




MEMORANDUM

TO: Mike Rolband

FROM: Chelsea Trant 

CC: Jennifer Feese, Ben Rosner, Mark Headly, Ally St. Onge

RE: Northern Virginia Stream Restoration Bank
Snakeden Branch Watershed
Supplemental Biological Monitoring 2011 (Year 3)
WSSI #20003, Task L1

DATE: August 24, 2011

Per maintenance and monitoring requirements defined in the “Northern Virginia Stream Restoration Bank Banking Instrument”, Section VI.B.2.(i), biological stream assessments are to be monitored prior to stream restoration, then in years 1, 5, and 10. However, monitoring was undertaken voluntarily in Year 3 (2011) at biomonitoring Reaches 1-A through 1-F, 2-A, 2-B, and 3-A to better understand and document the effects of stream restoration on the benthic community within the Snakeden Branch Watershed. Field work was conducted by WSSI environmental scientists Beth Clements, WPIT, CT¹, Lauren Shaffer, and Mark Navarro on May 23 and 24, 2011. The benthic macroinvertebrate and habitat field data sheets and benthic macroinvertebrate bench sheets for each reach are enclosed.

Habitat results for Year 3 (Post-Construction) show that five stream reaches have “Optimal” habitat conditions and the remaining four reaches are on the high end of “Sub-Optimal” habitat conditions (i.e. very close to “Optimal” habitat conditions) (Table 1, Figure 1). The average habitat assessment score for all restored stream reaches assessed in 2011 is 161 (Optimal) out of 200 following restoration. These results show improved habitat conditions following restoration, with scores exceeding the pre-restoration scores (which average 113 (Marginal) out of 200)².

The results of our data analysis indicate that the benthic macroinvertebrate community at all nine stream reaches (Reaches 1-A through 1-F, 2-A, 2-B, and 3-A) were in “Severe Stress” in 2011, based on their Stream Condition Index for Virginia Non-coastal Streams (VA-SCI)³ scores (Table 2, Figure 2). The average VA-SCI numerical score for all reaches assessed in 2011 is 35.08 (“Severe Stress”). Note that while all the reaches still remain in “Severe Stress”, on average, the VA-SCI scores are increasing when compared to previous years and the pre-restoration average of 20.47⁴. In conclusion, when compared to pre-restoration scores there has been quantifiable improvement in stream habitat and the benthic community composition in the 2011 sample reaches since the stream restoration activities were implemented.

Enclosures

¹ Wetland Professional In-Training, Society of Wetland Scientists Certification Program, Inc. and North American Benthological Society (NABS) Certified Family Level Taxonomist: All Phyla

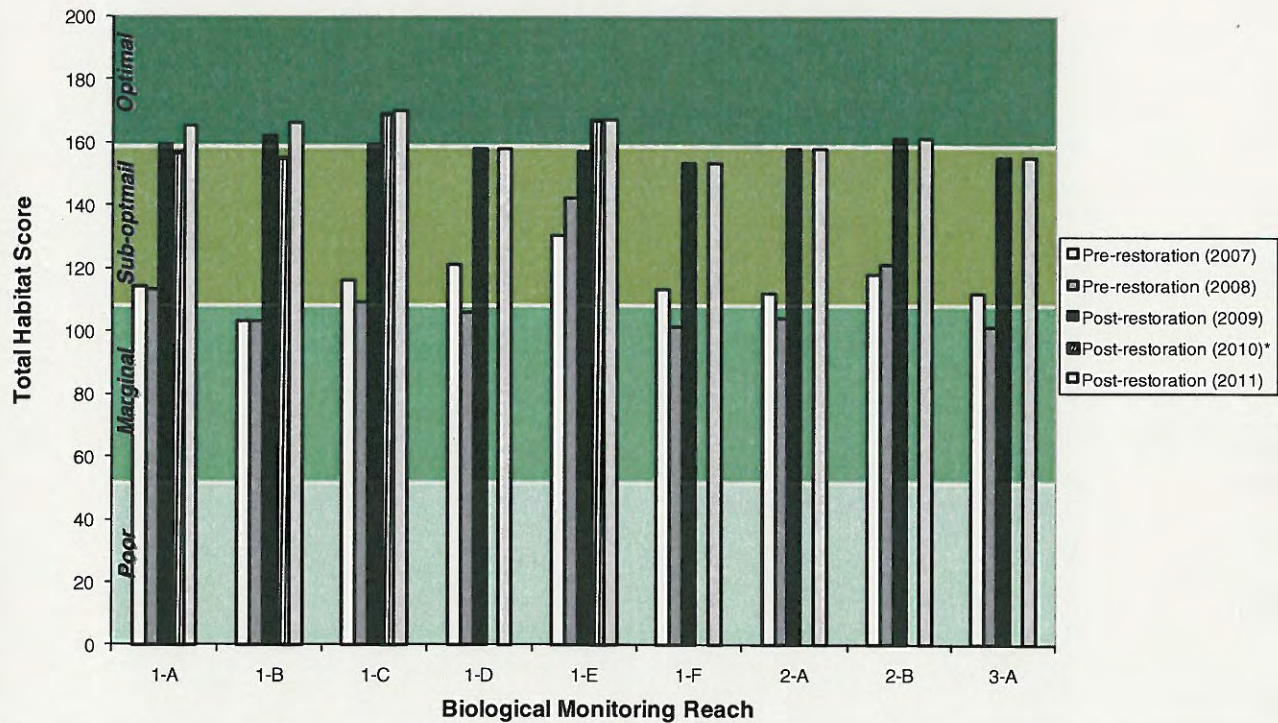
² This is an average of the pre-restoration Habitat Condition scores from 2007 and 2008.

³ The VA-SCI is a multi-metric Index of Biotic Integrity developed for the DEQ to assess Streams of the Commonwealth.

⁴ This is an average of the pre-restoration VA-SCI scores from 2007 and 2008.

Table 1. 2011 Total Habitat Assessment Scores		
BIOMONITORING REACH	Total Habitat Score	Narrative Rating
1-A	165	Optimal
1-B	166	Optimal
1-C	170	Optimal
1-D	158	Sub-Optimal
1-E	167	Optimal
1-F	153	Sub-Optimal
2-A	158	Sub-Optimal
2-B	161	Optimal
3-A	155	Sub-Optimal
Average	161	Optimal

Figure 1. Comparison of Habitat Assessment Scores from 2007-2011 for Snakeden

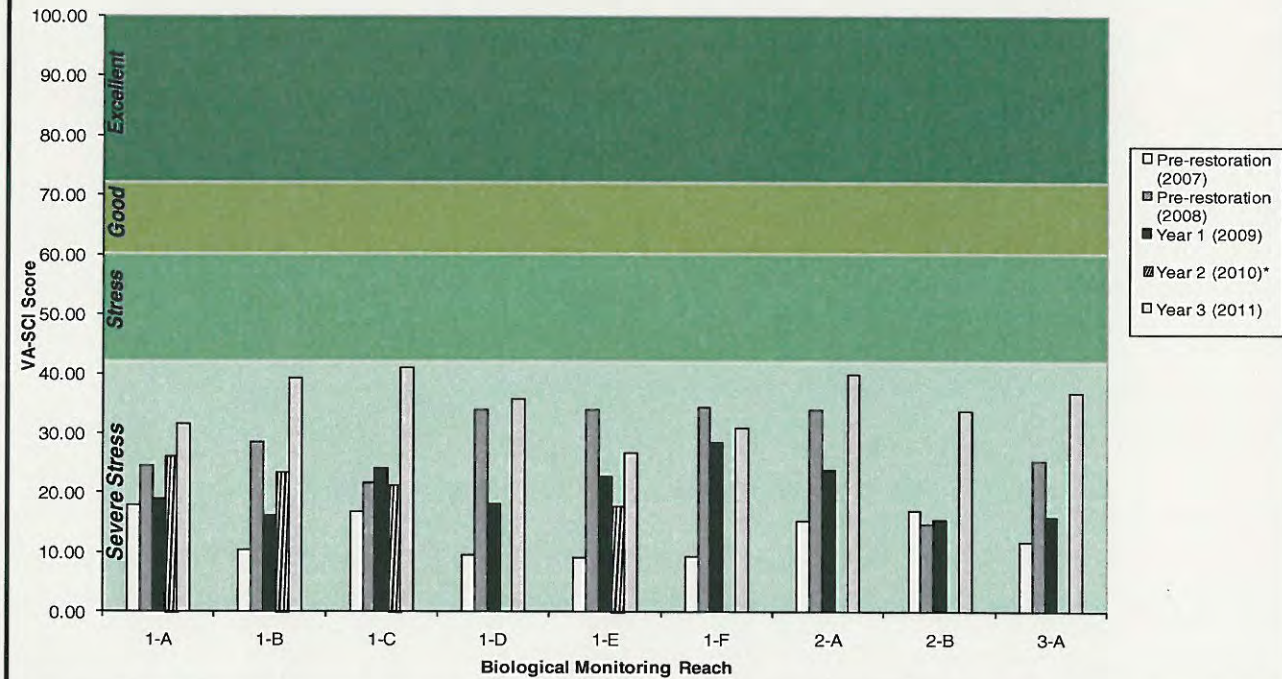


*Note that biological monitoring reach 1-D, 1-F, 2-A, 2-B, and 3-A were not assessed in 2010. Reaches 1-A and 1-B were assessed as part of a comprehensive study with South Lakes High School and the U.S. Geological Survey. Reaches 1-C and 1-E were assessed to determine the effects of a documented continuous diesel fuel leak, just above biomonitoring Reach 1-E, on the benthic community within Snakeden Branch.

Table 2. 2011 Biotic Metric and Index Weighting and VA-SCI at Snakeden Branch.

WEIGHTED METRIC	BIOLOGICAL MONITORING REACH								
	1-A	1-B	1-C	1-D	1-E	1-F	2-A	2-B	3-A
Total Taxa	40.91	36.36	18.18	40.91	18.18	9.09	31.82	27.27	13.64
EPT Taxa	9.09	18.18	18.18	18.18	0.00	0.00	9.09	9.09	0.00
Percent Ephemeroptera	0.00	1.79	1.42	1.52	0.00	0.00	0.00	0.00	0.00
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Percent Scrapers	5.48	12.78	0.00	3.62	3.46	0.00	42.82	0.00	0.00
Percent Chironomidae	49.06	60.44	70.43	71.96	70.54	80.43	87.21	54.64	67.03
Percent Top Two Dominant	70.89	87.34	101.78	35.11	2.58	28.27	43.69	78.96	96.87
HBI	76.44	97.29	117.26	115.04	119.49	129.80	104.99	99.91	117.49
VA-SCI Numerical Score	31.48	39.27	40.91	35.79	26.78	30.95	39.95	33.73	36.88
VA-SCI Narrative Score	Severe Stress	Severe Stress	Severe Stress	Severe Stress	Severe Stress	Severe Stress	Severe Stress	Severe Stress	Severe Stress
Average VA-SCI Numerical Score	35.08								
Average VA-SCI Narrative Score	Severe Stress								

Figure 2. Comparison of Virginia Stream Condition Index Scores from 2007-2011 at Snakeden



*Note that biological monitoring reach 1-D, 1-F, 2-A, 2-B, and 3-A were not assessed in 2010. Reaches 1-A and 1-B were assessed as part of a comprehensive study with South Lakes High School and the U.S. Geological Survey. Reaches 1-C and 1-E were assessed to determine the effects of a documented continuous diesel fuel leak, just above biomonitoring Reach 1-E, on the benthic community within Snakeden Branch.



Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 1-A	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	Year 3 Biomonitoring	Start time:	9:00:00 AM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	10:00:00 AM
Date:	5/23/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle): _____		Multi Habitat (Logs, Plants, etc.): <u> X </u>	
Riffle Quality:	Good <u> X </u>	Marginal _____	Poor _____	None _____
Habitats Sampled:	Riffle <u> X </u>	Snags _____	Sediment _____	Vegetation _____
# Jabs:	<u> 20 </u>	_____	_____	_____

Weather Observations

Current Weather:	Cloudy _____	Clear <u> X </u>	Rain/Snow _____	Foggy _____
Recent Precipitation:	Clear <u> X </u>	Showers _____	Rain _____	Storms _____
Stream Flow:	Low _____	Normal <u> X </u>	Above Normal _____	Flood _____

Biological Observations

Periphyton	3	Salamanders	0	Other....
Filamentous Algae	0	Warmwater Fish	0	0= Not observed
Submerged Macrophytes	0	Coldwater Fish	0	1= Sparse
Emergent Macrophytes	1	Beavers	0	2= Common to Abundant
Crayfish	0	Muskrats	0	3= Dominant-
Corbicula	0	Ducks/Geese	0	abnormally high density where other taxa
Unionidae	0	Snakes	1	are insignificant in relation to the dominant
Operculate Snails	0	Turtles	0	taxa. There can be situations where multiple
Non-operculate Snails	0	Frogs/Tadpoles	0	taxa are dominant such as algae and snails

Notes

High Gradient Habitat Data

Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	13
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14

Benthic Macroinvertebrate and Habitat Field Data Sheet

Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
5. 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.	15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.	19
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	8
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
Total Score					165



Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 1-B	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	Year 3 Biomonitoring	Start time:	11:30:00 AM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	12:30:00 PM
Date:	5/23/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

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Riffle Quality:	Good <input checked="" type="checkbox"/>	Marginal <input type="checkbox"/>	Poor <input type="checkbox"/>	None <input type="checkbox"/>
Habitats Sampled:	Riffle <input checked="" type="checkbox"/>	Snags <input type="checkbox"/>	Sediment <input type="checkbox"/>	Vegetation <input type="checkbox"/>
# Jabs:	20			

Weather Observations

Current Weather:	Cloudy <input type="checkbox"/>	Clear <input checked="" type="checkbox"/>	Rain/Snow <input type="checkbox"/>	Foggy <input type="checkbox"/>
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<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
Total Score					166

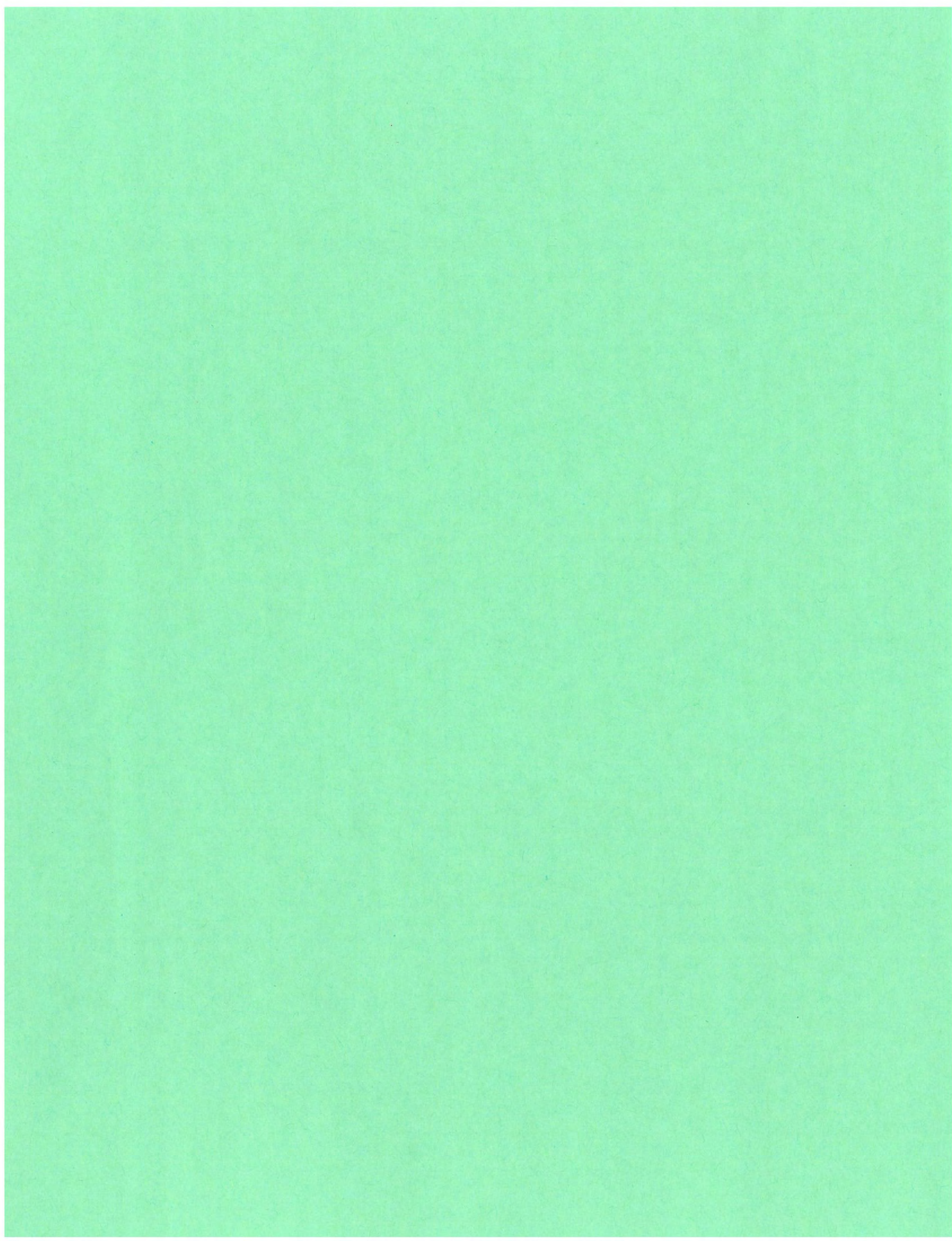
WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET

Job Name/#	Snakeden-20003	Sample submitted by:	MN, LLS
Station ID:	Reach 1-B	Date Submitted:	5/26/11
Stream Name:	Snakeden	# of Grids subsorted	6
Date Sampled:	5/23/11	Total # of subsorted insects:	118
Sampling Method:	Multihabitat	Sample Identified by:	LLS
		Total # identified:	91
		Date Identified:	6/20/11



Taxa Collected:

Nematoda	Unknown						
Porifera							
	Spongillidae						
Flatworms	Tricladida						
	Planariidae						
Gastropoda	Unknown						
Limpets	Ancylidae						
Snails	Immature						
	Lymnaeidae		Zygoptera				
	Physidae	3					
	Planorbidae						
	Hydrobiidae						
	Pleuroceridae						
	Viviparidae		Anisoptera				
Unionida	Immature						
	Corbiculidae						
	Sphaeriidae						
	Unionidae						
Oligochaeta	Unknown	38					
Lumbriculida	Lumbriculidae						
Tubificida							
	Enchytraeidae						
	Naididae		Plecoptera				
	Tubificidae						
Haplotaaxida							
	Haplotaaxidae						
Leeches	Hirudinea						
	Erpobdellidae						
	Glossiphoniidae						
	Hirudinidae						
	Piscioidae						
Branchiobdellida							
	Branchiobdellidae		Hemiptera				
Decapoda	Cambaridae						
	Portunidae						
Shrimp							
	Palaemonidae						
Isopoda							
	Asellidae						
Amphipoda							
	Crangonyctidae						
	Gammaridae						
	Talitridae						
Water Mites	Hydracarina						
Ostracoda							
Copepod	Harpacticoid		Neuroptera				
Ephemeroptera	Early Instar and/or damaged						
	Acanthometropodidae						
	Ameletidae						
	Baetidae	1	Megaloptera				
	Baetiscidae						
	Behningiidae						
	Caenidae		Trichoptera				
	Ephemerellidae						
	Ephemeridae						
	Heptageniidae						
	Isonychiidae						
	Leptophlebiidae						
TOTAL:		42	TOTAL:		9	TOTAL:	40





Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 1-C	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	YR 3 Biomonitoring	Start time:	9:00:00 AM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	10:00:00 AM
Date:	5/24/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle)	Multi Habitat (Logs, Plants, etc.)	X
Riffle Quality:	Good <u> X </u>	Marginal <u> </u>	Poor <u> </u> None <u> </u>
Habitats Sampled:	Riffle <u> X </u>	Snags <u> </u>	Banks <u> </u> Vegetation <u> </u>
# Jabs:	<u> 20 </u>		

Weather Observations

Current Weather	Cloudy <u> </u>	Clear <u> X </u>	Rain/Snow <u> </u>	Foggy <u> </u>
Recent Precipitation	Clear <u> X </u>	Showers <u> </u>	Rain <u> </u>	Storms <u> </u>
Stream Flow	Low <u> </u>	Normal <u> X </u>	Above Normal <u> </u>	Flood <u> </u>

Biological Observations

Periphyton	<u> 2 </u>	Salamanders	<u> 1 </u>	Other....	<u> </u>
Filamentous Algae	<u> 0 </u>	Warmwater Fish	<u> 2 </u>	0= Not observed	
Submerged Macrophytes	<u> 0 </u>	Coldwater Fish	<u> 0 </u>	1= Sparse	
Emergent Macrophytes	<u> 0 </u>	Beavers	<u> 0 </u>	2= Common to Abundant	
Crayfish	<u> 0 </u>	Muskrats	<u> 0 </u>	3= Dominant-	
Corbicula	<u> 0 </u>	Ducks/Geese	<u> 0 </u>	abnormally high density where other taxa	
unionidae	<u> 0 </u>	Snakes	<u> 0 </u>	are insignificant in relation to the dominant	
Operculate Snails	<u> 0 </u>	Turtles	<u> 0 </u>	taxa. There can be situations where multiple	
Non-operculate Snails	<u> 0 </u>	Frogs/Tadpoles	<u> 3 </u>	taxa are dominant such as algae and snails	

Notes

High Gradient Habitat Data

Habitat Parameter	Condition Category					Score
	Optimal	Suboptimal	Marginal	Poor		
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	15	
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	16	
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	15	
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	16	

Benthic Macroinvertebrate and Habitat Field Data Sheet

Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
5. 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.	15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.	19
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	8
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Total Score</i>					170



Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 1-D	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	YR 3 Biomonitoring	Start time:	11:00:00 AM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	12:00:00 PM
Date:	5/24/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle): _____		Multi Habitat (Logs, Plants, etc.): _____	
Riffle Quality:	Good <input checked="" type="checkbox"/>	Marginal _____	Poor _____	None _____
Habitats Sampled:	Riffle <input checked="" type="checkbox"/>	Snags _____	Sediment: _____	Vegetation <input checked="" type="checkbox"/>
# Jabs	19			1

Weather Observations

Current Weather:	Cloudy _____	Clear <input checked="" type="checkbox"/>	Rain/Snow _____	Foggy _____
Recent Precipitation:	Clear <input checked="" type="checkbox"/>	Showers _____	Rain _____	Storms _____
Stream Flow:	Low _____	Normal <input checked="" type="checkbox"/>	Above Normal _____	Flood _____

Biological Observations

Periphyton	2	Salamanders	2	Other....	_____
Filamentous Algae	0	Warmwater Fish	2	0= Not observed	
Submerged Macrophytes	0	Coldwater Fish	0	1= Sparse	
Emergent Macrophytes	0	Beavers	0	2= Common to Abundant	
Crayfish	0	Muskrats	0	3= Dominant-	
Corbicula	0	Ducks/Geese	0	abnormally high density where other taxa	
unionidae	0	Snakes	0	are insignificant in relation to the dominant	
Operculate Snails	0	Turtles	0	taxa. There can be situations where multiple	
Non-operculate Snails	0	Frogs/Tadpoles	2	taxa are dominant such as algae and snails	

Notes

High Gradient Habitat Data

Habitat Parameter	Condition Category					Score
	Optimal	Suboptimal	Marginal	Poor		
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	11	
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	12	
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	13	
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14	

Benthic Macroinvertebrate and Habitat Field Data Sheet					
Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
5. 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.	15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.	19
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	10
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	8
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	8
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	10
Total Score					158

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET

Job Name/#	Snakeden-20003	Sample subsorted by:	LLS
Station ID:	Reach 1-D	Date Subsorted:	6/2/11
Stream Name:	Snakeden	# of Grids subsorted	6
Date Sampled:	5/24/11	Total # of subsorted insects:	108
Sampling Method:	Multihabitat	Sample Identified by:	LLS
		Total # identified:	107
		Date Identified:	6/21/00



Taxa Collected:

Nematoda	Unknown	16					
Porifera							
	Spongillidae						
Flatworms	Tricladida						
	Planariidae						
Gastropoda	Unknown						
Limpets	Ancylidae						
Snails	Immature						
	Lymnaeidae		Zygoptera				
	Physidae	1					
	Planorbidae	1					
	Hydrobiidae						
	Pleuroceridae						
	Viviparidae		Anisoptera				
Unionida	Immature						
	Corbiculidae						
	Sphaeriidae	1					
	Unionidae						
Oligochaeta	Unknown	51					
Lumbriculida	Lumbriculidae						
Tubificida							
	Enchytraeidae						
	Naididae		Plecoptera				
	Tubificidae						
Haplotaxida							
	Haplotaxidae						
Leeches	Hirudinea						
	Erpobdellidae						
	Glossiphoniidae						
	Hirudinidae						
	Piscioidae						
Branchiobdellida							
	Branchiobdellidae		Hemiptera				
Decapoda	Cambaridae						
	Portunidae						
Shrimp							
	Palaemonidae						
Isopoda							
	Asellidae						
Amphipoda							
	Crangonyctidae						
	Gammaridae						
	Talitridae						
Water Mites	Hydracarina						
Ostracoda							
Copepod	Harpacticoid		Neuroptera				
Ephemeroptera	Early Instar and/or damaged						
	Acanthometropodidae						
	Ameletidae						
	Baetidae	1	Megaloptera				
	Baetiscidae						
	Behningiidae						
	Caenidae		Trichoptera				
	Ephemerellidae						
	Ephemeridae						
	Heptageniidae						
	Isonychiidae						
	Leptophlebiidae						
TOTAL:		71	TOTAL:		6	TOTAL:	30



Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 1-E	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	YR 3 Biomonitoring	Start time:	1:00:00 PM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	2:00:00 PM
Date:	5/24/2011	Latitude:	35°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle) _____	Multi Habitat (Logs, Plants, etc.)	X
Riffle Quality:	Good <input checked="" type="checkbox"/> _____	Marginal _____	Poor _____
Habitats Sampled:	Riffle <input checked="" type="checkbox"/> _____	Snags _____	Sediment _____
# Jabs:	20	Vegetation _____	_____

Weather Observations

Current Weather	Cloudy _____	Clear <input checked="" type="checkbox"/> _____	Rain/Snow _____	Foggy _____
Recent Precipitation	Clear <input checked="" type="checkbox"/> _____	Showers _____	Rain _____	Storms _____
Stream Flow	Low _____	Normal <input checked="" type="checkbox"/> _____	Above Normal _____	Flood _____

Biological Observations

Periphyton	3	Salamanders	1	Other....	_____
Filamentous Algae	0	Warmwater Fish	1	0= Not observed	
Submerged Macrophytes	0	Coldwater Fish	0	1= Sparse	
Emergent Macrophytes	2	Beavers	0	2= Common to Abundant	
Crayfish	0	Muskrats	0	3= Dominant-	
Corbicula	0	Ducks/Geese	0	abnormally high density where other taxa	
unionidae	0	Snakes	0	are insignificant in relation to the dominant	
Operculate Snails	0	Turtles	0	taxa. There can be situations where multiple	
Non-operculate Snails	0	Frogs/Tadpoles	1	taxa are dominant such as algae and snails	
Notes					

High Gradient Habitat Data

Habitat Parameter	Condition Category					Score
	Optimal	Suboptimal	Marginal	Poor		
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		15
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		16
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		15
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		16

Benthic Macroinvertebrate and Habitat Field Data Sheet					
Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
5. 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.	15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	9
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	9
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.	9
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
Total Score					167

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET

Job Name/#	Snakeden-20003	Sample subsorted by:	MN, LLS
Station ID:	Reach 1-E	Date Subsorted:	6/10/11
Stream Name:	Snakeden	# of Grids subsorted	3
Date Sampled:	5/24/11	Total # of subsorted insects:	121
Sampling Method:	Multihabitat	Sample Identified by:	KG
		Total # identified:	112
		Date Identified:	6/17/11



Taxa Collected:

Phylum/Class	Family	Count	Order	Family	Count	Order		
Nematoda	Unknown			Metreopodidae				
Porifera				Neophemeridae				
	Spongillidae			Oligoneuridae				
Flatworms	Tricladida			Pseudironidae				
	Planariidae			Polymitarcyidae				
Gastropoda	Unknown			Potamanthidae				
Limpets	Ancylidae			Siphonuridae				
Snails	Immature			Tricorythidae				
	Lymnaeidae		Zygoptera	Early Instar and/or damaged				
	Physidae	1		Calopterygidae				
	Planorbidae			Coenagrionidae				
	Hydrobiidae			Lestidae				
	Pleuroceridae			Protoneuridae		Lepidoptera		
	Viviparidae		Anisoptera	Early Instar and/or damaged				
Unionida	Immature			Aeshnidae		Coleoptera		
	Corbiculidae			Cordulegastridae				
	Sphaeriidae			Corduliidae				
	Unionidae			Gomphidae				
Oligochaeta	Unknown	77		Libellulidae				
Lumbriculida	Lumbriculidae			Macromiidae				
Tubificida				Petaluridae				
	Enchytraeidae			Cordulidae/Libellulidae				
	Naididae		Plecoptera	Early Instar and/or damaged				
	Tubificidae			Capniidae				
Haplotoxida				Chloroperlidae				
	Haplotoxidae			Leuctridae				
Leeches	Hirudinea			Nemouridae				
	Erpobdellidae			Peltoperlidae				
	Glossiphoniidae			Perlidae				
	Hirudinidae			Perlodidae				
	Pisciolidae			Pteronarcyidae				
Branchiobdellida				Taeniopterygidae		Diptera		
	Branchiobdellidae		Hemiptera	Early Instar and/or damaged				
Decapoda	Cambaridae			Belostomatidae				
	Portunidae			Corixidae				
Shrimp				Gelastocoridae				
	Palaemonidae			Gerridae				
Isopoda				Hebridae				
	Asellidae			Hydrometridae				
Amphipoda				Mesoveliidae				
	Crangonyctidae			Naucoridae				
	Gammaridae			Nepidae				
	Talitridae			Notonectidae				
Water Mites	Hydracarina			Velidae				
Ostracoda				Pleidae				
Copepod	Harpacticoid		Neuroptera					
Ephemeroptera	Early Instar and/or damaged			Sisyridae				
	Acanthometropodidae							
	Ameletidae			Corydalidae				
	Baetidae		Megaloptera	Sialidae				
	Baetiscidae			Early Instar and/or damaged				
	Behningiidae			Branchycentridae				
	Caenidae		Trichoptera	Calamoceratidae				
	Ephemerellidae			Glossosomatidae				
	Ephemeridae			Goeridae				
	Heptageniidae			Helicopsychidae				
	Isonychiidae			Hydropsychidae				
	Leptophlebiidae			Hydroptilida				
TOTAL:		78	TOTAL:		0	TOTAL:		34

Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 1-F	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	YR 3 Biomonitoring	Start time:	2:00:00 PM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	3:00:00 PM
Date:	5/24/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle)	Multi Habitat (Logs, Plants, etc.)	X
Riffle Quality:	Good <input checked="" type="checkbox"/>	Marginal <input type="checkbox"/>	Poor <input type="checkbox"/> None <input type="checkbox"/>
Habitats Sampled:	Riffle <input checked="" type="checkbox"/>	Snags <input type="checkbox"/>	Sediment <input type="checkbox"/> Vegetation <input checked="" type="checkbox"/>
# Jabs:	19		1

Weather Observations

Current Weather	Cloudy <input checked="" type="checkbox"/>	Clear <input type="checkbox"/>	Rain/Snow <input type="checkbox"/>	Foggy <input type="checkbox"/>
Recent Precipitation	Clear <input checked="" type="checkbox"/>	Showers <input type="checkbox"/>	Rain <input type="checkbox"/>	Storms <input type="checkbox"/>
Stream Flow	Low <input type="checkbox"/>	Normal <input checked="" type="checkbox"/>	Above Normal <input type="checkbox"/>	Flood <input type="checkbox"/>

Biological Observations

Periphyton	2	Salamanders	0	Other....	_____
Filamentous Algae	1	Warmwater Fish	1	0= Not observed	
Submerged Macrophytes	0	Coldwater Fish	0	1= Sparse	
Emergent Macrophytes	1	Beavers	0	2= Common to Abundant	
Crayfish	0	Muskrats	0	3= Dominant-	
Corbicula	0	Ducks/Geese	0	abnormally high density where other taxa	
unionidae	0	Snakes	0	are insignificant in relation to the dominant	
Operculate Snails	0	Turtles	0	taxa. There can be situations where multiple	
Non-operculate Snails	0	Frogs/Tadpoles	2	taxa are dominant such as algae and snails	

Notes

High Gradient Habitat Data

Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	11
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	12
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	9
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	13



Benthic Macroinvertebrate and Habitat Field Data Sheet

Habitat Parameter	Condition Category					Score
	Optimal	Suboptimal	Marginal	Poor		
5. 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.		15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.		18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.		19
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		9
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.		9
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
Total Score						153

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET

Job Name/#	Snakeden-20003	Sample subsorted by:	LLS
Station ID:	Reach 1-F	Date Subsorted:	6/14/11
Stream Name:	Snakeden	# of Grids subsorted	2
Date Sampled:	5/24/11	Total # of subsorted insects:	111
Sampling Method:	Multihabitat	Sample Identified by:	KG
		Total # identified:	92
		Date Identified:	6/17/11



Taxa Collected:

Nematoda	Unknown		Metreopodidae		Lepidostomatidae	
Porifera			Neophemeridae		Leptoceridae	
	Spongillidae		Oligoneuridae		Limnephilidae	
Flatworms	Tricladida		Pseudironidae		Molannidae	
	Planariidae		Polymitarcyidae		Odontoceridae	
Gastropoda	Unknown		Potamanthidae		Philopotamidae	
Limpets	Ancylidae		Siphonuridae		Phryganeidae	
Snails	Immature		Tricorythidae		Polycentropodidae	
	Lymnaeidae	Zygoptera	Early Instar and/or damaged		Psychomyiidae	
	Physidae		Calopterygidae		Ryacophilidae	
	Planorbidae		Coenagrionidae		Sericostomatidae	
	Hydrobiidae		Lestidae		Uenoidae	
	Pleuroceridae		Protoneuridae	Lepidoptera	Early Instar and/or damaged	
	Viviparidae	Anisoptera	Early Instar and/or damaged		Pyralidae	
Unionida	Immature		Aeshnidae	Coleoptera	Early Instar and/or damaged	
	Corbiculidae		Cordulegastridae		Chrysomelidae	
	Sphaeriidae		Corduliidae		Curculionidae	
	Unionidae		Gomphidae		Dryopidae	
Oligochaeta	Unknown	74	Libellulidae		Dytiscidae	
Lumbriculida	Lumbriculidae		Macromiidae		Elmidae	
Tubificida			Petaluridae		Gyrinidae	
	Enchytraeidae		Cordulidae/Libellulidae		Halipidae	
	Naididae	Plecoptera	Early Instar and/or damaged		Helodidae	
	Tubificidae		Capniidae		Helophoridae	
Haplotoxida			Chloroperlidae		Hydraenidae	
	Haplotoxidae		Leuctridae		Hydrochidae	
Leeches	Hirudinea		Nemouridae		Hydrophilidae	
	Erpobdellidae		Peltoperlidae		Limnichidae	
	Glossiphoniidae		Perlidae		Noteridae	
	Hirudinidae		Perlodidae		Psephenidae	
	Piscioidae		Pteronarcyidae		Ptilodactylidae	
Branchiobdellida			Taeniopterygidae		Scirtidae	
	Branchiobdellidae	Hemiptera	Early Instar and/or damaged	Diptera	Early Instar and/or damaged	
Decapoda	Cambaridae		Belostomatidae		Athericidae	
	Portunidae		Corixidae		Blephariceridae	
Shrimp			Gelastocoridae		Canaceidae	
	Palaemonidae		Gerridae		Ceratopogonidae	
Isopoda			Hebridae		Choaboridae	
	Asellidae		Hydrometridae		Chironomidae (A)	18
Amphipoda			Mesoveliidae		Chironomidae (B)	
	Crangonyctidae		Naucoridae		Culicidae	
	Gammaridae		Nepidae		Dixidae	
	Talitridae		Notonectidae		Dolichopodidae	
Water Mites	Hydracarina		Veliidae		Epididae	
Ostracoda			Pleididae		Ephydriidae	
Copepod					Muscidae	
Ephemeroptera	Early Instar and/or damaged	Neuroptera			Nymphomyiidae	
	Acanthometropodidae		Sisyridae		Pelecorynchidae	
	Ameletidae				Psychodidae	
	Baetidae	Megaloptera	Corydalidae		Ptychopteridae	
	Baetiscidae		Sialidae		Sciomyzidae	
	Behningiidae		Early Instar and/or damaged		Simuliidae	
	Caenidae	Trichoptera	Branchycentridae		Stratiomyidae	
	Ephemerellidae		Calamoceratidae		Syrphidae	
	Ephemeridae		Glossosomatidae		Tabanidae	
	Heptageniidae		Goeridae		Tanyderidae	
	Isonychiidae		Hellicopsychidae		Thaumaleidae	
	Leptophlebiidae		Hydropsychidae		Tipulidae	
			Hydroptilidae			
TOTAL:		74	TOTAL:	0	TOTAL:	18



Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 2-A	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	YR 3 Biomonitoring	Start time:	1:30:00 PM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	2:30:00 PM
Date:	5/23/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle) _____	Multi Habitat (Logs, Plants, etc.) _____	X
Riffle Quality:	Good _____ X _____	Marginal _____	Poor _____ None _____
Habitats Sampled:	Riffle _____ X _____	Snags _____	Sediment _____ Vegetation _____ X _____
# Jabs:	19		1

Weather Observations

Current Weather	Cloudy _____ X _____	Clear _____	Rain/Snow _____	Foggy _____
Recent Precipitation	Clear _____ X _____	Showers _____	Rain _____	Storms _____
Stream Flow	Low _____	Normal _____ X _____	Above Normal _____	Flood _____

Biological Observations

Periphyton	1	Salamanders	1	Other....	_____
Filamentous Algae	0	Warmwater Fish	0	0= Not observed	
Submerged Macrophytes	0	Coldwater Fish	0	1= Sparse	
Emergent Macrophytes	2	Beavers	0	2= Common to Abundant	
Crayfish	0	Muskrats	0	3= Dominant-	
Corbicula	0	Ducks/Geese	0	abnormally high density where other taxa	
unionidae	0	Snakes	0	are insignificant in relation to the dominant	
Operculate Snails	0	Turtles	0	taxa. There can be situations where multiple	
Non-operculate Snails	0	Frogs/Tadpoles	2	taxa are dominant such as algae and snails	

Notes

High Gradient Habitat Data

Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	11
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	12
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	13
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.	
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14

Benthic Macroinvertebrate and Habitat Field Data Sheet

Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
5. 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.	15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.	19
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	8
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Total Score</i>					158

Benthic Macroinvertebrate and Habitat Field Data Sheet					
Station ID:	Reach 2-B	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/LLS/MN/BY	Survey Reason:	YR 3 Biomonitoring	Start time:	3:00:00 PM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	4:00:00 PM
Date:	5/24/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physicochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle) _____		Multi Habitat (Logs, Plants, etc.) _____		X
Riffle Quality:	Good _____	Marginal _____	Poor _____	None _____	
Habitats Sampled:	Riffle _____	Snags _____	Sediment _____	Vegetation _____	X
# Jabs:	19				1

Weather Observations

Current Weather	Cloudy _____	Clear _____	Rain/Snow _____	Foggy _____
Recent Precipitation	Clear _____	Showers _____	Rain _____	Storms _____
Stream Flow	Low _____	Normal _____	Above Normal _____	Flood _____

Biological Observations

Periphyton	0	Salamanders	0	Other....	_____
Filamentous Algae	0	Warmwater Fish	0	0= Not observed	
Submerged Macrophytes	0	Coldwater Fish	0	1= Sparse	
Emergent Macrophytes	2	Beavers	0	2= Common to Abundant	
Crayfish	0	Muskrats	0	3= Dominant-	
Corbicula	0	Ducks/Geese	1	abnormally high density where other taxa	
unionidae	0	Snakes	0	are insignificant in relation to the dominant	
Operculate Snails	0	Turtles	0	taxa. There can be situations where multiple	
Non-operculate Snails	0	Frogs/Tadpoles	0	taxa are dominant such as algae and snails	

Notes

High Gradient Habitat Data

Habitat Parameter	Condition Category					Score
	Optimal	Suboptimal	Marginal	Poor		
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		14
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		12
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		15
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.		
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		19

Benthic Macroinvertebrate and Habitat Field Data Sheet

Habitat Parameter	Condition Category					Score
	Optimal	Suboptimal	Marginal	Poor		
5. 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.		13
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.		15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.		19
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		8
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.		9
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0		
Total Score						161

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET

Job Name/#	Snakeden-20003	Sample subsorted by:	MN
Station ID:	Reach 2-B	Date Subsorted:	6/3/11
Stream Name:	Snakeden	# of Grids subsorted	5
Date Sampled:	5/24/11	Total # of subsorted insects:	120
Sampling Method:	Multihabitat	Sample Identified by:	MN
		Total # identified:	97
		Date Identified:	6/20/11



Taxa Collected:

Phylum	Class	Order	Family	Count
Nematoda			Unknown	
Porifera				
Flatworms			Spongillidae	
			Tricladida	
			Planariidae	
Gastropoda			Unknown	
Limpets			Ancylidae	
Snails			Immature	
		Zygoptera	Lymnaeidae	
			Physidae	
			Planorbidae	
			Hydrobiidae	
			Pleuroceridae	
			Viviparidae	
Unionida		Anisoptera	Immature	
			Corbiculidae	
			Sphaeriidae	2
			Unionidae	
Oligochaeta			Unknown	43
Lumbriculida			Lumbriculidae	
Tubificida				
			Enchytraeidae	
		Plecoptera	Naididae	
			Tubificidae	
Haplotoxida				
			Haplotoxidae	
Leeches			Hirudinea	
			Erpobdellidae	
			Glossiphoniidae	
			Hirudinidae	
			Piscioidae	
Branchiobdellida				
			Branchiobdellidae	
Decapoda			Cambaridae	
			Portunidae	
Shrimp				
			Palaemonidae	
Isopoda				
			Asellidae	
Amphipoda				
			Crangonyctidae	
			Gammaridae	
			Talitridae	
Water Mites			Hydracarina	
Ostracoda				
Copepod			Harpacticoid	3
Ephemeroptera			Early Instar and/or damaged	
			Acanthometropodidae	
			Ameletidae	
			Baetidae	
		Megaloptera	Baetiscidae	
			Behningiidae	
			Caenidae	
		Trichoptera	Ephemerellidae	
			Ephemeridae	
			Heptageniidae	
			Isonychiidae	
			Leptophlebiidae	
TOTAL:				48
			Metreopodidae	
			Neophemeridae	
			Oligoneuridae	
			Pseudironidae	
			Polymitarcyidae	
			Potamanthidae	
			Siphonuridae	
			Tricorythidae	
			Early Instar and/or damaged	
			Calopterygidae	
			Coenagrionidae	
			Lestidae	
		Lepidoptera	Protoneuridae	
			Early Instar and/or damaged	
		Coleoptera	Aeshnidae	
			Cordulegastridae	
			Corduliidae	
			Gomphidae	
			Libellulidae	
			Macromiidae	
			Petaluridae	
			Cordulidae/Libellulidae	
			Early Instar and/or damaged	
			Capniidae	
			Chloroperlidae	
			Leuctridae	
			Nemouridae	
			Peltoperlidae	
			Perlidae	
			Perlodidae	
			Pteronarcyidae	
			Taeniopterygidae	
		Diptera	Early Instar and/or damaged	
			Belostomatidae	
			Corixidae	
			Gelastocoridae	
			Gerridae	
			Hebridae	
			Hydrometridae	
			Mesoveliidae	
			Naucoridae	
			Nepidae	
			Notonectidae	
			Veliidae	
			Pleidae	
			Sisyridae	
			Corydalidae	
			Sialidae	
			Early Instar and/or damaged	
			Branchycentridae	
			Calamoceratidae	
			Glossosomatidae	
			Goeridae	
			Hellicopsychidae	
			Hydropsychidae	3
			Hydroptilida	
TOTAL:				3
			Lepidostomatidae	
			Leptoceridae	
			Limnephilidae	
			Molannidae	
			Odontoceridae	
			Philopotamidae	
			Phryganeidae	
			Polycentropodidae	
			Psychomyiidae	
			Rhyacophilidae	
			Sericostomatidae	
			Uenoidae	
			Early Instar and/or damaged	
			Pyralidae	
			Early Instar and/or damaged	
			Chrysomelidae	
			Curculionidae	
			Dryopidae	
			Dytiscidae	
			Elmidae	
			Gyrinidae	
			Halipidae	
			Helodidae	
			Helophoridae	
			Hydraenidae	
			Hydrochidae	
			Hydrophilidae	
			Limnichidae	
			Noteridae	
			Psephenidae	
			Ptilodactylidae	
			Scirtidae	
			Early Instar and/or damaged	
			Athericidae	
			Blephariceridae	
			Canaceidae	
			Ceratopogonidae	
			Choaboridae	
			Chironomidae (A)	44
			Chironomidae (B)	
			Culicidae	2
			Dixidae	
			Dolichopodidae	
			Epididae	
			Ephydriidae	
			Muscidae	
			Nymphomyiidae	
			Pelecornychidae	
			Psychodidae	
			Ptychopteridae	
			Sciomyzidae	
			Simuliidae	
			Stratiomyidae	
			Syrphidae	
			Tabanidae	
			Tanyderidae	
			Thaumaleidae	
			Tipulidae	
TOTAL:				46



Benthic Macroinvertebrate and Habitat Field Data Sheet

Station ID:	Reach 3-A	Ecoregion:	Piedmont	Land Use:	Urban
Field Team:	BC/MN/LLS/BY	Survey Reason:	YR 3 Biomonitoring	Start time:	12:00:00 PM
Stream Name:	Snakeden	Location:	Reston, Virginia	Finish time:	1:00:00 PM
Date:	5/24/2011	Latitude:	38°55'58"	Longitude:	77°21'01"

Stream Physiochemical Measurements

Instrument ID number:	N/A	pH:	N/A
Temperature:	N/A °C	Conductivity:	N/A uS/cm
Dissolved Oxygen:	N/A mg/L	Did instrument pass all post-calibration checks?	N/A
		If NO- which parameter(s) failed and action taken:	N/A

Benthic Macroinvertebrate Collection

Method Used:	Single Habitat (Riffle) _____	Multi Habitat (Logs, Plants, etc.) _____	X
Riffle Quality:	Good <u> X </u> _____	Marginal _____	Poor _____
Habitats Sampled:	Riffle <u> X </u> _____	Snags _____	Banks _____
	# Jabs: <u> 20 </u> _____	Vegetation _____	_____

Weather Observations

Current Weather	Cloudy _____	Clear <u> X </u> _____	Rain/Snow _____	Foggy _____
Recent Precipitation	Clear <u> X </u> _____	Showers _____	Rain _____	Storms _____
Stream Flow	Low _____	Normal <u> X </u> _____	Above Normal _____	Flood _____

Biological Observations

Periphyton	<u> 3 </u> _____	Salamanders	<u> 0 </u> _____	Other....	<u> Iron Oxidizing Bacteria: 1 </u> _____
Filamentous Algae	<u> 2 </u> _____	Warmwater Fish	<u> 1 </u> _____	0= Not observed	
Submerged Macrophytes	<u> 0 </u> _____	Coldwater Fish	<u> 0 </u> _____	1= Sparse	
Emergent Macrophytes	<u> 0 </u> _____	Beavers	<u> 0 </u> _____	2= Common to Abundant	
Crayfish	<u> 0 </u> _____	Muskrats	<u> 0 </u> _____	3= Dominant-	
Corbicula	<u> 0 </u> _____	Ducks/Geese	<u> 0 </u> _____	abnormally high density where other taxa	
unionidae	<u> 0 </u> _____	Snakes	<u> 0 </u> _____	are insignificant in relation to the dominant	
Operculate Snails	<u> 0 </u> _____	Turtles	<u> 0 </u> _____	taxa. There can be situations where multiple	
Non-operculate Snails	<u> 0 </u> _____	Frogs/Tadpoles	<u> 3 </u> _____	taxa are dominant such as algae and snails	

Notes

High Gradient Habitat Data

Habitat Parameter	Condition Category					Score
	Optimal	Suboptimal	Marginal	Poor		
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble, or other stable habitat and at stage to allow full colonization potential (i.e. snags/logs that are not new fall and not transient).	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization.	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	11	
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	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.		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	13	
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	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 low).	Dominated by 1 velocity/depth regime (usually slow-deep).		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	10	
4. Sediment Deposition	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, 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.		
<i>Score</i>	<i>20 19 18 17 16</i>	<i>15 14 13 12 11</i>	<i>10 9 8 7 6</i>	<i>5 4 3 2 1 0</i>	14	

Benthic Macroinvertebrate and Habitat Field Data Sheet					
Habitat Parameter	Condition Category				Score
	Optimal	Suboptimal	Marginal	Poor	
5. 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.	15
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances 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 a ratio of >25.	18
<i>Score</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetation disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	8
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	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.	10
<i>Score Left Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
<i>Score Right Bank</i>	10 9	8 7 6	5 4 3	2 1 0	
Total Score					155

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET

Job Name/#	Snakeden-20003	Sample subsorted by:	MN
Station ID:	Reach 3-A	Date Subsorted:	6/14/11
Stream Name:	Snakeden	# of Grids subsorted	5
Date Sampled:	5/24/11	Total # of subsorted insects:	105
Sampling Method:	Multihabitat	Sample Identified by:	MN
		Total # identified:	91
		Date Identified:	6/17/11



Taxa Collected:

Nematoda	Unknown		Metreopodidae		Lepidostomatidae	
Porifera			Neophemeridae		Leptoceridae	
	Spongillidae		Oligoneuridae		Limnephilidae	
Flatworms	Tricladida		Pseudironidae		Molannidae	
	Planariidae		Polymitarciidae		Odontoceridae	
Gastropoda	Unknown		Potamanthidae		Philopotamidae	
Limpets	Ancylidae		Siphonuridae		Phryganeidae	
Snails	Immature		Tricorythidae		Polycentropodidae	
	Lymnaeidae	Zygoptera	Early Instar and/or damaged		Psychomyiidae	
	Physidae		Calopterygidae		Ryacophilidae	
	Planorbidae		Coenagrionidae		Sericostomatidae	
	Hydrobiidae		Lestidae		Uenoidae	
	Pleuroceridae		Protoneuridae	Lepidoptera	Early Instar and/or damaged	
	Viviparidae	Anisoptera	Early Instar and/or damaged		Pyralidae	
Unionida	Immature		Aeshnidae	Coleoptera	Early Instar and/or damaged	
	Corbiculidae		Cordulegastridae		Chrysomelidae	
	Sphaeriidae		Corduliidae		Curculionidae	
	Unionidae		Gomphidae		Dryopidae	
Oligochaeta	Unknown	60	Libellulidae		Dytiscidae	
Lumbriculida	Lumbriculidae		Macromiidae		Elmidae	
Tubificida			Petaluridae		Gyrinidae	
	Enchytraeidae		Cordullidae/Libellulidae		Halipidae	
	Naididae	Plecoptera	Early Instar and/or damaged		Helodidae	
	Tubificidae		Capniidae		Helophoridae	
Haplotaaxida			Chloroperlidae		Hydraenidae	
	Haplotaaxidae		Leuctridae		Hydrochidae	
Leeches	Hirudinea		Nemouridae		Hydrophilidae	
	Erpobdellidae		Peltoperlidae		Limnichidae	
	Glossiphoniidae		Perlidae		Noteridae	
	Hirudinidae		Perlodidae		Psephenidae	
	Piscioidae		Pteronarcyidae		Ptilodactylidae	
Branchiobdellida			Taeniopterygidae		Scirtidae	
	Branchiobdellidae	Hemiptera	Early Instar and/or damaged	Diptera	Early Instar and/or damaged	
Decapoda	Cambaridae		Belostomatidae		Athericidae	
	Portunidae		Corixidae		Blephariceridae	
Shrimp			Gelastocoridae		Canaceidae	
	Palaemonidae		Gerridae		Ceratopogonidae	
Isopoda			Hebridae		Choaboridae	
	Asellidae		Hydrometridae		Chironomidae (A)	30
Amphipoda			Mesoveliidae		Chironomidae (B)	
	Crangonyctidae		Naucoridae		Culicidae	
	Gammaridae		Nepidae		Dixidae	
	Talitridae		Notonectidae		Dolichopodidae	
Water Mites	Hydracarina		Vellidae		Epididae	
Ostracoda			Pleidae		Ephydriidae	
Copepod	Harpacticoid	Neuroptera			Muscidae	
Ephemeroptera	Early Instar and/or damaged		Sisyridae		Nymphomyiidae	
	Acanthometropodidae				Pelecorhynchidae	
	Ameletidae		Corydalidae		Psychodidae	
	Baetidae	Megaloptera	Sialidae		Ptychopteridae	
	Baetiscidae		Early Instar and/or damaged		Sciomyzidae	
	Behningiidae		Branchycentridae		Simuliidae	
	Caenidae	Trichoptera	Calamoceratidae		Stratiomyidae	
	Ephemerellidae		Glossosomatidae		Syrphidae	
	Ephemeridae		Goeridae		Tabanidae	
	Heptageniidae		Hellicopsychidae		Tanyderidae	
	Isonychiidae		Hydropsychidae		Thaumaleidae	
	Leptophlebiidae		Hydroptilida		Tipulidae	1
TOTAL:		60	TOTAL:	0	TOTAL:	31