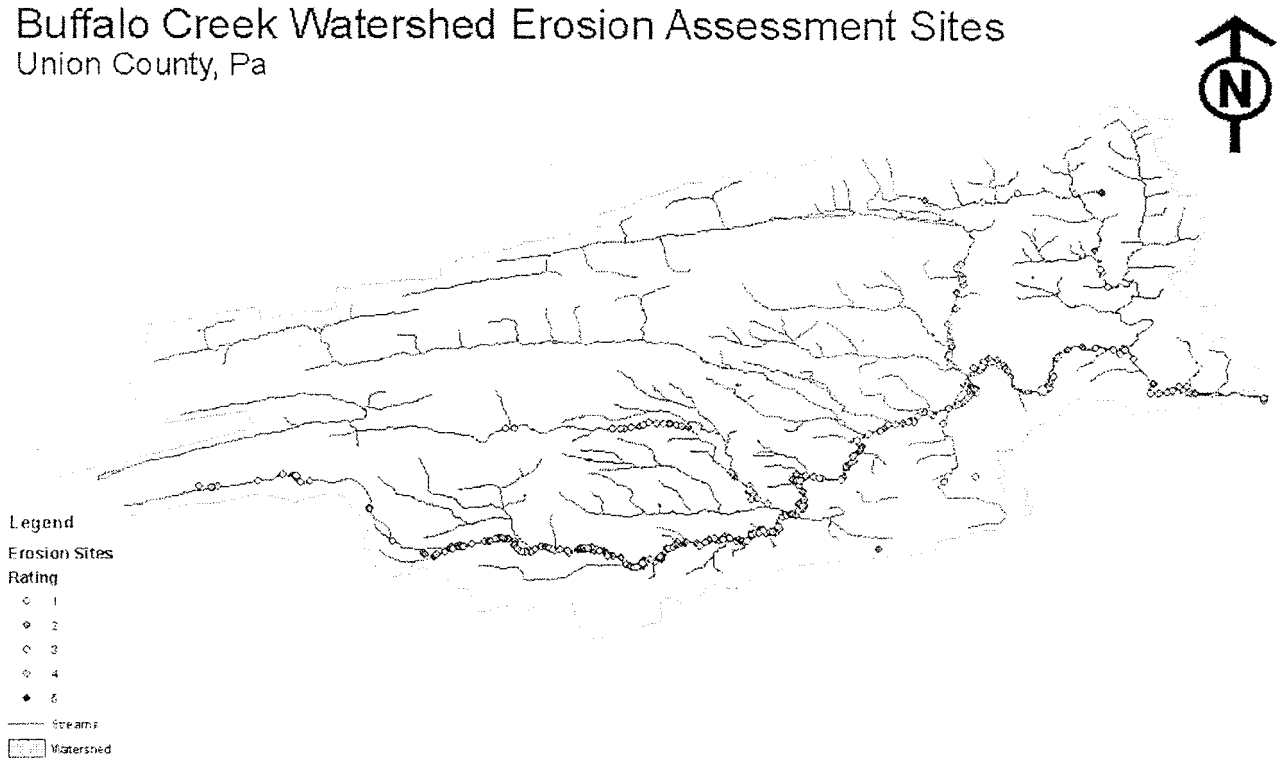


Table 4. Total Phosphorus of Buffalo Creek Water Testing Sites in 2004 and 2005

Sites	1	2	3	4	5	6
Spring 05		0.22	0.95	0.54	0.16	0.15
May-05	0.12	0.14	0.35	0.27	0.34	0.24
June-05	0.07	0.07	0.62	1.31	1.19	1.32
June-04	0.33	0.33	0.42	0.41	0.38	0.31
July-04	0.00	0.09	0.08	0.19	0.21	0.24
Mean	0.13	0.16	0.36	0.54	0.53	0.53
SD	0.14	0.12	0.22	0.52	0.45	0.53

Figure 6.



1. Erosion sites with Zero Highs
2. Erosion sites with One High
3. Erosion sites with Two Highs
4. Erosion sites with Three Highs
5. Erosion sites with Four Highs

Figure 7.

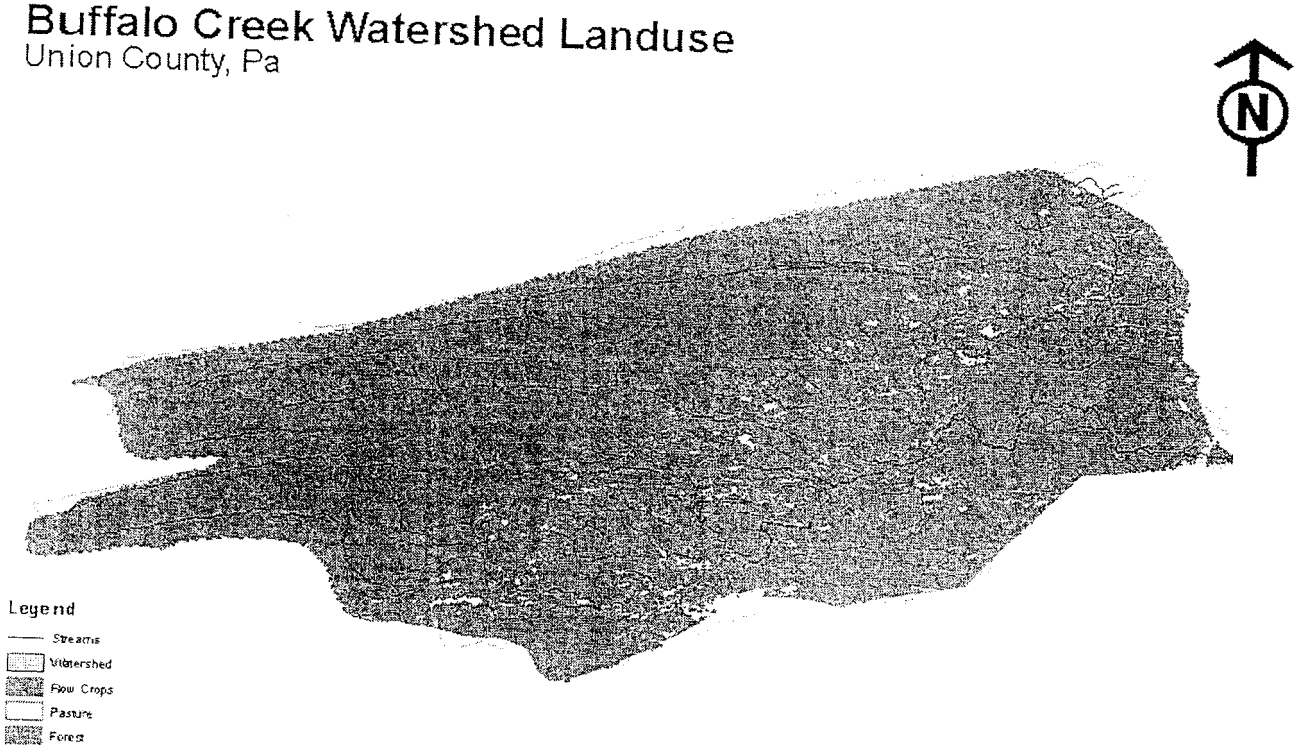


Table 5. GPS Sites for Buffalo Creeks Five Tributaries

Site	Latitude	Longitude
RR 1	40 59.568	77 12.231
RR 2	40 58.827	77 10.623
SR 1	41 00.731	77 06.966
SR 2	40 58.638	76 58.753
BR 1	40 55.769	76 59.155
BR 2	40 57.697	76 59.152
LB 1	41 02.197	76 57.838
LB 2	41 00.196	76 55.538
NB 1	40 57.547	77 07.823
NB 2	40 55.947	77 02.277

Figure 8. Erosion Assessment Data Sheet

MEL ZIMMERMAN - erosion form.xls Page 2

		Bank Height			Bank Angle			Density of Roots			Particle Size			
Site #:	RB	L	M	H	L	M	H	L	M	H	L	M	H
Site Type:	LB	L	M	H	L	M	H	L	M	H	L	M	H

Width of Stream (Feet) 10-25___ 26-50___ 51-100___ 101-150___ 150+___
Length of Site (Feet) 0-50___50-100___101-250___251-500___501-1000___1000+____

RB Dist. Erosion to Structure (Feet) 0-25___ 26-50___ 51-100___ 100+___
RB Structure Type - House___ Garage___ Bridge___ Culvert___ Road___ Other_____
LB Dist. Erosion to Structure (Feet) 0-25___ 26-50___ 51-100___ 100+___
LB Structure Type - House___ Garage___ Bridge___ Culvert___ Road___ Other_____

Side	Right Bank	Left Bank
Length Bank		
Height Bank		
Adjacent Land Use Pasture/Fenced/ Machine Accessible		
Soil Texture		
Stream Alignment		
Vegetation		
Stream Gradient		
Slope		
Slope Depo Bar		
Position of Erosion Feature	Lat:	Lon:

Picture #'s Taken:
Comments:

		Bank Height			Bank Angle			Density of Roots			Particle Size			
Site #:	RB	L	M	H	L	M	H	L	M	H	L	M	H
Site Type:	LB	L	M	H	L	M	H	L	M	H	L	M	H

Width of Stream (Feet) 10-25___ 26-50___ 51-100___ 101-150___ 150+___
Length of Site (Feet) 0-50___50-100___101-250___251-500___501-1000___1000+____

RB Dist. Erosion to Structure (Feet) 0-25___ 26-50___ 51-100___ 100+___
RB Structure Type - House___ Garage___ Bridge___ Culvert___ Road___ Other_____
LB Dist. Erosion to Structure (Feet) 0-25___ 26-50___ 51-100___ 100+___
LB Structure Type - House___ Garage___ Bridge___ Culvert___ Road___ Other_____

Side	Right Bank	Left Bank
Length Bank		
Height Bank		
Adjacent Land Use Pasture/Fenced/ Machine Accessible		
Soil Texture		
Stream Alignment		
Vegetation		
Stream Gradient		
Slope		
Slope Depo Bar		
Position of Erosion Feature	Lat:	Lon:

Picture #'s Taken:

Figure 9. Total Tributary Disturbances

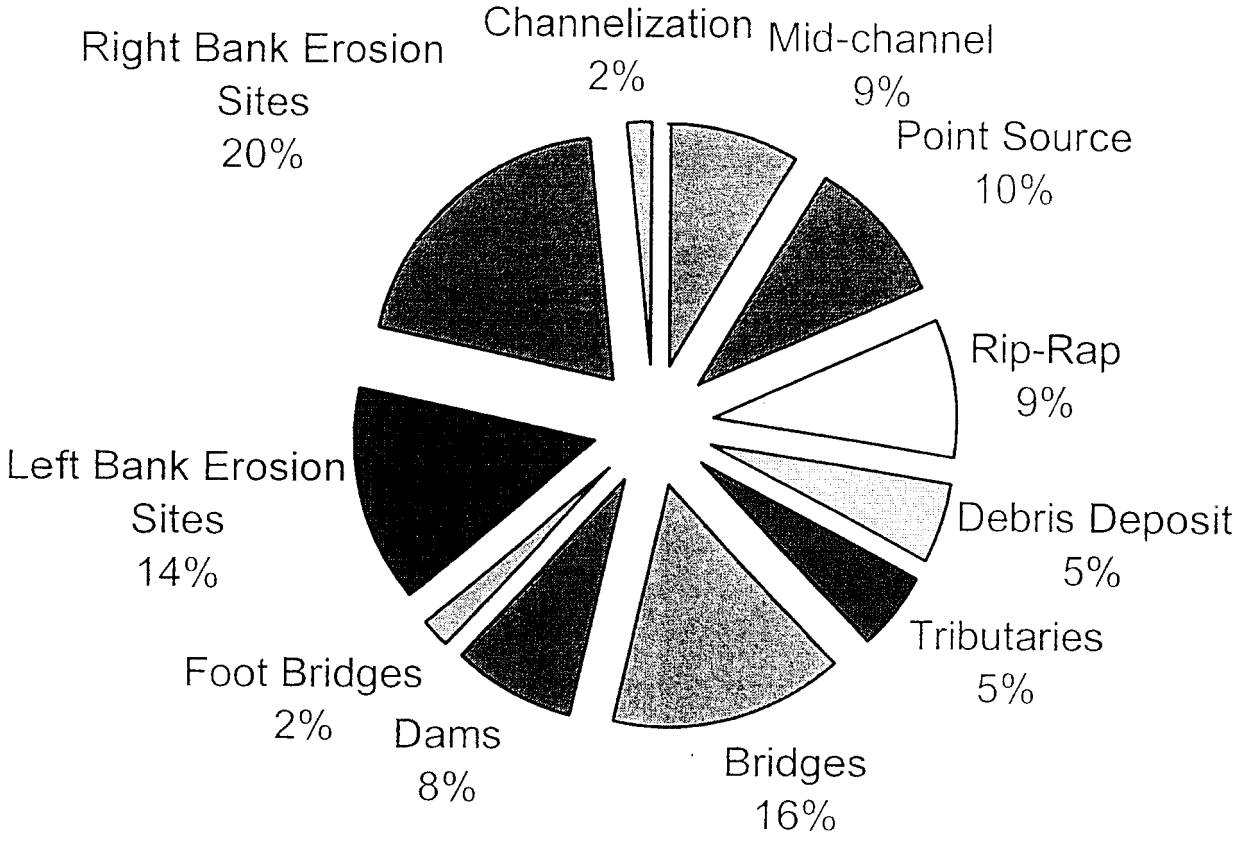


Table 6. Buffalo Creek Watershed Soil Loss (tons/acre/year)

Forest	0.000167
Pasture	0.012498
Rowcrops	8.33187

Figure 10.

Summary of Disturbances Along Buffalo Creek in 2004

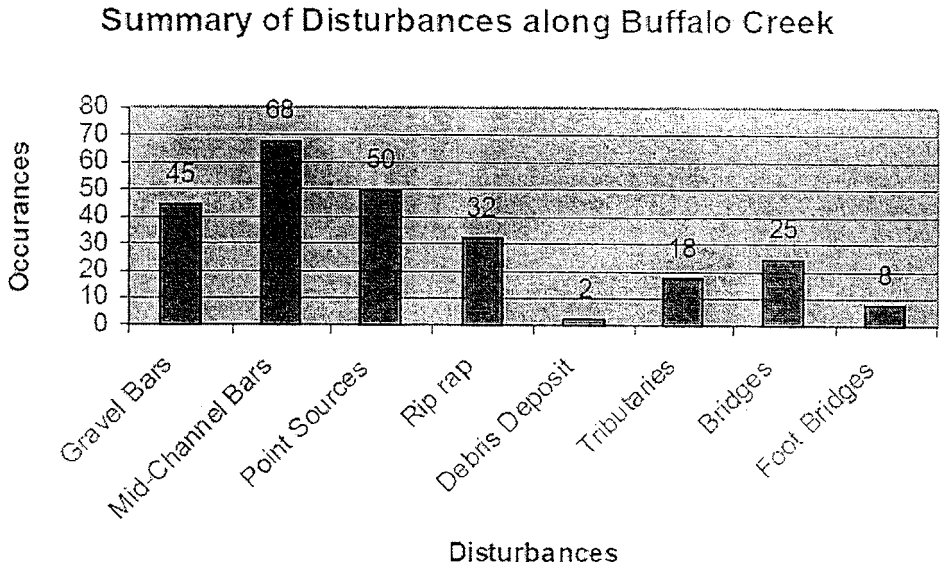


Figure 9. Total Tributary Disturbances

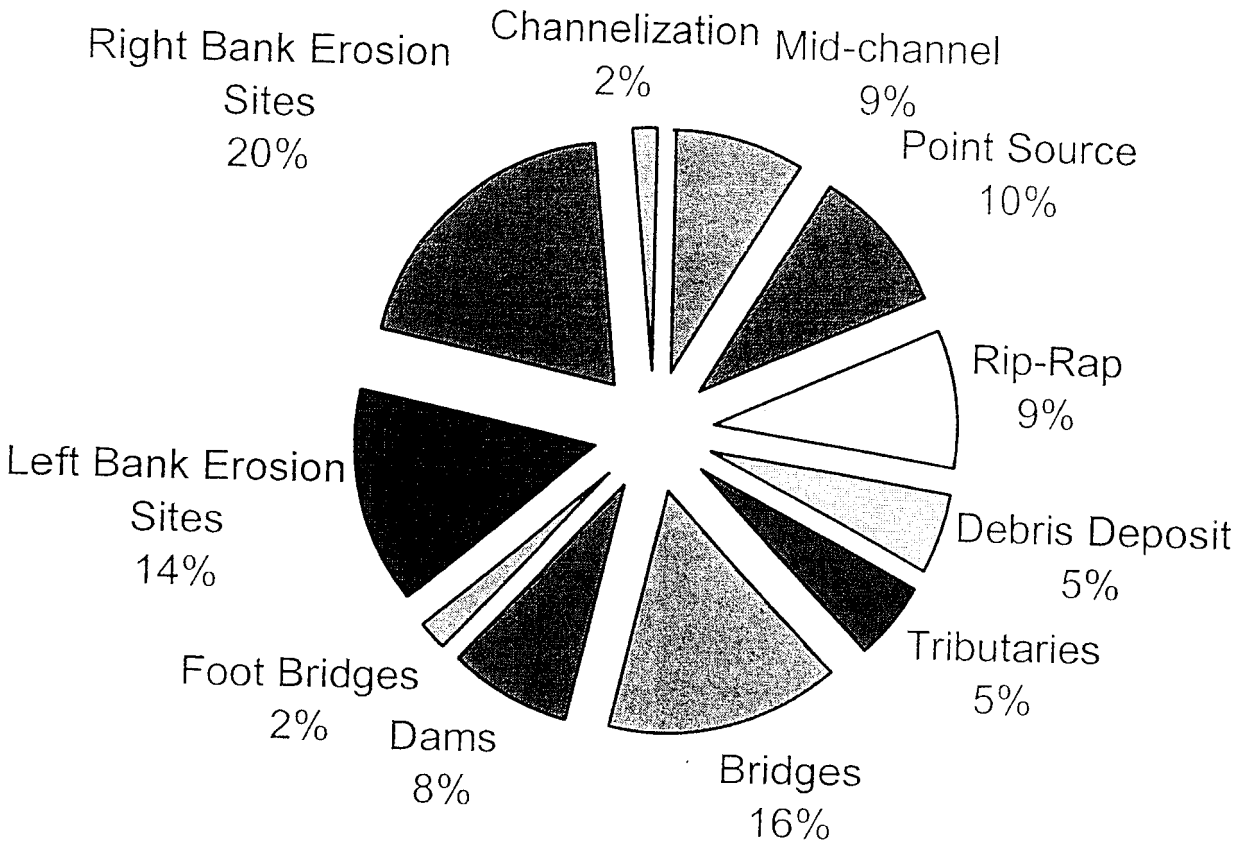


Table 6. Buffalo Creek Watershed Soil Loss (tons/acre/year)

Forest	0.000167
Pasture	0.012498
Rowcrops	8.33187

Appendix A.

Buffalo Creek's Zero Highs, One Highs, Two Highs, and Three Highs

GPS site locations along the Main Branch of Buffalo Creek are provided for the summer of 2004 study. The map in Figure 6 shows the locations of the sites. The sites are listed from upstream to downstream in categories; zero high, one high, two high, three high, and four high. Sites listed as zero high show no high erosion potential based on bank height (BH), bank angle (BA), root density (DR), or particle size (PS). See erosion form in Figure 8. Sites with at least one, two, three, or four highs are listed in sequence. "H" = high erosion potential, "L" = low erosion potential, and "M" = medium erosion potential for the categories. Note that there were no sites with four high erosion potential indicators.

Sites Along Buffalo Creek With Zero Highs						
Longitude	Latitude	BH	BA	DR	PS	Picture #
W 76 13.510'	N 40 56.395	L	L	L	M	BC6.9-001,002
W 77 13.490'	N 40 56.397	L	M	M	M	BC6.9-003
W 77 13.465	N 40 56.403	L/L	L/L	M/M	M/M	BC6.9-005R 006L
W 77 13.374	N 40 56.434	L	M	M	M	BC6.9-010
W 77 13.374	N 40 56.434	L	L	L	M	BC6.9-011
W 77 13.355	N 40 56.431	L	L	L	L	BC6.9-014
W 77 12.576	N 40 56.527	M	M	L	L	BC6.9-020
W 77 12.095	N 40 56.660	M	M	L	L	BC6.11-002
W 77 11.896	N 40 56.639	M	L	L	L	BC6.11-009, 010
W 77 11.843	N 40 56.637	M/L	M/L	M/L	L/L	BC6.11-013, 014
W 77 11.806	N 40 56.569	M/L	M/M	M/M	M/M	BC6.11-018L, 019R
W 77 11.806	N 40 56.569	L/L	M/M	M/M	M/M	BC6.11-022R, 023L
W 77 11.763	N 40 56.500	L	L	M	L	BC6.11-025
W 77 11.586	N 40 56.542	M	L	L	L	BC6.11-026
W 77 10.449	N 40 56.021	L	M	M	L	BC 8.5-037
W 77 10.444	N 40 55.987	L	M	L	L	BC 8.5-038
W 77 09.397	N 40 55.118	L/L	L/L	L/L	M/M	BC 6.14-003,004, 005R
W 77 09.381	N 40 55.103	L/L	L/M	M/M	M/M	BC 6.14-007,008

W 77 09.363	N 40 55.083	M/L	L/M	M/M	M/M	BC 6.14-010L, 011R
W 77 09.191	N 40 55.047	L	L	M	M	BC 6.14-012
W 77 09.147	N 40 55.083	L	L	L	L	BC 6.14-020, 021, 022, 023
W 77 08.754	N 40 55.258	L	L	M	M	BC 6.14-041
W 77 08.688	N 40 55.264	L/L	L/L	L/L	M/M	BC 6.14-045
W 77 08.658	N 40 55.268	L	L	M	M	BC 6.14-046
W 77 08.463	N 40 55.298	L	L	L	M	BC 6.18-002
W 77 07.718	N 40 55.397	L	L	M	M	BC 6.18-007,008,009
W 77 07.902	N 40 55.439	L	L	L	M	BC 6.18-027,028
W 77 07.932	N 40 55.412	L	M	L	M	BC 6.18-030
W 77 07.983	N 40 55.406	L	L	M	M	BC 6.18-031
W 77 08.094	N 40 55.370	L	L	L	N	BC 6.18-038
W 77 08.185	N 40 55.366	L	L	M	M	BC 6.18-043, 044
W 77 07.594	N 40 55.367	L	L	L	M	BC 6.21-003, 004
W 77 07.473	**N 40 55.139**	**L**	**L**	**L**	**M**	**BC 6.21-034, 035**
W 77 07.301	N 40 55.161	L	L	L	M	BC 6.21-043, 044
W 77 07.271	N 40 55.140	L	L	L	M	BC 6.21-045
W 77 06.809	N 40 55.184	L	L	L	M	BC 6.21-075
W 77 06.711	N 40 55.199	L	L	L	M	BC 6.21-077
W 77 06.512	N 40 55.125	L	L	L	M	BC 6.21-086
W 77 06.324	N 40 55.204	L	M	L	M	BC 6.21-090
W 77 06.008	**N 40 55.180**	**M**	**L**	**M**	**M**	**BC 6.24-002-005**
W 77 05.969	N 40 55.188	L	L	M	M	BC 6.24-013,014
W 77 05.825	N 40 55.172	L	M	L	M	BC 6.24-024
W 77 05.663	N 40 55.066	M	L	M	M	BC 6.24-038
W 77 04.689	N 40 55.089	L	M	L	M	BC 6.25-033-035
W 77 04.615	**N 40 55.168**	**L**	**L**	**L**	**M**	**BC 6.25-036**
W 77 04.370	N 40 55.292	L	L	L	M	BC 6.25-053
W 77 04.226	**N 40 55.334**	**L**	**M**	**M**	**M**	**BC 6.25-057**
W 77 04.010	**N 40 55.337**	**L**	**L**	**L**	**L**	**BC 6.28-001**
W 77 04.010	N 40 55.337	M	L	M	M	BC 6.28-003
W 77 03.585	N 40 55.382	L	L	M	M	BC 6.28-021
W 77 02.128	**N 40 56.604**	**M**	**L**	**M**	**M**	**BC 7.01-016**
W 77 01.105	**N 40 56.855**	**L**	**M**	**M**	**M**	**BC 7.02-008-010**
W 76 58.964	**N 40 58.035**	**L**	**M**	**M**	**M**	**BC 7.20-003**
W 76 58.829	N 40 58.088	M	M	L	M	BC 7.20-007
W 76 58.788	N 40 58.145	L/L	L/L	L/L	M/M	BC 7.20-009, 010
W 76 58.628	N 40 58.286	M/L	L/L	M/M	M/M	BC 7.20-016, 017
W 76 58.610	**N 40 58.757**	**L**	**L**	**M**	**M**	**BC 7.20-018**
W 76 58.563	**N 40 58.291**	**L**	**L**	**M**	**M**	**BC 7.20-020**
W 76 58.665	N 40 58.425	M	M	M	M	BC 7.20-032, 033

W 76 59.560	N 40 57.904	L	M	M	M	BC 7.21-025
W 76 59.560	N 40 57.904	L	M	L	M	BC 7.21-027, 029
W 76 59.464	N 40 57.879	L	M	L	M	BC 7.21-037
W 76 57.170	N 40 58.436	L	L	M	L	BC 7.26-015-018
W 76 57.078	**N 40 58.599**	**L**	**L**	**M**	**M**	**BC 8.04-004**
W 76 57.096	N 40 58.657	L	L	L	M	BC 8.04-006
W 76 56.810	N 40 59.137	M	L	M	M	BC 8.04-015
W 76 55.782	N 40 59.062	L	M	L	M	BC 8.04-025
W 76 55.130	N 40 58.487	M	L	M	M	BC 8.04-035
W 76 54.862	N 40 58.323	L	L	M	M	BC 8.06-004, 005
W 76 54.755	**N 40 58.358**	**L**	**L**	**M**	**M**	**BC 8.06-006**
W 76 54.480	N 40 58.420	L	L	L	L	BC 8.06-011, 012
W 76 54.446	N 40 58.310	L	L	M	L	BC 8.06-014
W 76 53.003	N 4058.175	M	M	L	M	BC 8.04-007
Sites Along Buffalo Creek With Single Highs						
Longitude	**Latitude**	**BH**	**BA**	**DR**	**PS**	**Picture #**
W 77 13.490'	N 40 56.397	L	H	M	M	BC6.9-004
W 77 12.095	N 40 56.660	H	M	L	L	BC6.11-003
W 77 11.843	N 40 56.637	M	M	H	L	BC6.11-017
W 77 11.573	N 40 56.541	H	L	M	M	BC6.11-027, 028, 029
W 77 09.185	N 40 55.058	H	L	M	M	BC 6.14-013, 014, 015
W 77 09.166	N 40 55.092	L	L	L	H	BC 6.14-018, 019
W 77 09.139	N 40 55.101	L	L	L	H	BC 6.14-025
W 77 08.982	N 40 55.139	L	L	L	H	BC 6.14-030
W 77 08.878	N 40 55.233	L	L	L	H	BC 6.14-035
W 77 08.870	N 40 55.234	L	L	L	H	BC 6.14-036
W 77 08.845	N 40 55.241	L	L	M	H	BC 6.14-037
W 77 08.829	N 40 55.234	L/L	L/L	M/M	H/H	BC 6.14-038
W 77 08.821	N 40 55.205	L	L	M	H	BC 6.14-039
W 77 08.634	N 40 55.259	L	L	L	H	BC 6.14-047
W 77 08.604	N 40 55.265	L	L	M	H	BC 6.14-048
W 77 07.747	N 40 55.401	L	M	L	H	BC 6.18-010,011,012
W 77 07.748	N 40 55.407	M/L	M/M	M/L	H/M	BC 6.18-013,014,015
W 77 07.791	N 40 55.411	L/L	L/L	M/M	H/H	BC 6.18-016R,017L
W 77 07.804	N 40 55.413	L/L	L/M	M/M	H/H	BC 6.18-019R, 020L
W 77 08.113	N 40 55.366	H	L	M	M	BC 6.18-039
W 77 08.101	N 40 55.368	L	M	M	H	BC 6.18-040
W 77 07.589	N 40 55.306	L/L	L/L	L/L	H/H	BC 6.21-009-012
W 77 07.595	**N 40 55.285**	**L**	**L**	**L**	**H**	**BC 6.21-014**

W 77 07.618	N 40 55.289	L	L	M	H	BC 6.21-021
W 77 07.507	N 40 55.166	H	L	L	M	BC 6.21-028-030
W 77 07.457	N 40 55.143	L	L	M	H	BC 6.21-038-040
W 77 07.379	N 40 55.134	L	L	M	H	BC 6.21-041, 042
W 77 07.202	N 40 55.194	L	L	M	H	BC 6.21-047-050
W 77 07.102	N 40 55.228	L	M	M	H	BC 6.21-052
W 77 07.080	N 40 55.243	L	L	L	H	BC 6.21-053, 054
W 77 07.080	N 40 55.243	L	L	L	H	BC 6.21-056, 056
W 77 06.990	N 40 55.239	L	M	M	H	BC 6.21-061
W 77 06.947	N 40 55.230	L	L	L	H	BC 6.21-062
W 77 06.901	N 40 55.216	L	L	L	H	BC 6.21-065
W 77 06.907	N 40 55.222	L	L	L	H	BC 6.21-066
W 77 06.860	N 40 55.212	L	L	L	H	BC 6.21-068
W 77 06.852	N 40 55.190	L	L	L	H	BC 6.21-070-072
W 77 06.575	N 40 55.172	L/L	L/L	M/M	H/H	BC 6.21-080, 081
W 77 06.539	N 40 55.163	L	L	L	H	BC 6.21-082
W 77 06.315	N 40 55.216	L	M	L	H	BC 6.21-091
W 77 06.270	N 40 55.238	M	L	M	H	BC 6.21-092-094
W 77 06.239	N 40 55.237	L	M	M	H	BC 6.21-095
W 77 06.158	**N 40 55.226**	**L**	**L**	**L**	**H**	**BC 6.21-097**
W 77 06.128	N 40 55.219	L	M	M	H	BC 6.21-098
W 77 06.097	N 40 55.211	L	M	L	H	BC 6.21-099
W 77 06.008	**N 40 55.180**	**L**	**L**	**L**	**H**	**BC 6.24-001**
W 77 06.008	N 40 55.180	L	M	M	H	BC 6.24-006
W 77 05.969	N 40 55.188	L	L	L	H	BC 6.24-011,012
W 77 05.925	N 40 55.170	L	L	M	H	BC 6.24-015,016
W 77 06.078	N 40 55.262	L	M	M	H	BC 6.24-017-021
W 77 05.795	N 40 55.137	L	M	L	H	BC 6.24-025
W 77 05.786	N 40 55.139	L	M	L	H	BC 6.24-026,027
W 77 05.747	N 40 55.116	L	L	H	M	BC 6.24-028,029
W 77 05.744	N 40 55.079	L	L	M	H	BC 6.24-031
W 77 05.295	N 40 54.862	L	M	M	H	BC 6.25-006,007
W 77 05.120	N 40 54.882	L	M	L	H	BC 6.25-014
W 77 05.060	N 40 54.884	L	L	M	H	BC 6.25-015
W 77 05.062	N 40 54.957	L	L	L	H	BC 6.25-018
W 77 05.038	N 40 54.983	L	M	L	H	BC 6.25-019
W 77 04.984	N 40 54.984	L	L	M	H	BC 6.25-020
W 77 04.934	N 40 55.005	L	M	M	H	BC 6.25-022
W 77 04.934	N 40 55.005	L	L	M	H	BC 6.25-024
W 77 04.843	N 40 54.970	L	L	M	H	BC 6.25-027
W 77 04.713	N 40 55.026	L	M	M	H	BC 6.25-031

W 77 04.615	N 40 55.168	L	L	M	H	BC 6.25-037
W 77 04.614	N 40 55.238	L/L	L/L	L/M	H/H	BC 6.25-040,041
W 77 04.588	N 40 55.238	L	M	M	H	BC 6.25-042
W 77 04.480	N 40 55.256	L	L	L	H	BC 6.25-046,047
W 77 04.393	N 40 55.358	L	L	M	H	BC 6.25-051
W 77 04.226	N 40 55.334	L	M	L	H	BC 6.25-058
W 77 04.213	N 40 55.358	L	M	L	H	BC 6.25-059,060
W 77 04.010	N 40 55.337	L	L	M	H	BC 6.28-002
W 77 03.837	N 40 55.344	L	L	M	H	BC 6.28-008
W 77 03.754	N 40 55.373	L	L	M	H	BC 6.28-010,011
W 77 03.758	N 40 55.399	L	M	M	H	BC 6.28-013
W 77 03.634	N 40 55.415	L/L	L/M	M/M	H/H	BC 6.28-015,016
W 77 03.629	N 40 55.401	L	M	M	H	BC 6.28-019
W 77 03.574	N 40 55.392	L	M	M	H	BC 6.28-023
W 77 03.473	N 40 55.454	L/L	L/H	M/L	H/M	BC 6.28-028,029
W 77 03.392	N 40 55.449	L/L	M/L	M/M	H/H	BC 6.28-030-032
W 77 03.244	N 40 55.387	L	L	M	H	BC 6.28-037,038
W 77 03.195	N 40 55.411	L	L	M	H	BC 6.24-049
W 77 03.156	N 40 55.384	L	L	L	H	BC 6.24-050
W 77 03.143	N 40 55.378	L	L	M	H	BC 6.24-053-055
W 77 03.125	N 40 55.377	L	L	M	H	BC 6.24-057, 058
W 77 03.100	N 40 55.387	L	M	M	H	BC 6.24-060
W 77 03.100	N 40 55.387	L	L	M	H	BC 6.24-061-063
W 77 03.085	N 40 55.369	L	M	L	H	BC 6.24-064,065
W 77 03.036	N 40 55.379	L	M	M	H	BC 6.24-068,069
W 77 02.946	N 40 55.458	L/L	L/L	L/L	H/H	BC 6.24-073-077
W 77 02.946	N 40 55.458	L/L	L/L	M/L	H/H	BC 6.24-078-080
W 77 02.957	N 40 55.487	L/L	L/L	L/L	H/H	BC 6.24-081,082
W 77 02.809	N 40 55.561	L	L	M	H	BC 6.24-090
W 77 02.778	N 40 55.551	L	L	M	H	BC 6.30-004
W 77 02.728	N 40 55.583	L	L	M	H	BC 6.30-008,009
W 77 02.701	N 40 55.581	L	L	M	H	BC 6.30-011
W 77 02.677	N 40 55.555	L	L	L	H	BC 6.30-012
W 77 02.658	N 40 55.553	L	L	L	H	BC 6.30-014
W 77 02.759	N 40 55.592	L	M	M	H	BC 6.30-016
W 77 02.578	N 40 55.559	L	L	M	H	BC 6.30-018
W 77 02.531	N 40 55.561	L	M	M	H	BC 6.30-020
W 77 02.478	N 40 55.550	M	L	M	H	BC 6.30-021
W 77 02.410	N 40 55.609	L	L	M	H	BC 6.30-023
W 77 02.427	N 40 55.677	L	M	M	H	BC 6.30-027
W 77 02.357	N 40 55.866	L	M	M	H	BC 6.30-033

W 77 02.336	N 40 55.898	L	L	L	H	BC 6.30-036
W 77 02.288	N 40 55.896	L	L	M	H	BC 6.30-039
W 77 02.190	**N 40 55.905**	**L**	**L**	**L**	**H**	**BC 6.30-045**
W 77 01.933	N 40 56.085	L	L	M	H	BC 7.01-001
W 77 01.959	**N 40 56.060**	**L**	**L**	**M**	**H**	**BC 7.01-003**
W 77 02.017	N 40 56.131	L/L	L/L	M/M	H/H	BC 7.01-004, 005
W 77 02.017	N 40 56.131	L	M	M	H	BC 7.01-006
W 77 02.952	N 40 56.199	L	L	M	H	BC 7.01-007
W 77 01.945	N 40 56.343	L	L	L	H	BC 7.01-010
W 77 02.095	**N 40 56.573**	**L**	**L**	**L**	**H**	**BC 7.01-013**
W 77 02.128	**N 40 56.604**	**L**	**L**	**M**	**H**	**BC 7.01-015**
W 77 02.149	N 40 56.594	M	L	M	H	BC 7.01-017,018
W 77 02.085	N 40 56.684	L	M	M	H	BC 7.01-019
W 77 01.995	**N 40 56.551**	**L**	**L**	**L**	**H**	**BC 7.01-021**
W 77 01.969	N 40 56.654	L	M	M	H	BC 7.01-025
W 77 01.969	N 40 56.654	L	L	M	H	BC 7.01-026
W 77 01.908	**N 40 56.659**	**L**	**M**	**M**	**H**	**BC 7.01-028**
W 77 01.830	N 40 56.658	M	M	M	H	BC 7.01-033, 034
W 77 01.729	**N 40 56.646**	**L**	**L**	**L**	**H**	**BC 7.01-036**
W 77 01.581	N 40 56.619	L/L	L/L	M/L	H/H	BC 7.01-041, 042
W 77 01.152	N 40 56.636	L	M	H	M	BC 7.02-001, 002
W 77 01.118	N 40 56.763	L	L	H	M	BC 7.02-003, 004
W 77 01.112	N 40 56.827	M	M	H	L	BC 7.02-006, 007
W 77 01.105	**N 40 56.855**	**L**	**L**	**H**	**M**	**BC 7.02-011, 012**
W 77 01.051	N 40 56.889	L	L	H	L	BC 7.02-013, 014
W 77 01.031	N 40 56.907	L/M	L/M	H/H	L/M	BC 7.02-015-019
W 77 00.998	N 40 56.931	M	M	H	M	BC 7.02-020, 021
W 77 00.966	**N 40 56.949**	**L**	**L**	**M**	**H**	**BC 7.02-024**
W 77 00.950	N 40 57.074	M	M	M	H	BC 7.02-028-032
W 77 00.790	**N 40 57.214**	**L**	**L**	**H**	**M**	**BC 7.02-038**
W 77 00.793	N 40 57.247	L	M	H	M	BC 7.02-039
W 77 00.844	N 40 57.283	L	M	H	M	BC 7.02-041, 042, 044
W 77 00.893	**N 40 57.342**	**L**	**L**	**H**	**M**	**BC 7.02-045, 046**
W 76 59.097	N 40 57.983	L	L	M	H	BC 7.20-002
W 76 58.964	**N 40 58.035**	**L**	**L**	**M**	**H**	**BC 7.20-004**
W 76 58.907	N 40 58.071	L	L	L	H	BC 7.20-005
W 76 58.724	N 40 58.181	L	L	L	H	BC 7.20-012
W 76 58.576	N 40 58.376	M	M	M	H	BC 7.20-023
W 77 00.686	N 40 57.445	H	M	M	M	BC 7.21-002, 003
W 77 00.678	N 40 57.470	L	M	L	H	BC 7.21-006
W 77 00.466	N 40 57.524	M	L	M	H	BC 7.21-007

W 77 00.345	N 40 57.596	L/L	L/M	M/L	H/H	BC 7.21-011, 012
W 77 00.133	**N 40 57.674**	**L**	**L**	**M**	**H**	**BC 7.21-016**
W 76 59.993	N 40 57.702	L	M	L	H	BC 7.21-017
W 76 59.832	N 40 57.739	L	M	M	H	BC 7.21-019
W 76 59.779	N 40 57.725	L	L	M	H	BC 7.21-023
W 76 59.395	N 40 57.852	M	M	L	H	BC 7.21-034
W 76 58.500	N 40 58.711	M/L	L/L	M/L	H/H	BC 7.22-008-010
W 76 58.424	N 40 58.874	L	L	M	H	BC 7.22-014, 015
W 76 58.319	N 40 58.959	L	M	M	H	BC 7.22-018
W 76 58.162	N 40 58.930	L	M	M	H	BC 7.22-019
W 76 58.051	N 40 58.826	L	M	L	H	BC 7.22-021
W 76 58.005	N 40 58.751	L	M	M	H	BC 7.22-025
W 76 57.955	N 40 58.703	L	M	L	H	BC 7.22-029, 030
W 76 57.153	N 40 58.414	M	M	M	H	BC 8.04-001
W 76 57.141	N 40 58.490	L	M	M	H	BC 8.04-002
W 76 57.024	N 40 58.960	L	L	M	H	BC 8.04-010
W 76 56.981	N 40 58.985	H	M	M	M	BC 8.04-011
W 76 56.251	N 40 59.165	L	L	H	M	BC 8.04-021
W 76 55.782	N 40 59.062	L	L	M	H	BC 8.04-024
W 76 55.725	N 40 59.173	M	L	M	H	BC 8.04-
W 76 55.524	N 40 58.962	L	L	M	H	BC 8.04-033
W 76 55.011	N 40 58.301	L	L	H	M	BC 8.06-001
W 76 54.755	**N 40 58.358**	**L**	**L**	**H**	**L**	**BC 8.06-007**
W 76 52.992	N 40 58.208	M	M	M	H	BC 8.04-006
Sites Along Buffalo Creek With Two Highs						
Longitude	**Latitude**	**BH**	**BA**	**DR**	**PS**	**Picture #**
W 77 10.013	N 40 55.365	M	H	M	H	BC 8.5-041
W 77 07.818	N 40 55.421	L	M	H	H	BC 6.18-021
W 77 07.850	N 40 55.425	L	L	H	H	BC 6.18-O22,023
W 77 07.856	N 40 55.435	L	M	H	H	BC 6.18-025
W 77 07.595	**N 40 55.285**	**H**	**M**	**M**	**H**	**BC 6.21-013,015-020**
W 77 07.558	N 40 55.225	H	M	M	H	BC 6.21-022-025
W 77 07.553	N 40 55.188	H	M	M	H	BC 6.21-027
W 77 07.473	**N 40 55.139**	**H**	**M**	**M**	**H**	**BC 6.21-032, 033, 036, 037**
W 77 06.158	**N 40 55.226**	**L**	**H**	**L**	**H**	**BC 6.21-097**
W 77 05.481	N 40 55.053	M	L	H	H	BC 6.25-002
W 77 05.385	N 40 54.920	L/L	M/H	H/L	H/H	BC 6.25-004
W 77 05.320	N 40 54.882	L	M	H	H	BC 6.25-005
W 77 05.242	N 40 54.846	H	L	M	H	BC 6.25-010

W 77 05.186	N 40 54.862	H	M	M	H	BC 6.25-011,012
W 77 05.068	N 40 54.909	L	M	H	H	BC 6.25-016
W 77 05.068	N 40 54.944	L	H	M	H	BC 6.25-017
W 77 04.893	N 40 54.984	L	H	M	H	BC 6.25-025
W 77 04.721	N 40 55.081	L	L	H	H	BC 6.25-032
W 77 04.556	N 40 55.237	M/L	M/M	H/H	H/H	BC 6.25-043,044
W 77 04.480	**N 40 55.256**	**L**	**L**	**H**	**H**	**BC 6.25-048,049**
W 77 04.420	N 40 55.293	M/L	L/L	H/H	H/H	BC 6.25-054-056
W 77 03.980	N 40 55.306	L	L	H	H	BC 6.28-004
W 77 03.951	N 40 55.284	H	M	M	H	BC 6.28-005-007
W 77 03.837	**N 40 55.344**	**L**	**L**	**H**	**H**	**BC 6.28-009**
W 77 03.658	N 40 55.427	L	L	H	H	BC 6.28-014
W 77 03.506	N 40 55.402	L	L	H	H	BC 6.28-026
W 77 03.363	N 40 55.442	L	H	M	H	BC 6.28-033,034
W 77 02.954	N 40 55.511	L	M	H	H	BC 6.24-084-087
W 77 02.926	N 40 55.506	L	L	H	H	BC 6.24-088
W 77 02.880	N 40 55.543	L	L	H	H	BC 6.24-089
W 77 02.778	**N 40 55.551**	**L**	**L**	**H**	**H**	**BC 6.30-001,003**
W 77 02.701	**N 40 55.581**	**L**	**L**	**H**	**H**	**BC 6.30-010**
W 77 02.419	N 40 55.668	L	L	H	H	BC 6.30-026
W 77 02.357	N 40 55.866	L	L	H	H	BC 6.30-034
W 77 02.301	N 40 55.907	L	M	H	H	BC 6.30-037
W 77 02.256	N 40 55.892	L	L	H	H	BC 6.30-040
W 77 02.190	**N 40 55.905**	**L**	**L**	**H**	**H**	**BC 6.30-044**
W 77 02.169	N 40 55.912	L	M	H	H	BC 6.30-047
W 77 02.020	N 40 55.981	L	L	H	H	BC 6.30-052
W 77 01.957	N 40 56.017	H/L	L/L	H/H	M/H	BC 6.30-057,058
W 77 01.959	**N 40 56.060**	**H**	**M**	**M**	**H**	**BC 7.01-002**
W 77 01.917	N 40 56.199	L	L	H	H	BC 7.01-009
W 77 01.945	N 40 56.343	L	M	H	H	BC 7.01-011
W 77 02.018	N 40 56.473	L	L	H	H	BC 7.01-012
W 77 02.095	**N 40 56.573**	**L**	**M**	**H**	**H**	**BC 7.01-014**
W 77 01.995	**N 40 56.551**	**L**	**H**	**M**	**H**	**BC 7.01-022**
W 77 01.901	N 40 56.653	L	H	M	H	BC 7.01-027
W 77 01.908	**N 40 56.659**	**L**	**H**	**M**	**H**	**BC 7.01-029,030**
W 77 01.729	**N 40 56.646**	**L**	**L**	**L**	**H**	**BC 7.01-035**
W 77 01.636	N 40 56.622	L	H	M	H	BC 7.01-040
W 77 01.225	N 40 56.579	L	L	H	H	BC 7.01-043
W 77 00.966	**N 40 56.949**	**H**	**M**	**M**	**H**	**BC 7.02-022, 023, 025**
W 77 00.975	N 40 57.035	L	L	H	H	BC 7.02-026, 027
W 77 00.861	N 40 57.147	M	L	H	H	BC 7.02-033

W 77 00.830	N 40 57.175	M	L	H	H	BC 7.02-034-036
W 77 00.790	**N 40 57.214**	**H**	**H**	**M**	**M**	**BC 7.02-037**
W 77 00.893	**N 40 57.342**	**M**	**M**	**H**	**H**	**BC 7.02-047, 048**
W 76 58.610	**N 40 58.757**	**L**	**H**	**M**	**H**	**BC 7.20-018**
W 76 58.563	**N 40 58.291**	**L**	**H**	**M**	**H**	**BC 7.20-019**
W 76 58.595	N 40 58.381	L	M	H	H	BC 7.20-028
W 76 58.601	N 40 58.344	L	M	H	H	BC 7.20-029
W 77 00.678	N 40 57.470	L	H	L	H	BC 7.21-004, 005
W 77 00.420	N 40 57.544	H	M	M	H	BC 7.21-008-010
W 77 00.260	N 40 57.654	L	H	M	H	BC 7.21-013
W 77 00.133	**N 40 57.674**	**L**	**H**	**M**	**H**	**BC 7.21-015**
W 76 59.875	N 40 57.726	L	H	L	H	BC 7.21-018
W 76 59.684	N 40 57.812	L	H	M	H	BC 7.21-024
W 76 59.464	N 40 57.879	M	M	H	H	BC 7.21-033
W 76 58.553	N 40 56.675	H	M	M	H	BC 7.22-005-007
W 76 58.468	N 40 58.797	L	H	M	H	BC 7.22-011-013
N/A	N/A	L	H	M	H	BC 7.22-020
W 76 57.763	N 40 58.342	L	M	H	H	BC 7.56-010
W 76 57.135	N 40 58.527	L	M	H	H	BC 8.04-003
W 76 57.078	**N 40 58.599**	**M**	**M**	**H**	**H**	**BC 8.04-005**
W 76 56.507	N 40 59.187	L	M	H	H	BC 8.04-020
W 76 55.920	N 40 59.146	L	L	H	H	BC 8.04-024
W 76 55.681	N 40 59.141	M	H	M	H	BC 8.04-
W 76 54.631	N 40 58.433	L	H	M	H	BC 8.06-010
W 76 54.322	N 40 58.309	L	M	H	H	BC 8.06-017
Sites Along Buffalo Creek WithThree Highs						
Longitude	**Latitude**	**BH**	**BA**	**DR**	**PS**	**Picture #**
W 77 03.036	N 40 55.379	L	H	H	H	BC 6.24-071
W 77 02.531	**N 40 55.561**	**L**	**H**	**H**	**H**	**BC 6.30-019**
W 76 58.665	N 40 58.425	H	H	H	L	BC 7.20-031
W 76 55.181	N 40 58.291	H	M	H	H	BC 8.04-036

Appendix B.

Erosion Sites along Buffalo Creek's 5 Tributaries

GPS site locations along the Tributaries of Buffalo Creek are provided for the summer of 2005 study, in subsequent order of tributary. The map in Figure 6 shows the locations of the sites. The sites are listed from upstream to downstream in categories; zero high, one high, two high, three high, and four high. Sites listed as zero high show no high erosion potential based on bank height (BH), bank angle (BA), root density (DR), or particle size (PS). See erosion form in Figure 8. Sites with at least one, two, three, or four highs are listed in sequence. "H" = high erosion potential, "L" = low erosion potential, and "M" = medium erosion potential for the categories. Note that there were no sites with four high erosion potential indicators.

Erosion sites along North Branch with zero highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 57.568	77 07.625	L	L	L	L	NB 4
40 57.618	77 05.153	L	M	M	M	NB 22
40 57.657	77 04.574	L	L	M	M	NB 32
40 56.384	77 02.971	L	L	M	L	NB 62
Erosion sites along North Branch with one high.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 57.560	77 07.792	M	M	M	H	NB 1
40 57.568	77 05.430	M	M	M	H	NB 16
40 57.642	77 05.087	M	H	M	L	NB 23
40 57.700	77 04.956	L	H	M	M	NB 25
40 57.663	76 04.540	H	M	L	M	NB 34
40 57.663	76 04.540	L	M	M	H	NB 33
40 57.621	77 04.326	L	M	M	H	NB 39
40 57.583	77 04.182	L	M	M	H	NB 42
40 56.342	77 02.996	L	M	H	M	NB 63
40 56. 290	77 02.890	L	H	M	M	NB 68
Erosion sites along North Branch with two highs.						

Latitude	Longitude	BH	BA	DR	PS	Picture #
40 57.553	77 05.677	L	H	M	H	NB 11
40 57.554	77 05.527	L	H	M	H	NB 15
40 57.581	77 05.317	L	H	M	H	NB 20
40 57.673	77 04.815	M	H	H	M	NB 28
40 57.677	77 04.668	L	L	H	H	NB 30
40 57.635	77 04.422	H	M	M	H	NB 35
40 57.621	77 04.326	L	H	M	H	NB 40
40 56.448	77 02.978	H	M	M	H	NB 58
40 56. 384	77 02.971	L	L	H	H	NB 61
40 56.220	77 02.843	M	H	H	M	NB 71, 72
40 56.107	77 02. 645	L	H	H	M	NB 73
40 56.107	77 02. 645	L	H	H	M	NB 74
Erosion sites along Beaver Run with one high.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 57.698	76 59.208	L	L	H	M	BR 14
Erosion sites along Beaver Run with two highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 56.565	76 59.159	L/L	L/L	H/H	H/H	BR 7
Erosion sites along Little Buffalo with zero highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
41 02.201	76 57.796	L/L	L/L	L/L	L/L	LB 15,16
Erosion sites along Little Buffalo with one high.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
41 02.013	76 58.492	H	M	M	M	LB 9
41 02.207	76 57.802	M	M	M	H	LB 18
41 02.197	76 56.688	M	H	M	M	LB 22
41 02.222	76 56.153	L	M	L	H	LB 36
41 01.075	76 56.270	L	M	L	H	LB 38
41 00.655	76 56.118	M	H	M	M	LB 42
41 00.711	**76 56.188**	**L/H**	**L/M**	**H/L**	**M/M**	**LB 46,47**
Erosion sites along Little Buffalo with two highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
41 02.056	76 59.580	L	M	H	H	LB 4
41 00.357	76 56.019	M	M	H	H	LB 44
Erosion sites along Rapid Run with zero highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 58.933	77 03.917	M	L	M	M	RR 64
40 58.754	77 03.363	M	M	M	M	RR 99,100
40 58.286	77 02.070	M	M	M	M	RR 126
40 58.037	77 01.683	M/L	M/L	L/M	L/M	RR 138

Erosion sites along Rapid Run with one high.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 59.633	77 11.741	M	H	M	L	RR 11
40 59.078	77 09.229	M	M	H	M	RR 36
40 59.200	77 04.356	L	L	H	L	RR 47
40 59.143	77 04.216	M	M	H	L	RR 52
40 59.055	77 04.059	L	M	H	L	RR 56
40 58.922	77 03.887	M	M	H	M	RR 67
40 58.869	77 03.808	L	M	H	L	RR 68
40 58.847	77 03.744	L	L	H	M	RR 72
40 58.829	77 03.703	L	H	M	L	RR 77
40 58.765	77 03.580	M	M	H	M	RR 84
40 58	77 03	M	M	H	M	RR 101
40 58.706	77 03.889	M	M	H	M	RR 109
40 58.598	77 02.651	M	M	H	M	RR 116
40 58.438	77 02.399	H	M	L	L	RR 121
40 58.382	77 02.348	H	L	L	M	RR 123
40 58.289	77 02.013	L	M	H	L	RR 127
40 58.204	**77 01.926**	**M**	**M**	**M**	**H**	**RR 131**
40 57.628	77 01.124	L	H	M	M	RR 144
40 57.613	77 01.078	L	M	H	M	RR 145
Erosion sites along Rapid Run with two highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 59.555	77 12.014	M	H	H	M	RR 9
40 58.865	77 03.758	L	L	H	H	RR 69
40 58.747	77 03.420	M	H	H	M	RR 92
40 58.737	77 03.410	M	M	H	H	RR 96
40 58.745	77 03.206	M	M	H	H	RR 102
40 58.670	77 03.089	H	H	L	L	RR 104
40 58.657	77 02.727	L/L	M/H	H/H	H/M	RR 110
40 58.533	77 02.672	H	M	H	M	RR 127
40 58.204	**77 01.926**	**M**	**H**	**L**	**H**	**RR 131**
Erosion sites along Rapid Run with three highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
40 59.040	77 09.308	H	H	H	M	RR 35
Erosion sites along Spruce Run with zero highs.						
Latitude	Longitude	BH	BA	DR	PS	Picture #
41 00.556	76 58.851	L	L	M	M	SR16
41 00.408	76 58.819	L	M	M	M	SR20
41 00.232	76 58.950	L	M	M	M	SR21
40 59.620	76 59.120	L	L	M	M	SR28

40 59.168	76 59.043	M	M	M	M	SR36
40 59.050	76 59.091	M	H	M	M	SR39
40 58.813	76 59.064	M	M	L	M	SR46
Erosion sites along Spruce Run with one high.						
Latitude	**Longitude**	**BH**	**BA**	**DR**	**PS**	**Picture #**
41 00.793	76 58.886	L	L	H	M	SR12
41 00.570	76 58.870	L	M	L	H	SR15
41 00.408	76 58.819	L	L	H	M	SR18
40 59.933	76 58.981	H	M	M	M	SR27
40 59.933	76 58.956	L	L	H	M	SR31
40 59.191	76 59.030	M	L	H	M	SR35
40 58.966	76 59.128	M	H	M	M	SR43
Erosion sites along Spruce Run with two highs.						
Latitude	**Longitude**	**BH**	**BA**	**DR**	**PS**	**Picture #**
41 00.780	76 68.848	L	H	H	M	SR8
41 00.720	76 58.956	M	H	H	M	SR14
41 00.486	76 58.860	L	H	H	L	SR17
40 59.005	76 59.096	L	H	H	M	SR40