

MEMORANDUM

TO:

Mike Rolband

FROM:

Alison Robinson

CC:

Ben Rosner, Mark Headly, Scott Petrey

RE:

Northern Virginia Stream Restoration Bank

The Glade- Design Reaches 5 and 6

Supplemental Biological Monitoring 2013 (Year 3)

WSSI #20030, Task M2a

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 5 and 6¹. However, monitoring was undertaken voluntarily in Year 3 (2013)² at biomonitoring Reaches 1-A through 1-C to better understand and document the effects of stream restoration on the benthic community within The Glade Watershed³. Field work was conducted by WSSI environmental scientists Mark Navarro, WPIT and Michael Kopansky on March, 27 2013. Benthic macroinvertebrate habitat field data sheets and benthic macroinvertebrate bench sheets for each reach are enclosed within.

Habitat results for Year 3 (Post-Construction) show that all of the biomonitoring reaches sampled in The Glade have "Optimal" habitat conditions (<u>Table 1</u>, <u>Figure 1</u>). The average habitat assessment score for all restored biomonitoring reaches assessed in 2013 is 178 (Optimal) out of 200 following restoration. These results show improved habitat conditions following restoration, with scores exceeding the pre-restoration average of 154 (Sub-Optimal) out of 200. Improved habitat assessment scores following restoration relate to the continued success of the vegetated and stabilized banks with little erosion and depositional zones present in the restored portions of the monitoring reaches, as well as the continued stability of the non-restored portions of the Glade.

The results of our data analysis indicate that the benthic macroinvertebrate community at all three biomonitoring reaches were in "Severe Stress" in 2013, based on their Stream Condition Index for Virginia Non-coastal Streams (VA-SCI)⁴ scores (<u>Table 2</u>, <u>Figure 2</u>). The average VA-SCI numerical score for all reaches assessed in 2013 is 27.16 ("Severe Stress"). The 2013 average VA-SCI score is still lower than the pre-restoration average of 34.34 ("Severe Stress"); however, the average 2013 VA-SCI score exceeds the average VA-SCI score (20.07) for the Year 2 (2012) biomonitoring.

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Biomonitoring reach locations were selected prior to the design phase; therefore, biomonitoring reaches 1-A through 1-C are located within Design Reaches 5 and 6.

² Voluntary biomonitoring was conducted in Year 2 (2012), as described in a previous memo.

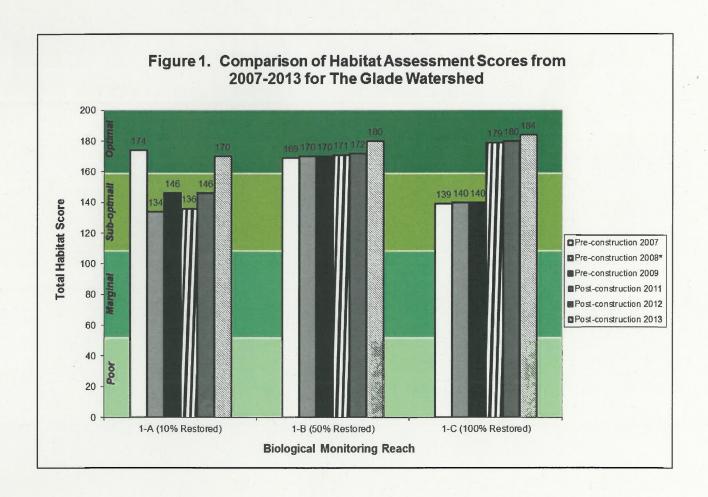
Note that Reach 1-A is 10% restored and Reach 1-B is 50% restored. Reach 1-C is the only fully restored reach in Design Reaches 5 and 6.

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

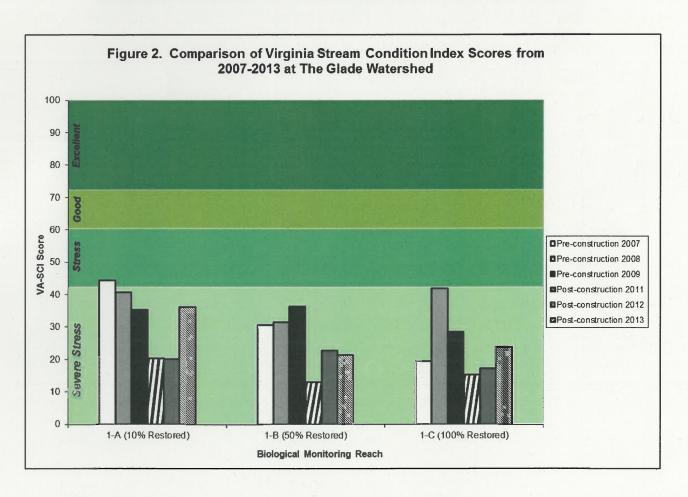
In conclusion, the results of the 2013 supplemental monitoring indicate that there has been a continued improvement of habitat scores and a slight improvement of the benthic community composition in the 2013 sampled reaches as compared to the first two years following restoration in 2011 and 2012.

Enclosures

Table 1. 2013 Total Habitat Assessment Scores							
BIOMONITORING REACH	Total Habitat	Narrative Rating					
1-A (10% Restored)	170	Suboptimal					
1-B (50% Restored)	180	Optimal					
1-C (100% Restored)	184	Optimal					
Average	178	Optimal					



	BIOLOGICAL MONITORING REACH						
WEIGHTED METRIC	1-A (10% Restored)	1-B (50% Restored)	1-C (100% Restored)				
Total Taxa	59.09	40.91	31.82				
EPT Taxa	18.18	9.09	9.09				
Percent Ephemeroptera	3.84	0.00	0.00				
Percent Plecoptera + Trichoptera (Excluding Hydropsychidae)	0.00	6.17	0.00				
Percent Scrapers	27.36	12,78	7.45				
Percent Chironomidae	51.76	18.68	41.35				
Percent Top Two Dominant	49.30	17.47	23.62				
HBI	80.28	66.26	77.35				
VA-SCI Numerical Score	36.23	21.42	23.83				
VA-SCI Narrative Score	Severe Stress	Severe Stress	Severe Stress				
Average VA-SCI Numerical Score	27.16						
Average VA-SCI Narrative Score	Severe Stress						





	Benthic	Macroiny	ertebrate	and Hab	oitat Fie	ld Data Sh	eet -	High Gradient	
Job # Task	20030	III GOI OIII V	Citobiato	una mak	onat i io	ia Data Oil		riigii Oraaiciit	
Station ID:	Reach 1-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 Bi	omonitoring	
Stream Physic	ochemical M	easurement	s						
Instrume	ent ID number:	N	I/A		pH:	N/A	_		
	Temperature:	N/A	°C	(Conductivity:	N/A	uS/cm		
Diss	solved 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	_
Benthic Macro	oinvertebra	te Collection							
Method Used:				bitat (Riffle)				ogs, Plants, etc.) X	
Riffle Quality:		Good	Х	Marginal Woody		Poor		None	_
Habitats Sampled	۱۰	Riffle	Х		Х	Ranks	x	Vegetation X	
Trabitats sampled			10	Debris	1	Dames	- 8	Vegetation X 1	_
Weather Obse	ervations	# 3 005.	10	· <u>-</u>					_
Current Weather		Cloudv		Clear	Х	Rain/Snow		Foggy	_
Recent Precipitati		Clear	Х	Showers				Storms	
Stream Flow		Low	^	Normal		Above Normal		Flood	_
Biological Obs	servations				•				_
	Periphyton	2			Salamanders	1		Other	
Fila	mentous Algae	2		War	rmwater Fish	1	•	0= Not observed	
Submerge	d Macrophytes	2		Co	oldwater Fish	0	•	1= Sparse	
Emergen	nt Macrophytes	0			Beavers	0	•	2= Common to Abundant	:
	Crayfish	0			Muskrats	0	•	3= Dominant-	
	Corbicula	0		1	Ducks/Geese	0		Abnormally high density w	nere other taxa are
	Unionidae	0			Snakes	0	_	insignificant in relation to t	
qO	perculate Snails	0					•		
- 1	ocioaiate oriano	U			Turtles	0		There can be situations wh	•
	perculate Snails	0			ogs/Tadpoles	0	•	There can be situations what are dominant such as a	•
			High Gr		ogs/Tadpoles		•		•
Non-op	perculate Snails	0		adient H	ogs/Tadpoles labitat C <u>Condi</u> t	0 Data Sheet tion Categor	У	are dominant such as a	gae and snails
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1. Epifa Substrate/ Cov 2. Embedo Velocity/ Regi	arameter aunal Available ver dedness r/Depth ime	Opt Greater than 7 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- by fine sedime cobble provides spi 20 19 All four velocity present (slov shallow) (slow is >0.3 20 19 Little or no e islands or point the bottom affer	cimal 70% of substrate for epifaunal difish cover; mix omerged logs, , cobble, or other and at stage to hization 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 <0.3m/s, deep is 5 m). 18 17 16 Inlargement of bars and <5% of cted by sediment	Adient H Subop 40-70% mil habitat; well: colonizatio adequate mainten populations; additional sul form of newfa prepared for 15 14 1 Gravel, cc boulder parti 50% surrour sedin 15 14 1 Only 3 of the present (if fa missing, scoi if missing oth Some new in formation, r gravel, sar sediment; 5	dabitat E Condition Condit	0 Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rer 10 9 8 Gravel, cobbli- boulder particles 75% surrounder sediment 10 9 8 Only 2 of the 4 regimes present shallow or slow- are missing, sct 10 9 8 Moderate depo new gravel, sam- sediment on old bars; 30-50% bottom affected;	ry al stable vallability irable; uuently moved. 7 6 e, and s are 50-d d by fine t. 7 6 habitat t (if fast-shallow ore low). 7 6 sittion of d, or fine and new of the sediment	Poor 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; pool	Score 18 17
1. Epifa Substrate/ Cov 2. Embedo Sco Velocity/ Regi	arameter aunal Available ver dedness r/Depth ime	Opt Greater than 7 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- by fine sedime cobble provides spi 20 19 All four velocity present (slov shallow) (slow is >0.3 20 19 Little or no e islands or point the bottom affer	cimal 70% of substrate for epifaunal dish 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 eydepth regimes wideep, slowist-deep, fast <0.3m/s, deep is 5 m). 18 17 16	Adient H Subop 40-70% mi habitat; well colonizatio adequate mainten populations; additional sul form of newfa prepared for 15 14 1 Gravel, cc boulder parti 50% surrour sedin 15 14 1 Only 3 of the present (if fa missing, scor if missing oth 15 14 1 Some new in formation, r gravel, sai sediment; 5 bottom affe	Iabitat E Condity Cond	0 Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rei 10 9 8 Gravel, cobbl- boulder particles 75% surrounder sediment 10 9 8 Only 2 of the 4 regimes present shallow or slow- are missing, soc 10 9 8 Moderate depo new gravel, sand sediment on old bars; 30-50% bottom affected; deposits at obsti	ry al stable vallability irable; uently moved. 7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low). 7 6 sittion of d, or fine and new of the sediment ructions,	Poor 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; pool almost absent due to	Score 18 17
1. Epifa Substrate/ Cov 2. Embedo Velocity/ Regi	arameter aunal Available ver dedness r/Depth ime	Opt Greater than 7 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- by fine sedime cobble provides spi 20 19 All four velocity present (slov shallow) (slow is >0.3 20 19 Little or no e islands or point the bottom affer	cimal 70% of substrate for epifaunal difish cover; mix omerged logs, , cobble, or other and at stage to hization 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 <0.3m/s, deep is 5 m). 18 17 16 Inlargement of bars and <5% of cted by sediment	Adient H Subop 40-70% mil habitat; well: colonizatio adequate mainten populations; additional sul form of newfa prepared for 15 14 1 Gravel, cc boulder parti 50% surrour sedin 15 14 1 Only 3 of the present (if fa missing, scoi if missing oth Some new in formation, r gravel, sar sediment; 5	Iabitat E Condity Cond	0 Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rei 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, sco 10 9 8 Moderate depo new gravel, sam sediment on old bars; 30-50% bottom affected; deposits at obst constrictions, an	stable vallability irable; uently 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, d bends;	Poor 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; pool almost absent due to substantial sediment	Score 18 17
1. Epifa Substrate/ Cov 2. Embedo Velocity/ Regin	arameter aunal Available //er dedness //Depth ime //re iment sition	Opt Greater than 7 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- by fine sedime cobble provides sp. 20 19 All four velocit present (slov shallow, fa shallow)(slow is >0.9 20 19 Little or no e islands or point the bottom affer depo	cimal 70% of substrate for epifaunal difish cover; mix omerged logs, , cobble, or other and at stage to hization 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 <0.3m/s, deep is 5 m). 18 17 16 Inlargement of bars and <5% of cted by sediment	Adient H Subop 40-70% mi habitat; well: colonization adequate mainten populations; additional sulform of newfa prepared for 15 14 1 Gravel, cc boulder parti 50% surrour sedin 15 14 1 Only 3 of the present (if fa missing, scon if missing oth 15 14 1 Some new in formation, r gravel, sar sediment; 5 bottom affe deposition	Iabitat E Condity Cond	0 Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a less than desi substrate freq disturbed or rei 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, sco 10 9 8 Moderate depo new gravel, sam sediment on old bars; 30-50% bottom affected; deposits at obstr constrictions, an moderate depo	stable vallability irable; uently 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, d bends;	Poor 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; pool almost absent due to	Score 18 17



H.I.Y. (B.		Condi	ion Category		
Habitat Parameter	Optimal	Suboptimal	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 available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channeliztion may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	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	14
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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
10. Riparian Vegetative Zone Width (score each 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	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
		Total Score			170

	WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET								
Job Name/#	Glade - 20030	Sample subsorted by:	MK	Waland					
Station ID:	Reach 1-A	Date Subsorted:	5/7/13	Studies and Solutions, It	mc.				
Stream Name:	The Glade	# of Grids subsorted	13	and Solutions	50				
Date Sampled:	3/27/13	Total # of subsorted insects:	99	Total # identified:	85				
Sampling Method:	D-NET	Sample Identified by:	ABR	Date Identified:					

Taxa Collected:

Taxa Collecte	<u>ea:</u>					-		
			-	Metretopodidae			Lepidostomatidae	
Porifera	Spongillidae			Neoephemeridae			Leptoceridae	
Ostracoda	Unknown			Oligoneuridae			Limnephilidae	
Flatworms	Tricladida			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			Calopterygidae			Ryacophilidae	
	Planorbidae	3		Coenagrionidae	2		Sericostomatidae	
	Hydrobiidae			Lestidae			Uenoidae	
	Pleuroceridae			Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged			Pyralidae	
Bivalvia	Immature		, ii iiooptoora	Aeshnidae		Coleoptera	Early Instar and/or damaged	
Divaivia	Corbiculidae			Cordulegastridae		Colcoptora	Chrysomelidae	
	Sphaeriidae	3		Corduliidae			Curculionidae	
	Unionidae	J		Gomphidae	2		Dryopidae Dryopidae	
Oligophoeto		15		· '	2			
Oligochaeta	Unknown	15		Libellulidae			Dytiscidae	-
Lumbriculida				Macromiidae			Elmidae	7
	Lumbriculidae			Petaluridae			Gyrinidae	
Tubificida				Cordullidae/Libelluidae			Haliplidae	3
	Enchytraeidae		Plecoptera	Early Instar and/or damaged			Helodidae	
	Naididae			Capniidae			Helophoridae	
	Tubificidae			Chloroperlidae			Hydraenidae	
Haplotaxida				Leuctridae			Hydrochidae	
	Haplotaxidae			Nemouridae			Hydrophilidae	
Leeches	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	2	·	Belostomatidae		·	Athericidae	
Decapoda	Cambaridae			Corixidae			Blephariceridae	
	Portunidae			Gelastocoridae			Canaceidae	
Shrimp				Gerridae			Ceratopogonidae	
Ommip	Palaemonidae			Hebridae			Choaboridae	
Isopoda	1 didefficillade			Hydrometridae			Chironomidae	41
Ізороца	Asellidae			Mesoveliidae			Culicidae	71
Amphipada	Asellidae	1		Naucoridae			Dixidae	
Amphipoda	Cranganyatidaa	ı						
	Crangonyctidae			Nepidae			Dolichopodidae	
	Gammaridae			Notonectidae			Epididae	
	Talitridae			Veliidae			Ephydridae	
Water Mites				Pleidae			Muscidae	
	Hydracarina		Neuroptera				Nymphomyiidae	
Ephemeroptera	Early Instar and/or damaged			Sisyridae			Pelecorhynchidae	
	Acanthometropodidae		Megaloptera				Psychodidae	
	Ameletidae			Corydalidae			Ptychopteridae	
	Baetidae			Sialidae			Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged			Simuliidae	
	Behningiidae			Branchycentridae			Stratiomyidae	
	Caenidae			Calamoceratidae			Syrphidae	
	Ephemerellidae			Glossosomatidae			Tabanidae	
	Ephemeridae			Goeridae			Tanyderidae	
	Heptageniidae	2		Heliicopsychidae			Thaumaleidae	
	Isonychiidae			Hydropsychidae	3		Tipulidae	1
	Leptophlebiidae			Hydroptilida				52
TOTAL:		26	TOTAL:	, .i	7	TOTAL:		
I O I AL.		_0			· '			



Benthio	: Macroinve	ertebrate	and Ha	bitat Fie	ld Data Sh	neet -	High Gradient	
Job # Task 20030	Madionite	, tobrate	ana na	Ditat i io	ia Data Oi	1001	riigii Ordalont	
Station ID: Reach 1-B	E	coregion:	Piedmont		Land Use:	Urban		
Field Team: MN/MK	L	ocation:	Reston, VA		Start time:			
Site: The Glade	L	atitude:			Finish time:			
Date: 3/27/2013	L	ongitude:			Survey Reason:	Year 4 Bi	omonitoring	
Stream Physiochemical I	Measurements							
Instrument ID numbe				pH:	N/A	_		
Temperature	e: <u>N/A</u> °	С		Conductivity:	N/A	uS/cm		
Dissolved Oxyger	n: <u>N/A</u> n	ng/L			ment pass all pos			i
Benthic Macroinvertebra	ate Collection				h parameter(s) fa	iled and a	oction taken: N/A	
Method Used:			oitat (Riffle)		Multi H	labitat (Lo	gs, Plants, etc.) X	
Riffle Quality:	Good _	Х			Poor		None	•
Habitate Campled	D:fflo	v	Woody		Danks	v	Vagatation	
Habitats Sampled:		X 17	Debris		Banks	X 3	Vegetation	•
Weather Observations	# Jabs:	1/	· -		•			•
Current Weather	Cloudy		Clear	Х	Rain/Snow		Foggy	
Recent Precipitation	Clear	Х	Showers				Storms	•
Stream Flow	Low		Normal	Х	Above Normal		Flood	•
Biological Observations							· · · · · · · · · · · · · · · · · · ·	·
Periphyto	n 0			Salamanders	0	_	Other	
Filamentous Alga	e 3		Wa	rmwater Fish	0	-	0= Not observed	
Submerged Macrophyte	s 2		С	oldwater Fish	0	_	1= Sparse	
Emergent Macrophyte	s 0			Beavers	0	_	2= Common to Abundant	
Crayfis	h0			Muskrats	0	_	3= Dominant-	
Corbicul	a <u> </u>			Ducks/Geese	0	_	Abnormally high density who	ere other taxa are
Unionida	e <u> </u>			Snakes	0	_	insignificant in relation to the	
Operculate Snai				Turtles		-	There can be situations whe are dominant such as alg	
Non-operculate Snai	s 0			ogs/Tadpoles	0		are deminant such as any	ac and shans
		nigh Gr	acient r		ata Sheet			
Habitat Parameter	Opti	mal	Subo	ptimal	tion Categor Margin		Poor	Score
	Greater than 70			nix of stable	wa giri	ui	1 001	00010
	favorable fo			suited for full				
1. Epifaunal	colonization and of snags, subr	· ·	colonizatio	on potential;				
Substrate/ Available					20-40% mix of		Less than 20% stable	
	undercut banks,		adequate	habitat for nance of	20-40% mix of habitat; habitat a less than des	vailability	habitat; lack of habitat is	
I Cover	undercut banks, stable habitat a	cobble, or other and at stage to	adequate mainte populations	habitat for nance of ; presence of	habitat; habitat a less than des substrate freq	vailability irable; juently	habitat; lack of habitat is obvious; substrate	
Cover	undercut banks, stable habitat a allow full colonia	cobble, or other and at stage to zation potential	adequate mainte populations additional su	habitat for nance of presence of ubstrate in the	habitat; habitat a less than des	vailability irable; juently	habitat; lack of habitat is	
	undercut banks, stable habitat a	cobble, or other and at stage to zation potential hat are not new	adequate mainte populations additional su form of newf	habitat for nance of ; presence of	habitat; habitat a less than des substrate freq	vailability irable; juently	habitat; lack of habitat is obvious; substrate	
Cover Score	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1	cobble, or other and at stage to exation potential that are not new transient).	adequate mainte populations additional su form of newf prepared for	habitat for nance of ; presence of ubstrate in the all, but not yet	habitat; habitat a less than des substrate freq disturbed or re	vailability irable; juently	habitat; lack of habitat is obvious; substrate	18
	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble	cobble, or other and at stage to cation potential that are not new transient). 8 17 16 and boulder	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c	habitat for nance of ; presence of ubstrate in the all, but not yet r colonization. 13 12 11 obble, and	habitat; habitat a less than des substrate freq disturbed or re	vailability irable; juently moved.	habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0 Gravel, cobble, and	18
	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1	cobble, or other and at stage to cation potential hat are not new transient). 8 17 16 , and boulder 5% surrounded	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par	habitat for nance of ; presence of ubstrate in the all, but not yet r colonization. 13 12 11 obble, and ticles are 25-	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl- boulder particles	vailability irable; juently moved. 7 6 e, and s are 50-	habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0 Gravel, cobble, and boulder particles are more	18
Score	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs ti fall and not 20 19 1 Gravel, cobble particles are 0-2: by fine sedimer cobble provides of	cobble, or other at stage to cation potential hat are not new transient). 8 17 16 , and boulder 5% surrounded ht. Layering of diversity of niche	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou	habitat for nance of ; presence of ubstrate in the all, but not yet r colonization. 13 12 11 obble, and	habitat; habitat a less than des substrate freq disturbed or re	vailability irable; quently moved. 7 6 e, and s are 50-d by fine	habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0 Gravel, cobble, and	18
Score 2. Embeddedness	undercut banks, stable habitat a allow full colonia (i.e. snags/logs ti fall and not 20 19 1 Gravel, cobble particles are 0-2 by fine sedimer cobble provides cospace	cobble, or other at stage to cation potential hat are not new transient). 8 17 16 , and boulder 5% surrounded ht. Layering of diversity of niche	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi	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.	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl boulder particles 75% surrounde	vailability irable; puently 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	
Score	undercut banks, stable habitat a allow full colonia (i.e. snags/logs ti fall and not 20 19 1 Gravel, cobble particles are 0-2 by fine sedimer cobble provides cospace	cobble, or other at stage to cation potential hat are not new transient). 8 17 16 , and boulder 5% surrounded ht. Layering of diversity of niche ce. 8 17 16	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi	habitat for nance of ; presence of Jubstrate in the all, but not yet r colonization. 13 12 11 obble, and ticles are 25- unded by fine ment.	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl- boulder particles 75% surrounde- sedimen 10 9 8	vailability irable; juently 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 fine sediment.	18 17
Score 2. Embeddedness Score	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-2: by fine sediment cobble provides cobble provides cobble 20 19 1 All four velocity/present (slow	cobble, or other at stage to zation potential hat are not new transient). 8 17 16, and boulder 5% surrounded ht. Layering of diversity of niche ce. 8 17 16 depth regimes deep, slow-	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	habitat for nance of ; presence of Jostrate in the all, but not yet r colonization. 13 12 11 obble, and ticles are 25- unded by fine ment.	habitat; habitat a less than des substrate freq disturbed or rei disturbed	vailability irable; puently moved. 7 6 e, and s are 50-d by fine t. 7 6 habitat	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	
Score 2. Embeddedness Score Velocity/Depth	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-25 by fine sedimer cobble provides cobble provide	cobble, or other at stage to cation potential hat are not new transient). 8 17 16, and boulder 5% surrounded ht. Layering of diversity of niche ce. 8 17 16 (depth regimes deep, slow-deep, fast	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of the present (if fremissing, second populations).	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. 13 12 11 ne 4 regimes ast-shallow is ore lower than	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl boulder particles 75% surrounde sedimen 10 9 8 Only 2 of the 4 regimes presen 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 Dominated by 1 velocity/depth regime	
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Score 2. Embeddedness Score Velocity/Depth	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-25 by fine sedimer cobble provides cobble provide	cobble, or other at stage to cation potential hat are not new transient). 8 17 16, and boulder 5% surrounded at. Layering of diversity of niche ce. 8 17 16 depth regimes deep, slow-deep, fast co.3m/s, deep is	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrous edit Only 3 of the present (if famissing, soci if missing of	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. 13 12 11 ne 4 regimes ast-shallow is ore lower than	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl- boulder particles 75% surrounde- sedimen 10 9 8 Only 2 of the 4 regimes presen- shallow or slow are missing, sco	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 Dominated by 1 velocity/depth regime	
Score 2. Embeddedness Score Velocity/Depth Regime	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-25 by fine sedimer cobble provides cobble provide	cobble, or other at stage to cation potential hat are not new transient). 8 17 16, and boulder 5% surrounded at. Layering of diversity of niche ce. 8 17 16 depth regimes deep, slow-deep, fast co.3m/s, deep is m).	adequate mainte populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrot sedi 15 14 Only 3 of the present (if famissing, scc if missing of 15 14	habitat for nance of types and the habitat for nance of types and the hall, but not yet of colonization. 13 12 11 obble, and ticles are 25-unded by fine ment. 13 12 11 ne 4 regimes ast-shallow is one lower than her regimes). 13 12 11	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl-boulder particles 75% surrounder sedimen 10 9 8 Only 2 of the 4 regimes present shallow or slow are missing, soc 10 9 8 Moderate depo	vailability irable; puently 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	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	17
Score 2. Embeddedness Score Velocity/Depth Regime Score	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-25 by fine sedimer cobble provides cobble provide	cobble, or other and at stage to zation potential hat are not new transient). 8 17 16, and boulder 5% surrounded at. Layering of diversity of niche 3e. 8 17 16 depth regimes -deep, slow-deep, fast co.3m/s, deep is m). 8 17 16	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of the present (if famissing, soci if missing of 15 14 Some new in 3 14	habitat for nance of ; presence of Jubstrate in the all, but not yet or 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).	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl- boulder particles 75% surrounde- sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, sco	vailability irable; puently 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	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	17
Score 2. Embeddedness Score Velocity/Depth Regime	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-20 by fine sedimer cobble provides cospared 20 19 1 All four velocity/ present (slow shallow, fast shallow)(slow is shallow)(slow is shallow) (slow is shallo	cobble, or other at stage to cation potential hat are not new transient). 8 17 16, and boulder 5% surrounded ht. Layering of diversity of niche ce. 8 17 16 depth regimes deep, slow-deep, fast co.3m/s, deep is m). 8 17 16 largement of the cars and <5% of	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrous edi 15 14 Only 3 of th present (if firmissing, scc if missing, scc if missing ot 15 14 Some new in formation, gravel, sa	habitat for nance of ; presence of jubstrate in the all, but not yet r colonization. 13 12 11 obble, and ticles are 25- anded by fine ment. 13 12 11 ne 4 regimes asst-shallow is ore lower than her regimes). 13 12 11	habitat; habitat a less than des substrate freq disturbed or rei disturbed or sedimen disturbed or sedimen disturbed or slow are missing, scot disturbed or solow are missing, scot disturbed or solow are missing, scot disturbed or solow are sediment on old bars; 30-50%	vailability 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 sition 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	17
Score 2. Embeddedness Score Velocity/Depth Regime Score	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-20 by fine sedimer cobble provides cobble provide	cobble, or other and at stage to cation potential hat are not new transient). 8 17 16 7, and boulder 5% surrounded the Layering of diversity of niche cate. 8 17 16 Glepth regimes deep, slow-deep, fast co.3m/s, deep is m). 8 17 16 largement of pars and <5% of ed by sediment	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrous edi 15 14 Only 3 of the present (if famissing, soci if missing of 15 14 Some new in formation, gravel, se sediment; 5	habitat for nance of ; presence of jubstrate 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	habitat; habitat a less than des substrate freq disturbed or rei disturbed or sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, sct 10 9 8 Moderate depo new gravel, san sediment on old bars; 30-50% bottom affected;	vailability 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 sittin 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	17
Score 2. Embeddedness Score Velocity/Depth Regime Score 4. Sediment	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-20 by fine sedimer cobble provides cospared 20 19 1 All four velocity/ present (slow shallow, fast shallow)(slow is shallow)(slow is shallow) (slow is shallo	cobble, or other and at stage to cation potential hat are not new transient). 8 17 16 7, and boulder 5% surrounded the Layering of diversity of niche cate. 8 17 16 Glepth regimes deep, slow-deep, fast co.3m/s, deep is m). 8 17 16 largement of pars and <5% of ed by sediment	adequate mainte populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrot sedi 15 14 Only 3 of the present (if famissing, scc if missing of 15 14 Some new in formation, gravel, se sediment; t bottom affer	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. 13 12 11 ne 4 regimes ast-shallow is one lower than her regimes). 13 12 11 ncrease in bar mostly from and, or fine 5-30% of the ected; slight	habitat; habitat a less than des substrate freq disturbed or rei 10 9 8 Gravel, cobbl-boulder particles 75% surrounder sedimen 10 9 8 Only 2 of the 4 regimes present shallow or slow are missing, scc 10 9 8 Moderate deponew gravel, san sediment on old bars; 30-50% bottom affected; deposits at obst	vailability irable; puently 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,	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	17
Score 2. Embeddedness Score Velocity/Depth Regime Score 4. Sediment	undercut banks, stable habitat a allow full coloniz (i.e. snags/logs the fall and not 20 19 1 Gravel, cobble particles are 0-2: by fine sedimer cobble provides of space 20 19 1 All four velocity/ present (slow shallow, fast shallow)(slow is < >0.5 20 19 1 Little or no en islands or point be the bottom affect depos	cobble, or other and at stage to cation potential hat are not new transient). 8 17 16 7, and boulder 5% surrounded the Layering of diversity of niche cate. 8 17 16 Glepth regimes deep, slow-deep, fast co.3m/s, deep is m). 8 17 16 largement of pars and <5% of ed by sediment	adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of the present (if famissing, soci if missing of 15 14 Some new in formation, gravel, se sediment; & bottom affideposition additional forms additional forms and the properties of the properties	habitat for nance of ; presence of jubstrate 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	habitat; habitat a less than des substrate freq disturbed or rei disturbed or sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, sct 10 9 8 Moderate depo new gravel, san sediment on old bars; 30-50% bottom affected;	vailability 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 sition of d, or fine and new of the sediment ructions, d 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	17



Habitat Daws		Condi	tion Category		
Habitat Parameter	Optimal	Suboptimal	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 available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	18
6. Channel Alteration	Channelization or dredging absent or minimal; stream width normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging, may be present, but recent channelization is not present.	Channeliztion may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
Score	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	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	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	9
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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
Score Left Bank	10 9	8 7 6	5 4 3	2 1 0	10
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
10. Riparian Vegetative Zone Width (score each 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	9
Score Right Bank	10 9	8 7 6	5 4 3	2 1 0	10
		Total Score			180

	WSSI BENTHIC	MACROINVERTEBRA	TE BENCH SHE	ET	
Job Name/#	Glade - 20030	Sample subsorted by:	MK	Watland	\
Station ID:	Reach 1-B	Date Subsorted:	9/26/12	Studies and Solutions, 1	nc.
Stream Name:	The Glade	# of Grids subsorted	9	and Solutions	
Date Sampled:	3/27/13	Total # of subsorted insect	s: 101	Total # identified:	91
Sampling Method:	D-NET	Sample Identified by:	ABR	Date Identified:	

				Metretopodidae		Lepidostomatidae	l
Porifera	Spongillidae			Neoephemeridae		Leptoceridae	
stracoda	Unknown		1	Oligoneuridae		Limnephilidae	2
atworms	Tricladida			Psuedironidae		Molannidae	
	Planariidae			Polymitarcyidae		Odontoceridae	
astropoda	Unknown		1	Potamanthidae		Philopotamidae	
mpets	Ancylidae		1	Siphlonuridae		Phryganeidae	
nails	Immature		1	Tricorythidae		Polycentropodidae	
	Lymnaeidae		Zygoptera	Early Instar and/or damaged		Psychomyiidae	
	Physidae		_,90010.4	Calopterygidae		Ryacophilidae	
	Planorbidae			Coenagrionidae		Sericostomatidae	
	Hydrobiidae			Lestidae		Uenoidae	
	Pleuroceridae			Protoneuridae	Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged	Lopidoptora	Pyralidae	
valvia	Immature		Anisopteera	Aeshnidae	Coleoptera	Early Instar and/or damaged	
vaivia					Coleoptera		
	Corbiculidae			Cordulegastridae		Chrysomelidae	-
	Sphaeriidae		!	Corduliidae Gomphidae		Curculionidae	<u> </u>
igoobooto	Unionidae	0		<u>'</u>		Dryopidae Dutinoidae	4
igochaeta	Unknown	3	ł l	Libellulidae Magramiidae		Dytiscidae	1
ımbriculida	Lumbriaulidaa		ł l	Macromiidae Petaluridae		Elmidae	6
	Lumbriculidae					Gyrinidae	
ubificida				Cordullidae/Libelluidae		Haliplidae	
	Enchytraeidae		Plecoptera	Early Instar and/or damaged		Helodidae	
	Naididae			Capniidae		Helophoridae	
	Tubificidae			Chloroperlidae		Hydraenidae	
aplotaxida				Leuctridae		Hydrochidae	
	Haplotaxidae			Nemouridae		Hydrophilidae	
eeches	Hirudinea			Peltoperlidae		Limnichidae	
	Erpobdellidae			Perlidae		Noteridae	
	Glossiphoniidae			Perlodidae		Psephenidae	
	Hirudinidae			Pteronarcyidae		Ptilodactylidae	
	Pisciolidae			Taeniopeterygidae		Scirtidae	
ranchiobdellida	Branchiobdellidae		Hemiptera	Early Instar and/or damaged	Diptera	Early Instar and/or damaged	
opepoda	Unknown			Belostomatidae		Athericidae	
ecapoda	Cambaridae			Corixidae		Blephariceridae	
	Portunidae		1	Gelastocoridae		Canaceidae	
nrimp			1	Gerridae		Ceratopogonidae	1
	Palaemonidae		1	Hebridae		Choaboridae	
opoda			1	Hydrometridae		Chironomidae	74
	Asellidae		1	Mesoveliidae		Culicidae	
mphipoda		1	1	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			Sisyridae		Pelecorhynchidae	
	Acanthometropodidae		Megaloptera	,		Psychodidae	
	Ameletidae		. 3 24.2.0	Corydalidae		Ptychopteridae	
	Baetidae		1	Sialidae		Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged		Simuliidae	1
	Behningiidae		Попориста	Branchycentridae		Stratiomyidae	<u>'</u>
	Caenidae		1	Calamoceratidae		Syrphidae Syrphidae	
			1	Glossosomatidae		Syrpnidae Tabanidae	
	Ephemerellidae						
	Ephemeridae			Goeridae		Tanyderidae	
	Heptageniidae			Heliicopsychidae		Thaumaleidae	
	Isonychiidae			Hydropsychidae		Tipulidae	2
	Leptophlebiidae			Hydroptilida			87



	: Macroinv	ertebrate	and Ha	bitat Fie	ld Data Sr	neet -	High Gradient	
Job # Task 20030								
Station ID: Reach 1-C		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 Physiochemical I	Measurement	S						
Instrument ID numbe		I/A	•	pH:	N/A	_		
Temperature		°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	-
				If NO- whic	h parameter(s) fa	iled and a	ction taken: N/A	•
Benthic Macroinvertebra	ate Collection							
Method Used:		_	bitat (Riffle)		ļ.		gs, Plants, etc.) X	-
Riffle Quality:	Good	X			Poor		None	-
Habitata Camulad.	D:ffl-	V	Woody		Damlin		Vacatation V	
Habitats Sampled:		X	Debris		Banks		Vegetation X	-
Weather Observations	# Jabs:	18	. <u>-</u>				2	-
Current Weather	Classia		Cl	V	Do:- /C		Γοσ - :	-
				Х	1		Foggy	•
Recent Precipitation		X			Rain		Storms	•
Stream Flow Biological Observations	Low	X	Normal		Above Normal	-	Flood	•
Periphyto	n 1			Calamanda	1		Other	
		•	\A/a	Salamanders	1	-		
Filamentous Alga		•		rmwater Fish	0	-	0= Not observed	
Submerged Macrophyte			C	oldwater Fish		-	1= Sparse	
Emergent Macrophyte				Beavers		-	2= Common to Abundant	
Crayfis		•		Muskrats	0	-	3= Dominant-	
Corbicul		•		Ducks/Geese		-	Abnormally high density wh	
Unionida		ī		Snakes		-	insignificant in relation to th There can be situations who	
Operculate Snai	_	•		Turtles	0		are dominant such as alg	•
			г.	oge/Todpoles	0		are dominant such as alg	gae and snails
Non-operculate Snail	5 0	High Cr		ogs/Tadpoles	0 Note Sheet		are dominant such as alg	gae and snails
Non operculate stidil	5 0	High Gr		labitat D	ata Sheet		are dominiant such as alg	gae and snails
Habitat Parameter			adient l	labitat E <u>Condi</u>	oata Sheet	<u>y</u>		
	Opt	timal	adient l	labitat E Condit ptimal	ata Sheet	<u>y</u>	Poor	Score
	Opt	timal 70% of substrate	Subo	Conditat C Conditation	oata Sheet	<u>y</u>		
Habitat Parameter	Opt Greater than 7 favorable	timal	Subo 40-70% m habitat; well	labitat E Condit ptimal	oata Sheet	r <u>y</u> al	Poor	
Habitat Parameter 1. Epifaunal	Opti Greater than 7 favorable colonization ar of snags, su	timal 70% of substrate for epifaunal and fish cover; mix bmerged logs,	Subo 40-70% m habitat; well colonizatio adequate	Condite ptimal pix of stable suited for full on potential; habitat for	Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a	stable availability		
Habitat Parameter 1. Epifaunal Substrate/ Available	Greater than 7 favorable colonization ar of snags, su undercut banks	timal 70% of substrate for epifaunal id fish cover; mix bmerged logs, s, cobble, or other	Subo 40-70% m habitat; well colonizatic adequate mainte	Conditor ptimal ix of stable suited for full on potential; habitat for nance of	Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a less than des	stable availability irable;	Poor Less than 20% stable habitat; lack of habitat is obvious; substrate	
Habitat Parameter 1. Epifaunal	Opt Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat	timal 70% of substrate for epifaunal and fish cover; mix bmerged logs,	Subo 40-70% m habitat; well colonizatic adequate mainte populations	Condite ptimal pix of stable suited for full on potential; habitat for	Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a	al stable evailability irable; quently	Poor Less than 20% stable habitat; lack of habitat is	
Habitat Parameter 1. Epifaunal Substrate/ Available	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs	timal 70% of substrate for epifaunal nd fish cover; mix bmerged logs, s, cobble, or other and at stage to nization potential at that are not new	Subo 40-70% rr habitat; well colonizatic adequate mainte populations additional st form of newf	Tabitat I Condition Condition ptimal iix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet	Data Sheet tion Categor Margin 20-40% mix of habitat; habitat a less than des substrate fred	al stable evailability irable; quently	Poor Less than 20% stable habitat; lack of habitat is obvious; substrate	
Habitat Parameter 1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and no	timal 70% of substrate for epifaunal ad fish cover; mix bmerged logs, s, cobble, or other and at stage to nization potential at that are not new ot transient).	Subo 40-70% rr habitat; well colonizatic adequate mainte populations additional st form of newf prepared for	Tabitat I Condition Condition ptimal aix of stable suited for full on potential; habitat for nance of ; presence of ubstrate in the all, but not yet r colonization.	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	stable evailability irable; uently moved.	Poor Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	Score
Habitat Parameter 1. Epifaunal Substrate/ Available	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19	timal 70% of substrate for epifaunal and fish cover; mix bmerged logs, s, cobble, or other and at stage to nization potential at that are not new of transient). 18 17 16	Subo 40-70% m habitat; well colonizatic adequate mainte populations additional st form of newf prepared for 15 14	Condite the suited for full in potential; habitat for nance of presence of ubstrate in the all, but not yet colonization.	Data Sheet ion Categor Margin 20-40% mix of habitat; habitat de less than des substrate free disturbed or re	stable availability irable; puently moved.	Poor Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobb	timal 70% of substrate for epifaunal ad fish cover; mix bmerged logs, s, cobble, or other and at stage to nization potential at that are not new ot transient).	Subo 40-70% rr habitat; well colonizatic adequate mainte populations additional st form of newf prepared for 15 14 Gravel, c	Tabitat C Condition of the condition of	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	al stable svailability irable; quently moved.	Poor Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0 Gravel, cobble, and	Score
Habitat Parameter 1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and color fall and color fall and color fall color fa	timal 70% of substrate for epifaunal and fish cover; mix brmerged logs, s, cobble, or other and at stage to nization potential that are not new ot transient). 18 17 16 le, and boulder 25% surrounded ent. Layering of	Subo 40-70% rr habitat; well colonizatic adequate mainte populations additional st form of newf prepared for 15 14 Gravel, c boulder page 50% surron	Condite the suited for full in potential; habitat for nance of presence of ubstrate in the all, but not yet colonization.	Data Sheet ion Categor Margin 20-40% mix of habitat; habitat de less than des substrate free disturbed or re	al stable vailability irable; juently moved. 7 6 e, and s are 50-	Poor Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	Score
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobb particles are 0-by fine sedim cobble provides	timal 70% of substrate for epifaunal and fish cover; mix brierged logs, s, cobble, or other and at stage to nization potential at that are not new but transient). 18 17 16 le, and boulder -25% surrounded ent. Layering of a diversity of niche	Subo 40-70% m habitat; well colonizatic adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou	Tabitat E Condition C	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	al stable vailability irable; juently moved. 7 6 e, and s are 50-d by fine	Poor 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	Score
1. Epifaunal Substrate/ Available Cover	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobb particles are 0-by fine sedim cobble provides sp	timal 70% of substrate for epifaunal and fish cover; mix brmerged logs, s, cobble, or other and at stage to nization potential that are not new ot transient). 18 17 16 le, and boulder 25% surrounded ent. Layering of	Adient F Subo 40-70% m habitat; well colonizatic adequate mainte populations additional su form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi	Condity Con	20-40% mix of habitat; habitat a less than des substrate free disturbed or re	al stable vailability irable; juently moved. 7 6 e, and s are 50-d by fine	Poor 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	Score 18
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and nc 20 19 Gravel, cobb particles are 0-by fine sedim cobble provides sp 20 19	timal 70% of substrate for epifaunal and fish cover; mix brierged logs, s, 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 diversity of niche ace.	Subo 40-70% m habitat; well colonizatic adequate mainte populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi	Condite ptimal ix of stable suited for full on potential; habitat for nance of; presence of ubstrate in the all, but not yet of colonization. 13 12 11 otble, 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 sta	Poor 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.	Score
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and no 20 19 Gravel, cobb particles are 0-by fine sedim cobble provides sp. 20 19 All four velocit present (slo	timal 70% of substrate for epifaunal and fish cover; mix bmerged logs, s, cobble, or other and at stage to nization potential at that are not new but transient). 18 17 16 18, and boulder 25% surrounded at diversity of niche ace. 18 17 16 19/depth regimes w-deep, slow-	Subo 40-70% rr habitat; well colonizatic 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	Condite ptimal in a suited for full on potential; habitat for nance of ; presence of abstrate in the all, but not yet reclonization. 13 12 11 obble, and ticles are 25-unded by finement.	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 Only 2 of the 4	r stable vailability irrable; puently moved. 7 6 e, and s are 50-d by fine t. 7 6 habitat	Poor 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	Score
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedimic cobble provides sp. 20 19 All four velocit present (slo shallow, fa	timal 70% of substrate for epifaunal d fish cover; mix bmerged logs, c, 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 lydepth regimes w-deep, slow- st-deep, fast	Subo 40-70% rr habitat; well colonizatic adequate mainte populations form of newf prepared for 15 14 Gravel, c boulder par 50% surrot sedi 15 14 Only 3 of tt present (if fa	Condite ptimal ix of stable suited for full on potential; habitat for nance of; presence of ubstrate in the all, but not yet of colonization. 13 12 11 otble, 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 examinability irrable; juently moved. 7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-	Poor 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	Score 18
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedime cobble provides 20 19 All four velocit present (slo shallow) (slow is shallow) (sl	timal 70% of substrate for epifaunal ad fish cover; mix brieged 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 s <0.3m/s, deep is	Subo 40-70% m habitat; well colonizatic adequate mainte populations 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	Condinate Condin	20-40% mix of habitat; 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	ry al stable valiability irable; juently moved. 7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow	Poor 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	Score 18
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth Regime	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedime cobble provides 20 19 All four velocit present (slo shallow) (slow is >0.	timal 70% of substrate for epifaunal ad fish cover; mix brieged 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 s diversity of niche ace. 18 17 16 y/depth regimes w-deep, slow- st-deep, fast s <0.3m/s, deep is 5 m).	Subo 40-70% m habitat; well colonizatic 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 fa missing, scc if missing ot	Conditive primal part of the process	20-40% mix of habitat; habitat; habitat a less than des substrate free disturbed or re 10 9 8 Gravel, cobbl boulder particlet 75% surrounde sedimen 10 9 8 Only 2 of the 4 regimes presen shallow or slow are missing, so	ry al stable vailability irable; uently moved. 7 6 e, and s are 50- d by fine t. 7 6 habitat t (if fastshallow ore low).	Poor 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 19
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedime cobble provides 20 19 All four velocit present (slo shallow) (slow is >0.	timal 70% of substrate for epifaunal ad fish cover; mix brieged 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 s <0.3m/s, deep is	Subo 40-70% m habitat; well colonizatic 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 fa missing, scc if missing ot	Conditional Description of the Interest of the	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	ry al stable vallability irrable; puently moved. 7 6 e, and s are 50-d d by fine t. 7 6 habitat t (if fast-shallow ore low). 7 6	Poor 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	Score
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth Regime	Greater than 7 favorable 1 favorable 20 olivation ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedim cobble provides sp 20 19 All four velocit present (slo shallow) (slow is >0. 20 19	timal 70% of substrate for epifaunal and fish cover; mix brierged logs, s, 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- sist-deep, fast s <0.3m/s, deep is 5 m). 18 17 16	Adient F Subo 40-70% m habitat; well colonizatic 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, soc if missing ot 15 14 Some new in	Conditional Desired Primary Conditional District Format Conditional Desired Primary Conditional Condit	20-40% mix of habitat; 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, sec	ry al stable examinability irrable; juently moved. 7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low). 7 6 sittion of d, or fine	Poor 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	18 19
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth Regime Score	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedim cobble provides spand 20 19 All four velocit present (slo shallow) (slow is >0. 20 19	timal 70% of substrate for epifaunal and fish cover; mix brierged logs, s, 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 diversity of niche ace. 18 17 16 ly/depth regimes w-deep, slow- st-deep, fast s < 0.3m/s, deep is 5 m). 18 17 16 leenlargement of	Adient F Subo 40-70% m habitat; well colonizatic adequate mainte populations 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 ot 15 14 Some new in formation,	Conditional Description of the Increase in bar mostly from	20-40% mix of habitat; 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	r stable valiability irable; juently 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	Poor 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	18 19
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth Regime Score 4. Sediment	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedimic cobble provides SD 20 19 All four velocit present (slo shallow) (slow is >0. 20 19	timal 70% of substrate for epifaunal dish cover; mix brief begin and at stage to nization potential that are not new ot transient). 18 17 16 19 18 17 16 19 19 19 19 19 19 19 19 19 19 19 19 19 1	Adient I Subo 40-70% m habitat; well colonizatic 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 ot 15 14 Some new in formation, gravel, sa	Condity ptimal nix of stable suited for full on potential; habitat for nance of ; presence of ribstrate in the all, but not yet reolonization. 13 12 11 obble, and ticles are 25- anded 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	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 Only 2 of the 4 regimes presen shallow or slow are missing, soc 10 9 8 Moderate deponew gravel, san sediment on old bars; 30-50%	ry al stable evailability 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 d, or fine and new of the	Poor 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 19
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth Regime Score	Greater than 7 favorable colonization and favorable toolonization are of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedimic cobble provides spanding fall and not 20 19 All four velocit present (slo shallow) (slow is >0. 20 19 Little or no e islands or point the bottom affer	timal 70% of substrate for epifaunal and fish cover; mix brierged logs, s, 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 diversity of niche ace. 18 17 16 ly/depth regimes w-deep, slow- st-deep, fast s < 0.3m/s, deep is 5 m). 18 17 16 leenlargement of	Adient I Subo 40-70% m habitat; well colonizatic adequate mainte populations additional st form of newf prepared for 15 14 Gravel, c boulder par 50% surrou sedi 15 14 Only 3 of tt present (if fe missing, scc if missing, scc if missing ot 15 14	Conditional Description of the Increase in bar mostly from	20-40% mix of habitat; 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	ry al stable vailability irable; uently moved. 7 6 e, and s are 50- d by fine t. 7 6 habitat t (if fast- shallow ore low). 7 6 sittion of d, or fine and new of the sediment	Poor 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 19
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth Regime Score 4. Sediment	Greater than 7 favorable colonization and favorable toolonization are of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedimic cobble provides spanding fall and not 20 19 All four velocit present (slo shallow) (slow is >0. 20 19 Little or no e islands or point the bottom affer	timal 70% of substrate for epifaunal and fish cover; mix bringed logs, cobble, or other and at stage to nization potential that are not new of transient). 18 17 16 18 17 16 18 17 16 18 17 16 19 diversity of niche ace. 18 17 16 25 w-deep, slow-st-deep, fast a co.3m/s, deep is 5 m). 18 17 16 20 enlargement of bars and 45% of cted by sediment	Adient I Subo 40-70% m habitat; well colonizatic adequate mainte populations form of newf prepared for 15 14 Gravel, c boulder par 50% surrot sedi 15 14 Only 3 of th present (if fa missing, scc if missing ot 15 14 Some new in formation, gravel, sa sediment; t bottom affe	Condity ptimal ix of stable suited for full on potential; habitat for nance of; presence of obstrate 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 asst-shallow is one lower than ther regimes). 13 12 11 oncrease in bar mostly from and, or fine 5-30% of the	20-40% mix of habitat; habitat; 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 particle: 10 9 8 Moderate deponew gravel, san sediment on old bars; 30-50% bottom affected; deposits at obst constrictions, and	ry al stable restable; res	Poor 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 substantial sediment	18 19
1. Epifaunal Substrate/ Available Cover Score 2. Embeddedness Score Velocity/Depth Regime Score 4. Sediment	Greater than 7 favorable colonization ar of snags, su undercut banks stable habitat allow full color (i.e. snags/logs fall and not 20 19 Gravel, cobb particles are 0-by fine sedime cobble provides specific shallow, fa shallow, (slow is >0. 20 19 Little or no e islands or point the bottom affe depo	timal 70% of substrate for epifaunal and fish cover; mix bringed logs, cobble, or other and at stage to nization potential that are not new of transient). 18 17 16 18 17 16 18 17 16 18 17 16 19 diversity of niche ace. 18 17 16 25 w-deep, slow-st-deep, fast a co.3m/s, deep is 5 m). 18 17 16 20 enlargement of bars and 45% of cted by sediment	Adient I Subo 40-70% m habitat; well colonizatic adequate mainte populations 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 ot 15 14 Some new in formation, gravel, se sediment; & bottom aff depositio	Labitat E Condit	20-40% mix of habitat; 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, sec	ry al stable examinability irrable; juently moved. 7 6 e, and s are 50-d by fine t. 7 6 habitat t (if fast-shallow one low). 7 6 sittion of d, or fine and new of the sediment ructions, d bends; sittion of	Poor 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 19



Habitat Parameter	Ontimal	Condition Suboptimal	tion Category	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.	Marginal Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	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			184

WSSI BENTHIC MACROINVERTEBRATE BENCH SHEET											
Job Name/#	Glade - 20030	Sample subsorted by:	MK,MN	Watland							
Station ID:	Reach 1-C	Date Subsorted:	5/5/13	Studies and Salutions	nc.						
Stream Name:	The Glade	# of Grids subsorted	10	and Soldhow,							
Date Sampled:	3/27/13	Total # of subsorted insects:	112	Total # identified:	104						
Sampling Method:	D-NET	Sample Identified by:	ABR	Date Identified:	5/31/13						

Taxa Collected:

Taxa Collecte	<u>:a.</u>							
			•	Metretopodidae			Lepidostomatidae	
Porifera	Spongillidae			Neoephemeridae			Leptoceridae	
Ostracoda	Unknown			Oligoneuridae			Limnephilidae	
Flatworms	Tricladida			Psuedironidae			Molannidae	
ļ	Planariidae			Polymitarcyidae			Odontoceridae	
Gastropoda	Unknown			Potamanthidae			Philopotamidae	
Limpets	Ancylidae			Siphlonuridae			Phryganeidae	
Snails	Immature		1	Tricorythidae			Polycentropodidae	
ļ	Lymnaeidae	3	Zygoptera	Early Instar and/or damaged			Psychomyiidae	
ļ	Physidae			Calopterygidae			Ryacophilidae	
	Planorbidae		1	Coenagrionidae	1		Sericostomatidae	
	Hydrobiidae		1	Lestidae			Uenoidae	
	Pleuroceridae		1	Protoneuridae		Lepidoptera	Early Instar and/or damaged	
	Viviparidae		Anisopteera	Early Instar and/or damaged			Pyralidae	
Bivalvia	Immature		1	Aeshnidae		Coleoptera	Early Instar and/or damaged	
	Corbiculidae		1	Cordulegastridae			Chrysomelidae	
ļ	Sphaeriidae	11	1	Corduliidae			Curculionidae	
ļ	Unionidae		•	Gomphidae			Dryopidae	
Oligophaeta	Unknown	26	4	Libellulidae			Dytiscidae	
Oligochaeta	OTIKTOWIT	20					-	4
Lumbriculida	Lumbrioulidas		1	Macromiidae Beteluridae			Elmidae	1
T 1:0:1	Lumbriculidae		Į.	Petaluridae			Gyrinidae	
Tubificida			L .	Cordullidae/Libelluidae			Haliplidae	
ļ	Enchytraeidae		Plecoptera	Early Instar and/or damaged			Helodidae	
ļ	Naididae			Capniidae			Helophoridae	
ļ	Tubificidae		1	Chloroperlidae			Hydraenidae	
Haplotaxida				Leuctridae			Hydrochidae	
ļ	Haplotaxidae			Nemouridae			Hydrophilidae	
Leeches	Hirudinea			Peltoperlidae			Limnichidae	
ļ	Erpobdellidae			Perlidae			Noteridae	
ļ	Glossiphoniidae		1	Perlodidae			Psephenidae	
ļ	Hirudinidae		1	Pteronarcyidae			Ptilodactylidae	
ļ	Pisciolidae		1	Taeniopeterygidae			Scirtidae	
Branchiobdellida	Branchiobdellidae		Hemiptera	Early Instar and/or damaged		Diptera	Early Instar and/or damaged	
Copepoda	Unknown		1	Belostomatidae			Athericidae	
Decapoda	Cambaridae		1	Corixidae			Blephariceridae	
	Portunidae		1	Gelastocoridae			Canaceidae	
Shrimp	- Ortaniado		•	Gerridae			Ceratopogonidae	
Ommp	Palaemonidae		1	Hebridae			Choaboridae	
Isopoda	i alaemonidae		1	Hydrometridae			Chironomidae	61
isopoda	Asellidae		4	Mesoveliidae			Culicidae	01
Amphipoda	Asellidae							
	Construction of		4	Naucoridae			Dixidae	
	Crangonyctidae			Nepidae			Dolichopodidae	
	Gammaridae			Notonectidae			Epididae	
	Talitridae			Veliidae			Ephydridae	
Water Mites				Pleidae			Muscidae	
ļ	Hydracarina		Neuroptera				Nymphomyiidae	
Ephemeroptera	Early Instar and/or damaged			Sisyridae			Pelecorhynchidae	
ļ	Acanthometropodidae		Megaloptera				Psychodidae	
ļ	Ameletidae			Corydalidae			Ptychopteridae	
ļ	Baetidae			Sialidae			Sciomyzidae	
	Baetiscidae		Trichoptera	Early Instar and/or damaged			Simuliidae	
	Behningiidae		1	Branchycentridae			Stratiomyidae	1
	Caenidae		1	Calamoceratidae			Syrphidae	
	Ephemerellidae		1	Glossosomatidae			Tabanidae	
	Ephemeridae		1	Goeridae			Tanyderidae	
	Heptageniidae		1	Heliicopsychidae			Thaumaleidae	
"	p		J					
İ	Isonychiidae			Hydronsychidae	1		Tinulidae	
	Isonychiidae Leptophlebiidae			Hydropsychidae Hydroptilida	1		Tipulidae	62
TOTAL:	Leptophlebiidae	40	TOTAL:	Hydropsychidae Hydroptilida	2	TOTAL:	Tipulidae	62