

MEMORANDUM

то:	Mike Rolband
FROM:	Alison Robinson
CC:	Ben Rosner, Mark Headly, Scott Petrey
RE:	Northern Virginia Stream Restoration Bank The Glade- Design Reaches 2, 3, 4A, and 4B Supplemental Biological Monitoring 2012 (Year 3) WSSI #20030, Task M2
DATE:	November 27, 2012

Per maintenance and monitoring requirements defined in the "Northern Virginia Stream Restoration Bank Banking Instrument", Section VI.B.2.(i), biological monitoring will be conducted prior to stream restoration, then in years 1, 5, and 10 in The Glade- Design Reaches 2, 3, 4A, and 4B¹. However, monitoring was undertaken voluntarily in Year 3 (2012) at biomonitoring Reaches 1-D through 1-G, 2-A, and 3-A to better understand and document the effects of stream restoration on the benthic community within The Glade Watershed. Field work was conducted by WSSI environmental scientists Alison Robinson, WPIT, CT and Mark Navarro on April 14, 2012. Benthic macroinvertebrate habitat field data sheets and benthic macroinvertebrate bench sheets for each reach are enclosed within².

Habitat results for Year 3 (Post-Construction) show that all of the biomonitoring reaches sampled in The Glade have "Optimal" habitat conditions (<u>Table 1</u>, <u>Figure 1</u>). The average habitat assessment score for all restored biomonitoring reaches assessed in 2012 is 176 (Optimal) out of 200 following restoration. These results show improved habitat conditions following restoration, with scores exceeding the pre-restoration average of 125 (Sub-Optimal) out of 200. This improvement is due to the continued stability of the restored stream and the increase in density of the reforested riparian zones. The average score in 2012 is the same as the average for 2011 (176) because although most reaches exhibited improved habitat scores, biomonitoring Reach 2-A exhibited additional sediment deposition.

Due to the low flow conditions at the time of sampling, biomonitoring reaches 1-G and 2-A were not sampled. The results of our data analysis indicate that the benthic macroinvertebrate community at the four sampled biomonitoring reaches were in "Severe Stress" in 2012, based on their Stream Condition Index for Virginia Non-coastal Streams (VA-SCI)³ scores (<u>Table 2</u>, <u>Figure 2</u>). The average VA-SCI numerical score for all reaches assessed in 2012 is 32.19 ("Severe Stress"). Note that while all the reaches still remain in "Severe Stress", on average, the VA-SCI scores increased when compared to the average pre-construction VA-SCI score of 23.74 ("Severe Stress") and the post-construction 2011 average of 28.76 ("Severe Stress").

¹ Biomonitoring reach locations were selected prior to the design phase; therefore, biomonitoring reaches 1-D through 1-G, 2-A, and 3-A are located within Design Reaches 2, 3, 4A, and 4B.

² Note that benthic macroinvertebrate bench sheets for biomonitoring reaches 1-G and 2-A are not included since these reaches were not sampled due to lack of flowing water.

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

⁵³⁰⁰ Wellington Branch Drive • Suite 100 • Gainesville, VA 20155 • Phone 703.679.5622 • Fax 703.679.5601 arobinson@wetlandstudies.com • www.wetlandstudies.com

In conclusion, the results of the 2012 supplemental monitoring indicate that there has been a continued improvement of habitat scores and a slight improvement of the benthic community composition in the 2012 sampled reaches as compared to previous years.

Enclosures

Table 1. 2012 Total Habitat Assessment Scores									
BIOMONITORING REACH	Total Habitat	Narrative Rating							
1-D	180	Optimal							
1-E	180	Optimal							
1-F	181	Optimal							
1-G	171	Optimal							
2-A	164	Optimal							
3-A	180	Optimal							
Average	176	Optimal							

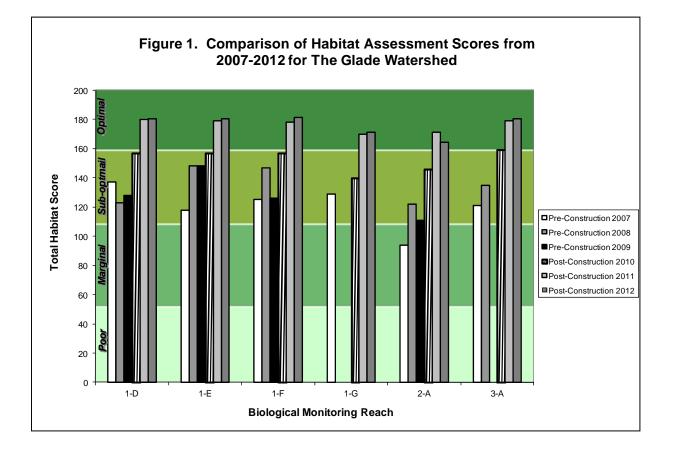
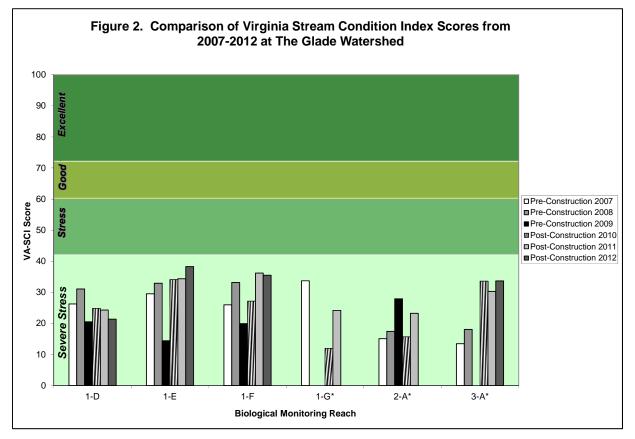


Table 2. 2012 Biotic Metric ar	Table 2. 2012 Biotic Metric and Index Weighting and VA-SCI at The Glade.								
WEIGHTED METRIC	BIOLOGICAL MONITORING REACH								
WEIGHTED METRIC	1-D	1-E	1-F	1-G	2-A	3-A			
Total Taxa	27.27	45.45	36.36	N/A	N/A	27.27			
EPT Taxa	0.00	0.00	0.00	N/A	N/A	0.00			
Percent Ephemeroptera	0.00	0.00	0.00	N/A	N/A	0.00			
Percent Plecoptera + Trichoptera	0.00	0.00	0.00	N/A	N/A	0.00			
(Excluding Hydropsychidae)	0.00	0.00	0.00			0.00			
Percent Scrapers	0.00	4.00	1.94	N/A	N/A	1.88			
Percent Chironomidae	43.69	80.41	75.00	N/A	N/A	81.55			
Percent Top Two Dominant	26.66	81.94	67.92	N/A	N/A	44.90			
HBI	73.39	94.30	102.65	N/A	N/A	113.65			
VA-SCI Numerical Score	21.38	38.26	35.48	N/A	N/A	33.66			
VA-SCI Narrative Score	Severe	Severe	Severe	N/A	N/A	Severe			
VA-SCI Nallative Scole	Stress	Stress	Stress			Stress			
Average VA-SCI Numerical Score	32.19								
Average VA-SCI Narrative Score	Severe								
Average VA-SCI Narrative Score	Stress								



*Note that the following biological monitoring reaches were not sampled due to the lack of flowing water: 1-G in 2008, 2009, and 2012; biological monitoring reach 2-A in 2012; and biological monitoring reach 3-A in 2009.

 $\label{eq:linear} L: \cite{20000s} 20030 \cite{20030c} Admin \cite{05-ENVR} \cite{Biomonitoring} \cite{Postcon Year 3-2012 Monitoring} \cite{2012-11_Glade_Benthic_Memo.docx} and \cite{Discontrang} \cit$



EXHIBIT 6: HABITAT ASSESSMENT FIELD DATA SHEET - SUMMARY WORKSHEET

Stream ID:	The G	lade and Unr	named Trib	utaries of Th	e Glade		Date: 4/13	/12							
Evaluators: ABR/MN				HUC: 020)70008										
ssessmer	nt Perio	od:	P	ost-constru	ction - Year	3									
				· · · · ·	······	Condition	Category								
Assessment Reach Embedded- Sediment Name Substrate ness Velocity Depositon			Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability*	Vegetation Protection*	Riparian Zone*	TOTAL SCORE	Condition	Reach Length	Stream Type			
Stream 1	1-A	-	-	-	-	-	-	-	-	-	-	-		-	-
	1-B	-	-	-	-	-	-	-	-	-	-	-	CONTRACTOR OF CONTRACTOR		
	1-C	-	-	-	-	- :	-	-	-	-	-	-	and the second	-	
	1-D	Optimal	Optimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	180	Optimal	300	R3
	1-E	Optimal	Optimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	180	Optimal	300	R3
	1-F	Optimal	Optimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	181	Optimal	300	R3
	1-G	Suboptimal	Optimal	Marginal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal	171	Optimal	300	R4/RE
Stream 2	2-A	Suboptimal	Optimal	Marginal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	Suboptimal		Optimal	300	R4/RE
Stream 3	3-A	Optimal	Optimal	Suboptimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	Optimal	180	Optimal	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.

Studies and Solutions, Inc.

Lon Training States	Bent	thic Macr	oinvertebrat	e and	Habitat Fi	eld Data Sheet	
Station ID: Reach 1-	D	Ecoregion:	Piedmont		Land Use:	Urban	
Field Team: ABR/MN		Survey Reaso	n: YR 3 Biomonitoring		Start time:	1	
Stream Name: Glade		Location:	Reston, Virginia		Finish time:		
Date: 4/13/201	12	Latitude:	38°55'26"		Longitude	-77°21'08"	
Stream Physiochem	nical Measureme	nts					
Instrument ID number:		N/A	pH:		N/A		
Temperature:	N/A	_°C	Con	ductivity:	N/A	uS/cm	
Dissolved Oxygen:	N/A	mg/L		Did inst	trument pass all	post-calibration checks?	N/A
				If NO- wi	hich parameter(s	a) failed and action taken:	N/A
Benthic Macroinve	rtebrate Collection	on					
Method Used:	Si	ngle Habitat (Ri	ffle):		Multi Ha	abitat (Logs, Plants, etc.):	Х
Riffle Quality:	Good	<u>x</u>	Marginal		Poor	None	
Habitats Sampled:	Riffle	e <u>X</u>	Snags	х	Sediment	Vegetation	Х
	# Jabs:	17		1	_		2
Weather Observation	ons						
Current Weather:	Cloudy		Clear	х	Rain/Snow	Foggy	
Recent Precipitation:	Clear	r <u>X</u>	Showers		Rain	Storms	
Stream Flow:	Low	X	Normal		Above Normal	Flood	
Biological Observat	ions						
Periphyton	2	_	Salamanders		0	Other	ron Oxidizing Bacteria: 2
Filamentous Algae	1	_	Warmwater Fish		2	0= Not observed	
Submerged Macrophytes	0	_	Coldwater Fish		0	1= Sparse	
Emergent Macrophytes	0	_	Beavers		0	2= Common to A	bundant
Crayfish	0	_	Muskrats		0	3= Dominant-	
Corbicula	0	_	Ducks/Geese		0	abnormally high	density where other taxa
Unionidae	00	_	Snakes		0	_	in relation to the dominant
Operculate Snails	0	-	Turtles		0		be situations where multiple
Non-operculate Snails	0	_	Frogs/Tadpoles		0	taxa are dominar	nt such as algae and snails
Notos							

Habitat Parameter		Con	dition Category		
Habitat I diameter	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	543210	18
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	543210	18
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	543210	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	543210	16

Score Left Bank 10 9 8 7 6 5 4 3 2 10 10 Score Right 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, insuption evident but no class of potential to any great extent, more than one-half of the potential plant subble height remaining. 50-70% of the streambank surfaces covered by vegetation, disruption obvious; patches of bare soil or closely cropped vegetation, obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant subble height remaining. Less than 50% 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 subble height remaining. Less than 50% 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 subble height remaining. Less than 50% of the streambank surfaces covered by atreambank surfaces covered by atreambank surf				labitat Field Data	Sileet	
Channel Flow status Water files 3/2% of channel substrate is exposed. Biffer Substrate is exposed. Concernence of files network damaned exposed. Concernence of files network daman	Habitat Parameter			dition Category		
5. Channel Flow status Iower bank, armininal amount of orbanal subtrates exposed. Water files 37% of the available substate is exposed. Water files 37% of the substate is exposed. Charmelized of the substate is ex	Thubhat T drameter	Optimal	Suboptimal	Marginal	Poor	Score
6. Channel Channelization or dredging abset or minimal is reasm within the international is reasma withernational international is reasma withing within the		lower banks, and minimal amount of channel substrate is	channel; or <25% of channel	availible channel, and/or riffle	mostly present as standing	
6. Channel Channelization or dredging absent or minmal, stream based or minmal, stream based or minmal, stream based or minmal, stream based or more apattern. Some channelization present, may be greatern based or many be advertisely, embody many based or more apattern. Banks shored with gabion or center, core 80% of the stream each channelized or more apattern, may be greatern but needs the stream each channelized or many based or many base	Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	18
Concurrence of riffles relatively frequent; ratio of distance between riffles divided by dth of the stream c.71 (generally is distance between riffles divided by the width of the stream is between 7 to 15. Coccurrence of riffles infrequent; ratio of distance between riffles divided by the width of the stream is between 7 to 15. Coccurrence of riffles infrequent; ratio of distance between riffles divided by the width of the stream is between 7 to 15. Coccusional riffle or bend; bottom controws provide score the argent riftles divided by the width of the stream is between 7 to 15. Coccusional riffle or bend; bottom controws provide score the argent riftles divided by the width of the stream is between 7 to 15. Coccusional riffle or bend; bottom controws provide score the argent riftles divided by the width of the stream is between 1 to 15 to 4 13 12 11 Coccusional riffle or bend; bottom controws provide score the argent riftles divided by the width of the stream is between 1 to 5. General riftle divide score the argent riftles divided by the width of the stream is between 1 to 5. Coccusional riffle or bend; bottom riftles divided by the width of the stream is between 1 to 5. Coccusional riffle or bend; bottom riftles divided by the width of the stream is between 1 to 5. Coccusional riffle or bend; bottom riftles divided by the width of the stream is between 1 to 5. Coccusional riffle or bend; bottom riftles divided by the width of the stream is between 1 to 5. Coccusional riffle or bend; bottom riftles divided by the width of the stream is between 1 to 5. Coccusional riffle or bend; bottom riftles divided by the width of the stream is between 1 to 5. Coccusional riffle or bend; bottom riftle or bend; bottom riftle divided diffle or bend; bend riftle divided divided divided dif		absent or minimal; stream width	usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent	extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed	
Cocurrence of rifles relatively frequent; rais of distance between rifles divided of the stream -2:1 (generally is of the stream is of boulders or other large, natural boulders or other large, natural boulders or other large, natural immediate experiment of boulders or other large, natural immediate experiment of stream is stable; evidence of resion or bank failure absent future problems5% of bank affected. Cocasional riffle or benc; boulders or other large, natural interaction is bank stable; evidence of erosion or bank failure absent future problems5% of bank affected. Cocasional riffle or benc; boulders or other large, natural interaction is bank failure absent future problems5% of bank affected. Cocasional riffle or benc; boulders or other large, natural interaction is bank is of the stream has areas of erosion. Generally all flat water or shallow riffles; poor habitat; distance between fiftes divides bound interaction is core erosion or bank failure absent future problems5% of bank interaction accore so of the streambank affected. Occasional riffle or benc; bound resource and bound erosion or bunk in the streambank interaction accore so or acch bank). Generally all flat water or shallow riffles; poor habitat; distance between and bound erosion or bunk in the stream habitat; distance between and bound erosion or bunk in the stream habitat; distance between and bound erosion or bunk in the stream habitat; distance between and bound erosion or otheritation accore so or acch bank).	Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	16
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, manual as of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Moderately unstable; 30-60% of bank reach has areas of erosion, fliph erosion potential during floods. Unstable; may eroded areas; raw areas frequent along straight sections and bends; obvious bank stologhing; 60- 100% of bank has areas of erosion, fliph erosion potential during floods. Unstable; may eroded areas; raw areas frequent along straight sections and bends; obvious bank stologhing; 60- 100% of bank has areas of erosion, fliph erosion potential during floods. Unstable; may eroded areas; raw areas frequent along straight sections and bends; obvious bank stologhing; 60- 100% of bank has areas of erosion, fliph erosion potential during floods. Unstable; may eroded areas; raw areas frequent along straight sections and bends; obvious bank stologhing; 60- 100% of bank has areas of erosion, fliph erosion potential during floods. Unstable; may eroded areas; raw areas frequent along straight sections and bends; 00% of bank has areas of erosion, fliph erosion potential disruption obvious; patches of bare soil or closely cropped vegetation close to bends anaverage stubble height. Unstable; may		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	distance between riffles divided by the width of the stream is	bottom contours provide some habitat; distances between riffles divided by the width of the	shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a	
8. Bank Stability (score each bank) erosion or bank failure abeen or minima; little potential for fuure problems. <5% of bank affected. Moderately stable; infrequent, small areas of erosion. Moderately unstable; 30-60% of bank reach has areas of erosion, thigh erosion potential during floods. "raw" areas frequent along straight sections and bends; obvious bank stolughing; 60- 100% of bank has erosional scars. Score Left Bank 10 9 8 7 6 5 4 3 2 10 9. Vegetation Protection (score each bank) Note: ight side by facing downstream. More than 90% of the streambank surfaces and immediate inpaina zone or worde to native segetation, including trees, understory shubs, or nor-woody moving minimal or not eviden; atmost all plants allowed to grow naturally. 70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not reliverers moving minimal or not eviden; atmost all plants allowed to grow naturally. 50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches disruption as table height remaining. Score Left Bank 10 9 8 7 6 5 4 3 2 0 10 10. Riparian vegetation is nativelies (i.e. parking lots, roadbeds, clear cus, lawns, or crosp) impacted zone. Width of riparian zone 12-18 meters; human activities have impacted zone a great deal.	Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	19
Score Right Bank109876543210109. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.More than 90% of the streambank surfaces and including trees, understory shrubs, or non-woody macrophytes; vegetation, affecting full plant growth potential to any great extent; more than one-half of the potential plant slowed to grow naturally.70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption through grazing or moving 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 through grazing or moving 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 through grazing or more than one-half of the potential plant slowed to grow naturally.70-90% of the streambank surfaces covered by native vegetation common; less than one-half of the potential plant slobble height remaining.Less than 50% of the streambank surfaces covered by vegetation; disruption for streambank surfaces covered by repertive to 5 centimeters or less in average stubble height.10. Riparian Vegetative Zone Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clear- uts, 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 <td>-</td> <td>erosion or bank failure absent or minimal; little potential for future problems. <5% of bank</td> <td>small areas of erosion mostly healed over. 5-30% of bank in</td> <td>bank reach has areas of erosion; high erosion potential</td> <td>"raw" areas frequent along straight sections and bends; obvious bank sloughing; 60- 100% of bank has erosional</td> <td></td>	-	erosion or bank failure absent or minimal; little potential for future problems. <5% of bank	small areas of erosion mostly healed over. 5-30% of bank in	bank reach has areas of erosion; high erosion potential	"raw" areas frequent along straight sections and bends; obvious bank sloughing; 60- 100% of bank has erosional	
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9. Vegetation Protection (score each bank) Note: Determine left or ight side by facing downstream.streambank surfaces and immediate riparian zone 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 copped vegetation common; less than one-half of the potential plant stubble height remaining.Less than 50% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely copped vegetation common; less than one-half of the potential plant stubble height remaining.Score Left Bank1098765432101010. Riparian width (score each ank riparian zone)Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clear- outs, 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.10. Riparian wank riparian zone)1098765432010 <td>Score Right Bank</td> <td>10 9</td> <td>8 7 6</td> <td>5 4 3</td> <td>2 1 0</td> <td></td>	Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	
Score Right Bank 10 9 8 7 6 5 4 3 2 1 0 10 10. Riparian 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 Width of riparian zone 6-12 Width of riparian zone <6	Protection (score each bank) Note: Determine left or ight side by facing	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	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	surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant	streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or	
10. Riparian Width of riparian zone >18 Vegetative Zone Width of riparian zone >18 Width (score each Width, (score each width (score each Width, (score each width (score each Width of riparian zone) Score Left Bank 10 10 9 87 6 5 4 2 10					2 1 0	10
Vegetative Zone Width (score each pank riparian zone) meters; human activities (i.e. parking lots, roadbeds, clear- cuts, lawns, or crops) have not impacted zone. Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. Width of riparian zone 6-12 meters; human activities have impacted zone only minimally. Score Left Bank 10 9 8 7 6 5 4 3 2 1 0 10	Score Hight Bank	10 9	8 7 6	5 4 3	2 1 0	10
Coare Dight Dept	Vegetative Zone Width (score each	meters; human activities (i.e. parking lots, roadbeds, clear- cuts, lawns, or crops) have not	meters; human activities have	meters; human activities have	meters; little or no riparian vegetation due to human	
Coore Dight Donk	Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
	Score Right Bank	10 9				

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET								
Job Name/#	Glade - 20030	Sample subsorted by:	BC,SG,KG	NYY 1 1				
Station ID:	Reach 1-D	Date Subsorted:	8/24/12	Wetland				
Stream Name:	The Glade	# of Grids subsorted	4	Studies and Solutions, Inc.				
Date Sampled:	4/13/12	Total # of subsorted insects:	117	Total # identified: 109				
Sampling Method:	Multihabitat	Sample Identified by:	ABR	Date Identified: 9/4/12				

Taxa Collected:

Taxa Collect				Metrotopolitic		•		
Devilo				Metretopodidae			Lepidostomatidae	
Porifera	Spongillidae		4	Neoephemeridae			Leptoceridae	
Ostracoda	Unknown			Oligoneuridae		1	Limnephilidae	
Flatworms	Tricladida		1	Psuedironidae		J	Molannidae	
_	Planariidae			Polymitarcyidae		1	Odontoceridae	
Gastropoda	Unknown			Potamanthidae			Philopotamidae	
Limpets	Ancylidae			Siphlonuridae			Phryganeidae	
Snails	Immature			Tricorythidae]	Polycentropodidae	1
	Lymnaeidae		Zygoptera	Early Instar and/or damaged		1	Psychomyiidae	
	Physidae			Calopterygidae		1	Ryacophilidae	
	Planorbidae			Coenagrionidae	8	1	Sericostomatidae	
	Hydrobiidae		1	Lestidae		1	Uenoidae	
	Pleuroceridae		1	Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged			Pyralidae	
Bivalvia	Immature		1	Aeshnidae		Coleoptera	Early Instar and/or damaged	
	Corbiculidae		1	Cordulegastridae			Chrysomelidae	
	Sphaeriidae		1	Corduliidae		1	Curculionidae	
	Unionidae		1	Gomphidae		1	Dryopidae	
Oligochaeta	Unknown	1	1	Libellulidae	— —	1	Dytiscidae	
Lumbriculida			1	Macromiidae		1	Elmidae	
	Lumbriculidae		1	Petaluridae		1		
Tubificida	Lambridandae		1	Cordullidae/Libelluidae		4	Gyrinidae	
r donicida	Enchytraeidae		Discontoro			1	Haliplidae	
	Naididae		Plecoptera	Early Instar and/or damaged		1	Helodidae	
			4	Capniidae		1	Helophoridae	
L la al a tax dala	Tubificidae			Chloroperlidae		1	Hydraenidae	
Haplotaxida			1	Leuctridae		1	Hydrochidae	
	Haplotaxidae		1	Nemouridae			Hydrophilidae	
Leeches	Hirudinea			Peltoperlidae			Limnichidae	
	Erpobdellidae			Perlidae		1	Noteridae	
	Glossiphoniidae			Perlodidae			Psephenidae	
	Hirudinidae			Pteronarcyidae			Ptilodactylidae	
	Pisciolidae			Taeniopeterygidae			Scirtidae	
Branchiobdellida	Branchiobdellidae		Hemiptera	Early Instar and/or damaged		Diptera	Early Instar and/or damaged	
Copepoda	Unknown			Belostomatidae			Athericidae	
Decapoda	Cambaridae			Corixidae			Blephariceridae	
	Portunidae			Gelastocoridae			Canaceidae	
Shrimp				Gerridae			Ceratopogonidae	
	Palaemonidae			Hebridae			Choaboridae	
Isopoda				Hydrometridae			Chironomidae	87
	Asellidae			Mesoveliidae			Culicidae	
Amphipoda				Naucoridae			Dixidae	
	Crangonyctidae			Nepidae			Dolichopodidae	
	Gammaridae			Notonectidae			Epididae	
	Talitridae			Veliidae				
Water Mites				Pleidae			Ephydridae	
	Hydracarina		Neuroptera				Muscidae	
Ephemeroptera	Early Instar and/or damaged		neuropiera	Sisyridae			Nymphomyiidae	
cpriemeroptera	Acanthometropodidae		Magalenter	Sisynuae			Pelecorhynchidae	
			Megaloptera				Psychodidae	
	Ameletidae			Corydalidae			Ptychopteridae	
	Baetidae			Sialidae			Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged			Simuliidae	7
	Behningiidae			Branchycentridae			Stratiomyidae	
	Caenidae			Calamoceratidae			Syrphidae	
	Ephemerellidae			Glossosomatidae			Tabanidae	
	Ephemeridae			Goeridae			Tanyderidae	
	Heptageniidae	1		Heliicopsychidae			Thaumaleidae	
	Isonychiidae			Hydropsychidae	4		Tipulidae	
	Leptophlebiidae			Hydroptilida		TOTAL:		95
TOTAL:		2	TOTAL:		12	'		
						I		

Studies and Solutions, **Benthic Macroinvertebrate and Habitat Field Data Sheet** Station ID: Reach 1-E Ecoregion Piedmont Land Use: Urban Field Team: ABR/MN YR 3 Biomonitoring Survey Reason: Start time: Stream Name: Glade Location: Reston, Virginia Finish time: 4/13/2012 Date: Latitude: 38°55'35" Longitude -77°21'40 **Stream Physiochemical Measurements** Instrument ID number: N/A pH: N/A Temperature: N/A °C Conductivity: N/A uS/cm Dissolved Oxygen: N/A mg/L Did instrument pass all post-calibration checks? N/A If NO- which parameter(s) failed and action taken: N/A **Benthic Macroinvertebrate Collection** Method Used: Single Habitat (Riffle): Multi Habitat (Logs, Plants, etc.): х Riffle Quality: Good Marginal х Poor None Habitats Sampled: Riffle х Snags Sediment Х Vegetation Х # Jabs: 18 1 1 Weather Observations Current Weather: Cloudy Clear Х Rain/Snow Foggy **Recent Precipitation:** Clear Х Showers Rain Storms Stream Flow: Low Normal Х Above Normal Flood **Biological Observations** Periphyton 0 Salamanders 0 Other.... Iron Oxidizing Bacteria= 3 Filamentous Algae 1 Warmwater Fish 1 0= Not observed Submerged Macrophytes 0 Coldwater Fish 0 1= Sparse **Emergent Macrophytes** 0 Beavers 0 2= Common to Abundant Crayfish 0 Muskrats 0 3= Dominant-Corbicula 0 Ducks/Geese 0 abnormally high density where other taxa are insignificant in relation to the dominant unionidae 0 Snakes 0 taxa. There can be situations where multiple **Operculate Snails** 0 Turtles 0 taxa are dominant such as algae and snails Non-operculate Snails 0 Frogs/Tadpoles 3 Notes

'etland

Habitat Parameter		Con	dition Category		(Becharles)
<u>Habitat Falameter</u>	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	543210	18
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	543210	19
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	543210	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	543210	16

		Con	dition Category							
Habitat Parameter	Condition Category Optimal Suboptimal Marginal Poor									
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the 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					
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	19					
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	543210	16					
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	543210	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	10					
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10					
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	9					
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9					

	WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET										
Job Name/#	Glade - 20030	Sample subsorted by:	BC, SG, KG		<u></u>						
Station ID:	Reach 1-E	Date Subsorted:	8/24/12								
Stream Name:	The Glade	# of Grids subsorted	3	Studies and Solutions, In	3-						
Date Sampled:	4/13/12	Total # of subsorted insects:	107	Total # identified:	97						
Sampling Method:	Multihabitat	Sample Identified by:	ABR	Date Identified:	9/25/12						

Metretopodidae

Taxa Collected:

				Metretopodidae
Porifera	Spongillidae		1	Neoephemeridae
Ostracoda	Unknown	17	1	Oligoneuridae
Flatworms	Tricladida		7	Psuedironidae
	Planariidae		7	Polymitarcyidae
Gastropoda	Unknown			Potamanthidae
Limpets	Ancylidae			Siphlonuridae
Snails	Immature			Tricorythidae
	Lymnaeidae		Zygoptera	Early Instar and/or o
	Physidae	2		Calopterygidae
	Planorbidae			Coenagrionidae
	Hydrobiidae		1	Lestidae
	Pleuroceridae		1	Protoneuridae
	Viviparidae		Anisopteera	Early Instar and/or o
Bivalvia	Immature		1	Aeshnidae
	Corbiculidae		1	Cordulegastridae
	Sphaeriidae	1	1	Corduliidae
	Unionidae		1	Gomphidae
Oligochaeta	Unknown	23	1	Libellulidae
Lumbriculida			1	Macromiidae
	Lumbriculidae		1	Petaluridae
Tubificida			1	Cordullidae/Libelluid
	Enchytraeidae		Plecoptera	Early Instar and/or o
	Naididae	7	1	Capniidae
	Tubificidae	14	1	Chloroperlidae
Haplotaxida			1	Leuctridae
	Haplotaxidae		1	Nemouridae
Leeches	Hirudinea			Peltoperlidae
	Erpobdellidae		4	Perlidae
	Glossiphoniidae		1	Periodidae
	Hirudinidae		4	Pteronarcyidae
	Pisciolidae		-	Taeniopeterygidae
Branchiobdelli			Hemiptera	Early Instar and/or d
Copepoda	Unknown	4	riomptera	Belostomatidae
Decapoda	Cambaridae	· · · · · · · · · · · · · · · · · · ·		Corixidae
Dooupouu	Portunidae			Gelastocoridae
Shrimp				Gerridae
onnip	Palaemonidae		-	Hebridae
Isopoda			-	Hydrometridae
loopodu	Asellidae		1	Mesoveliidae
Amphipoda	, loomado	7	1	Naucoridae
mpmpodd	Crangonyctidae		1	Nepidae
	Gammaridae		1	Notonectidae
	Talitridae		4	Veliidae
Water Mites	Taittidae		4	
Water Wites	Hydracarina		Nouroptoro	Pleidae
Ephemeroptera	Hydracarina Early Instar and/or damaged		Neuroptera	Circuide e
cphemeroptera	Acanthometropodidae		Manalantan	Sisyridae
	Ameletidae		Megaloptera	O
	Baetidae		1	Corydalidae
			.	Sialidae
	Baetiscidae		Trichoptera	Early Instar and/or d
	Behningiidae		1	Branchycentridae
	Caenidae		1	Calamoceratidae
	Ephemerellidae		1	Glossosomatidae
	Ephemeridae		1	Goeridae
	Heptageniidae			Heliicopsychidae
	Isonychiidae			Hydropsychidae
	Leptophlebiidae			Hydroptilida
TOTA	L:	75	TOTAL:	

			Lepidostomatidae	
)			Leptoceridae	
			Limnephilidae	
			Molannidae	
			Odontoceridae	
			Philopotamidae	
			Phryganeidae	
			Polycentropodidae	
or damaged			Psychomyiidae	
			Ryacophilidae	
			Sericostomatidae	
			Uenoidae	
		Lepidoptera	Early Instar and/or damaged	
r damaged		1	Pyralidae	
		Coleoptera	Early Instar and/or damaged	
			Chrysomelidae	
			Curculionidae	
			Dryopidae	
			Dytiscidae	
			Elmidae	
uidae			Gyrinidae	
uidae			Haliplidae	
r damaged			Helodidae	
			Helophoridae	
			Hydraenidae	
			Hydrochidae	
			Hydrophilidae	
			Limnichidae	
			Noteridae	
			Psephenidae	
			Ptilodactylidae	
e			Scirtidae	
r damaged	·	Diptera	Early Instar and/or damaged	
			Athericidae	
			Blephariceridae	
			Canaceidae	
			Ceratopogonidae	
			Choaboridae	
			Chironomidae	19
			Culicidae	1
			Dixidae	
			Dolichopodidae	
			Epididae	
			Ephydridae	
			Muscidae	
			Nymphomyiidae	
			Pelecorhynchidae	
			Psychodidae	
			Ptychopteridae	
			Sciomyzidae	
damaged			Simuliidae	
 			Stratiomyidae	
			Syrphidae	
			Tabanidae	
			Tanyderidae	
			Thaumaleidae	
			Lunu di de e	0
		TOTAL:	Tipulidae	2

-...- Wetland

Martin State		Bent	hic Macro	oinvertebrate	e and I	Habitat Fi	eld Data Shee	at t		Sta Mar
Station ID:	Reach 1-F		Ecoregion	Piedmont		Land Use:	Urban	~		
Field Team:	ABR/MN			YR 3 Biomonitoring		Start time:	or ball			
Stream Name:	Glade		Location	Glade		Finish time:				
Date:	4/13/2012		Latitude:	38°55'36"		Longitude	-77°21'45"			
Stream Phy	siochemical I	Measuremer	nts			Longitude	77 21 45			-
Instrument ID r	number:	N	/A	pH:		N/A				
Temperature:		N/A	°C	- ·	ductivity:	N/A	uS/cm			
Dissolved Oxyg	en:	N/A	mg/L				post-calibration checks	,	N/A	
) failed and action take	-	N/A	
Benthic Ma	croinvertebra	ate Collectio	n			nen parameter(s	, railed and action take	-	N/A	
Method Used:		Sir	gle Habitat (Rif	fle)		Multi Ha	abitat (Logs, Plants, etc.)	X	
Riffle Quality:		Good	х	Marginal		Poor		None		
Habitats Sampl	ed:	Riffle	х	Snags		Banks	Ve	etation	x	
	# Ja	ibs:	16			•			4	
Weather Ob	oservations							-		
Current Weath	er	Cloudy		Clear	х	Rain/Snow		Foggy		
Recent Precipit	ation	Clear	х	Showers		Rain		Storms		
Stream Flow		Low	х	Normal		Above Normal		Flood		
Biological O	bservations							-		
Periphyton		2		Salamanders		0	Other	. 1	ron Oxidizing Bacteri	ia= 3
Filamentous Alg	gae	1		Warmwater Fish		0	0= Not	- observed		
Submerged Ma	crophyte s	0		Coldwater Fish		0	1= Spar	se		
Emergent Macr	ophytes	0		Beavers		0	2= Com	mon to A	bundant	
Crayfish		0		Muskrats		0	3= Dom	inant-		
Corbicula		0		Ducks/Geese		0	abnor	mally hig	h density where othe	er taxa
unionidae		0		Snakes		0	are insi	gnificant	in relation to the dor	ninant
Operculate Snai	ils	0		Turtles		0			be situations where i	
Non-operculate	Snails	0		Frogs/Tadpoles		2	taxa are	e domina	nt such as algae and	snails
Notes	-									

Habitat Parameter		Con	dition Category		19 Start
<u>Habitat l'alameter</u>	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	543210	19
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	543210	18
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	543210	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	543210	18



Channel Flow status Optimal Suboptimal Marginal Poor Sc 5. Channel Flow status Water reaches base of both our dramet dustrate is exposed. Water files 75% of the water dustrate is exposed. Water files 75% of the subtrate is exposed. The subtrate is exposed. Water files 75% of the subtrate is exposed. Water files 75% of the subtrate is exposed. Channettoon may be exposed. Channettoon may be exposed.<		Condition Category										
5. Channel Flow status Water status of total anount of deared substrates opposed. Water file 25-75% of the aubtrate see opposed. Vary stike water in channel and monty present as standing posed. 5. Channel Alteration Commission of redging above for deared members and members on mail pattern. Some channel substrate see opposed. Water file 25-75% of the aubtrates are notify spesent as standing posed. Very stike water in channel and monty present as standing posed. 6. Channel Alteration Channelization of redging above for members and normal pattern. Some channelization present. Channelization may be extensive enhancement of above for members and members and present. Banks shored with gaboo of estrates enhancement of above for members and present. Banks shored with gaboo of estrates enhancement of above for members and present. Banks shored with gaboo of estrates enhancement of above for members and present. Channelization and present. Channelization and present. Banks shored with gaboo of estrates enhancement of boots on orbits fail and water of atometication is more of anone and present. Banks shored with gaboo of dearable. Channelization and present. Banks shored with gaboo of estrates enhancement of boots on orbits fail and the stream is between 15 to 25. Bank shored with gaboo of dearable. Channelization and atometication is more and atometication is more and atometication is more and atometication is more and atometication atometication present and shore and atometication atometication present and shore and atometication atometication atomore of members. Channelization free atometication a	Habitat Parameter											
6. Channel Chamelization or dredging absent or mininal; atream within areas of handization, i.e. dredging, absent or mininal; atream within areas of handization, i.e. dredging, move present, but costs of the handization is not present. but costs of the handization is not present, but costs of the handization is not present, but costs of the handization is not present. but costs of the handization is not present, but costs of the handization is not present. but costs		lower banks, and minimal amount of channel substrate is	channel; or <25% of channel	availible channel, and/or riffle	Very little water in channel and mostly present as standing							
6. Channel Channelzed and stream with a faread of bridge about or minula; stream with annalization, i.e. dredging, about or minula; stream with annalization, i.e. dredging, move present, but ceeds the stream babit stream with annalization is not present. Unit ceeds the stream babit stream with annalization is not present. Unit ceeds the stream babit stream with annalization is not present. Unit ceeds the stream babit stream with annalization is not present. Unit ceeds the stream babit stream babits stream babitstream	Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	18						
Cocurrence of riffles relatively frequent; ratio of distance between riffles divided by the width of the stream is between 71 to 15. Occurrence of riffles infrequent; ratio of distance between riffles divided by the width of the stream is between 71 to 15. Occurrence of riffles infrequent; ratio of distance between riffles divided by the width of the stream is between 71 to 15. Occurrence of riffles infrequent; ratio of 225. Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is between 7 to 15. Score 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 11 Bank Stability (score each bank) Banks stable; evidence of or minima; little potental for thrue problems. exists of bask in reach has areas of oresion. Moderately stable; observed by native reach has areas. Unstable; many croded areas; obvious bank sloughing; 60 100% of bank in reach has areas of oresion. Unstable; many croded areas; obvious bank sloughing; 60 100% of bank in reach has areas of oresion. Score Left Bank 10 9 8 7 6 5 4 3 2 1 0 1 9. Vegetation Protection (score each bank), Note: Determine left or indight stoked to grow natural). More than own of worthe areas of oresion potential disciption robiolis; patches or bask indight; or power of the ore than on-half or the potential for any great edent, potential or any great edent, potential to any great edent, potential to any great ede		absent or minimal; stream width normal pattern.	usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and	cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed							
7. Frequency of Riffles frequent; ratio of distance between riffles divided by with of the stream exit (generally) by variety of halital is key. In stream where riffles are obstruction is important. Occarrence of riffles infrequent; bitween riffle sidvided by the width of the stream is between riffle sidvided by the width of the stream is a ratio of >25. Generally all flat water or shallow riffles; por habitat; distance between riffles divided by the width of the stream is between riffle sidvided 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 1 8. Bank Stability (score each bank) Banks stable; widence of or minimal; title potential for future problem. <sk bank<br="" of="">affected. Moderately ustable; infrequent, future problem. <sk bank<br="" of="">reach has areas of erosion. Moderately ustable; 30-60% of bank reach has areas of erosion. Unstable; many eroded areas; raw' areas frequent along straight sclobar and bands; obvious bank sloughing; 60 10% of bank has erosional screas. Score Left Bank 10 9 8 7 6 5 4 3 2 1 0 1 9. Vegetation Protection (score each bank) Note: betermine left or inght side by facing downstream. More than 60% of the streambank surfaces and or erost an ore-hid of the potential potential or not evident. 50-0% of the streambank surfaces covered by native vegetation, the ore notices or instable height 10 9</sk></sk>	Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	<u>1</u> 6						
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; title potential for fuure problems. <5% of bank in affected. Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion. Moderately unstable; 30-00% of bank reach has areas of erosion; high erosion potential during floods. Unstable; many eroded areas; "raw" areas frequent along straight sections and bonds; obvious bank soughing; 60- 100% of bank has erosional scars. Score Left Bank 10 9 8 7 6 5 4 3 2 0 1 9. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream. More than 90% of the streambank surfaces and including trees, understop; shrubs, or nor-woody macrophyte; vegetation disruption obvious; patches of brees oil or closely cropped mowing minimal or not evident; atmost al plants allowed grow naturally. 70-90% of the streambank surfaces covered by native vegetation cerved by native vegetation cerved by native remaining. 50-70% of the streambank surfaces covered by native vegetation cerved by native vegetation cerved by analy streambank surfaces and mowing minimal or not evident; atmost al plants allowed grow naturally. 50-70% of the streambank surfaces covered by native vegetation cerved by analy streambank surfaces covered by streambank surfaces covered by		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	distance between riffles divided by the width of the stream is	bottom contours provide some habitat; distances between riffles divided by the width of the	shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a							
8. Bank Stability (score each bank) Woderately stable; infrequent, mimmal; ittle potential for future problems. <5% of bank affected. Moderately stable; infrequent, mall 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. "raw" areas frequent along straight sections and bends; 00% of bank has erosional scars. Score Left Bank 10 9 8 7 6 5 4 3 2 0 1 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 overed by native vegetation, including trees, understory shubs, rone-word by disruption hrough grazing or mowing minimal or not evident; atmost all plants subble height. 70-90% of the streambank surfaces covered by native vegetation put on echait of the potential to any great extent; more than one-half of the potential plant stubble height remaining. Vidth of riparian zone < 6	Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	18						
Score Right Bank10987654321019. 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 overed 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 obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant and subble height remaining.Less than 50% 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 subble height remaining.Score Left Bank109876543210110. Riparian Vegetative Zone Width of riparian zoneWidth of riparian zone 12-18 impacted zone.Width of riparian zone 12-18 meters; human activities have impacted zone only minimaly.Width of riparian zone 6-12 meters; human activities have impacted zone only minimaly.Width of riparian zone 6-12 meters; human activities have impacted zone only minimaly.Score Left Bank10987654320110. Riparian cone, law this, lawms, or crops have not impacted zone.10987 </td <td>-</td> <td>erosion or bank failure absent or minimal; little potential for future problems. <5% of bank</td> <td>small areas of erosion mostly healed over. 5-30% of bank in</td> <td>bank reach has areas of erosion; high erosion potential</td> <td>"raw" areas frequent along straight sections and bends; obvious bank sloughing; 60- 100% of bank has erosional</td> <td></td>	-	erosion or bank failure absent or minimal; little potential for future problems. <5% of bank	small areas of erosion mostly healed over. 5-30% of bank in	bank reach has areas of erosion; high erosion potential	"raw" areas frequent along straight sections and bends; obvious bank sloughing; 60- 100% of bank has erosional							
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 zone70-90% of the streambank surfaces covered by naive 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 height50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than stubble height remaining.Less than 50% of the streambank surfaces covered by vegetation; disruption of disruption obvious; patches of bare soil or closely cropped vegetation common; less than stubble height remaining.Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than stubble heightLess than 50% of the streambank surfaces covered by regetation; disruption of streambank surfaces or removed to 5 centimeters or less in average stubble height.Score Left Bank10987654321110. Riparian Vegetative Zone Width of riparian zoneWidth of riparian zone >18 meters; hurma activities fave impacted zone.Width of riparian zone 12-18 meters; hurma activities have impacted zone.Width of riparian zone 6-12 meters; hurma activities have impacted zone only minimally.Score Left Bank1098765432101 </td <td>Score Left Bank</td> <td>10 9</td> <td></td> <td>5 4 3</td> <td>2 1 0</td> <td>10</td>	Score Left Bank	10 9		5 4 3	2 1 0	10						
9. Vegetation Protection (score each bank) Note: Determine left or ight side by facing downstream.streambank surfaces and immediate riparian zone overed 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.27-90% 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 obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.Score Left Bank10987654320110. Riparian Vegetative Zone Width (score each bank riparian zone)Width of riparian zone >18 meters; human activities have 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 only minimally.Width of riparian zone 6-12 meters; human activities have impacted zone only minimally.Width of riparian zone 6-12 meters; human activities have impacted zone only minimally.Score Left Bank1098	Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10						
Score Right Bank10 98 7 65 4 32 1 0110. Riparian Vegetative 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; luttle or no riparian vegetation due to human activities.Score Left Bank10 98 7 65 4 32 1 01	Protection (score each bank) Note: Determine left or right side by facing	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	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	surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant	streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or							
10. Riparian Vegetative 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 1						10						
Vegetative Zone Width (score each pank riparian zone) meters; human activities (i.e. parking lots, roadbeds, clear- cuts, lawns, or crops) have not impacted zone. Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. Width of riparian zone 6-12 meters; human activities have impacted zone a great deal. Width of riparian zone <6 meters; little or no riparian vegetation due to human activities. Score Left Bank 10 9 8 7 6 5 4 3 2 10 1	Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10						
	Vegetative Zone Width (score each	meters; human activities (i.e. parking lots, roadbeds, clear- cuts, lawns, or crops) have not	meters; human activities have	meters; human activities have	meters; little or no riparian vegetation due to human							
	Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10						
		10 9				9						

	WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET									
Job Name/#	Glade - 20030	Sample subsorted by:	ABR							
Station ID:	Reach 1-F	Date Subsorted:	9/24/12							
Stream Name:	The Glade	# of Grids subsorted	6	Studics and Solutions, Inc.						
Date Sampled:	4/13/12	Total # of subsorted insects:	100	Total # identified: 100						
Sampling Method:	Multihabitat	Sample Identified by:	ABR	Date Identified: 9/24/12						

Taxa Collected:

Porifera	Spongillidae		1
Ostracoda	Unknown	5	1
Flatworms	Tricladida		1
	Planariidae		1
Gastropoda	Unknown		1
Limpets	Ancylidae		1
Snails	Immature		1
	Lymnaeidae		Zygoptera
	Physidae	1	
	Planorbidae		1
	Hydrobiidae		1
	Pleuroceridae		
	Viviparidae		Anisopteera
Bivalvia	Immature		
	Corbiculidae		1
	Sphaeriidae		1
	Unionidae		1
Oligochaeta	Unknown	28	1
Lumbriculida			1
	Lumbriculidae		1
Tubificida		<u> </u>	1
	Enchytraeidae		Plecoptera
	Naididae	8	riocoptora
	Tubificidae	8	1
Haplotaxida			
hapiotaxida	Haplotaxidae		
Leeches	Hirudinea		
20001100	Erpobdellidae		
	Glossiphoniidae		
	Hirudinidae		
	Pisciolidae		
Branchiobdellida			Hemiptera
Copepoda	Unknown	5	Hemiptera
Decapoda	Cambaridae	5	
Decapoda	Portunidae		
Shrimp	Tortunidae		
ommp	Palaemonidae		
Isopoda	1 didemoniude		
Isopoua	Asellidae		
Amphipoda	Asemuae	19	
Апрпроца	Crangonyatidaa	19	
	Crangonyctidae Gammaridae		
	Talitridae		
Water Mites	Tailuiuae		
Water Miles	Hydracarina	1	Nourontero
Ephemeroptera	Early Instar and/or damaged	'	Neuroptera
Ephometoptera	Acanthometropodidae		Megaloptera
	Ameletidae		wegaloptera
	Baetidae		
	Baetiscidae		Trichentere
	Behningiidae		Trichoptera
	Caenidae		
	Ephemerellidae Ephemeridae		
	Ephemeridae		
	Heptageniidae Isonychiidae		
TOTAL:	Leptophlebiidae	75	TOTAL
TOTAL:		75	TOTAL:

Neoephemeridae	 	4	Leptoceridae	
Oligoneuridae			Limnephilidae	
Psuedironidae			Molannidae	
Polymitarcyidae			Odontoceridae	
Potamanthidae			Philopotamidae	
Siphlonuridae		1	Phryganeidae	
Tricorythidae			Polycentropodidae	
Early Instar and/or damaged			Psychomyiidae	
Calopterygidae			Ryacophilidae	
Coenagrionidae			Sericostomatidae	
Lestidae			Uenoidae	
Protoneuridae		Lepidoptera	Early Instar and/or damaged	
Early Instar and/or damaged		1	Pyralidae	
Aeshnidae		Coleoptera	Early Instar and/or damaged	
Cordulegastridae			Chrysomelidae	
Corduliidae			Curculionidae	
Gomphidae			Dryopidae	
Libellulidae			Dytiscidae	
Macromiidae			Elmidae	
Petaluridae			Gyrinidae	
Cordullidae/Libelluidae			Haliplidae	
Early Instar and/or damaged]	Helodidae	
Capniidae		1	Helophoridae	
Chloroperlidae		1	Hydraenidae	
Leuctridae			Hydrochidae	
Nemouridae			Hydrophilidae	
Peltoperlidae			Limnichidae	
Perlidae			Noteridae	
Perlodidae			Psephenidae	
Pteronarcyidae			Ptilodactylidae	
Taeniopeterygidae			Scirtidae	
Early Instar and/or damaged		Diptera	Early Instar and/or damaged	
Belostomatidae			Athericidae	
Corixidae			Blephariceridae	
Gelastocoridae			Canaceidae	
Gerridae			Ceratopogonidae	
lebridae			Choaboridae	
lydrometridae			Chironomidae	25
Vlesoveliidae			Culicidae	
Naucoridae			Dixidae	
Nepidae			Dolichopodidae	
Notonectidae			Epididae	
/eliidae			Ephydridae	
Pleidae			Muscidae	
			Nymphomyiidae	
Sisyridae			Pelecorhynchidae	
			Psychodidae	
Corydalidae			Ptychopteridae	
Sialidae			Sciomyzidae	
Early Instar and/or damaged			Simuliidae	
Branchycentridae			Stratiomyidae	
Calamoceratidae			Syrphidae	
Glossosomatidae			Tabanidae	
Goeridae			Tanyderidae	
leliicopsychidae			Thaumaleidae	
lydropsychidae			Tipulidae	
lydroptilida		TOTAL:		25

DTAL:



	Dent	hie Mee	rainvartekast	e end	Linkitet Pt. I		
			roinvertebrat	e and		d Data Sheet	
Station ID: Reach 1	÷	Ecoregion:	Piedmont		Land Use: Ur	rban	
Field Team: ABR/MN	1	Survey Reas	on: YR 3 Biomonitoring	5	Start time:		
Stream Name. Glade		Location.	Reston, Virginia		Finish time:		
Date: 4/13/20	12	Latitude:	38°55'36"		Longitude -7	7°22'03"	
Stream Physiocher	nical Measuremer	nts					
Instrument ID number:	N	I/A	pH:		N/A		
Temperature:	N/A	°C	Con	ductivity:	N/A uS	i/cm	
Dissolved Oxygen:	N/A	mg/L		Did ins	strument pass all pos	st-calibration checks?	N/A
		•				ailed and action taken:	N/A
Benthic Macroinve	rtebrate Collectio	n			,	-	
Method Used:	Sir	ngle Habitat (I	Riffle):		Multi Habit	at (Logs, Plants, etc.):	
Riffle Quality:	Good	х	Marginal		– Poor	None	
Habitats Sampled:	Riffle		Snags		Sediment:	Vegetation	
	# Jabs						
Weather Observati	ions						
Current Weather:	Cloudy		Clear	х	Rain/Snow	Foggy	
Recent Precipitation:	Clear	Х	Showers		Rain		
Stream Flow:	Low		Normal	х	Above Normal	Flood	
Biological Observat	tions						
Periphyton	0		Salamanders		0	Other	
Filamentous Algae	1		Warmwater Fish		0	0= Not observed	
Submerged Macrophyte	s 0		Coldwater Fish		0	1= Sparse	
Emergent Macrophytes	0		Beavers		0	2= Common to A	Abundant
Crayfish	0		Muskrats		0	3= Dominant-	
Corbicula	0		Ducks/Geese		0		h density where other taxa
unionidae	0		Snakes		0		in relation to the dominant
Operculate Snails	0		Turtles		0		be situations where multiple
Non-operculate Snails	0		Frogs/Tadpoles		2	taxa are domina	nt such as algae and snails
Notes			0				

Habitat Parameter	and the second second second	Con	dition Category		
<u>Inabitat i arameter</u>	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).	potential; adequate habitat for maintainance of populations; presence of additional substrate in the form of newfall, but not	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	543210	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	543210	18
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	543210	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	543210	16

Studies and Solutions, Inc.

and the second second	Statistic Construction and Construction and	Con	dition Category	and the state of the second	The second second			
Habitat Parameter	Optimal Suboptimal Marginal Poor							
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the 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			
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	20			
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	543210	16			
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	543210	20			
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	10			
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10			
10. Riparian Vegetative Zone Width (score each vank 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	8			
		8 7 6		······································	~			



Section of the	- shade is	Benth	ic Macr	oinvertebrat	te and	Habitat F	ield Data	Sheet	English I a	4520.87
Station ID:	Reach 2-A		Ecoregion	Piedmont		Land Use:	Urban			
Field Team:	ABR/MN		Survey Reaso	n. YR 3 Biomonitoring	g	Start time:				
Stream Name:	Glade		Location	Glade		Finish time:				
Date:	4/13/2012		Latitude:	38°55'29"		Longitude	-77°21'12"			
Stream Phy	siochemical	Measuremen	ts							
Instrument ID	number:	N/	A	рН	:	N/A				
Temperature:		N/A	°C	_	nductivity:	N/A	uS/cm			
Dissolved Oxyg	en:	N/A	mg/L			trument pass all	- 1	n checks?	N/A	
						hich parameter(_	N/A	
Benthic Ma	croinvertebr	ate Collection				,	-,	-	ЩА	
Method Used:		Sing	gle Habitat (R	iffle)		Multi H	abitat (Logs, Pl	ants, etc.)		
Riffle Quality:		Good	х	Marginal		– Poor		None		
Habitats Sampl	ed:	Riffle		Snags		- Sediment		Vegetation		
	# Ja	abs:				-				
Weather Ob	servations	-				-				
Current Weath	er	Cloudy		Clear	х	Rain/Snow		Foggy		
Recent Precipit	ation	Clear	Х	Showers		- Rain		Storms		
Stream Flow		Low	х	Normal		Above Normal		– Flood		
Biological O	bservations					-				
Periphyton		2		Salamanders		0		Other		
Filamentous Al	gae	2		Warmwater Fish		0	-	0= Not observed		
Submerged Ma	crophyt es	0		Coldwater Fish		0	-	1= Sparse		
Emergent Macr	ophytes	1		Beavers		0	-	2= Common to A	bundant	
Crayfish		0		Muskrats		0	-	3= Dominant-		
Corbicula	orbicula 0 Du		Ducks/Geese	Ducks/Geese		0 abnormally high o		density where	other taxa	
unionidae 0			Snakes		0	are insignificant in relation				
Operculate Sna	ils -	0		Turtles		0 taxa. There can be situation				
Non-operculate	Snails	0		Frogs/Tadpoles		taxa are dominant such as algae an			and snails	
Notes										

Habitat Parameter	Condition Category						
Trabitat T arameter	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	543210	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	543210	16		
Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow- shallow, fast-deep, fast shallow)(slow is <0.3m/s, deep is >0.5 m).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow- shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).			
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	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	543210	13		



downstream.mowing minimal or not evident; almost all plants allowed to grow naturally.mode that other hall of the remaining.stubble height remaining.less in average stubble height.Score Left Bank10 98 7 65 4 32 1 010Score Right Bank10 98 7 65 4 32 1 01010. Riparian Vegetative Zone Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clear- cuts, lawns, or crops) have notWidth 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 only minimally.Width of riparian zone 6-12 meters; human activities have impacted zone only minimally.Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of riparian zone clear meters; human activities have impacted zone a great deal.Width of human						COLOR LOL				
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5. Channel Flow status Inverteants, and nammal exposed. Water files 2/5% of them substatus is exposed. Water files 2/5% of the substatus is exposed. Water files 2/5% of the substatus is exposed. Value files 2/5% of the substatus is		Optimal	Suboptimal	Marginal	Poor	Score				
status amount of channel substrates is concerned substrate are monitory researt as standing sources are sponded. available channel, and/or offits sources are sponded. 20 Score 20 19 18 17 6 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 16 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 16 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 16 14 13 12 10 9 8 7 6 5 4 3 2 1 0 16 14 13 12 10 9 8 7 5 4 3 2 1 0 16 14 13 12 10 9 8 7 6 5 4 3 2 1 10 16 16 14 13 </td <td>5. Channel Flow</td> <td></td> <td>Water fills >75% of the availible</td> <td>Water fills 25-75% of the</td> <td>Very little water in channel and</td> <td></td>	5. Channel Flow		Water fills >75% of the availible	Water fills 25-75% of the	Very little water in channel and					
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Alteration absert or mininal, stream width normal pattern. absert of mininal, stream width norm	6. Channel	Channelization or dredging			cement; over 80% of the					
Normal patient: may be present, but recent channelization is not present. steam reach channelization disrupted. greatly altered or removed entrely. Score 20 19 18 17 16 16 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 16 7. Frequency of Riffles Occurrence of riffes relatively requent, ratio of distance obtivemen riffles divided by the width of the stream is streams where riffles are contraince, placement to budkers or other large, natural obtactions in placement streams shately; evidence of erosion or bank failure absent of stare problem riffles divided problem by the width of the stream is affected. Occurance of riffles infrequent, ratio of >25. 6 5 4 3 2 1 0 19 8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent stream banks, stable; evidence of erosion or bank failure absent riminal; tille potence stable; distreams or reach has areas of erosion. Score Left 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. 10 9 8 7 6 5 4 3 2 1 0 10 10. Riparian and rate allow of the streambank surfaces on- teat hank is allow of the streambank surfaces on- teat hank is allow of the streambank surfaces on- send in the or each rimedial priamize as of romedial fing rest, understory atteation control to the streambank surfaces on- teat hank is reambank surfaces on- teat hank is reambank surfaces on- read hank is reambank surfaces on- read hank is allowed to control rimeding rest, unders										
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Cocurrence of rifles relatively frequent; ratio of distance between rifles divided by width of the stream x-71 (generally 5) the stream x-71 (generally 5) or name rifles interquent; or name rifles interquent; interquent interquent; future problems, c% of bark affected. Occasional rifle or bend; by the width of the stream is a statio of >25. 8. Bank Stability (score each bank) Barks stable; endemo of ture problems, c% of bark affected. 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 19 9. Vegetation Protection (score each bank) Note: Determine lift or ight side by facing downstream. More than 90% of the streambark surfaces and and right and or advents; in row tances covered by native or than on-half of the potential part subble height remaining. 50-70% of the streambark surfaces covered by native or station or closely covered by native or potential during floco. So 70% of the streambark surfaces covered by native or station or closely covered by native or or now-voot marks in a station station parts and bends; indication parts and bends; indics or or now-voot marks in parts and bends; indication p			channelization is not present.	disrupted.	entirely.					
T. Frequency of Riffles Frequent, ratio of defance by the stream scale (generally) of the stream scale (generally) obstruction is important. Occurrence of riffles interquent, between 716 15. Occursional riffle or bend, bottom concluse provide some attrants dutaticat dutances between titles divided by the width of the stream between 17 to 15. Generally all fit water or shallow riffles; poor habitat; distance between titles divided by the width of the stream between 15 to 25. Generally all fit water or shallow riffles; poor habitat; distance between titles 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 Barks stabil; weidence of orosion rbark failure absent future problems, of the stream bark is evidence of three orbinal still be distance absent future problems, 	Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	16				
7. Frequency of Riffies between riffes divided by wethin 07; variety of habitat is key, 107; variety of habitat is key, 108; variety of habitat 109; variety of habitat is key, 108; variety of habitat 109; variety of habitat 109; variety of habitat 109; variety of habitat 100; variety of habitata										
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8. Bank Stability (score each bank) Banks stable: evidence of erosion or bank failure absent or minimal; ittle potential for future problems. <5% of bank affected. Moderately stable: infrequent, small 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 kisoughing; 60- 100% of bank has erosional scars. Score Left Bank 10 9 8 7 6 5 4 3 2 10 9. Vegetation Protection (score each bank) Note: Determine left or including trees, understory shubs, or non-woody macrophyte; vegetation, disruption through grazing downstream. 70-90% of the streambank streambank surfaces and immediate riparian zone covered by native egetation, disruption through grazing mowing minimal or not evident almost all plants allowed to grow naturally. 70-90% of the streambank streambank surfaces covered by netweetation, but one classe or obselv cropped vegetation common; less than one-half of the potential plant subble height remaining. 50-70% of the streambank surfaces covered by native estimation common; less than one-half of the potential plant subble height remaining. Less than 50% of the streambank surfaces covered by vegetation disruption through grazing mowing minimal or not evident almost all plants allowed to grow naturally. 50-70% of the streambank surfaces covered by native estimation common; less than one-half of the potential plant subble height remaining. 50-70% of the streambank surfaces covered by vegetation of treambank surfaces covered by vegetation disc be entimeters or less in	Score		15 14 13 12 11	10 0 9 7 6	542210	40				
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Or Datin Glashing or minimal; little potential for future problems. <5% of bank affected. or minimal; little potential for future problems. <5% of bank affected. bank reach has areas of erosion; high ression potential during floods. straight sections and bends; erosin; high ression potential during floods. straight sections and bends; bank reach has areas of erosin; high ression potential during floods. straight sections and bends; erosin; high ression potential during floods. Score Left Bank 10 9 8 7 6 5 4 3 2 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, understoy shuds, 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 vegetation, disruption of disruption orbids; patches of bare soil or closely croppet vegetation common; less than non-half of the potential plant stubble height remaining. 50-70% of the streambank surfaces covered by vegetation; disruption orbids; patches of bare soil or closely croppet vegetation common; less than stubble height remaining. Score Left Bank 10 9 8 7 6 5 4 3 2 10 Score Right Bank 10 9 8 7 6 5 <td>8 Bank Stability</td> <td></td> <td></td> <td></td> <td></td> <td></td>	8 Bank Stability									
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Score Left Bank10987654321010Score Right Bank109876543210109. Vegetation Protection (score each bank) Note: Determine left or right side by facing downstream.More than 90% of the streambank surfaces and including trees, understory shrubs, or non-woody macrophytes; vegetation disruption without prazing 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, ore than one-half of the potential plant stubble height remaining.50-70% of the streambank surfaces covered by vegetation; disruption evident; remaining.Less than 50% of the streambank surfaces overed by vegetation; disruption obvious; patches of bars soil or closely cropped to rethan one-half of the potential plant stubble height remaining.50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bars soil or closely cropped removed to 5 centimeters or less in average stubble height.Score Left Bank109876543201010. Riparian pank riparian zone bank riparian zoneWidth of riparian zone >18 meters; human activities flaw impacted zone only minimally.Width of riparian zone 6-12 meters; human activities have impacted zone only minimally.Width of riparian zone 6-12 meters; human activities have impacted zone only minimally.Width of riparian zone 6-12 meters; human activities have impacte	(oreno odom banny		reach has areas of erosion.		100% of bank has erosional					
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Score Right Bank 10 9 8 7 6 5 4 3 2 1 0 8	ank riparian zone)	impacted zone.			acuvi(les,					
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	Score Right Bank	10 9	8 7 6	5 4 3	2 1 0					

Wetland Studies and Solutions, Inc.

	1.	Bent	hic Macr	oinvertebr	ate and	Habitat F	ield Data Sheet
Station ID:	Reach 3-A		Ecoregion:	Piedmont		Land Use:	Urban
Field Team:	ABR/MN		Survey Reaso	n: YR 3 Biomonitor	ing	Start time:	
Stream Name:	Glade		Location:	Glade		Finish time:	
Date:	4/13/2012		Latitude:	38°55'42"		Longitude	-77°21'48"
Stream Phys	iochemical	Measuremer	nts				
Instrument ID n	umber:	N,	/A		pH:	N/A	
Temperature:		N/A	°C	(Conductivity:	N/A	uS/cm
Dissolved Oxyge	en:	N/A	mg/L		Did inst	rument pass all	Il post-calibration checks? N/A
							r(s) failed and action taken: N/A
Benthic Mac	roinvertebr	ate Collectio	n				
Method Used:		Sin	gle Habitat (Ri	iffle)		Multi H	Habitat (Logs, Plants, etc.) X
Riffle Quality:		Good	Х	Marginal		Poor	or None
Habitats Sample	d:	Riffle	Х	Snags	Х	- Sediment	nt Vegetation X
	#J	abs:	16		1	-	
Weather Ob	servations						
Current Weathe	r	Cloudy		Clear	Х	Rain/Snow	wFoggy
Recent Precipita	tion	Clear	Х	Showers		Rain	
Stream Flow		Low	Х	Normal		Above Normal	al Flood
Biological Ob	servations						
Periphyton		2		Salamanders		0	Other Iron Oxidizing Bacteria=1
Filamentous Alga	ае	1		Warmwater Fish		1	0= Not observed
Submerged Mac	rophytes	0		Coldwater Fish		0	 1= Sparse
Emergent Macro	phytes	0		Beavers		0	= 2= Common to Abundant
Crayfish		0		Muskrats		0	3= Dominant-
Corbicula		0		Ducks/Geese		0	abnormally high density where other taxa
unionidae 0		- Snakes			0	are insignificant in relation to the dominant	
Operculate Snail	s	0		Turtles		0	taxa. There can be situations where multiple
Non-operculate	Snails	0		Frogs/Tadpoles		3	taxa are dominant such as algae and snails
Notos							

Habitat Parameter	Condition Category								
Tiabitat Farameter	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	543210	17				
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	543210	18				
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	543210	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	543210	19				

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and the protocol of the service of the	In the same of the second second second	C	dition Cotononi					
Habitat Parameter	Condition Category Optimal Suboptimal Marginal Poor							
5. Channel Flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the availible channel; or <25% of channel substrate is exposed.		Very little water in channel and mostly present as standing pools.	Score			
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	543210	18			
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	543210	16			
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	543210	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 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	10			
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10			
10. Riparian Vegetative Zone Width (score each eank 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			180			

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET								
Job Name/#	Glade - 20030	Sample subsorted by:	ABR					
Station ID:	Reach 3-A	Date Subsorted:	9/25/12					
Stream Name:	The Glade	# of Grids subsorted	4	sures and Solutions, in				
Date Sampled:	4/13/12	Total # of subsorted insects:	103	Total # identified:	103			
Sampling Method:	Multihabitat	Sample Identified by:	ABR	Date Identified.	9/25/12			

Taxa Collected:

Taxa Collect				Metretopodidae		1	Lepidostomatidae	
Porifera	Spongillidae	1	1	Neoephemeridae	<u> </u>	1	Leptoceridae	
Ostracoda	Unknown	30	1	Oligoneuridae		1	Limnephilidae	
Flatworms	Tricladida		1	Psuedironidae		1	Molannidae	
	Planariidae		1	Polymitarcyidae		1	Odontoceridae	
Gastropoda	Unknown		1	Potamanthidae		1		
Limpets	Ancylidae		1	Siphlonuridae		1	Philopotamidae	
Snails	Immature	<u> </u>	4	Tricorythidae			Phryganeidae	
Shans						1	Polycentropodidae	
	Lymnaeidae		Zygoptera	Early Instar and/or damaged		1	Psychomyiidae	
	Physidae	1	-	Calopterygidae			Ryacophilidae	
	Planorbidae	ļ	4	Coenagrionidae			Sericostomatidae	
	Hydrobiidae		4	Lestidae			Uenoidae	
	Pleuroceridae		4	Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged			Pyralidae	
Bivalvia	Immature			Aeshnidae		Coleoptera	Early Instar and/or damaged	
	Corbiculidae]	Cordulegastridae			Chrysomelidae	
	Sphaeriidae			Corduliidae			Curculionidae	
	Unionidae		r	Gomphidae			Dryopidae	
Oligochaeta	Unknown	41]	Libellulidae			Dytiscidae	
Lumbriculida			1	Macromiidae			Elmidae	
	Lumbriculidae		1	Petaluridae			Gyrinidae	
Tubificida			1	Cordullidae/Libelluidae			Haliplidae	
	Enchytraeidae		Plecoptera	Early Instar and/or damaged			Helodidae	
	Naididae	4	1	Capniidae			Helophoridae	
	Tubificidae	8	1	Chloroperlidae			Hydraenidae	
Haplotaxida		<u> </u>	1	Leuctridae				
aprotavida	Haplotaxidae		1	Nemouridae			Hydrochidae	
Leeches	Hirudinea		1	Peltoperlidae			Hydrophilidae	
20001103	Erpobdellidae		4				Limnichidae	
	Glossiphoniidae		4	Perlidae			Noteridae	
			1	Perlodidae			Psephenidae	
	Hirudinidae		1	Pteronarcyidae			Ptilodactylidae	
	Pisciolidae			Taeniopeterygidae			Scirtidae	
	Branchiobdellidae		Hemiptera	Early Instar and/or damaged		Diptera	Early Instar and/or damaged	
Copepoda	Unknown			Belostomatidae			Athericidae	
Decapoda	Cambaridae		1	Corixidae			Blephariceridae	
	Portunidae			Gelastocoridae			Canaceidae	
Shrimp				Gerridae			Ceratopogonidae	
	Palaemonidae			Hebridae			Choaboridae	
sopoda				Hydrometridae			Chironomidae	19
	Asellidae			Mesoveliidae			Culicidae	
Amphipoda				Naucoridae			Dixidae	
	Crangonyctidae			Nepidae			Dolichopodidae	
	Gammaridae			Notonectidae			Epididae	
	Talitridae			Veliidae			Ephydridae	
Water Mites				Pleidae			Muscidae	
	Hydracarina		Neuroptera				Nymphomyiidae	
Ephemeroptera	Early Instar and/or damaged			Sisyridae			Pelecorhynchidae	
	Acanthometropodidae		Megaloptera				Psychodidae	
	Ameletidae			Corydalidae			Ptychopteridae	
	Baetidae			Sialidae			Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged			Simuliidae	
	Behningiidae			Branchycentridae				
	Caenidae			Calamoceratidae	——————————————————————————————————————		Stratiomyidae	
I							Syrphidae	
	Ephemerellidae			Glossosomatidae			Tabanidae	
	Ephemeridae			Goeridae			Tanyderidae	
	Heptageniidae			Heliicopsychidae			Thaumaleidae	
	Isonychiidae			Hydropsychidae			Tipulidae	
	Leptophlebiidae			Hydroptilida				19
TOTAL:		84	TOTAL:		0	TOTAL:		