BIOLOGICAL MONITORING REPORT #3

Post-construction Monitoring Year 1

NORTHERN VIRGINIA STREAM RESTORATION BANK

Snakeden Branch Watershed
(20,068 LINEAR FEET)

FAIRFAX COUNTY, VIRGINIA

Prepared For:

Northern Virginia Stream Restoration, L.C.
c/o Wetland Studies and Solutions, Inc.
5300 Wellington Branch Drive, Suite 100
Gainesville, Virginia 20155

WSSI Project #20003

OCTOBER 2, 2009

Wetland
Studies and Solutions, Inc.

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I. Executive Summary

In accordance with the "Northern Virginia Stream Restoration Bank Banking Instrument" (Banking Instrument), 20,068 linear feet of streams and drainage features within the Snakeden Branch Watershed were stabilized and restored from February 2008 to March 2009 and from June 2009 to October 2009.

In the first year following restoration, Wetland Studies and Solutions, Inc. (WSSI) conducted biological stream assessments along the Snakeden Branch Watershed portion of the Northern Virginia Stream Restoration Bank (NVSRB) in 2009 pursuant to the maintenance and monitoring requirements defined in the NVSRB Banking Instrument, Section VI.B.2.(i). The assessed reaches were selected to be representative of the condition of Snakeden Branch and unnamed tributaries of Snakeden Branch following the restoration. This report summarizes the 2009 Year 1 monitoring, as compared to the 2007 and 2008 pre-construction baseline conditions.

Biological stream monitoring was conducted along nine permanent biological monitoring reaches using benthic macroinvertebrate and habitat data. Fieldwork was conducted on May 20-21, 2009 and on September 16, 2009. Benthic macroinvertebrate data was used to calculate a Stream Condition Index for Virginia Non-coastal Streams (VA-SCI) and habitat data was used to calculate the percentage of best possible habitat for each reach.

Our Year 1 post-restoration results indicate that the habitat of the streams within the Snakeden Branch watershed portion of the NVSRB on average has increased following restoration. Benthic macroinvertebrate density and Percent Ephemeroptera (a sensitive taxa) have also increased following restoration; however, overall benthic macroinvertebrate condition has not improved. These results suggest that the restoration has provided a stable substrate for colonization, but other water quality measures not directly addressed through the restoration (i.e., nutrients, oil leaks, etc.) are affecting these streams. It will take time for benthic macroivertebrates to re-colonize these streams and in order to expedite colonization, water quality enhancements will need to be undertaken within the watershed.

II. Introduction

As set forth in the "Northern Virginia Stream Restoration Bank Banking Instrument" (Banking Instrument), dated February 17, 2006 and prepared by Wetland Studies and Solutions, Inc. (WSSI), Northern Virginia Stream Restoration, L.C. will restore approximately 14 miles of streams and upland buffers, within portions of the Snakeden Branch, Colvin Run, and The Glade watersheds in Reston, Virginia. To date, Northern Virginia Stream Restoration, L.C. stabilized and restored 20,068 linear feet of streams and drainage features within the Snakeden Branch Watershed from February 2008 to March 2009 and from June 2009 to October 2009.

As required in Section VI.B.2.(i) of the Banking Instrument, biological monitoring will be conducted within restored streams within these watersheds. These stream restoration activities should result in a direct improvement of in-stream habitat. Using benthic macroinvertebrate and habitat data, this Year 1 post-construction monitoring report characterizes the restored streams within the Snakeden

Branch Watershed portion of the NVSRB in 2009, as compared to baseline conditions described in Biological Monitoring Reports #1 (Dated January 29, 2008) and #2 (Dated October 24, 2008). With these data, and data from previous and subsequent monitoring reports, we propose to determine the effect of stream restoration on the condition of streams within the Snakeden Branch Watershed portion of the NVSRB[1].

III. Project Area

The study area includes 20,068 linear feet of stream along Snakeden Branch and several unnamed tributaries of Snakeden Branch, as well as the adjacent riparian corridor. The study area is located southeast of Reston Parkway (Route 602) and immediately northwest of Lake Audubon in Fairfax County, Virginia. Exhibit 1 is a vicinity map that depicts the approximate location of the study area.

The study area is covered mostly by mixed-deciduous forest, as depicted on the Biological Stream Monitoring Map (Exhibit 4). Snakeden Branch flows in a southeasterly direction through the central portion of the study area. An asphalt recreational trail, which crosses Snakeden Branch multiple times, is located parallel to the stream and to several of its unnamed tributaries. The study area is gently to moderately sloping. The topography can be seen in the excerpt from the Vienna, Virginia-Maryland 1994 USGS topographical quadrangle map included as Exhibit 2.

IV. Overall Methodology

Per maintenance and monitoring requirements defined in the Banking Instrument, Section VI.B.2.(i), biological stream assessment reaches are to be established for every 2000 linear feet of stream restoration along samplable streams at the NVSRB. Once established, these reaches are to be monitored prior to stream restoration, then in years 1, 5, and 10. The following methods are to be employed:

- Biological Reconnaissance (BioRecon), following guidance established in the U.S. Environmental Protection Agency's "Rapid Bioassessment Protocols for Use in Streams and Wadable Rivers" (EPA's RBP; Barbour et al. 1999)[2].
- Biological stream assessment for Calculating the Stream Condition Index for Virginia Non-coastal Streams (VA-SCI), following guidance established in "A Stream Condition Index for Virginia Non-Coastal Streams" (Tetra Tech 2003) and "Using Probabilistic Monitoring Data to Validate the Non-Coastal Virginia Stream Condition Index" (DEQ 2006a)[3].

V. Biological Stream Monitoring

Biological Stream Monitoring Methodology. The biological stream monitoring consisted of two components: 1) Stream habitat assessment and 2) benthic macroinvertebrate assessment. The

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1 *Note that monitoring reports for the Colvin Run and The Glade watershed portions of the NVSRB will be provided under separate cover.*

2 *Note that the BioRecon was used to aid in the selection of permanent monitoring reaches during the first year of pre-construction monitoring and is not required in subsequent monitoring years. The results of the BioRecon are described in "Biological Monitoring Report #1, Pre-construction Monitoring, Northern Virginia Stream Restoration Bank, Snakeden Branch Watershed", dated January 29, 2008.*

3 *This method is to be used in all monitoring years and is accompanied by a habitat assessment, following guidance established in Virginia Department of Environmental Quality's (DEQ) standard operating procedures for stream habitat assessment (SOPs; DEQ 2006b) and the EPA's RBP for habitat (Barbour et al. 1999).*

habitat assessment field work was conducted using guidance established in the DEQ standard operating procedures for stream habitat assessment (SOPs; DEQ 2006b) and the EPA's RBP for habitat (Barbour et al. 1999). The benthic macroinvertebrate assessment field work was conducted using guidance established in the SOPs for multi-habitat benthic macroinvertebrate sampling (DEQ 2006b).

WSSI assessed the nine permanent sampling reaches that were selected in Biological Monitoring Report #1 (Reaches 1-A through 1-F, 2-A, 2-B, and 3-A). The locations of these nine sampling reaches relative to the 17 restoration design reaches are depicted in Exhibit 3[4]. As required by the SOPs, each reach is 300 linear feet. The approximate location of each reach is depicted on the Biological Stream Monitoring Map (Exhibit 4). Photographs of each reach are included on Exhibit 6. Benthic macroinvertebrate sampling and habitat assessment field work was conducted by WSSI environmental scientists Sean D. Sipple, CT, PWS, PWD[5], Jennifer D. Feese, PWS, PWD, CT[6], and Benjamin N. Rosner, PWS, PWD, CT[7] on May 20-21, 2009 and September 16, 2009.

In accordance with the SOPs, habitat conditions were assessed by qualitatively rating ten habitat parameters, including Epifaunal Substrate/Available Cover, Pool Substrate Characterization, Pool Variability, Sediment Deposition, Channel Flow Status, Channel Alteration, Channel Sinuosity, Bank Stability, Vegetative Protection, and Riparian Vegetative Zone. The overall habitat quality of each reach was determined by calculating the percentage of the best possible score[8], where the best possible score for each reach equals 200. The following formula was used to determine the percentage of best possible score for each reach:

Percentage of Best Possible Score = (Total Habitat Score)/(200)*100

Each reach was then assigned a narrative rating according to the calculated percentage of best possible score, where "Excellent" is >90, "Good" is 75-88, "Fair" is 60-73, and "Poor" is <58. WSSI Habitat Assessment Field Data Sheets (developed from the EPA's RBP Habitat Assessment Field Data Sheets) for each reach are included as Exhibit 6.

To assess benthic macroinvertebrate condition, 60 linear feet of best-available habitat was sampled in each reach using a D-Framed Net. Habitat types sampled include cobble/gravel, snags/leafpacks, under-cut banks, root-wads, and submerged vegetation. Benthic field data was

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4 *Note that the nine permanent monitoring reaches correspond with reaches of the NVSRB-Snakeden Branch plan sets, as follows: Reach 1-F corresponds with Reach 1 of the May 2007 plan set; Reach 1-E corresponds with Reach 2 of the August 2007 plan set; Reach 3-A corresponds with Reach 4 of the October 2007 plan set; Reaches 1-D and 1-C correspond with Reaches 5 and 7, respectively of the November 2007 plan set; Reaches 2-A and 2-B correspond with Reaches 13 and 15, respectively of the July 2, 2008 plan set; and Reaches 1-A and 1-B correspond with Reaches 12 and 17, respectively of the July 10, 2008 plan set.*

5 *Professional Wetland Scientist #1730, Society of Wetlands Scientists Certification Program, Inc.; North American Benthological Society (NABS) Certified Level 2 Taxonomist: EPT Taxa (Ephemeroptera, Plecoptera, Trichoptera).*

6 *Professional Wetland Scientist #1871, Society of Wetlands Scientists Certification Program, Inc.; Virginia Certified Professional Wetland Delineator #3402-000095; North American Benthological Society (NABS) Certified Level 1 Taxonomist: All Phyla*

7 *Professional Wetland Scientist #0001766, Society of Wetlands Scientists Certification Program, Inc.; Certified Professional Wetland Delineator #3402-000080, VDPOR Board of Professional Soil Scientists and Wetland Delineators; North American Benthological Society (NABS) Certified Level 1 Taxonomist: All Phyla.*

8 *The SOPs indicate that overall habitat quality is determined by calculating the percent similarity to reference score. Since reference reaches were not available to assess, WSSI used the best possible score as the reference score.*

recorded on WSSI Benthic Macroinvertebrate Field Data Sheets (developed from the EPA's RBP Benthic Macroinvertebrate Field Data Sheets), which are included in Exhibit 6 for each reach.

Benthic macroinvertebrate samples were processed and subsampled by WSSI staff using guidance from the SOPs. Specifically, a fixed-count method was used, where one hundred twenty organisms were randomly picked from a gridded (numbered) tray and the organisms were identified to the family level (if possible) using a dissecting microscope. Each individual (containing a head) found in a sample was recorded and enumerated on a WSSI Benthic Macroinvertebrate I.D. and Enumeration Bench Sheet, which are included in Exhibit 6 for each reach.

Benthic macroinvertebrate data were analyzed by calculating the Stream Condition Index for Virginia Non-coastal Streams (VA-SCI), following guidance established in "A Stream Condition Index for Virginia Non-Coastal Streams" and "Using Probabilistic Monitoring Data to Validate the Non-Coastal Virginia Stream Condition Index". The VA-SCI is a multi-metric Index of Biotic Integrity developed for the DEQ to assess Streams of the Commonwealth. The VA-SCI uses seven biotic metrics and one biotic index including Total Taxa, EPT Taxa, Percent Ephemeroptera, Percent Plecoptera + Trichoptera (Excluding Hydropsychidae), Percent Scrapers, Percent Chironomidae, Percent Top Two Dominant Taxa, and Hilsenhoff Biotic Index. The individual metrics and index used are defined and described as follows:

- Total Taxa Richness. Total Taxa Richness represents the total number of taxa in a sample. Total Taxa Richness is expected to be relatively high in undisturbed streams and is expected to decrease in response to environmental disturbance. Total Taxa Richness can range from 0-22 for the VA-SCI.

- EPT Taxa Richness. EPT Taxa Richness represents the number of taxa from the aquatic insect orders Ephemeroptera, Plecoptera, and Trichoptera. EPT taxa are generally very sensitive to pollution. Total EPT Taxa Richness is expected to be relatively high in undisturbed streams, and it is expected to decrease in response to environmental disturbance. EPT Taxa Richness can range from 0-11 for the VA-SCI.

- Percent Ephemeroptera. The Percent Ephemeroptera represents the ratio of members of the aquatic insect order Ephemeroptera (mayflies) to the total number of individuals in a sample. Mayflies are generally very sensitive to pollution, thus Percent Ephemeroptera is expected to decrease in response to environmental disturbance. Percent Ephemeroptera can range from 0-61.3 for the VA-SCI.

- Percent Plecoptera + Trichoptera (Excluding Hydropsychidae). The Percent Plecoptera + Trichoptera (Excluding Hydropsychidae) represents the ratio of members of the aquatic insect orders Plecoptera (stoneflies) and Trichoptera (caddisflies) (excluding the those in the pollution tolerant family Hydropsychidae) to the total number of individuals in a sample. Percent Plecoptera + Trichoptera (Excluding Hydropsychidae) is expected to decrease in response to environmental disturbance. Percent Plecoptera + Trichoptera (Excluding Hydropsychidae) can range from 0-35.6 for the VA-SCI.

- Percent Scrapers. The Percent Scrapers represents the ratio of taxa adapted primarily for scraping food from a substrate to the total number of individuals in a sample. Percent Scrapers is expected to decrease in response to environmental disturbance. Percent Scrapers can range from 0-51.6 for the VA-SCI.

- Percent Chironomidae. The Percent Chironomidae represents the ratio of members of the aquatic insect family Chironomidae (non-biting midges) to the total number of individuals in a sample. Because chironomids are generally tolerant to pollution, Percent Chironomidae is expected to increase in response to environmental disturbance. Percent Chrionomidae can range from 0-100 for the VA-SCI.

- Percent Top Two Dominant. The Percent Top Two Dominant is the ratio of the top two most abundant taxa in a sample to the total number of individuals in a sample. Percent Top Two Dominant is expected to increase in response to environmental disturbance. Percent Top Two Dominant can range from 30.8-100 for the VA-SCI.

- Hilsenhoff Biotic Index (HBI). The Hilsenhoff Biotic Index is the abundance-weighted average tolerance of assemblage of organisms (Family taxonomic level). The HBI is expected to increase in response to environmental disturbance. The HBI can range from 3.2-10 for the VA-SCI.

- The VA-SCI was calculated by taking the weighted average of the individual metric (and index) scores, with an VA-SCI range of 0-100. The weighting is as follows:

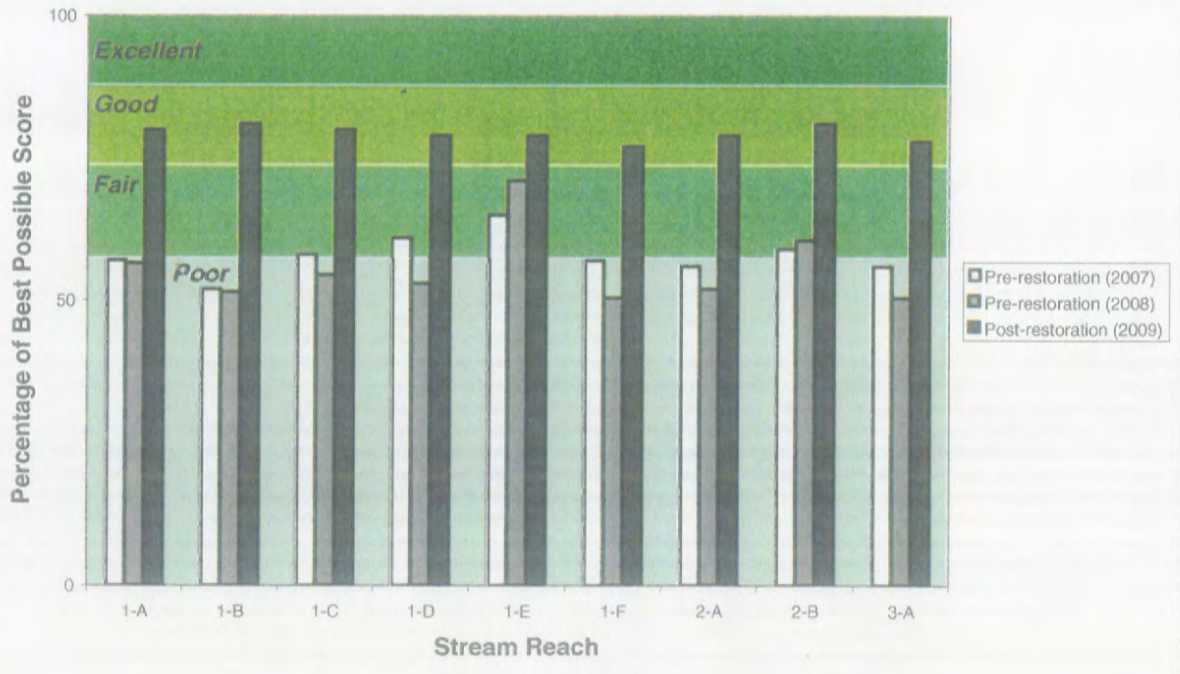
    - Total Taxa: Score = 100 x (X/22), where X = Metric Value
    - EPT Taxa: Score = 100 x (X/11), where X = Metric Value
    - Percent Ephemeroptera: Score = 100 x (X/61.3), where X = Metric Value
    - Percent Plecoptera + Trichoptera less Hydropsychidae: Score = 100 x (X/35.6), where X = Metric Value
    - Percent Scrapers: Score = 100 x (X/51.6), where X = Metric Value
    - Percent Chironomidae: Score = 100 x [(100-X) (100-0)], where X = Metric Value
    - Percent Top 2 Dominant: Score = 100 x [(100-X) (100-30.8)], where X = Metric Value
    - Hilsenhoff Biotic Index: Score = 100 x [(100-X) (100-3.2)], where X = Metric Value

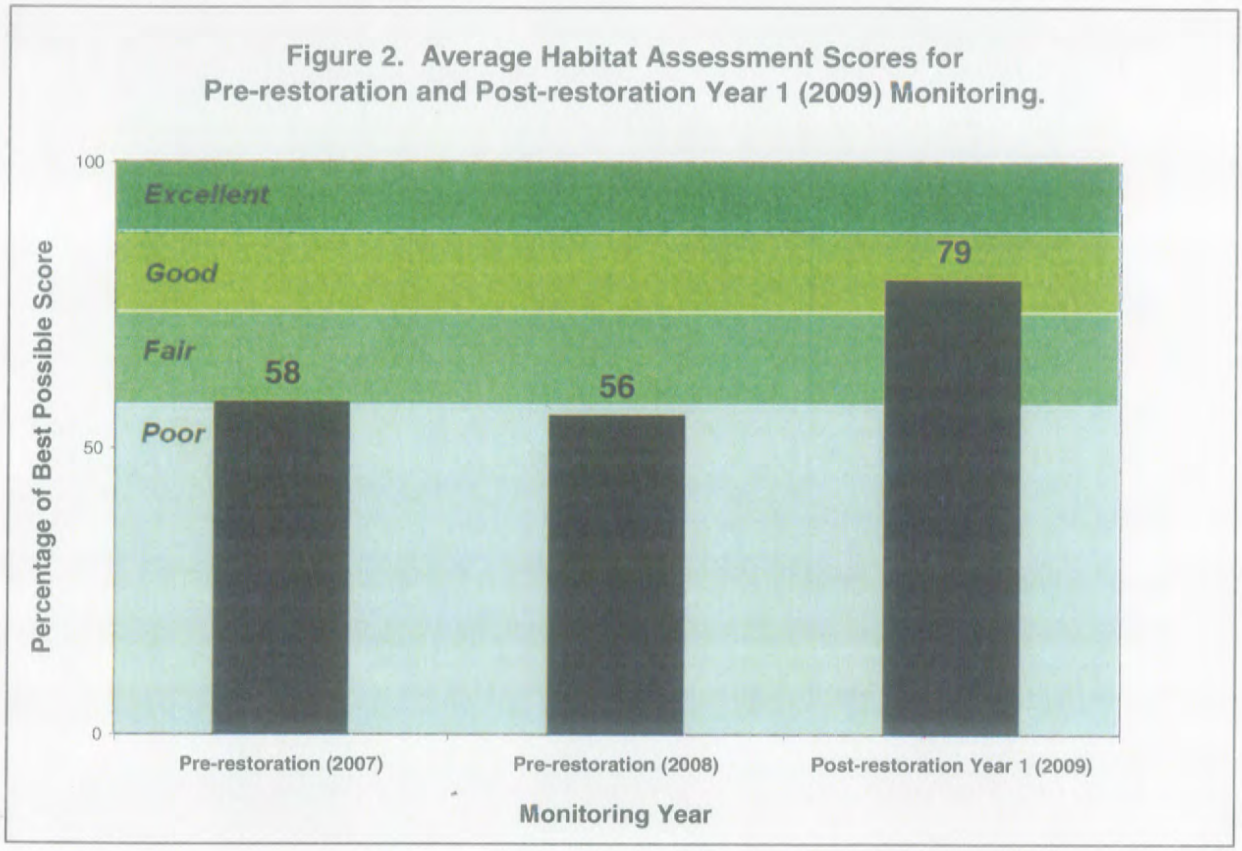
Each reach was then assigned a narrative rating according to the calculated VA-SCI, where "Excellent" is >73, "Good" is 60-72, "Stress" is 43-59, and "Severe Stress" is <42.

Biological Stream Monitoring Results and Discussion. Habitat results for 2009 show that all restored biological monitoring stream reaches (Reaches 1-A through 1-F, 2-A, 2-B and 3-A) have "good" habitat condition (Figure 1, Table 1) following restoration. The average habitat assessment score for all restored streams assessed within the Snakeden Branch Watershed portion of the NVSRB in 2009 is 158, which is 79 percent of the best possible score ("Good"). These results show improved habitat conditions following restoration, with average scores exceeding the pre-restoration scores (Figure 1 and Figure 2), and it is expected that this trend will continue over time. Improved habitat assessment scores relate to the success of the well vegetated and stabilized banks, with little erosion or depositional zones present throughout the restored reaches.

Table 1. 2009 Snakeden Branch Watershed Total Habitat Assessment Scores.			
REACH	**Habitat Assessment Score**	**Percent Best Possible Score**	**Narrative Rating**
1-A	159	80	Good
1-B	162	81	Good
1-C	159	80	Good
1-D	158	79	Good
1-E	157	79	Good
1-F	153	77	Good
2-A	158	79	Good
2-B	161	81	Good
3-A	155	78	Good
Average	**158**	**79**	Good

Figure 1. Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 Monitoring Years





Benthic macroinvertebrate results show that individuals from 17 taxa[9] were collected from all nine reaches collectively (Table 2, below) during the 2009 post-construction (Year 1) benthic macroinvertebrate monitoring. These 17 taxa include physid snails (Family Physidae); naiadid, tubificid, and unknown oligochaete worms (Families Naiadidae, Tubificidae, and Oligochaeta Family #1); black fly, crane fly, biting midge, mosquito, dance fly, and non-biting midge larvae (Families Simuliidae, Tipulidae, Ceratopogonidae, Culicidae, Empididae, and Chironomidae, respectively); common net-spinning caddisfly larvae (Family Hydropsychidae); aquatic weevils, predaceous diving beetles, riffle beetles, and water scavenger beetles (Families Curculionidae, Dytiscidae, Elmidae, and Hydrophilidae, respectively); narrow-winged damselfly larvae (Family Coenagrionidae); and small minnow mayfly larvae (Family Baetidae). Of all 17 taxa collected, non-biting midge larvae and oligochaete worms comprised the majority of individuals in each reach (Table 2, below).

[9] *Although 19 taxa are listed in Table 2, Gastropoda, and Oligochaeta were not included as part of the total taxa collected within the study area, because individuals were too damaged to identify to the family-level.*

Table 2. 2009 Snakeden Branch Watershed Raw Data										
	REACH									
TAXA	1-A	1-B	1-C	1-D	1-E	1-F	2-A	2-B	3-A	Total
BAETIDAE	1	1	2	1	-	-	-	1	-	6
CERATOPOGNIDAE	-	-	1	-	-	-	-	-	-	1
CHIRONOMIDAE	79	90	81	95	52	22	43	77	93	632
COENAGRIONIDAE	-	-	-	-	-	-	-	3	-	3
CULICIDAE	-	-	2	-	-	-	-	1	-	3
CURCULIONIDAE	1	-	-	-	-	-	-	-	2	3
DYTISCIDAE	-	1	-	-	-	-	-	1	1	3
ELMIDAE (L)	1	-	-	-	-	-	-	-	-	1
EMPIDIDAE	-	-	-	-	-	-	-	1	-	1
GASTROPODA	-	-	-	2	-	-	-	-	-	2
HYDROPHILIDAE	-	-	-	1	-	-	-	-	-	1
HYDROPSYCHIDAE	-	-	1	-	-	-	-	4	-	5
NAIDIDAE	-	-	-	1	4		2	-	1	8
OLIGOCHAETA	3	7	6	7	37	90	20	-	8	178
OLIGOCHAETA FAMILY #1	-	-	-	-	-	1	-	-	-	1
PHYSIDAE	1	-	12	3	-	-	-	-	5	21
SIMULIDAE	39	13	7	2	-	-	38	-	-	99
TIPULIDAE	-	-	-	-	1	-	-	-	-	1
TUBIFICIDAE	1	-	2	3	21	6	11	-	8	52
Total	**126**	**112**	**114**	**115**	**115**	**119**	**114**	**88**	**118**	**1021**

The above data collected for each reach were used to calculate the biotic metrics as shown in Table 3, below. The VA-SCI requires that these metrics be weighted to determine the VA-SCI, as shown in Table 4, below. The results of our data analysis indicate that the benthic macroinvertebrate community at all restored stream reaches (Reaches 1-A through 1-F, 2-A, 2-B, and 3-A) is in "Severe Stress" following restoration based on their VA-SCI scores (Table 4, below). The average VA-SCI numerical score for all restored streams assessed within the Snakeden Branch Watershed portion of the NVSRB in 2009 is 20.42 ("Severe Stress") (Figure 4, below).

Table 3. 2009 Snakeden Branch Watershed Biotic Metric Scores								
Reach	Total Taxa	Total EPT Taxa	Percent Ephemeroptera	Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	Percent Scrapers	Percent Chironomidae	Percent Top Two Dominant	HBI
1-A	7	1	0.79	0.00	1.59	62.70	93.65	5.87
1-B	5	1	0.89	0.00	0.00	80.36	91.96	5.61
1-C	8	2	1.75	0.00	10.53	71.05	81.58	5.96
1-D	7	1	0.87	0.00	2.61	82.61	88.70	5.68
1-E	4	0	0.00	0.00	0.00	45.22	77.39	4.84
1-F	3	0	0.00	0.00	0.00	18.49	94.12	1.61
2-A	4	0	0.00	0.00	0.00	37.72	71.05	5.37
2-B	7	1	1.14	0.00	0.00	87.50	92.05	6.06
3-A	6	0	0.00	0.00	4.24	78.81	92.37	5.95

Table 4. 2009 Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI									
METRIC	REACH								
	1-A	1-B	1-C	1-D	1-E	1-F	2-A	2-B	3-A
Total Taxa	31.82	22.73	36.36	31.82	18.18	13.64	18.18	31.82	27.27
EPT Taxa	9.09	9.09	18.18	9.09	0.00	0.00	0.00	9.09	0.00
Percent Ephemeroptera	1.29	1.46	2.86	1.42	0.00	0.00	0.00	1.85	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	3.08	0.00	20.40	5.06	0.00	0.00	0.00	0.00	8.21
Percent Chironomidae	37.30	19.64	28.95	17.39	54.78	81.51	62.28	12.50	21.19
Percent Top Two Dominant	9.18	11.61	26.62	16.34	32.67	8.50	41.83	11.50	11.02
HBI	60.81	64.60	59.47	63.55	75.83	123.33	68.11	57.99	59.57
VA-SCI Numerical Score	**19.07**	**16.14**	**24.11**	**18.08**	**22.68**	**28.37**	**23.80**	**15.59**	**15.91**
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	**20.42**								
Average VA-SCI Narrative Score	**Severe Stress**								

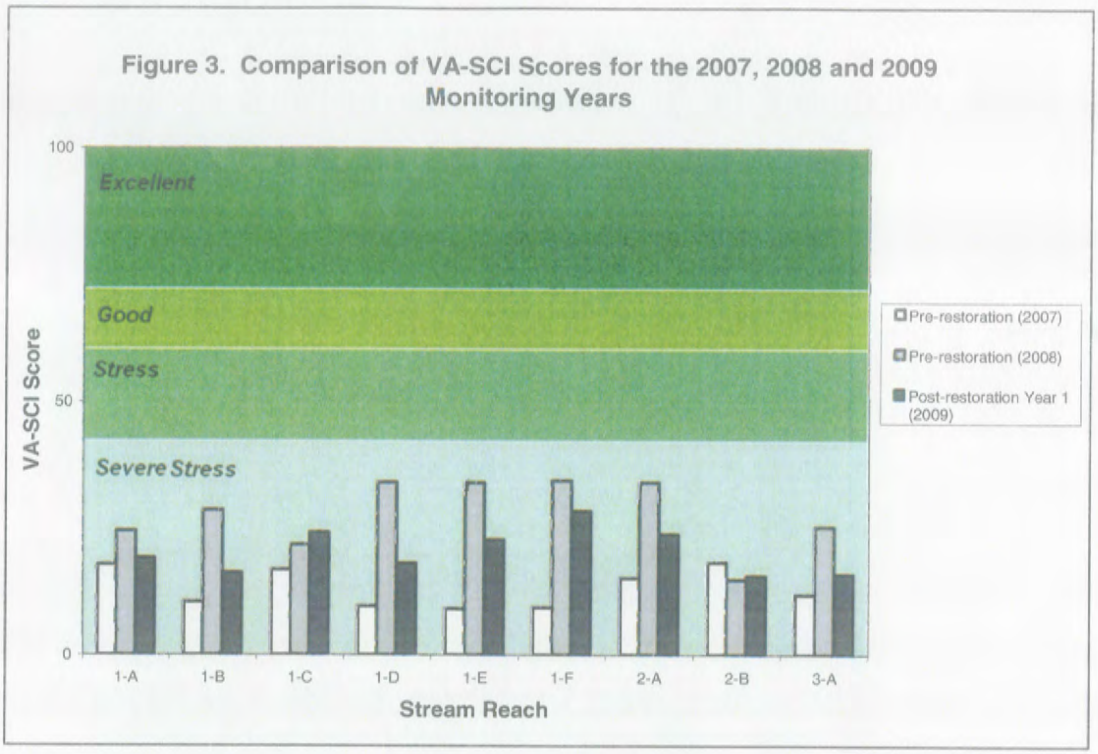


Figure 3. Comparison of VA-SCI Scores for the 2007, 2008 and 2009 Monitoring Years

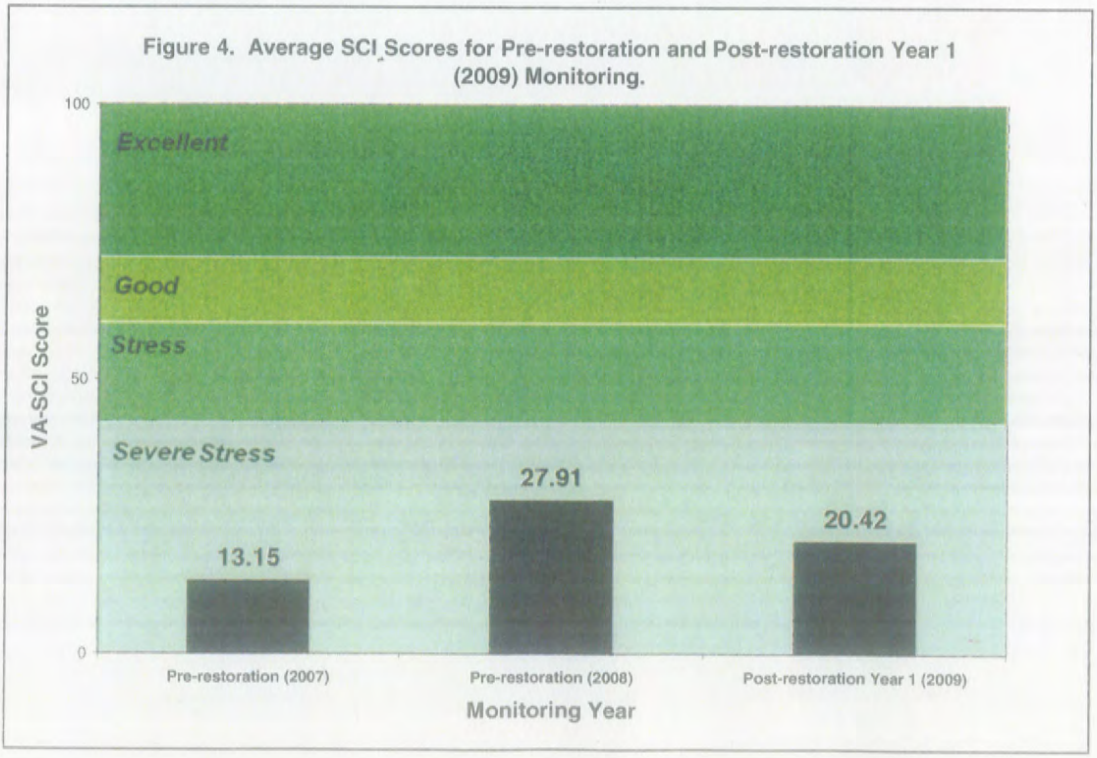
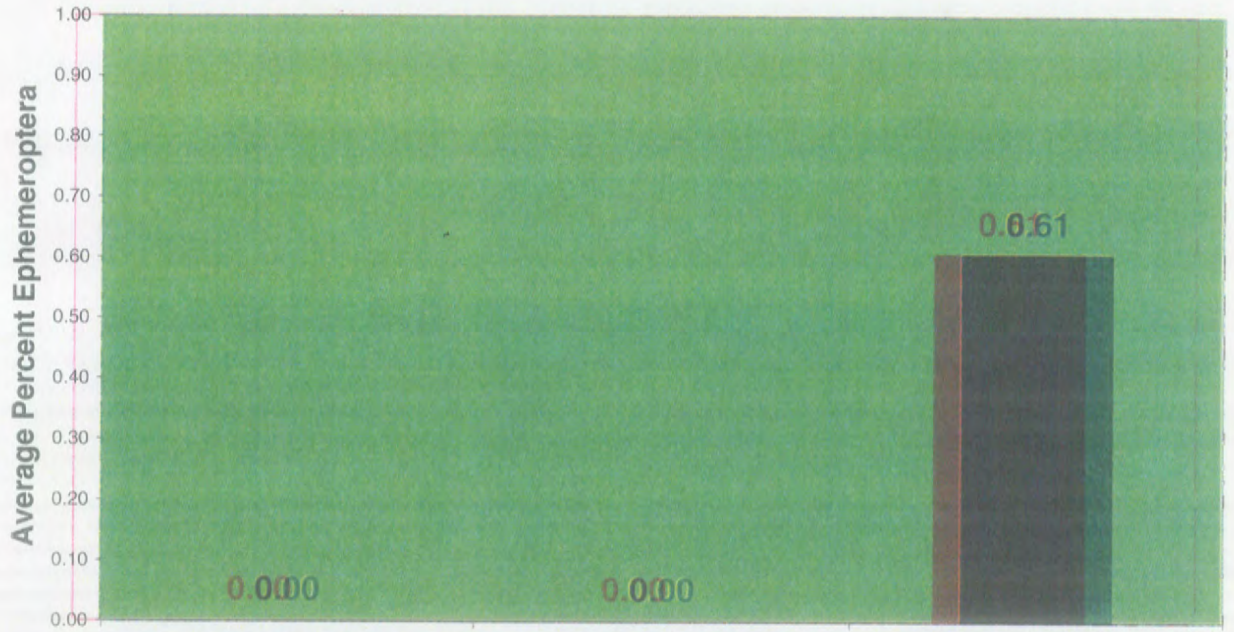


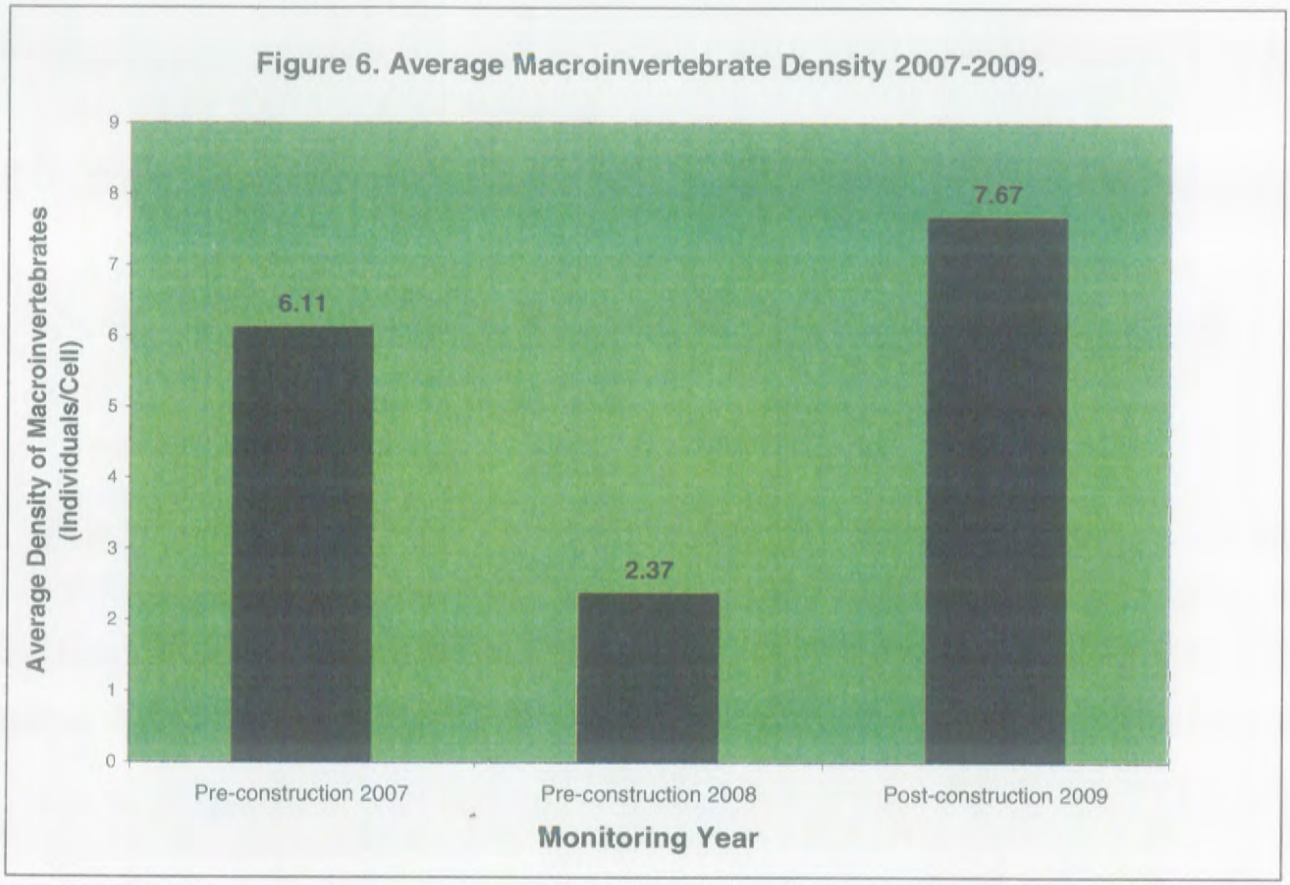
Figure 4. Average SCI Scores for Pre-restoration and Post-restoration Year 1 (2009) Monitoring.

These scores are the result of the low number of total taxa, low number of total EPT taxa, low number of Ephemeroptera taxa, low percentage of Plecoptera + Trichoptera (excluding Hydropsychidae taxa), low percentage of Scraper taxa, high percentage of Chironomidae, high percentage of top two dominant taxa, and high HBI found within the reaches assessed (Table 3).

Although VA-SCI scores following the restoration are lower on average than VA-SCI scores during the 2008 pre-restoration monitoring, VA-SCI scores in 2009 have exceeded the 2007 pre-restoration monitoring scores. It is expected that the VA-SCI scores would decrease immediately following restoration efforts due to the recent disturbance. Although it is still very low, average Percent Ephemeroptera has increased following restoration (Figure 5), as well as macroinvertebrate density (Figure 6).

Figure 5. Average Percent Ephemeroptera 2007-2009.





Although macroinvertebrate density is not always correlated with biotic condition, these results suggest that the restoration has provided a stable substrate for macroinvertebrate colonization, as shown in our 2009 stream habitat scores and observed increase in macroinvertebrate density (Figure 6). The increase in mayfly larvae, which are generally sensitive taxa, also suggests that the restoration has provided more stability. However, the overall low VA-SCI scores in 2009 indicate that water quality within the Snakeden Branch Watershed is still poor.

An analysis of land use within the watershed of each stream reach indicates that each watershed is highly developed, with all reaches having greater than 20 percent impervious land cover (with a weighted watershed average of 38 percent), as depicted in the Land Cover Map (Exhibit 5 and Table 5, below). It has been documented that increases in watershed imperviousness reduce macroinvertebrate diversity, such that when imperviousness exceeds 10 to 15 percent, macroinvertebrate diversity becomes low (Klein 1979). Runoff from the highly impervious land within these watersheds typically produces a high volume and velocity of flowing water and sediment in the stream channels during storm events. As a result, epifaunal substrate/available cover within these streams becomes highly mobile and benthic macrofauna can not easily colonize the available substrate (Debrey and Lockwood 1990) or get buried and killed by high sediment deposition (Wood and Armitage 1997). However, because the restored streams within our study area have been engineered to accommodate high volume flows, future habitat degradation should be minimized and it is anticipated that benthic condition may increase overtime if water quality enhancing measures undertaken in the watershed.

Table 5. Impervious Land Cover and VA-SCI for Each Reach			
REACH	Watershed Acres	Percent Impervious	VA-SCI
1-A	863	38	24.43
1-B	540	45	28.53
1-C	386	46	21.68
1-D	291	45	34.03
1-E	77	50	33.97
1-F	55	47	34.40
2-A	256	26	34.02
2-B	169	25	14.85
3-A	75	49	25.28

Nutrients, pesticides, and other chemical pollutants that enter the streams through runoff, stormwater pipes, or other sources can also have a negative effect on water quality and the macroinvertebrate community (Wright et al 1995; O'Halloran et al. 1996; Kiffney and Clements 1994). Sources for such pollutants within the streams we assessed likely include residential lawns, roads, the Reston National Golf Course, waterfowl, faulty sewer lines, and oil spills and leaks. Evidence of nutrient pollution input into Snakeden Branch can be found in the DEQ Final 2006 305(b)/303(d) Water Quality Assessment Integrated Report (Integrated Report), dated October 30, 2006 and approved by the EPA on October 16, 2006. In this report the DEQ identified Snakeden Branch as an impaired water body, based on high numbers of *Escherichia coli*, which is an indicator of fecal bacterial contamination from urban/residential areas within the watershed (DEQ 2006c). In addition, in July 2009, both a waste cooking oil spill and a continuous diesel fuel leak were discovered just above biomonitoring Reach 1-E in two separate incidents. The incidents are since being remediated by Fairfax County (Foremsky 2009). High amounts of such pollutants into streams inevitably result in a shift in macroinvertebrate community composition, where pollution tolerant taxa such as non-biting midges and oligochaete worms out-compete pollution sensitive taxa such as EPT (Shueler 1994). Thus, it is not a surprise that our 2009 benthic macroinvertebrate results show low VA-SCI scores and non-biting midges and oligochaete worms as dominant taxa. However, because the restoration has provided a stable substrate for colonization of benthic macroinvertebrates, we anticipate an increase in benthic condition over time through colonization. Note that in order to accomplish a significant improvement within these streams, water quality enhancements likely will need to be undertaken within the watershed.

VII. Conclusions

The above results indicate that the habitat of the streams within the Snakeden Branch watershed portion of the NVSRB on average has increased following restoration. Although benthic macroinvertebrate density and Percent Ephemeroptera (a sensitive taxa) have increased slightly following restoration, the overall benthic macroinvertebrate condition has not improved. These results suggest that the restoration has provided a stable substrate for colonization, but other water quality measures not directly addressed through the restoration (i.e., nutrients, oil spills, etc.) are affecting these streams. It will also take time for benthic macroivertebrates to re-colonize these streams and in

order to maximize colonization, water quality enhancements would need to be undertaken within the watershed as well.

VIII. Limitations

This study is based on examination of the conditions on the site at the time of our review and does not address conditions in the future. Such conditions may change over time and will be addressed in subsequent monitoring reports. Our biological monitoring report has been prepared in accordance with generally accepted guidelines for the conduct of such evaluations. We make no other warranties, either expressed or implied, and our report is not a recommendation to buy, sell or develop the property.

We offer no opinion and do not purport to opine on the possible application of various building codes, zoning ordinances, other land use or platting regulations, environmental or health laws and other similar statutes, laws, ordinances, code and regulations affecting the possible use and occupancy of the property for the purpose for which it is being used, except as specifically provided above. The opinions set forth above are rendered only and exclusively for the benefit of the addressees, the COE, the DEQ, and no other parties, successors or assigns. The foregoing opinions are based on applicable laws, ordinances, and regulations in effect as of the date hereof and should not be construed to be an opinion as to the matters set out herein should such laws, ordinances or regulations be modified, repealed or amended.

This document is solely for your benefit and is not to be quoted in whole or in part or otherwise referred to in any statement or document (except for purposes of identification) nor is it to be filed with any governmental agency or other person (other than the COE and DEQ), without the prior written consent of this firm, unless required by law.

WETLAND STUDIES AND SOLUTIONS, INC.

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Project Environmental Scientist

Mark Headly, PWS, PWD, LEED® AP
Executive Vice President

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Vicinity Map
Snakeden Branch
WSSI #20003
Scale: 1" = 2000'

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USGS Quad Map
Vienna, VA-MD 1994
Snakeden Branch
WSSI #20003
Scale: 1" = 2000'

Latitude: 38°55'59" N
Longitude: 77°21'00" W
Hydrologic Unit Code (HUC): 02070008
Stream Class: III
Name of Watershed: Snakeden Branch

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Stream Reach Location Map
Snakeden Branch
WSSI #20003
Scale: 1" = 600'

N
W E
S

Design Reach 1
Sampling Reach 1F
Design Reach 2
Sampling Reach 1E
Design Reach 3
Design Reach 4
Design Reach 5
Design Reach 6B
Design Reach 6A
Design Reach 6
Design Reach 8A
Design Reach 8
Design Reach 7
Sampling Reach 3A
Sampling Reach 1D
Sampling Reach 1C
Design Reach 9
Design Reach 10
Design Reach 11
Sampling Reach 1B
Design Reach 13
Design Reach 14
Sampling Reach 2B
Design Reach 15
Sampling Reach 2A
Design Reach 16
Design Reach 12
Design Reach 17
Sampling Reach 1A

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Exhibit 3

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Biological Stream Monitoring Map 2009

Northern Virginia Stream Restoration Bank

Snakeden Branch Watershed

Reston, Virginia

77°21'40"W 77°21'20"W 77°21'0"W 77°20'40"W 77°20'20"W

38°56'40"N 38°56'20"N

Sampling Reach 1F
Photo
Design Reach 1
Reston Parkway
Sampling Reach 1E
Photo
Design Reach 2
Colts Neck Road
Design Reach 3
Design Reach 6B
Design Reach 6A
Design Reach 6
Design Reach 6C
South Lakes Drive
Design Reach 13
Photo
Sampling Reach 2B
Terraset Elementary School
Design Reach 14
Langston Hughes Middle School
Lake Thoreau
Glade Drive
Design Reach 4
Design Reach 4
Design Reach 5
Photo
Sampling Reach 1D
Photo
Sampling Reach 3A
Design Reach 7
Design Reach 8
Photo
Sampling Reach 1C
Snakeden Branch
Design Reach 9
Soapstone Road
Design Reach 15
Sampling Reach 2A
Photo
South Lakes High School
South Lakes Drive
Hunters Woods Elementary School
Design Reach 12
Photo
Sampling Reach 1B
Design Reach 10
Design Reach 11
Design Reach 16
Design Reach 17
Sampling Reach 1A
Photo
Glade Drive
Soapstone Road
Lake Audubon

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Key Map
Map Area
Fairfax

Virginia Coordinate System of 1983
(VCS NAD 83), North Zone, U.S. Survey Foot

0 250 500 1,000 Feet

Scale 1" = 250'

Legend

- 300 LF Biological Sampling Reaches
- Restored Streams (Bankfull)
- Stream Restoration Easements

December 2008 Aerial Imagery Source: Aerials Express

Exhibit 4

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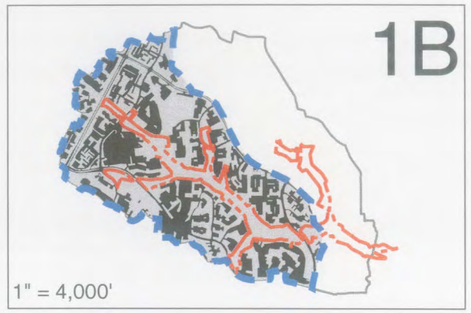
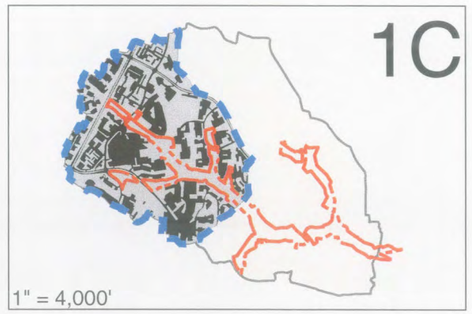
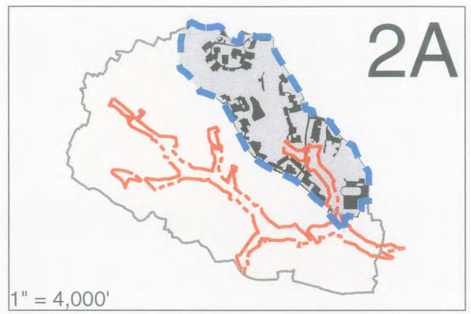
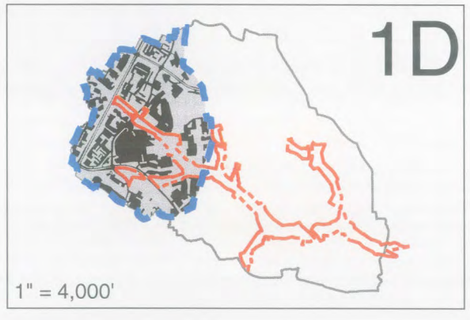


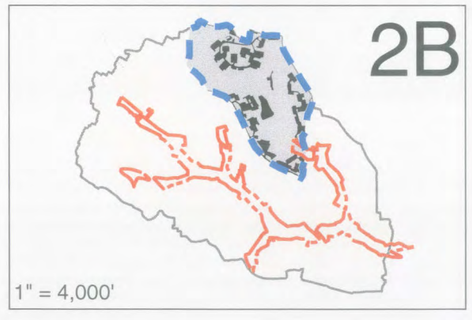


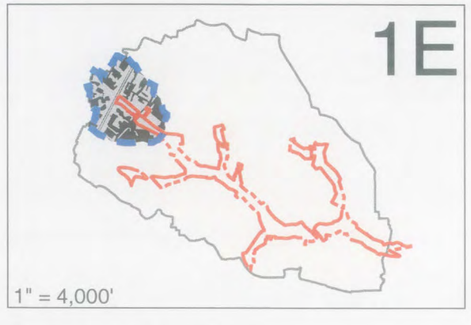


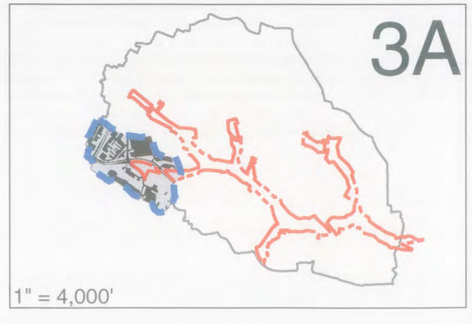
Land Cover Map

Snakeden Branch
Scale as Noted









Stream ID	Impervious Percent	Total Acres
1A	38%	863
1B	45%	540
1C	46%	386
1D	45%	291
1E	50%	77
1F	47%	55
2A	26%	256
2B	25%	169
3A	49%	75

STREAM RESTORATION EASEMENTS

DRAINAGE BOUNDARIES

IMPERVIOUS AREAS

PERVIOUS AREAS

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Exhibit 5

EXHIBIT 6 – INDIVIDUAL REACH DATA

- BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
- COMPARISON OF HABITAT ASSESSMENT SCORES
- HABITAT ASSESSMENT DATA SHEET
- BENTHIC MACROINVERTEBRATE FIELD DATA SHEET
- COMPARISON OF VA-SCI SCORES
- BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET
- BIOTIC METRIC SCORES AND VA-SCI SCORES BY MONITORING YEAR

REACH 1-A
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking northwest (upstream) at Reach 1-A of Snakeden Branch on the eastern portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking northwest (upstream) at Reach 1-A of Snakeden Branch on the eastern portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 1-A
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. **Looking northwest (upstream) at Reach 1-A of Snakeden Branch on the eastern portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.**

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 1-A

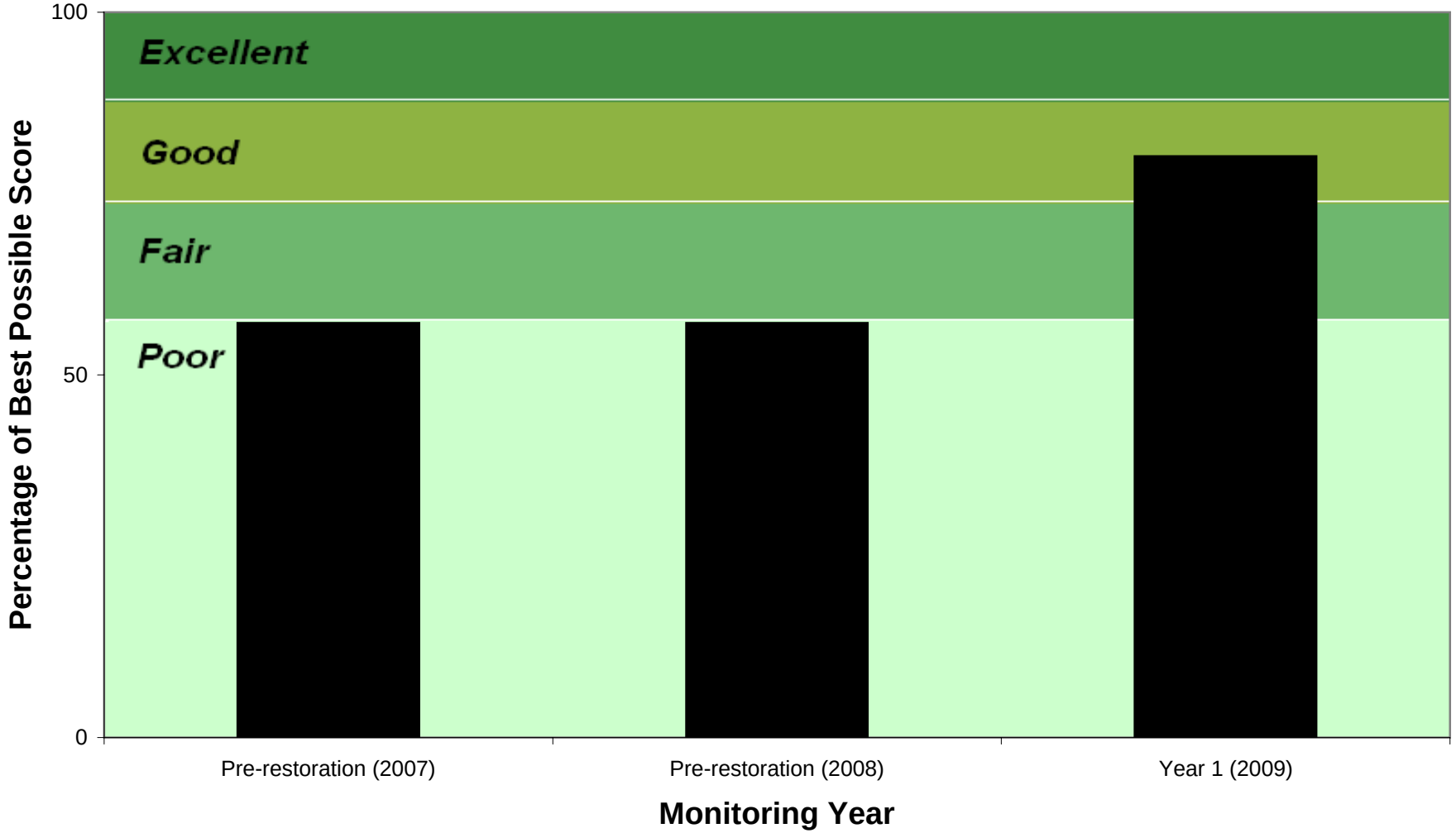

EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	1-A	Marginal	Marginal	Optimal	Marginal	Marginal	Optimal	Optimal	Poor	Poor	Optimal	114	57	300	R3
	Pre-restoration (2008)	1-A	Marginal	Poor	Suboptimal	Marginal	Marginal	Optimal	Optimal	Poor	Optimal	Optimal	113	57	300	R3
	Year 1 (2009)	1-A	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Suboptimal	Optimal	159	80	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

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WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	10:00AM
Investigators		**HUC**	Potomac	**Locality**	
BNR/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-A		863	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Score
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 maintainance 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.	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	13
3. 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).	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		66

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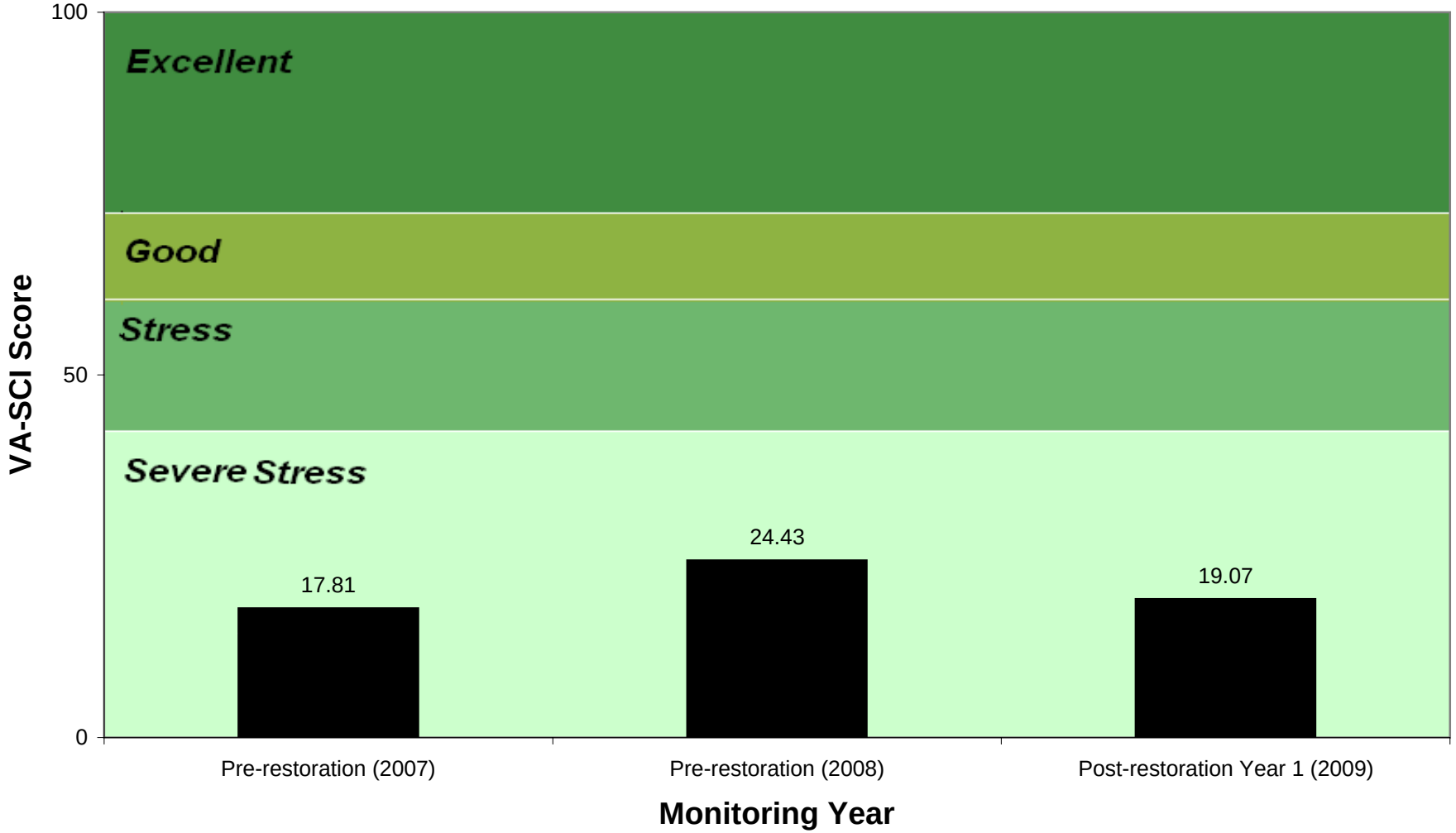
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	10:00AM
Investigators		**HUC**	Potomac	**Locality**	
SDS/BNR		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-A		863	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Score
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
Total Score					159

Comparison of VA-SCI Scores for Reach 1-A:
2007, 2008 and 2009 Monitoring Years



WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/20/2009	9.23AM

Investigators	HUC	Locality
BNR/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
1-A	863	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	80	**Sand**	40	**Rootwads**	0	**Vegetated Banks**	5
Large Woody Debris	0	**Undercut Banks**	0	**Leaf Packs**	0		

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	19	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	0
				Vegetated Banks	1	*Large Woody Debris*	0

General Comments

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	4	Slimes	0
Filamentous Algae	0	Macroinvertebrates	3
Macrophytes	1	Fish	1

Wetland Studies and Solutions, Inc.

WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post Con. 2009	20003	1-A	BNR/SDS	1	128
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/29/2009	6/24/2009	ASO	ASO	11	126

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		TETRASTEMMATIDAE		CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		NOCTUIDAE		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		TAENIOPTERGIDAE	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
BAETIDAE	1	MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		CORYDALIDAE		BRACHYCENTRIDAE	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		CALAMOCERATIDAE	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		SIALIDAE		DIPSEUDOPSIDAE	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		GLOSSOSOMATIDAE	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anisptera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		AESHNIDAE		HELICOPSYCHIDAE	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		HYDROPSYCHIDAE	
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		CORDULEGASTRIDAE		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		CORDULIIDAE		Parapsyche sp.	
Ephemera sp.		GOMPHIDAE		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		HYDROPTILIDAE	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		LEPIDOSTOMATIDAE	
LEPTOPHLEBIDAE		LIBELLULIDAE		Lepidostoma sp.	
Leptophlebia sp.		MACROMIIDAE		LEPTOCERIDAE	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		PETALURIDAE		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		CALOPTERYGIDAE		LIMNEPHILIDAE	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		COENAGRIONIDAE		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		LESTIDAE		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	3	MOLANNIDAE	
Siphlonurus sp.		LUMBRICINA		Molanna sp.	
TRICORYTHIDAE		ENCHYTRAEIDAE		ODONTOCERIDAE	
Tricorythodes sp.		NAIDIDAE		Psilotreta sp.	
GASTROPODA - Snails		TUBIFICIDAE	1	PHILOPOTAMIDAE	
ANCYLIDAE		LUMBRICULIDAE		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		AEOLOSOMATIDAE		PHRYGANEIDAE	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		POLYCENTROPIDAE	
Stagnicola sp.		PERLIDAE		Cymellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE	1	Beloneuria sp.		PSYCHOMYIDAE	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		RHYACOPHILIDAE	
Gyraulus sp.		*Perlinella sp.*		Ryacophila sp.	
PLEUROCERIDAE		PERLODIDAE		UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		TUBELLARIA - Flatworms	
HAPLOSCLERIDA		Isoperla sp.		PLANARIIDAE	
SPONGILLIDAE		Cultus sp.		DENDROCOELIDAE	
HEMIPTERA - True Bugs		PTERONARCYIDAE			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		PELTOPERLIDAE			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		LEUCTRIDAE			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealeuctra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		CAPNIDAE			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		NEMOURIDAE			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post Con. 2009	20003	1-A	BNR/SDS	1	128
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/29/2009	6/24/2009	ASO	ASO	11	126

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	79	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE	1	Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE		Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccomis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE	1	Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Haliplus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	39
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinis sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

Reach 1-A Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	**Total Taxa**	**Total EPT Taxa**	**Percent Ephemeroptera**	**Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)**	**Percent Scrapers**	**Percent Chironomidae**	**Percent Top Two Dominant**	**HBI**
Pre-con 2007	9	1	0.00	1.69	2.54	81.36	92.37	6.39
Pre-con 2008	9	1	0.00	0.00	0.00	64.63	78.05	4.67
Post-con 2009	7	1	0.79	0.00	1.59	62.70	93.65	5.87

Reach 1-A Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
METRIC	**Monitoring Year**		
	2007	**2008**	**2009**
Total Taxa	40.91	40.91	31.82
EPT Taxa	9.09	9.09	9.09
Percent Ephemeroptera	0.00	0.00	1.29
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	4.76	0.00	0.00
Percent Scrapers	4.93	0.00	3.08
Percent Chironomidae	18.64	35.37	37.30
Percent Top Two Dominant	11.02	31.72	9.18
HBI	53.09	78.37	60.81
VA-SCI Numerical Score	**17.81**	**24.43**	**19.07**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 1-B
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking west (upstream) at Reach 1-B of Snakeden Branch on the eastern portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking west (upstream) at Reach 1-B of Snakeden Branch on the eastern portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 1-B
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. Looking west (upstream) at Reach 1-B of Snakeden Branch on the eastern portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 1-B

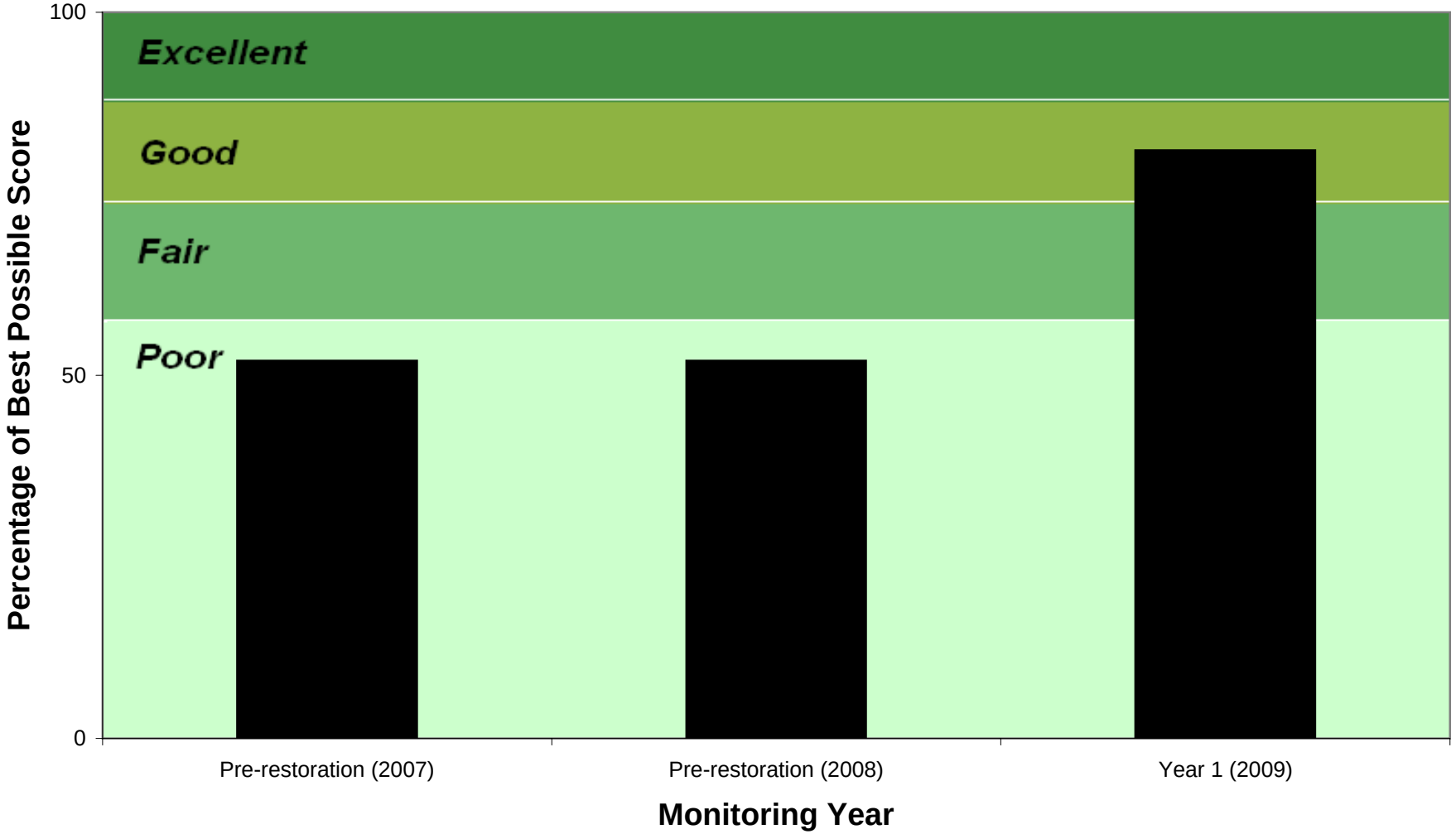

EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	1-B	Marginal	Marginal	Optimal	Marginal	Marginal	Optimal	Optimal	Poor	Poor	Optimal	103	52	300	R3
	Pre-restoration (2008)	1-B	Poor	Poor	Suboptimal	Poor	Marginal	Optimal	Optimal	Poor	Suboptimal	Optimal	103	52	300	R3
	Year 1 (2009)	1-B	Suboptimal	Suboptimal	Optimal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Suboptimal	Optimal	162	81	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

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WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	12:00PM
Investigators		**HUC**	Potomac	**Locality**	
BNR/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-B		540	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Score
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 maintainance 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.	
Score	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.	
Score	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).	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	16
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		69

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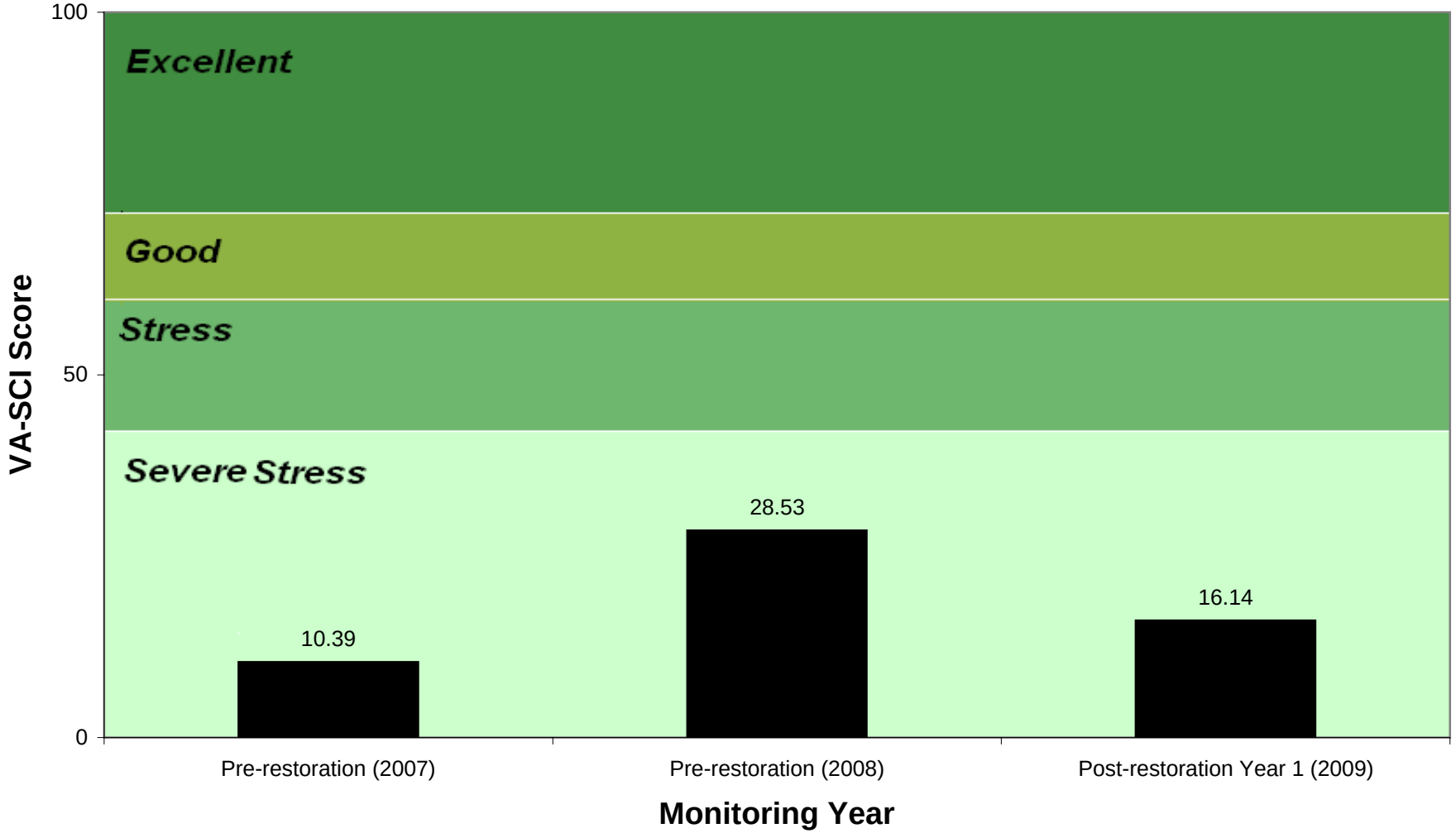
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	12:00PM
Investigators		**HUC**	Potomac	**Locality**	
BNR/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-B		540	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Score
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
			Total Score		162

Comparison of VA-SCI Scores for Reach 1-B:
2007, 2008 and 2009 Monitoring Years



Wetland Studies and Solutions, Inc.

WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/20/2009	11:32AM

Investigators	HUC	Locality
BNR/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
1-B	540	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	80	**Sand**	40	**Rootwads**	0	**Vegetated Banks**	5		
Large Woody Debris	0	**Undercut Banks**	0	**Leaf Packs**	0				

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	18	*Undercut Banks*	1
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	1
				Vegetated Banks	2	*Large Woody Debris*	0

General Comments

Red eared slider (Trachemys scripta elegans)

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	3	Slimes	0
Filamentous Algae	0	Macroinvertebrates	3
Macrophytes	1	Fish	0

WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post Con. 2009	20003	1-B	BNR/SDS	1	122
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/26/2009	6/26/2009	CEK	CEK	16	112

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	90	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE	1	Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	13
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post Con. 2009	20003	1-B	BNR/SDS	1	122
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/26/2009	6/26/2009	CEK	CEK	16	112

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE	1	MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	7	**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**		Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**		**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		**AEOLOSOMATIDAE**		**PHRYGANEIDAE**	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		**POLYCENTROPIDAE**	
Stagnicola sp.		**PERLIDAE**		Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE		Beloneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		*Perlinella sp.*		Ryacophila sp.	
PLEUROCERIDAE		**PERLODIDAE**		**UENOIDAE**	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		**TUBELLARIA - Flatworms**	
HAPLOSCLERIDA		Isoperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Cultus sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		**PTERONARCYIDAE**			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		**PELTOPERLIDAE**			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		**LEUCTRIDAE**			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		**CAPNIDAE**			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		**NEMOURIDAE**			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 1-B Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	**Total Taxa**	**Total EPT Taxa**	**Percent Ephemeroptera**	**Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)**	**Percent Scrapers**	**Percent Chironomidae**	**Percent Top Two Dominant**	**HBI**
Pre-con 2007	3	1	0.00	0.00	0.00	98.54	100.00	5.99
Pre-con 2008	12	0	0.00	0.00	14.94	58.62	71.26	5.79
Post-con 2009	5	1	0.89	0.00	0.00	80.36	91.96	5.61

Reach 1-B Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	**Pre-con 2007**	**Pre-con 2008**	**Pre-con 2009**
Total Taxa	13.64	54.55	22.73
EPT Taxa	9.09	0.00	9.09
Percent Ephemeroptera	0.00	0.00	1.46
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00
Percent Scrapers	0.00	28.96	0.00
Percent Chironomidae	1.46	41.38	19.64
Percent Top Two Dominant	0.00	41.53	11.61
HBI	58.93	61.87	64.60
VA-SCI Numerical Score	**10.39**	**28.53**	**16.14**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 1-C
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking northwest (upstream) at Reach 1-C of Snakeden Branch on the central portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking northwest (upstream) at Reach 1-C of Snakeden Branch on the central portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 1-C
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. Looking northwest (upstream) at Reach 1-C of Snakeden Branch on the central portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 1-C

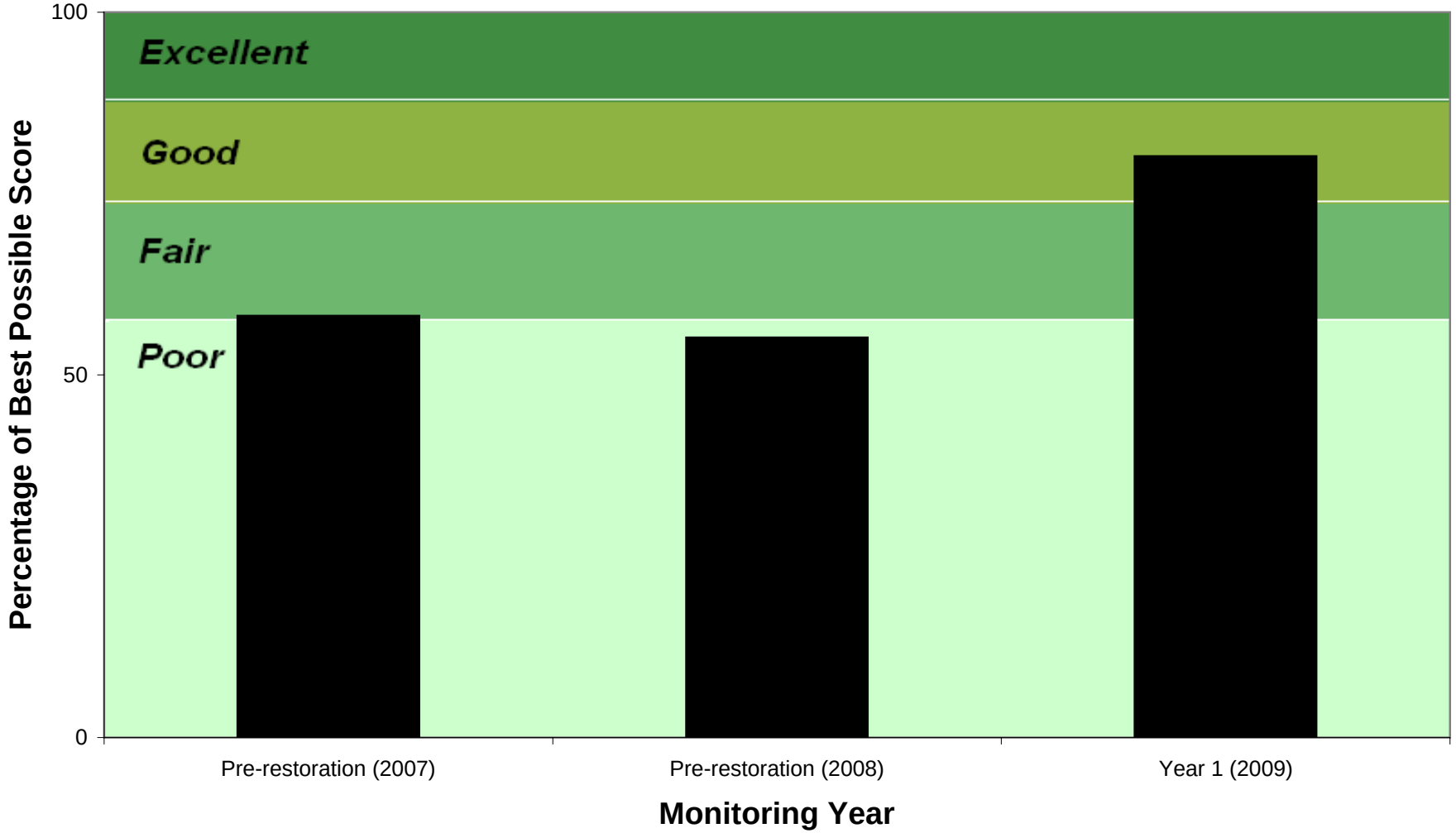

EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	1-C	Marginal	Marginal	Optimal	Marginal	Suboptimal	Optimal	Suboptimal	Poor	Poor	Optimal	116	58	300	R3
	Pre-restoration (2008)	1-C	Marginal	Marginal	Marginal	Marginal	Marginal	Optimal	Suboptimal	Poor	Optimal	Optimal	109	55	300	R3
	Year 1 (2009)	1-C	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Suboptimal	Optimal	159	80	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

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WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	1:40PM
Investigators		**HUC**	Potomac	**Locality**	
BNR/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-C		386	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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 maintainance 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.	
Score	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.	
Score	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).	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		66

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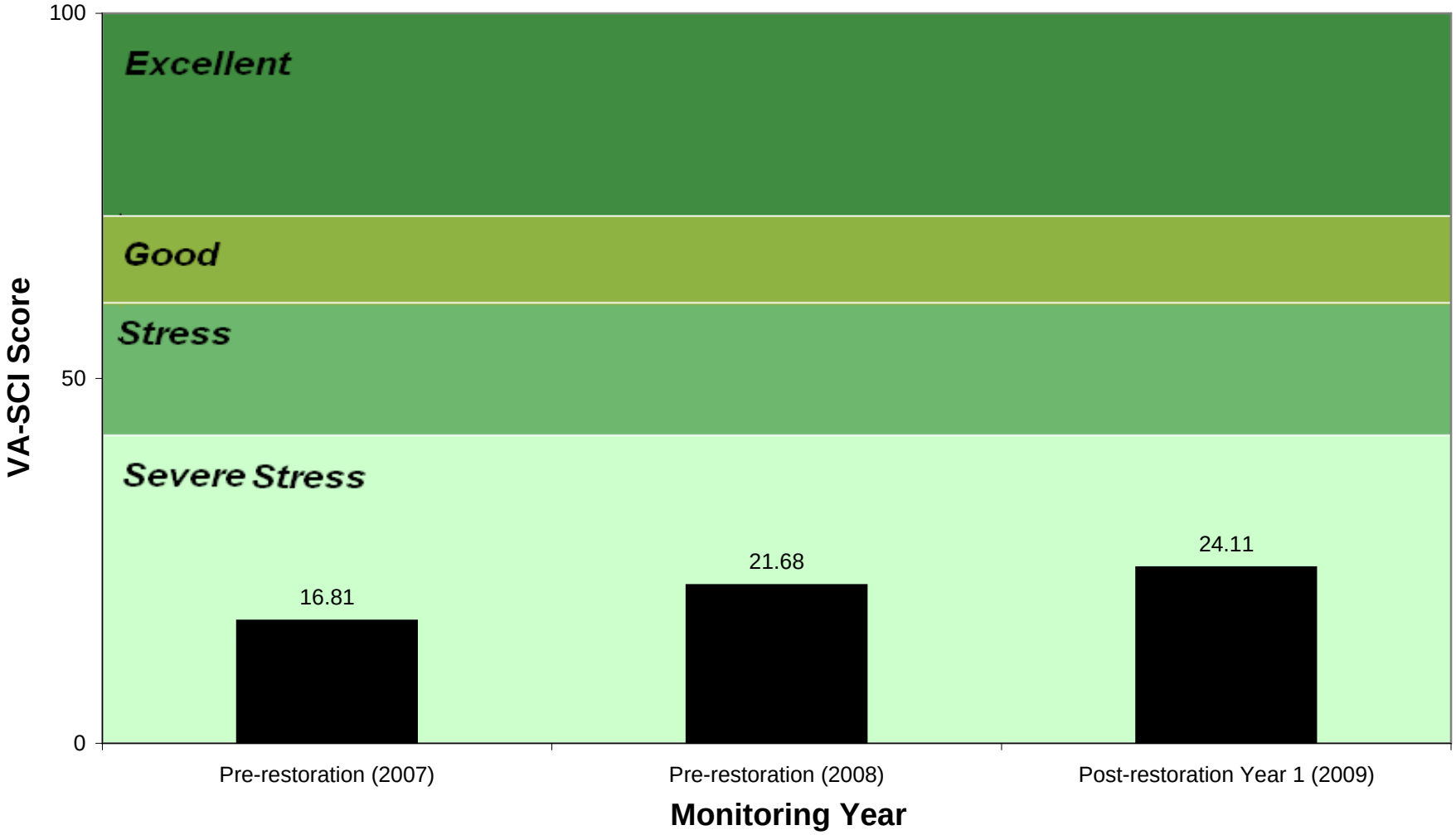
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	1:40PM
Investigators		**HUC**	Potomac	**Locality**	
BNR/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-C		386	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Score
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
Total Score					159

General Comments: Easement in reach.

Comparison of VA-SCI Scores for Reach 1-C: 2007, 2008 and 2009 Monitoring Years



Wetland Studies and Solutions, Inc.

WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/20/2009	1:30PM

Investigators	HUC	Locality
BNR/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
1-C	386	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	100	**Sand**	20	**Rootwads**	0	**Vegetated Banks**	5		
Submerged Macrophytes	0	**Undercut Banks**	0						
Large Woody Debris	2	**Leaf Packs**	5	**Other (bedrocks)**	5				

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	18	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	0
				Vegetated Banks	2	*Large Woody Debris*	0

General Comments

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	3	Slimes	0
Filamentous Algae	0	Macroinvertebrates	3
Macrophytes	1	Fish	1

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con. 2009	20003	1-C	SDS/BNR	1	128
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
7/1/2009	6/26/2009	ASO	SDS	24	114

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	81	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE		Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	2
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	7
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE	1	Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

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Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
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Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
7/1/2009	6/26/2009	ASO	SDS	24	114

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE	2	MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	1
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	6	**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**		Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**	2	**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		**AEOLOSOMATIDAE**		**PHRYGANEIDAE**	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		**POLYCENTROPIDAE**	
Stagnicola sp.		**PERLIDAE**		Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE	12	Beloneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		*Perlinella sp.*		Ryacophila sp.	
PLEUROCERIDAE		**PERLODIDAE**		**UENOIDAE**	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		**TUBELLARIA - Flatworms**	
HAPLOSCLERIDA		Isoperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Cultus sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		**PTERONARCYIDAE**			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		**PELTOPERLIDAE**			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		**LEUCTRIDAE**			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		**CAPNIDAE**			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		**NEMOURIDAE**			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 1-C Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	**Total Taxa**	**Total EPT Taxa**	**Percent Ephemeroptera**	**Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)**	**Percent Scrapers**	**Percent Chironomidae**	**Percent Top Two Dominant**	**HBI**
Pre-con 2007	8	1	0.00	0.00	2.78	79.63	94.44	6.24
Pre-con 2008	4	1	0.00	0.00	0.00	56.14	94.74	3.56
Post-con 2009	8	2	1.75	0.00	10.53	71.05	81.58	5.96

Reach 1-C Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	**Pre-con 2007**	**Pre-con 2008**	**Pre-con 2009**
Total Taxa	36.36	18.18	36.36
EPT Taxa	9.09	9.09	18.18
Percent Ephemeroptera	0.00	0.00	2.86
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00
Percent Scrapers	5.38	0.00	20.40
Percent Chironomidae	20.37	43.86	28.95
Percent Top Two Dominant	8.03	7.61	26.62
HBI	55.28	94.69	59.47
VA-SCI Numerical Score	**16.81**	**21.68**	**24.11**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 1-D
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking southwest (upstream) at Reach 1-D of Snakeden Branch on the central portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking southwest (upstream) at Reach 1-D of Snakeden Branch on the central portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 1-D
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. **Looking southwest (upstream) at Reach 1-D of Snakeden Branch on the central portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.**

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 1-D

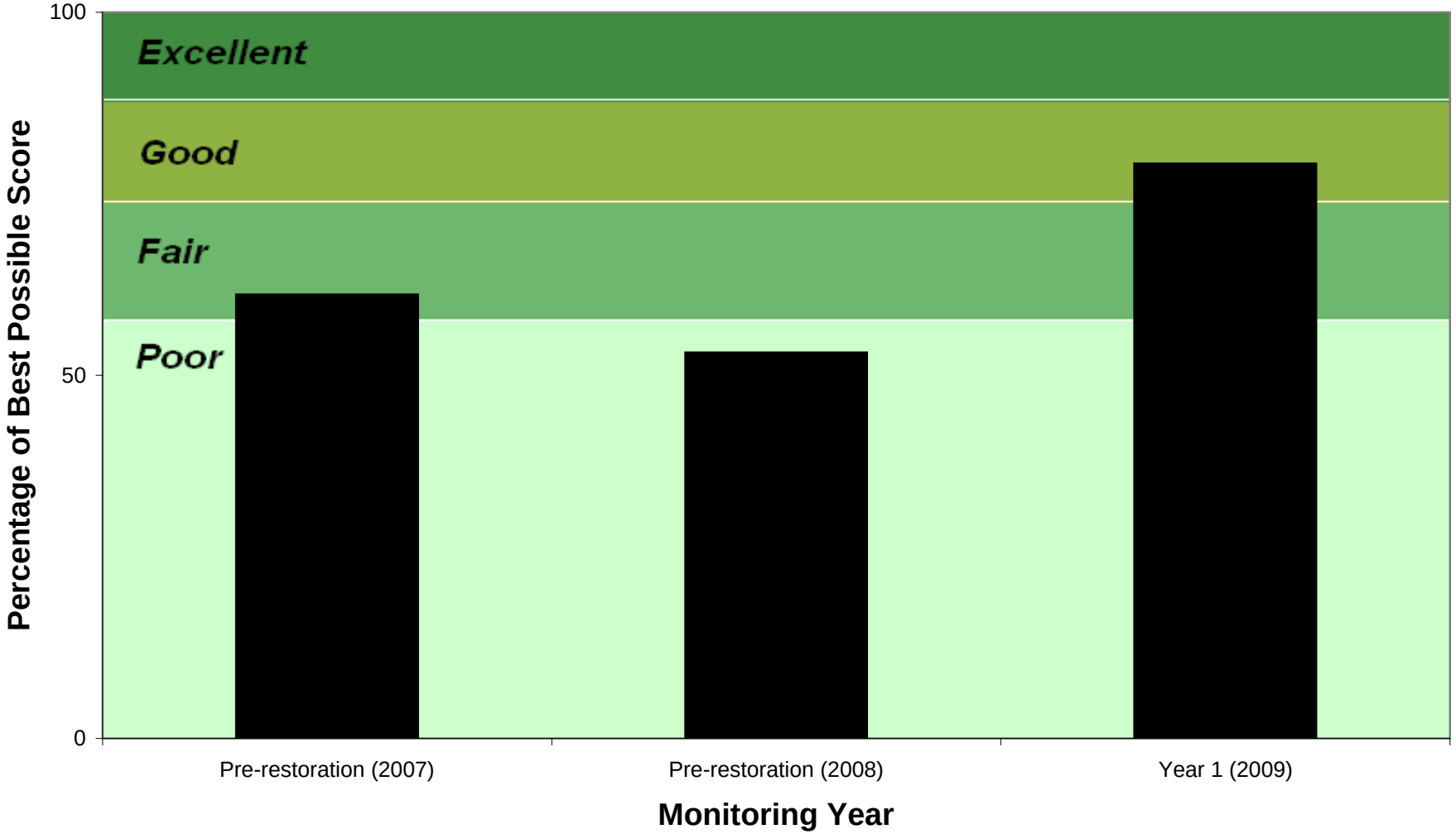

EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BRN/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	1-D	Marginal	Marginal	Optimal	Marginal	Suboptimal	Optimal	Optimal	Poor	Poor	Optimal	121	61	300	R3
	Pre-restoration (2008)	1-D	Marginal	Marginal	Optimal	Marginal	Suboptimal	Optimal	Optimal	Poor	Poor	Optimal	106	53	300	R3
	Year 1 (2009)	1-D	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Suboptimal	Optimal	158	79	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

Wetland Studies and Solutions, Inc.

WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	5/20/2009	2:00PM
Investigators		**HUC**		**Locality**	
BNR/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-D		291	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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 maintainance 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.	
Score	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.	
Score	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).	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		65

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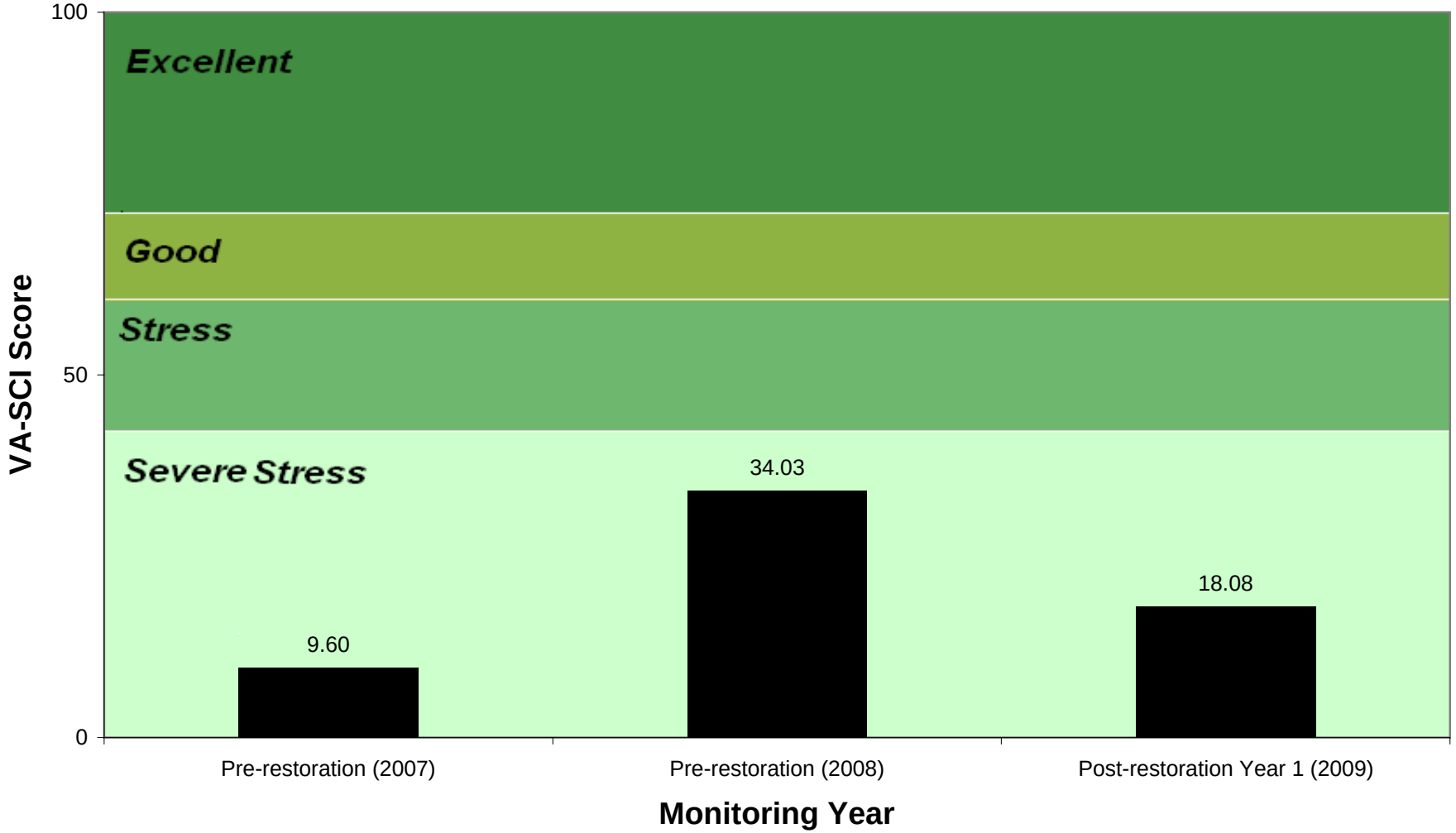
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	5/20/2009	2:00PM
Investigators		**HUC**		**Locality**	
P		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-D		291	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
Total Score					158

Comparison of VA-SCI Scores for Reach 1-D:
2007, 2008 and 2009 Monitoring Years



WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/20/2009	1:50PM

Investigators	HUC	Locality
BNR/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
1-D	291	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	80	**Sand**	30	**Rootwads**	0	**Vegetated Banks**	0		
Submerged Macrophytes	0	**Undercut Banks**	0						
Large Woody Debris	5	**Leaf Packs**	0	**Other (bedrocks)**	0				

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	18	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	0
				Vegetated Banks	2	*Large Woody Debris*	0

General Comments

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	3	Slimes	0
Filamentous Algae	1	Macroinvertebrates	2
Macrophytes	0	Fish	2

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch Post-Con 2009	20003	1-D	BNR/SDS	1	125
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/29/2009	6/29/2009	CAT	CAT	14	115

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	62	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE		Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch Post-Con 2009	20003	1-D	BNR/SDS	1	125
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/29/2009	6/29/2009	CAT	CAT	14	115

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE		MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms		**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**		Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**	17	**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		**AEOLOSOMATIDAE**		**PHRYGANEIDAE**	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		**POLYCENTROPIDAE**	
Stagnicola sp.		**PERLIDAE**		Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE		Beloneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		*Perlinella sp .*		Ryacophila sp.	
PLEUROCERIDAE		**PERLODIDAE**		**UENOIDAE**	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		**TUBELLARIA - Flatworms**	
HAPLOSCLERIDA		Isoperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Cultus sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		**PTERONARCYIDAE**			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		**PELTOPERLIDAE**			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		**LEUCTRIDAE**			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		**CAPNIDAE**			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		**NEMOURIDAE**			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 1-D Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	**Total Taxa**	**Total EPT Taxa**	**Percent Ephemeroptera**	**Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)**	**Percent Scrapers**	**Percent Chironomidae**	**Percent Top Two Dominant**	**HBI**
Pre-con 2007	2	0	0.00	0.00	0.00	78.48	100.00	6.86
Pre-con 2008	9	0	0.00	0.00	6.00	19.00	72.00	3.32
Post-con 2009	7	1	0.87	0.00	2.61	82.61	88.70	5.68

Reach 1-D Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	**Pre-con 2007**	**Pre-con 2008**	**Pre-con 2009**
Total Taxa	9.09	40.91	31.82
EPT Taxa	0.00	0.00	9.09
Percent Ephemeroptera	0.00	0.00	1.42
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00
Percent Scrapers	0.00	11.63	5.06
Percent Chironomidae	21.52	81.00	17.39
Percent Top Two Dominant	0.00	40.46	16.34
HBI	46.16	98.24	63.55
VA-SCI Numerical Score	**9.60**	**34.03**	**18.08**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 1-E
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking northwest (upstream) at Reach 1-E of Snakeden Branch on the western portion of the study area during the 2007 preconstruction fieldwork. Photographs taken April 2007.**

2. **Looking northwest (upstream) at Reach 1-E of Snakeden Branch on the western portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 1-E
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. **Looking northwest (upstream) at Reach 1-E of Snakeden Branch on the western portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.**

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 1-E

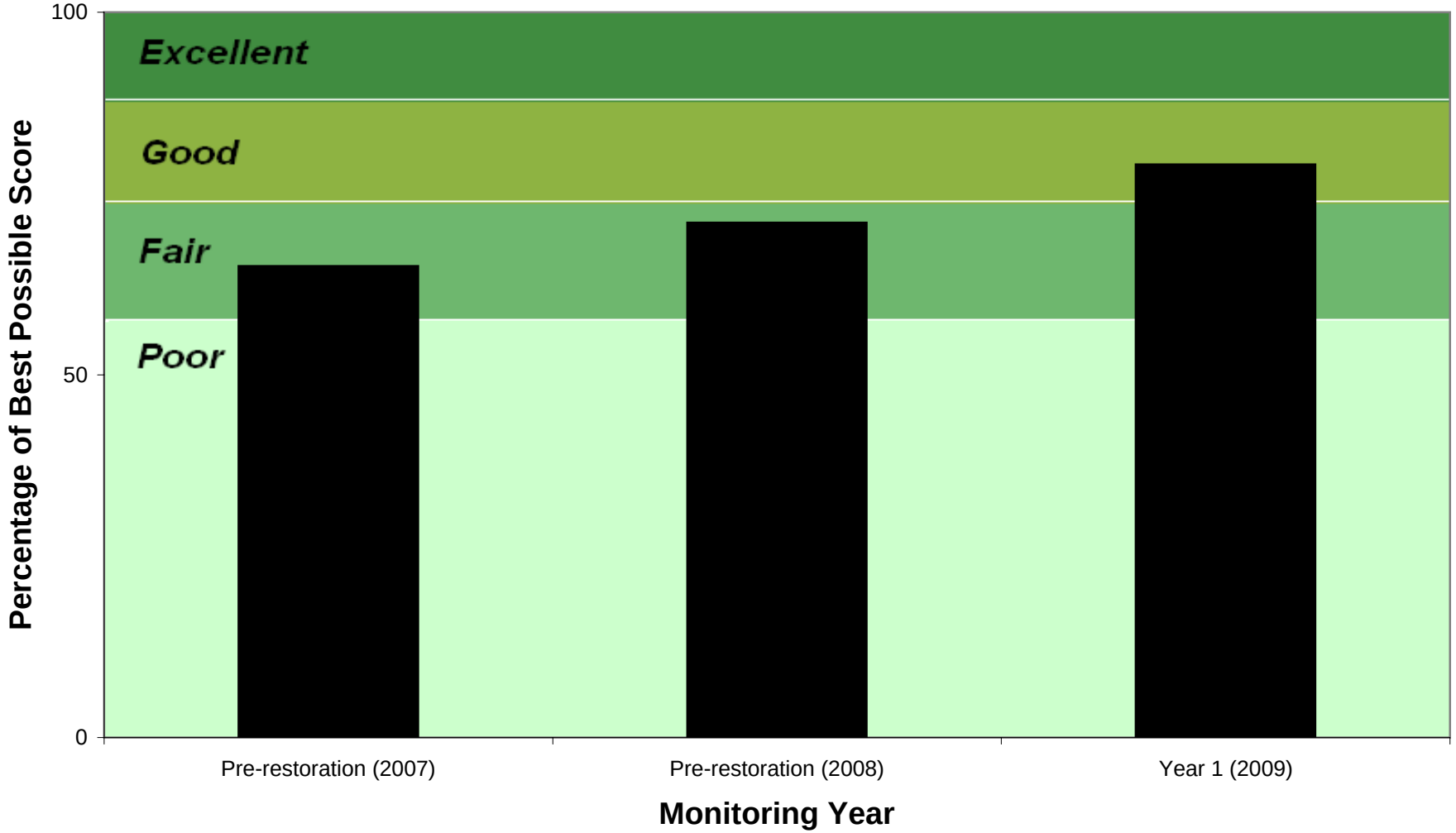


EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	1-E	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Marginal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	130	65	300	R3
	Pre-restoration (2008)	1-E	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Marginal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	142	71	300	R3
	Year 1 (2009)	1-E	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	157	79	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

Wetland Studies and Solutions, Inc.

WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	5/21/2009	1:30PM
Investigators		**HUC**		**Locality**	
JDF/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-E		77	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Score
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 maintainance 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.	
Score	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.	
Score	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).	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		70

Wetland Studies and Solutions, Inc.

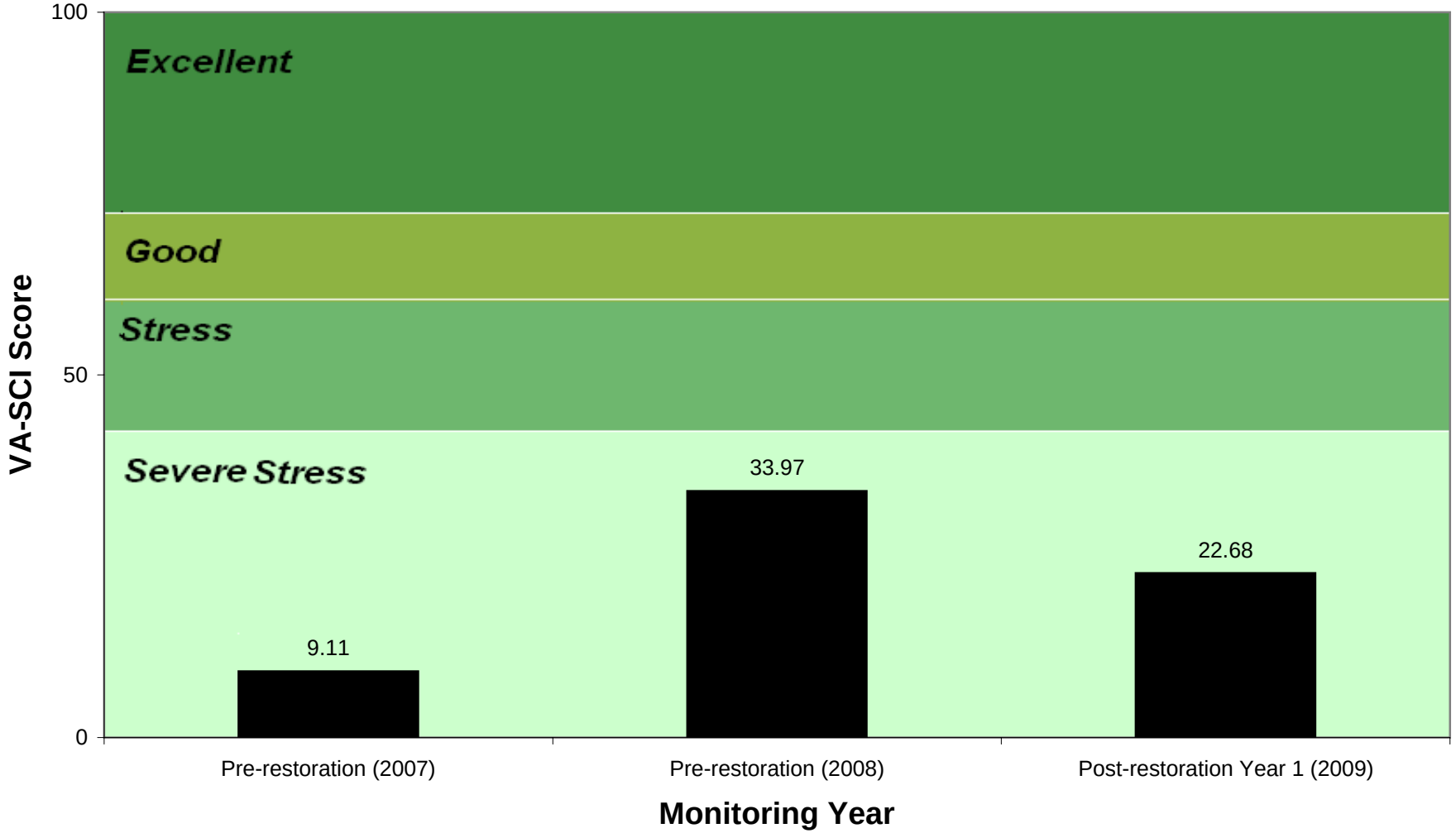
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/21/2009	1:30PM
Investigators		**HUC**	Potomac	**Locality**	
P		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-E		77	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor	Score
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	7
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	8
Total Score					157

General Comments: Restored reach.

Comparison of VA-SCI Scores for Reach 1-E:
2007, 2008 and 2009 Monitoring Years



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WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/21/2009	1:15PM

Investigators	HUC	Locality
JDF/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
1-E	77	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	80	**Sand**	45	**Rootwads**	5	**Vegetated Banks**	2
Submerged Macrophytes	0	**Undercut Banks**	1				
Large Woody Debris	1	**Leaf Packs**	5			**Other (bedrocks)**	0

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	16	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	2	*Leaf Packs*	2
				Vegetated Banks	0	*Large Woody Debris*	0

General Comments

Caught 2 Two Lined Salamanders (Eurycea bislineata) and 1 fish in net.

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	3	Slimes	0
Filamentous Algae	0	Macroinvertebrates	1
Macrophytes	0	Fish	2

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch Post-Con 2009	20003	1-E	SDS/JDF	1	126
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/30/2009	6/29/2009	ASO	ASO	14	115

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	52	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE		Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	1
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

Wetland Studies and Solutions, Inc.

WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch Post-Con 2009	20003	1-E	SDS/JDF	1	126
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/30/2009	6/29/2009	ASO	ASO	14	115

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE		MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	37	**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**	4	Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**	21	**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		**AEOLOSOMATIDAE**		**PHRYGANEIDAE**	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		**POLYCENTROPIDAE**	
Stagnicola sp.		**PERLIDAE**		Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE		Beloneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		*Perlinella sp.*		Ryacophila sp.	
PLEUROCERIDAE		**PERLODIDAE**		**UENOIDAE**	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		**TUBELLARIA - Flatworms**	
HAPLOSCLERIDA		Isoperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Cultus sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		**PTERONARCYIDAE**			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		**PELTOPERLIDAE**			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		**LEUCTRIDAE**			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		**CAPNIDAE**			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		**NEMOURIDAE**			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 1-E Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	Total Taxa	Total EPT Taxa	Percent Ephemeroptera	Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	Percent Scrapers	Percent Chironomidae	Percent Top Two Dominant	HBI
Pre-con 2007	2	0	0.00	0.00	0.00	97.37	99.12	5.93
Pre-con 2008	11	2	0.00	1.69	3.39	35.59	74.58	3.81
Post-con 2009	4	0	0.00	0.00	0.00	45.22	77.39	4.84

Reach 1-E Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	Pre-con 2007	Pre-con 2008	Pre-con 2009
Total Taxa	9.09	50.00	18.18
EPT Taxa	0.00	18.18	0.00
Percent Ephemeroptera	0.00	0.00	0.00
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	4.76	0.00
Percent Scrapers	0.00	6.57	0.00
Percent Chironomidae	2.63	64.41	54.78
Percent Top Two Dominant	1.27	36.74	32.67
HBI	59.86	91.10	75.83
VA-SCI Numerical Score	**9.11**	**33.97**	**22.68**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 1-F
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking northwest (upstream) at Reach 1-F of Snakeden Branch on the western portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking northwest (upstream) at Reach 1-F of Snakeden Branch on the western portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 1-F
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. **Looking northwest (upstream) at Reach 1-F of Snakeden Branch on the western portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.**

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 1-F

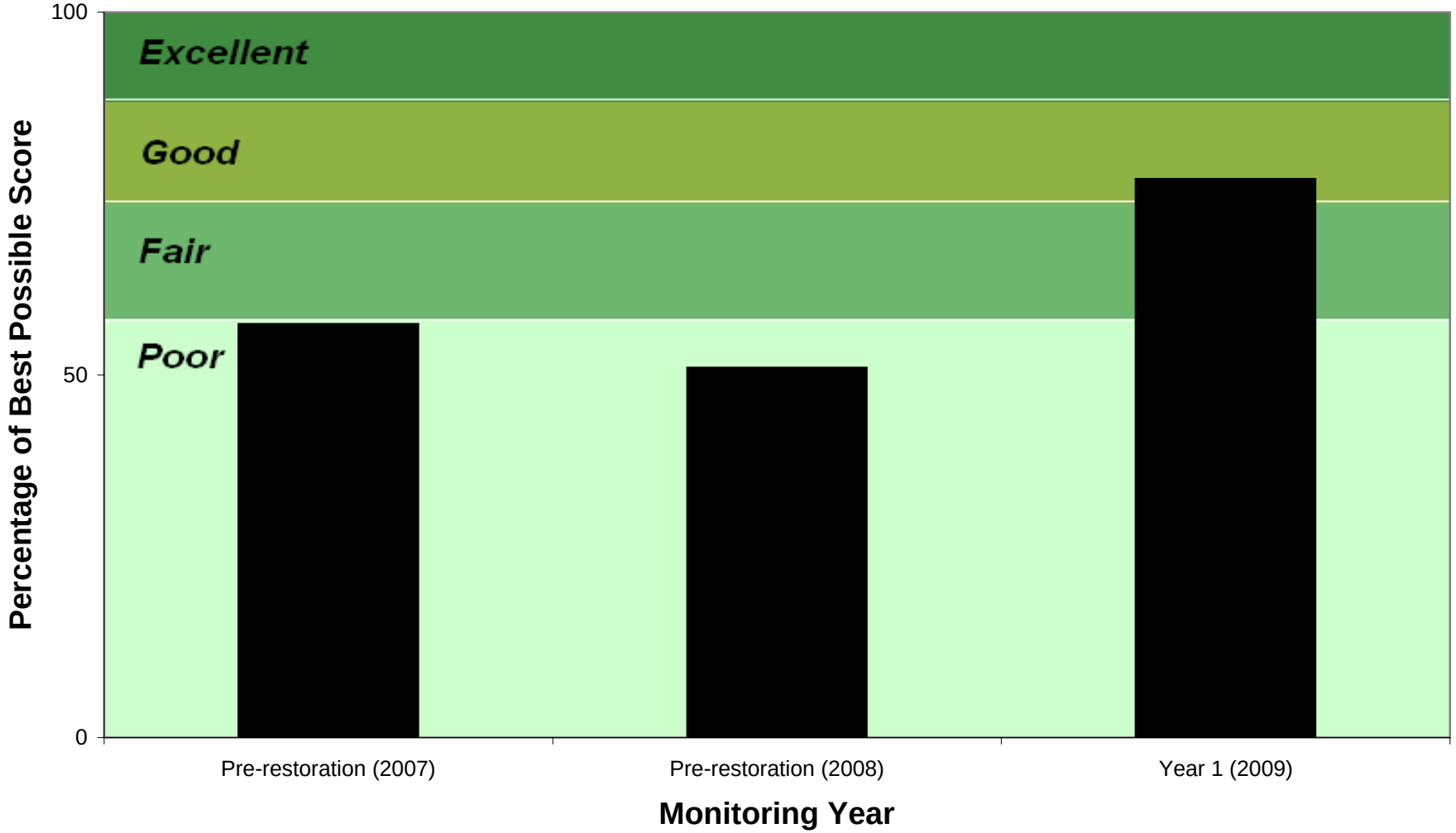

EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	1-F	Marginal	Suboptimal	Suboptimal	Marginal	Marginal	Suboptimal	Optimal	Marginal	Marginal	Optimal	113	57	300	R3
	Pre-restoration (2008)	1-F	Marginal	Suboptimal	Suboptimal	Marginal	Marginal	Suboptimal	Optimal	Marginal	Marginal	Optimal	101	51	300	R3
	Year 1 (2009)	1-F	Suboptimal	Suboptimal	Marginal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	153	77	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

Wetland Studies and Solutions, Inc.

WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R4	Potomac	5/21/2009	2:30PM
Investigators		**HUC**		**Locality**	
JDF/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-F		55	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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 maintainance 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.	
Score	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.	
Score	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).	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	13
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		60

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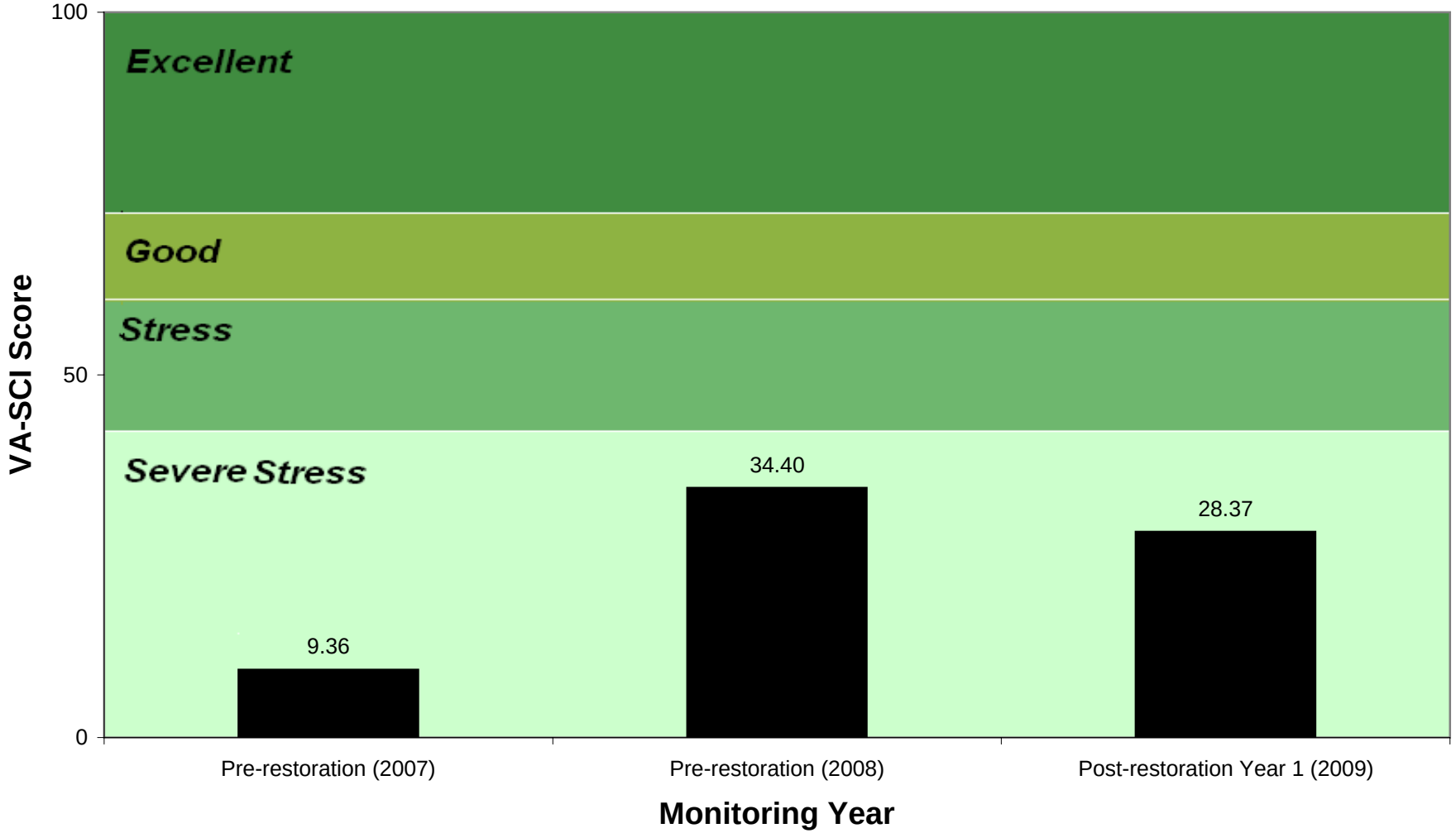
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R4	Potomac	5/20/2009	2:30PM
Investigators		**HUC**		**Locality**	
JDF/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
1-F		55	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	Score
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
Total Score					153

Comparison of VA-SCI Scores for Reach 1-F:
2007, 2008 and 2009 Monitoring Years



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WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/21/2009	2:15PM

Investigators	HUC	Locality
JDF/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
1-F	55	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	85	**Sand**	40	**Rootwads**	1	**Vegetated Banks**	0		
Submerged Macrophytes	0	**Undercut Banks**	0						
Large Woody Debris	1	**Leaf Packs**	2	**Other (bedrocks)**	0				

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	20	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	0
				Vegetated Banks	0	*Large Woody Debris*	0

General Comments

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	3	Slimes	0
Filamentous Algae	2	Macroinvertebrates	1
Macrophytes	1	Fish	1

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	1-F	SDS/JDF	1	121
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/25/2009	6/25/2009	CAT	CAT	10	119

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	22	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE		Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccomis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Haliplus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp.		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

Wetland Studies and Solutions, Inc.

WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	1-F	SDS/JDF	1	121
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/25/2009	6/25/2009	CAT	CAT	10	119

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE		MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anisptera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	90	**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**		Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**	6	**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		OLIGOCHAETA FAMILY #1	1	Wormaldia sp.	
HYDROBIIDAE		POLYCHAETA - Polychaete Worms		**PHRYGANEIDAE**	
LYMNAEIDAE		**AEOLOSOMATIDAE**		Ptilostomis sp.	
Fossaria sp.		Aeolosoma sp.		**POLYCENTROPIDAE**	
Stagnicola sp.		PLECOPTERA - Stonefly Larvae		Cymellus sp.	
Pseudosuccinea sp.		**PERLIDAE**		Polycentropus sp.	
PHYSIDAE		Acroneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Beloneuria sp.		Lype sp.	
PLANORBIDAE		Eccoptura sp.		Psychomyia sp.	
Menetus sp.		Neoperla sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		Perlesta sp.		Ryacophila sp.	
PLEUROCERIDAE		*Perlinella sp.*		**UENOIDAE**	
VIVIPARIDAE		**PERLODIDAE**		Neophylax sp.	
Viviparus sp.		Clioperla sp.		TUBELLARIA - Flatworms	
HAPLOSCLERIDA		Diploperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Isoperla sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		Cultus sp.			
BELOSTOMATIDAE		**PTERONARCYIDAE**			
Belostoma sp.		Pteronarcys sp.			
Lethocerus sp.		**PELTOPERLIDAE**			
CORIXIDAE		Peltoperla sp.			
GELASTOCORIDAE		**LEUCTRIDAE**			
GERRIDAE		Leuctra sp.			
Trepobates sp.		Zealeuctra sp.			
HEBRIDAE		Paraleuctra sp.			
HYDROMETRIDAE		**CAPNIDAE**			
MESOVELIIDAE		Allocapnia sp.			
NEPIDAE		Paracapnia sp.			
Nepa sp.		**NEMOURIDAE**			
Ranatra sp.		Amphinemura sp.			
VELIIDAE		Ostrocerca sp			
		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 1-F Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	**Total Taxa**	**Total EPT Taxa**	**Percent Ephemeroptera**	**Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)**	**Percent Scrapers**	**Percent Chironomidae**	**Percent Top Two Dominant**	**HBI**
Pre-con 2007	2	0	0.00	0.00	0.00	96.30	99.07	5.87
Pre-con 2008	7	0	0.00	0.00	0.00	4.81	78.85	2.00
Post-con 2009	3	0	0.00	0.00	0.00	18.49	94.12	1.61

Reach 1-F Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	**Pre-con 2007**	**Pre-con 2008**	**Pre-con 2009**
Total Taxa	9.09	31.82	13.64
EPT Taxa	0.00	0.00	0.00
Percent Ephemeroptera	0.00	0.00	0.00
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00
Percent Scrapers	0.00	0.00	0.00
Percent Chironomidae	3.70	95.19	81.51
Percent Top Two Dominant	1.34	30.57	8.50
HBI	60.73	117.65	123.33
VA-SCI Numerical Score	**9.36**	**34.40**	**28.37**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 2-A
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking northwest (upstream) at Reach 2-A of an unnamed tributary of Snakeden Branch on the eastern portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking northwest (upstream) at Reach 2-A of an unnamed tributary of Snakeden Branch on the eastern portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 2-A
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. **Looking northwest (upstream) at Reach 2-A of an unnamed tributary of Snakeden Branch on the eastern portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.**

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 2-A

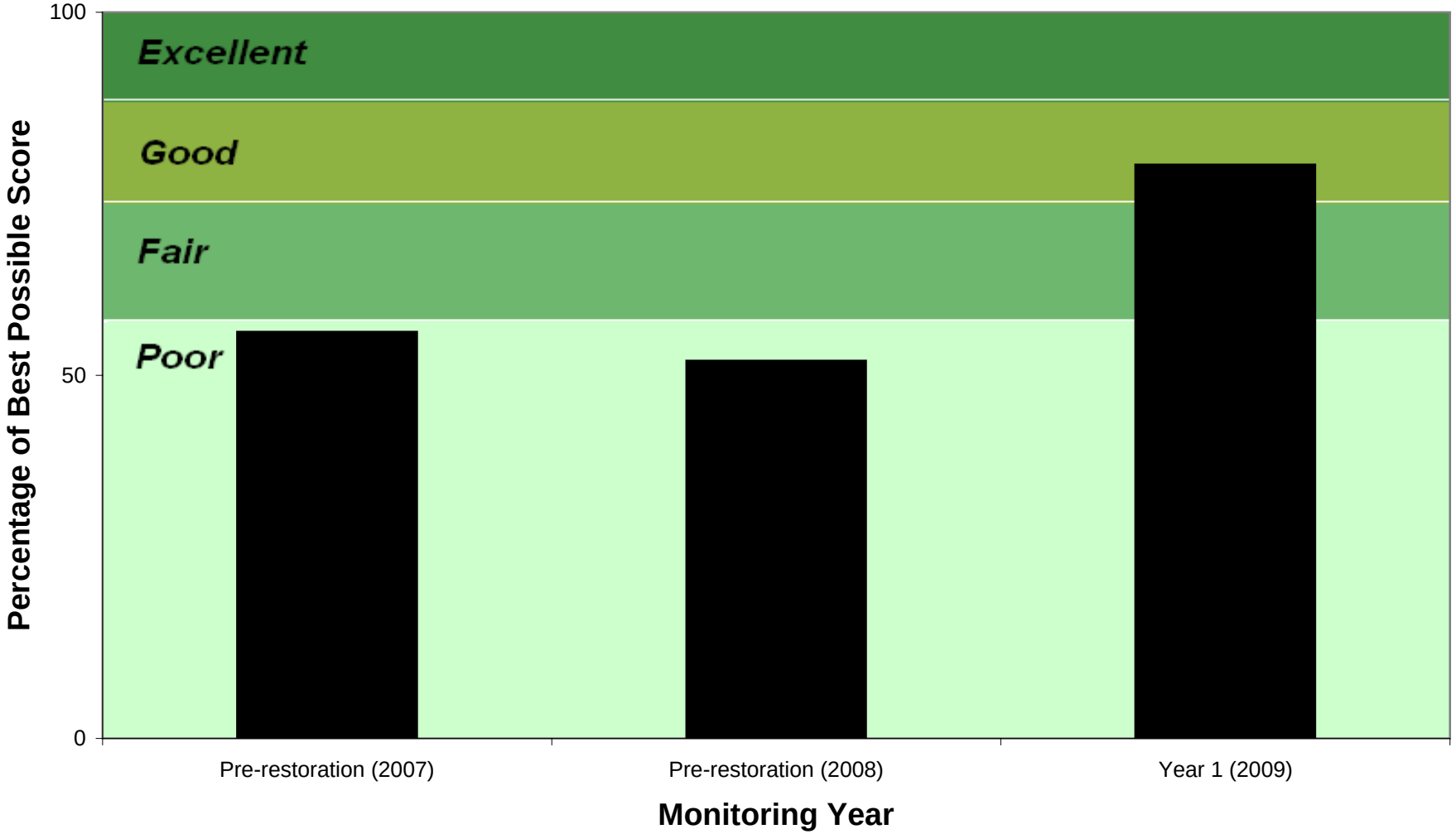


EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 5/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	2-A	Marginal	Marginal	Optimal	Marginal	Marginal	Optimal	Optimal	Poor	Poor	Optimal	112	56	300	R3
	Pre-restoration (2008)	2-A	Marginal	Marginal	Optimal	Marginal	Marginal	Optimal	Optimal	Poor	Poor	Optimal	104	52	300	R3
	Year 1 (2009)	2-A	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	158	79	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

Wetland Studies and Solutions, Inc.

WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	5/21/2009	11:30AM
Investigators		**HUC**		**Locality**	
JDF/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
2-A		256	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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 maintainance 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.	
Score	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.	
Score	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).	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		65

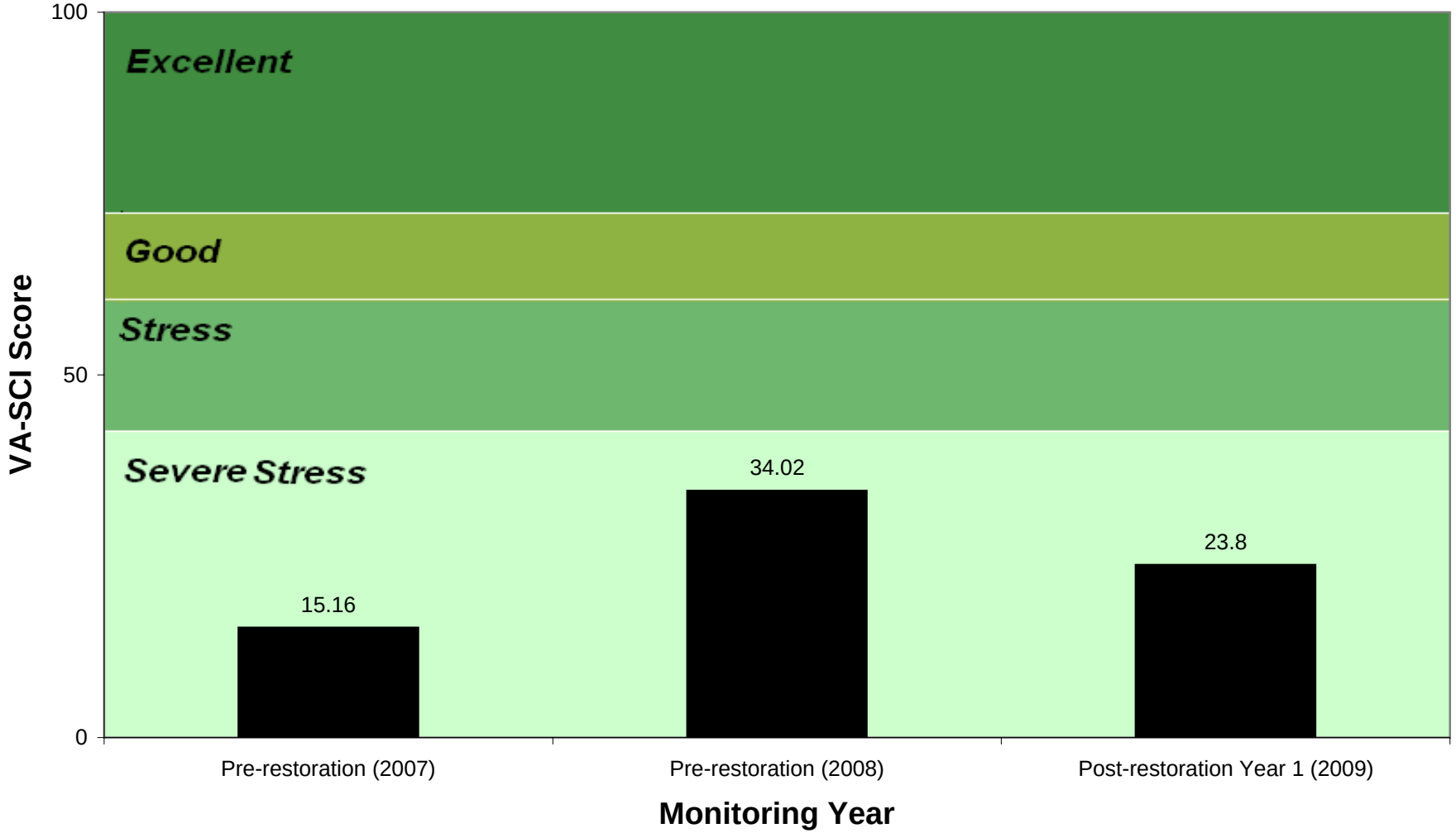
Wetland Studies and Solutions, Inc.

WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	5/21/2009	11:30AM
Investigators		**HUC**		**Locality**	
SDS/JDF		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
2-A		256	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
Total Score					158

Comparison of VA-SCI Scores for Reach 2-A:
2007, 2008 and 2009 Monitoring Years



WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/21/2009	11:00AM

Investigators	HUC	Locality
JDF/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
2-A	256	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	80	**Sand**	30	**Rootwads**	0	**Vegetated Banks**	0
Large Woody Debris	0	**Undercut Banks**	0	**Leaf Packs**	0		

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	20	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	0
				Vegetated Banks	0	*Large Woody Debris*	0

General Comments

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	1	Slimes	0
Filamentous Algae	0	Macroinvertebrates	2
Macrophytes	2	Fish	0

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	2-A	SDS/JDF	1	122
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
7/1/2009	6/29/2009	ASO	ASO	9	114

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	43	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE		Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	38
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

Wetland Studies and Solutions, Inc.

WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	2-A	SDS/JDF	1	122
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
7/1/2009	6/29/2009	ASO	ASO	9	114

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE		MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	20	**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**	2	Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**	11	**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		**AEOLOSOMATIDAE**		**PHRYGANEIDAE**	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		**POLYCENTROPIDAE**	
Stagnicola sp.		**PERLIDAE**		Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE		Beloneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		*Perlinella sp.*		Ryacophila sp.	
PLEUROCERIDAE		**PERLODIDAE**		**UENOIDAE**	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		**TUBELLARIA - Flatworms**	
HAPLOSCLERIDA		Isoperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Cultus sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		**PTERONARCYIDAE**			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		**PELTOPERLIDAE**			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		**LEUCTRIDAE**			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		**CAPNIDAE**			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		**NEMOURIDAE**			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 2-A Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	Total Taxa	Total EPT Taxa	Percent Ephemeroptera	Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	Percent Scrapers	Percent Chironomidae	Percent Top Two Dominant	HBI
Pre-con 2007	7	0	0.00	0.00	3.74	86.92	94.39	5.85
Pre-con 2008	8	0	0.00	0.00	4.00	12.00	56.00	4.80
Post-con 2009	4	0	0.00	0.00	0.00	37.72	71.05	5.37

Reach 2-A Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	Pre-con 2007	Pre-con 2008	Pre-con 2009
Total Taxa	31.82	36.36	18.18
EPT Taxa	0.00	0.00	0.00
Percent Ephemeroptera	0.00	0.00	0.00
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00
Percent Scrapers	7.24	7.75	0.00
Percent Chironomidae	13.08	88.00	62.28
Percent Top Two Dominant	8.10	63.58	41.83
HBI	61.02	76.47	68.11
VA-SCI Numerical Score	**15.16**	**34.02**	**23.80**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 2-B
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking northwest (upstream) at Reach 2-B of an unnamed tributary of Snakeden Branch on the eastern portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking northwest (upstream) at Reach 2-B of an unnamed tributary of Snakeden Branch on the eastern portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 2-B
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. Looking northwest (upstream) at Reach 2-B of an unnamed tributary of Snakeden Branch on the eastern portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken September 16, 2009.

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 2-B

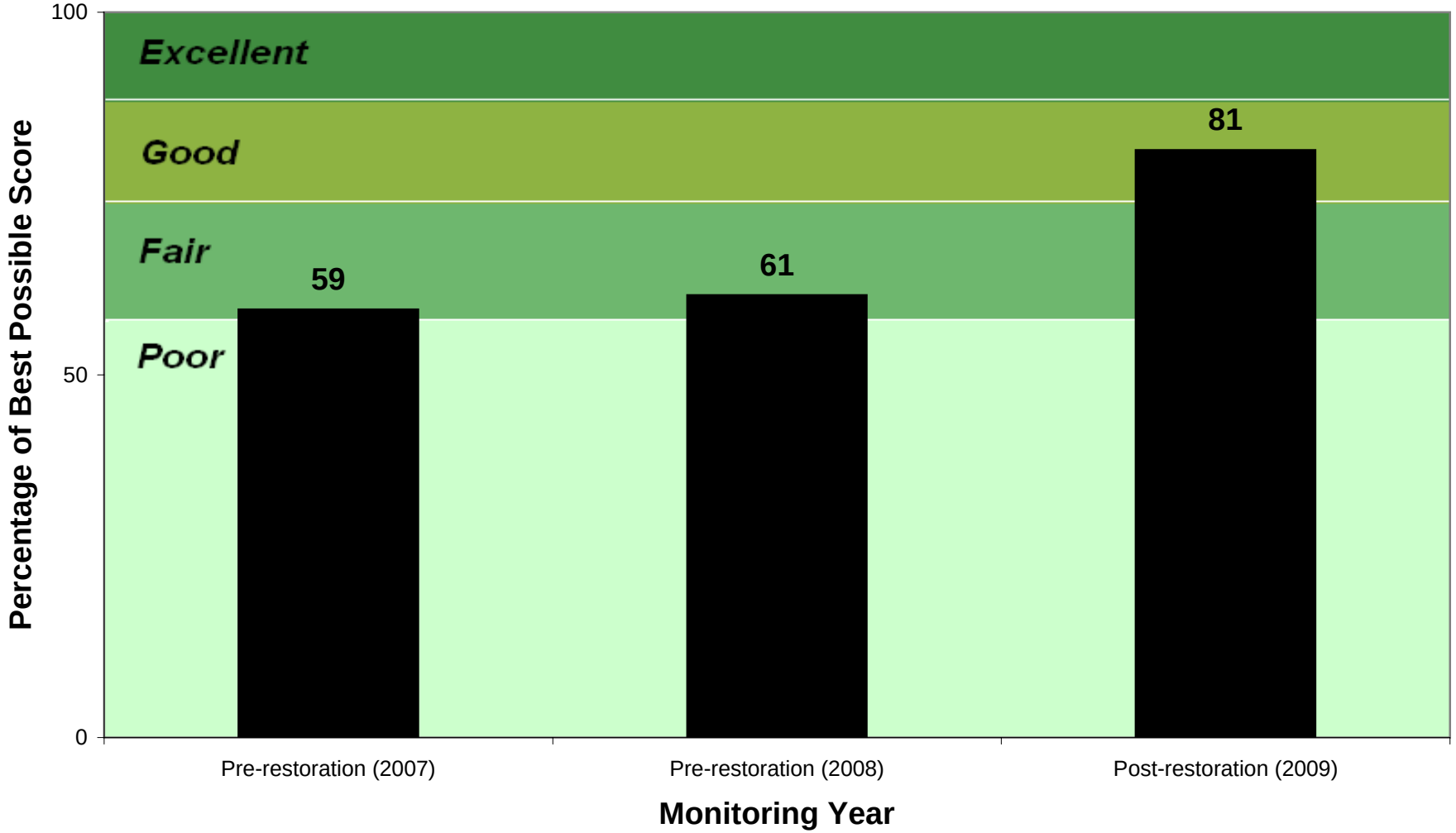

EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: Pre-restoration 2007, 2008; Post-restoration 2009

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	2-B	Suboptimal	Marginal	Optimal	Marginal	Marginal	Suboptimal	Suboptimal	Marginal	Marginal	Suboptimal	118	59	300	R3
	Pre-restoration (2008)	2-B	Suboptimal	Marginal	Optimal	Marginal	Marginal	Suboptimal	Suboptimal	Marginal	Marginal	Suboptimal	121	61	300	R3
	Post-restoration (2009)	2-B	Suboptimal	Suboptimal	Suboptimal	Optimal	Suboptimal	Suboptimal	Optimal	Optimal	Suboptimal	Optimal	161	81	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

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WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	9/16/2009	10:30
Investigators		**HUC**		**Locality**	
JDF/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
2-B		169	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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 maintainance 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.	
Score	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.	
Score	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).	
Score	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	13
			Total Score		73

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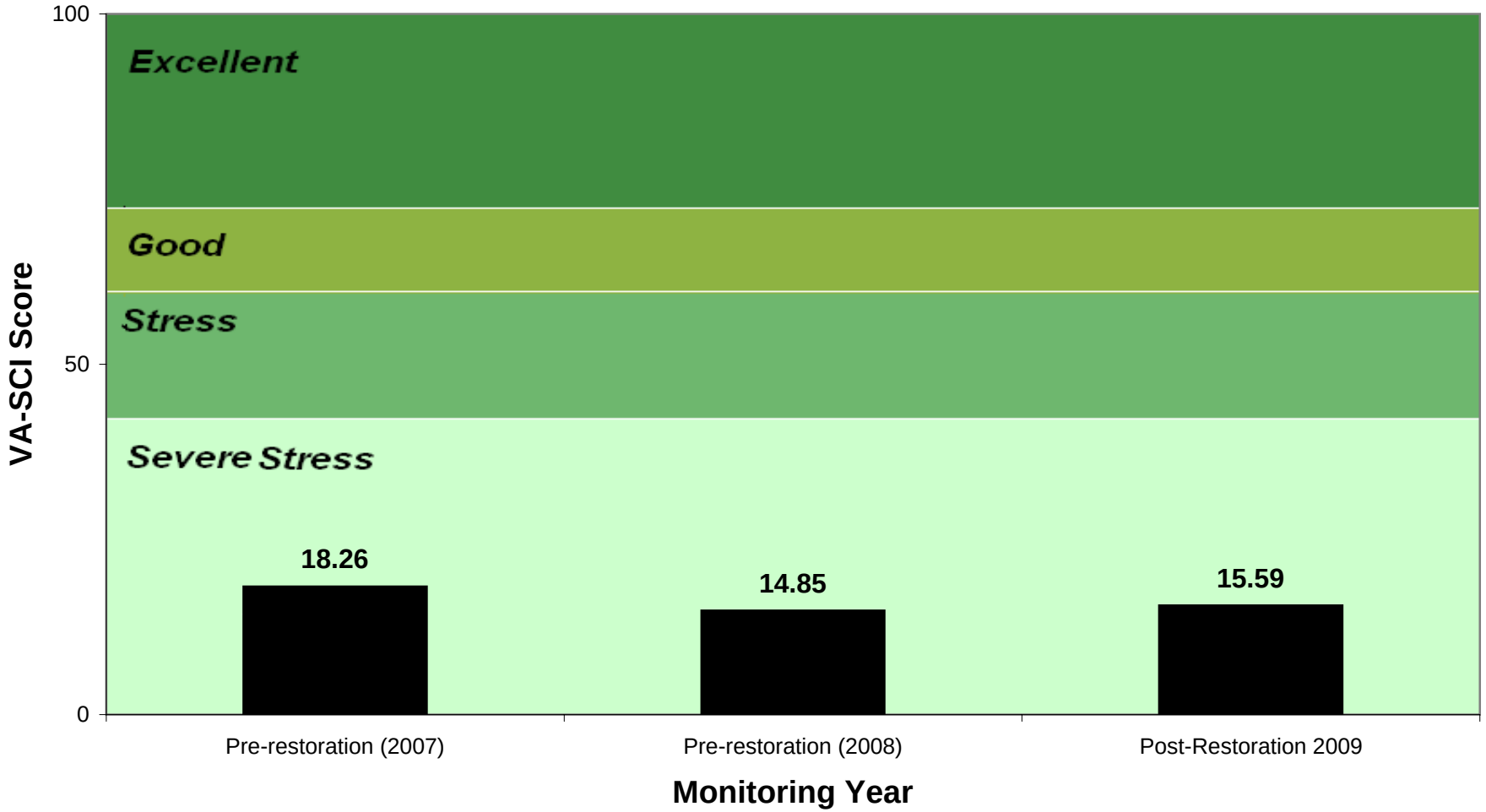
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	2/12/2008	0.4375
Investigators		**HUC**		**Locality**	
SDS/JDF		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
2-B		169	300	3	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
Total Score					161

Comparison of VA-SCI Scores for Reach 2-B:
2007, 2008 and 2009
Pre-construction Monitoring Years



WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	9/16/2009	10:30 AM

Investigators	HUC	Locality
JDF/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
2-B	169	300	3

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	45	**Sand**	70	**Rootwads**	1	**Vegetated Banks**	0		
Large Woody Debris	1	**Undercut Banks**	3	**Leaf Packs**	10				

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	20	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	0
				Vegetated Banks	0	*Large Woody Debris*	0

General Comments

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	0	Slimes	0
Filamentous Algae	0	Macroinvertebrates	1
Macrophytes	0	Fish	0

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	2-B	SDS/JDF	1	99
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
9/17/2009	9/17/2009	CAT	CAT	102	88

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	77	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE	1	Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	1
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	1
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	
DIPTERA FAMILY #1					

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	2-B	SDS/JDF	1	99
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
7/1/2009	7/1/2009	CAT	CAT	10	88

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE	1	MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	4
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**	3	Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms		**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**		Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**		**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		**AEOLOSOMATIDAE**		**PHRYGANEIDAE**	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		**POLYCENTROPIDAE**	
Stagnicola sp.		**PERLIDAE**		Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE		Beloneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		*Perlinella sp.*		Ryacophila sp.	
PLEUROCERIDAE		**PERLODIDAE**		**UENOIDAE**	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		**TUBELLARIA - Flatworms**	
HAPLOSCLERIDA		Isoperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Cultus sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		**PTERONARCYIDAE**			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		**PELTOPERLIDAE**			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		**LEUCTRIDAE**			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		**CAPNIDAE**			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		**NEMOURIDAE**			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 2-B Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	Total Taxa	Total EPT Taxa	Percent Ephemeroptera	Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	Percent Scrapers	Percent Chironomidae	Percent Top Two Dominant	HBI
Pre-con 2007	9	0	0.00	0.00	8.49	83.02	89.62	6.14
Pre-con 2008	6	0	0.00	0.00	3.92	87.25	92.16	5.93
Post-con 2009	7	1	1.14	0.00	0.00	87.50	92.05	6.06

Reach 2-B Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	Pre-con 2007	Pre-con 2008	Post-Con 2009
Total Taxa	40.91	27.27	31.82
EPT Taxa	0.00	0.00	9.09
Percent Ephemeroptera	0.00	0.00	1.85
Percent Plecoptera + Trichoptera	0.00	0.00	0.00
Percent Scrapers	16.45	7.60	0.00
Percent Chironomidae	16.98	12.75	12.50
Percent Top Two Dominant	15.00	11.33	11.50
HBI	56.74	59.83	57.99
VA-SCI Numerical Score	**18.26**	**14.85**	**15.59**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**

REACH 3-A
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

1. **Looking west (upstream) at Reach 3-A, an unnamed tributary of Snakeden Branch on the western portion of the study area during the 2007 preconstruction fieldwork. Photograph taken April 2007.**

2. **Looking west (upstream) at Reach 3-A, an unnamed tributary of Snakeden Branch on the western portion of the study area during the 2008 preconstruction fieldwork. Photograph taken February 2008.**

REACH 3-A
BIOLOGICAL STREAM ASSESSMENT PHOTOGRAPHS
SNAKEDEN BRANCH WATERSHED
WSSI #20003

3. **Looking west (upstream) at Reach 3-A, an unnamed tributary of Snakeden Branch on the western portion of the study area during the 2009 post construction, Year 1, fieldwork. Photograph taken May 2009.**

Comparison of Habitat Assessment Scores for 2007, 2008, and 2009 for Reach 3-A

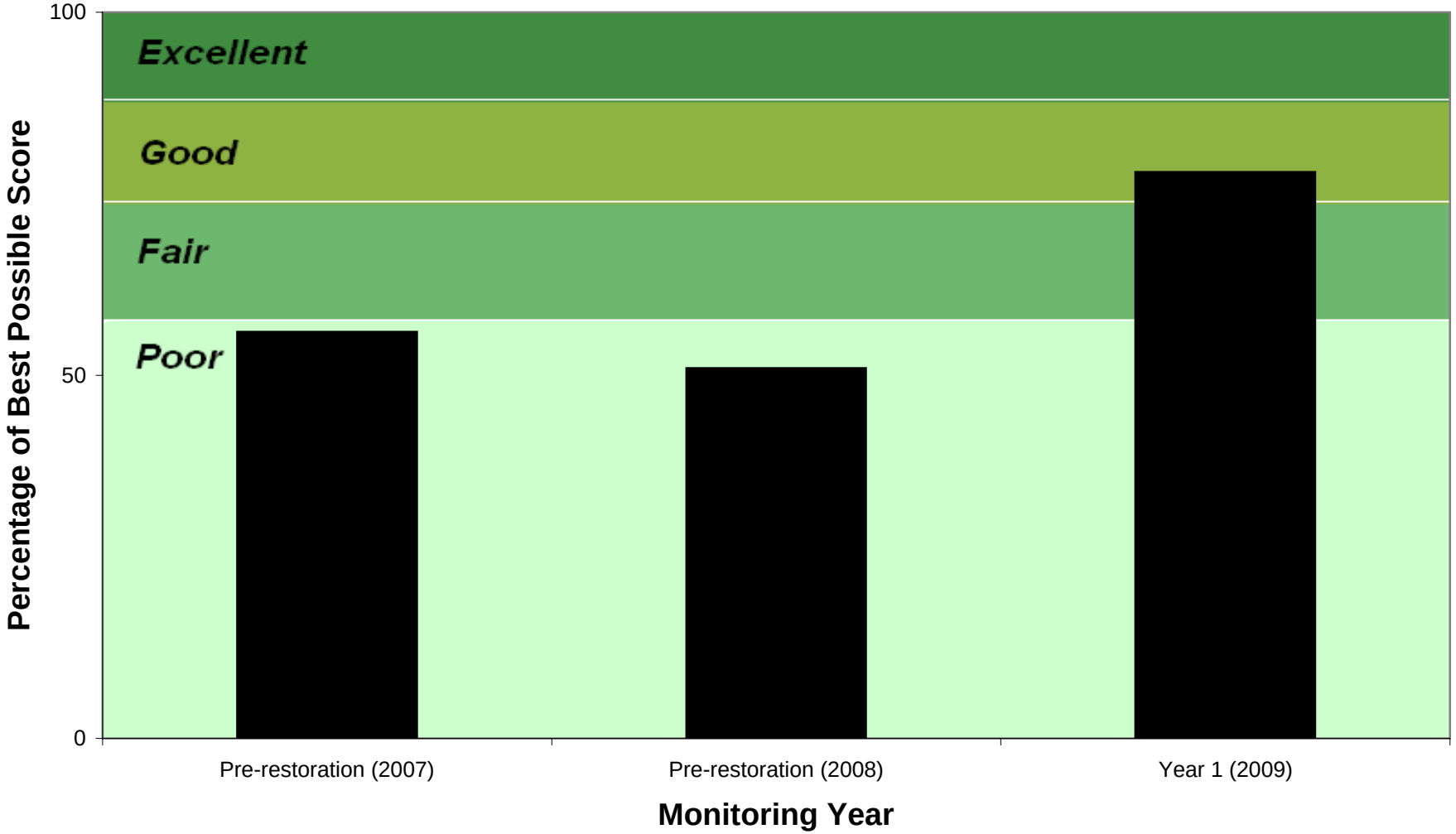

EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Name and WSSI Number: Northern Virginia Stream Restoration Bank: Snakeden Branch (WSSI # 20003)

Stream ID: Snakeden Branch and Unnamed Tributaries to Snakeden Branch

Date: 12/11/07, 12/12/07, 2/12/08, 2/14/08, 5/20/09, 5/21/09

Evaluators: TSS/SDS/CAG/BNR/JDF

HUC: 02070008

Assessment Period: **Pre-restoration 2007, 2008; Year 1**

Assessment Reach Name			Condition Category										TOTAL SCORE	Percent of Best Possible Score***	Reach Length	Stream Type
			Substrate	*Embedded-ness*	*Velocity*	*Sediment Depostion*	*Flow Status*	*Channel Alteration*	*Frequency of Riffles*	*Bank Stability**	*Vegetation Protection**	*Riparian Zone**				
Stream 1	Pre-restoration (2007)	3-A	Marginal	Suboptimal	Optimal	Marginal	Marginal	Optimal	Optimal	Poor	Poor	Optimal	112	56	300	R3
	Pre-restoration (2008)	3-A	Marginal	Suboptimal	Optimal	Marginal	Marginal	Optimal	Optimal	Poor	Poor	Optimal	101	51	300	R3
	Year 1 (2009)	3-A	Suboptimal	Suboptimal	Marginal	Suboptimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	155	78	300	R3

* The score for Bank Stability, Vegetation Protection and Riparian Zone combines the left and right bank scores.

** The stream is characterized as non-perennial by Fairfax County and is thus either intermittent or ephemeral.

*** Percentage of Best Possible Score= (Total Habitat Score)/(200)*100

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WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Potomac	5/20/2009	3:30PM
Investigators		**HUC**		**Locality**	
BNR/SDS		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
3-A		75	300	1	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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 maintainance 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.	
Score	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.	
Score	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).	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	14
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the availible channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	15
			Total Score		63

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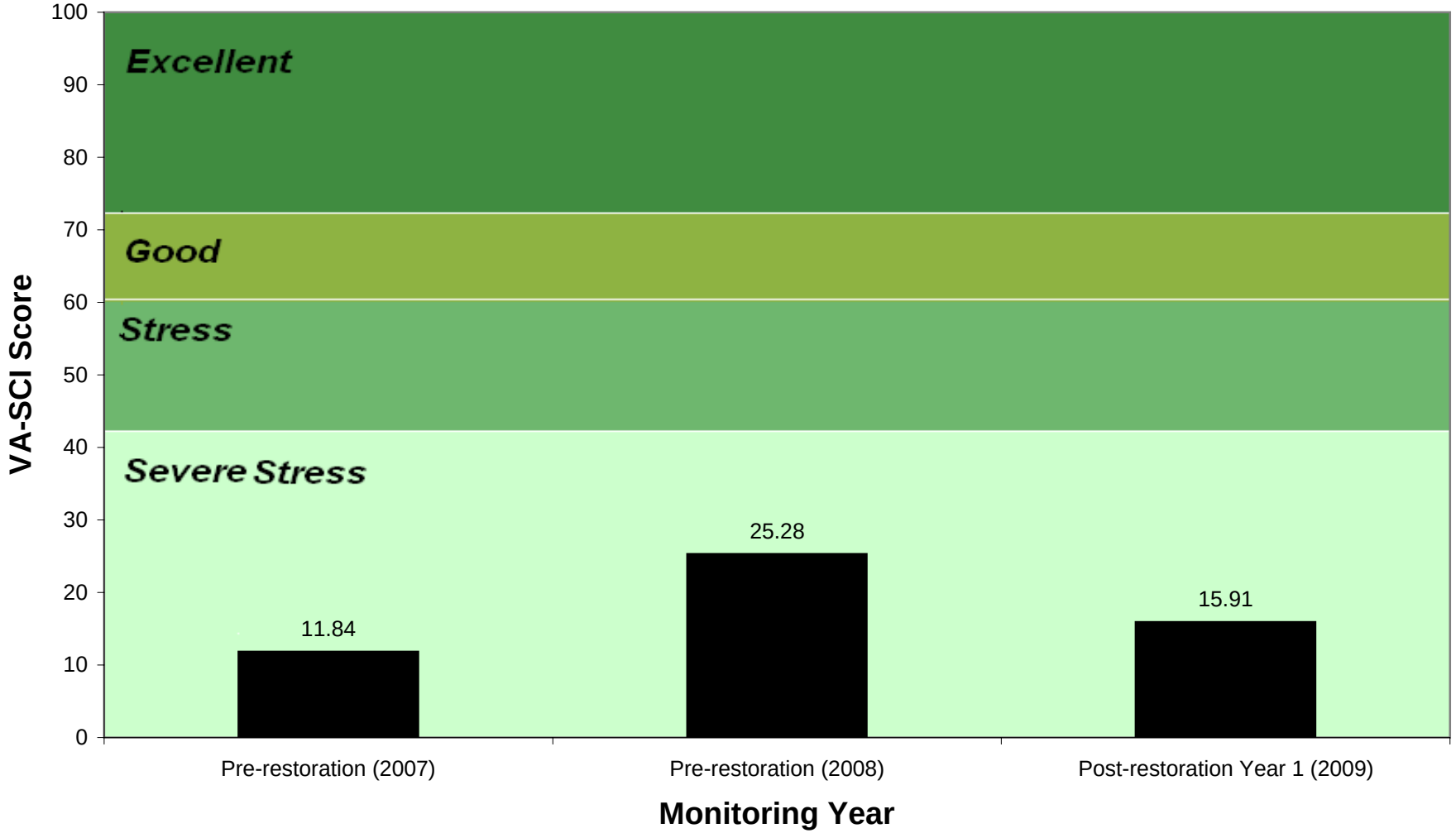
WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS

Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	3:30PM
Investigators		**HUC**	Potomac	**Locality**	
SDS/BNR		02070008		Fairfax County	
Reach		**D.A. (Acres)**	**Reach Length (LF)**	**Order**	
3-A		75	300	1	
Latitude	**Longitude**	**Stream Name**			
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch			

Habitat Parameter	Condition Category				
	Optimal	**Suboptimal**	**Marginal**	**Poor**	**Score**
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.	Channeliztion 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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	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.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	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 riperian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
			Total Score		155

General Comments: Easement in reach.

Comparison of VA-SCI Scores for Reach 3-A:
2007, 2008 and 2009 Monitoring Years



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WSSI BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Project #	Site	Cowardin	River Basin	Date	Time
20003	Snakeden	R3	Potomac	5/20/2009	3:00PM

Investigators	HUC	Locality
BNR/SDS	2070008	Fairfax County

Reach	D.A. (Acres)	Reach Length (LF)	Order
3-A	75	300	1

Latitude	Longitude	Stream Name
38°55'58"	77°21'01"	Unnamed Tributary to Snakeden Branch

Habitat Types (Indicate Percentage of Each Habitat Present)

Cobble	100	**Sand**	20	**Rootwads**	0	**Vegetated Banks**	0	
Submerged Macrophytes	0			**Undercut Banks**	1			
Large Woody Debris	0			**Leaf Packs**	3	**Other (bedrocks)**		2

Sample Collection

Gear Used		How Were Samples Collected?		Number of Jabs/Kicks Taken from Each Habitat			
D-Frame	x	*Wading*	x				
Kick-Net		*From Bank*		*Cobble*	20	*Undercut Banks*	0
Other		*From Boat*		*Sand*	0	*Submerged Macro-phytes*	0
				Rootwads	0	*Leaf Packs*	0
				Vegetated Banks	0	*Large Woody Debris*	0

General Comments

Qualitative Listing of Aquatic Biota

Indicate Estimated Abundance: 0=Absent/Not Observed, 1=Rare, 2=Common, 3=Abundant, 4=Dominant

Periphyton	3	Slimes	2
Filamentous Algae	1	Macroinvertebrates	1
Macrophytes	0	Fish	1

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET*

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	3-A	BNR/SDS	1	126
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/30/2009	6/30/2009	SDS	SDS	36	118

BIVALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp.		**CHAOBORIDAE**		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		**CHIRONOMIDAE**	93	**Tanypodinae**	
UNIONIDAE		**Chironominae**		Ablabesmyia sp.	
BRANCHIOBDELLIDA		**Chironomini**		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE	2	Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE	1	Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		**CULICIDAE**	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		**Tanytarsini**		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		**DIXIDAE**	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		**DOLICHOPODIDAE**	
Helophorus sp.		**Diamesinae**		**EMPIDIDAE**	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		**EPHYDRIDAE**	
PSEPHENIDAE		**Orthocladiinae**		**PELCORHYNCHIDAE**	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		**PSYCHODIDAE**	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		**SIMULIDAE**	
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		**STRATIOMYIDAE**	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		**SYRPHIDAE**	
CRUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		**TABANIDAE**	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		**TANYDERIDAE**	
Lirceus sp.		Paraphaenocladius sp.		**THAUMALEIDAE**	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		**TIPULIDAE**	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	

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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI #	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
Snakeden Branch - Post-Con 2009	20003	3-A	BNR/SDS	1	126
Date ID'd	**Date Sorted**	**Taxonomist**	**Sorter**	**# Grids in Subsample**	**Total No. Organisms ID'd**
6/30/2009	6/30/2009	SDS	SDS	36	118

Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp.		HOPLONEMERTEA - Ribbon Worms		Shipsa sp.	
Erioptera sp.		**TETRASTEMMATIDAE**		**CHLOROPERLIDAE**	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		**NOCTUIDAE**		Sweltsa sp.	
EPHEMEROPTERA - Mayflies		Archanara sp.		**TAENIOPTERGIDAE**	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		**PYRALIDAE**		Taeniopteryx sp.	
BAETIDAE		MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		**CORYDALIDAE**		**BRACHYCENTRIDAE**	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		**CALAMOCERATIDAE**	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		**SIALIDAE**		**DIPSEUDOPSIDAE**	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		**GLOSSOSOMATIDAE**	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		**AESHNIDAE**		**HELICOPSYCHIDAE**	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		**HYDROPSYCHIDAE**	
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp.		**CORDULEGASTRIDAE**		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		**CORDULIIDAE**		Parapsyche sp.	
Ephemera sp.		**GOMPHIDAE**		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		**HYDROPTILIDAE**	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		**LEPIDOSTOMATIDAE**	
LEPTOPHLEBIDAE		**LIBELLULIDAE**		Lepidostoma sp.	
Leptophlebia sp.		**MACROMIIDAE**		**LEPTOCERIDAE**	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		**PETALURIDAE**		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		**CALOPTERYGIDAE**		**LIMNEPHILIDAE**	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		**COENAGRIONIDAE**		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		**LESTIDAE**		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	8	**MOLANNIDAE**	
Siphlonurus sp.		**LUMBRICINA**		Molanna sp.	
TRICORYTHIDAE		**ENCHYTRAEIDAE**		**ODONTOCERIDAE**	
Tricorythodes sp.		**NAIDIDAE**	1	Psilotreta sp.	
GASTROPODA - Snails		**TUBIFICIDAE**	8	**PHILOPOTAMIDAE**	
ANCYLIDAE		**LUMBRICULIDAE**		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		**AEOLOSOMATIDAE**		**PHRYGANEIDAE**	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		**POLYCENTROPIDAE**	
Stagnicola sp.		**PERLIDAE**		Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE	5	Beloneuria sp.		**PSYCHOMYIDAE**	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp.		Perlesta sp.		**RHYACOPHILIDAE**	
Gyraulus sp.		*Perlinella sp.*		Ryacophila sp.	
PLEUROCERIDAE		**PERLODIDAE**		**UENOIDAE**	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		**TUBELLARIA - Flatworms**	
HAPLOSCLERIDA		Isoperla sp.		**PLANARIIDAE**	
SPONGILLIDAE		Cultus sp.		**DENDROCOELIDAE**	
HEMIPTERA - True Bugs		**PTERONARCYIDAE**			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		**PELTOPERLIDAE**			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		**LEUCTRIDAE**			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		**CAPNIDAE**			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		**NEMOURIDAE**			
Nepa sp.		Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			

* Taxa in grey are higher-level taxa (i.e., phylum, class, subclass order). Taxa in bold are either family or subfamily-level taxa.

Reach 3-A Snakeden Branch Watershed Biotic Metric Scores (2007-2009)								
Reach	**Total Taxa**	**Total EPT Taxa**	**Percent Ephemeroptera**	**Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)**	**Percent Scrapers**	**Percent Chironomidae**	**Percent Top Two Dominant**	**HBI**
Pre-con 2007	4	0	0.00	0.00	2.73	90.91	95.45	6.22
Pre-con 2008	5	0	0.00	0.00	0.92	3.67	85.32	5.91
Post-con 2009	6	0	0.00	0.00	4.24	78.81	92.37	5.95

Reach 3-A Weighted Snakeden Branch Watershed Biotic Metrics and VA-SCI (2007-2009)			
	Monitoring Year		
METRIC	**Pre-con 2007**	**Pre-con 2008**	**Pre-con 2009**
Total Taxa	18.18	22.73	27.27
EPT Taxa	0.00	0.00	0.00
Percent Ephemeroptera	0.00	0.00	0.00
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00
Percent Scrapers	5.29	1.78	8.21
Percent Chironomidae	9.09	96.33	21.19
Percent Top Two Dominant	6.57	21.21	11.02
HBI	55.61	60.17	59.57
VA-SCI Numerical Score	**11.84**	**25.28**	**15.91**
VA-SCI Narrative Score	**Severe Stress**	**Severe Stress**	**Severe Stress**