

# MEMORANDUM

TO:

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 2013 (Year 4)

WSSI #20030, Task M2

DATE:

August 5, 2013

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 4B<sup>1</sup>. However, monitoring was undertaken voluntarily in Year 4 (2013)<sup>2</sup> 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 Mark Navarro, WPIT and Michael Kopansky on March 27 and March 28, 2013. Benthic macroinvertebrate habitat field data sheets and benthic macroinvertebrate bench sheets for each reach are enclosed within<sup>3</sup>.

Habitat results for Year 4 (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 2013 is 177 (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 2013 increased only slightly from the average for 2012 (176) because although most reaches exhibited improved habitat scores, biomonitoring Reach 2-A exhibited additional sediment deposition and little heterogeneity in habitat type.

The results of our data analysis indicate that the benthic macroinvertebrate community at the five sampleable biomonitoring reaches were in "Severe Stress" in 2013, based on their Stream Condition Index for Virginia Non-coastal Streams (VA-SCI)<sup>4</sup> scores (<u>Table 2</u>, <u>Figure 2</u>). The average VA-SCI numerical score for all biomonitoring reaches assessed in 2013 is 27.27 ("Severe Stress"). Note that while all the biomonitoring reaches still remain in "Severe Stress",

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.

Voluntary biomonitoring was conducted in Year 2 (2011) and Year 3 (2012), as described in previous memos.

Note that the benthic macroinvertebrate bench sheets for biomonitoring reach 1-G is not included since this reach was not sampled due to lack of flowing water.

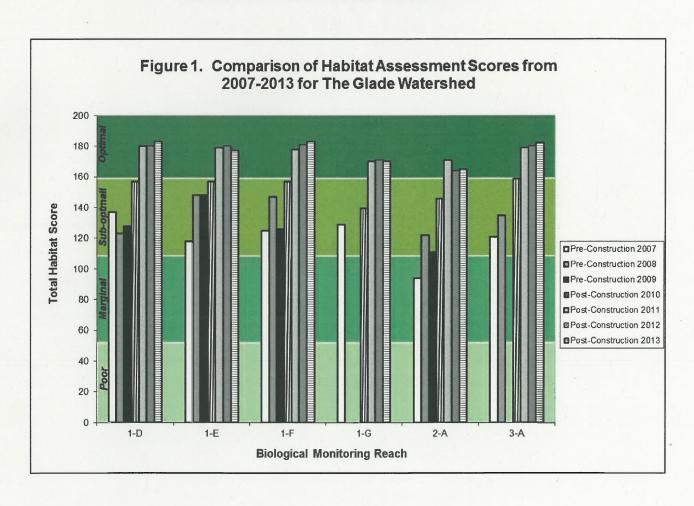
The VA-SCI is a multi-metric Index of Biotic Integrity developed for the Department of Environmental Quality to assess Streams of the Commonwealth.

on average, the VA-SCI scores increased when compared to the average pre-construction VA-SCI score of 23.74 ("Severe Stress").

In conclusion, the results of the 2013 supplemental monitoring indicate that there has been a continued improvement of habitat scores and a slight improvement of the benthic community composition in the 2013 sampled reaches as compared to the pre-construction benthic community composition.

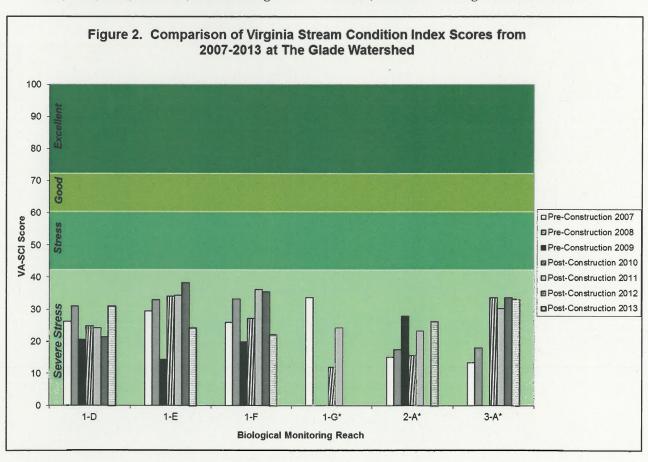
## Enclosures

BIOMONITORING REACH	Total Habitat	Narrative Rating
1-D	183	Optimal
1-E	177	Optimal
1-F	183	Optimal
1-G	170	Optimal
2-A	165	Optimal
3-A	182	Optimal
Average	177	Optimal



WEIGHTED METRIC	***	BIOLO	GICAL MOI	NITORING	REACH	
WEIGHTED METRIC	1-D	1-E	1-F	1-G	2-A	3-A
Total Taxa	27.27	27.27	18.18	N/A	31.82	22.73
EPT Taxa	0.00	9.09	0.00	N/A	9.09	0.00
Percent Ephemeroptera	0.00	0.00	0.00	N/A	0.00	0.00
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	0.00	0.00	N/A	0.00	0.00
Percent Scrapers	4.46	0.00	0.00	N/A	2.20	0.00
Percent Chironomidae	80.46	48.00	50.54	N/A	54.55	99.03
Percent Top Two Dominant	16.61	13.49	7.77	N/A	11.50	4.21
HBI	118.49	95.49	99.62	N/A	99.26	139.63
VA-SCI Numerical Score	30.91	24.17	22.01	N/A	26.05	33.20
VA-SCI Narrative Score	Severe Stress	Severe Stress	Severe Stress	N/A	Severe Stress	Severe
Average VA-SCI Numerical Score	27.27					
Average VA-SCI Narrative Score	Severe Stress					

<sup>\*</sup>Note that the following biomonitoring reaches were not sampled due to the lack of flowing water: 1-G in 2008, 2009, 2012, and 2013; biomonitoring reach 2-A in 2012; and biomonitoring reach 3-A in 2009.



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	Benthic	Macroiny	ertebrate	and Ha	hitat Fie	ld Data Sh	neet -	High Gradient		
Job # Task	20030	inaoi oni v	Citobiato	ana na	bitat i io	ia Data Oi	1001	riigii Oraaloiii		
Station ID:	Reach 1-D		Ecoregion:	Piedmont		Land Use:	Urban			
Field Team:	MN/MK		Location:	Reston, VA		Start time:				
Site:	The Glade		Latitude:			Finish time:				
Date:	3/27/2013		Longitude:			Survey Reason:	Year 4 Bi	omonitoring		
Stream Phys	siochemical M	easurement	S							
Instru	ıment ID number:		I/A	•	pH:	N/A	_			
	Temperature:	N/A	°C		Conductivity:	N/A	uS/cm			
D	Dissolved Oxygen:	N/A	mg/L			ment pass all pos			_	
Benthic Mad	croinvertebrat	e Collection			If NO- whic	h parameter(s) fa	iled and a	action taken: N/A	_	
Method Used:						Multi F	labitat (Lo	gs, Plants, etc.) X	_	
Riffle Quality:		Good	X			Poor		None		
Habitate Campl	lad.	Difflo	v	Woody	V	Danks		Vogetation V		
Habitats Sample	iea:		X 16	Debris	X	Banks		Vegetation X 3	_	
Weather Ob	nservations	# Jabs:	16	. <u>-</u>	1	•		3	_	
Current Weath		Cloudy		Clear	Х	Rain/Snow		Foggy	_	
Recent Precipit		Clear	X	Showers		·'		Storms	_	
Stream Flow	<del></del>	Low		Normal		Above Normal		Flood		
Biological O	bservations								_	
	Periphyton	1			Salamanders	0	_	Other		
Fi	ilamentous Algae	2		Wa	rmwater Fish	2	-	0= Not observed		
Submerg	ged Macrophytes	1		С	oldwater Fish	0	-	1= Sparse		
Emerg	gent Macrophytes	0			Beavers	0	_	2= Common to Abunda	nt	
	Crayfish	0			Muskrats	0	_	3= Dominant-		
	Corbicula	0			Ducks/Geese	1	_	Abnormally high density	where other	r taxa are
	Unionidae	0			Snakes	0	-	insignificant in relation to		
	Operculate Snails	0			Turtles		_	There can be situations was are dominant such as		•
Non-	-operculate Snails	0		Fr	ogs/Tadpoles	1		are dominant such as	algae alla si	
			Himb Cu	ا عمرة الم	labitat F	Sata Chast				
			High Gr	adient I		ata Sheet				
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Habitat F	Parameter	Greater than 7 favorable f	timal 70% of substrate for epifaunal	Subo 40-70% m habitat; well	Condite ptimal bix of stable suited for full	tion Categor Margin	r <u>y</u> ial	Poor	Sc	core
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1. Epi Substrate Co So 2. Embed Velocit Reg	ifaunal e/ Available over  core ddedness core ty/Depth gime	Greater than 7 favorable 1 colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobble particles are 0-by fine sedime cobble provides \$20 19 All four velocity present (slov shallow, fashallow)(slow is >0.1	timal  70% of substrate for epifaunal and fish cover; mix brinerged logs, and cobble, or other and at stage to alization potential at that are not new but transient).  18 17 16 le, and boulder 25% surrounded ent. Layering of adiversity of niche ace.  18 17 16 y/depth regimes w-deep, slow- st-deep, fast a 0.3m/s, deep is 5 m).  18 17 16	Subo  40-70% m habitat; well colonization adequate mainte populations additional st form of newf prepared for 15 14  Gravel, c boulder par 50% surrou sedi  15 14  Only 3 of th present (if fr missing, soc if missing ot  15 14  Some new in	Conditive ptimal with of stable suited for full on potential; habitat for manure of; presence of ubstrate in the all, but not yet of colonization.  13 12 11 obble, and ticles are 25-unded by fine ment.  13 12 11 one 4 regimes ast-shallow is one lower than ther regimes).	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, second and	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low). 7 6 sistion of d, or fine	Less than 20% stable habitat; lack of habitat obvious; substrate unstable or lacking.  5 4 3 2 1 ( Gravel, cobble, and boulder particles are more than 75% surrounded to fine sediment.  5 4 3 2 1 ( Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 ( Heavy deposits of fine material, increased ba	s s	18
1. Epi Substrate Co 2. Embed Velocit Reg	ifaunal e/ Available over  core ddedness core ty/Depth gime	Greater than 7 favorable for colonization and of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not shallow, fall shallow, fall shallow, fall shallow, fall shallow, fall shallow, fall shallow, fallow,	timal  70% of substrate for epifaunal and fish cover; mix bringed logs, a, cobble, or other and at stage to nization potential at that are not new but transient).  18 17 16 I.e., and boulder 25% surrounded ent. Layering of a diversity of niche ace. 18 17 16  y/depth regimes w-deep, slow- st-deep, fast a 0.3m/s, deep is 5 m).	Subo  40-70% m habitat; well colonization adequate mainte populations additional st form of newf prepared for  15 14  Gravel, c boulder par 50% surrou sedi  15 14  Only 3 of th present (if famissing, sco if missing ot  15 14  Some new in formation,	Conditive ptimal with of stable suited for full on potential; habitat for nance of; presence of ubstrate in the all, but not yet colonization.  13 12 11 obble, and ticles are 25-unded by fine ment.  13 12 11 one 4 regimes ast-shallow is one lower than her regimes).	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, soc	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low). 7 6 sistion of d, or fine and new	Less than 20% stable habitat; lack of habitat obvious; substrate unstable or lacking.  5 4 3 2 1 ( Gravel, cobble, and boulder particles are more than 75% surrounded if fine sediment.  5 4 3 2 1 ( Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 ( Heavy deposits of fine	s s	18
1. Epi Substrate Co So 2. Ember Velocit Reg So 4. Sec	ifaunal e/ Available over  core  ddedness  core  ty/Depth gime	Greater than 7 favorable 1 colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and nc 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides specific present (slow shallow, fashallow) (slow is >0.9 19 Little or no e islands or point the bottom affer	timal  70% of substrate for epifaunal and fish cover; mix bringed logs, a, cobble, or other and at stage to nization potential at that are not new but transient).  18 17 16 lee, and boulder 25% surrounded ent. Layering of a diversity of niche ace. 18 17 16  18 17 16  18 17 16  18 17 16  19 and boulder ace. 18 17 16  19 and ace. 18 37 46  19 and ace. 19	Subo  40-70% rr habitat; well colonization adequate mainte populations additional su form of newf prepared for  15 14  Gravel, c boulder par 50% surrou sedi  15 14  Only 3 of th present (if fa missing, scc if missing, scc if missing, scc if missing, scc sediment; se	Condit ptimal hix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet colonization.  13 12 11 obble, and ticles are 25-inded by fine ment.  13 12 11 in the 4 regimes ast-shallow is ore lower than their regimes).  13 12 11 increase in bar mostly from and, or fine 5-30% of the	20-40% mix of habitat; habitat a less than des substrate free disturbed or re disturbed or re 10 9 8 Gravel, cobbl boulder particle: 75% surrounder sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, sed Moderate deponew gravels, as sediment on old bars; 30-50% bottom affected;	f stable examinability irrable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow ore low).  7 6 sistion of d, or fine and new of the sediment	Less than 20% stable habitat; lack of habitat obvious; substrate unstable or lacking.  5 4 3 2 1 (Gravel, cobble, and boulder particles are mothan 75% surrounded la fine sediment.  5 4 3 2 1 (Gravel, depth regime (usually slow-deep).  5 4 3 2 1 (Gravel, depth regime (usually slow-deep).  5 4 3 2 1 (Gravel).	s s	18
1. Epi Substrate Co So 2. Ember Velocit Reg So 4. Sec	ifaunal e/ Available over  core  ddedness core  ty/Depth gime core	Greater than 7 favorable 1 colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and nc 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides specific present (slow shallow, fashallow) (slow is >0.9 19 Little or no e islands or point the bottom affer	timal  70% of substrate for epifaunal ad fish cover; mix brierged logs, s, cobble, or other and at stage to nization potential that are not new ot transient).  18 17 16 lee, and boulder 25% surrounded ent. Layering of diversity of niche ace. 18 17 16 y/depth regimes w-deep, slow- st-deep, fast c 0.3m/s, deep is 5 m).  18 17 16 enlargement of bars and <5% of	Subo  40-70% m habitat; well colonization adequate mainte populations additional st form of newf prepared for  15 14  Gravel, c boulder par 50% surrout sedi  15 14  Only 3 of th present (if farmissing, soci if missing of  15 14  Some new in formation, gravel, sa sediment; t bottom affi	Conditive ptimal with of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet colonization.  13 12 11 obble, and ticles are 25-independent of the properties of the ptime of t	20-40% mix of habitat; habitat a less than des substrate free disturbed or re disturbed or re 10 9 8 Gravel, cobbl boulder particle: 75% surrounde sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, second particle: 10 9 8 Moderate deponew gravel, san sediment on old bars; 30-50% bottom affected; deposits at obst	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 c. habitat t (if fast-shallow one low).  7 6 c. habitat t (if fast-shallow one low).	Less than 20% stable habitat; lack of habitat obvious; substrate unstable or lacking.  5 4 3 2 1 ( Gravel, cobble, and boulder particles are mothan 75% surrounded the fine sediment.  5 4 3 2 1 ( Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 ( Heavy deposits of fine material, increased badevelopment; more than 50% of the bottom changing frequently; po almost absent due to	s s	18
1. Epi Substrate Co So 2. Ember Velocit Reg So 4. Sec	ifaunal e/ Available over  core  ddedness core  ty/Depth gime core	Greater than 7 favorable 1 colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and nc 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides specific present (slow shallow, fashallow) (slow is >0.9 19 Little or no e islands or point the bottom affer	timal  70% of substrate for epifaunal and fish cover; mix bringed logs, a, cobble, or other and at stage to nization potential at that are not new but transient).  18 17 16  18 17 16  18 17 16  19 diversity of niche ace. 18 17 16  18 17 16  19 diversity of niche ace. 18 17 16  19 diversity of niche ace. 18 17 16  19 diversity of niche ace. 19 diversity of niche ace. 10 diversity of niche ace. 11 diversity of niche ace. 12 diversity of niche ace. 13 17 16  14 17 16  15 anilargement of bars and <5% of cted by sediment	Subo  40-70% m habitat; well colonization adequate mainte populations additional st form of newf prepared for  15 14  Gravel, c boulder par 50% surrout sedi  15 14  Only 3 of th present (if farmissing, soci if missing of  15 14  Some new in formation, gravel, sa sediment; t bottom affi	Condit ptimal hix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet colonization.  13 12 11 obble, and ticles are 25-inded by fine ment.  13 12 11 in the 4 regimes ast-shallow is ore lower than their regimes).  13 12 11 increase in bar mostly from and, or fine 5-30% of the	20-40% mix of habitat; habitat a less than des substrate free disturbed or re disturbed or re 10 9 8 Gravel, cobbl boulder particle: 75% surrounder sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, sed Moderate deponew gravels, as sediment on old bars; 30-50% bottom affected;	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow ore low).  7 6 sition of d, or fine and new of the sediment ructions, and bends; and bends; and bends;	Less than 20% stable habitat; lack of habitat obvious; substrate unstable or lacking.  5 4 3 2 1 (Gravel, cobble, and boulder particles are mothan 75% surrounded la fine sediment.  5 4 3 2 1 (Gravel, depth regime (usually slow-deep).  5 4 3 2 1 (Gravel, depth regime (usually slow-deep).  5 4 3 2 1 (Gravel).	s s	18
1. Epi Substrate Co 2. Ember Velocit Reg 4. Sec Depo	ifaunal e/ Available over  core  ddedness core  ty/Depth gime core	Greater than 7 favorable 1 colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobble particles are 0-by fine sedime cobble provides 20 19 All four velocity present (slovishallow) (slow is >0.3 20 19 Little or no e islands or point the bottom affer deport	timal  70% of substrate for epifaunal and fish cover; mix bringed logs, a, cobble, or other and at stage to nization potential at that are not new but transient).  18 17 16  18 17 16  18 17 16  19 diversity of niche ace. 18 17 16  18 17 16  19 diversity of niche ace. 18 17 16  19 diversity of niche ace. 18 17 16  19 diversity of niche ace. 19 diversity of niche ace. 10 diversity of niche ace. 11 diversity of niche ace. 12 diversity of niche ace. 13 17 16  14 17 16  15 anilargement of bars and <5% of cted by sediment	Subo  40-70% m habitat; well colonization adequate mainte populations additional st form of newf prepared for  15 14  Gravel, c boulder par 50% surrou sedi  15 14  Only 3 of th present (if famissing, soc if missing of  15 14  Some new in formation, gravel, se sediment; s bottom aff deposition	Conditive ptimal with of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet colonization.  13 12 11 obble, and ticles are 25-independent of the properties of the ptime of t	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, so: 10 9 8  Moderate deponew gravel, san sediment on old bars; 30-50% bottom affected; deposits at obst constrictions, an moderate depo	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow ore low).  7 6 sition of d, or fine and new of the sediment ructions, and bends; and bends; and bends;	Less than 20% stable habitat; lack of habitat obvious; substrate unstable or lacking.  5 4 3 2 1 ( Gravel, cobble, and boulder particles are methan 75% surrounded the fine sediment.  5 4 3 2 1 ( Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 ( Heavy deposits of fine material, increased be development; more the 50% of the bottom changing frequently; po almost absent due to substantial sediment.	s 1	18



Habitat Parameter	Ontimal	Condition Suboptimal	tion Category Marginal	Poor	Score
5. Channel Flow Status	Optimal  Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the	Very little water in channel	Score
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	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	5 4 3 2 1 0	17
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
8. Bank Stability (score each bank) Note: Determine left or right side by facing downstream.	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)	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.	vegetation, but one class	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 panks riparian zone)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
		Total Score			183

	WSSI BENTHIC	MACROINVERTEBRATE	BENCH SHE	ET	
Job Name/#	Glade - 20030	Sample subsorted by:	MK, NG	Watland	\
Station ID:	Reach 1-D	Date Subsorted:	Date Subsorted: 4/30/13		nc.®
Stream Name:	The Glade	# of Grids subsorted	4	Studies and Solutions, 1	
Date Sampled:	3/27/13	Total # of subsorted insects:	115	Total # identified:	87
Sampling Method:	D-NET	Sample Identified by:	ABR	Date Identified:	6/26/13

sampling ivieth	ou.	D-NE I		Sample identified by:	AB	,,,	Date Identified:	6/26/13
Taxa Collecte	ed:							
				Metretopodidae			Lepidostomatidae	
Porifera	Spongillidae		1	Neoephemeridae			Leptoceridae	
Stracoda	Unknown		1	Oligoneuridae			Limnephilidae	
atworms	Tricladida		1	Psuedironidae			Molannidae	
	Planariidae		1	Polymitarcyidae			Odontoceridae	
astropoda	Unknown		1	Potamanthidae			Philopotamidae	
mpets	Ancylidae		1	Siphlonuridae			Phryganeidae	
nails	Immature		1	Tricorythidae			Polycentropodidae	
iano	Lymnaeidae		Zygoptera	Early Instar and/or damaged			Psychomyiidae	
	Physidae	2	_, gopto.a	Calopterygidae			Ryacophilidae	
	Planorbidae		1	Coenagrionidae			Sericostomatidae	
	Hydrobiidae		1	Lestidae			Uenoidae	
	Pleuroceridae		•	Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anicontooro			Lepidoptera	Pyralidae	
valvia	Immature		Anisopteera	Early Instar and/or damaged  Aeshnidae		Coleoptera	Early Instar and/or damaged	
vaivia	Corbiculidae		4			Coleoptera	Chrysomelidae	
				Cordulegastridae			,	
	Sphaeriidae	6	ł	Comphidae			Curculionidae	
inaaha-t-	Unionidae	00		Gomphidae			Dryopidae Dryingidae	<u> </u>
igochaeta	Unknown	60	4	Libellulidae			Dytiscidae	<del> </del>
ımbriculida	l construction district		Į	Macromiidae			Elmidae	
.L. (£) _ ( _) _	Lumbriculidae			Petaluridae			Gyrinidae	
ıbificida				Cordullidae/Libelluidae			Haliplidae	
	Enchytraeidae		Plecoptera	Early Instar and/or damaged			Helodidae	
	Naididae			Capniidae			Helophoridae	
	Tubificidae			Chloroperlidae			Hydraenidae	
aplotaxida				Leuctridae			Hydrochidae	
	Haplotaxidae			Nemouridae			Hydrophilidae	
eches	Hirudinea			Peltoperlidae			Limnichidae	
	Erpobdellidae			Perlidae			Noteridae	
	Glossiphoniidae			Perlodidae			Psephenidae	
	Hirudinidae			Pteronarcyidae			Ptilodactylidae	
	Pisciolidae			Taeniopeterygidae			Scirtidae	
anchiobdellida	Branchiobdellidae		Hemiptera	Early Instar and/or damaged		Diptera	Early Instar and/or damaged	
opepoda	Unknown	1		Belostomatidae			Athericidae	
ecapoda	Cambaridae			Corixidae			Blephariceridae	
	Portunidae			Gelastocoridae			Canaceidae	
nrimp				Gerridae			Ceratopogonidae	
	Palaemonidae			Hebridae			Choaboridae	
opoda				Hydrometridae			Chironomidae	17
	Asellidae			Mesoveliidae			Culicidae	
nphipoda				Naucoridae			Dixidae	
	Crangonyctidae		1	Nepidae			Dolichopodidae	
	Gammaridae		1	Notonectidae			Epididae	
	Talitridae		1	Veliidae			Ephydridae	
ater Mites			1	Pleidae			Muscidae	
	Hydracarina		Neuroptera				Nymphomyiidae	
hemeroptera	Early Instar and/or damaged		1	Sisyridae			Pelecorhynchidae	
•	Acanthometropodidae		Megaloptera	<del>'</del>			Psychodidae	
	Ameletidae		1	Corydalidae			Ptychopteridae	
	Baetidae		1	Sialidae			Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged			Simuliidae	
	Behningiidae		1	Branchycentridae			Stratiomyidae	
	Caenidae		1	Calamoceratidae			Syrphidae	
	Ephemerellidae		1	Glossosomatidae			Tabanidae	
	Ephemeridae		1	Goeridae			Tanyderidae	
	Heptageniidae		1	Heliicopsychidae			Thaumaleidae	
	Isonychiidae			Hydropsychidae			Tipulidae	1
	Leptophlebiidae		1	Hydropsychidae Hydroptilida		TOTAL:	i ipuliuae	18
	CPLOPI II GUIIUAG			m ryurupunud		IOTAL:		10



	Benthic	Macroinv	ertebrate	and Ha	bitat Fie	ld Data Sh	neet -	High Gradien	t	
Job # Task	20030		0110101010							
Station ID:	Reach 1-E		Ecoregion:	Piedmont		Land Use:	Urban			
Field Team:	MN/MK		Location:	Reston, VA		Start time:				
Site:	The Glade		Latitude:			Finish time:				
Date:	3/28/2013		Longitude:			Survey Reason:	Year 4 Bi	omonitoring		
Stream Phys	siochemical M		_			·				
Instru	ment ID number:	N	/A		pH:	N/A	_			
	Temperature:	N/A	°C		Conductivity:	N/A	uS/cm			
D	issolved Oxygen:	N/A	mg/L		Did instru	ment pass all pos	t-calibrati	ion checks? N//	4	
					If NO- whic	h parameter(s) fa	iled and a	action taken: N/A	4	
Benthic Mad	croinvertebrat	e Collection								
Method Used:			_	bitat (Riffle)				ogs, Plants, etc.) X		
Riffle Quality:		Good		Marginal Woody	Х	Poor		None		
Habitats Sample	ed.	Riffle	Х	Debris		Ranks		Vegetation X		
riabitats sample	cu.	# Jabs:		Debits		Burnes		2	_	
Weather Ob	servations	π Jub3.	10	•						
Current Weath		Cloudy		Clear	Х	Rain/Snow		Foggy		
Recent Precipit		Clear				Rain		Storms		
Stream Flow		Low		Normal	Х	Above Normal		Flood		
<b>Biological O</b>	bservations	•		•						
	Periphyton	0			Salamanders	0		Other		
Fi	lamentous Algae	3		Wa	armwater Fish	0	_	0= Not observed		
Submerg	ged Macrophytes	1		(	Coldwater Fish	1	_	1= Sparse		
Emerg	ent Macrophytes	0			Beavers	0	_	2= Common to Abund	ant	
	Crayfish	0			Muskrats	0	-	3= Dominant-		
	Corbicula	0			Ducks/Geese	0	_	Abnormally high density	whe	re other taxa are
	Unionidae	0			Snakes	0	_	insignificant in relation t		
	Operculate Snails	0			Turtles	0	_	There can be situations are dominant such a		•
Non-	operculate Snails	0			rogs/Tadpoles	1		are dominant such a	is aiga	ie aliu silalis
			High Gr	adient l		ata Sheet				
Habitat F	Parameter Parameter	_				ion Categor				
			imal		ptimal	Margin	al	Poor		Score
			0% of substrate or epifaunal		nix of stable Il suited for full					
1 Eni	ifaunal		d fish cover; mix		on potential;	20-40% mix of	stable	Less than 20% stab		
_	/ Available	•	omerged logs,		e habitat for	habitat; habitat a		habitat; lack of habita		
			, cobble, or other and at stage to		enance of s; presence of	less than des substrate free		obvious; substrate		
Co	over	allow full colon	nization potential	additional s	ubstrate in the	disturbed or re	moved.	unstable or lacking		
			that are not new of transient).		fall, but not yet or colonization.					
Sc	core		18 17 16		13 12 11	10 9 8	7 6	5 4 3 2 1	0	15
		Gravel, cobbl	e, and boulder		cobble, and	Gravel, cobbl		Gravel, cobble, and	_	10
2 Ember	ddedness	•	25% surrounded ent. Layering of	,	rticles are 25-	boulder particles		boulder particles are m		
Z. Elliber	uueuness		diversity of niche		unded by fine	75% surrounde		than 75% surrounded	by	
		SD	ace.	sea	iment.	sedimen		fine sediment.	•	4.5
So	core		18 17 16	15 14	13 12 11	10 9 8	7 6	5 4 3 2 1	0	18
Valas!	iv/Don4h		y/depth regimes w-deep, slow-		he 4 regimes	Only 2 of the 4		Dominated by 1		
	y/Depth		st-deep, fast		fast-shallow is ore lower than	regimes presen shallow or slow	*	velocity/depth regim	е	
Reg	gime	, ,	<0.3m/s, deep is		ther regimes).	are missing, sco		(usually slow-deep)		
0	oro		5 m).	Ţ.	,			5 4 2 2 4	0	4.5
50	core	20 19	18 17 16	15 14	13 12 11	10 9 8 Moderate depo		5 4 3 2 1 Heavy deposits of fire		15
				Some new i	ncrease in bar	new gravel, san		material, increased b		
4 904	diment		nlargement of		mostly from	sediment on old		development; more th		
	sition		bars and <5% of cted by sediment		and, or fine 5-30% of the	bars; 30-50% bottom affected;		50% of the bottom changing frequently; p		
реро	<b>วอเนบ</b> เเ		sition.		fected; slight	deposits at obst		almost absent due t		
				deposition	on in pools.	constrictions, an		substantial sedimer	it	
	core	20 10	18 17 16	15 14	13 12 11	moderate depo		deposition.  5 4 3 2 1	0	18
Sc										



Habitat Parameter	Optimal	Suboptimal	tion Category Marginal	Poor	Score
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the	Very little water in channel	Score
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	17
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channeliztion may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	17
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
8. Bank Stability (score each bank) Note: Determine left or right side by facing downstream.	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)	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.	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	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 banks riparian zone)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
		Total Score			177

	WSSI BENTHIC	MACROINVERTEBRAT	E BENCH SHE	ET	
Job Name/#	Glade - 20030	Sample subsorted by:	BC, SG, KG	Watland	
Station ID:	Reach 1-E	Date Subsorted:	4/1/13	Studies and Solutions, I	nc.
Stream Name:	The Glade	# of Grids subsorted	9	- and Solution	
Date Sampled:	3/28/13	Total # of subsorted insects:	99	Total # identified:	75
Sampling Method:	Multihabitat	Sample Identified by:	ABR	Date Identified:	6/25/13

Taxa Collecte	<u>54.</u>			Metretopodidae	I	1	Lepidostomatidae	
Porifera	Spongillidae		ŀ	Neoephemeridae		1	Leptoceridae	
		4				4	·	
Ostracoda	Unknown	1		Oligoneuridae			Limnephilidae	
Flatworms	Tricladida			Psuedironidae		4	Molannidae	
	Planariidae			Polymitarcyidae		4	Odontoceridae	
Gastropoda	Unknown			Potamanthidae			Philopotamidae	
impets	Ancylidae			Siphlonuridae			Phryganeidae	
Snails	Immature			Tricorythidae			Polycentropodidae	
	Lymnaeidae		Zygoptera	Early Instar and/or damaged			Psychomyiidae	
	Physidae			Calopterygidae			Ryacophilidae	
	Planorbidae			Coenagrionidae			Sericostomatidae	
	Hydrobiidae			Lestidae			Uenoidae	
	Pleuroceridae			Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged		1	Pyralidae	
Bivalvia	Immature			Aeshnidae		Coleoptera	Early Instar and/or damaged	
	Corbiculidae			Cordulegastridae		1	Chrysomelidae	
	Sphaeriidae	3		Corduliidae		1	Curculionidae	
	Unionidae	-		Gomphidae		1	Dryopidae	
Dligochaeta	Unknown	29		Libellulidae		1	Dytiscidae	
Lumbriculida	Challown	23		Macromiidae		1	Elmidae	
-umbricullua	Lumbriculidae			Petaluridae	-	1	Gyrinidae	
Tubificida	Lumbriculidae			Petaluridae  Cordullidae/Libelluidae		-	Haliplidae	
ubificida			DI .			4	'	
	Enchytraeidae		Plecoptera	Early Instar and/or damaged		4	Helodidae	
	Naididae			Capniidae			Helophoridae	
	Tubificidae			Chloroperlidae			Hydraenidae	
laplotaxida				Leuctridae		1	Hydrochidae	
	Haplotaxidae			Nemouridae			Hydrophilidae	
eeches	Hirudinea			Peltoperlidae			Limnichidae	
	Erpobdellidae			Perlidae		1	Noteridae	
	Glossiphoniidae			Perlodidae			Psephenidae	
	Hirudinidae			Pteronarcyidae		1	Ptilodactylidae	
	Pisciolidae			Taeniopeterygidae		1	Scirtidae	
Branchiobdellida	Branchiobdellidae		Hemiptera	Early Instar and/or damaged		Diptera	Early Instar and/or damaged	
Copepoda	Unknown		·	Belostomatidae		1	Athericidae	
Decapoda	Cambaridae			Corixidae		1	Blephariceridae	
Josephan	Portunidae			Gelastocoridae		1	Canaceidae	
Shrimp	i ortaniado			Gerridae		1	Ceratopogonidae	
Jillilip	Palaemonidae			Hebridae		1	Choaboridae	
	Falaemonidae						Chironomidae	39
sopoda	A = = 11: -1 = -			Hydrometridae		4		39
	Asellidae	-		Mesoveliidae		4	Culicidae	
Amphipoda		2		Naucoridae			Dixidae	
	Crangonyctidae			Nepidae			Dolichopodidae	
	Gammaridae			Notonectidae		1	Epididae	
	Talitridae			Veliidae			Ephydridae	
Vater Mites				Pleidae			Muscidae	
	Hydracarina		Neuroptera				Nymphomyiidae	
phemeroptera	Early Instar and/or damaged			Sisyridae			Pelecorhynchidae	
	Acanthometropodidae		Megaloptera			1	Psychodidae	
	Ameletidae			Corydalidae		1	Ptychopteridae	
	Baetidae			Sialidae		1	Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged		1	Simuliidae	
	Behningiidae		,	Branchycentridae		1	Stratiomyidae	
	Caenidae			Calamoceratidae		1	Syrphidae	
	Ephemerellidae			Glossosomatidae		1	Tabanidae	
						1		
	Ephemeridae			Goeridae		ł	Tanyderidae	
	Heptageniidae			Heliicopsychidae	4	Į.	Thaumaleidae	
	Isonychiidae			Hydropsychidae	1	TOT * :	Tipulidae	00
	Leptophlebiidae			Hydroptilida		TOTAL:		39
TOTAL:		35	TOTAL:		1	I		



	Benthic	Macroinv	ertebrate	and Ha	bitat Fie	ld Data Sh	neet -	High Gradient	
Job # Task	20030								
Station ID:	Reach 1-F		Ecoregion:	Piedmont		Land Use:	Urban		
Field Team:	MN/MK		Location:	Reston, VA		Start time:			
Site:	The Glade		Latitude:			Finish time:			
Date:	3/28/2013		Longitude:			Survey Reason:	Year 4 Bi	omonitoring	
Stream Phys	siochemical M	leasurement	S						
Instru	ment ID number:	N	I/A	•	pH:	N/A	_		
	Temperature:	N/A	°C		Conductivity:	N/A	uS/cm		
C	Dissolved Oxygen:	N/A	mg/L		Did instru	ment pass all pos	t-calibrati	ion checks? N/A	
					If NO- whic	h parameter(s) fa	iled and a	action taken: N/A	ı
Benthic Ma	croinvertebrat	te Collection							
Method Used:			-	bitat (Riffle)		1		ogs, Plants, etc.) X	i
Riffle Quality:		Good		Marginal	Х	Poor		None	
Habitats Sampl	ed:	Piffle	Х	Woody Debris		Ranks		Vegetation	
nabitats Sampi	eu.			Deniis		Daliks	-	vegetation	•
Weather Ob	servations	# Jabs:	20			•			:
Current Weath		Cloudy	Х	Clear		Rain/Snow		Foggy	•
Recent Precipit			X			Rain		Storms	•
Stream Flow		Low		Normal	Х	Above Normal		Flood	•
Biological O	bservations	2011				, , , , , , , , , , , , , , , , , , , ,			•
<u> </u>	Periphyton	1			Salamanders	0		Other	
Fi	ilamentous Algae			Wa	armwater Fish	0	-	0= Not observed	
	ged Macrophytes	1			oldwater Fish	0	•	1= Sparse	
	ent Macrophytes	1			Beavers	0	•	2= Common to Abundant	
	Crayfish	0			Muskrats		-	3= Dominant-	
	Corbicula	0			Ducks/Geese		-	Abnormally high density who	aro othor tava aro
	Unionidae	0			Snakes	0	•	insignificant in relation to the	
	Operculate Snails	0			Turtles	0	•	There can be situations whe	re multiple taxa
	operculate Snails	0		Fi	rogs/Tadpoles	1	•	are dominant such as alg	ae and snails
			Hiah Gr	adient l	-labitat [	ata Sheet			
						tion Categor			
<u>Habitat I</u>	<u>Parameter</u>	Opt	timal	Subo	ptimal	Margin		Poor	Score
		Greater than 7	'0% of substrate		nix of stable				
			for epifaunal		I suited for full	00.400/			
1. Ep	ifaunal		nd fish cover; mix bmerged logs,		on potential; e habitat for	20-40% mix of habitat; habitat a		Less than 20% stable	
-	e/ Available		, cobble, or other		nance of	less than des	,	habitat; lack of habitat is	
Co	over		and at stage to		s; presence of	substrate free		obvious; substrate unstable or lacking.	
			nization potential		ubstrate in the fall, but not yet	disturbed or re	moved.	anotable of labiting.	
			that are not new of transient).		r colonization.				
Sc	core		18 17 16		13 12 11	10 9 8	7 6	5 4 3 2 1 0	19
		Gravel, cobb	le, and boulder	Gravel. d	cobble, and	Gravel, cobbl		Gravel, cobble, and	
2 Ember	ddedness	•	25% surrounded ent. Layering of	boulder par	rticles are 25-	boulder particles	s are 50-	boulder particles are more	
Z. LITIDE	uueuness		diversity of niche		unded by fine	75% surrounde		than 75% surrounded by	
_		SD:	ace.	sea	iment.	sedimen		fine sediment.	, -
So	core		18 17 16	15 14	13 12 11	10 9 8	7 6	5 4 3 2 1 0	19
<b> </b> ,,	(5)		y/depth regimes w-deep, slow-		he 4 regimes	Only 2 of the 4		Dominated by 1	
	ty/Depth		st-deep, slow-		ast-shallow is	regimes presen	*	velocity/depth regime	
Re	gime	shallow)(slow is	<0.3m/s, deep is	-	ore lower than ther regimes).	shallow or slow are missing, sco		(usually slow-deep).	
			5 m).			_			
Sc	core	20 19	18 17 16	15 14	13 12 11	10 9 8		5 4 3 2 1 0	15
				Some new i	ncrease in bar	Moderate depo new gravel, san		Heavy deposits of fine material, increased bar	
		Little or no e	enlargement of		mostly from	sediment on old		development; more than	
	diment	islands or point	bars and <5% of	gravel, sa	and, or fine	bars; 30-50%	of the	50% of the bottom	
Depo	osition		cted by sediment		5-30% of the	bottom affected;			
		depo	osition.		ected; slight on in pools.	deposits at obst constrictions, an		almost absent due to substantial sediment	
				acpositio	III pools.	moderate depo		deposition.	
S/	core	20 19	18 17 16	15 14	13 12 11	10 9 8		5 4 3 2 1 0	16



Habitat Parameter	Optimal	Suboptimal	tion Category Marginal	Poor	Score
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the	Very little water in channel	Score
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	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	5 4 3 2 1 0	17
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	20
8. Bank Stability (score each bank) Note: Determine left or right side by facing downstream.	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)	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.	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	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 banks riparian zone)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clear- cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	8
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
		Total Score			183

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET								
Job Name/#	Glade - 20030	Sample subsorted by:	MK	Watland	)—···			
Station ID:	Reach 1-F	Date Subsorted:	5/1/13	Studies and Solutions	nc.			
Stream Name:	The Glade	# of Grids subsorted	11	and solutions				
Date Sampled:	3/27/13	Total # of subsorted insects:	102	Total # identified:	93			
Sampling Method:	D-NET	Sample Identified by:	ABR	Date Identified:	5/31/13			

Sampling Meth	iou.	D-NE I		Sample identified by:	, ,-	3K	Date identified:	5/31/13
Taxa Collecte	eq.							
Taxa Concord	<u>54.</u>			Metretopodidae	1	Ī	Lepidostomatidae	
Davifara	Changillidae		1					
Porifera	Spongillidae			Neoephemeridae			Leptoceridae	
Ostracoda	Unknown			Oligoneuridae			Limnephilidae	
Flatworms	Tricladida			Psuedironidae			Molannidae	
o	Planariidae			Polymitarcyidae			Odontoceridae	
Gastropoda	Unknown			Potamanthidae			Philopotamidae	
_impets	Ancylidae			Siphlonuridae			Phryganeidae	
Snails	Immature		_	Tricorythidae			Polycentropodidae	
	Lymnaeidae		Zygoptera	Early Instar and/or damaged			Psychomyiidae	
	Physidae			Calopterygidae			Ryacophilidae	
	Planorbidae			Coenagrionidae			Sericostomatidae	
	Hydrobiidae			Lestidae			Uenoidae	
	Pleuroceridae			Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged			Pyralidae	
Bivalvia	Immature			Aeshnidae		Coleoptera	Early Instar and/or damaged	
	Corbiculidae			Cordulegastridae			Chrysomelidae	
	Sphaeriidae	3		Corduliidae			Curculionidae	
	Unionidae			Gomphidae			Dryopidae	
Oligochaeta	Unknown	42		Libellulidae			Dytiscidae	
_umbriculida				Macromiidae			Elmidae	
	Lumbriculidae			Petaluridae			Gyrinidae	
ubificida				Cordullidae/Libelluidae			Haliplidae	
	Enchytraeidae		Plecoptera	Early Instar and/or damaged			Helodidae	
	Naididae			Capniidae			Helophoridae	
	Tubificidae			Chloroperlidae			Hydraenidae	
łaplotaxida				Leuctridae			Hydrochidae	
	Haplotaxidae			Nemouridae			Hydrophilidae	
eeches	Hirudinea			Peltoperlidae			Limnichidae	
	Erpobdellidae			Perlidae			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	
sopoda				Hydrometridae			Chironomidae	46
	Asellidae			Mesoveliidae			Culicidae	
Amphipoda	, i.eaae	2		Naucoridae			Dixidae	
пртпросс	Crangonyctidae	_		Nepidae			Dolichopodidae	
	Gammaridae			Notonectidae			Epididae	
	Talitridae			Veliidae			Ephydridae	
Vater Mites	Tallifidae			Pleidae			Muscidae	
valer Miles	Hydracarina		Neuroptera	i idiuac			Nymphomyiidae	
-nhemoroptors	Early Instar and/or damaged		reuropiera	Sisyridae			Pelecorhynchidae	
phemeroptera	Acanthometropodidae		Megaloptera	Olayfluae			Psychodidae Psychodidae	
			iviegaloptera	Considerida			Ptychopteridae Ptychopteridae	
	Ameletidae Baetidae			Corydalidae Sialidae				
			Trichontoro	Sialidae Early Instar and/or damaged			Sciomyzidae	
	Baetiscidae		Trichoptera				Simuliidae	
	Behningiidae			Branchycentridae			Stratiomyidae	
	Caenidae			Calamoceratidae			Syrphidae	
	Ephemerellidae			Glossosomatidae			Tabanidae	
	Ephemeridae			Goeridae			Tanyderidae	
	Heptageniidae			Heliicopsychidae			Thaumaleidae	
	Isonychiidae			Hydropsychidae			Tipulidae	
	Leptophlebiidae			Hydroptilida		TOTAL:		46
TOTAL:		47	TOTAL:		0		<u>-</u>	



	- 411			and Solu		<b>0</b> 1 /		
		Macroinv	ertebrate	and Habita	t Field Data	Sheet -	High Gradient	
Job # Task	20030					_		
Station ID:	Reach 1-G		Ecoregion:	Piedmont	Land Use:	Urban		
Field Team:	MN/MK		Location:	Reston, VA	Start time			
Site:	The Glade		Latitude:		Finish time			
Date:	3/28/2013		Longitude:		Survey Rea	ason: Year 4 B	iomonitoring	
	iochemical M							
Instrur	ment ID number:		I/A	ī	pH: N/A			
	Temperature:		°C	Condu	ctivity: N/A	uS/cm		
D	issolved Oxygen:	N/A	mg/L	Di	d instrument pass	all post-calibrat	ion checks? N/A	i.
				If N	O- which paramet	er(s) failed and a	action taken: N/A	i
	roinvertebrat	te Collection						
Method Used:		Const	_	bitat (Riffle)			ogs, Plants, etc.) X	i.
Riffle Quality:		Good		Marginal	<u> </u>	Poor	None	1
Habitats Sample	eq.	Riffle				Ranks	Vegetation	
Trabitats sample	cu.						vegetation	•
Weather Ob	servations	# Jau5.		· —	<del></del>	-	<u> </u>	•
Current Weather		Cloudy	Х	Clear	Rain	/Snow	Foggy	•
Recent Precipita			X	Showers		Rain	Storms	
Stream Flow	20011	Low	X	Normal		ormal		
Biological Ol	bservations	LUW	^		Above N		11000	•
o <sub>0</sub> OI	Periphyton	1		Salam	anders 0		Other	
Fil	lamentous Algae		ı	Warmwai			0= Not observed	
	ged Macrophytes	0	•	Coldwat			1= Sparse	
_	ent Macrophytes		•		Beavers 0		2= Common to Abundant	
Emerge	Crayfish	0	•		uskrats 0		3= Dominant-	
	Corbicula		•		/Geese 0			
	Unionidae	0	•				Abnormally high density who	
	Onionidae Operculate Snails	0			Snakes 0 Turtles 0		insignificant in relation to the There can be situations whe	
	operculate silalis				Turties 0			
Non-c	nnerculate Snails	<u> </u>	ı	Frogs/Ta			are dominant such as alg	ae and snails
Non-c	operculate Snails	0	High Gr	Frogs/Ta	idpoles 0	neet	are dominant such as alg	ae and snails
Non-c	operculate Snails	0	High Gr	adient Habi	tat Data SI		are dominant such as alg	ae and snails
	operculate Snails  Parameter			adient Habi <u>c</u>	tat Data SI condition Cat	<u>egory</u>		
		Opt	timal	adient Habi <u>C</u> Suboptim	tat Data Si condition Cat		are dominant such as alg	Score
		Opt Greater than 7		adient Habi <u>c</u>	tat Data SI condition Cat al Ma	<u>egory</u>		
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Habitat F	Parameter Ifaunal	Opt Greater than 7 favorable tolonization ar of snags, sul	timal 70% of substrate for epifaunal ad fish cover; mix bmerged logs,	Adient Habi  Suboptim  40-70% mix of st habitat; well suited colonization pote adequate habita	tat Data SI condition Catal Malable for full nitial; 20-40% habitat; ha	egory arginal mix of stable abitat availability		
Habitat F  1. Epi Substrate	Parameter  Ifaunal / Available	Opt Greater than 7 favorable tolonization ar of snags, sul undercut banks	timal 70% of substrate for epifaunal and fish cover; mix	Adient Habi  Suboptim  40-70% mix of st habitat; well suited colonization pote	tat Data SI condition Cat al Ma able for full initial; t for bof less th	egory arginal mix of stable abitat availability an desirable;	Poor  Less than 20% stable habitat; lack of habitat is obvious; substrate	
Habitat F  1. Epi Substrate	Parameter Ifaunal	Greater than 7 favorable e colonization ar of snags, sul undercut banks stable habitat allow full color	timal  70% of substrate for epifaunal Id fish cover; mix bmerged logs, c, cobble, or other and at stage to nization potential	Suboptim 40-70% mix of st habitat; well suited colonization pote adequate habita maintenance populations; prese additional substrate	tat Data SI condition Cat al Ma able for full ntial; t for of ence of en in the	egory arginal mix of stable abitat availability	Poor  Less than 20% stable habitat; lack of habitat is	
Habitat F  1. Epi Substrate	Parameter  Ifaunal / Available	Greater than 7 favorable (colonization ar of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs	timal 70% of substrate for epifaunal ad fish cover; mix brnerged logs, c, cobble, or other and at stage to nization potential that are not new	Suboptim 40-70% mix of st habitat; well suited colonization pote adequate habita maintenance populations; prese additional substratt form of newfall, but	tat Data SI condition Cat al Ma table for full initial; t for bord less the substrate of e in the not yet	mix of stable abitat availability an desirable; te frequently	Poor  Less than 20% stable habitat; lack of habitat is obvious; substrate	
Habitat F  1. Epi Substrate Co	Parameter  ifaunal // Available over	Greater than 7 favorable to colonization and of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not stable to the stable to the snags/logs fall and not snag	timal 70% of substrate for epifaunal ad fish cover; mix brnerged logs, c, cobble, or other and at stage to nization potential that are not new bt transient).	Adient Habi  Suboptim  40-70% mix of st habitat; well suited colonization pote adequate habita maintenance populations; prese additional substratt form of newfall, but prepared for coloni	tat Data SI condition Cat al Ma table for full initial; t for of e in the not yet zation.	egory arginal mix of stable abitat availability an desirable; tet frequently d or removed.	Poor  Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	Score
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Habitat Parameter	Ontimal	Condi Suboptimal	tion Category Marginal	Poor	Score
5. Channel Flow Status	Optimal  Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the	Very little water in channel	Score
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	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.	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 entirely.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	17
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	20
8. Bank Stability (score each bank) Note: Determine left or right side by facing downstream.	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)	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.	vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more	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 panks riparian zone)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
		Total Score			170



Benthio	Macroiny	ertebrate	and Habitat Fi	eld Data Sh	neet - l	High Gradient	
Job # Task 20030	, macronity	Citobiato	and nabitat in	cia Data Oil		ngii Gradiciit	
Station ID: Reach 2-A		Ecoregion:	Piedmont	Land Use:	Urban		
Field Team: MN/MK		Location:	Reston, VA	Start time:			
Site: The Glade		Latitude:		Finish time:			
Date: 3/27/2013		Longitude:		Survey Reason:	Year 4 Bio	omonitoring	
Stream Physiochemical I	Measurement	s					•
Instrument ID number	::N	/A	рН	l: N/A	_		
Temperature	:: N/A	°C	Conductivity	/: N/A	uS/cm		
Dissolved Oxyger	: N/A	mg/L	Did inst	ument pass all pos	t-calibratio	on checks? N/A	
Benthic Macroinvertebra	ate Collection		If NO- wh	ich parameter(s) fa	iled and a	ction taken: N/A	
Method Used:		Single Hal	oitat (Riffle)	Multi H	labitat (Lo	gs, Plants, etc.) X	
Riffle Quality:	Good	_	Marginal X				
	•		Woody				
Habitats Sampled:	Riffle	Χ	Debris	Banks		Vegetation X 1	
	# Jabs:	19		_		1	
Weather Observations							
Current Weather		X				Foggy	
Recent Precipitation	Clear		Showers	Rain		Storms	
Stream Flow Biological Observations	Low	X	Normal	Above Normal		Flood	
	2 1		Calamanda	s 0		Othor	
Periphyto			Salamandei Warmwater Fis		-	Other 0= Not observed	
Filamentous Alga Submerged Macrophyte			Coldwater Fis		-		
Emergent Macrophyte			Beaver		-	1= Sparse 2= Common to Abundant	
Crayfis			Muskra		-	3= Dominant-	
Corbicul	·——		Ducks/Gees		-		
Unionida	·——		•	s 0	-	Abnormally high density whe insignificant in relation to the	
Operculate Snail			Turtle		•	There can be situations when	
Non-operculate Snail			Frogs/Tadpole		-	are dominant such as alga	ae and snails
·		High Gr	adient Habitat				
Habitat Danamatan				ition Categor			
Habitat Parameter	Opt	imal	Suboptimal	Margin	al	Poor	Score
	Greater than 7	0% of cubetrate					00010
			40-70% mix of stable				00010
I	favorable f	or epifaunal	habitat; well suited for fu		f stable		55515
1. Epifaunal	favorable f colonization an			II 20-40% mix of habitat; habitat a		Less than 20% stable	Coorc
Substrate/ Available	favorable f colonization an of snags, sul undercut banks	for epifaunal ad fish cover; mix comerged logs, , cobble, or other	habitat; well suited for fu colonization potential; adequate habitat for maintenance of	20-40% mix of habitat; habitat a less than desi	vailability irable;	Less than 20% stable habitat; lack of habitat is obvious; substrate	330.13
	favorable f colonization an of snags, sul undercut banks stable habitat	or epifaunal d fish cover; mix omerged logs, , cobble, or other and at stage to	habitat; well suited for fu colonization potential; adequate habitat for maintenance of populations; presence o	20-40% mix of habitat; habitat a less than desi substrate freq	availability irable; quently	habitat; lack of habitat is	000.0
Substrate/ Available	favorable f colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs	or epifaunal d fish cover; mix omerged logs, , cobble, or other and at stage to dization potential that are not new	habitat; well suited for fu colonization potential; adequate habitat for maintenance of populations; presence o additional substrate in th form of newfall, but not ye	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rei	availability irable; quently	habitat; lack of habitat is obvious; substrate	33010
Substrate/ Available Cover	favorable f colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and no	or epifaunal dish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new of transient).	habitat; well suited for fu colonization potential; adequate habitat for maintenance of populations; presence o additional substrate in th form of newfall, but not ye prepared for colonization	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relat	availability irable; quently moved.	habitat; lack of habitat is obvious; substrate unstable or lacking.	
Substrate/ Available	favorable f colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and no	or epifaunal d fish cover; mix omerged logs, , cobble, or other and at stage to dization potential that are not new	habitat; well suited for fu colonization potential; adequate habitat for maintenance of populations; presence o additional substrate in th form of newfall, but not ye prepared for colonizatior 15 14 13 12 11	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet to the substrate frequency and the substrate frequency disturbed or relet to the substrate frequency and the substra	availability irable; quently moved.	habitat; lack of habitat is obvious; substrate unstable or lacking.	12
Substrate/ Available Cover	favorable f colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-	or epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new at transient).  18 17 16  18 17 16  19 16 19 19 19 19 19 19 19 19 19 19 19 19 19	habitat; well suited for fu colonization potential; adequate habitat for maintenance of populations; presence o additional substrate in th form of newfall, but not ye prepared for colonizatior 15 14 13 12 11 Gravel, cobble, and	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet.  10 9 8  Gravel, cobble	availability irable; quently moved.	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and	
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Substrate/ Available Cover	favorable facolonization and of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravet, cobble particles are 0-by fine sedime cobble provides	or epifaunal d fish cover; mix omerged logs, , cobble, or other and at stage to nization potential that are not new transient).  18 17 16 lee, and boulder 25% surrounded ent. Layering of diversity of niche	habitat; well suited for fu colonization potential; adequate habitat for maintenance of populations; presence o additional substrate in th form of newfall, but not yu prepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25- 50% surrounded by fine	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rei at	availability irable; quently moved.  7 6 e, and s are 50-d by fine t.	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by	
Substrate/ Available Cover  Score  2. Embeddedness  Score	favorable facolonization and of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not complete the color of the stable facolor of the stable facolor of snags/logs fall and not color of snags/logs f	or epifaunal d fish cover; mix omerged logs, , cobble, or other and at stage to nization potential that are not new of transient).  18 17 16 e., and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 y/depth regimes	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence or additional substrate in the form of newfall, but not yup repared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet to the disturb	revailability irable; puently moved.  7 6 e, and s are 50-d by fine t. 7 6	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth	favorable facolonization and of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not gravel, cobble particles are 0-by fine sedime cobble provides sp. 20 19  All four velocity present (slovenization and source)	or epifaunal d fish cover; mix omerged logs, , cobble, or other and at stage to nization potential that are not new of transient).  18 17 16 e, and boulder 25% surrounded that are not new of transient of diversity of niche ace.  18 17 16 ey/depth regimes w-deep, slow-	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence or additional substrate in the form of newfall, but not yeprepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11  Only 3 of the 4 regimes present (if fast-shallow is	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet .  10 9 8  Gravel, cobble boulder particles 75% surrounder sediment 10 9 8  Only 2 of the 4 regimes present	vailability irable; yuently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1	12
Substrate/ Available Cover  Score  2. Embeddedness  Score	favorable facolonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides sp. 20 19 All four velocit present (slov shallow, fa	or epifaunal d fish cover; mix omerged logs, , cobble, or other and at stage to nization potential that are not new of transient).  18 17 16 e., and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 y/depth regimes	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence or additional substrate in the form of newfall, but not yeprepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11  Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than and potential present that the sediment is sediment.	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or releast.  10 9 8  Gravel, cobble boulder particles 75% surrounder sediment 10 9 8  Only 2 of the 4 regimes present shallow or slow-	vailability irable; puently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime	favorable f colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and nc 20 19 Gravel, cobbl particles are 0- by fine sedime cobble provides sp: 20 19 All four velocit present (slot shallow, fa shallow)(slow is	or epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new of transient).  18 17 16 lee, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 ley/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not suprepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11 Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet .  10 9 8 Gravel, cobble boulder particles 75% surrounder sediment 10 9 8 Only 2 of the 4 regimes present shallow or slow are missing, so	availability irable; yuently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fastshallow ore low).	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth	favorable f colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and nc 20 19 Gravel, cobbl particles are 0- by fine sedime cobble provides sp: 20 19 All four velocit present (slot shallow, fa shallow)(slow is	or epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new of transient).  18 17 16 e.e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 e.g., slow-st-deep, slow-st-deep, fast <0.3m/s, deep is	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence or additional substrate in the form of newfall, but not yeprepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11  Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than and potential present that the sediment is sediment.	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet.  10 9 8 Gravel, cobble boulder particles 75% surrounder sediment 10 9 8 Only 2 of the 4 regimes present shallow or slow are missing, soc	availability irable; puently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow ore low). 7 6	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime	favorable f colonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and nc 20 19 Gravel, cobbl particles are 0- by fine sedime cobble provides sp: 20 19 All four velocit present (slot shallow, fa shallow)(slow is	or epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new of transient).  18 17 16 lee, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 ley/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not suprepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11  Only 3 of the 4 regimes present (if fast-shallow is missing, score lower that if missing other regimes)	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet .  10 9 8 Gravel, cobble boulder particles 75% surrounder sediment 10 9 8 Only 2 of the 4 regimes present shallow or slow are missing, soc	availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 c. habitat t (if fast-shallow one low).  7 6 esition of	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score	favorable facolonization and of snags, sulfundercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19  Gravel, cobbling particles are 0-by fine sedime cobble provides specified and sold for the sedime cobble provides specified shallow, fashallow) (slow is \$0.000.0000.00000000000000000000000000	or epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new of transient).  18 17 16 lee, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 ley/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not suprepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11 Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or relet .  10 9 8 Gravel, cobble boulder particles 75% surrounder sediment 10 9 8 Only 2 of the 4 regimes present shallow or slow are missing, soc	availability irable; yuently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low). 7 6 sistion of d, or fine	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score  4. Sediment	favorable facolonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides septimes and provides specific present (slow shallow) (slow is 50.19  Little or no e islands or point	or epifaunal of fish cover; mix or epifaunal of fish cover; mix or expected to the cover; mix or expected to the cover; mix or expected to the cover of the covero of the cover of the cover of the cover of the cover of the cove	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence or additional substrate in the form of newfall, but not yuprepared for colonization.  15 14 13 12 11  Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11  Only 3 of the 4 regimes present (if fast-shallow is missing, score lower that if missing other regimes)  15 14 13 12 11  Some new increase in ba formation, mostly from gravel, sand, or fine	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rei et at the substrate frequency from the substrate frequency from the substrate frequency from the substrate frequency frequency from the substrate frequency freq	availability irable; puently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow ore low).  7 6 estition of d, or fine and new of the	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score	favorable facolonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not particles are 0-by fine sedime cobble provides specific present (slowshallow) fashallow) (slow is \$-0.5 title or no expecific point the bottom affer stands or point the bottom affer stands or stands or point the bottom affer stands or point stands or poin	for epifaunal of fish cover; mix or epifaunal of fish cover; mix or mix or expense of the cover; mix or expense of the cover; mix or epifaunal of the cover of th	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence or additional substrate in the form of newfall, but not yuprepared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11  Only 3 of the 4 regimes present (if fast-shallow is missing, score lower that if missing other regimes)  15 14 13 12 11  Some new increase in ba formation, mostly from gravel, sand, or fine sediment; 5-30% of the	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or retent to the substrate frequency and the substrate	availability irable; puently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow ore low).  7 6 sistion of d, or fine and new of the sediment	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score  4. Sediment	favorable facolonization an of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not particles are 0-by fine sedime cobble provides specific present (slowshallow) fashallow) (slow is \$-0.5 title or no expecific point the bottom affer stands or point the bottom affer stands or stands or point the bottom affer stands or point stands or poin	or epifaunal of fish cover; mix or epifaunal of fish cover; mix or expected to the cover; mix or expected to the cover; mix or expected to the cover of the covero of the cover of the cover of the cover of the cover of the cove	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence or additional substrate in the form of newfall, but not yuprepared for colonization.  15 14 13 12 11  Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11  Only 3 of the 4 regimes present (if fast-shallow is missing, score lower that if missing other regimes)  15 14 13 12 11  Some new increase in ba formation, mostly from gravel, sand, or fine	20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rei et at the substrate frequency from the substrate frequency from the substrate frequency from the substrate frequency frequency from the substrate frequency freq	availability irable; guently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fastshallow one low). 7 6 sition of d, or fine and new of the sediment ructions,	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom	12
Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score  4. Sediment	favorable facolonization and of snags, sul undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19  Gravel, cobbling particles are 0-by fine sedime cobble provides specific shallow, fashallow) (slow is shallow) (slow is solution or point the bottom affer deports of snags and shallow) (slow is shallow) (slow	for epifaunal of fish cover; mix or epifaunal of fish cover; mix or mix or expense of the cover; mix or expense of the cover; mix or epifaunal of the cover of th	habitat; well suited for furcolonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yopenared for colonization 15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.  15 14 13 12 11 Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes)  15 14 13 12 11 Some new increase in be formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight	20-40% mix of habitat; habitat at less than desi substrate freq disturbed or release.  10 9 8  Gravel, cobble boulder particles 75% surrounder sediment 10 9 8  Only 2 of the 4 regimes present shallow or slow are missing, scc. 10 9 8  Moderate deponew gravel, sand sediment on old bars; 30-50% bottom affected; deposits at obstructions, an moderate depo	availability irable; yuently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low).  7 6 sition of d, or fine and new of the sediment ructions, id bends;	habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to	12



Habitat Parameter	Ontimal	Suboptimal	tion Category Marginal	Poor	Score
5. Channel Flow Status	Optimal  Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the	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	5 4 3 2 1 0	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	5 4 3 2 1 0	17
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	16
8. Bank Stability (score each bank) Note: Determine left or right side by facing downstream.	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)	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.	vegetation, but one class of plants is not well- represented; disruption evident but not affecting full plant growth potential to any great extent; more	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 panks riparian zone)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
		Total Score			165

	W	SSI BEN	THIC MA	CROINVERTEBRA	TE BEN	CH SHE	ET	
Job Name/#		Glade - 2003	30	Sample subsorted by:	MK	, MN	W/- 111	\
Station ID:		Reach 2-A		Date Subsorted:	4/3	0/13	Studies and Solutions, V	30 nC:
Stream Name:		The Glade		# of Grids subsorted	1	2	adles and Solutions,	
Date Sampled:		3/27/13		Total # of subsorted insects	•	103	Total # identified:	88
Sampling Method		D-NET		Sample Identified by:		BR	Date Identified:	
		D-INE I		Sample identified by.	Al	DK .	Date identified.	6/26/13
Taxa Collecte	<u>ed:</u>			NA		-		
Porifera	Spongillidae		1	Metretopodidae  Neoephemeridae			Lepidostomatidae  Leptoceridae	
Ostracoda	Spongillidae Unknown			Oligoneuridae			Limnephilidae	
Flatworms	Tricladida		1	Psuedironidae			Molannidae	
	Planariidae			Polymitarcyidae			Odontoceridae	
Gastropoda	Unknown			Potamanthidae			Philopotamidae	
Limpets	Ancylidae			Siphlonuridae			Phryganeidae	
Snails	Immature			Tricorythidae			Polycentropodidae	
	Lymnaeidae		Zygoptera	Early Instar and/or damaged			Psychomyiidae	
	Physidae	1		Calopterygidae			Ryacophilidae	
	Planorbidae Hydrobiidae			Coenagrionidae Lestidae	1		Sericostomatidae Uenoidae	
	Pleuroceridae		-	Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged		Lopidoptora	Pyralidae	
Bivalvia	Immature			Aeshnidae		Coleoptera	Early Instar and/or damaged	
	Corbiculidae			Cordulegastridae			Chrysomelidae	
	Sphaeriidae	3	1	Corduliidae			Curculionidae	
	Unionidae			Gomphidae			Dryopidae	
Oligochaeta	Unknown	41		Libellulidae			Dytiscidae	
Lumbriculida				Macromiidae			Elmidae	
<b>T</b> 1 ''' : 1	Lumbriculidae			Petaluridae			Gyrinidae	
Tubificida	Enchytraeidae		Plecoptera	Cordullidae/Libelluidae Early Instar and/or damaged			Haliplidae Helodidae	
	Naididae		riecopteia	Capniidae			Helophoridae	
	Tubificidae			Chloroperlidae			Hydraenidae	
Haplotaxida				Leuctridae			Hydrochidae	
·	Haplotaxidae		1	Nemouridae			Hydrophilidae	
Leeches	Hirudinea			Peltoperlidae			Limnichidae	
	Erpobdellidae			Perlidae			Noteridae	
	Glossiphoniidae			Perlodidae			Psephenidae	
	Hirudinidae			Pteronarcyidae			Ptilodactylidae	
5	Pisciolidae			Taeniopeterygidae		D: .	Scirtidae	
Branchiobdellida	Branchiobdellidae		Hemiptera	Early Instar and/or damaged		Diptera	Early Instar and/or damaged  Athericidae	
Copepoda Decapoda	Unknown Cambaridae			Belostomatidae Corixidae			Blephariceridae	
Decapoda	Portunidae			Gelastocoridae			Canaceidae	
Shrimp	i ortaniado		1	Gerridae			Ceratopogonidae	
,	Palaemonidae			Hebridae			Choaboridae	
Isopoda			1	Hydrometridae			Chironomidae	40
	Asellidae			Mesoveliidae			Culicidae	
Amphipoda				Naucoridae			Dixidae	
	Crangonyctidae			Nepidae			Dolichopodidae	
	Gammaridae			Notonectidae			Epididae	
Water Mites	Talitridae	4		Veliidae			Ephydridae Museidae	
water miles	Hydracarina	1	Neuroptera	Pleidae			Muscidae Nymphomyiidae	
Ephemeroptera	Early Instar and/or damaged		Neuropiera	Sisyridae			Pelecorhynchidae	
Epitomoropiora	Acanthometropodidae		Megaloptera	Cicyridae			Psychodidae	
	Ameletidae		ı Ö	Corydalidae			Ptychopteridae	
	Baetidae		1	Sialidae			Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged			Simuliidae	
	Behningiidae			Branchycentridae			Stratiomyidae	
	Caenidae		I	Calamoceratidae			Syrphidae	
	Ephemerellidae			Glossosomatidae			Tabanidae	
	Ephemeridae			Goeridae			Tanyderidae	
	Heptageniidae		Į	Heliicopsychidae			Thaumaleidae Tipulidae	
	Isonychiidae Leptophlebiidae		ł	Hydropsychidae Hydroptilida	1		Tipulidae	40
TOTAL:	Loptophilobildae	46	TOTAL:	тушорина	2	TOTAL:		70
					_			



Benthio	Macroiny	ertebrate	and Ha	hitat Fie	ld Data Sh	neet -	High Gradient	
Job # Task 20030	, maor on v	Citobiato	una ma	Ditat i io	ia Data Oi	1001	riigii Ordaloitt	
Station ID: Reach 3-A		Ecoregion:	Piedmont		Land Use:	Urban		
Field Team: MN/MK		Location:	Reston, VA		Start time:			
Site: The Glade		Latitude:			Finish time:			
Date: 3/28/2013		Longitude:			Survey Reason:	Year 4 Bi	omonitoring	
Stream Physiochemical I	Measurements	S						
Instrument ID number	: <u>N</u>	/A	•	pH:	N/A	_		
Temperature	e: N/A	°C		Conductivity:	N/A	uS/cm		
Dissolved Oxyger	n: N/A	mg/L		Did instru	ment pass all pos	t-calibrati	on checks? N/A	•
Benthic Macroinvertebra	ate Collection			If NO- whic	h parameter(s) fa	iled and a	action taken: N/A	
Method Used:		Single Hal	bitat (Riffle)		Multi F	labitat (Lo	ogs, Plants, etc.) X	
Riffle Quality:	Good	_	Marginal					•
	•		Woody					•
Habitats Sampled:	Riffle	Χ	Debris	Х	Banks		Vegetation X 2	
	# Jabs:	17		1			2	
Weather Observations								•
Current Weather	Cloudy	Х				\ <u></u>	Foggy	•
Recent Precipitation		Х			Rain		Storms	
Stream Flow	Low		Normal _	Х	Above Normal		Flood	•
Biological Observations  Periphyto	n 1			Salamanders	0		Other	
• •			\M/a		0	-	0= Not observed	
Filamentous Alga Submerged Macrophyte				rmwater Fish oldwater Fish	1	-		
Emergent Macrophyte			C			-	1= Sparse 2= Common to Abundant	
Crayfis				Beavers Muskrats		=	3= Dominant-	
Corbicul	· <del></del>			Ducks/Geese	_	-		
Unionida	·——			Snakes		-	Abnormally high density who insignificant in relation to th	
Operculate Snail				Turtles	_	-	There can be situations who	
Non-operculate Snail			Fr	ogs/Tadpoles	1	_	are dominant such as alg	ae and snails
		High Gr	adient F	labitat D	ata Sheet			
Habitat Davamatar								
Hanifat Parameter				Condi	ion Catego			
Habitat Parameter		imal		ptimal		r <u>y</u>	Poor	Score
<u>nabitat i arameter</u>	Greater than 7	0% of substrate	40-70% m	ptimal nix of stable	ion Categor	r <u>y</u>	Poor	Score
	Greater than 7 favorable f	0% of substrate or epifaunal	40-70% m habitat; well	ptimal nix of stable suited for full	ion Categor Margin	r <u>y</u> ial		Score
1. Epifaunal	Greater than 7 favorable f colonization an	0% of substrate	40-70% m habitat; well colonization	ptimal nix of stable	ion Categor	f stable	Less than 20% stable	Score
1. Epifaunal Substrate/ Available	Greater than 7 favorable f colonization an of snags, sub undercut banks	0% of substrate for epifaunal d fish cover; mix omerged logs, , cobble, or other	40-70% m habitat; well colonizatio adequate mainte	ptimal nix of stable I suited for full on potential; habitat for nance of	Margin 20-40% mix of habitat; habitat a less than des	f stable availability irable;		Score
1. Epifaunal	Greater than 7 favorable f colonization an of snags, sub undercut banks stable habitat	0% of substrate for epifaunal dish cover; mix omerged logs, , cobble, or other and at stage to	40-70% m habitat; well colonizatio adequate mainter populations	ptimal nix of stable suited for full on potential; habitat for nance of ; presence of	Margin 20-40% mix of habitat; habitat a	f stable availability irable; quently	Less than 20% stable habitat; lack of habitat is	Score
1. Epifaunal Substrate/ Available	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs	0% of substrate for epifaunal difish cover; mix omerged logs, cobble, or other and at stage to bization potential that are not new	40-70% m habitat; well colonizatio adequate maintel populations additional su form of newf	ptimal hix of stable I suited for full on potential; habitat for nance of ; presence of ubstrate in the fall, but not yet	20-40% mix of habitat; habitat a less than des substrate free	f stable availability irable; quently	Less than 20% stable habitat; lack of habitat is obvious; substrate	Score
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full color (i.e. snags/logs fall and no	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new t transient).	40-70% m habitat; well colonizatic adequate mainter populations additional su form of newf prepared for	ptimal nix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the fall, but not yet r colonization.	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	f stable availability irable; quently moved.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
1. Epifaunal Substrate/ Available	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full color (i.e. snags/logs fall and no	0% of substrate for epifaunal difish cover; mix omerged logs, cobble, or other and at stage to bization potential that are not new	40-70% m habitat; well colonization adequate mainter populations additional su form of newf prepared for	ptimal hix of stable   suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet r colonization.  13 12 11	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	f stable availability irable; quently moved.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	Score
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and colon colon fall and colon colon fall colon colon particles are 0-	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new ot transient).  18 17 16 e, and boulder 25% surrounded	40-70% m habitat; well colonizatic adequate mainter populations additional su form of newf prepared for 15 14 Gravel, c	ptimal hix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet r colonization.  13 12 11 obble, and	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	f stable availability irable; quently moved.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and	
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new at transient).  18 17 16 e, and boulder 25% surrounded ent. Layering of	40-70% m habitat; well colonizatic adequate mainter populations additional su form of newf prepared for 15 14  Gravel, c boulder par 50% surrou	ptimal hix of stable   suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet r colonization.  13 12 11	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	f stable availability irable; quently moved.  7 6 e, and s are 50-	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new ot transient).  18 17 16 e, and boulder 25% surrounded	40-70% m habitat; well colonizatio adequate mainter populations additional su form of newf prepared for 15 14  Gravel, c boulder par 50% surrou	ptimal nix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet r colonization. 13 12 11 obble, and ticles are 25-	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more	
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravet, cobbl particles are 0-by fine sedime cobble provides	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new at transient).  18 17 16 19, and boulder 25% surrounded ant. Layering of diversity of niche	40-70% m habitat; well colonizatic adequate maintel populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi	ptimal  ix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the fall, but not yet r colonization.  13 12 11  obble, and ticles are 25- unded by fine	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by	
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravet, cobbl particles are 0-by fine sedime cobble provides spiral four velocity.	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new at transient).  18 17 16 e., and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16	40-70% m habitat; well colonizatic adequate mainter populations additional st form of newf prepared for 15 14  Gravel, c boulder par 50% surrou sedii	ptimal hix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet r colonization. 13 12 11 obble, and ticles are 25- unded by fine ment.	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particlet 75% surrounde sedimen 10 9 8	ry al stable ryaliability irable; upently moved.  7 6 e, and s are 50- d by fine t. 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides spart 20 19 All four velocity present (slov	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to dization potential that are not new ot transient).  18 17 16 e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 le diversity of niche ace.  18 17 16 le diversity of niche ace.	40-70% m habitat; well colonizatic adequate maintel populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of th present (if fa	ptimal hix of stable suited for full on potential; habitat for nance of ; presence of abstrate in the all, but not yet r colonization.  13 12 11 obble, and ticles are 25- unded by fine ment.  13 12 11  he 4 regimes ast-shallow is	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 c. habitat t (if fast-	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides spg 20 19 All four velocity present (slov shallow, far.	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to nization potential that are not new at transient).  18 17 16 e., and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16	40-70% m habitat; well colonizatic adequate mainter populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedii 15 14 Only 3 of th present (if fa missing, sco	ptimal hix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the iall, but not yet r colonization.  13 12 11 hobble, and ticles are 25- unded by fine ment.  13 12 11 he 4 regimes ast-shallow is ore lower than	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides sp. 20 19 All four velocity present (slov shallow, fashallow) (slow is >0.6	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new at transient).  18 17 16 e.e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 ey/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).	40-70% m habitat; well colonizatic adequate mainter populations additional st form of newf prepared for 15 14  Gravel, c boulder par 50% surrou sedii  15 14  Only 3 of th present (if fa missing, scc if missing ot	ptimal hix of stable I suited for full on potential; habitat for nance of r; presence of ubstrate in the all, but not yet r colonization.  13 12 11 obble, and ticles are 25- unded by fine ment.  14 12 11 he 4 regimes ast-shallow is ore lower than her regimes).	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounder sedimen 10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, so	f stable invaliability irable; juently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow one low).	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides sp. 20 19 All four velocity present (slov shallow, fashallow) (slow is >0.6	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new at transient).  18 17 16 e.e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 ey/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is	40-70% m habitat; well colonizatic adequate mainter populations additional st form of newf prepared for 15 14  Gravel, c boulder par 50% surrou sedii  15 14  Only 3 of th present (if fa missing, scc if missing ot	ptimal hix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the iall, but not yet r colonization.  13 12 11 hobble, and ticles are 25- unded by fine ment.  13 12 11 he 4 regimes ast-shallow is ore lower than	20-40% mix of habitat; habitat a less than des substrate free disturbed or re 10 9 8 Gravel, cobbl boulder particle: 75% surrounder sedimes presen shallow or slow are missing, so:	f stable examinability irable; puently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow ore low).  7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides sp. 20 19 All four velocity present (slov shallow, fashallow) (slow is >0.6	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new at transient).  18 17 16 e.e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 ey/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).	40-70% m habitat; well colonizatic adequate mainter populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of th present (if fa missing, scc if missing of	ptimal hix of stable suited for full on potential; habitat for nance of represence of ubstrate in the all, but not yet recolonization.  13 12 11  bubble, and ticles are 25- unded by fine ment.  14 12 11  15 12 11  16 4 regimes ast-shallow is ore lower than her regimes).  15 12 11	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, soc	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 c. habitat t (if fast-shallow one low).  7 6 c. habitat t (if fast-shallow one low).	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0 Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no colonization and colonization fall four velocity present (slow shallow, fall shallow) (slow is >0.5 colonization fall fall four velocity present (slow shallow) (slow is 20 19 colonization fall fall fall fall fall fall fall fal	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new of transient).  18 17 16 e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16  y/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).  18 17 16	40-70% m habitat; well colonizatic adequate maintel populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of th present (if fa missing, scc if missing of	ptimal hix of stable I suited for full on potential; habitat for nance of r; presence of ubstrate in the all, but not yet r colonization.  13 12 11 obble, and ticles are 25- unded by fine ment.  14 12 11 he 4 regimes ast-shallow is ore lower than her regimes).	20-40% mix of habitat; habitat a less than des substrate free disturbed or re 10 9 8 Gravel, cobbl boulder particle: 75% surrounder sedimes presen shallow or slow are missing, so:	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low). 7 6 sistion of d, or fine	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score  4. Sediment	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides spirate and present (slow shallow, farshallow) (slow is 20 19 Little or no e islands or point	0% of substrate for epifaunal d fish cover; mix merged logs, cobble, or other and at stage to sization potential that are not new transient).  18 17 16 e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 y/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).  18 17 16  Inlargement of bars and <5% of	40-70% m habitat; well colonizatic adequate maintel populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrou, sedii  15 14 Only 3 of tt present (if fe missing, sco if missing of	ptimal hix of stable I suited for full on potential; habitat for nance of r; presence of ubstrate in the all, but not yet r colonization.  13 12 11  obble, and ticles are 25- unded by fine ment.  13 12 11  he 4 regimes ast-shallow is ore lower than her regimes).  13 12 11  ncrease in bar mostly from and, or fine	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, scr	ry al stable ryaliability irable; upently moved.  7 6 e, and s are 50- d by fine t. 7 6 habitat t (if fastshallow ore low).  7 6 d, or fine d, or fine and new of the	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0 Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides specific shallow, far shallow) (slow is >0.9 19 Little or no e islands or point the bottom affect	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new at transient).  18 17 16 e, and boulder 25% surrounded ent. Layering of diversity of niche ace. 18 17 16 y/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).  18 17 16  Inlargement of bars and <5% of cted by sediment	40-70% m habitat; well colonizatic adequate mainter populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of th present (if fa missing, sco if missing, sco if missing ot	ptimal hix of stable I suited for full on potential; habitat for nance of r; presence of ubstrate in the all, but not yet r colonization.  13 12 11  obble, and ticles are 25- unded by fine ment.  13 12 11  he 4 regimes ast-shallow is ore lower than her regimes).  13 12 11  norcease in bar mostly from and, or fine 5-30% of the	20-40% mix of habitat; habitat a less than des substrate free disturbed or re disturbed or re 10 9 8 Gravel, cobbl boulder particle: 75% surrounder sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, sed Moderate deponew gravel, san sediment on old bars; 30-50% bottom affected;	f stable examinability irrable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 habitat t (if fast-shallow ore low).  7 6 sistion of d, or fine and new of the sediment	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0 Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score  4. Sediment	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides specific shallow, far shallow) (slow is >0.9 19 Little or no e islands or point the bottom affect	0% of substrate for epifaunal d fish cover; mix merged logs, cobble, or other and at stage to sization potential that are not new transient).  18 17 16 e, and boulder 25% surrounded ent. Layering of diversity of niche ace.  18 17 16 y/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).  18 17 16  Inlargement of bars and <5% of	40-70% m habitat; well colonizatic adequate maintel populations additional st form of newf prepared for 15 14  Gravel, c boulder par 50% surrou sedii  15 14  Only 3 of th present (if fa missing, scc if missing ot  15 14  Some new ir formation, gravel, sa sediment; s bottom affa	ptimal hix of stable I suited for full on potential; habitat for nance of r; presence of ubstrate in the all, but not yet r colonization.  13 12 11  obble, and ticles are 25- unded by fine ment.  13 12 11  he 4 regimes ast-shallow is ore lower than her regimes).  13 12 11  ncrease in bar mostly from and, or fine	20-40% mix of habitat; habitat a less than des substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, scr	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 c. habitat t (if fast-shallow one low).  7 6 c. habitat t (if fast-shallow one low).	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0 Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom	18
1. Epifaunal Substrate/ Available Cover  Score  2. Embeddedness  Score  Velocity/Depth Regime  Score  4. Sediment	Greater than 7 favorable f colonization an of snags, sut undercut banks stable habitat allow full colon (i.e. snags/logs fall and no 20 19 Gravel, cobbl particles are 0-by fine sedime cobble provides spirate (slops shallow) (slow is shallow) (slow is shallow) (slow is slands or point the bottom affect depo	0% of substrate for epifaunal d fish cover; mix omerged logs, cobble, or other and at stage to hization potential that are not new at transient).  18 17 16 e, and boulder 25% surrounded ent. Layering of diversity of niche ace. 18 17 16 y/depth regimes w-deep, slow-st-deep, fast <0.3m/s, deep is 5 m).  18 17 16  Inlargement of bars and <5% of cted by sediment	40-70% m habitat; well colonizatic adequate maintel populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of th present (if fa missing, sco if missing, sco if missing ot  Some new ir formation, gravel, se sediment; & bottom affe depositio	ptimal  nix of stable I suited for full on potential; habitat for nance of r; presence of ubstrate in the all, but not yet r colonization.  13 12 11  obble, and ticles are 25- unded by fine ment.  13 12 11  ne 4 regimes ast-shallow is ore lower than her regimes).  13 12 11  ncrease in bar mostly from and, or fine 5-30% of the ected; slight	20-40% mix of habitat; habitat a less than das substrate free disturbed or re  10 9 8  Gravel, cobbl boulder particle: 75% surrounde sedimen  10 9 8  Only 2 of the 4 regimes presen shallow or slow are missing, so: 10 9 8  Moderate deponew gravel, san sediment on old bars; 30-50% bottom affected; deposits at obst constrictions, an moderate depo	f stable availability irable; quently moved.  7 6 e, and s are 50-d by fine t.  7 6 c habitat t (if fast-shallow ore low).  7 6 d, or fine and new of the sediment ructions, and bends; and bends; and bends;	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.  5 4 3 2 1 0  Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.  5 4 3 2 1 0  Dominated by 1 velocity/depth regime (usually slow-deep).  5 4 3 2 1 0  Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to	18



Habitat Parameter	Ontimal	Suboptimal	tion Category Marginal	Poor	Score
5. Channel Flow Status	Optimal  Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the	Very little water in channel	Score
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	17
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.	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 entirely.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	17
7. Frequency of Riffles	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distances between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	19
8. Bank Stability (score each bank) Note: Determine left or right side by facing downstream.	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)	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.	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	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 panks riparian zone)	Width of riparian zone >18 meters; human activities (i.e. parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12- 18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
		Total Score			182

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET									
Job Name/#	Glade - 20030	Sample subsorted by:	MK,NG	Watland	\				
Station ID:	Reach 3-A	Date Subsorted:	5/1/13		nc.®				
Stream Name:	The Glade	# of Grids subsorted	4	and solutions					
Date Sampled:	3/28/13	Total # of subsorted insects:	219	Total # identified:	103				
Sampling Method:	D-NET	Sample Identified by:	ABR	Date Identified:	6/26/13				
T 0 " 1 1									

Sampling Meth	ou.	D-NET		Sample Identified by:	AB		Date Identified:	6/26/1
Taxa Collecte	ed:							
	<del></del>			Metretopodidae			Lepidostomatidae	
Porifera	Spongillidae		7	Neoephemeridae			Leptoceridae	
			4	<del> </del>				<del>                                     </del>
Ostracoda	Unknown			Oligoneuridae			Limnephilidae	<b></b>
Flatworms	Tricladida		-	Psuedironidae			Molannidae	<b></b>
_	Planariidae			Polymitarcyidae			Odontoceridae	<b></b>
Gastropoda	Unknown			Potamanthidae			Philopotamidae	
Limpets	Ancylidae			Siphlonuridae			Phryganeidae	
Snails	Immature			Tricorythidae			Polycentropodidae	
	Lymnaeidae		Zygoptera	Early Instar and/or damaged			Psychomyiidae	
	Physidae			Calopterygidae			Ryacophilidae	
	Planorbidae			Coenagrionidae			Sericostomatidae	
	Hydrobiidae			Lestidae			Uenoidae	
	Pleuroceridae			Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged			Pyralidae	
Bivalvia	Immature			Aeshnidae		Coleoptera	Early Instar and/or damaged	
2.74.7.4	Corbiculidae		1	Cordulegastridae		o o.oopto.a	Chrysomelidae	
	Sphaeriidae	5	1	Corduliidae			Curculionidae	
	•	3	1					<u> </u>
Olimani	Unionidae	0.5	1	Gomphidae			Dryopidae	
Oligochaeta	Unknown	95	4	Libellulidae			Dytiscidae	<u> </u>
Lumbriculida			1	Macromiidae			Elmidae	
	Lumbriculidae			Petaluridae			Gyrinidae	
Tubificida				Cordullidae/Libelluidae			Haliplidae	
	Enchytraeidae		Plecoptera	Early Instar and/or damaged			Helodidae	
	Naididae			Capniidae			Helophoridae	
	Tubificidae			Chloroperlidae			Hydraenidae	
Haplotaxida			1	Leuctridae			Hydrochidae	
·	Haplotaxidae		1	Nemouridae			Hydrophilidae	
Leeches	Hirudinea		1	Peltoperlidae			Limnichidae	
2000.100	Erpobdellidae		1	Perlidae			Noteridae	
	Glossiphoniidae			Perlodidae			Psephenidae	
			4				· ·	<del> </del>
	Hirudinidae			Pteronarcyidae			Ptilodactylidae	<b></b>
	Pisciolidae			Taeniopeterygidae			Scirtidae	
	Branchiobdellidae		Hemiptera	Early Instar and/or damaged		Diptera	Early Instar and/or damaged	<b></b>
Copepoda	Unknown	1		Belostomatidae			Athericidae	
Decapoda	Cambaridae			Corixidae			Blephariceridae	
	Portunidae			Gelastocoridae			Canaceidae	
Shrimp				Gerridae			Ceratopogonidae	
	Palaemonidae			Hebridae			Choaboridae	
Isopoda				Hydrometridae			Chironomidae	1
·	Asellidae		1	Mesoveliidae			Culicidae	
Amphipoda				Naucoridae			Dixidae	
-FF-200	Crangonyctidae		1	Nepidae			Dolichopodidae	
	Gammaridae		1	Notonectidae			Empididae	1
			1				·	<del>- '</del>
\A/-+	Talitridae		1	Veliidae			Ephydridae M	
Water Mites			1.	Pleidae			Muscidae	
	Hydracarina		Neuroptera				Nymphomyiidae	
Ephemeroptera	Early Instar and/or damaged		1	Sisyridae			Pelecorhynchidae	
	Acanthometropodidae		Megaloptera				Psychodidae	<u> </u>
	Ameletidae			Corydalidae			Ptychopteridae	
	Baetidae		1	Sialidae			Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged			Simuliidae	
	Behningiidae		1	Branchycentridae			Stratiomyidae	
	Caenidae		1	Calamoceratidae			Syrphidae	
	Ephemerellidae		1	Glossosomatidae			Tabanidae	
			1	<u> </u>				<del>                                     </del>
	Ephemeridae		1	Goeridae			Tanyderidae	
	Heptageniidae		4	Heliicopsychidae			Thaumaleidae	<u> </u>
	Isonychiidae			Hydropsychidae			Tipulidae	
	Leptophlebiidae		J	Hydroptilida				2
TOTAL:		101	TOTAL:		0	TOTAL:		