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



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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'.

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 Noncoastal 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

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

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

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.

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 3⁴. 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, PWD⁵, Jennifer D. Feese, PWS, PWD, CT⁶, and Benjamin N. Rosner, PWS, PWD, CT⁷ 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, 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

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).

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

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.

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.

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.

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 061.3 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:
 - o Total Taxa: Score = $100 \times (X/22)$, where X = Metric Value

 \circ EPT Taxa: Score = 100 x (X/11), where X = Metric Value

 \circ 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

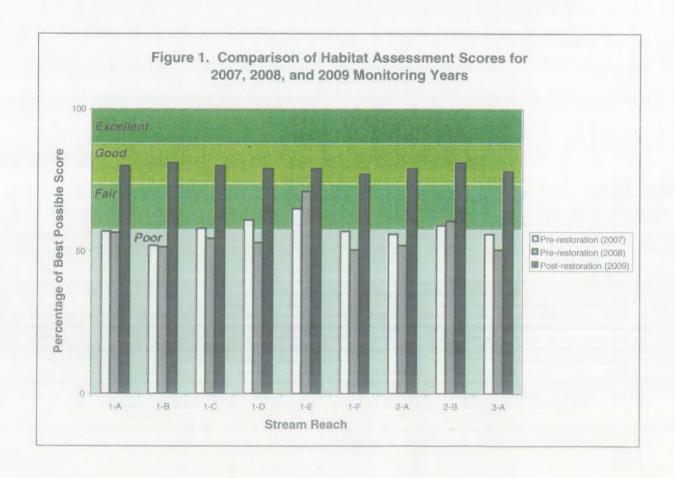
o Percent Scrapers: Score = $100 \times (X/51.6)$, where X = Metric Value

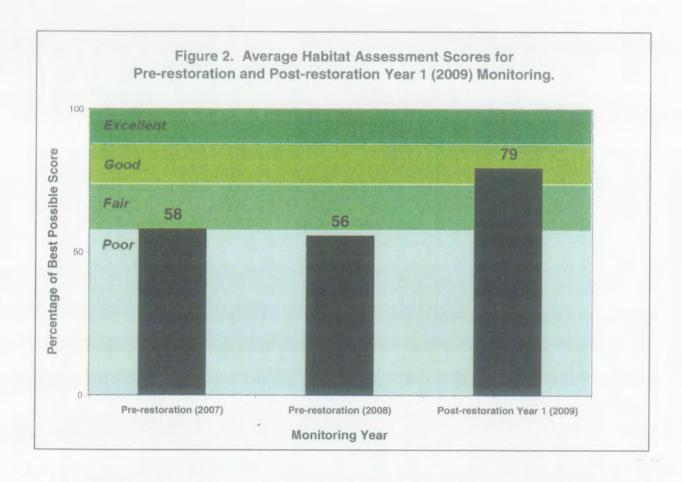
- o Percent Chironomidae: Score = $100 \times [(100-X)(100-0)]$, where X = Metric Value
- o Percent Top 2 Dominant: Score = 100 x [(100-X) (100-30.8)], where X = Metric Value
- o Hilsenhoff Biotic Index: Score = 100 x [(100-X) (100-3.2)], where X = Metric Value

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.

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





Benthic macroinvertebrate results show that individuals from 17 taxa⁹ were collected from all nine reaches collectively (<u>Table 2</u>, 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 (<u>Table 2</u>, below).

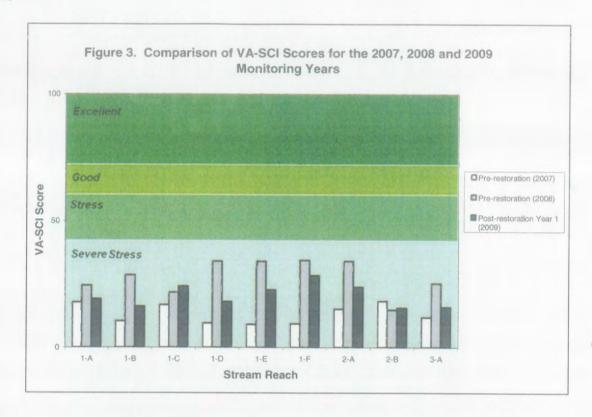
Although 19 taxa are listed in <u>Table 2</u>, Gastropoda, and Oligochaeta were not included as part of the total taxa collected within the study area, because individuals were too damaged to identify to the family-level.

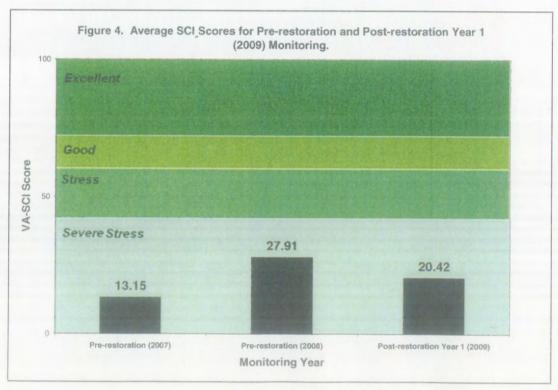
	Table	2. 2009	Snake	den Bra	nch Wat	tershed	Raw Da	ata		
	Hi had				RE	ACH				100
TAXA	1-A	1-B	1-C	1-D	1-E	1-F	2-A	2-B	3-A	Total
BAETIDAE	1	1	2	1	-	-	-	1	-	6
CERATOPOGNIDAE	-	-	1	-	-	-	-	-	-	1
CHIRONOMIDAE	79	90	81	95	52	22	43	77	93	632
COENAGRIONIDAE	-	-	-	-	-	-	-	3	-	3
CULICIDAE	-	-	2	-	-	-	-	1	-	3
CURCULIONIDAE	1	-	-	-	-	-	-	-	2	3
DYTISCIDAE	-	1	-	-	-	-	-	1	1	3
ELMIDAE (L)	1	-	-	-	-	-	-	-	-	1
EMPIDIDAE	-	-	- 1	-	-	-	-	1	-	1
GASTROPODA	-	-	-	2	-	-	-	-	-	2
HYDROPHILIDAE	-	-	-	1	-	-	-	-	2	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	2	-	-	-	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 <u>Table 3</u>, below. The VA-SCI requires that these metrics be weighted to determine the VA-SCI, as shown in <u>Table 4</u>, 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 (<u>Table 4</u>, 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") (<u>Figure 4</u>, below).

Reach	Total Taxa	Total EPT Taxa	Percent Ephemeroptera	Percent Plecoptera + Trichoptera (Excluding Hydrapsychidae)	Percent Scrapers	Percent Chironomidae	Percent Top Two Dominant	нві
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

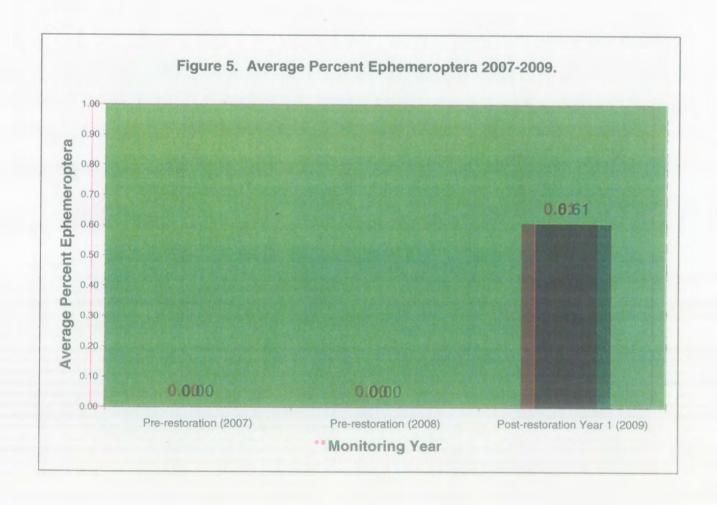
Та	ble 4. 200	9 Weighte	d Snaked	en Branch	Watersh RÉAC		Metrics and	VA-SCI	LIES 95
METRIC	1-A	1-B	1-C	1-D	1-E	1-F	2-A	2-B	3-A
Total Taxa	31.82	22.73	36.36	31.82	18.18	13.64	18.18	31.82	27.27
EPT Taxa	9.09	9.09	18.18	9.09	0.00	0.00	0.00	9.09	0.00
Percent Ephemeroptera	1.29	1.46	2.86	1.42	0.00	0.00	0.00	1.85	0.00
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	ō.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							
Average VA- SCI Numerical Score	20.42								
Average VA- SCI Narrative Score	Severe Stress								

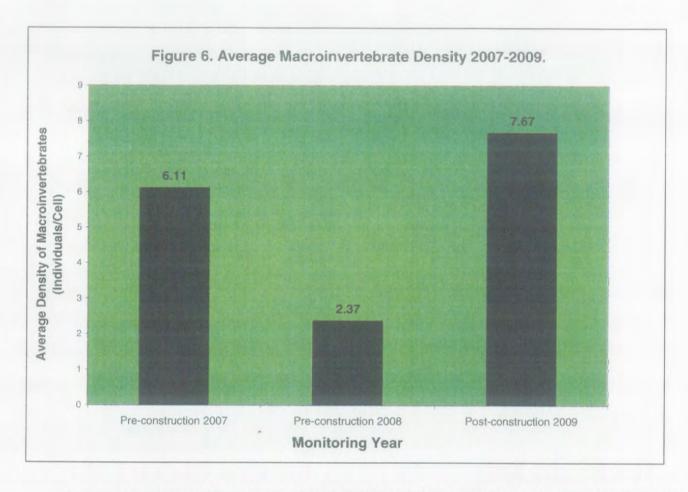




These scores are the result of the low number of total taxa, low number of total EPT taxa, low number of Ephemeroptera taxa, low percentage of Plecoptera + Trichoptera (excluding Hydropsychidae taxa), low percentage of Scraper taxa, high percentage of Chironomidae, high percentage of top two dominant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

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).





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.

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 (DEO 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

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Executive Vice President

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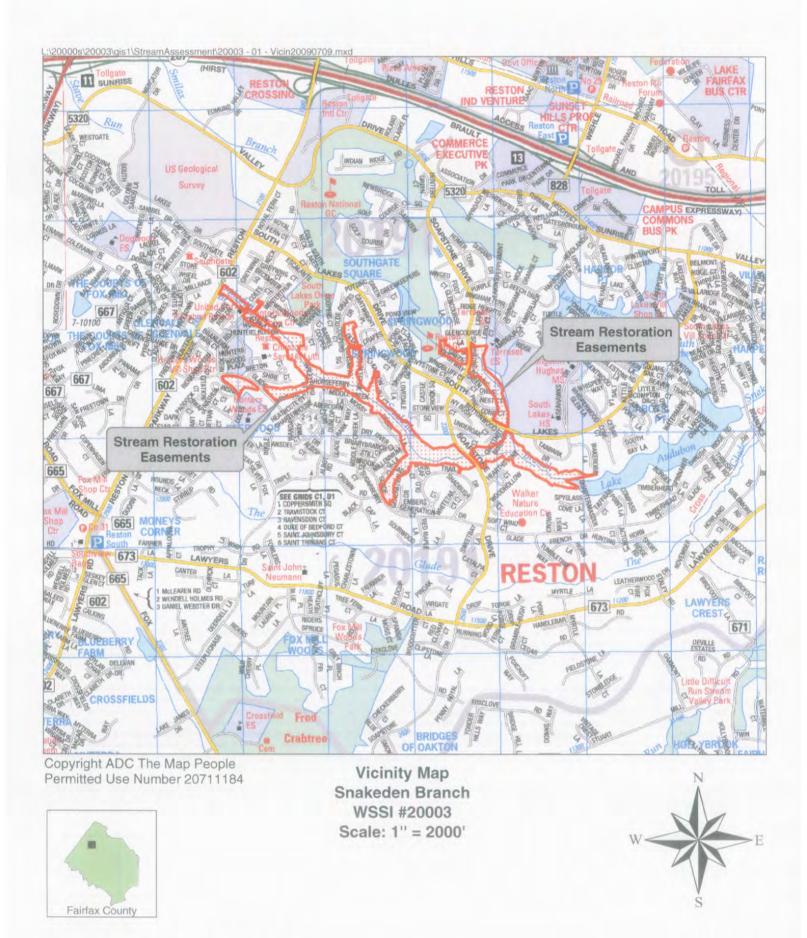
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USGS Quad Map Vienna, VA-MD 1994 Snakeden Branch WSSI #20003 Scale: 1" = 2000'

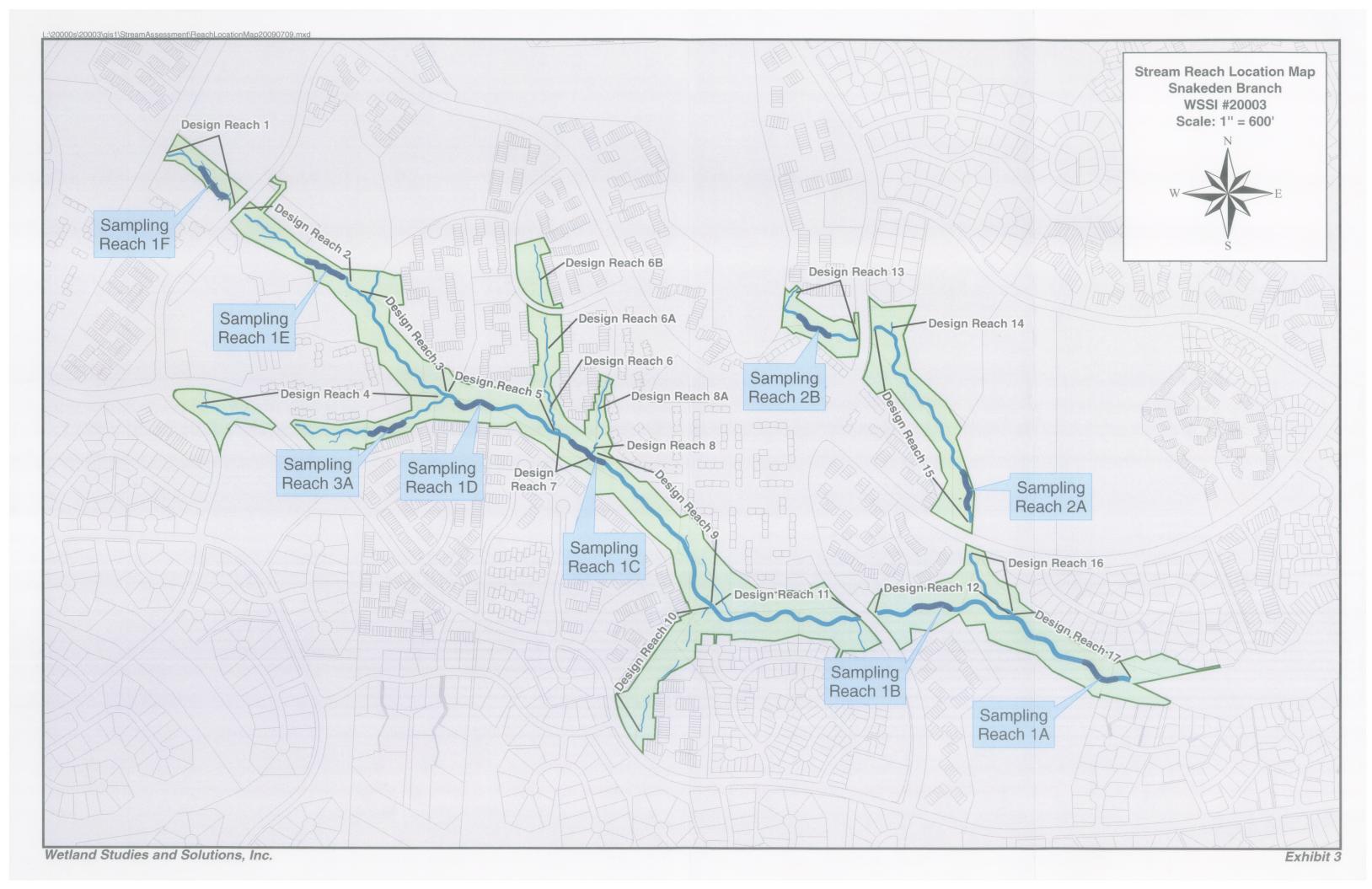
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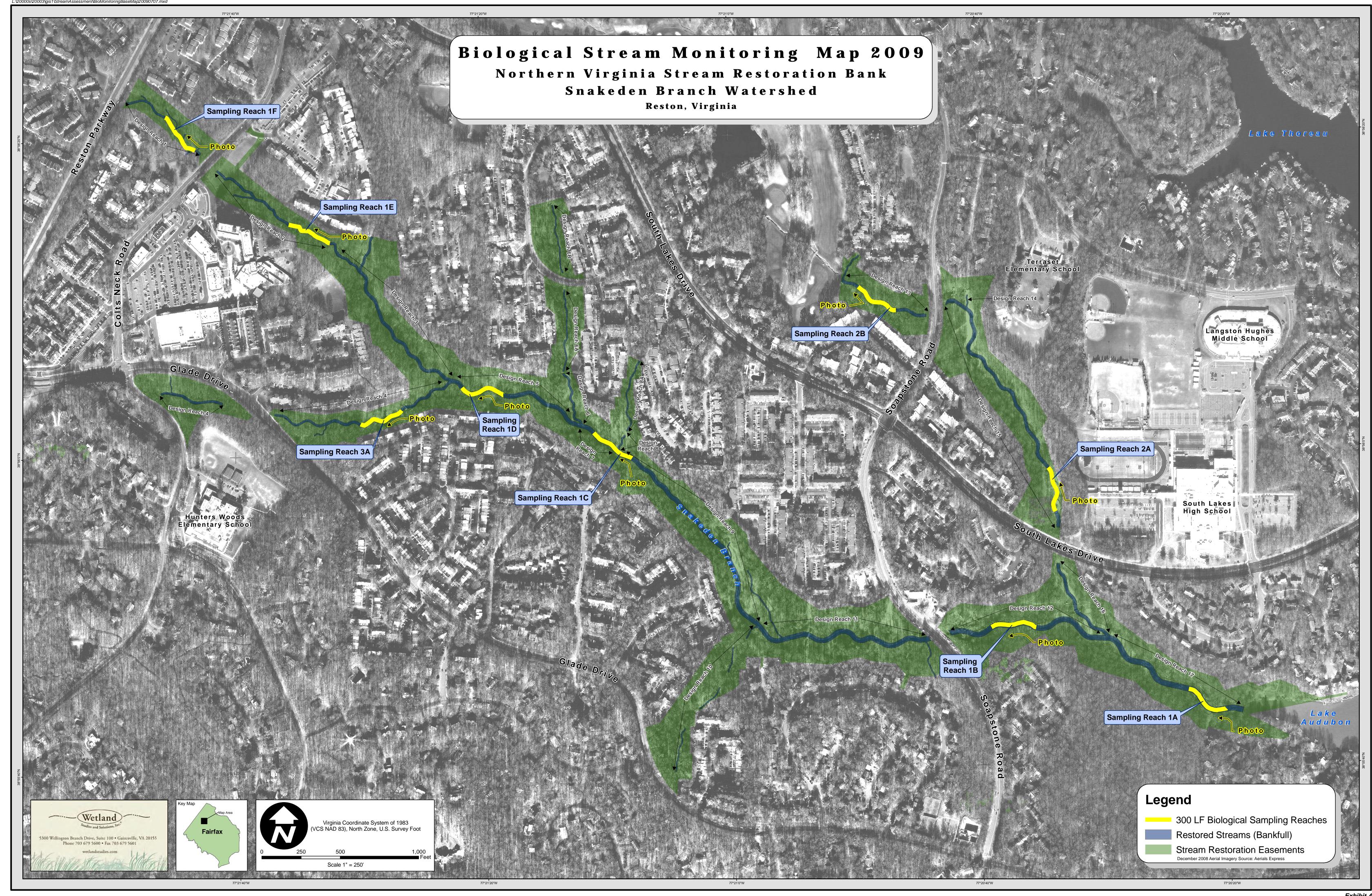
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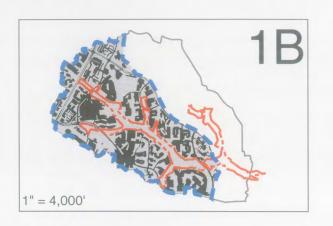
Stream Class: III

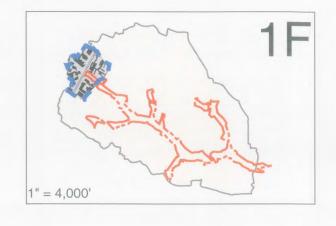
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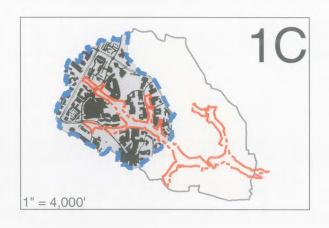


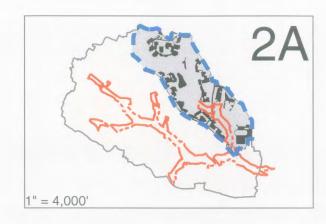


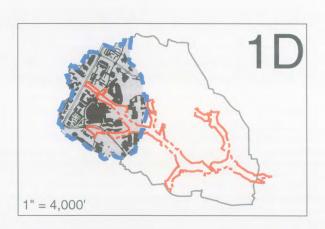


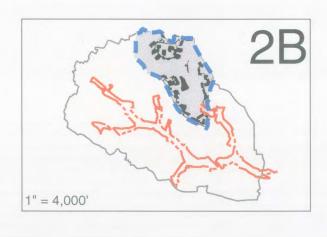




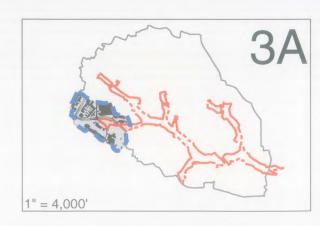














Land Cover Map

Snakeden Branch Scale as Noted

Stream	Impervious	Total
ID	Percent	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

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

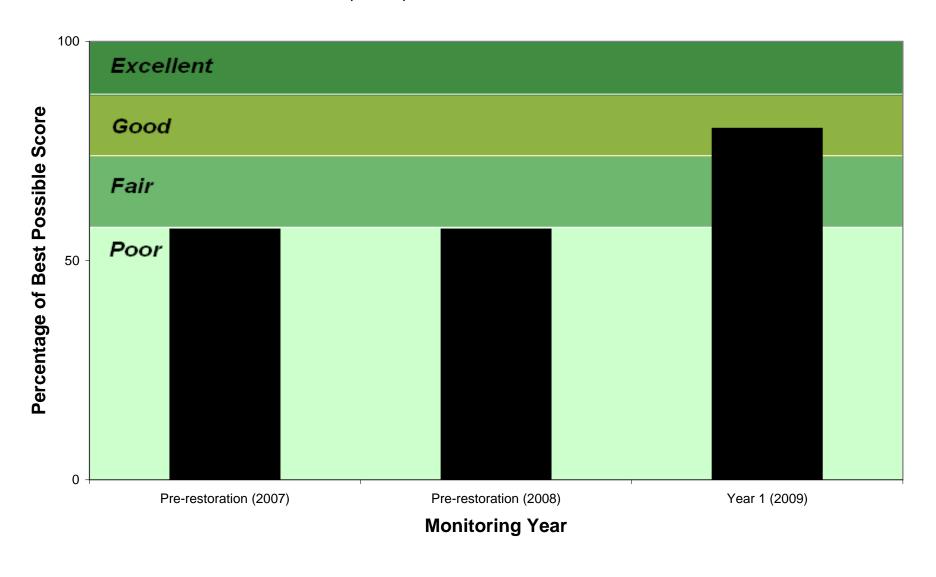




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Na	me and WSSI Nur	mber: Nort	hern Virginia S	Stream Resto	ration Bank:	Snakeden Bra	anch (WSSI #	20003)								
Stream ID:	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	s: TSS/SDS/CAG/E	BNR/JDF						HUC : 020	70008							
Assessme	nt Period:			Pre-restora	ation 2007, 20	008; Year 1										
							Condition C	ategory						Percent of		
				Embedded-		Sediment		Channel	Frequency of	Bank	Vegetation	Riparian	TOTAL	Best Possible	Reach	Stream
As	sessment Reach Na	ame	Substrate	ness	Velocity	Depostion	Flow Status	Alteration	Riffles	Stability*	Protection*	Zone*	SCORE	Score***	Length	Type
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

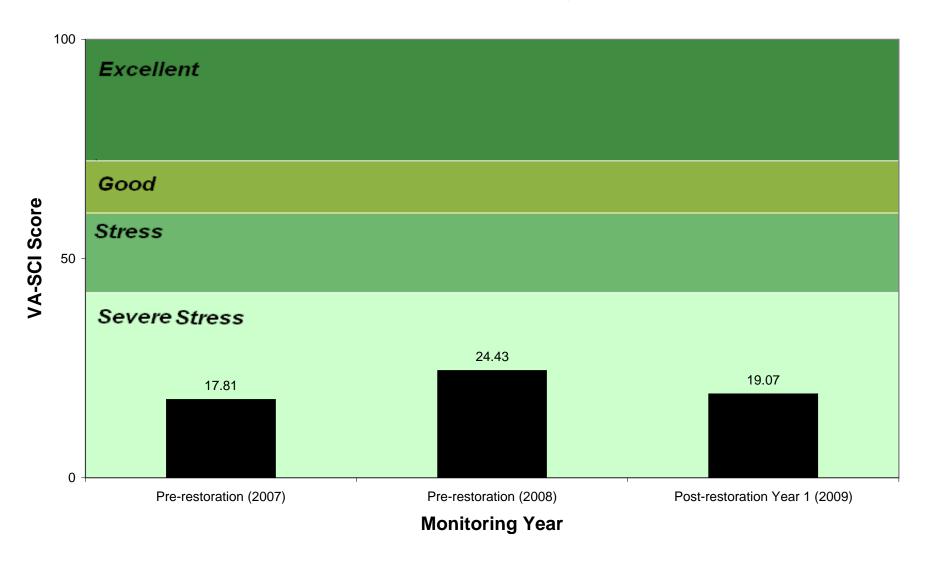


Project #	Site	Cowardin		Date	Time
20003	NOVA Stream Bank	R3	River Basin	5/20/2009	10:00AN
	igators	HUC		Locality	10.00711
	/SDS	02070008	Potomac	Fairfax Coun	hv
	ach	D.A. (Acres)	Reach Length (LF)	Order	y
	-A	863	300	3	
Latitude	Longitude	000	Stream Nam		
38°55'58"	77°21'01"		Snakeden Brai		
Habitat Parameter			dition 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).		
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
STATE OF THE PARTY OF	No compared to the last	Total Score	Name of Street, or other Designation of the Owner, where the Parket of the Owner, where the Owner, which is the Owner, where the Owner, which is the Owner, where the Owner, which is the Owner, whic		66



	ABITAT ASSESSM		SHEET-HIGH GRA		
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3		5/20/2009	10:00AN
	igators	HUC	Potomac	Locality	
	/BNR	02070008		Fairfax Count	У
	ach	D.A. (Acres)	Reach Length (LF)	Order	
	-A	863	300	3	
Latitude	Longitude		Stream Nam		
38°55'58"	77°21'01"		Snakeden Brar	nch	
Habitat Parameter		Con	dition Category		
napitat ratameter	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. dradging, 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 cament; 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
	Occurrence of riffles relatively	10 10 11			10
7. Frequency of Riffles	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.		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 1	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 ight 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
		7 Olar OCO76			100

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





	V	VSSI BENT	HIC MA	CROINVI	ERTEBRA	TE FIELD	DATA SI	HEET		
Proje	ect #	Sit	е	Cow	ardin	River I	Basin	Date	Time	
200		Snake	eden		₹3	Potor		5/20/2009	9.23AM	
		igators			UC			cality		
		/SDS		_	8000			x County		
		ach			(Acres)	Reach Lei	<u> </u>	Orde	r	
		<u>-A</u>		8	63	30	-	3		
Latit		Longi					m Name			
38°55	5'58"	77°21	'01"	<u> </u>		Snaked	en Branch			
		Habitat	Types (In	dicate Per	centage of	Each Habita	t Present)			
Cobble	80	Sand	40	Rootwads		Vegetate	d Banks	5		
Large	Woody D	ebris	0	Underc	ut Banks	Ŏ				
					e Collection					
Gear	Used			ples Colle	cted?	Number	of Jabs/K	icks Taken fro	m Each	
D-Frame	Х	Wadi	ing		Х					
								Undercut		
Kick-Net		From E	Bank			Cobble	19	Banks	0	
Other		From I	Boat			Sand	0	Submerged Macro-phytes	0	
						Rootwads	0	Leaf Packs	0	
						Vegetated		Large Woody		
						Banks	1	Debris	0	
				_						
				<u>Genera</u>	I Comment	<u>s</u>				
			Over	litativo Lia	line of Asse	etie Diete				
			Qual	illative List	ting of Aqua	alic Biota				
Indica	ate Estima	ted Abundan	ce: 0=Abs	ent/Not Ob	served, 1=R	tare, 2=Comr	mon, 3=Abı	undant, 4=Domi	nant	
Periphyton				4	Slimes				0	
Filamentous				0	Macroinve	rtebrates			3	
Macrophyte	S			1	Fish				1	
				Pa	ge 1 of 1					



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sort
Snakeden Branch - Post Con.	20002	1.6	DND/CDC		100
2009	20003	1-A	BNR/SDS	# 0-14-1- 0-11-	128
Date ID'd	Date Sorted	Taxonomist	Sorter	# Grids in Subsample	Total No. Organisms ID
6/29/2009	6/24/2009	ASO	ASO	11	126
Pedicia sp.		Microvelia sp.		Paranemoura sp.	
imonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp. Erioptera sp.		HOPLONEMERTEA - Ribbon Worms TETRASTEMMATIDAE		Shipsa sp. CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
RICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		NOCTUIDAE		Sweltsa sp.	
HEMEROPTERA - Mayflies		Archanara sp. Bellura sp.		TAENIOPTERGIDAE Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
BAETIDAE	1.	MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		CORYDALIDAE		BRACHYCENTRIDAE	
Acerpenna sp. Baetis sp.		Chauliodes sp. Corydalus sp.		Brachycentrus sp. CALAMOCERATIDAE	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		SIALIDAE		DIPSEUDOPSIDAE	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp. CAENIDAE		NEMATODA - Roundworms NEMATOMORPHA - Horsehair Worms		GLOSSOSOMATIDAE Glossosoma sp.	
Caenis sp.		ODONATA (Anispotera - Dragonflies)		Agapetus sp.	
EPHEMERELLIDAE		AESHNIDAE		HELICOPSYCHIDAE	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp. Ephemerella sp.		Basiaeshna sp. Boyeria sp.		HYDROPSYCHIDAE Chaumatopsycha an	
Eurylophella sp.		CORDULEGASTRIDAE		Cheumatopsyche sp. Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		CORDULIIDAE		Parapysche sp.	
Ephemera sp. HEPTAGENIIDAE		GOMPHIDAE Arigomphus sp.		Potamyia sp. HYDROPTILIDAE	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp. LEPTOPHLEBIDAE		Stylogomphus sp. LIBELLULIDAE		LEPIDOSTOMATIDAE Lepidostoma sp.	
Leptophlebia sp.		MACROMIDAE		LEPTOCERIDAE	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp.		PETALURIDAE		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp. LIMNEPHILIDAE	
NEOEPHEMERIDAE DLIGONEURIDAE		CALOPTERYGIDAE Calopteryx sp.		Apatina sp.	
Isonychia sp.		COENAGRIONIDAE		Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		LESTIDAE		Pycnopsyche sp.	
SIPHLONEURIDAE Siphlonurus sp.		OLIGOCHAETA - Oligochaete Worms LUMBRICINA	3	MOLANNIDAE Molanna sp.	
TRICORYTHIDAE		ENCHYTRAEIDAE		ODONTOCERIDAE	
Tricorythodes sp.		NAIDIDAE		Psilotreta sp.	
ASTROPODA - Snails		TUBIFICIDAE	1	PHILOPOTAMIDAE	
ANCYLIDAE Ferissa sp.		LUMBRICULIDAE		Chimarra sp.	
HYDROBIIDAE		POLYCHAETA - Polychaete Worms AEOLOSOMATIDAE		Wormaldia sp. PHRYGANEIDAE	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PERLIDAE		POLYCENTROPIDAE	
Stagnicola sp. Pseudosuccinea sp.		Acroneuria sp.		Cymellus sp. Polycentropus sp.	
PHYSIDAE	1	Beloneuria sp.		PSYCHOMYIDAE	
Physelia sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE Menetus sp.		Neoperia sp. Periesta sp.		Psychomyia sp. RHYACOPHILIDAE	
Gyraulus sp.		Perlinella sp.		Ryacophila sp.	
PLEUROCERIDAE		PERLODIDAE		UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp. APLOSCLERIDA		Diploperla sp.		TUBELLARIA - Flatworms	
SPONGILLIDAE		Isoperla sp. Cultus sp.		PLANARIIDAE DENDROCOELIDAE	
EMIPTERA - True Bugs		PTERONARCYIDAE			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		PELTOPERLIDAE			
Lethocerus sp. CORIXIDAE		Peltoperia sp. LEUCTRIDAE			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE HYDROMETRIDAE		CAPNIDAE Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		NEMOURIDAE			
Nepa sp.		Amphinemura sp.			
Ranatra sp. VELIIDAE		Ostrocerca sp Nemoura sp.			
r sealing PAG		ivernoura sp.			

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



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

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sort
Snakeden Branch - Post Con.	00000	1.0	DND/CDC		100
2009	20003	1-A	BNR/SDS	# Cride in Cubermale	128
Date ID'd	Date Sorted	Taxonomist	Sorter	# Grids in Subsample	Total No. Organisms ID
6/29/2009	6/24/2009	ASO	ASO	11	126
VALVIA - Clams		Forcipomyia sp.		Synorthocladius sp.	
SPHAERIDAE Sphaerium sp.		Probezzia sp.		Thienemanniella sp.	
Pisidium sp.		Sphaeromias sp. Stilobezzia sp.		Tvetenia sp. Unniella sp.	
Musculium sp.		CHAOBORIDAE		Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	79	Tanypodinae	
UNIONIDAE RANCHIOBDELLIDA		Chironominae Chironomini		Ablabesmyla sp. Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
OLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE DRYOPIDAE	1	Dicrotendipes sp. Einfeldia sp.		Krenopelopia 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. Laccomis sp.		Pagastiella sp. Parachironomus sp.		Procladius 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. Promoresia sp.		Stenochironomus sp. Stictochironomus sp.		Trissopelopia sp. Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		CULICIDAE	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		Tanytarsini		Anopheles	
Outimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus Gyrinus		Micropsectra sp.		Mansonia	
HALIPIDAE		Micropsectra/Tanysarsus complex Paratanytarsus sp.		Orthopodomyia Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		DIXIDAE	
Derallus sp. Helochares sp.		Tanytarsus sp.		Dixa sp. DOLICHOPODIDAE	
Helophorus sp.		Zavrelia sp. Diamesinae		EMPIDIDAE	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropistemus sp.		Potthastilà sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp. PSEPHENIDAE		Sympotthastia sp. Orthocladlinae		PELCORHYNCHIDAE	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchylarsus sp. OPEPODA		Cricotopus sp.		SIMULIDAE	39
RUSTACEA (Amphipoda- Scuds)		Cricotopus/Orthocladius sp. Diplocladius sp.		Simulium sp. Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp. GAMMARIDAE		Hydrobaenus sp. Limnophyes sp.		Ectemnia sp. STRATIOMYIDAE	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		SYRPHIDAE	
RUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE RUSTACEA (Isopoda- Sowbugs)		Orthocladius sp.		TABANIDAE	
ASELIDAE (Isopoda- Sowbugs)		Parachaetocladius sp. Parakiefferiella sp.		Chrysops sp. Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
PTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		TIPULIDAE	
Atherix sp.		Paratrissociadius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE CERATOPOGNIDAE		Pseudorthocladius sp. Psilometriocnemus sp.		Leptotarsus 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.		Symposicoladius sp.		Omosia 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 Chironomi dae	Percent Top Two Dominant	НВІ	
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							
METRIO	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

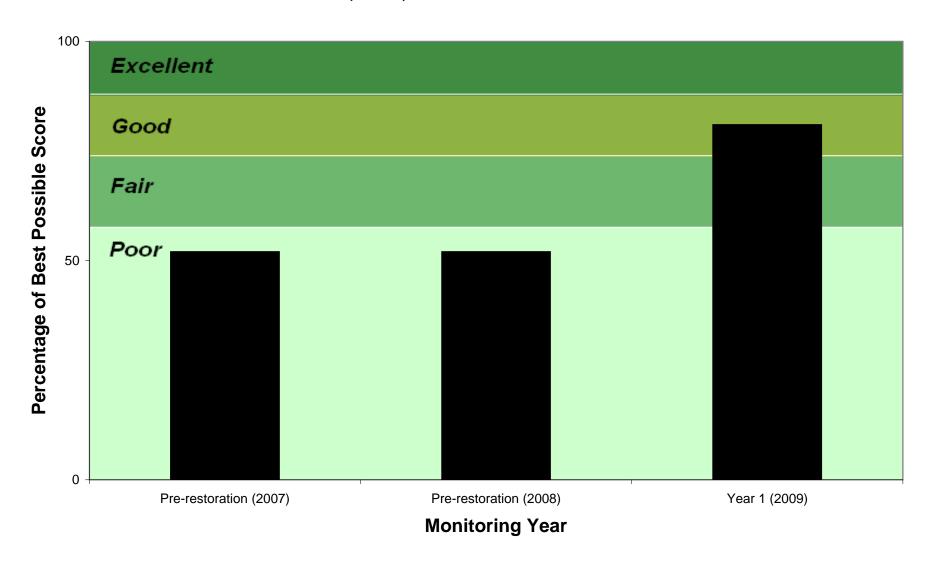




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Stream ID	: Snakeden Branch	and Unnan	ned Tributari	es to Snake	den Branch			Date: 12/1	11/07, 12/12/0	07, 2/12/08	, 2/14/08, 5/2	0/09, 5/21/0	9			
Evaluator	s: TSS/SDS/CAG/BN	NR/JDF						HUC: 020	70008							
Assessme	ent Period:			Pre-restora	tion 2007, 2	008; Year	l									
							Condition	n Category						Percent of		
A	ssessment Reach Nai	ne	Substrate	Embedded- ness	Velocity	Sediment Depostion	Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability*	Vegetation Protection*	Riparian Zone*	TOTAL SCORE	Best Possible Score***	Reach Length	Stream Type
A Stream 1	Pre-restoration (2007)	ne 1-B	Substrate Marginal		Velocity Optimal		Flow Status Marginal				~		-			

Optimal

Optimal

Optimal

Suboptimal

Optimal

162

81

300

R3

Suboptimal Suboptimal

Optimal

Suboptimal Suboptimal

1-B

Year 1 (2009)

^{*} 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

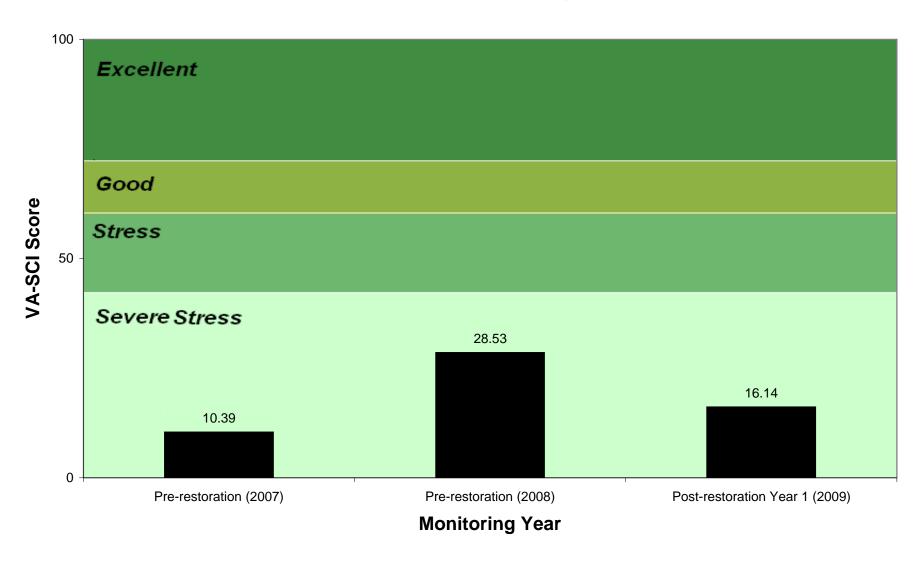


Project #	Site	Cowardin		Date	Time			
20003	NOVA Stream Bank	R3	River Basin	5/20/2009	12:00PN			
	igators	HUC		Locality	7210011			
BNR		02070008	Potomac	Fairfax Coun	tv			
	ach	D.A. (Acres)	Reach Length (LF)	Order	.,			
	-B	540	300	3				
Latitude	Longitude	010	Stream Nam		-			
38°55'58"	77°21'01"	Snakeden Branch						
00 00 00	11 2101			11011				
Habitat Parameter			dition Category					
rapitat i aramotor	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.	armed .			
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			
Company of the last of the las		Total Score			69			



Project #	Site	Cowardin	THE RESERVE AND ADDRESS OF THE PARTY OF THE	Date	Time
20003	NOVA Stream Bank	R3	River Basin	5/20/2009	12:00PN
	gators	HUC		Locality	12.001
BNR		02070008	Potomac	Fairfax Count	V
	ach	D.A. (Acres)	Reach Length (LF)	Order	y
	-B	540	300	3	
Latitude	Longitude	010	Stream Nam		
38°55'58"	77°21'01"	7.7	Snakeden Bra		
Habitat Parameter	Ontine		dition Category	D	-
	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 ight 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 pank 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
		Name and Address of the Owner, where the Owner, which is the Owner, where the Owner, which is the Owner, where the Owner, which is the Owner, whi			162

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





	V	VSSI BEN	THIC MA	CROINVE	RTEBRA	TE FIELD	DATA S	HEET	
Proj	ect #	Si	te	Cow	ardin	River I	Basin	Date	Time
200	003	Snak	eden	F	13	Potor	mac	5/20/2009	11:32AM
	Invest	igators		Н	JC		cality		
	BNR	/SDS		207	8000		Fairfa	ax County	
	Re	ach		D.A. (Acres)	Reach Lei	ngth (LF)	Orde	r
		-B		5-	40	30		3	
	tude	Long					m Name		
38°5	5'58"	77°2′	1'01"			Snaked	en Branch		
		Habitat	: Types (In	dicate Perc	entage of l	Each Habita	t Present)		
Cobble	80	Sand	40	Rootwads	0	Vegetate	d Banks	5	
Large	e Woody D		0	Undercu	t Banks	0	Lea	f Packs	0
					Collection				
Gear	Used			ples Collec	ted?	Number	of Jabs/K	icks Taken fro	m Each
D-Frame	Х	Wad	ling	,	X		H	abitat	
								Undercut	
Kick-Net		From			Banks	1			
Other		From	Roat			Sand	0	Submerged Macro-phytes	0
Otrici		110111	Dout			Rootwads	0	Leaf Packs	1
						Vegetated		Large Woody	
						Banks	2	Debris	0
				<u>General</u>	Comment	<u>s</u>			
			Red eare	d slider (Tra	achemys sc	ripta elegans)		
			Qual	itative List	ing of Agua	atic Biota			
Indic	ate Estima	ted Abundan					non, 3=Ab	undant, 4=Domi	nant
Periphyton				3	Slimes				0
Filamentou				0	Macroinve	rtebrates			3
Macrophyte				1	Fish				0
				Pag	e 1 of 1				



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

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorte
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
IVALVIA - Clams	0,=0,=00	Forcipomyia sp.	02.1	Synorthocladius sp.	1
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp. Musculium sp.		Stilobezzia sp. CHAOBORIDAE		Unniella sp. Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	90	Tanypodinae	
UNIONIDAE BRANCHIOBDELLIDA		Chironominae Chironomini		Ablabesmyia sp. Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles CANTHERIDAE		Cryptotendipes sp. Demicryptochironomus sp.		Conchapelopia sp. Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp. DYTISCIDAE	1	Endochironomus sp. Glyptotendipes sp.		Larsia sp. Macropelopia sp.	
Agabus sp.	•	Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp. Oreodytes sp.		Nilothauma sp. Pagastiella sp.		Pentaneura sp. Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE Microcylloepus sp.		Paratendipes sp. Phaenopsectra sp.		Tanypus sp. Thienemannimyia gp.	
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp. Zavrelimyia sp.	
Promoresia sp. Macronychus sp.		Stictochironomus sp. Tribelos sp.		CULICIDAE	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		Tanytarsini		Anopheles	
Oulimnius sp. GYRINIDAE		Cladotanytarsus sp. Constempellina sp.		Culex Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE Halipus sp.		Paratanytarsus sp. Rheotanytarsus sp.		Psorophora Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp. Derallus sp.		Sublettea sp. Tanytarsus sp.		DIXIDAE Dixa sp.	
Helochares sp.		Zavrelia sp.		DOLICHOPODIDAE	
Helophorus sp.		Diamesinae		EMPIDIDAE	
Hydrophilus sp. Hydrochus sp.		Diamesa sp. Pagastia sp.		Chelifera sp. Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp. PSEPHENIDAE		Sympotthastia sp. Orthocladiinae		EPHYDRIDAE PELCORHYNCHIDAE	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp. PTILODACTYLIDAE		Chaetocladius sp. Corynoneura sp.		Pericoma sp. Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		SIMULIDAE	13
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds) CRANYONYCTIDAE		Diplocladius sp. Eukiefferiella sp.		Prosimulium sp. Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp. Hydrobaenus sp.		Stegopterna sp. Ectemnia sp.	
Synurella sp. GAMMARIDAE		Hydrobaenus sp. Limnophyes sp.		Ectemnia sp. STRATIOMYIDAE	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp. CRUSTACEA (Decopoda - Crayfish)		Mesosmittia sp. Nanocladius sp.		SYRPHIDAE Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		TABANIDAE	
CRUSTACEA (Isopoda- Sowbugs) ASELIDAE		Parachaetocladius sp. Parakiefferiella sp.		Chrysops sp. Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
DIPTERA - True Flies ATHERICIDAE		Parasmittia sp. Paratrichocladius sp.		Thaumalea sp. TIPULIDAE	
Atherix sp.		Paratricriociadius sp. Paratrissociadius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE CERATOPOGNIDAE		Pseudorthocladius sp. Psilometriocnemus sp.		Leptotarsus sp. Molophilus sp.	
Alluaudomyia sp.		Psilometriocnemus sp. Rheocricotopus sp.		Molophilus sp. Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp. Dasyhelea sp.		Stilocladius sp. Symposiocladius sp.		Limnophila sp. Ormosia sp.	
op.					



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorte
Snakeden Branch - Post Con.	20002	1.0	DND/CDC	4	400
2009	20003	1-B	BNR/SDS	1	122
Date ID'd	Date Sorted	Taxonomist	Sorter	# Grids in Subsample	Total No. Organisms ID'o
6/26/2009	6/26/2009	CEK	CEK	16	112
Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches		Prostoia sp.	
Pilaria sp. Erioptera sp.		HOPLONEMERTEA - Ribbon Worms TETRASTEMMATIDAE		Shipsa sp. CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp. PHEMEROPTERA - Mayflies		NOCTUIDAE Archanara sp.		Sweltsa sp. TAENIOPTERGIDAE	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
Acentrella sp.	1	MEGALOPTERA - Dobsonflies CORYDALIDAE		TRICHOPTERA - Caddisflies BRACHYCENTRIDAE	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		CALAMOCERATIDAE	
Centroptilum sp.		Nigronia sp. SIALIDAE		Heteroplectron sp. DIPSEUDOPSIDAE	
Diphetor sp. BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		GLOSSOSOMATIDAE	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp. EPHEMERELLIDAE		ODONATA (Anispotera - Dragonflies) AESHNIDAE		Agapetus sp. HELICOPSYCHIDAE	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		HYDROPSYCHIDAE	
Ephemerella sp. Eurylophella sp.		Boyeria sp. CORDULEGASTRIDAE		Cheumatopsyche sp. Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		CORDULIIDAE		Parapysche sp.	
Ephemera sp. HEPTAGENIIDAE		GOMPHIDAE		Potamyia sp.	
Epeorus sp.		Arigomphus sp. Gomphus sp.		HYDROPTILIDAE Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp. Stylogomphus sp.		Ochrotrichia sp. LEPIDOSTOMATIDAE	
Stenonema sp. LEPTOPHLEBIDAE		LIBELLULIDAE		Lepidostoma sp.	
Leptophlebia sp.		MACROMIIDAE		LEPTOCERIDAE	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp. Paraleptophlebia sp.		PETALURIDAE ODONATA Zygoptera - Damselflies)		Ceraclea sp. Oecetis sp.	
NEOEPHEMERIDAE		CALOPTERYGIDAE		LIMNEPHILIDAE	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp. POLYMITARCYIDAE		COENAGRIONIDAE		Hydatophylax sp. Ironoquia sp.	
POTAMANTHIDAE		Argia sp. LESTIDAE		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	7	MOLANNIDAE	
Siphlonurus sp.		LUMBRICINA		Molanna sp.	
TRICORYTHIDAE Tricorythodes sp.		ENCHYTRAEIDAE NAIDIDAE		ODONTOCERIDAE Psilotreta sp.	
GASTROPODA - Snails		TUBIFICIDAE		PHILOPOTAMIDAE	
ANCYLIDAE		LUMBRICULIDAE		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE LYMNAEIDAE		AEOLOSOMATIDAE Aeolosoma sp.		PHRYGANEIDAE Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		POLYCENTROPIDAE	
Stagnicola sp.		PERLIDAE		Cyrnellus sp. Polycentropus sp.	
Pseudosuccinea sp. PHYSIDAE		Acroneuria sp. Beloneuria sp.		PSYCHOMYIDAE	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp. Gyraulus sp.		Perlesta sp. Perlinella sp.		RHYACOPHILIDAE Ryacophila sp.	
PLEUROCERIDAE		PERLODIDAE		UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp. IAPLOSCLERIDA		Diploperla sp. Isoperla sp.		TUBELLARIA - Flatworms PLANARIIDAE	
SPONGILLIDAE		Cultus sp.		DENDROCOELIDAE	
IEMIPTERA - True Bugs		PTERONARCYIDAE			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp. Lethocerus sp.		PELTOPERLIDAE Peltoperla sp.			
CORIXIDAE		LEUCTRIDAE			
GELASTOCORIDAE	-	Leuctra sp.	-		
GERRIDAE Trepobates sp.		Zealuectra sp. Paraleuctra sp.			
HEBRIDAE		CAPNIDAE			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE	·	Paracapnia sp.			
NEPIDAE Nepa sp.		NEMOURIDAE Amphinemura sp.			
Ranatra sp.		Ostrocerca sp			
ranana sp.					1
VELIIDAE		Nemoura 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.

	Read	ch 1-B Snak	eden Branch Water	shed Biotic Metric	Scores (200	7-2009)		
Reach	Total Taxa	Total EPT Taxa	Percent Ephemeroptera	Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	Percent Scrapers	Percent Chironomi dae	Percent Top Two Dominant	НВІ
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 Weight Metri		SCI (2007-20	09)
		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

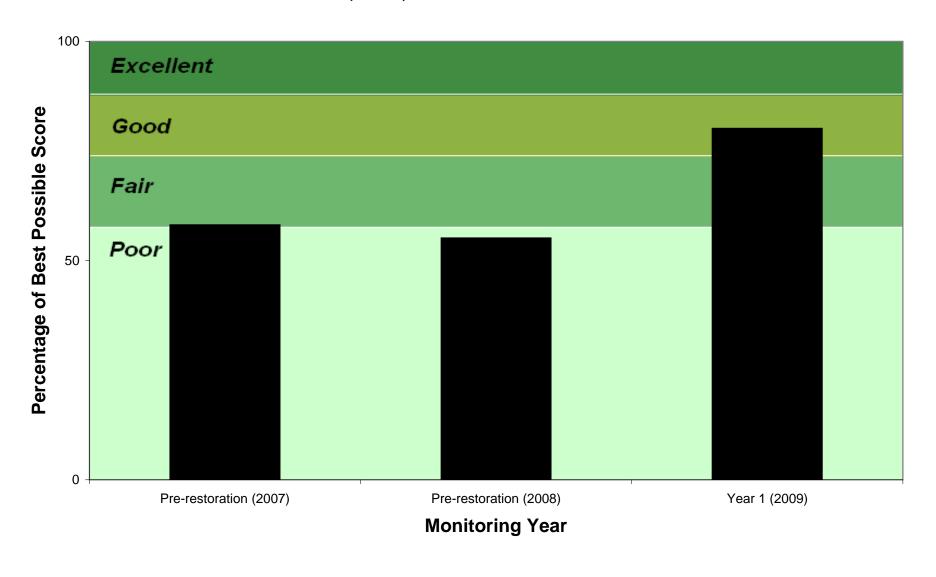




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Stream ID: Snakeden Branch and U	nnamed Tribi	utaries to Sna	akeden Bran	nch		Date: 12/1	1/07, 12/12/0	07, 2/12/08,	2/14/08, 5/20	0/09, 5/21/09	9			
Evaluators: TSS/SDS/CAG/BNR/JD	F					HUC: 020	70008							
Assessment Period:		Pre-restora	tion 2007, 2	008; Year 1										
					Conditio	n Category						Percent of		
		Embedded-		Sediment		Channel	Frequency of	Bank	Vegetation	Riparian	TOTAL	Best Possible	Reach	Stream
Assessment Reach Name	Substrate	ness	Velocity	Depostion	Flow Status	Alteration	Riffles	Stability*	Protection*	Zone*	SCORE	Score***	Length	Туре
Pre-restoration														

							Condition	Category						Percent of		
				Embedded-		Sediment		Channel	Frequency of	Bank	Vegetation	Riparian	TOTAL	Best Possible	Reach	Stream
As	sessment Reach N	lame	Substrate	ness	Velocity	Depostion	Flow Status	Alteration	Riffles	Stability*	Protection*	Zone*	SCORE	Score***	Length	Type
	Pre-restoration															
Stream 1	(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

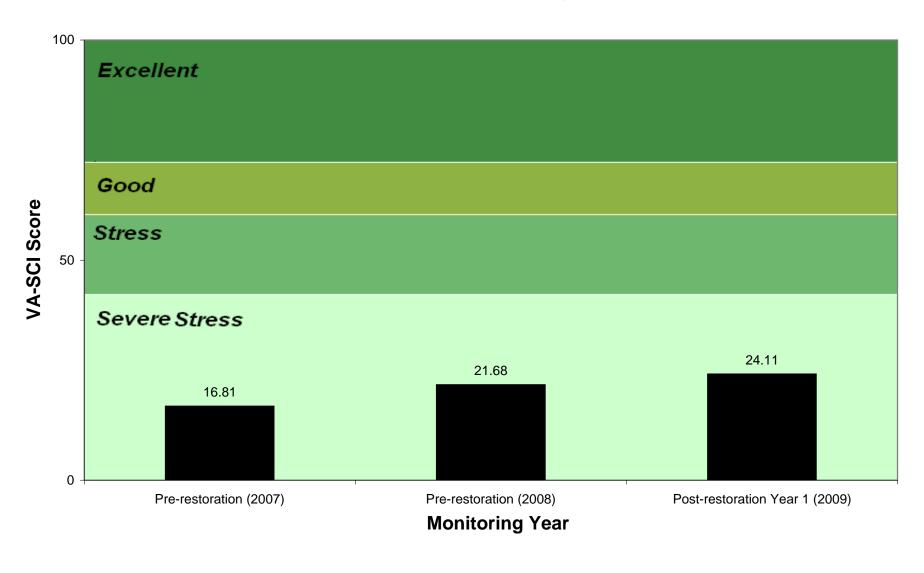


Project #	Site	Cowardin	Di D :	Date	Time				
20003	NOVA Stream Bank	R3	River Basin	5/20/2009	1:40PN				
	igators	HUC		Locality					
BNR		02070008	Potomac	Fairfax Count	V				
	ach	D.A. (Acres)	Reach Length (LF)	Order					
1.	-C	386	300	3					
Latitude	Longitude	Stream Name							
38°55'58"	77°21'01"	Snakeden Branch							
Habitat Parameter	Outlined	the same of the sa	dition Category	D					
	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				
TO SERVICE STREET		Total Score			66				



Project #	ABITAT ASSESSM Site	Cowardin		Date	Time
20003	NOVA Stream Bank	R3	River Basin	5/20/2009	1:40PN
	igators	HUC		Locality	1,401 19
BNR		02070008	Potomac	Fairfax Count	V
	ach	D.A. (Acres)	Reach Length (LF)	Order	y
	-C	386	300	3	
Latitude	Longitude		Stream Nam		
38°55'58"	77°21'01"		Snakeden Bra		
		0-11	distan Catagoni		
Habitat Parameter	Optimal	Suboptimal	dition Category Marginal	Poor	Score
	Орини	ousopilliu	marginar	1001	50010
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
	Occurrence of riffles relatively				10
7. Frequency of Riffles	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
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-C: 2007, 2008 and 2009 Monitoring Years





	٧	VSSI BEN	THIC MA	CROINVI	RTEBR <i>A</i>	TE FIELD	DATA SI	HEET			
Proje	ect #	Si	te	Cow	ardin	River I	Basin	Date	Time		
200	003	Snak	eden	R	:3	Potor	mac	5/20/2009	1:30PM		
		gators		HUC Locality							
	BNR/	SDS		2070008 Fairfax County							
	Rea	ach		D.A. (Acres)	Reach Ler	ngth (LF)	Orde	r		
	1-	·C		38	36	30	0	3			
Latit		Long	itude			Strea	m Name				
38°5	5'58"	77°2	1'01"			Snaked	en Branch				
	Habitat Types (Indicate Percentage of Each Habitat Present)										
Cobble 100 Sand 20 Rootwads 0 Vegetated Banks 5											
	Submerged Macrophytes 0 Undercut Banks 0										
	Woody D		2		Packs	5	Other	(bedrocks)	5		
								,	-		
				Sampl	e Collectio	n					
Gear	Used	How	Were Sam	ples Collec			of Jahs/K	icks Taken fron	n Fach		
D-Frame	Х	Wad			χ	110111501		abitat			
D Traine	,	· · · ·	<u>.</u>		•			Undercut			
Kick-Net		From	Bank			Cobble	18	Banks	0		
ruon ruot		7 10111	Barin			CODDIO	10	Submerged Macro-	•		
Other		From	Boat			Sand	0	phytes	0		
						Rootwads	0	Leaf Packs	0		
						Vegetated		Large Woody			
						Banks	2	Debris	0		
				<u>Genera</u>	I Commen	t <u>s</u>					
			Qua	litative List	ing of Aqu	atic Biota					
Indic	ate Estima	ted Abunda	nce: 0=Abs	sent/Not Ob	served, 1=F	Rare, 2=Com	mon, 3=Abı	undant, 4=Domir	nant		
Periphyton				3	Slimes				0		
Filamentous	s Algae			0	Macroinve	tebrates			3		
Macrophyte				1	Fish				1		
, ,											
				Pa	ge 1 of 1						



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	20002	1-C	CDC/DND	1	128
Date ID'd	20003 Date Sorted	Taxonomist	SDS/BNR Sorter	# Grids in Subsample	Total No. Organisms ID'd
7/1/2009	6/26/2009	ASO	SDS	# Grius in Subsample	114
	0/20/2000		ODO		117
BIVALVIA - Clams SPHAERIDAE		Forcipomyia sp. Probezzia sp.		Synorthocladius sp. Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp. CORBICULIDAE		CHAOBORIDAE Chaborus sp.		Xylotopus sp. Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	81	Tanypodinae	
UNIONIDAE		Chironominae		Ablabesmyia sp.	
BRANCHIOBDELLIDA BRANCHIOBDELLIDAE		Chironomini Chironomus sp.		Alotanypus sp. Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE CURCULIONIDAE		Demicryptochironomus sp. Dicrotendipes sp.		Guttipelopia sp. Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE Agabus sp.		Glyptotendipes sp. Kiefferulus sp.		Macropelopia sp. Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp. Laccornis sp.		Pagastiella sp. Parachironomus sp.		Procladius sp. Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp. Optioservus sp.		Phaenopsectra sp. Polypedilum sp.		Thienemannimyia gp. Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp. Dubiraphia sp.		Tribelos sp. Zavreliella sp.		CULICIDAE Aedes	2
Ancyronyx sp.		Tanytarsini		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE Dineutus		Constempellina sp. Micropsectra sp.		Culiseta Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp. HYDROPHILIDAE		Rheotanytarsus sp. Stempellina sp.		Toxorhynchites Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		DIXIDAE	
Derallus sp. Helochares sp.		Tanytarsus sp. Zavrelia sp.		Dixa sp. DOLICHOPODIDAE	
Helophorus sp.		Diamesinae		EMPIDIDAE	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp. Tropisternus sp.		Pagastia sp. Potthastia sp.		Clinocera sp. Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		EPHYDRIDAE	
PSEPHENIDAE Psephenus sp.		Orthocladiinae Brillia sp.		PELCORHYNCHIDAE Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE Anchytarsus sp.		Corynoneura sp. Cricotopus sp.		Psycoda sp. SIMULIDAE	7
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	·
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE Stygonectes sp.		Eukiefferiella sp. Heleniella sp.		Cnephia sp. Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp. GAMMARIDAE		Hydrobaenus sp.		Ectemnia sp. STRATIOMYIDAE	
Gammarus sp.		Limnophyes sp. Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		SYRPHIDAE	
CRUSTACEA (Decopoda - Crayfish) CAMBARIDAE		Nanocladius sp. Orthocladinae A		Chrysogaster sp. Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		TABANIDAE	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE Caecidotea sp.		Parakiefferiella sp. Parametriocnemus sp.		Tabanus sp. TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
DIPTERA - True Flies	-	Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE Atherix sp.		Paratrichocladius sp. Paratrissocladius sp.		TIPULIDAE Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp. Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE Alluaudomyia sp.	1	Psilometriocnemus sp. Rheocricotopus sp.		Molophilus sp. Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp.		Stilocladius sp. Symposiocladius sp.		Limnophila sp. Ormosia sp.	
Daevhalaa en			1	Oπποσία σμ.	1
Dasyhelea sp.		сутрологация ор.			
Dasyhelea sp.		cymposiosiaaiae op.			



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sort
nakeden 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'
7/1/2009	6/26/2009	ASO	SDS	24	114
7/1/2009	0/20/2009	ASO	303	24	114
Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp.		HIRUDINEA - Leeches HOPLONEMERTEA - Ribbon Worms		Prostoia sp. Shipsa sp.	
Pilaria sp. Erioptera sp.		TETRASTEMMATIDAE		CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp.		NOCTUIDAE		Sweltsa sp.	
PHEMEROPTERA - Mayflies AMELETIDAE		Archanara sp. Bellura sp.		TAENIOPTERGIDAE Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
BAETIDAE	2	MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		CORYDALIDAE		BRACHYCENTRIDAE	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp. CALAMOCERATIDAE	
Baetis sp. Centroptilum sp.		Corydalus 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. EPHEMERELLIDAE		ODONATA (Anispotera - Dragonflies) AESHNIDAE		Agapetus sp. HELICOPSYCHIDAE	
Dannella sp.	1	Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		HYDROPSYCHIDAE	1
Ephemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp. Serratella sp.		CORDULEGASTRIDAE Cordulegaster sp.		Diplectrona sp. Hydropsyche sp.	
EPHEMERIDAE		CORDULIIDAE		Parapysche sp.	
Ephemera sp.		GOMPHIDAE		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		HYDROPTILIDAE	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp. Stenacron sp.		Hagenius sp. Lanthus sp.		Leucotrichia sp. Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		LEPIDOSTOMATIDAE	
LEPTOPHLEBIDAE		LIBELLULIDAE		Lepidostoma sp.	
Leptophlebia sp.		MACROMIIDAE		LEPTOCERIDAE	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp. Paraleptophlebia sp.		PETALURIDAE ODONATA Zygoptera - Damselflies)		Ceraclea sp. Oecetis sp.	
NEOEPHEMERIDAE		CALOPTERYGIDAE		LIMNEPHILIDAE	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		COENAGRIONIDAE		Hydatophylax sp.	
POLYMITARCYIDAE POTAMANTHIDAE		Argia sp. LESTIDAE		Ironoquia sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	6	Pycnopsyche sp. MOLANNIDAE	
Siphlonurus sp.		LUMBRICINA		Molanna sp.	
TRICORYTHIDAE		ENCHYTRAEIDAE		ODONTOCERIDAE	
Tricorythodes sp.		NAIDIDAE		Psilotreta sp.	
ASTROPODA - Snails		TUBIFICIDAE	2	PHILOPOTAMIDAE	
ANCYLIDAE		POLYCHAETA - Polychaete Worms		Chimarra sp.	
Ferissa sp. HYDROBIIDAE		AEOLOSOMATIDAE		Wormaldia sp. PHRYGANEIDAE	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		POLYCENTROPIDAE	
Stagnicola sp. Pseudosuccinea sp.		PERLIDAE Acroneuria sp.		Cyrnellus sp. Polycentropus sp.	
PHYSIDAE	12	Beloneuria sp.		PSYCHOMYIDAE	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.	<u> </u>	Psychomyia sp.	
Menetus sp.		Perlesta sp.		RHYACOPHILIDAE	
Gyraulus sp. PLEUROCERIDAE		Perlinella sp. PERLODIDAE		Ryacophila sp. UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		TUBELLARIA - Flatworms	
APLOSCLERIDA		Isoperla sp.		PLANARIIDAE	
SPONGILLIDAE		Cultus sp.		DENDROCOELIDAE	
EMIPTERA - True Bugs BELOSTOMATIDAE		PTERONARCYIDAE Pteronarcys sp.			
Belostoma sp.		PELTOPERLIDAE			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		LEUCTRIDAE			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE Trepobates sp.		Zealuectra sp. Paraleuctra sp.			
HEBRIDAE		CAPNIDAE			
HYDROMETRIDAE	1	Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		NEMOURIDAE			
Nepa sp.		Amphinemura sp.			
Ranatra 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-C Snakeden Branch Watershed Biotic Metric Scores (2007-2009)											
Reach	Total Taxa	Total EPT Taxa	Percent Ephemeroptera	Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	Scrapers	Percent Chironomi dae	Percent Top Two Dominant	НВІ				
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 Weigh Metri	ted Snakede ics and VA-S		
		Monitoring	y 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

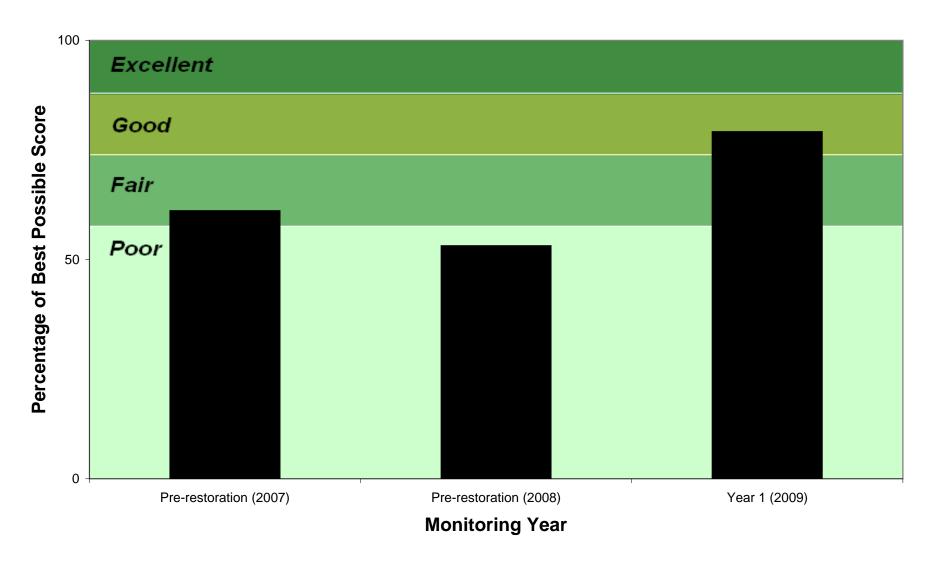




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Na	me and WSSI N	umber: No	orthern Virgi	nia Stream I	Restoration I	Bank: Snak	eden Branch	n (WSSI # 2	0003)							
Stream ID:	Snakeden Bran	ch and Unr	named Tribu	taries to Sn	akeden Brar	nch		Date: 12/1	1/07, 12/12/	07, 2/12/08	2/14/08, 5/2	20/09, 5/21/0	9			
Evaluators	: TSS/SDS/CAG	/BRN/JDF						HUC: 020	70008							
Assessment Period: Pre-restoration 2007, 2008; Year 1						1										
							Condition	Category						Percent of		
Ass	essment Reach N	ame	Substrate	Embedded- ness	Velocity	Sediment Depostion	Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability*	Vegetation Protection*	Riparian Zone*	TOTAL SCORE	Best Possible Score***	Reach Length	Stream Type
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	Suboptima	Suboptima	Suboptimal	Suboptima	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

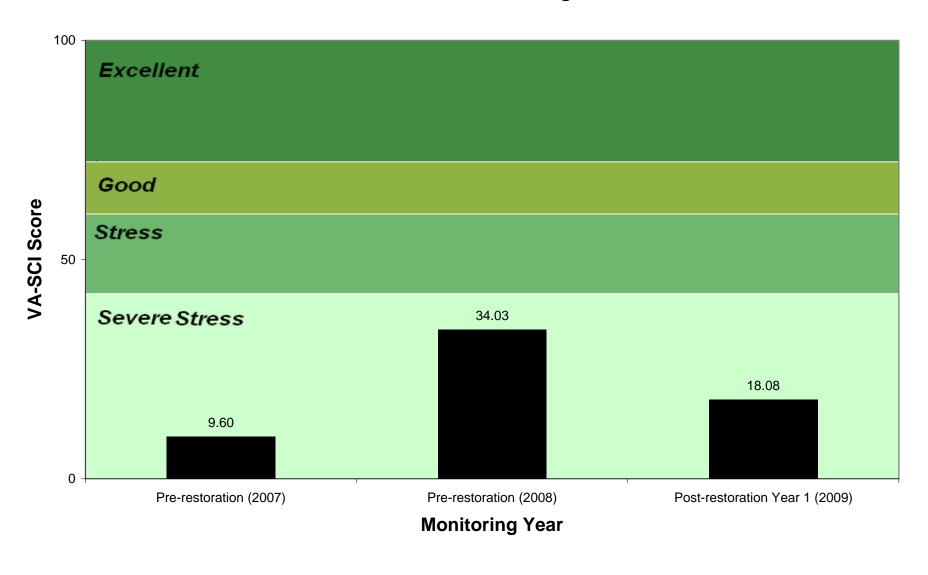


	ABITAT ASSESSM		SHEET-HIGH GRA		
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	TAVOT DUSITI	5/20/2009	2:00PM
	tigators	HUC	Potomac	Locality	
BNR	R/SDS	02070008	1 Otomao	Fairfax Count	ty
Re	each	D.A. (Acres)	Reach Length (LF)	Order	
1	-D	291	300	3	
Latitude	Longitude		Stream Nam	ne	
38°55'58"	77°21'01"		Snakeden Bra	nch	
		Con	dition Category		
Habitat Parameter	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
		Page 1 of 2			



WSSI HA	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS					
Project #	Site	Cowardin	River Basin	Date	Time				
20003	NOVA Stream Bank	R3	KIVEL DASIN	5/20/2009	2:00PM				
	igators	HUC	Potomac	Locality					
	D	02070008		Fairfax Count	ty				
	ach	D.A. (Acres)	Reach Length (LF)	Order					
	-D	291	3						
Latitude 38°55'58"	Longitude 77°21'01"	Stream Name Snakeden Branch							
38,22,38	77.2101		Shakeden Bra	ncn					
Habitat Parameter			dition Category						
Traditat Farameter	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				
		Page 2 of 2							

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





	\	WSSI BEN	NTHIC MA	CROINV	ERTEBR <i>A</i>	TE FIELD	DATA S	HEET			
Proje	ect #	Si	ite	Cow	ardin	River	Basin	Date	Time		
200	003	Snak	eden		3	Poto	mac	5/20/2009	1:50PM		
	Invest	igators		H	ocality						
	BNR	SDS		207	8000			ax County			
	Rea	ach		D.A. (Acres)	Reach Le	ngth (LF)	Orde	der		
	1-	-D		2	91	30	00	3			
	tude		jitude			Strea	m Name				
38°5	5'58"	77°2	1'01"			Snaked	den Branch				
		Habita	at Types (Ir	ndicate Per	centage of	Each Habita	at Present)				
Cobble	80	Sand	30	Rootwads	0	Vegetate	d Banks	0			
	Submerged Macrophytes 0 Undercut Banks 0										
	e Woody D		5		Packs	0	Other	(bedrocks)	0		
	•										
	Sample Collection										
Gear	Gear Used How Were Samples Collected?										
D-Frame	Х	Wa	ding		X	Number of	Jabs/Kicks	Taken from E	ach Habitat		
								Undercut			
Kick-Net		From	Bank			Cobble	18	Banks	0		
								Submerged			
Other		From	Boat			Sand	0	Macro-phytes	0		
						Rootwads	0	Leaf Packs	0		
						Vegetated	0	Large Woody	0		
						Banks	2	Debris	0		
				0	10	4-					
				Genera	I Commen	ıs					
			Qua	alitative I ie	ting of Aqu	atic Biota					
			<u> </u>	antative LIS	ing or Aqu	atio biota					
Indi	cate Estima	ated Abunda	ance: 0=Ab	sent/Not Ob	served, 1=F	Rare, 2=Com	mon, 3=Ab	undant, 4=Domi	nant		
Periphyton				3	Slimes				0		
Filamentou				1	Macroinver	tebrates			2		
Macrophyte	es			0	Fish				2		
				Pa	ge 1 of 1						



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

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorted
0 0 0 0000	20002	1 D	DND/CDC	4	105
Snakeden Branch Post-Con 2009	20003	1-D	BNR/SDS	# Grids in Subsample	125
Date ID'd 6/29/2009	Date Sorted 6/29/2009	Taxonomist CAT	Sorter CAT	# Grids in Subsample	Total No. Organisms ID'd
<u>'</u>	0/29/2009		CAT		110
BIVALVIA - Clams SPHAERIDAE		Forcipomyia sp. Probezzia sp.		Synorthocladius sp. Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp. CORBICULIDAE		CHAOBORIDAE Chaborus sp.		Xylotopus sp. Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	62	Tanypodinae	
UNIONIDAE		Chironominae		Ablabesmyia sp.	
BRANCHIOBDELLIDA BRANCHIOBDELLIDAE		Chironomini		Alotanypus sp.	
TETRASTEMMATIDAE		Chironomus sp. Cryptochironomus sp.		Apsectrotanypus sp. Clinotanypus sp.	
COLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE		Demicryptochironomus sp.		Guttipelopia sp.	
CURCULIONIDAE DRYOPIDAE		Dicrotendipes sp. Einfeldia sp.		Krenopelopia sp. Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE		Glyptotendipes sp.		Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp. Coptotomus sp.		Microtendipes sp. Nilothauma sp.		Paramerina sp. Pentaneura sp.	
Oreodytes sp.		Pagastiella sp.		Procladius sp.	
Laccornis sp.		Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp. ELMIDAE		Paracladopelma sp. Paratendipes sp.		Rheopelopia sp. Tanypus sp.	
Microcylloepus sp.		Phaenopsectra sp.		Thienemannimyia gp.	
Optioservus sp.	-	Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp. Promoresia sp.		Stenochironomus sp. Stictochironomus sp.		Trissopelopia sp. Zavrelimyia sp.	
Macronychus sp.		Tribelos sp.		CULICIDAE	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp. Oulimnius sp.		Tanytarsini Cladotanytarsus sp.		Anopheles Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus HALIPIDAE		Micropsectra/Tanysarsus complex		Orthopodomyia Psorophora	
Halipus sp.		Paratanytarsus sp. Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp. Derallus sp.		Sublettea sp. Tanytarsus sp.		DIXIDAE Dixa sp.	
Helochares sp.		Zavrelia sp.		DOLICHOPODIDAE	
Helophorus sp.		Diamesinae		EMPIDIDAE	
Hydrophilus sp.		Diamesa sp. Pagastia sp.		Chelifera sp. Clinocera sp.	
Hydrochus sp. Tropisternus sp.		Pagastia sp. Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		EPHYDRIDAE	
PSEPHENIDAE Psephenus sp.		Orthocladiinae Brillia sp.		PELCORHYNCHIDAE Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE Anchytarsus sp.		Corynoneura sp. Cricotopus sp.		Psycoda sp. SIMULIDAE	
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE Stygonectes sp.		Eukiefferiella sp. Heleniella sp.		Cnephia sp. Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp.		Hydrobaenus sp.		Ectemnia sp.	
GAMMARIDAE Gammarus sp.		Limnophyes sp. Lopescladius sp.		STRATIOMYIDAE	
Gammarus sp. HYALELLIDAE		Lopescladius sp. Mesocricotopus sp.		Oxycera sp. Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		SYRPHIDAE	
CRUSTACEA (Decopoda - Crayfish)	·	Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE PALAEMONIDAE		Orthocladinae A Orthocladius sp.		Eristalis sp. TABANIDAE	
CRUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp. Paraphaenocladius sp.		TANYDERIDAE THAUMALEIDAE	
Lirceus sp. DIPTERA - True Flies		Paraphaenocladius sp. Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE		Paratrichocladius sp.		TIPULIDAE	
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE CECIDOMYIIDAE		Psectrocladius sp. Pseudorthocladius sp.		Hexatoma sp. Leptotarsus sp.	
CERATOPOGNIDAE		Pseudormociadius sp. Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
Bezzia sp. Ceratopogon sp.		Rheosmittia sp. Smittia sp.		Psuedolimnophila sp. Dicranota sp.	
Ceratopogon sp. Culicoides sp.		Stilocladius sp.		Limnophila sp.	
Dasyhelea sp.		Symposiocladius sp.		Ormosia sp.	
	-				
		1	1		L
		Page	1 of 2		



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorte
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'o
6/29/2009	6/29/2009	CAT	CAT	14	115
0/23/2003	0/23/2003	CAI	- CAT	14	113
Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp. Pilaria sp.		HIRUDINEA - Leeches HOPLONEMERTEA - Ribbon Worms		Prostoia sp. Shipsa sp.	
Erioptera sp.		TETRASTEMMATIDAE		CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
Trichocera sp. PHEMEROPTERA - Mayflies		NOCTUIDAE Archanara sp.		Sweltsa sp. TAENIOPTERGIDAE	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
BAETIDAE		MEGALOPTERA - Dobsonflies		TRICHOPTERA - Caddisflies	
Acentrella sp.		CORYDALIDAE		BRACHYCENTRIDAE	
Acerpenna sp. Baetis sp.		Chauliodes sp. Corydalus sp.		Brachycentrus sp. CALAMOCERATIDAE	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		SIALIDAE		DIPSEUDOPSIDAE	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp. CAENIDAE		NEMATODA - Roundworms NEMATOMORPHA - Horsehair Worms		GLOSSOSOMATIDAE 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. Eurylophella sp.		Boyeria sp. CORDULEGASTRIDAE		Cheumatopsyche sp. Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		CORDULIIDAE		Parapysche sp.	
Ephemera sp.		GOMPHIDAE		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		HYDROPTILIDAE	
Epeorus sp. Leucrocuta sp.		Gomphus sp. Hagenius sp.		Hydroptila sp. Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		LEPIDOSTOMATIDAE	
LEPTOPHLEBIDAE		LIBELLULIDAE		Lepidostoma sp.	
Leptophlebia sp.		MACROMIIDAE		LEPTOCERIDAE	
Habrophlebia sp. Habrophlebiodes sp.		Macromia sp. PETALURIDAE		Triaenodes sp. Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		CALOPTERYGIDAE		LIMNEPHILIDAE	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		COENAGRIONIDAE		Hydatophylax sp.	
POLYMITARCYIDAE POTAMANTHIDAE		Argia sp. LESTIDAE		Ironoquia sp. Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms		MOLANNIDAE	
Siphlonurus sp.		LUMBRICINA		Molanna sp.	
TRICORYTHIDAE		ENCHYTRAEIDAE		ODONTOCERIDAE	
Tricorythodes sp.		NAIDIDAE	17	Psilotreta sp.	
ASTROPODA - Snails ANCYLIDAE		TUBIFICIDAE LUMBRICULIDAE	17	PHILOPOTAMIDAE Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		AEOLOSOMATIDAE		PHRYGANEIDAE	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp. Stagnicola sp.		PLECOPTERA - Stonefly Larvae PERLIDAE		POLYCENTROPIDAE 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. Gyraulus sp.		Perlesta sp. Perlinella sp.		RHYACOPHILIDAE Ryacophila sp.	
PLEUROCERIDAE		PERLODIDAE		UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		TUBELLARIA - Flatworms	
APLOSCLERIDA		Isoperla sp.		PLANARIIDAE	
SPONGILLIDAE EMIPTERA - True Bugs		Cultus sp. PTERONARCYIDAE		DENDROCOELIDAE	
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		PELTOPERLIDAE			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE		LEUCTRIDAE			
GELASTOCORIDAE GERRIDAE		Leuctra sp. Zealuectra sp.			
Trepobates sp.		Zealuectra sp. Paraleuctra sp.			
HEBRIDAE		CAPNIDAE			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		NEMOURIDAE			
Nepa sp. Ranatra sp.		Amphinemura 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)	Scrapers	Percent Chironomi dae	Percent Top Two Dominant	НВІ				
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

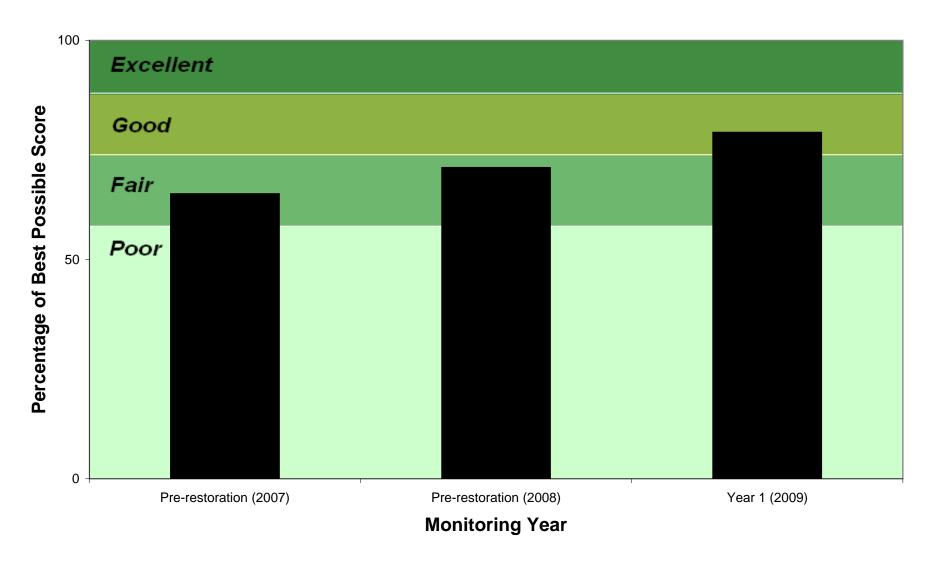




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

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

Marginal Suboptimal Suboptimal Suboptimal

Optimal

Optimal

Optimal

Optimal

142

157

71

79

300

300

R3

R3

Suboptimal Suboptimal Suboptimal Suboptimal

Suboptimal Suboptimal Suboptimal Suboptimal Optimal

1-E

1-E

Pre-restoration

(2008)

Year 1 (2009)

^{*} 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

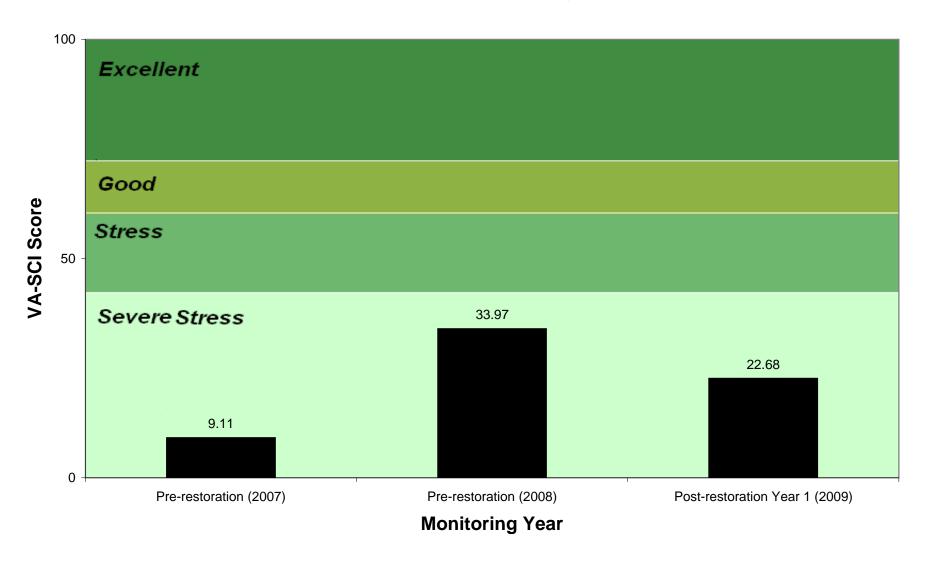


WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS											
Project #	Site	Cowardin	River Basin	Date	Time						
20003	NOVA Stream Bank	R3	River Dasiii	5/21/2009	1:30PM						
Invest	igators	HUC	Potomac	Locality							
JDF/	SDS	02070008	1 Otomac	Fairfax County							
Rea	ach	D.A. (Acres)	Order	Order							
1.	-E	77	3								
Latitude	Longitude	Stream Name									
38°55'58"	77°21'01" Snakeden Branch										
Hall Not Barrens day	Condition Category										
Habitat Parameter	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						
Page 1 of 2											



WSSI H	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS	
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Kivei Dasiii	5/21/2009	1:30PM
Invest	igators	HUC	Potomac	Locality	
	P	02070008	1 Otomac	Fairfax Count	ty
Re	ach	D.A. (Acres)	Reach Length (LF)	Order	
	-E	77	300	3	
Latitude	Longitude		Stream Nam		
38°55'58"	77°21'01"		Snakeden Bra	nch	
Habitat Barameter		Con	dition Category		
Habitat Parameter	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: Res	stored reach.		

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





Proj	ect #	Si	ite	Cow	ardin	River	Basin	Date	Time
	003		eden		3	Poto		5/21/2009	1:15PM
200		igators		_	JC	1 010		ocality	1.1011
		/SDS		2070008				ax County	
		ach				Reach Le		Orde	r
	1	-E		•	7	30		3	
Lati	tude	Long	itude			Strea	m Name		
	5'58"	77°2	1'01"			Snaked	en Branch		
		<u>-</u>							
		Habita	t Types (In	dicate Perd	centage of	Each Habita	t Present)		
Cobble	80	Sand	45	Rootwads	5	Vegetate	d Banks	2	
	rged Macro	ophytes	0		ıt Banks	1		-	
Large	e Woody D	ebris	1	Leaf	Packs	5	Other	(bedrocks)	0
					e Collectio				
	Used		Were Sam	ples Collec	ted?	Number	of Jabs/K	icks Taken fror	n Each
D-Frame	Х	Wad	ding	,	X		H	abitat	
								Undercut	
Kick-Net		From	Bank			Cobble	16	Banks	0
Othor		From	Boat			Sand	0	Submerged	0
Other		FIOIII	Б 0аі			Rootwads	0 2	Macro-phytes Leaf Packs	0 2
						Vegetated		Large Woody	
						Banks	0	Debris Debris	0
						Barmo		200110	
				Genera	I Commen	ts			
		Caught 2	Γwo Lined S	Salamander	s (Eurycea	bislineata) an	d 1 fish in i	net.	
			<u>Qua</u>	litative List	ing of Aqu	atic Biota			
Indic	ate Estima	ted Abunda	nce: 0=Abs	sent/Not Ob	served, 1=F	Rare, 2=Comi	mon, 3=Ab	undant, 4=Domii	nant
maic									
				3	Slimes				0
Periphyton Filamentou	s Algae			3	Slimes Macroinve	rtebrates			<u>0</u> 1

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

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorte
Deeles des Bressels Brest One 2000	20003	1-E	SDS/JDF	1	126
Date ID'd	Date Sorted	Taxonomist	Sorter	# Grids in Subsample	Total No. Organisms ID'o
6/30/2009	6/29/2009	ASO	ASO	# Grius in Subsample	115
	GIZGIZGGG		7100	<u>'</u>	110
VALVIA - Clams SPHAERIDAE		Forcipomyia sp. Probezzia sp.		Synorthocladius sp. Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp. Musculium sp.		Stilobezzia sp. CHAOBORIDAE		Unniella sp. Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	52	Tanypodinae	
UNIONIDAE		Chironominae		Ablabesmyia sp.	
RANCHIOBDELLIDA BRANCHIOBDELLIDAE		Chironomini Chironomus sp.		Alotanypus sp. Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
OLEOPTERA - Beetles		Cryptotendipes sp.		Conchapelopia sp.	
CANTHERIDAE CURCULIONIDAE		Demicryptochironomus sp. Dicrotendipes sp.		Guttipelopia sp. Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE Agabus sp.		Glyptotendipes sp. Kiefferulus sp.		Macropelopia sp. Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp. Laccornis sp.		Pagastiella sp. Parachironomus sp.		Procladius sp. Psectrotanypus sp.	
Dytiscus sp.		Parachironomus sp. Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE		Paratendipes sp.		Tanypus sp.	
Microcylloepus sp. Optioservus sp.		Phaenopsectra sp. Polypedilum sp.		Thienemannimyia gp. Thienemannimyia sp.	
Optioservus sp. Stenelmis sp.		Stenochironomus sp.		Trienemannimyia sp. Trissopelopia sp.	
Promoresia sp.		Stictochironomus sp.		Zavrelimyia sp.	
Macronychus sp. Dubiraphia sp.		Tribelos sp. Zavreliella sp.		CULICIDAE Aedes	
Ancyronyx sp.		Tanytarsini		Anopheles	
Oulimnius sp.		Cladotanytarsus sp.		Culex	
GYRINIDAE		Constempellina sp.		Culiseta	
Dineutus Gyrinus		Micropsectra sp. Micropsectra/Tanysarsus complex		Mansonia Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE Cymbiodyta sp.		Stempellina sp. Stempellinella sp.		Uranotaenia Wyeomyia	
Berosus sp.		Sublettea sp.		DIXIDAE	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp. Helophorus sp.		Zavrelia sp. Diamesinae		DOLICHOPODIDAE EMPIDIDAE	
Hydrophilus sp.		Diamesa sp.		Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropisternus sp. Hydrobius sp.		Potthastia sp. Prodiamesa sp		Hemerodromia sp. Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		EPHYDRIDAE	
PSEPHENIDAE		Orthocladiinae		PELCORHYNCHIDAE	
Psephenus sp. Ectopria sp.		Brillia sp. Cardiocladius sp.		Glutops sp. PSYCHODIDAE	
Dicranopselaphus sp.		Chaetocladius sp.		Pericoma sp.	
PTILODACTYLIDAE		Corynoneura sp.		Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		SIMULIDAE	
OPEPODA RUSTACEA (Amphipoda- Scuds)		Cricotopus/Orthocladius sp. Diplocladius sp.		Simulium sp. Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp. Synurella sp.		Heterotrissocladius sp. Hydrobaenus sp.		Stegopterna sp. Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		STRATIOMYIDAE	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE Hyalella sp.		Mesocricotopus sp. Mesosmittia sp.		Odontomyia sp. SYRPHIDAE	
RUSTACEA (Decopoda - Crayfish)		Nanocladius sp.		Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		TABANIDAE	
RUSTACEA (Isopoda- Sowbugs) ASELIDAE		Parachaetocladius sp. Parakiefferiella sp.		Chrysops sp. Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
PTERA - True Flies ATHERICIDAE		Parasmittia sp. Paratrichocladius sp.		Thaumalea sp. TIPULIDAE	1
Atherix sp.		Paratrissocladius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE CERATOPOGNIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
Alluaudomyia sp.		Psilometriocnemus sp. Rheocricotopus sp.		Molophilus sp. Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
		Stilocladius sp.		Limnophila sp. Ormosia sp.	
Culicoides sp.		Symposiocladius on			
		Symposiocladius sp.		Official sp.	
Culicoides sp.		Symposiocladius sp.		Official sp.	



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sort
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
6/30/2009	6/29/2009	ASO	ASO	# Grius in Subsample	115
6/30/2009	0/29/2009	ASO	ASO	14	115
Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp. Pilaria sp.		HIRUDINEA - Leeches HOPLONEMERTEA - Ribbon Worms		Prostoia sp. Shipsa sp.	
Erioptera sp.		TETRASTEMMATIDAE		CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE Trichocera sp.		NOCTUIDAE		Haploperla sp. Sweltsa sp.	
PHEMEROPTERA - Mayflies		Archanara sp.		TAENIOPTERGIDAE	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
BAETIDAE Acentrella sp.		MEGALOPTERA - Dobsonflies CORYDALIDAE		TRICHOPTERA - Caddisflies BRACHYCENTRIDAE	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		CALAMOCERATIDAE	
Centroptilum sp. Diphetor sp.		Nigronia sp. SIALIDAE		Heteroplectron sp. DIPSEUDOPSIDAE	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		GLOSSOSOMATIDAE	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp. EPHEMERELLIDAE		ODONATA (Anispotera - Dragonflies) AESHNIDAE		Agapetus sp. HELICOPSYCHIDAE	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		HYDROPSYCHIDAE	
Ephemerella sp.	•	Boyeria sp.		Cheumatopsyche sp.	
Eurylophella sp. Serratella sp.		CORDULEGASTRIDAE Cordulegaster sp.		Diplectrona sp. Hydropsyche sp.	
EPHEMERIDAE		CORDULIDAE		Parapysche sp.	
Ephemera sp.		GOMPHIDAE		Potamyia sp.	
HEPTAGENIIDAE		Arigomphus sp.		HYDROPTILIDAE	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp. Stenacron sp.		Hagenius sp. Lanthus sp.		Leucotrichia sp. Ochrotrichia sp.	
Stenonema sp.		Stylogomphus sp.		LEPIDOSTOMATIDAE	
LEPTOPHLEBIDAE		LIBELLULIDAE		Lepidostoma sp.	
Leptophlebia sp. Habrophlebia sp.		MACROMIIDAE Macromia sp.		LEPTOCERIDAE Triaenodes sp.	
Habrophlebiodes sp.		PETALURIDAE		Ceraclea sp.	
Paraleptophlebia sp.		ODONATA Zygoptera - Damselflies)		Oecetis sp.	
NEOEPHEMERIDAE		CALOPTERYGIDAE		LIMNEPHILIDAE	
DLIGONEURIDAE Isonychia sp.		Calopteryx sp. COENAGRIONIDAE		Apatina sp. Hydatophylax sp.	
POLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
POTAMANTHIDAE		LESTIDAE		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	37	MOLANNIDAE	
Siphlonurus sp. TRICORYTHIDAE		LUMBRICINA ENCHYTRAEIDAE		Molanna sp. ODONTOCERIDAE	
Tricorythodes sp.		NAIDIDAE	4	Psilotreta sp.	
ASTROPODA - Snails		TUBIFICIDAE	21	PHILOPOTAMIDAE	
ANCYLIDAE		LUMBRICULIDAE		Chimarra sp.	
Ferissa sp. HYDROBIIDAE		POLYCHAETA - Polychaete Worms AEOLOSOMATIDAE		Wormaldia sp.	
LYMNAEIDAE		Aeolosoma sp.		PHRYGANEIDAE Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		POLYCENTROPIDAE	
Stagnicola sp.		PERLIDAE		Cyrnellus sp.	
Pseudosuccinea sp. PHYSIDAE		Acroneuria sp. Beloneuria sp.		Polycentropus sp. PSYCHOMYIDAE	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE	-	Neoperla sp.	-	Psychomyia sp.	1
Menetus sp.		Perlesta sp.		RHYACOPHILIDAE	
Gyraulus sp. PLEUROCERIDAE		Perlinella sp. PERLODIDAE		Ryacophila sp. UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		TUBELLARIA - Flatworms	
APLOSCLERIDA SPONGILLIDAE		Isoperla sp.		PLANARIIDAE DENDROCOELIDAE	
SPONGILLIDAE EMIPTERA - True Bugs		Cultus sp. PTERONARCYIDAE		DENDRUCUELIDAE	
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		PELTOPERLIDAE			
Lethocerus sp.		Peltoperla sp.			
CORIXIDAE GELASTOCORIDAE		LEUCTRIDAE Leuctra sp.			
GERRIDAE		Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		CAPNIDAE			
HYDROMETRIDAE MESOVELIIDAE		Allocapnia sp. 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)	Scrapers	Percent Chironomi dae	Percent Top Two Dominant	НВІ		
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 Weight Metri		en Branch W SCI (2007-20	
		Monitoring	y 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

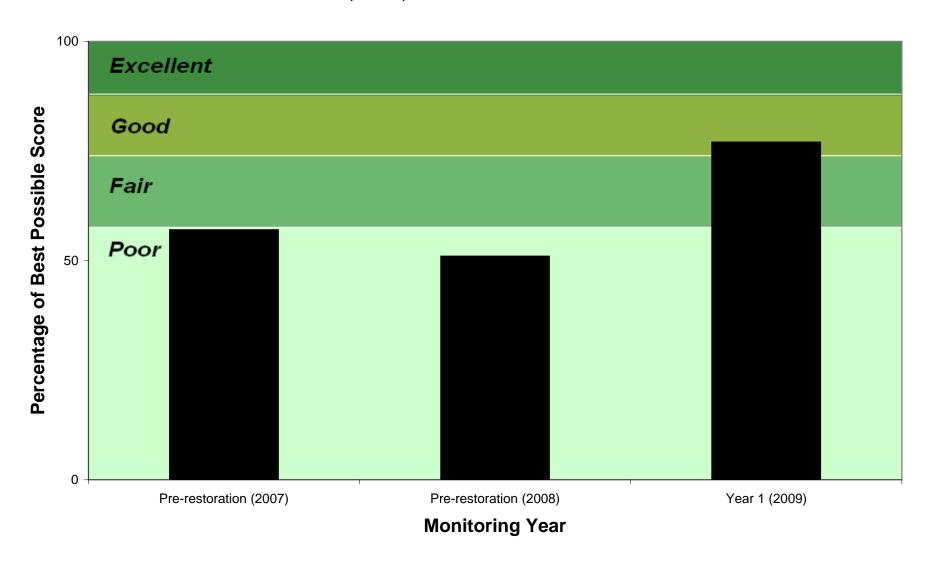




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Na	me and WSSI Nເ	ımber: No	rthern Virgin	ia Stream R	estoration B	ank: Snake	den Branch	(WSSI # 20	003)							
Stream ID:	Snakeden Brand	ch and Unn	amed Tribut	aries to Sna	keden Bran	ch		Date: 12/1	1/07, 12/12/	07, 2/12/08,	2/14/08, 5/2	20/09, 5/21/0	9			
Evaluators	: TSS/SDS/CAG/	/BNR/JDF						HUC : 020	70008							
Assessme	nt Period:			Pre-restora	tion 2007, 2	2008; Year 1	1									
				Embedded-		Codiment	Condition	Channel	Eraguanay of	I Ponk	Vacatation	Ringrian	TOTAL	Percent of	Deceb	Stream
Ass	essment Reach Na	ame	Substrate	ness	Velocity	Sediment Depostion	Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability*	Vegetation Protection*	Riparian Zone*	TOTAL SCORE	Best Possible Score***	Reach Length	Type
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

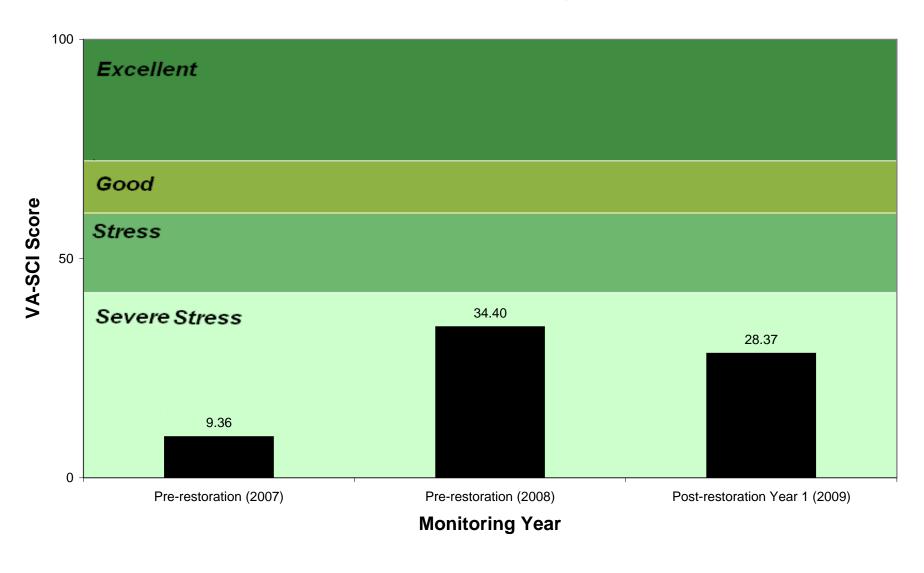


	,		SHEET-HIGH GRA	ADIENT STREAMS	
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R4		5/21/2009	2:30PM
	igators	HUC	Potomac	Locality	
	/SDS	02070008		Fairfax Count	:y
	ach	D.A. (Acres)	Reach Length (LF)	Order	
1	-F	55	300	3	
Latitude	Longitude		Stream Nam	•	
38°55'58"	77°21'01"		Snakeden Bra	nch	
		Con	dition Category		
Habitat Parameter	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
		Page 1 of 2			



	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS	
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R4	11101 20011	5/20/2009	2:30PM
	igators /SDS	HUC	Potomac	Locality	h
	ach	02070008 D.A. (Acres)	Reach Length (LF)	Fairfax Count Order	ty
	<u>асп</u> -F	55	300	3	
Latitude	Longitude	33	Stream Nam		
38°55'58"	77°21'01"		Snakeden Bra		
		Con	dition Cotogony		
<u>Habitat Parameter</u>	Optimal	Suboptimal	dition Category 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
		Page 2 of 2	?		

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





	V	VSSI BEN	ITHIC MA	ACROINVE	ERTEBRA	TE FIELD	DATA SH	HEET	
Proj	ect #	S	ite		ardin	River I	Basin	Date	Time
200	003	Snak	keden		13	Potor	mac	5/21/2009	2:15PM
	Investi	igators		Н	<u> </u>		Lo	cality	
	JDF/	SDS		207	3008		Fairfa	x County	
	Rea	ach		D.A. (Acres)	Reach Lei	ngth (LF)	Orde	r
	1.	-F		5	5	30	0	3	
	tude	Long	jitude			Strea	m Name		
38°5	5'58"	77°2	1'01"			Snaked	en Branch		
		<u>Habita</u>	at Types (lı	ndicate Per	centage of	Each Habita	t Present)		
Cobble	85	Sand	40	Rootwads	1	Vegetate	d Banks	0	
Subme	rged Macro	phytes	0	Undercu	ıt Banks	0			
	e Woody D		1	Leaf	Packs	2	Other	(bedrocks)	0
			•						
				Sampl	e Collectio	n			
Gear	Used	How	Were San	nples Collec	ted?	Number	of Jabs/Ki	cks Taken from	n Each
D-Frame	Х	Wa	ding		x		Ha	abitat	
								Undercut	
Kick-Net		From	Bank			Cobble	20	Banks	0
0.4			D (01	0	Submerged	0
Other		From	Boat			Sand	0	Macro-phytes	0
						Rootwads	U	Leaf Packs	U
						Vegetated	_	Large Woody	
						Banks	0	Debris	0
					10				
				<u>Genera</u>	I Comment	t <u>s</u>			
				114 - 41- 114	· C A	- (' - D' -			
			Qua	alitative List	ing of Aqu	atic Biota			
Indi	cate Estima	ted Abunda	nce: 0=Ab	sent/Not Ob	served, 1=F	Rare, 2=Comr	mon, 3=Abu	ındant, 4=Domi	nant
Periphyton				3	Slimes				0
ilamentou	s Algae			2	Macroinve	tebrates			1
									-
Macrophyte	es			1 1	Fish				1



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

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorte
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'
6/25/2009	6/25/2009	CAT	CAT	10	119
VALVIA - Clams		Forcipomyla sp.		Synorthocladius sp.	
SPHAERIDAE		Probezzia sp.		Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp.		Stilobezzia sp.		Unniella sp.	
Musculium sp. CORBICULIDAE		CHAOBORIDAE Chaborus sp.		Xylotopus sp. Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	22	Tanypodinae	
UNIONIDAE		Chironominae	2.0	Ablabesmyia sp.	
RANCHIOBDELLIDA		Chironomini		Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
OLEOPTERA - Beetles CANTHERIDAE		Cryptotendipes sp.		Conchapelopia sp.	
CURCULIONIDAE		Demicryptochironomus sp. Dicrotendipes sp.		Guttipelopia 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. Oreodytes sp.		Nilothauma sp. Pagastiella sp.		Pentaneura 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. Stenelmis sp.		Polypedilum sp. Stenochironomus sp.		Thienemannimyia 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. GYRINIDAE		Cladotanytarsus sp. Constempellina sp.		Culex	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE		Paratanytarsus sp.		Psorophora	
Halipus sp.		Rheotanytarsus sp.		Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp. Berosus sp.		Stempellinella sp. Sublettea sp.		Wyeomyia DIXIDAE	
Derallus sp.		Tanytarsus sp.		Dixa sp.	
Helochares sp.		Zavrelia sp.		DOLICHOPODIDAE	
Helophorus sp.		Diamesinae		EMPIDIDAE	
Hydrophilus sp.		Diamesa sp.	Y	Chelifera sp.	
Hydrochus sp.		Pagastia sp.		Clinocera sp.	
Tropistemus sp. Hydrobius sp.		Potthastia sp. Prodiamesa sp		Hemerodromia sp. Dolichocephala sp.	
Laccobius sp.		Sympotthastia sp.		EPHYDRIDAE	
PSEPHENIDAE		Orthocladiinae		PELCORHYNCHIDAE	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp. PTILODACTYLIDAE		Chaetocladius sp.		Pericoma sp.	
Anchylarsus sp.		Corynoneura sp. Cricotopus sp.		Psycoda sp. SIMULIDAE	
OPEPODA .		Cricotopus/Orthocladius sp.		Simulium sp.	
RUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE		Eukiefferiella sp.		Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp. Synurella sp.		Heterotrissociadius sp. Hydrobaenus sp.		Stegoptema sp. Ectemnia sp.	
GAMMARIDAE		Limnophyes sp.		STRATIOMYIDAE	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		SYRPHIDAE	
RUSTACEA (Decopoda - Crayfish) CAMBARIDAE		Nanocladius sp. Orthocladinae A		Chrysogaster sp.	
PALAEMONIDAE		Orthocladius sp.		Eristalis sp. TABANIDAE	
RUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE		Parakiefferiella sp.		Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
IPTERA - True Flies ATHERICIDAE		Parasmittia sp. Paratrichocladius sp.		Thaumalea sp. TIPULIDAE	
Atherix sp.		Paratrichociadius sp. Paratrissociadius sp.		Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE		Psilometriocnemus sp.		Molophilus sp.	
Alluaudomyia sp.		Rheocricotopus sp.		Tipula sp.	
		Rheosmittia sp, Smittia sp,		Psuedolimnophila sp. Dicranota sp.	
Bezzia sp. Ceratopogon sp.		Stilocladius sp.		Limnophila sp.	
Ceratopogon sp.					
				Ormosia sp.	
Ceratopogon sp. Culicoides sp.		Symposiocladius sp.		Ormosia sp.	
Ceratopogon sp. Culicoldes sp.				Omosia sp.	
Ceratopogon sp. Culicoides sp.				Omosia sp.	



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms So
nakeden 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
6/25/2009	6/25/2009	CAT	CAT	10	119
	O/EO/EOO	0/11	ON		
Pedicia sp.		Microvelia sp.		Paranemoura sp.	
imonia sp.		HIRUDINEA - Leeches HOPLONEMERTEA - Ribbon Worms		Prostoia sp. Shipsa sp.	
Erioptera sp.		TETRASTEMMATIDAE		CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
RICHOCERIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
richocera sp.		NOCTUIDAE		Sweltsa sp.	
HEMEROPTERA - Mayllies		Archanara sp.		TAENIOPTERGIDAE	
MELETIDAE		Bellura sp.		Strophopteryx sp.	
meletus sp.		PYRALIDAE		Taeniopteryx sp.	
AETIDAE centrella sp.		MEGALOPTERA - Dobsonflies CORYDALIDAE		TRICHOPTERA - Caddisflies BRACHYCENTRIDAE	
cerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
aetis sp.		Corydalus sp.		CALAMOCERATIDAE	
entroptilum sp.		Nigronia sp.		Heteroplectron sp.	
hiphetor sp.		SIALIDAE		DIPSEUDOPSIDAE	
AETISCIDAE		Sialis sp.		Phylocentropus sp.	
aetisca sp.		NEMATODA - Roundworms		GLOSSOSOMATIDAE	
AENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
aenis sp.		ODONATA (Anispotera - Dragonflies) AESHNIDAE		Agapetus sp. HELICOPSYCHIDAE	
PHEMERELLIDAE annella sp.		Anax sp.		Helicopsyche sp.	
runella sp.		Basiaeshna sp.		HYDROPSYCHIDAE	
phemerella sp.		Boyeria sp.		Cheumatopsyche sp.	
urylophella sp.		CORDULEGASTRIDAE		Diplectrona sp.	
erratella sp.		Cordulegaster sp.		Hydropsyche sp.	
PHEMERIDAE		CORDULIIDAE		Parapysche sp.	
phemera sp. EPTAGENIIDAE		GOMPHIDAE		Potamyia sp. HYDROPTILIDAE	
peorus sp.		Arigomphus sp. Gomphus sp.		Hydroptila sp.	
eucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
tenacron sp.		Lanthus sp.		Ochrotrichia sp.	
tenonema sp.		Stylogomphus sp.		LEPIDOSTOMATIDAE	
PTOPHLEBIDAE		LIBELLULIDAE		Lepidostoma sp.	
eptophlebia sp.		MACROMIDAE		LEPTOCERIDAE	
abrophlebia sp.		Macromia sp.		Triaenodes sp.	
abrophlebiodes sp.		PETALURIDAE		Ceraclea sp.	
araleptophlebia sp. EOEPHEMERIDAE		ODONATA Zygoptera - Damselflies) CALOPTERYGIDAE		Oecetis sp. LIMNEPHILIDAE	
IGONEURIDAE		Calopteryx sp.		Apatina sp.	
ionychia sp.		COENAGRIONIDAE		Hydatophylax sp.	
DLYMITARCYIDAE		Argia sp.		Ironoquia sp.	
DTAMANTHIDAE		LESTIDAE		Pycnopsyche sp.	
PHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	90	MOLANNIDAE	
iphlonurus sp.		LUMBRICINA		Molanna sp.	
RICORYTHIDAE		NAIDIDAE NAIDIDAE		ODONTOCERIDAE Politototo en	
ricorythodes sp. STROPODA - Snails		TUBIFICIDAE	6	PHILOPOTAMIDAE	
NCYLIDAE		LUMBRICULIDAE	-	Chimarra sp.	
erissa sp.		OLIGOCHAETA FAMILY #1	1	Wormaldia sp.	
YDROBIIDAE		POLYCHAETA - Polychaete Worms		PHRYGANEIDAE	
MNAEIDAE		AEOLOSOMATIDAE		Ptilostomis sp.	
ossaria sp.		Aeolosoma sp. PLECOPTERA - Stonefly Larvae		POLYCENTROPIDAE	
tagnicola sp. seudosuccinea sp.		PERLIDAE		Cymellus sp. Polycentropus sp.	
TYSIDAE		Acroneuria sp.		PSYCHOMYIDAE	
hysella sp.		Beloneuria sp.		Lype sp.	
ANORBIDAE		Eccoptura sp.		Psychomyla sp.	
enetus sp.		Neoperla sp.		RHYACOPHILIDAE	
yraulus sp.		Perlesta sp.		Ryacophila sp.	
LEUROCERIDAE		PERLODIDAE		Neophylax sp.	
VIPARIDAE Viparus sp.		Clioperla sp.		TUBELLARIA - Flatworms	
PLOSCLERIDA		Diploperla sp.		PLANARIDAE	
PONGILLIDAE		Isoperla sp.		DENDROCOELIDAE	
MIPTERA - True Bugs		Cultus sp.			
ELOSTOMATIDAE		PTERONARCYIDAE			
elostoma sp.		Pteronarcys sp.			
ethocerus sp.		PELTOPERLIDAE			
DRIXIDAE ELASTOCORIDAE		Peltoperla sp. LEUCTRIDAE			
ERRIDAE		Leuctra sp.			
repobates sp.		Zealuectra sp.			
EBRIDAE		Paraleuctra sp.			4
YDROMETRIDAE		CAPNIDAE			
ESOVELIIDAE		Allocapnia sp.			
EPIDAE		Paracapnia sp.			
Nepa sp.		NEMOURIDAE			
Ranatra sp.		Amphinemura sp.			
ELIIDAE		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 Chironomi dae	Percent Top Two Dominant	НВІ					
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 Weight Metri	ted Snakede cs and VA-9		
		Monitoring	y 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

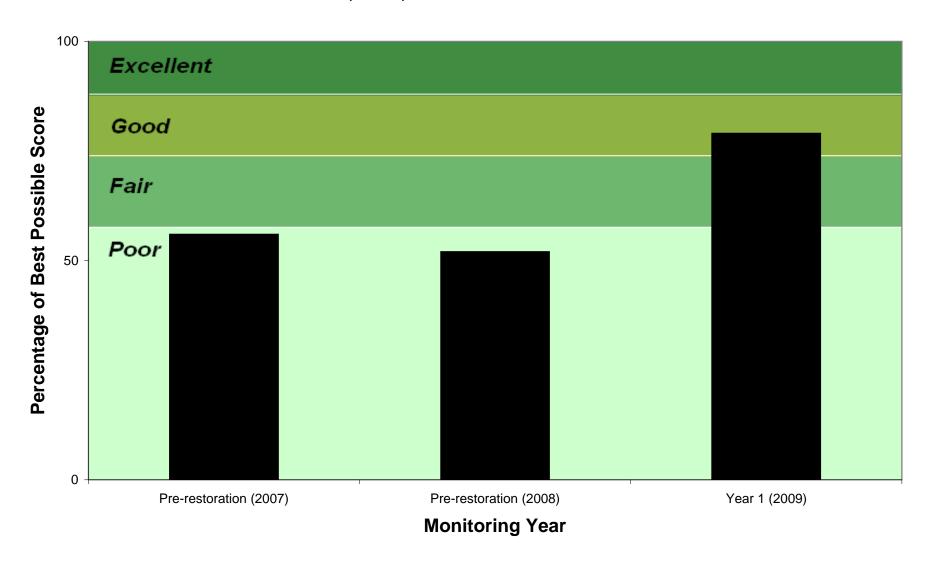




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

	me and WSSI Nu							,	1/07. 5/12/0	7 2/42/00 1	0/4.4/09 E/00	V00 F/24/00				
Stream ID:	Snakeden Branc	n and Unn	amed Tributa	iries to Shar	eden Branc	n		Date: 12/1	1/07, 5/12/0	1, 2/12/00, 2	2/14/06, 5/20	1/09, 5/2 1/09				
Evaluators	: TSS/SDS/CAG/I	BNR/JDF						HUC: 020	70008							
Assessme	nt Period:			Pre-restora	tion 2007, 2	2008; Year 1	l									
							Condition	Category						Percent of		
Ass	sessment Reach Na	ame	Substrate	Embedded- ness	Velocity	Sediment Depostion	Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability*	Vegetation Protection*	Riparian Zone*	TOTAL SCORE	Best Possible Score***	Reach Length	Stream Type
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

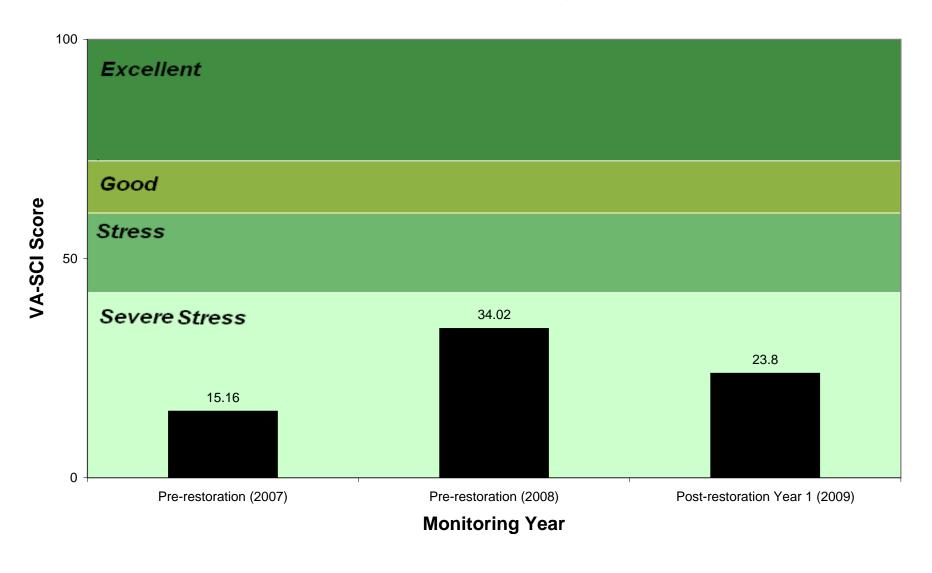


WSSI HA	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS	
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	River Dasiii	5/21/2009	11:30AM
Investi	igators	HUC	Potomac	Locality	
JDF/	SDS	02070008	1 Otomac	Fairfax Coun	ty
Rea	ach	D.A. (Acres)	Reach Length (LF)	Order	
2-	-A	256	300	3	
Latitude	Longitude		Stream Nam		
38°55'58"	77°21'01"	Un	named Tributary to Sna	akeden Branch	
Habitat Parameter		Con	dition Category		
Habitat Parameter	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
		Page 1 of 2	<u> </u>		



	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS	
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	THIEF DUSIN	5/21/2009	11:30AM
	igators	HUC	Potomac	Locality	
SDS		02070008		Fairfax Coun	ty
Re	ach	D.A. (Acres)	Reach Length (LF)	Order	
2	-A	256	300	3	
Latitude	Longitude		Stream Nam		
38°55'58"	77°21'01"	Un	named Tributary to Sna	akeden Branch	
Habitat Parameter			dition 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.	. 0
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
		Page 2 of 2			
		1 aye 2 01 2			

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





	WS	SI BENTI	HIC MAC	ROINVER	TEBRAT	E FIELD	DATA SH	EET	
Proje		Si		Cow			Basin	Date	Time
200		Snak	eden	R		Poto	mac	5/21/2009	11:00AM
	Investi			HU			Loc	cality	
	JDF/	SDS		2070	8000			County	
	Rea	ach		D.A. (Acres)	Reach Le	ngth (LF)	Ord	der
	2-	·A		25	56	30	00	3	3
Latit	tude	Long				Strean	n Name		
38°5	5'58"	77°2′	I'01"		Unname	ed Tributary	to Snakede	n Branch	
		Habitat 1	ypes (Indi	cate Perce	ntage of Ea	ach Habitat	Present)		
Cobble	80	Sand	30	Rootwads	0	Vegetate	ed Banks	C)
	e Woody D		0	Undercu		0		Packs	0
Lui g			<u> </u>	0.100.00			Loui	. 40.0	J
				Sample (Collection				
Gear	Used	Ном	Were Sam	ples Collec		Number	of .lahs/Kid	cks Taken fr	om Fach
D-Frame	X	Wad			(Number		bitat	om Lacii
Diramo		Wac	ıı ıg		`		110	Undercut	
Kick-Net		From	Rank			Cobble	20	Banks	0
7 don 7 vot		7 70111	Barin			CODDIO	20	Barmo	
								Submerged	
Other		From	Boat			Sand	0	Macro-phytes	0
						Rootwads	0	Leaf Packs	0
								Large	
						Vegetated		Woody	
						Banks	0	Debris	0
				General C	<u>Comments</u>				
			Qualit	ative Listin	g of Aquat	ic Biota			
Indicat	te Estimated	d Abundance	e: 0=Abser	nt/Not Obse	rved, 1=Ra	re, 2=Comm	non, 3=Abui	ndant, 4=Dor	minant
Periphyton				1	Slimes				0
Filamentou	s Algae				Macroinve	rtebrates			2
Macrophyte				2	Fish	tobrates			0
Madrophyte									U
				Page	1 of 1				



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	0,=0,=00	•	7.00	-	1
SPHAERIDAE		Forcipomyia sp. Probezzia sp.		Synorthocladius sp. Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp. Musculium sp.		Stilobezzia sp. CHAOBORIDAE		Unniella sp. Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	43	Tanypodinae	
UNIONIDAE BRANCHIOBDELLIDA		Chironominae Chironomini		Ablabesmyia sp. Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles CANTHERIDAE		Cryptotendipes sp. Demicryptochironomus sp.		Conchapelopia sp. Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp. DYTISCIDAE		Endochironomus sp. Glyptotendipes sp.		Larsia sp. Macropelopia sp.	
Agabus sp.		Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp. Oreodytes sp.		Nilothauma sp. Pagastiella sp.		Pentaneura sp. Procladius sp.	
Laccornis sp.		Pagastiella sp. Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE Microcylloepus sp.		Paratendipes sp. Phaenopsectra sp.		Tanypus sp. Thienemannimyia gp.	1
Optioservus sp.		Polypedilum sp.		Thienemannimyia gp. Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp. Macronychus sp.		Stictochironomus sp. Tribelos sp.		Zavrelimyia sp. CULICIDAE	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		Tanytarsini		Anopheles	
Oulimnius sp. GYRINIDAE		Cladotanytarsus sp. Constempellina sp.		Culex Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE Halipus sp.		Paratanytarsus sp. Rheotanytarsus sp.		Psorophora Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp. Derallus sp.		Sublettea sp. Tanytarsus sp.		DIXIDAE Dixa sp.	
Helochares sp.		Zavrelia sp.		DOLICHOPODIDAE	
Helophorus sp.		Diamesinae		EMPIDIDAE	
Hydrophilus sp. Hydrochus sp.		Diamesa sp. Pagastia sp.		Chelifera sp. Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp. PSEPHENIDAE		Sympotthastia sp. Orthocladiinae		EPHYDRIDAE PELCORHYNCHIDAE	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp. PTILODACTYLIDAE		Chaetocladius sp. Corynoneura sp.		Pericoma sp. Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		SIMULIDAE	38
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds) CRANYONYCTIDAE		Diplocladius sp. Eukiefferiella sp.		Prosimulium sp. Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp. GAMMARIDAE		Hydrobaenus sp. Limnophyes sp.		Ectemnia sp. STRATIOMYIDAE	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp. CRUSTACEA (Decopoda - Crayfish)		Mesosmittia sp. Nanocladius sp.		SYRPHIDAE Chrysogaster sp.	1
CAMBARIDAE		Orthocladius sp.		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		TABANIDAE	
CRUSTACEA (Isopoda- Sowbugs) ASELIDAE		Parachaetocladius sp. Parakiefferiella sp.		Chrysops sp. Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE Atherix sp.		Paratrichocladius sp. Paratrissocladius sp.		TIPULIDAE Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	<u> </u>
CERATOPOGNIDAE Alluaudomyia sp.		Psilometriocnemus sp. Rheocricotopus sp.		Molophilus sp. Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp. Dasyhelea sp.		Stilocladius sp. Symposiocladius sp.		Limnophila sp. Ormosia sp.	
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	·				<u> </u>
		Page	1 of 2		



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sort
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'
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. TRICHOCERIDAE		Prostoma sp. LEPIDOPTERA - Moth Larvae		Alloperla sp. Haploperla sp.	
Trichocera sp.		NOCTUIDAE		Sweltsa sp.	
PHEMEROPTERA - Mayflies		Archanara sp.		TAENIOPTERGIDAE	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
Acentrella sp.		MEGALOPTERA - Dobsonflies CORYDALIDAE		TRICHOPTERA - Caddisflies BRACHYCENTRIDAE	
Acertella sp. Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		CALAMOCERATIDAE	
Centroptilum sp.		Nigronia sp.		Heteroplectron sp.	
Diphetor sp.		SIALIDAE		DIPSEUDOPSIDAE	
BAETISCIDAE Baetisca sp.		Sialis sp. NEMATODA - Roundworms		Phylocentropus sp. 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. Ephemerella sp.		Basiaeshna sp. Boyeria sp.		HYDROPSYCHIDAE Cheumatopsyche sp.	
Eurylophella sp.		CORDULEGASTRIDAE		Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		CORDULIIDAE		Parapysche sp.	
Ephemera sp.		GOMPHIDAE		Potamyia sp.	
HEPTAGENIIDAE Epeorus sp.		Arigomphus sp. Gomphus sp.		HYDROPTILIDAE 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. Habrophlebia sp.		MACROMIIDAE 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. POLYMITARCYIDAE		COENAGRIONIDAE Argia sp.		Hydatophylax sp. Ironoquia sp.	
POTAMANTHIDAE		LESTIDAE		Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	20	MOLANNIDAE	
Siphlonurus sp.		LUMBRICINA		Molanna sp.	
TRICORYTHIDAE		ENCHYTRAEIDAE		ODONTOCERIDAE	
Tricorythodes sp.		NAIDIDAE TUBIFICIDAE	2 11	Psilotreta sp.	
ASTROPODA - Snails ANCYLIDAE		LUMBRICULIDAE	11	PHILOPOTAMIDAE Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE		AEOLOSOMATIDAE		PHRYGANEIDAE	
LYMNAEIDAE		Aeolosoma sp.		Ptilostomis sp.	
Fossaria sp. Stagnicola sp.		PLECOPTERA - Stonefly Larvae PERLIDAE		POLYCENTROPIDAE Cyrnellus sp.	
Pseudosuccinea sp.		Acroneuria sp.		Polycentropus sp.	
PHYSIDAE		Beloneuria sp.		PSYCHOMYIDAE	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE Menetus sp.		Neoperla sp. Perlesta sp.		Psychomyia sp. RHYACOPHILIDAE	
Gyraulus sp.		Periesta sp. Perlinella sp.		Ryacophila sp.	
PLEUROCERIDAE		PERLODIDAE		UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp.		Diploperla sp.		TUBELLARIA - Flatworms	
APLOSCLERIDA SPONGILLIDAE		Isoperla sp. Cultus sp.		PLANARIIDAE DENDROCOELIDAE	
EMIPTERA - True Bugs		PTERONARCYIDAE		DENDROCOLLIDAE	
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp.		PELTOPERLIDAE			
Lethocerus sp.	·	Peltoperla sp.			
CORIXIDAE GELASTOCORIDAE		LEUCTRIDAE			
GERRIDAE GERRIDAE		Leuctra sp. Zealuectra sp.			
Trepobates sp.		Paraleuctra sp.			
HEBRIDAE		CAPNIDAE			
HYDROMETRIDAE		Allocapnia sp.	·		
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE Nepa sp.		NEMOURIDAE Amphinemura sp.			1
Ranatra sp.		Ostrocerca sp			
VELIIDAE		Nemoura sp.			
					1

* 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)	Scrapers	Percent Chironomi dae	Percent Top Two Dominant	НВІ					
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 Weigh Metri		en Branch W SCI (2007-20	
		Monitoring	y 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

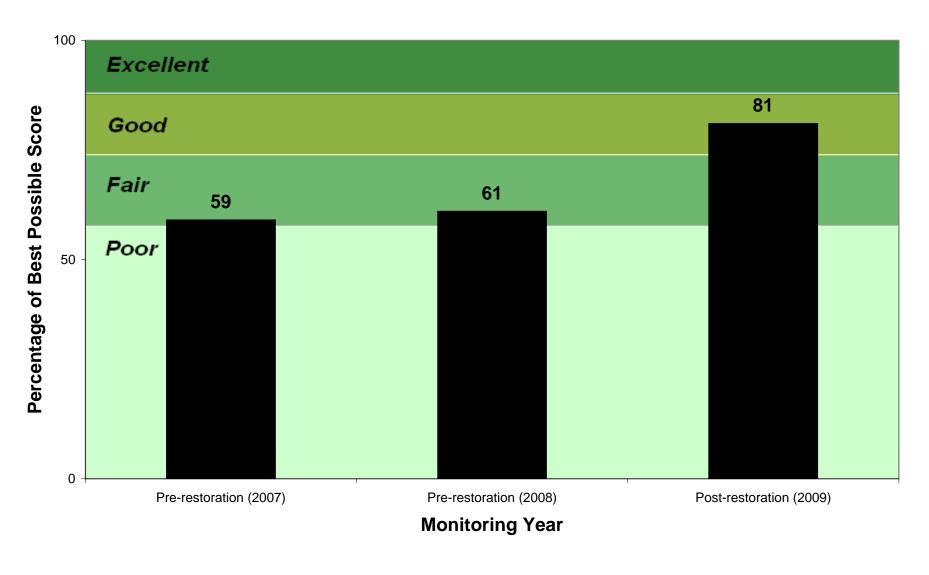




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

r roject re	ame and WSSI	tuniber. 1	orthorn virg	ina Otream	restoration	Dank. Ona	incach Bran	on (woon #	20000)							
Stream ID	: Snakeden Bra	inch and Ur	nnamed Trib	utaries to Sr	nakeden Bra	anch		Date: 12/1	1/07, 12/12/0	07, 2/12/08	, 2/14/08, 5/2	20/09, 5/21/0	9			
Evaluator	s: TSS/SDS/CA	G/BNR/JDF	:					HUC : 020	70008							
Assessme	ent Period:		Pre-res	storation 200)7, 2008; Po	ost-restoration	on 2009									
							Conditio	1 Category						Percent of		
Ass	essment Reach N	Name	Substrate	Embedded- ness	Velocity	Sediment Depostion	Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability*	Vegetation Protection*	Riparian Zone*	TOTAL SCORE	Best Possible Score***	Reach Length	Stream Type
	Pre-restoration (2007)	2-B	Suboptimal	Marginal	Optimal	Marginal			Suboptimal			Suboptimal	118	59	300	R3

Marginal Marginal Suboptimal Suboptimal Marginal

Marginal Suboptimal

Optimal Suboptimal Optimal

121

161

61

81

300

300

R3

R3

Suboptimal Marginal

Optimal

Suboptimal Suboptimal Suboptimal Optimal Suboptimal Suboptimal

2-B

2-B

Pre-restoration (2008)

Post-restoration (2009)

^{*} 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

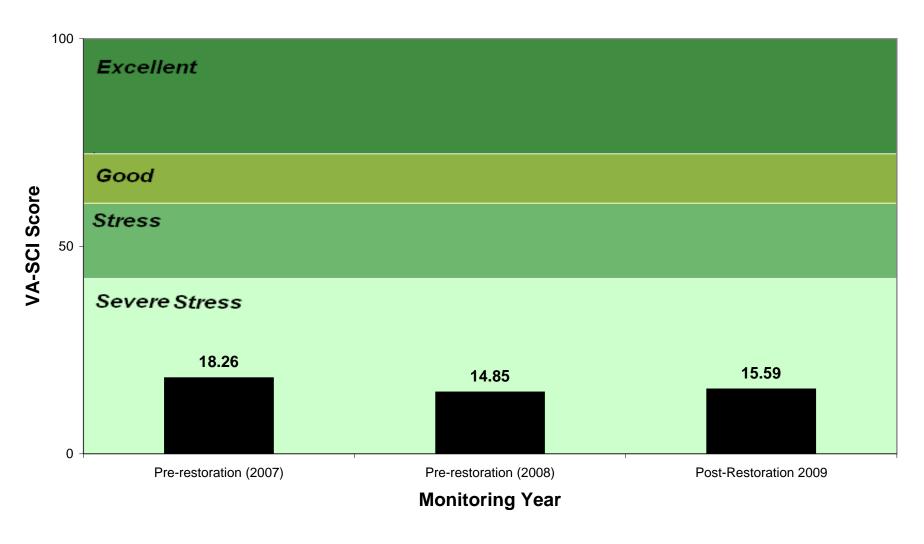


WSSI H	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS	
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	River Dasiii	9/16/2009	10:30
Invest	igators	HUC	Potomac	Locality	
JDF/	SDS	02070008	Polomac	Fairfax Count	y
Re	ach	D.A. (Acres)	Reach Length (LF)	Order	
2	-B	169	300	3	
Latitude	Longitude		Stream Nam	ne	
38°55'58"	77°21'01"	Un	named Tributary to Sna	akeden Branch	
Habitat Baramatar		Con	dition Category		
Habitat Parameter	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
		Page 1 of 2			



WSSI HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS									
Project #	Site	Cowardin	River Basin	Date	Time				
20003	NOVA Stream Bank	R3	Kiver Busin	2/12/2008	0.4375				
	tigators	HUC	Potomac	Locality					
	S/JDF	02070008		Fairfax County					
Reach		D.A. (Acres)	Reach Length (LF)	Order					
	2-B	169	300	3					
Latitude	Longitude	1.1	Stream Nam	-					
38°55'58"	77°21'01"	Un	named Tributary to Sna	akeden Branch					
Hebitet Devemeter	Condition Category								
Habitat Parameter	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. 15 14 13 12 11	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.	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





	WS	SI BENTI	HC MAC	ROINVER	TEBRAT	E FIELD [DATA SH	EET				
Proje	ect #	Si	te	Cow	ardin	River Basin		Date	Time			
200	003	Snakeden			3	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			1	69	300		3					
Latit				Stream Name								
38°5	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						
	e Woody D	ebris	1		ut Banks	3		Packs	10			
				Sample (Collection							
Gear	Gear Used How Were Sample					Number of Jabs/Kicks Taken f			rom Each			
D-Frame	Х	Wad	ding		x	-	Hal	bitat				
								Undercut				
Kick-Net		From	Bank			Cobble	20	Banks	0			
								Submerged				
0.44			D (0	0	Macro-	0			
Other		From	Boat			Sand	0	phytes	0			
						Rootwads	U	Leaf Packs Large	0			
						Vegetated		Woody				
						Banks	0	Debris	0			
						Dariks		Debits	U			
				General (Comments							
				<u>Jeneral</u>	VOITINIE III S							
i												
			Qualit	ative Listin	a of Aquat	ic Biota						
			<u> </u>	ALTO EIGHT	., . ,							
Indicat	e Estimated	d Abundance	e: 0=Abser	nt/Not Obse	rved, 1=Ra	re, 2=Comm	on, 3=Abur	ndant, 4=Do	minant			
Periphyton				0	Slimes				0			
Filamentou	s Alnae			0	Macroinve	rtehrates			1			
Macrophyte				0	Fish	riculates			0			
iviaciopityte	, o				•				U			
				Page	1 of 1							



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			0,11	-	1
SPHAERIDAE		Forcipomyia sp. Probezzia sp.		Synorthocladius sp. Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp. Musculium sp.		Stilobezzia sp. CHAOBORIDAE		Unniella sp. Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	77	Tanypodinae	
UNIONIDAE BRANCHIOBDELLIDA		Chironominae Chironomini		Ablabesmyia sp. Alotanypus sp.	
BRANCHIOBDELLIDAE		Chironomus sp.		Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles CANTHERIDAE		Cryptotendipes sp. Demicryptochironomus sp.		Conchapelopia sp. Guttipelopia sp.	
CURCULIONIDAE		Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp. DYTISCIDAE	1	Endochironomus sp. Glyptotendipes sp.		Larsia sp. Macropelopia sp.	
Agabus sp.	l	Kiefferulus sp.		Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp. Oreodytes sp.		Nilothauma sp. Pagastiella sp.		Pentaneura sp. Procladius sp.	
Laccornis sp.		Pagastiella sp. Parachironomus sp.		Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
ELMIDAE Microcylloepus sp.		Paratendipes sp. Phaenopsectra sp.		Tanypus sp. Thienemannimyia gp.	1
Optioservus sp.		Polypedilum sp.		Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp. Macronychus sp.		Stictochironomus sp. Tribelos sp.		Zavrelimyia sp. CULICIDAE	1
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		Tanytarsini		Anopheles	
Oulimnius sp. GYRINIDAE		Cladotanytarsus sp. Constempellina sp.		Culex Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE Halipus sp.		Paratanytarsus sp. Rheotanytarsus sp.		Psorophora Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp. Derallus sp.		Sublettea sp. Tanytarsus sp.		DIXIDAE Dixa sp.	
Helochares sp.		Zavrelia sp.		DOLICHOPODIDAE	
Helophorus sp.		Diamesinae		EMPIDIDAE	1
Hydrophilus sp. Hydrochus sp.		Diamesa sp. Pagastia sp.		Chelifera sp. Clinocera sp.	
Tropisternus sp.		Potthastia sp.		Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp. PSEPHENIDAE		Sympotthastia sp. Orthocladiinae		EPHYDRIDAE PELCORHYNCHIDAE	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp. PTILODACTYLIDAE		Chaetocladius sp. Corynoneura sp.		Pericoma sp. Psycoda sp.	
Anchytarsus sp.		Cricotopus sp.		SIMULIDAE	
COPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
CRUSTACEA (Amphipoda- Scuds) CRANYONYCTIDAE		Diplocladius sp. Eukiefferiella sp.		Prosimulium sp. Cnephia sp.	
Stygonectes sp.		Heleniella sp.		Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp. GAMMARIDAE		Hydrobaenus sp. Limnophyes sp.		Ectemnia sp. STRATIOMYIDAE	
Gammarus sp.		Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp. CRUSTACEA (Decopoda - Crayfish)		Mesosmittia sp. Nanocladius sp.		SYRPHIDAE Chrysogaster sp.	
CAMBARIDAE		Orthocladinae A		Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		TABANIDAE	
CRUSTACEA (Isopoda- Sowbugs) ASELIDAE		Parachaetocladius sp. Parakiefferiella sp.		Chrysops sp. Tabanus sp.	
Caecidotea sp.		Parametriocnemus sp.		TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
DIPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE Atherix sp.		Paratrichocladius sp. Paratrissocladius sp.		TIPULIDAE Antocha sp.	
BLEPHARICERIDAE		Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	<u> </u>
CERATOPOGNIDAE Alluaudomyia sp.		Psilometriocnemus sp. Rheocricotopus sp.		Molophilus sp. Tipula sp.	
Bezzia sp.		Rheosmittia sp.		Psuedolimnophila sp.	
Ceratopogon sp.		Smittia sp.		Dicranota sp.	
Culicoides sp. Dasyhelea sp.		Stilocladius sp. Symposiocladius sp.		Limnophila sp. Ormosia sp.	
DIPTERA FAMILY #1		- y poolooidada op.		Simoua op.	
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WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorte
Snakeden Branch - Post-Con 200	20003	2-B	SDS/JDF	1	99
Date ID'd	Date Sorted	Taxonomist	Sorter	# Grids in Subsample	Total No. Organisms ID'o
7/1/2009	7/1/2009	CAT	CAT	10	88
1/1/2003	17172003	CAI	OAT	10	00
Pedicia sp.		Microvelia sp.		Paranemoura sp.	
Limonia sp. Pilaria sp.		HIRUDINEA - Leeches HOPLONEMERTEA - Ribbon Worms		Prostoia sp. Shipsa sp.	
Erioptera sp.		TETRASTEMMATIDAE		CHLOROPERLIDAE	
Rhabdomastix sp.		Prostoma sp.		Alloperla sp.	
TRICHOCERIDAE Trichocera sp.		NOCTUIDAE		Haploperla sp. Sweltsa sp.	
PHEMEROPTERA - Mayflies		Archanara sp.		TAENIOPTERGIDAE	
AMELETIDAE		Bellura sp.		Strophopteryx sp.	
Ameletus sp.		PYRALIDAE		Taeniopteryx sp.	
Acentrella sp.	1	MEGALOPTERA - Dobsonflies CORYDALIDAE		TRICHOPTERA - Caddisflies BRACHYCENTRIDAE	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	
Baetis sp.		Corydalus sp.		CALAMOCERATIDAE	
Centroptilum sp. Diphetor sp.		Nigronia sp. SIALIDAE		Heteroplectron sp. DIPSEUDOPSIDAE	
BAETISCIDAE		Sialis sp.		Phylocentropus sp.	
Baetisca sp.		NEMATODA - Roundworms		GLOSSOSOMATIDAE	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp. EPHEMERELLIDAE		ODONATA (Anispotera - Dragonflies) AESHNIDAE		Agapetus sp. HELICOPSYCHIDAE	
Dannella sp.		Anax sp.		Helicopsyche sp.	
Drunella sp.		Basiaeshna sp.		HYDROPSYCHIDAE	4
Ephemerella sp. Eurylophella sp.		Boyeria sp. CORDULEGASTRIDAE		Cheumatopsyche sp. Diplectrona sp.	
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	
EPHEMERIDAE		CORDULIIDAE		Parapysche sp.	
Ephemera sp. HEPTAGENIIDAE		GOMPHIDAE Arigomphus sp.		Potamyia sp. HYDROPTILIDAE	
Epeorus sp.		Gomphus sp.		Hydroptila sp.	
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp. Stenonema sp.		Lanthus sp. Stylogomphus sp.		Ochrotrichia sp. LEPIDOSTOMATIDAE	
LEPTOPHLEBIDAE		LIBELLULIDAE		Lepidostoma sp.	
Leptophlebia sp.		MACROMIIDAE		LEPTOCERIDAE	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp. Paraleptophlebia sp.		PETALURIDAE ODONATA Zygoptera - Damselflies)		Ceraclea sp. Oecetis sp.	
NEOEPHEMERIDAE		CALOPTERYGIDAE		LIMNEPHILIDAE	
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp.		COENAGRIONIDAE	3	Hydatophylax sp.	
POLYMITARCYIDAE POTAMANTHIDAE		Argia sp. LESTIDAE		Ironoquia sp. Pycnopsyche sp.	
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms		MOLANNIDAE	
Siphlonurus sp.		LUMBRICINA		Molanna sp.	
TRICORYTHIDAE		ENCHYTRAEIDAE		ODONTOCERIDAE	
Tricorythodes sp. ASTROPODA - Snails		NAIDIDAE TUBIFICIDAE		Psilotreta sp. PHILOPOTAMIDAE	
ANCYLIDAE		LUMBRICULIDAE		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE LYMNAEIDAE		AEOLOSOMATIDAE Aeolosoma sp.		PHRYGANEIDAE Ptilostomis sp.	
Fossaria sp.		PLECOPTERA - Stonefly Larvae		POLYCENTROPIDAE	
Stagnicola sp.		PERLIDAE		Cyrnellus sp.	
Pseudosuccinea sp. PHYSIDAE		Acroneuria sp. Beloneuria sp.		Polycentropus sp. PSYCHOMYIDAE	
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	
Menetus sp. Gyraulus sp.		Perlesta sp. Perlinella sp.		RHYACOPHILIDAE Ryacophila sp.	
PLEUROCERIDAE		PERLODIDAE		UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp. APLOSCLERIDA		Diploperla sp.		TUBELLARIA - Flatworms PLANARIIDAE	
SPONGILLIDAE		Isoperla sp. Cultus sp.		DENDROCOELIDAE	
EMIPTERA - True Bugs		PTERONARCYIDAE			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp. Lethocerus sp.		PELTOPERLIDAE Peltoperla sp.			
CORIXIDAE		LEUCTRIDAE			
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE		Zealuectra sp.	·		
Trepobates sp. HEBRIDAE		Paraleuctra sp. CAPNIDAE			
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.			
NEPIDAE		NEMOURIDAE			
Nepa sp. Ranatra sp.		Amphinemura sp. Ostrocerca sp			
	1	Nemoura sp.			1
VELIIDAE		iverrioura 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 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 Chironomi dae	Percent Top Two Dominant	НВІ
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 Weigh		en Branch W SCI (2007-20	
		Monitoring	y 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 Percent	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
НВІ	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

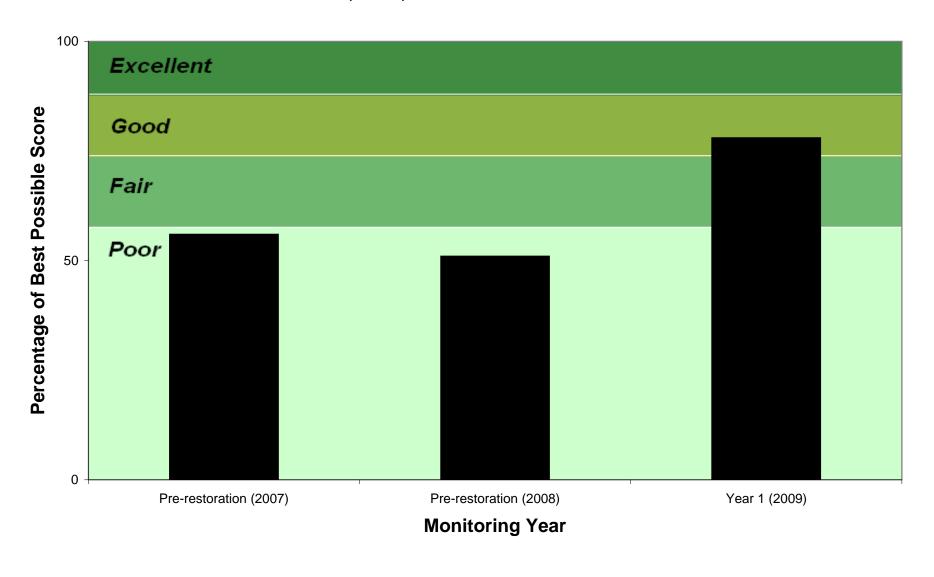




EXHIBIT 5: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Project Na	me and WSSI N	Number: N	orthern Virgi	inia Stream F	Restoration I	Bank: Snak	eden Branch	n (WSSI # 2	0003)							
Stream ID:	Snakeden Bra	nch and Un	named Tribu	utaries to Sna	akeden Brar	nch		Date: 12/1	1/07, 12/12/0	07, 2/12/08,	2/14/08, 5/2	0/09, 5/21/09	9			
Evaluators	s: TSS/SDS/CAC	G/BNR/JDF						HUC: 020	70008							
Assessme	ent Period:			Pre-restorat	tion 2007, 2	2008; Year 1	l	<u> </u>								
							Conditio	n Category						Percent of		
Asse	essment Reach N	lame	Substrate	Embedded- ness	Velocity	Sediment Depostion	Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability*	Vegetation Protection*	Riparian Zone*	TOTAL SCORE	Best Possible Score***	Reach Length	Stream Type
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

Optimal

Optimal

Optimal

Optimal

155

78

300

R3

Suboptimal Suboptimal Marginal Suboptimal Suboptimal Optimal

3-A

Year 1 (2009)

^{*} 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

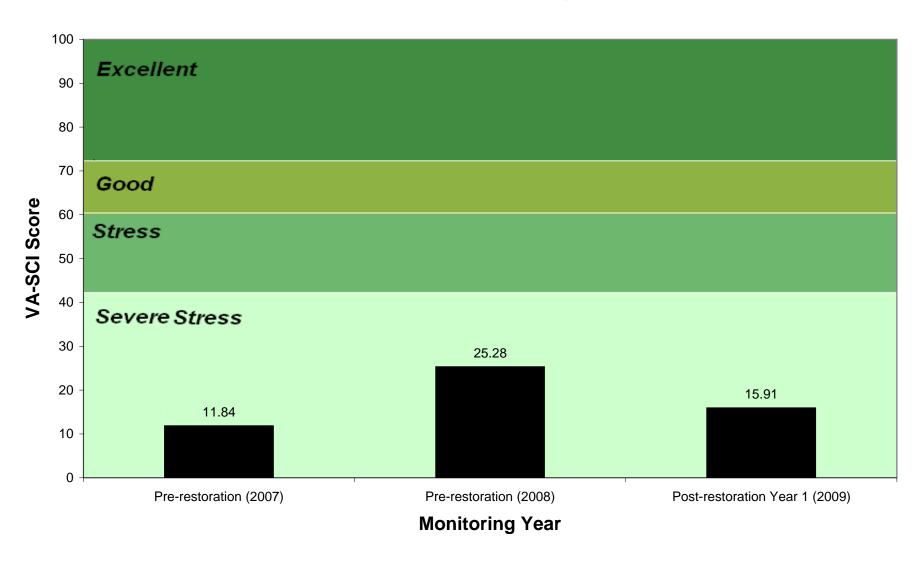


WSSI H	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS	
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	River Dasiii	5/20/2009	3:30PM
Invest	igators	HUC	Potomac	Locality	
BNR	/SDS	02070008	Polomac	Fairfax Count	ty
Re	ach	D.A. (Acres)	Reach Length (LF)	Order	
3	-A	75	300	1	
Latitude	Longitude		Stream Nam	ne	
38°55'58"	77°21'01"	Un	named Tributary to Sna	akeden Branch	
Habitat Danamatan		Con	dition Category		
Habitat Parameter	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
		Page 1 of 2			



WSSI H	ABITAT ASSESSM	ENT FIELD DATA	SHEET-HIGH GRA	ADIENT STREAMS	1
Project #	Site	Cowardin	River Basin	Date	Time
20003	NOVA Stream Bank	R3	Kivei Dasiii	5/20/2009	3:30PM
	igators	HUC	Potomac	Locality	
SDS	/BNR	02070008		Fairfax Coun	ty
Re	ach	D.A. (Acres)	Reach Length (LF)	Order	
3	-A	75	300	1	
Latitude	Longitude		Stream Nam		
38°55'58"	77°21'01"	Un	named Tributary to Sna	akeden Branch	
Habitat Parameter			dition Category		
114411411 41411111111	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.	. 0
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
	Ge	neral Comments: Ease	ment in reach.		_

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





	V	VSSI BEN	ITHIC MA	CROINVE	RTEBRA	ATE FIELD	DATA SI	HEET		
Proje	ect #	9	te	Cow	ardin	River	Basin	Date	Time	
200	03	Snak	eden		.3	Poto		5/20/2009	3:00PM	
		gators			JC			cality		
	BNR/	SDS		2070	8000			x County		
	Rea	ach		D.A. (Acres)	Reach Le	ngth (LF)	Orde	er	
	3-	-A		7	5	30	0	1		
Latit	ude		itude			Stream Name				
38°55	5'58"	77°2	1'01"		Unnai	med Tributary	y to Snaked	en Branch		
		Habita	at Types (In	dicate Per	centage of	Each Habita	t Present)			
Cobble	100	Sand	20	Rootwads	0	Vegetate	d Banks	0		
	ged Macro	0 0	0		ıt Banks	1		<u> </u>		
Large	Woody D	ebris	0		Packs	3	Other	(bedrocks)	2	
							331	(
				Sampl	e Collectio	n				
Gear	llsed	How	Were Sam			<u></u>				
D-Frame	X		ding		ζ	Number of .	lahs/Kicks	Taken from Ea	ach Hahitat	
Dirame	^	Wat	anig		`	rumber or t	l abs/ttions	Undercut	l	
Kick-Net		From	Rank			Cobble	20	Banks	0	
MCK-IVEL		1 10111	Darik			CODDIE	20	Submerged Macro	_	
Other		From	Boat			Sand	0	phytes	0	
						Rootwads	0	Leaf Packs	0	
						Vegetated		Large Woody		
						Banks	0	Debris	0	
						200		2 00.10		
				Genera	I Commen	ts				
			<u>Qua</u>	litative List	ing of Aqu	atic Biota				
Indic	cate Estima	ted Abunda	nce: 0=Abs	sent/Not Ob	served, 1=F	Rare, 2=Com	mon, 3=Abı	undant, 4=Domi	nant	
Periphyton				3	Slimes				2	
Filamentous	s Algae			1	Macroinve	rtebrates			1	
Macrophyte				0	Fish				1	
					ge 1 of 1				<u> </u>	



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

Site	WSSI#	Reach	Collectors	# Jars in Sample	Total No. Organisms Sorte
Snakeden Branch - Post-Con	20002	3-A	DND/CDC	1	106
2009 Date ID'd	20003 Date Sorted		BNR/SDS Sorter	# Grids in Subsample	126 Total No. Organisms ID'd
6/30/2009	6/30/2009	Taxonomist SDS	Sorter SDS	# Grius in Subsample	118
	0/00/2000		000		110
SIVALVIA - Clams SPHAERIDAE		Forcipomyia sp. Probezzia sp.		Synorthocladius sp. Thienemanniella sp.	
Sphaerium sp.		Sphaeromias sp.		Tvetenia sp.	
Pisidium sp. Musculium sp.		Stilobezzia sp. CHAOBORIDAE		Unniella sp. Xylotopus sp.	
CORBICULIDAE		Chaborus sp.		Zalutschia sp.	
Corbicula fluminea sp.		CHIRONOMIDAE	93	Tanypodinae	
UNIONIDAE		Chironominae Chironomini		Ablabesmyia sp.	
BRANCHIOBDELLIDA BRANCHIOBDELLIDAE		Chironomus sp.		Alotanypus sp. Apsectrotanypus sp.	
TETRASTEMMATIDAE		Cryptochironomus sp.		Clinotanypus sp.	
COLEOPTERA - Beetles CANTHERIDAE		Cryptotendipes sp. Demicryptochironomus sp.		Conchapelopia sp. Guttipelopia sp.	
CURCULIONIDAE	2	Dicrotendipes sp.		Krenopelopia sp.	
DRYOPIDAE		Einfeldia sp.		Labrundinia sp.	
Helichus sp.		Endochironomus sp.		Larsia sp.	
DYTISCIDAE Agabus sp.	1	Glyptotendipes sp. Kiefferulus sp.		Macropelopia sp. Meropelopia sp.	
Hydroporous sp.		Microtendipes sp.		Paramerina sp.	
Coptotomus sp.		Nilothauma sp.		Pentaneura sp.	
Oreodytes sp. Laccornis sp.		Pagastiella sp. Parachironomus sp.		Procladius sp. Psectrotanypus sp.	
Dytiscus sp.		Paracladopelma sp.		Rheopelopia sp.	
Microcylloenus en		Paratendipes sp.		Tanypus sp. Thienemannimyia gp.	
Microcylloepus sp. Optioservus sp.		Phaenopsectra sp. Polypedilum sp.		Thienemannimyia gp. Thienemannimyia sp.	
Stenelmis sp.		Stenochironomus sp.		Trissopelopia sp.	
Promoresia sp. Macronychus sp.		Stictochironomus sp. Tribelos sp.		Zavrelimyia sp. CULICIDAE	
Dubiraphia sp.		Zavreliella sp.		Aedes	
Ancyronyx sp.		Tanytarsini		Anopheles	
Oulimnius sp. GYRINIDAE		Cladotanytarsus sp. Constempellina sp.		Culex Culiseta	
Dineutus		Micropsectra sp.		Mansonia	
Gyrinus		Micropsectra/Tanysarsus complex		Orthopodomyia	
HALIPIDAE Halipus sp.		Paratanytarsus sp. Rheotanytarsus sp.		Psorophora Toxorhynchites	
HYDROPHILIDAE		Stempellina sp.		Uranotaenia	
Cymbiodyta sp.		Stempellinella sp.		Wyeomyia	
Berosus sp.		Sublettea sp.		DIXIDAE	
Derallus sp. Helochares sp.		Tanytarsus sp. Zavrelia sp.		Dixa sp. DOLICHOPODIDAE	
Helophorus sp.		Diamesinae		EMPIDIDAE	
Hydrophilus sp. Hydrochus sp.		Diamesa sp.		Chelifera sp.	
Tropisternus sp.		Pagastia sp. Potthastia sp.		Clinocera sp. Hemerodromia sp.	
Hydrobius sp.		Prodiamesa sp		Dolichocephala sp.	
Laccobius sp. PSEPHENIDAE		Sympotthastia sp. Orthocladiinae		EPHYDRIDAE PELCORHYNCHIDAE	
Psephenus sp.		Brillia sp.		Glutops sp.	
Ectopria sp.		Cardiocladius sp.		PSYCHODIDAE	
Dicranopselaphus sp. PTILODACTYLIDAE		Chaetocladius sp.		Pericoma sp. Psycoda sp.	
Anchytarsus sp.		Corynoneura sp. Cricotopus sp.		SIMULIDAE	
OPEPODA		Cricotopus/Orthocladius sp.		Simulium sp.	
RUSTACEA (Amphipoda- Scuds)		Diplocladius sp.		Prosimulium sp.	
CRANYONYCTIDAE Stygonectes sp.		Eukiefferiella sp. Heleniella sp.		Cnephia sp. Twinia sp.	
Crangonyx sp.		Heterotrissocladius sp.		Stegopterna sp.	
Synurella sp. GAMMARIDAE		Hydrobaenus sp.		Ectemnia sp. STRATIOMYIDAE	
Gammarus sp.		Limnophyes sp. Lopescladius sp.		Oxycera sp.	
HYALELLIDAE		Mesocricotopus sp.		Odontomyia sp.	
Hyalella sp.		Mesosmittia sp.		SYRPHIDAE	
RUSTACEA (Decopoda - Crayfish) CAMBARIDAE		Nanocladius sp. Orthocladinae A		Chrysogaster sp. Eristalis sp.	
PALAEMONIDAE		Orthocladius sp.		TABANIDAE	
RUSTACEA (Isopoda- Sowbugs)		Parachaetocladius sp.		Chrysops sp.	
ASELIDAE Caecidotea sp.		Parakiefferiella sp. Parametriocnemus sp.		Tabanus sp. TANYDERIDAE	
Lirceus sp.		Paraphaenocladius sp.		THAUMALEIDAE	
IPTERA - True Flies		Parasmittia sp.		Thaumalea sp.	
ATHERICIDAE Atherix sp.		Paratrichocladius sp. Paratrissocladius sp.		TIPULIDAE Antocha sp.	
BLEPHARICERIDAE		Paratrissociadius sp. Psectrocladius sp.		Hexatoma sp.	
CECIDOMYIIDAE		Pseudorthocladius sp.		Leptotarsus sp.	
CERATOPOGNIDAE Alluaudomyia sp.		Psilometriocnemus sp. Rheocricotopus sp.		Molophilus 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.	



WSSI BENTHIC MACROINVERTEBRATE I.D. AND ENUMERATION BENCH SHEET

Snakeden Branch - Post-Con 2009 Date ID'd 6/30/2009 Pedicia sp. Limonia sp. Pilaria sp. Erioptera sp. Rhabdomastix sp. TRICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE AMELETIDAE Ameletus sp. BAETIDAE Acentrella sp.	20003 Date Sorted 6/30/2009	3-A Taxonomist SDS	BNR/SDS Sorter SDS	1 # Grids in Subsample	126 Total No. Organisms ID'd
Date ID'd 6/30/2009 Pedicia sp. Limonia sp. Pillaria sp. Erioptera sp. Rhabdomastix sp. RRICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE	Date Sorted	Taxonomist SDS	Sorter	# Grids in Subsample	
6/30/2009 Pedicia sp. Limonia sp. Pilaria sp. Erioptera sp. Rhabdomastix sp. RICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE AMELETIDAE BAETIDAE BAETIDAE		SDS		# Grids in Subsample	l otal No. Organisms ID'd
Pedicia sp. Limonia sp. Pilaria sp. Finotra sp. Rhabdomastix sp. RICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE	6/30/2009		SDS		440
Limonia sp. Pilaria sp. Erioptera sp. Rhabdomastix sp. ITRICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE		Microvelia en	020	36	118
Pilaria sp. Erioptera sp. Rhabdomastix sp. RICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE		Microvelia sp.		Paranemoura sp.	
Erioptera sp. Rhabdomastix sp. TRICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE		HIRUDINEA - Leeches HOPLONEMERTEA - Ribbon Worms		Prostoia sp. Shipsa sp.	+
Rhabdomastix sp. TRICHOCERIDAE Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE		TETRASTEMMATIDAE		CHLOROPERLIDAE	-
Trichocera sp. PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE		Prostoma sp.		Alloperla sp.	
PHEMEROPTERA - Mayflies AMELETIDAE Ameletus sp. BAETIDAE		LEPIDOPTERA - Moth Larvae		Haploperla sp.	
AMELETIDAE Ameletus sp. BAETIDAE		NOCTUIDAE Archanara sp.		Sweltsa sp. TAENIOPTERGIDAE	+
BAETIDAE		Bellura sp.		Strophopteryx sp.	
		PYRALIDAE		Taeniopteryx sp.	
		MEGALOPTERA - Dobsonflies CORYDALIDAE		TRICHOPTERA - Caddisflies BRACHYCENTRIDAE	
Acerpenna sp.		Chauliodes sp.		Brachycentrus sp.	+
Baetis sp.		Corydalus sp.		CALAMOCERATIDAE	
Centroptilum sp.		Nigronia sp. SIALIDAE		Heteroplectron sp. DIPSEUDOPSIDAE	_
Diphetor sp. BAETISCIDAE		Sialis sp.		Phylocentropus sp.	-
Baetisca sp.		NEMATODA - Roundworms		GLOSSOSOMATIDAE	
CAENIDAE		NEMATOMORPHA - Horsehair Worms		Glossosoma sp.	
Caenis sp. EPHEMERELLIDAE		ODONATA (Anispotera - Dragonflies) AESHNIDAE		Agapetus sp. HELICOPSYCHIDAE	_
Dannella sp.		Anax sp.		Helicopsyche sp.	+
Drunella sp.		Basiaeshna sp.		HYDROPSYCHIDAE	
Ephemerella sp. Eurylophella sp.		Boyeria sp. CORDULEGASTRIDAE		Cheumatopsyche sp. Diplectrona sp.	_
Serratella sp.		Cordulegaster sp.		Hydropsyche sp.	-
EPHEMERIDAE		CORDULIIDAE		Parapysche sp.	
Ephemera sp. HEPTAGENIIDAE		GOMPHIDAE		Potamyia sp. HYDROPTILIDAE	_
Epeorus sp.		Arigomphus sp. Gomphus sp.		Hydroptila sp.	+
Leucrocuta sp.		Hagenius sp.		Leucotrichia sp.	
Stenacron sp.		Lanthus sp.		Ochrotrichia sp. LEPIDOSTOMATIDAE	4
Stenonema sp. LEPTOPHLEBIDAE		Stylogomphus sp.		Lepidostoma sp.	+
Leptophlebia sp.		MACROMIIDAE		LEPTOCERIDAE	
Habrophlebia sp.		Macromia sp.		Triaenodes sp.	
Habrophlebiodes sp. Paraleptophlebia sp.		PETALURIDAE ODONATA Zygoptera - Damselflies)		Ceraclea sp. Oecetis sp.	
NEOEPHEMERIDAE		CALOPTERYGIDAE		LIMNEPHILIDAE	+
OLIGONEURIDAE		Calopteryx sp.		Apatina sp.	
Isonychia sp. POLYMITARCYIDAE		COENAGRIONIDAE		Hydatophylax sp. Ironoquia sp.	+
POTAMANTHIDAE		Argia sp. LESTIDAE		Pycnopsyche sp.	-
SIPHLONEURIDAE		OLIGOCHAETA - Oligochaete Worms	8	MOLANNIDAE	
Siphlonurus sp.		LUMBRICINA		Molanna sp.	
TRICORYTHIDAE Tricorythodes sp.		ENCHYTRAEIDAE NAIDIDAE	1	ODONTOCERIDAE Psilotreta sp.	_
GASTROPODA - Snails		TUBIFICIDAE	8	PHILOPOTAMIDAE	-
ANCYLIDAE		LUMBRICULIDAE		Chimarra sp.	
Ferissa sp.		POLYCHAETA - Polychaete Worms		Wormaldia sp.	
HYDROBIIDAE LYMNAEIDAE		AEOLOSOMATIDAE Aeolosoma sp.		PHRYGANEIDAE Ptilostomis sp.	+
Fossaria sp.		PLECOPTERA - Stonefly Larvae		POLYCENTROPIDAE	
Stagnicola sp.		PERLIDAE Agrenourie en		Cyrnellus sp. Polycentropus sp.	4
Pseudosuccinea sp. PHYSIDAE	5	Acroneuria sp. Beloneuria sp.		PSYCHOMYIDAE	-
Physella sp.		Eccoptura sp.		Lype sp.	
PLANORBIDAE		Neoperla sp.		Psychomyia sp.	_
Menetus sp. Gyraulus sp.		Perlesta sp. Perlinella sp.		RHYACOPHILIDAE Ryacophila sp.	+
PLEUROCERIDAE		PERLODIDAE		UENOIDAE	
VIVIPARIDAE		Clioperla sp.		Neophylax sp.	
Viviparus sp. IAPLOSCLERIDA		Diploperla sp. Isoperla sp.		TUBELLARIA - Flatworms PLANARIIDAE	
SPONGILLIDAE		Cultus sp.		DENDROCOELIDAE	-
IEMIPTERA - True Bugs		PTERONARCYIDAE			
BELOSTOMATIDAE		Pteronarcys sp.			
Belostoma sp. Lethocerus sp.		PELTOPERLIDAE Peltoperla sp.			_
CORIXIDAE		LEUCTRIDAE			<u> </u>
GELASTOCORIDAE		Leuctra sp.			
GERRIDAE Trepobates sp.		Zealuectra sp.			+
HEBRIDAE		Paraleuctra sp. CAPNIDAE			+
HYDROMETRIDAE		Allocapnia sp.			
MESOVELIIDAE		Paracapnia sp.	-		1
NEPIDAE		NEMOURIDAE			-
Nepa sp. Ranatra sp.		Amphinemura 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)	Scrapers	Percent Chironomi dae	Percent Top Two Dominant	НВІ
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						