APPENDICES

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APPENDIX A

WATER CHEMISTRY RESULTS

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CHEMISTRY · MICROBIOLOGY · FOOD SAFETY · CONSUMER PRODUCTS
WATER · AIR · WASTES · FOOD · PHARMACEUTICALS · NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	
Date Received	8/1/2003
Sample ID	9955-02033
Invoice No.	
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject CRI 08/01/03

Sampled By: CLIENT Date 8/1/2003 Time 10:30

Test	Result	Date	Time	Tech	Method
SOLIDS, SUSPENDED	7 MG/L	8/6/2003		JB	SM 18TH 2540D
BIO. OXYGEN DEMAND	3 MG/L	8/1/2003	18:30	JB	SM 18TH 5210B
SULFATE	23.4 MG/L	8/1/2003	10:49	DJA	EPA 300.0
TEMP RECD	4 C	8/1/2003	10:30	CMC	
Sample Properly Preserved?	YES	8/1/2003	10:30	CMC	
NITRATE NITROGEN	2.4 MG/L	8/1/2003	15:40	DJA	EPA 300.0
PHOSPHORUS, TOTAL	0.04 MG/L	8/11/2003		GLF	SM 18TH 4500E
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/8/2003		GLF	SM18TH 4500BE
AMMONIA NITROGEN	MG/L				SM 19TH 4500D
Coliform, Fecal	4500 COL/100ML	8/1/2003	14:00	MAS	EPA600 578017

CR1-0.28

THIS REPORT WAS MODIFIED ON AUGUST 27TH 2003 DUE TO THE IMPROPER REPORTING OF THE PHOSPHORUS RESULTS. (DJA)

Respectfully Submitted: Cherie Casari
Microbac Laboratories, Inc.

The data and information on this and all...

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported
Date Received 8/5/2003
Sample ID 9956-00052
Invoice No.
Cust # 004195
Cust P.O. #
Cust Permit #

Subject CR SAMPLES 8/5/03

Sampled By: HC Date 8/5/2003 Time

Test	Result	Date	Time	Tech	Method	
SOLIDS, SUSPENDED	45 MG/L	8/6/2003		JB	SM 18TH 2540D	CR2-4.09
SULFATE	24.2 MG/L	8/6/2003	15:00	DJA	EPA 300.0	
BIO. OXYGEN DEMAND	<2 MG/L	8/7/2003	13:00	JB	SM 18TH 5210B	
[illegible] RECD	7 C	8/5/2003		EAP		
[illegible]ple Properly Preserved?	YES	8/5/2003		EAP		
NITRATE NITROGEN	7.5 MG/L	8/6/2003	15:00	DJA	EPA 300.0	
PHOSPHORUS, TOTAL	0.06 MG/L	8/11/2003		GLF	SM 18TH 4500E	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/8/2003		GLF	SM18TH 4500BE	
AMMONIA NITROGEN	MG/L				SM 19TH 4500D	
Colliform, Fecal	30 COL/100ML	8/5/2003	17:00	MAS	EPA600 578017	
SOLIDS, SUSPENDED	2 MG/L	8/6/2003		JB	SM 18TH 2540D	CR3-2.17
SULFATE	24.9 MG/L	8/6/2003	15:00	DJA	EPA 300.0	
BIO. OXYGEN DEMAND	<2 MG/L	8/7/2003	13:00	JB	SM 18TH 5210B	
NITRATE NITROGEN	5.1 MG/L	8/6/2003	15:00	DJA	EPA 300.0	

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Date Reported	
Date Received	8/5/2003
Sample ID	9956-00052
Invoice No.	
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject CR SAMPLES 8/5/03

Sampled By: HC Date 8/5/2003 Time

Test	Result	Date	Time	Tech	Method
PHOSPHORUS, TOTAL	<0.02 MG/L	8/11/2003		GLF	SM 18TH 4500E
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/8/2003		GLF	SM18TH 4500BE
AMMONIA NITROGEN	MG/L				SM 19TH 4500D
Coliform, Fecal	170 COL/100ML	8/5/2003	17:00	MAS	EPA600 578017
SOLIDS, SUSPENDED	1 MG/L	8/6/2003		JB	SM 18TH 2540D
SULFATE	27.7 MG/L	8/6/2003	15:00	DJA	EPA 300.0
BIO. OXYGEN DEMAND	<2 MG/L	8/7/2003	13:00	JB	SM 18TH 5210B
NITRATE NITROGEN	1.5 MG/L	8/6/2003	15:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/8/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.02 MG/L	8/11/2003		GLF	SM 18TH 4500E
AMMONIA NITROGEN	MG/L				SM 19TH 4500D
...rm, Fecal	20 COL/100ML	8/5/2003	17:00	MAS	EPA600 578017

CR4-0.39

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CAMP HILL,PA 17011

Date Reported	
Date Received	8/5/2003
Sample ID	9956-00052
Invoice No.	
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject **CR SAMPLES 8/5/03**

Sampled By: HC Date 8/5/2003 Time

Test	Result	Date	Time	Tech	Method

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported
Date Received 8/7/2003
Sample ID 9956-00098
Invoice No.
Cust # 004195
Cust P.O. #
Cust Permit #

Subject HARRY CAMPBELL 8/7/03

Sampled By: HC Date 8/7/2003 Time 9:00

Test	Result	Date	Time	Tech	Method	
[redacted]						
Coliform, Fecal	800 COL/100ML	8/7/2003	14:30	MAS	EPA600 578017	YB1-0.28
BIO. OXYGEN DEMAND	<2 MG/L	8/7/2003	13:00	JB	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	8/15/2003		GLF	SM 19TH 4500D	
[illegible]TE NITROGEN	2.3 MG/L	8/7/2003	17:21	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/15/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	0.06 MG/L	8/11/2003		GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	11 MG/L	8/13/2003		JB	SM 18TH 2540D	
SULFATE	17.0 MG/L	8/7/2003	17:21	DJA	EPA 300.0	
TEMP RECD	12 C	8/7/2003	9:00	EAP		
Sample Properly Preserved?	YES	8/7/2003	9:00	EAP		
[redacted]						
Coliform, Fecal	100 COL/100ML	8/7/2003	14:30	MAS	EPA600 578017	YB5-15.26
BIO. OXYGEN DEMAND	<2 MG/L	8/7/2003	13:00	JB	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	8/15/2003		GLF	SM 19TH 4500D	
NITRATE NITROGEN	2.3 MG/L	8/7/2003	17:21	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/15/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	0.05 MG/L	8/11/2003		GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	11 MG/L	8/13/2003		JB	SM 18TH 2540D	
SULFATE	14.1 MG/L	8/7/2003	17:21	DJA	EPA 300.0	

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	
Date Received	8/7/2003
Sample ID	9956-00098
Invoice No.	
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 8/7/03

Sampled By: HC Date 8/7/2003 Time 9:00

Test	Result	Date	Time	Tech	Method

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Microbac Laboratories, Inc.

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CERTIFICATE OF ANALYSIS

GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	8/25/2003
Date Received	8/12/2003
Sample ID	9956-00395
Invoice No.	19795
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 8/12/03

Sampled By: HC Date 8/12/2003 Time 11:00

Test	Result	Date	Time	Tech	Method
PR1					
Coliform, Fecal	0 COL/100ML	8/12/2003	14:00	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	8/13/2003	21:00	JB	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	8/15/2003		GLF	SM 19TH 4500D
ATE NITROGEN	0.7 MG/L	8/12/2003	19:06	DJA	EPA 300.0
IDAHL NITROGEN, TOTAL	<1 MG/L	8/15/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.06 MG/L	8/19/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	9 MG/L	8/18/2003		JB	SM 18TH 2540D
SULFATE	15.2 MG/L	8/12/2003	18:45	DJA	EPA 300.0
TEMP RECD	7 C	8/12/2003	11:00	EAP	
Sample Properly Preserved?	YES	8/12/2003	11:00	EAP	

PR1-0.17

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HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	
Date Received	8/18/2003
Sample ID	9956-00752
Invoice No.	
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 8/18/03

Sampled By: Date 8/18/2003 Time

Test	Result	Date	Time	Tech	Method	
[redacted]						
Coliform, Fecal	460 COL/100ML	8/18/2003	15:30	GLF	EPA600 578017	SR1-0.43
PHOSPHORUS, TOTAL	0.08 MG/L	8/19/2003		GLF	SM 18TH 4500E	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/19/2003		GLF	SM18TH 4500BE	
[illegible]NIA NITROGEN	0.15 MG/L	8/21/2003		GLF	SM 19TH 4500D	
[illegible]OXYGEN DEMAND	<2 MG/L	8/19/2003	22:00	JB	SM 18TH 5210B	
SULFATE	20.9 MG/L	8/19/2003	11:33	DJA	EPA 300.0	
SOLIDS, SUSPENDED	7 MG/L	8/24/2003		JB	SM 18TH 2540D	
NITRATE NITROGEN	1.4 MG/L	8/19/2003	11:33	DJA	EPA 300.0	
TEMP RECD	17 C	8/18/2003		EAP		
Sample Properly Preserved?	YES	8/18/2003		EAP		
[redacted]						
Coliform, Fecal	1150 COL/100ML	8/18/2003	15:30	GLF	EPA600 578017	SR2-5.09
PHOSPHORUS, TOTAL	0.07 MG/L	8/19/2003		GLF	SM 18TH 4500E	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	8/19/2003		GLF	SM18TH 4500BE	
AMMONIA NITROGEN	0.15 MG/L	8/21/2003		GLF	SM 19TH 4500D	
BIO. OXYGEN DEMAND	<2 MG/L	8/19/2003	22:00	JB	SM 18TH 5210B	
SULFATE	25.4 MG/L	8/19/2003	11:33	DJA	EPA 300.0	
SOLIDS, SUSPENDED	3 MG/L	8/24/2003		JB	SM 18TH 2540D	
NITRATE NITROGEN	0.9 MG/L	8/19/2003	11:33	DJA	EPA 300.0	
[redacted]						
[illegible]m, Fecal	310 COL/100ML	8/18/2003	15:30	GLF	EPA600 578017	SR3-1.06
PHOSPHORUS, TOTAL	0.04 MG/L	8/19/2003		GLF	SM 18TH 4500E	

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MEMBER

ANALYST GLF

QA SUPERVISOR _____

SPEC CELL: _____ cm WAVELENGTH 880 nm

PHOSPHORUS ANALYSIS
✓ TOTAL
___ ORTHO
___ HYDROLYZABLE

Plof2

PAGE NO. 28

DATE : 8-1

CURVE NO: _____

SAMPLE NUMBER	A INITIAL SAMPLE SIZE ML or GM	B DILUTION DILUTED TO ML	C FURTHER SAMPLE ALIQUOT ML	D DILUTION DILUTED TO ML	E ABSORBANCE	F CONC. MG/L	G DILUTION FACTOR (B/A) x (D/C)	
~~BLANK~~	~~50~~ GLF	~~0.0065 50~~	—	—	~~0.002~~	~~0.0065~~	~~50/50~~	
~~STD~~	~~50~~	~~50~~	—	—	~~0.1250~~	~~0.2026~~	~~50/50~~	
5663-3	10	50	—	—	0.1410	0.2283	50/10	1.1
56-98-2	50	50	—	—	0.0310	0.0515	50/50	A
56-98-1	50	50	—	—	0.0390	0.0644	50/50	A
56-86-1	~~35~~	~~50~~	—	—	0.0800	0.1303	50/35	0.9
* 56-66-2	2	50	—	—	0.2300	0.3713	50/2	9.2
* 56-66-1	5	50	—	—	0.0570	0.0965	50/5	0.9
56-52-8	50	50	—	—	0.0120	0.0210	50/50	A
56-52-5	50	50	—	—	0.0090	0.0162	50/50	N
56-52-2	50	50	—	—	0.0330	0.0547	50/50	N
~~56-36-4~~	~~5~~	~~50~~	—	—	~~0.2500~~	~~0.4034~~	~~50/5~~	
56-4-2	10	50	—	—	0.0790	0.1286	50/10	0.6
56-4-1	2	50	—	—	0.1040	0.1688	50/2	4.2
55-2033-2	50	50	—	—	0.0250	0.0419	50/50	A
~~55-2033-3~~	50	50	—	—	0.0280	0.0467	50/50	A
55-1510-1	5	50	—	—	0.0890	0.1447	50/5	1.4

DUPLICATE ANALYSIS

56-63-3	10	50	—	—	0.1330	0.2154	50/10	1.0

STANDARD RECOVERY - INDICATE THE CONCENTRATION OF THE STANDARD IN THE SAMPLE NUMBER BLOCK.

0.20 std	50	50	—	—	0.1250	0.2026	50/50	0.2
0.20 STD	50	50	—	—	0.1280	0.2074	50/50	0.2

MATRIX SPIKE - INDICATE THE CONCENTRATION OF THE SPIKE HERE: _____

56-63-3	6	50	—	—	0.1870	0.3022	50/10	1.5

QA CALCULATIONS

DUPLICATE - RELATIVE PERCENT DIFFERENCE SAMPLE NO. 56-63-3

Mean = (Result 1 + Result 2) / 2

(1.14 + 1.08) / 2 = 1.11

RPD = [(Result 1 - Result 2) / Mean] x 100

[(1.14 - 1.07) / 1.11] x 100 = 5%

STANDARDS - PERCENT RECOVERY

%R = (Analysis Result / True Value) x 100

(0.20 / 0.20) x 100 = 100%

MATRIX SPIKE - PERCENT RECOVERY SAMPLE NO. 56-63-3

%R = [(Spike Result - Background) / Spike Added] x 100

[(1.511 - 1.14) / 0.40] x 100 = 93%

ANALYST GLF

QA SUPERVISOR

SPEC CELL: cm WAVELENGTH 880 nm

PHOSPHORUS ANALYSIS
✓ TOTAL
ORTHO
HYDROLYZABLE

Aq + cons

p1 of 2

PAGE NO. 3

@ 1200 DATE: 8-1

CURVE NO:

SAMPLE NUMBER	A INITIAL SAMPLE SIZE CM or ML	B DILUTION DILUTED TO ML	C FURTHER SAMPLE ALIQUOT ML	D DILUTION DILUTED TO ML	E ABSORBANCE	F CONC. MG/L	G DILUTION FACTOR (B/A) x (D/C)	
BLANK	50	50	–	–	0.0020	0.0049	50/50	
Std	50	50	–	–	0.1180	0.1913	50/50	0
56-36-4	5	50	–	–	0.1780	0.2877	50/5	2
* 56-88-1	50		–	–	0.1246	0.2010	50/50	0
* 56-88-2	50		–	–	0.0050	0.0087	↓	N
* 56-88-3	50		–	–	0.0310	0.0515		N
* 56-88-4	50		–	–	0.1190	0.1929		0
56-419-1	10		–	–	0.1130	0.1833	50/10	0.
56-435-1	35		–	–	0.0830	0.1351	50/35	0.
56-751-1	2		–	–	0.0540	0.0885	50/2	2.
56-751-2	10		–	–	0.0800	0.1303	50/10	0.
56-752-1	50		–	–	0.0470	0.0772	50/50	N
56-752-2	50		–	–	0.0430	0.0708	50/50	N
56-752-3	50		–	–	0.0250	0.0419	50/50	N
56-759-1	10		–	–	0.1840	0.2974	50/10	1.
Blank	50	↓	–	–	0.0020	0.0049	50/50	N

DUPLICATE ANALYSIS

56-36-4	5	50	–	–	0.1870	0.3022	50/50	

STANDARD RECOVERY - INDICATE THE CONCENTRATION OF THE STANDARD IN THE SAMPLE NUMBER BLOCK.

0.20 Std	50	50	–	–	0.1180	0.1913	50/50	0.1
0.20 Std	50	50	–	–	0.1230	0.1993	50/50	0.2

MATRIX SPIKE - INDICATE THE CONCENTRATION OF THE SPIKE HERE: 0.40

56 36-4	5	50	–	–	0.2010	0.3247	50/5	3.2

QA CALCULATIONS

DUPLICATE - RELATIVE PERCENT DIFFERENCE SAMPLE NO. 56-36-4

Mean = (Result 1 + Result 2) / 2

(3.02 + 2.88) / 2 = 2.95

RPD = [(Result 1 - Result 2) / Mean] x 100

[(3.02 - 2.88) / 2.95] x 100 = 5%

STANDARDS - PERCENT RECOVERY

%R = (Analysis Result / True Value) x 100

(0.19 / 0.20) x 100 = 95%

(0.20 / 0.20) x 100 = 100%

MATRIX SPIKE - PERCENT RECOVERY SAMPLE NO. 56-36-4

%R = [(Spike Result - Background) / Spike Added] x 100

[(3.25 - 2.88) / 0.4] x 100 = 93%

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CERTIFICATE OF ANALYSIS

GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/10/2003
Date Received	8/19/2003
Sample ID	9956-00795
Invoice No.	20584
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 8/19/03

Sampled By: HC Date 8/19/2003 Time 10:00

Test	Result	Date	Time	Tech	Method	
Coliform, Fecal	490 COL/100ML	8/19/2003	16:15	CMC	EPA600 578017	DR1-0.70
BIO. OXYGEN DEMAND	<2 MG/L	8/19/2003	22:00	JB	SM 18TH 5210B	
AMMONIA NITROGEN	0.14 MG/L	8/21/2003		GLF	SM 19TH 4500D	
NITRATE NITROGEN	1.7 MG/L	8/19/2003	11:33	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/3/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	0.11 MG/L	9/8/2003		GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	3 MG/L	8/26/2003		JB	SM 18TH 2540D	
SULFATE	14.5 MG/L	8/19/2003	11:35	DJA	EPA 300.0	
TEMP RECD	18 C	8/19/2003	10:00	EAP		
Sample Properly Preserved?	YES	8/19/2003	10:00	EAP		
Coliform, Fecal	1350 COL/100ML	8/19/2003	16:15	CMC	EPA600 578017	DR2-1.85
BIO. OXYGEN DEMAND	<2 MG/L	8/19/2003	22:00	JB	SM 18TH 5210B	
AMMONIA NITROGEN	0.16 MG/L	8/21/2003		GLF	SM 19TH 4500D	
NITRATE NITROGEN	1.0 MG/L	8/19/2003	11:33	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/3/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	0.11 MG/L	9/8/2003		GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	8 MG/L	8/26/2003		JB	SM 18TH 2540D	
SULFATE	13.0 MG/L	8/19/2003	11:35	DJA	EPA 300.0	
Coliform, Fecal	220 COL/100ML	8/19/2003	16:15	CMC	EPA600 578017	DR3-5.08
BIO. OXYGEN DEMAND	<2 MG/L	8/19/2003	22:00	JB	SM 18TH 5210B	

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/10/2003
Date Received	8/19/2003
Sample ID	9956-00795
Invoice No.	20584
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 8/19/03

Sampled By: HC Date 8/19/2003 Time 10:00

Test	Result	Date	Time	Tech	Method
AMMONIA NITROGEN	0.15 MG/L	8/21/2003		GLF	SM 19TH 4500D
NITRATE NITROGEN	<0.5 MG/L	8/19/2003	11:33	DJA	EPA 300.0
[illegible]AHL NITROGEN, TOTAL	<1 MG/L	9/3/2003		GLF	SM18TH 4500BE
[illegible]PHORUS, TOTAL	<0.02 MG/L	9/8/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	3 MG/L	8/26/2003		JB	SM 18TH 2540D
SULFATE	5.6 MG/L	8/19/2003	11:35	DJA	EPA 300.0

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HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/10/2003
Date Received	8/21/2003
Sample ID	9956-00862
Invoice No.	20585
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 8/21/03

Sampled By: AC Date 8/21/2003 Time 15:00

Test	Result	Date	Time	Tech	Method	
[redacted]						
Coliform, Fecal	56 COL/100ML	8/21/2003	19:30	GLF	EPA600 578017	LD1-0.97
BIO. OXYGEN DEMAND	<2 MG/L	8/21/2003	18:00	JB	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D	
[illegible]TE NITROGEN	<0.5 MG/L	8/21/2003	12:00	DJA	EPA 300.0	
[illegible]DAHL NITROGEN, TOTAL	<1 MG/L	9/3/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	0.03 MG/L	9/8/2003		GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	33 MG/L	8/26/2003		JB	SM 18TH 2540D	
SULFATE	7.7 MG/L	8/21/2003	12:00	DJA	EPA 300.0	
TEMP RECD	18 C	8/21/2003	15:00	EAP		
Sample Properly Preserved?	YES	8/21/2003	15:00	EAP		
[redacted]						
Coliform, Fecal	110 COL/100ML	8/21/2003	19:30	GLF	EPA600 578017	OR1-0.51
BIO. OXYGEN DEMAND	<2 MG/L	8/21/2003	18:00	JB	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D	
NITRATE NITROGEN	<0.5 MG/L	8/21/2003	12:00	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/3/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	<0.02 MG/L	9/8/2003		GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	<1 MG/L	8/26/2003		JB	SM 18TH 2540D	
SULFATE	6.2 MG/L	8/21/2003	12:00	DJA	EPA 300.0	
[redacted]						
[illegible]form, Fecal	22 COL/100ML	8/21/2003	19:30	GLF	EPA600 578017	OR2-2.74
BIO. OXYGEN DEMAND	<2 MG/L	8/21/2003	18:00	JB	SM 18TH 5210B	

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HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/10/2003
Date Received	8/21/2003
Sample ID	9956-00862
Invoice No.	20585
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 8/21/03

Sampled By: AC Date 8/21/2003 Time 15:00

Test	Result	Date	Time	Tech	Method
[redacted]					
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D
NITRATE NITROGEN	<0.5 MG/L	8/21/2003	12:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/3/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	<0.02 MG/L	9/8/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	6 MG/L	8/26/2003		JB	SM 18TH 2540D
SULFATE	4.2 MG/L	8/21/2003	12:00	DJA	EPA 300.0
[redacted]					
Coliform, Fecal	410 COL/100ML	8/21/2003	19:30	GLF	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	8/21/2003	18:00	JB	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D
NITRATE NITROGEN	1.8 MG/L	8/21/2003	12:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/3/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.04 MG/L	9/8/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	7 MG/L	8/26/2003		JB	SM 18TH 2540D
SULFATE	10.1 MG/L	8/21/2003	12:00	DJA	EPA 300.0

YB6-24.44

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HARRY CAMPBELL
207 SENATE AVENUE
N-300
CAMP HILL,PA 17011

Date Reported	9/10/2003
Date Received	8/22/2003
Sample ID	9956-01107
Invoice No.	20586
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject SAMPLES RECEIVED 08/22/03

Sampled By: CLIENT Date 8/22/2003 Time 10:00

Test	Result	Date	Time	Tech	Method	
[redacted]						
Coliform, Fecal	300 COL/100ML	8/22/2003	15:30	MAS	EPA600 578017	MN1-1.09
BIO. OXYGEN DEMAND	4 MG/L	8/24/2003	21:40	JB	SM 18TH 5210B	
SOLIDS, SUSPENDED	3 MG/L	8/26/2003		JB	SM 18TH 2540D	
[illegible]TE	15.8 MG/L	8/22/2003	11:00	DJA	EPA 300.0	
[illegible]DAHL NITROGEN, TOTAL	<1 MG/L	9/9/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	0.07 MG/L	9/8/2003		GLF	SM 18TH 4500E	
NITRATE NITROGEN	0.7 MG/L	8/22/2003	11:00	DJA	EPA 300.0	
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D	
TEMP RECD	4 C	8/22/2003	10:00	CMC		
Sample Properly Preserved?	YES	8/22/2003	10:00	CMC		
[redacted]						
Coliform, Fecal	54 COL/100ML	8/22/2003	15:30	MAS	EPA600 578017	CSR1-0.82
BIO. OXYGEN DEMAND	7 MG/L	8/24/2003	21:40	JB	SM 18TH 5210B	
SOLIDS, SUSPENDED	4 MG/L	8/26/2003		JB	SM 18TH 2540D	
SULFATE	5.6 MG/L	8/22/2003	11:00	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/9/2003		GLF	SM18TH 4500BE	
PHOSPHORUS, TOTAL	<0.02 MG/L	9/8/2003		GLF	SM 18TH 4500E	
NITRATE NITROGEN	<0.5 MG/L	8/22/2003	11:00	DJA	EPA 300.0	
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D	
[redacted]						
Coliform, Fecal	94 COL/100ML	8/22/2003	15:30	MAS	EPA600 578017	CSR2-2.09
BIO. OXYGEN DEMAND	3 MG/L	8/24/2003	21:40	JB	SM 18TH 5210B	

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
N-300
CAMP HILL,PA 17011

Date Reported	9/10/2003
Date Received	8/22/2003
Sample ID	9956-01107
Invoice No.	20586
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject SAMPLES RECEIVED 08/22/03

Sampled By: CLIENT Date 8/22/2003 Time 10:00

Test	Result	Date	Time	Tech	Method
[redacted]					
SOLIDS, SUSPENDED	5 MG/L	8/26/2003		JB	SM 18TH 2540D
SULFATE	4.7 MG/L	8/22/2003	11:00	DJA	EPA 300.0
[illegible]AHL NITROGEN, TOTAL	<1 MG/L	9/9/2003		GLF	SM18TH 4500BE
[illegible]PHORUS, TOTAL	<0.02 MG/L	9/8/2003		GLF	SM 18TH 4500E
NITRATE NITROGEN	<0.5 MG/L	8/22/2003	11:00	DJA	EPA 300.0
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D

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207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/22/2003
Date Received	8/25/2003
Sample ID	9956-01368
Invoice No.	21103
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject WATER STUDY SAMPLE 8/25/03

Sampled By: HC Date 8/25/2003 Time

Test	Result	Date	Time	Tech	Method
Coliform, Fecal	140 COL/100ML	8/25/2003	15:00	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	8/27/2003	22:30	JB	SM 18TH 5210B
AMMONIA NITROGEN	0.2 MG/L	9/3/2003		GLF	SM 19TH 4500D
NITRATE NITROGEN	1.1 MG/L	8/26/2003	15:30	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/9/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.05 MG/L	9/8/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	3 MG/L	8/26/2003		JB	SM 18TH 2540D
SULFATE	6.1 MG/L	8/26/2003	15:30	DJA	EPA 300.0
TEMP RECD	18 C	8/25/2003		EAP	
Sample Properly Preserved?	YES	8/25/2003		EAP	

YB2-42.48

Coliform, Fecal	18 COL/100ML	8/25/2003	15:00	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	8/27/2003	22:30	JB	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D
NITRATE NITROGEN	<0.5 MG/L	8/26/2003	15:30	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/9/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	<0.02 MG/L	9/16/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	4 MG/L	8/26/2003		JB	SM 18TH 2540D
SULFATE	5.7 MG/L	8/26/2003	15:30	DJA	EPA 300.0

KH1-1.09

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/22/2003
Date Received	8/25/2003
Sample ID	9956-01368
Invoice No.	21103
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject **WATER STUDY SAMPLE 8/25/03**

Sampled By: HC Date 8/25/2003 Time

Test	Result	Date	Time	Tech	Method

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
N-300
CAMP HILL,PA 17011

Date Reported	9/22/2003
Date Received	8/28/2003
Sample ID	9956-01473
Invoice No.	21104
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject SAMPLES RECEIVED 08/28/03

Sampled By: CLIENT Date 8/28/2003 Time 9:40

Test	Result	Date	Time	Tech	Method
[redacted]					
Coliform, Fecal	600 COL/100ML	8/29/2003	10:15	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	8/29/2003	13:00	JB	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D
[illegible]TE NITROGEN	1.3 MG/L	8/28/2003	17:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/9/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.05 MG/L	9/16/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	5 MG/L	9/2/2003		JB	SM 18TH 2540D
SULFATE	8.6 MG/L	8/28/2003	17:00	DJA	EPA 300.0
TEMP RECD	8 C	8/28/2003	9:40	CMC	
Sample Properly Preserved?	YES	8/28/2003	9:40	CMC	

y87

YB7-29.12

[redacted]					
Coliform, Fecal	<2 COL/100ML	8/29/2003	10:15	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	8/29/2003	13:00	JB	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	9/3/2003		GLF	SM 19TH 4500D
NITRATE NITROGEN	<0.5 MG/L	8/28/2003	17:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/9/2003		GLF	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.02 MG/L	9/16/2003		GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	2 MG/L	9/2/2003		JB	SM 18TH 2540D
SULFATE	7.2 MG/L	8/28/2003	17:00	DJA	EPA 300.0

PH1-2.10

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
N-300
CAMP HILL,PA 17011

Date Reported	9/22/2003
Date Received	8/28/2003
Sample ID	9956-01473
Invoice No.	21104
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject SAMPLES RECEIVED 08/28/03

Sampled By: CLIENT Date 8/28/2003 Time 9:40

Test	Result	Date	Time	Tech	Method

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GANNETT FLEMING HBG DIVISION
HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/30/2003
Date Received	9/15/2003
Sample ID	9957-00420
Invoice No.	21553
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 9/15/03

Sampled By: HC Date 9/15/2003 Time

Test	Result	Date	Time	Tech	Method	
[redacted]						
Coliform, Fecal	26 COL/100ML	9/15/2003	17:00	GLF	EPA600 578017	STH1-1.72
BIO. OXYGEN DEMAND	<2 MG/L	9/17/2003	12:00	GLF	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	9/26/2003		TLS	SM 19TH 4500D	
NITRATE NITROGEN	<0.5 MG/L	9/16/2003	20:00	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/23/2003	15:45	TLS	SM18TH 4500BE	
PHOSPHORUS, TOTAL	<0.02 MG/L	9/16/2003	14:00	TLS	SM 18TH 4500E	
SOLIDS, SUSPENDED	1 MG/L	9/16/2003		JB	SM 18TH 2540D	
SULFATE	6.7 MG/L	9/16/2003	20:00	DJA	EPA 300.0	
TEMP RECD	12 C	9/15/2003		EAP		
Sample Properly Preserved?	YES	9/15/2003		EAP		
[redacted]						
Coliform, Fecal	220 COL/100ML	9/15/2003	17:00	GLF	EPA600 578017	HSH1-1.61
BIO. OXYGEN DEMAND	<2 MG/L	9/17/2003	12:00	GLF	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	9/26/2003		TLS	SM 19TH 4500D	
NITRATE NITROGEN	<0.5 MG/L	9/16/2003	20:00	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/23/2003	15:45	TLS	SM18TH 4500BE	
PHOSPHORUS, TOTAL	<0.02 MG/L	9/16/2003	14:00	TLS	SM 18TH 4500E	
SOLIDS, SUSPENDED	4 MG/L	9/16/2003		JB	SM 18TH 2540D	
SULFATE	6.5 MG/L	9/16/2003	20:00	DJA	EPA 300.0	
IG1						
[redacted]						
Coliform, Fecal	100 COL/100ML	9/15/2003	17:00	GLF	EPA600 578017	IG1-0.88
BIO. OXYGEN DEMAND	<2 MG/L	9/17/2003	12:00	GLF	SM 18TH 5210B	

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207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	9/30/2003
Date Received	9/15/2003
Sample ID	9957-00420
Invoice No.	21553
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject HARRY CAMPBELL 9/15/03

Sampled By: HC Date 9/15/2003 Time

Test	Result	Date	Time	Tech	Method
AMMONIA NITROGEN	<0.1 MG/L	9/26/2003		TLS	SM 19TH 4500D
NITRATE NITROGEN	<0.5 MG/L	9/16/2003	20:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/23/2003	15:45	TLS	SM18TH 4500BE
PHOSPHORUS, TOTAL	<0.02 MG/L	9/16/2003	14:00	TLS	SM 18TH 4500E
SOLIDS, SUSPENDED	2 MG/L	9/16/2003		JB	SM 18TH 2540D
SULFATE	3.8 MG/L	9/16/2003	20:00	DJA	EPA 300.0
Coliform, Fecal	190 COL/100ML	9/15/2003	17:00	GLF	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	9/17/2003	12:00	GLF	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	9/26/2003		TLS	SM 19TH 4500D
NITRATE NITROGEN	2.8 MG/L	9/16/2003	20:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/23/2003	15:45	TLS	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.02 MG/L	9/16/2003	14:00	TLS	SM 18TH 4500E
SOLIDS, SUSPENDED	1 MG/L	9/16/2003		JB	SM 18TH 2540D
SULFATE	12.4 MG/L	9/16/2003	20:00	DJA	EPA 300.0

YB3-47.21

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207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	10/7/2003
Date Received	9/17/2003
Sample ID	9957-00486
Invoice No.	21807
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject CAMPBELL 9/17/03

Sampled By: HC Date 9/17/2003 Time 12:30

Test	Result	Date	Time	Tech	Method	
Coliform, Fecal	80 COL/100ML	9/17/2003	14:30	MAS	EPA600 578017	MN3-15.10
BIO. OXYGEN DEMAND	<2 MG/L	9/18/2003	16:00	GLF	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	9/29/2003		TLS	SM 19TH 4500D	
ATE NITROGEN	<0.5 MG/L	9/18/2003	18:30	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/26/2003		TLS	SM18TH 4500BE	
PHOSPHORUS, TOTAL	<0.02 MG/L	10/2/2003	15:00	GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	1 MG/L	9/22/2003		TLS	SM 18TH 2540D	
SULFATE	3.4 MG/L	9/18/2003	18:30	DJA	EPA 300.0	
TEMP RECD	18 C	9/17/2003	12:30	EAP		
Sample Properly Preserved?	YES	9/17/2003	12:30	EAP		
Coliform, Fecal	42 COL/100ML	9/17/2003	14:30	MAS	EPA600 578017	TR1-0.85
BIO. OXYGEN DEMAND	<2 MG/L	9/18/2003	16:00	GLF	SM 18TH 5210B	
AMMONIA NITROGEN	<0.1 MG/L	9/29/2003		TLS	SM 19TH 4500D	
NITRATE NITROGEN	<0.5 MG/L	9/18/2003	18:30	DJA	EPA 300.0	
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/26/2003		TLS	SM18TH 4500BE	
PHOSPHORUS, TOTAL	<0.02 MG/L	10/2/2003	15:00	GLF	SM 18TH 4500E	
SOLIDS, SUSPENDED	<1 MG/L	9/22/2003		TLS	SM 18TH 2540D	
SULFATE	3.6 MG/L	9/18/2003	18:30	DJA	EPA 300.0	

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CAMP HILL,PA 17011

Date Reported	10/7/2003
Date Received	9/17/2003
Sample ID	9957-00486
Invoice No.	21807
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject CAMPBELL 9/17/03

Sampled By: HC Date 9/17/2003 Time 12:30

Test	Result	Date	Time	Tech	Method

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Date Reported	10/7/2003
Date Received	9/18/2003
Sample ID	9957-00512
Invoice No.	21808
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject CAMPBELL 9/18/03

Sampled By: HC Date 9/18/2003 Time 10:30

Test	Result	Date	Time	Tech	Method
Coliform, Fecal	190 COL/100ML	9/18/2003	15:30	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	9/18/2003	16:00	GLF	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	9/29/2003		TLS	SM 19TH 4500D
NITRATE NITROGEN	4.7 MG/L	9/18/2003	18:30	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	9/26/2003		TLS	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.03 MG/L	10/2/2003	15:00	GLF	SM 18TH 4500E
SOLIDS, SUSPENDED	2 MG/L	9/22/2003		TLS	SM 18TH 2540D
SULFATE	22.8 MG/L	9/18/2003	18:30	DJA	EPA 300.0
TEMP RECD	13 C	9/18/2003	10:30	EAP	
Sample Properly Preserved?	YES	9/18/2003	10:30	EAP	

UNT1-0.11

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HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	10/13/2003
Date Received	10/1/2003
Sample ID	9958-00019
Invoice No.	21998
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject SAMPLES 10/1/03

Sampled By: HC Date 10/1/2003 Time

Test	Result	Date	Time	Tech	Method
Coliform, Fecal	70 COL/100ML	10/1/2003	14:45	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	10/2/2003	15:30	JB	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	10/3/2003		TLS	SM 19TH 4500D
ATE NITROGEN	0.7 MG/L	10/3/2003	8:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	10/2/2003		TLS	SM18TH 4500BE
PHOSPHORUS, TOTAL	<0.02 MG/L	10/9/2003		TLS	SM 18TH 4500E
SOLIDS, SUSPENDED	2 MG/L	10/6/2003	13:30	JB	SM 18TH 2540D
SULFATE	7.5 MG/L	10/3/2003	8:00	DJA	EPA 300.0
TEMP RECD	13 C	10/1/2003		EAP	
Sample Properly Preserved?	YES	10/1/2003		EAP	

MN2-4.77

YB4

Coliform, Fecal	72 COL/100ML	10/1/2003	14:45	MAS	EPA600 578017
BIO. OXYGEN DEMAND	<2 MG/L	10/2/2003	15:30	JB	SM 18TH 5210B
AMMONIA NITROGEN	<0.1 MG/L	10/3/2003		TLS	SM 19TH 4500D
NITRATE NITROGEN	2.2 MG/L	10/3/2003	8:00	DJA	EPA 300.0
KJEHDAHL NITROGEN, TOTAL	<1 MG/L	10/2/2003		TLS	SM18TH 4500BE
PHOSPHORUS, TOTAL	0.05 MG/L	10/9/2003		TLS	SM 18TH 4500E
SOLIDS, SUSPENDED	4 MG/L	10/6/2003	13:30	JB	SM 18TH 2540D
SULFATE	14.0 MG/L	10/3/2003	8:00	DJA	EPA 300.0

YB4-10.32

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HARRY CAMPBELL
207 SENATE AVENUE
CAMP HILL,PA 17011

Date Reported	10/13/2003
Date Received	10/1/2003
Sample ID	9958-00019
Invoice No.	21998
Cust #	004195
Cust P.O. #	
Cust Permit #	

Subject SAMPLES 10/1/03

Sampled By: HC Date 10/1/2003 Time

Test	Result	Date	Time	Tech	Method

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APPENDIX B

RAW BENTHIC MACROINVERTEBRATE DATA

Raw RBP data collected from 33 study sites.

Site:	Hilsenhoff[a]	Habit[b]	FFG[c]	CR1	CR2	CR3	CR4	CSR1	CSR2	DR1	DR2	DR3	HSH1	IRG1	KH1	LD1	MN1	MN2	MN3
OLIGOCHAETA	**10**	**--**	**GC**	2	1		5			2	4					6	4		
ISOPODA																			
Asellidae	**6**	**--**	**GC**	3	110	1	1			3	1					1			
AMPHIPODA																			
Gammaridae	**4**	**--**	**GC**	92	15	26	14			16			2				1		
EPHEMEROPTERA																			
Tricorythidae	**4**	**SP**	**GC**																
Baetidae	**6**	**SW**	**GC**								4	2					1	4	
Heptageniidae	**3**	**CN**	**SC**									4					8	17	
Ephemerellidae	**2**	**CN**	**GC**						2					1	4			8	2
Caenidae	**7**	**SP**	**GC**														1		
Ephemeridae	**4**	**BU**	**GC**																
Leptophlebiidae	**4**	**SW**	**GC**																
Isonychiidae	**3**	**SW**	**FC**							4							2	2	
PLECOPTERA																			
Leuctridae	**0**	**SP**	**SH**					4	24			1	15	6	18				7
Perlidae	**3**	**CN**	**PR**									2	2	3	1		1	4	3
Pteronarcyidae	**0**	**SP**	**SH**																
Chloroperlidae	**0**	**CN**	**PR**									3						1	2
Perlodidae	**2**	**CN**	**PR**					1					2						
Peltoperlidae	**2**	**CN**	**SH**												1				
Nemouridae	**2**	**SP**	**SH**										1						
TRICHOPTERA																			
Hydropsychidae	**5**	**CN**	**FC**				3	3	24	4	2	7	24	19	21		4	19	17
Philopotamidae	**3**	**CN**	**FC**					10	24		2	7	2	1	11	1		12	8
Brachycentridae	**1**	**CN**	**FC**											1					
Limnephilidae	**4**	**SP**	**SH**					1		1								1	
Lepidostomatidae	**1**	**SP**	**SH**							1									1
Glossosomatidae	**0**	**CN**	**SC**									1							2
Rhyacophilidae	**1**	**CN**	**PR**										2		2				4
HEMIPTERA																			
Corixidae	**--**	**SW**	**PR**								2								
Gerridae	**--**	**SK**	**PR**																
MEGALOPTERA																			
Corydalidae	**3**	**CN**	**PR**					1	1			2	2	1	1	1		1	3

Raw RBP data collected from 33 study sites, cont.

Site:	Hilsenhoff[a]	Habit[b]	FFG[c]	CR1	CR2	CR3	CR4	CSR1	CSR2	DR1	DR2	DR3	HSH1	IRG1	KH1	LD1	MN1	MN2	MN3
COLEOPTERA																			
Psephenidae	**4**	**CN**	**SC**							4									
Elmidae	**5**	**CN**	**GC**	2				4	7	22	1		11	15	8	1	11	4	24
Dytiscidae	**5**	**SW**	**PR**					1											
Hydrophilidae	**5**	**SW**	**PR**																
DIPTERA																			
Chironomidae	**6**	**BU**	**GC**	1	1	42	18	63	11	34	60	31	27	74	36	57	50	32	46
Empididae	**6**	**SP**	**PR**					6	3	3	2		1	3		10	4		1
Simuliidae	**6**	**CN**	**FC**			7	8	32	13	1	5	23	25	3	5	12		5	1
Stratiomyidae	**8**	**SP**	**CG**								3								
Tipulidae	**4**	**BU**	**SH**					1		1		5	2		1		2	2	3
Ceratopogonidae	**6**	**BU**	**PR**								1		1		2	2	1		
Culicidae	**8**	**SW**	**GC**								3								
Psychodidae	**10**	**BU**	**GC**									1							
Tabanidae	**6**	**SP**	**PR**									1					1		
GASTROPODA																			
Fam 1	**7**	**--**	**SC**	1		25	37									1			
Fam 2	**7**	**--**	**SC**	2		11	3				1								
ODONATA																			
Coenagrionidae	**8**	**CB**	**PR**								4								
Calopterygidae	**5**	**CB**	**PR**							1				1					2
Gomphidae	**4**	**SP**	**PR**											1	1			2	
Aeshnidae	**3**	**CB**	**PR**														1		
BIVALVIA	**6**	**--**	**FC**				4				9								
COPEPODA	**--**	**--**	**GC**								2				1	1			
ARACHNIDIA	**--**	**--**																	
ANNELIDA	**9**	**--**	**GC**									1	1					1	
HYDRACARINA	**7**	**--**	**PR**													1			
COLLEMBOLA	**--**	**--**	**GC**		1						2					1			

[a] **Tolerance values taken from PADEP State Water Assessments Spreadsheet**

[b] **Habit characterizations taken from RBP Manual.**
CB (climber), CN (clinger), SP (sprawler), SW (swimmer), and BU (burrower).

[c] **FFG characterizations taken from RBP Manual.**
CG (collector-gatherer), FC (filterer-collector), PR (predator), SC (scraper), and SH (shredder).

Raw RBP data collected from 33 study sites, cont.

Site:	OR1	OR2	PH1	PR1	SR1	SR2	SR3	STH1	TR1	UNT1	YB1	YB2	YB3	YB4	YB5	YB6	YB7
OLIGOCHAETA		1		2		18					18		3	10	11	24	5
ISOPODA																	
Asellidae				1		1				5	2	76					
AMPHIPODA																	
Gammaridae				5	1	11	1	4		40	26	36		6	15	1	7
EPHEMEROPTERA																	
Tricorythidae											1						
Baetidae	10	1		23	32	21	32		8	3	3	4		10	18	15	6
Heptageniidae	12	1		9	6		16		7				9	13	6	8	13
Ephemerellidae				1	1				3					3	2	1	1
Caenidae															1	3	9
Ephemeridae																1	3
Leptophlebiidae									7				6				
Isonychiidae	5				1												
PLECOPTERA																	
Leuctridae		8		3													
Perlidae	2						1	2	4								
Pteronarcyidae	1								1								
Chloroperlidae		1							2								
Perlodidae																	
Peltoperlidae									1								
Nemouridae																	
TRICHOPTERA																	
Hydropsychidae	9	17		19	14		8	10	6	2	11	2	5	2	13	7	4
Philopotamidae	10	4					4	18	6		1		2				1
Brachycentridae														1	1	1	
Limnephilidae			1									1					1
Lepidostomatidae		2							1								
Glossosomatidae	1						1		1								
Rhyacophilidae									6								
HEMIPTERA																	
Corixidae						5											
Gerridae			1														
MEGALOPTERA																	
Corydalidae				1				1									

Raw RBP data collected from 33 study sites, cont.

Site:	OR1	OR2	PH1	PR1	SR1	SR2	SR3	STH1	TR1	UNT1	YB1	YB2	YB3	YB4	YB5	YB6	YB7
COLEOPTERA																	
Psephenidae				1	2		1				1			3		2	1
Elmidae	17	2		12	8	3	9		7	35	10	23	3	29	38	25	16
Dytiscidae																	
Hydrophilidae									1								
DIPTERA																	
Chironomidae	21	45	62	26	39	30	26	19	33	6	22	9	67	3	5	11	36
Empididae	2		1		2		6	2	2	1	1				1	1	1
Simuliidae	4	12		3	1		13	35	13	9		6	3		2	2	1
Stratiomyidae																1	
Tipulidae		3	1	5	2	1	1		4					1	1	2	
Ceratopogonidae		2	1			2											
Culicidae													1				
Psychodidae								1	1								
Tabanidae						1											
GASTROPODA																	
Fam 1						2								1	1		1
Fam 2													1				
ODONATA																	
Coenagrionidae						2				1							
Calopterygidae					2					1							
Gomphidae	1	1															
Aeshnidae																	1
BIVALVIA				1		1				1	1			2			2
COPEPODA																	
ARACHNIDIA														2			
ANNELIDA																	
HYDRACARINA																	
COLLEMBOLA			14	1		1					1						

[a] **Tolerance values taken from PADEP State Water Assessments Spreadsheet**

[b] **Habit characterizations taken from RBP Manual.**
CB (climber), CN (clinger), SP (sprawler), SW (swimmer), and BU (burrower).

[c] **FFG characterizations taken from RBP Manual.**
CG (collector-gatherer), FC (filterer-collector), PR (predator), SC (scraper), and SH (shredder).

APPENDIX C

BENTHIC MACROINVERTEBRATE BENCH SHEETS

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Cedar Run 17th St, NWDA	LOCATION
STATION # CR1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-1-03	LOT # —
TAXONOMIST EJC DATE 8-19-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam 1	2				Megaloptera					
Hirudinea						Coleoptera	Elmidae	2	L		
Isopoda	Asellidae	3									
Amphipoda	Gammaridae	92				Diptera	Chironomidae	1			
Decapoda											
Ephemeroptera											
						Gastropoda	Fam 1	1			
							Fam 2	2			
						Pelecypoda					
Plecoptera											
						Other					
Trichoptera											
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 103 **Total No. Taxa** 7

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-19-03

Number of grids picked: 2

Time expenditure 1 hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 8-19-03

Explain TCR ratings of 3-5:

~

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Cedar Run	LOCATION
STATION # CR2 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-5-03	LOT # —
TAXONOMIST EJC DATE 9-22-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	1				Megaloptera					
Hirudinea						Coleoptera					
Isopoda	Asellidae	110									
Amphipoda	Gammaridae	15				Diptera	Chironomidae	1			
Decapoda											
Ephemeroptera											
						Gastropoda					
						Pelecypoda					
Plecoptera											
						Other	Collembola	1			
Trichoptera											
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 128 **Total No. Taxa** 5

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-25-03

Number of grids picked: 1/2

Time expenditure 1/2 hr No. of organisms ~120

Indicate the presence of large or obviously abundant organisms:

Scuds, isopods

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 9-22-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Cedar Run	LOCATION
STATION # CR3 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-5-03	LOT # —
TAXONOMIST EJC DATE 8-19-03	SUBSAMPLE TARGET ☒100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera					
Isopoda	Asellidae	1									
Amphipoda	Gammaridae	26				Diptera	Chironomidae	42			
							Simuliidae	7			
Decapoda											
Ephemeroptera											
						Gastropoda	Fam 1	25			
							Fam 2	11			
Plecoptera						Pelecypoda					
						Other					
Trichoptera											
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 112 **Total No. Taxa** 6

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-19-03

Number of grids picked: 1

Time expenditure 1.5 hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

fil algae

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷	(	# organisms recovered by checker	+	# organisms originally sorted	)	=	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 8-19-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Cedar Run	LOCATION
STATION # CR4 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 8-5-03	LOT # —
TAXONOMIST EJC DATE 8-18-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam 1	5				Megaloptera					
Hirudinea						Coleoptera					
Isopoda	Asellidae	1									
Amphipoda	Gammaridae	14				Diptera	Simuliidae	8			
Decapoda							Tipulidae	1			3
Ephemeroptera							Chironomidae	18			
							Empididae	1			
						Gastropoda	Fam 1	37			
							Fam 2	3			
Plecoptera						Pelecypoda					
						Other	Blackniosedae	2			
Trichoptera	Hydropsychidae	3					Bivalvia	4			
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 94 **Total No. Taxa** 10

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-18-03

Number of grids picked: 10

Time expenditure 1.5hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

Scuds

QC: ❑ YES ❑ NO **QC Checker** _____

$$\frac{\text{\# organisms originally sorted}}{\text{\# organisms recovered by checker} + \text{\# organisms originally sorted}} = \text{\% sorting efficiency}$$

$$\frac{\square}{\left(\square + \square\right)} = \square$$

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 8-18-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Cold Spring Run	LOCATION
STATION # CSR1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 8-22-03	LOT # —
TAXONOMIST EJC DATE 10-29-03	SUBSAMPLE TARGET ☒100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera	Corydalidae	1			
Hirudinea						Coleoptera	Elmidae	4	L&A		
Isopoda							Dytiscidae	1	L		
Amphipoda						Diptera	Simuliidae	32			
Decapoda							Chironomidae	63			
Ephemeroptera							Empididae	6	L&A		
							Tipulidae	1			
						Gastropoda					
						Pelecypoda					
Plecoptera	Leuctridae	4			2						
	Perlodidae	1			4	Other					
Trichoptera	Hydropsychidae	3									
	Philopotamidae	10									
	Limnephilidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 127 **Total No. Taxa** 12

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-28-03

Number of grids picked: 1

Time expenditure 30min No. of organisms ~120

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-29-03

Explain TCR ratings of 3-5:
Leuctridae - difficult to see pleural folds
Perlodidae - very tiny - educated guess.

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Cold Spring Run	LOCATION
STATION # CSR2 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 8-22-03	LOT # —
TAXONOMIST EJC DATE 10-29-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera	Corydalidae	1			
Hirudinea						Coleoptera	Elmidae	7	L/A		
Isopoda											
Amphipoda						Diptera	Simuliidae	13	LEP		
Decapoda							Chironomidae	11			
Ephemeroptera	Ephemerellidae	2					Empididae	3	LEP		
Plecoptera	Leuctridae	24				Gastropoda					
Trichoptera	Philopotamidae	24				Pelecypoda					
	Hydropsychidae	24				Other					
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 109 **Total No. Taxa** 9

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-23-03

Number of grids picked: 1

Time expenditure 45 min No. of organisms _____

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-29-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Dogwood Run	LOCATION
STATION # DR1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-19-03	LOT # —
TAXONOMIST EJC DATE 10-29-03	SUBSAMPLE TARGET ☒100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	2			
Hirudinea					
Isopoda	Asellidae	3			
Amphipoda	Gammaridae	16			
Decapoda					
Ephemeroptera	Isonychidae	4			3
Plecoptera					
Trichoptera	Hydropsychidae	4			
	Lepidostomatidae	1			
	Limnephilidae	1			
Hemiptera					

Organisms		No.	LS	TI	TCR
Megaloptera					
Coleoptera	Psephenidae	4			
	Elmidae	22	L&A		
Diptera	Chironomidae	34			
	Simuliidae	1			
	Tipulidae	1			
	Empididae	3	P		
Gastropoda					
Pelecypoda					
Other	Calopterygidae	1			

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 97 **Total No. Taxa** 14

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-21-03

Number of grids picked: 1

Time expenditure 30 min No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-29-03

Explain TCR ratings of 3-5:

Amelet'dae were small - educated guess.

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Dogwood Run, UNT	LOCATION
STATION # DR2 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-19-03	LOT # —
TAXONOMIST EJC DATE 10-29-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR
Oligochaeta	Fam 1	4			
Hirudinea					
Isopoda	Asellidae	1			
Amphipoda					
Decapoda					
Ephemeroptera	Baetidae	4			
Plecoptera					
Trichoptera	Philopotamidae	2			
	Hydropsychidae	2			
Hemiptera	Corixidae	2			

Organisms		No.	LS	TI	TCR
Megaloptera					
Coleoptera	Elmidae	1	A		
Diptera	Chironomidae	60	L&P		
	Simuliidae	5			
	Empididae	2			
	Stratiomyidae	3			
	Ceratopogonidae	1			
Gastropoda	Fam 2	1			
Pelecypoda					
Other	Coenagrionidae	4			
	Copepoda	2			
	Collembola	2			
	Bivalvia	9			

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 105 **Total No. Taxa** 17

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-16-03

Number of grids picked: 2

Time expenditure 1hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-29-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Dogwood Run	LOCATION
STATION # DR3 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-19-03	LOT # —
TAXONOMIST EJC DATE 10-24-03	SUBSAMPLE TARGET ☑ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera	Corydalidae	2			
Hirudinea						Coleoptera					
Isopoda											
Amphipoda						Diptera	Simuliidae	23	L&P		
Decapoda							Chironomidae	31	L&P		
Ephemeroptera	Heptageniidae	4					Psychodidae	1			
	Baetidae	2					Tipulidae	5			
							Tabanidae	1			
						Gastropoda					
Plecoptera	Perlidae	2				Pelecypoda					
	Chloroperlidae	3									
	Leuctridae	1				Other	Annelida	1			
Trichoptera	Hydropsychidae	7									
	Fam? pupa	1			5						
	Philopotamidae	7									
	Glossosomatidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 91 **Total No. Taxa** 15

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-23-03

Number of grids picked: 2

Time expenditure 1 hr No. of organisms _____

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

$$\frac{\text{\# organisms originally sorted}}{\text{\# organisms originally sorted}} \div \left(\frac{\text{\# organisms recovered by checker}}{\text{\# organisms originally sorted}} + \text{\# organisms originally sorted} \right) = \text{\% sorting efficiency}$$

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-24-03

Explain TCR ratings of 3-5:

T. Pupa → really bad shape, not counted

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Hairy Spring Hollow	LOCATION
STATION # HSHL RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 9-15-03	LOT # —
TAXONOMIST EJC DATE 11-19-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera	Corydalidae	2			
Hirudinea						Coleoptera	Elmidae	11	L&A		
Isopoda											
Amphipoda	Gammaridae	2				Diptera	Simuliidae	25	L&P		
							Chironomidae	27			
Decapoda							Tipulidae	2			
							Empididae	1			
Ephemeroptera							Ceratopogonidae	1			
						Gastropoda					
Plecoptera	Perlidae	2				Pelecypoda					
	Perlodidae	2									
	Leuctridae	15									
	Nemouridae	1			3	Other	Annelida	1			
Trichoptera	Hydropsychidae	24									
	Philopotamidae	2									
	Rhyacophilidae	2									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 120 **Total No. Taxa** 16

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-19-03

Number of grids picked: 2

Time expenditure 1.5hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+ # organisms originally sorted)	= % sorting efficiency
	÷			

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-19-03

Explain TCR ratings of 3-5:

Nemouridae small, only neck gills.

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Irish Gap Hollow	LOCATION
STATION # IRG1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 9-15-03	LOT # —
TAXONOMIST EJC DATE 11-25-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR
Oligochaeta					
Hirudinea					
Isopoda					
Amphipoda					
Decapoda					
Ephemeroptera	Ephemerellidae	1			
Plecoptera	Perlidae	3			
	Leuctridae	6			
Trichoptera	Hydropsychidae	19			
	Brachycentridae	1			
	Philopotamidae	1			3
Hemiptera					
Megaloptera	Corydalidae	1			
Coleoptera	Elmidae	15	L&A		
Diptera	Chironomidae	74			
	Simuliidae	3			
	Empididae	3			
Gastropoda					
Pelecypoda					
Other	Gomphidae	1			
	Calopterygidae	1			

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 129 **Total No. Taxa** 13

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-24-03

Number of grids picked: 1

Time expenditure 45 min No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-25-03

Explain TCR ratings of 3-5:

Philopotamidae very small & in bad shape - best guess based on other samples.

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Kings Gap Hollow	LOCATION
STATION # KH1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 8-25-03	LOT # —
TAXONOMIST EJC DATE 11-13-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera	Corydalidae	1			
Hirudinea						Coleoptera	Elmidae	8	L&A		
Isopoda											
Amphipoda						Diptera	Chironomidae	36			
Decapoda							Ceratopogonidae	2			
Ephemeroptera	Ephemerellidae	4					Simuliidae	5			
							Tipulidae	1			
						Gastropoda					
						Pelecypoda					
Plecoptera	Peltoperlidae	1									
	Lenctridae	18				Other	Gomphidae	1			
	Perlidae	1					Copepoda	1			
Trichoptera	Hydropsychidae	21									
	Philopotamidae	11									
	Rhyacophilidae	2									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 113 **Total No. Taxa** 15

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-5-03

Number of grids picked: 1

Time expenditure 1 hr No. of organisms ~110

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷	(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-13-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Little Dogwood	LOCATION
STATION # LD1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-21-03	LOT # —
TAXONOMIST EJC DATE 10-22-03	SUBSAMPLE TARGET ☑100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	6				Megaloptera	Corydalidae	1			
Hirudinea						Coleoptera	Elmidae	1			
Isopoda	Asellidae	1									
Amphipoda						Diptera	Simuliidae	12			
							Chironomidae	57	L&P		
Decapoda							Ceratopogonidae	2			
							Empididae	10			
Ephemeroptera						Gastropoda	Fam I	1			
						Pelecypoda					
Plecoptera											
						Other	Copepoda	1			
							Hydracarina	1			
							Arachnidia	1			
Trichoptera	Philopotamidae	1					Collembola	1			
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 14 **Total No. Taxa** 96

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-21-03

Number of grids picked: 4

Time expenditure 2 hrs No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

midges

QC: ❑ YES ❑ NO **QC Checker** _____

$$\frac{\text{\# organisms originally sorted}}{\square} \div \left(\frac{\text{\# organisms recovered by checker}}{\square} + \frac{\text{\# organisms originally sorted}}{\square} \right) = \frac{\text{\% sorting efficiency}}{\square}$$

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-22-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Mountain Run	LOCATION
STATION # MN1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 8-22-03	LOT # —
TAXONOMIST EJC DATE 11-24-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	4				Megaloptera					
Hirudinea						Coleoptera	Elmidae	11	L&A		
Isopoda											
Amphipoda	Gammaridae	1				Diptera	Chironomidae	50	L&P		
Decapoda							Tipulidae	2			
Ephemeroptera	Heptageniidae	8					Ceratopogonidae	1			
	Baetidae	1					Empididae	4	P		
	Caenidae	1					Tabanidae	1			
	Isonychiidae	2				Gastropoda					
Plecoptera	Perlidae	1				Pelecypoda					
Trichoptera	Hydropsychidae	4				Other	Alshnidae	1			
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 92 **Total No. Taxa** 15

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-24-03

Number of grids picked: 3

Time expenditure 1 hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-24-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Mountain Creek	LOCATION
STATION # MN2 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 10-1-03	LOT # —
TAXONOMIST EJC DATE 11-19-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR
Oligochaeta					
Hirudinea					
Isopoda					
Amphipoda					
Decapoda					
Ephemeroptera	Heptageniidae	17			
	Ephemerellidae	8			
	Baetidae	4			
	Isonychidae	2			3
Plecoptera	Perlidae	4			3
	Chloroperlidae	1			
Trichoptera	Philopotamidae	12			
	Hydropsychidae	19			
	Limnephilidae	1			
Hemiptera					

Organisms		No.	LS	TI	TCR
Megaloptera	Corydalidae	1			
Coleoptera	Elmidae	4	L&A		
Diptera	Chironomidae	32	L&P		
	Simuliidae	5			
	Tipulidae	2			
	→ flat (terrestrial)	1			3
Gastropoda					
Pelecypoda					
Other	Gomphidae	2			3
	Annelida	1			

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 115 **Total No. Taxa** 16

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-19-03

Number of grids picked: 2

Time expenditure 1 hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

$$\text{\# organisms originally sorted} \div \left(\text{\# organisms recovered by checker} + \text{\# organisms originally sorted} \right) = \text{\% sorting efficiency}$$

$$\square \div \left(\square + \square \right) = \square$$

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-19-03

Explain TCR ratings of 3-5:
Gomphidae, Perlidae (most) small
Ephemerellidae small, best guess.

Other Comments (e.g. condition of specimens):
terrestrial dipteran (?) not counted

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail
Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Mountain Creek	LOCATION
STATION # MN3 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 9-17-03	LOT # —
TAXONOMIST EJC DATE 11-19-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera	Corydalidae	3			
Hirudinea						Coleoptera	Elmidae	24	L&A		
Isopoda											
Amphipoda						Diptera	Chironomidae	46	L&P		
Decapoda							Simuliidae	1			
							Tipulidae	3			
Ephemeroptera	Ephemerellidae	2					Empididae	1	P		
						Gastropoda					
						Pelecypoda					
Plecoptera	Perlidae	3									
	Leuctridae	7									
	Chloroperlidae	2			3	Other	—				
							Calopterygidae	2			
Trichoptera	Hydropsychidae	17									
	Lepidostomatidae	1									
	Rhyacophilidae	4									
	Philopotamidae	8									
	Glossosomatidae	2									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 126 **Total No. Taxa** 16

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-19-03

Number of grids picked: 3

Time expenditure 1.5hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

2 Megaloptera (Large)

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-19-03

Explain TCR ratings of 3-5:

Chloroperlidae → small

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Old Town Run	LOCATION
STATION # OR1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-21-03	LOT # —
TAXONOMIST EJC DATE 10-24-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera	Elmidae	17	L&A		
Isopoda											
Amphipoda						Diptera	Simuliidae	4			
							Chironomidae	21	L&P		
Decapoda							Empididae	2			
Ephemeroptera	Heptageniidae	12									
	Baetidae	10				Gastropoda					
	Isonychidae	5									
						Pelecypoda					
Plecoptera	Perlidae	2									
	Pteronarcyidae	1									
						Other	Gomphidae	1			
Trichoptera	Philopotamidae	10									
	Hydropsychidae	9									
	Glossosomatidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 95 **Total No. Taxa** 13

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-22-03

Number of grids picked: 1

Time expenditure 30min No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

crayfish

QC: ❑ YES ❑ NO **QC Checker** _____

$$\frac{\text{\# organisms originally sorted}}{\text{\# organisms originally sorted}} \div \left(\frac{\text{\# organisms recovered by checker}}{\text{\# organisms originally sorted}} + \text{\# organisms originally sorted} \right) = \text{\% sorting efficiency}$$

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-24-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Old Town Run	LOCATION
STATION # OR2 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-21-03	LOT # —
TAXONOMIST EJC DATE 10-28-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	1				Megaloptera					
Hirudinea						Coleoptera	Elmidae	2			
Isopoda											
Amphipoda						Diptera	Chironomidae	45			
							Simuliidae	12			
Decapoda							Ceratopogonidae	2			
							Tipulidae	3			
Ephemeroptera	Heptageniidae	1									
	Baetidae	1			3	Gastropoda					
						Pelecypoda					
Plecoptera	Leuctridae	8									
	Chloroperlidae	1									
						Other	Gomphidae	1			
Trichoptera	Hydropsychidae	17									
	Philopotamidae	4									
	Lepidostomatidae	2									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 101 **Total No. Taxa** 14

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-28-03

Number of grids picked: 2

Time expenditure 1 hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-28-03

Explain TCR ratings of 3-5:

Baetidae in bad shape

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Peach Hollow	LOCATION
STATION # PH1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 8-28-03	LOT # —
TAXONOMIST EJC DATE 11-17-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera					
Isopoda											
Amphipoda						Diptera	Chironomidae	62			
							Ceratopogonidae	1			
Decapoda							Tipulidae	1			
							Empididae	1			
Ephemeroptera											
						Gastropoda					
						Pelecypoda					
Plecoptera											
						Other	Collembola	14			
Trichoptera	Limnephilidae	1									
Hemiptera	Gerridae	1									

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 81 **Total No. Taxa** 7

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-17-03

Number of grids picked: 6

Time expenditure 3 hrs No. of organisms ≤100

Indicate the presence of large or obviously abundant organisms:

few bugs

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+ # organisms originally sorted)	= % sorting efficiency
	÷			

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-17-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Pippins Run	LOCATION
STATION # PR1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HLC DATE 8-12-03	LOT # —
TAXONOMIST EJC DATE 9-17-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	2				Megaloptera	Corydalidae	1			
Hirudinea						Coleoptera	Elmidae	12	L&A		
Isopoda	Asellidae	1					Psephenidae	1			
Amphipoda	Gammaridae	5				Diptera	Chironomidae	26			
Decapoda							Simuliidae	3			
Ephemeroptera	Heptageniidae	9					Tipulidae	5	L&P		
	Baetidae	23			3	Gastropoda					
	Ephemerellidae	1			3						
						Pelecypoda					
Plecoptera	Leuctridae	3			3						
						Other	Bivalvia	1			
							Collembola	1			
Trichoptera	Hydropsychidae	19									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 113 **Total No. Taxa** 16

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-19-03

Number of grids picked: 1

Time expenditure 45min No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

Stoneflies, caddisflies, scuds

QC: ❑ YES ❑ NO **QC Checker** _____

$$\frac{\text{\# organisms originally sorted}}{\left(\text{\# organisms recovered by checker} + \text{\# organisms originally sorted}\right)} = \text{\% sorting efficiency}$$

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 9-17-03

Explain TCR ratings of 3-5:

Scope not resolute enough for small bugs

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Stony Run	LOCATION
STATION # SR1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HL DATE 8-18-03	LOT # —
TAXONOMIST EJC DATE 11-24-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera	Psephenidae	2			
							Elmidae	8	L&A		
Isopoda											
Amphipoda	Gammaridae	1				Diptera	Chironomidae	39	L&P		
							Tipulidae	2			
Decapoda							Simuliidae	1			
							Empididae	2			
Ephemeroptera	Baetidae	32									
	Heptageniidae	6				Gastropoda					
	Ephemerellidae	1									
	Isonychiidae	1									
						Pelecypoda					
Plecoptera											
						Other	Calopterygidae	2			
Trichoptera	Hydropsychidae	14									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 111 **Total No. Taxa** 13

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-24-03

Number of grids picked: 2

Time expenditure 45min No. of organisms ≥100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-24-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Stony Run	LOCATION
STATION # SR2 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-18-03	LOT # —
TAXONOMIST EJC DATE 8-22-03	SUBSAMPLE TARGET ☑ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	18				Megaloptera					
Hirudinea						Coleoptera	Elmidae	3	L&A		
Isopoda	Asellidae	1				Diptera	Chironomidae	30	L&P		
Amphipoda	Gammaridae	11					Ceratopogonidae	2			
Decapoda							Tipulidae	1			
Ephemeroptera	Baetidae	21			3		Tabanidae	1			
Plecoptera						Gastropoda	Fam I	2			
Trichoptera						Pelecypoda					
Hemiptera	Corixidae	5				Other	Bivalvia	1			
							Coenagrionidae	2			
							Collembola	1			

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 99 **Total No. Taxa** 14

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-25-03

Number of grids picked: 3

Time expenditure 1 hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+ # organisms originally sorted)	= % sorting efficiency
	÷			

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 9-22-03

Explain TCR ratings of 3-5:

low scope resolution

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Stony Run	LOCATION
STATION # SR3 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-18-03	LOT # —
TAXONOMIST EJC DATE 11-11-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera	Elmidae	9	L&A		
							Psephenidae	1			
Isopoda											
Amphipoda	Gammaridae	1				Diptera	Simuliidae	13	L&P		
							Chironomidae	26			
Decapoda							Empididae	6			
							Tipulidae	1			
Ephemeroptera	Heptageniidae	16									
	Baetidae	32			3	Gastropoda					
						Pelecypoda					
Plecoptera	Perlidae	1									
						Other					
Trichoptera	Hydropsychidae	8									
	Philopotamidae	4									
	Glossosomatidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 119 **Total No. Taxa** 13

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-11-03

Number of grids picked: 1

Time expenditure 45 min No. of organisms ~120

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-11-03

Explain TCR ratings of 3-5:

Baetidae too small to be sure - educated guess ~70% of them

Other Comments (e.g. condition of specimens):

large Perlidae

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Shromes Hollow	LOCATION
STATION # STH1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 9-9-03	LOT # —
TAXONOMIST EJC DATE 11-17-03	SUBSAMPLE TARGET ☑ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera	Corydalidae	1			
Hirudinea						Coleoptera					
Isopoda											
Amphipoda	Gammaridae	4				Diptera	Simuliidae	35			
Decapoda							Chironomidae	19			
Ephemeroptera							Empididae	2			
							Psychodidae	1			4
						Gastropoda					
						Pelecypoda					
Plecoptera	Perlidae	2									
						Other					
Trichoptera	Hydropsychidae	10									
	Philopotamidae	18	L&P								
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 92 **Total No. Taxa** 9

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-17-03

Number of grids picked: 3

Time expenditure 1.5hr No. of organisms _____

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-17-03

Explain TCR ratings of 3-5:

Psychodidae really small, based on similar specimens in other samples.

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Toms Run	LOCATION
STATION # TR1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 9-17-03	LOT # —
TAXONOMIST EJC DATE 11-12-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera	Elmidae	7			
							Hydrophilidae	1			2
Isopoda											
Amphipoda						Diptera	Chironomidae	33			
							Simuliidae	13			
Decapoda							Tipulidae	4			
							Empididae	2			
Ephemeroptera	Heptageniidae	7					Psychodidae	1			4
	Ephemerellidae	3				Gastropoda					
	Leptophlebiidae	7									
	Baetidae	8									
						Pelecypoda					
Plecoptera	Pteronarcyidae	1									
	Peltoperlidae	1									
	Perlidae	4				Other					
	Chloroperlidae	2									
Trichoptera	Philopotamidae	6									
	Hydropsychidae	6									
	Rhyacophilidae	6			3						
	Lepidostomatidae	1									
	Glossosomatidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 114 **Total No. Taxa** 20

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-12-03

Number of grids picked: 2

Time expenditure 45 min No. of organisms ~120

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-12-03

Explain TCR ratings of 3-5: Hydrophilidae - difficult to key
Rhyacophilidae - no anal spine, but doesn't fit elsewhere
Psychodidae - difficult to key

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Unnamed trib	LOCATION
STATION # UNT1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 9-18-03	LOT # —
TAXONOMIST EJC DATE 11-17-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera	Elmidae	35	L&A		
Isopoda	Asellidae	5									
Amphipoda	Gammaridae	40				Diptera	Chironomidae	6			
							Simuliidae	9			
Decapoda							Empididae	1			
Ephemeroptera	Baetidae	3									
						Gastropoda					
						Pelecypoda					
Plecoptera											
						Other	Calopterygidae	1			
							Ceenagrionidae	1			
							Bivalvia	1			
Trichoptera	Hydropsychidae	2									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 104 **Total No. Taxa** 11

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-17-03

Number of grids picked: 2

Time expenditure 30min No. of organisms _____

Indicate the presence of large or obviously abundant organisms:

Salamander

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-17-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION
STATION # YB1 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-7-03	LOT # —
TAXONOMIST EJC DATE 8-19-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	18				Megaloptera					
Hirudinea						Coleoptera	Psephenidae	1			
							Elmidae	10	L		
Isopoda	Asellidae	2									
Amphipoda	Gammaridae	26				Diptera	Chironomidae	22			
							Empididae	1	P		
Decapoda											
Ephemeroptera	Tricorythidae	1			3						
	Baetidae	3				Gastropoda					
						Pelecypoda					
Plecoptera											
						Other	Bivalvia	1			
							Collembola	1			
Trichoptera	Hydropsychidae	11									
	Philopotamidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 98 **Total No. Taxa** 13

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-18-03

Number of grids picked: 10

Time expenditure 1.5 hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:
Hydropsychidae
Scuds

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 8-19-03

Explain TCR ratings of 3-5:
1/2 gills gone (Trichorythidae)

Other Comments (e.g. condition of specimens):
—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail
Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION
STATION # YB2 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-25-03	LOT # —
TAXONOMIST EJC DATE 10-22-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta						Megaloptera					
Hirudinea						Coleoptera	Elmidae	23			
Isopoda	Asellidae	76									
Amphipoda	Gammaridae	36				Diptera	Chironomidae	9			
							Simuliidae	16			
Decapoda											
Ephemeroptera	Baetidae	4			3						
						Gastropoda					
						Pelecypoda					
Plecoptera											
						Other					
Trichoptera	Hydropsychidae	2									
	Limnephilidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 157 **Total No. Taxa** 8

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-16-03

Number of grids picked: 1

Time expenditure 20min No. of organisms ~150

Indicate the presence of large or obviously abundant organisms:

too many bugs

QC: ❑ YES ❑ NO QC Checker _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-22-03

Explain TCR ratings of 3-5:

Baetidae too small to be sure.

Other Comments (e.g. condition of specimens):

~

QC: ❑ YES ❑ NO QC Checker _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION
STATION # YB3 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 9-15-03	LOT # —
TAXONOMIST EJC DATE 10-30-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR
Oligochaeta	Fam 1	3			
Hirudinea					
Isopoda					
Amphipoda					
Decapoda					
Ephemeroptera	Ameletidae	9			
	Leptophlebiidae	6			3
Plecoptera					
Trichoptera	Hydropsychidae	5			
	Philopotamidae	2			
Hemiptera					

Organisms		No.	LS	TI	TCR
Megaloptera					
Coleoptera	Elmidae	3			
Diptera	Chironomidae	67			
	Simuliidae	3	LEP		
	Culicidae	1			3
Gastropoda	Fam 2	1			
Pelecypoda					
Other					

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 100 **Total No. Taxa** 10

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-16-03

Number of grids picked: 1

Time expenditure 30 min No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-30-03

Explain TCR ratings of 3-5:
Leptophlebiidae - one gill on one insect (loose). Others had similar body structure
Culicidae - underdeveloped, but has enough features to be reasonably sure

Other Comments (e.g. condition of specimens): —

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION
STATION # YB4 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 10-1-03	LOT # —
TAXONOMIST EJC DATE 10-21-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	10				Megaloptera					
Hirudinea						Coleoptera	Elmidae	29	L&A		
							Psephenidae	3			
Isopoda											
Amphipoda	Gammaridae	6				Diptera	Chironomidae	3			
							Tipulidae	1			
Decapoda											
Ephemeroptera	Heptageniidae	13									
	Ephemerellidae	3				Gastropoda	Fam I	3			
	Baetidae	10			2						
						Pelecypoda					
Plecoptera											
						Other	Bivalvia	2			
							Arachnidia	2			
Trichoptera	Hydropsychidae	12									
	Brachycentridae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 98 **Total No. Taxa** 14

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 10-23-03

Number of grids picked: 2

Time expenditure 45 min No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted	÷ (	# organisms recovered by checker	+	# organisms originally sorted	) =	% sorting efficiency

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 10-24-03

Explain TCR ratings of 3-5:

Baetidae small

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION
STATION # YB5 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-7-03	LOT # —
TAXONOMIST EJC DATE 8-14-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	11				Megaloptera					
Hirudinea						Coleoptera	Elmidae	38	L		
Isopoda											
Amphipoda	Gammaridae	15				Diptera	Chironomidae	5			
Decapoda							Simuliidae	2			
Ephemeroptera	Heptageniidae	6					Empididae	1	L		
	Baetidae	18			4		Tipulidae	1	L		
	Caenidae	1				Gastropoda	Fam I	1			
	Ephemerellidae	2									
Plecoptera						Pelecypoda					
Trichoptera	Hydropsychidae	13				Other					
	Brachycentridae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 115 **Total No. Taxa** 14

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-19-03

Number of grids picked: 1

Time expenditure 45 No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 8-19-03

Explain TCR ratings of 3-5:

Baetidae - small & loss of gills & legs

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION
STATION # YBE RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-21-03	LOT # —
TAXONOMIST EJC DATE 9-22-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	24				Megaloptera					
Hirudinea						Coleoptera	Elmidae	25	L&A		
							Psephenidae	2			
Isopoda											
Amphipoda	Gammaridae	19				Diptera	Chironomidae	11	L&P		
							Simuliidae	2			
Decapoda							Empididae	1	P		
							Tipulidae	2			
Ephemeroptera	Heptageniidae	8									
	Ephemeridae	1				Gastropoda					
	Caenidae	3									
	Ephemerellidae	1									
	Baetidae	15				Pelecypoda					
Plecoptera											
						Other					
Trichoptera	Hydropsychidae	7									
	Brachycentridae	1									
	(Fam I	1	)		*						
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 122 **Total No. Taxa** 15

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 8-25-03

Number of grids picked: 1

Time expenditure 1/2 hr No. of organisms ~110

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 9-22-03

Explain TCR ratings of 3-5:

Back end of Trichop. Fam I larvae was missing (not counted)

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION
STATION # YB7 RIVERMILE —	STREAM CLASS
LAT — LONG —	RIVER BASIN Yellow Breeches
STORET # —	AGENCY —
COLLECTED BY HC DATE 8-28-03	LOT # —
TAXONOMIST EJC DATE 11-24-03	SUBSAMPLE TARGET ☒ 100 ☐ 200 ☐ 300 ☐ Other ___

Enter Family and/or Genus and Species name on blank line.

Organisms		No.	LS	TI	TCR	Organisms		No.	LS	TI	TCR
Oligochaeta	Fam I	5				Megaloptera					
Hirudinea						Coleoptera	Elmidae	16	L&A		
							Psephenidae	1			
Isopoda											
Amphipoda	Gammaridae	7				Diptera	Chironomidae	36	L&P		
							Simuliidae	1	P		
Decapoda							Empididae	1			
Ephemeroptera	Heptageniidae	13									
	Caenidae	9				Gastropoda	Fam I	1			
	Ephemeridae	3									
	Baetidae	6									
	Ephemerellidae	1				Pelecypoda					
Plecoptera											
						Other	Bivalvia	2			
							Aeshnidae	1			
Trichoptera	Hydropsychidae	4									
	Philopotamidae	1									
	Limnephilidae	1									
Hemiptera											

Taxonomic certainty rating (TCR) 1-5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 108 **Total No. Taxa** 18

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

SUBSAMPLING/SORTING INFORMATION

Sorter EJC

Date 11-24-03

Number of grids picked: 3

Time expenditure 1hr No. of organisms ~100

Indicate the presence of large or obviously abundant organisms:

—

QC: ❑ YES ❑ NO **QC Checker** _____

# organisms originally sorted		(# organisms recovered by checker	+	# organisms originally sorted)	=	% sorting efficiency
	÷					

≥90%, sample passes _____

<90%, sample fails, action taken _____

TAXONOMY

ID EJC

Date 11-24-03

Explain TCR ratings of 3-5:

—

Other Comments (e.g. condition of specimens):

—

QC: ❑ YES ❑ NO **QC Checker** _____

Organism recognition ❑ pass ❑ fail

Verification complete ❑ YES ❑ NO

General Comments (use this space to add additional comments):

APPENDIX D

HABITAT ASSESSMENT FIELD SHEETS

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Cedar Run	LOCATION 17th St. USGS Station	
STATION # CR1 RIVERMILE	STREAM CLASS 3	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY GF/HRG	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8/1/03 TIME 11:30 (AM) PM	REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 (12) 11	(10) 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 4 (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 3 (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 (1) 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

14
10
10
11
9 54
15 84
15
5 89
10 99
19

Total Score 118

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME unnamed trib to CR	LOCATION Rossmoyne Rd, 100ft from cross
STATION # CR2 RIVERMILE	STREAM CLASS 4
LAT LONG	RIVER BASIN MB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, MB	
FORM COMPLETED BY AG	DATE 8-5-03 TIME 12:00 AM (PM)
REASON FOR SURVEY Asst	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 **(14)** 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 8 (LB)	Left Bank 10 9	**(8)** 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	**(8)** 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 7 (LB)	Left Bank 10 9	8 **(7)** 6	5 4 3	2 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	**(2)** 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 **(3)**	2 1 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 **(1)** 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Unnamed to CR	LOCATION State Hill @ Yahmaha 100 us from cross.
STATION # CR3 RIVERMILE	STREAM CLASS 4
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AMG, MB	
FORM COMPLETED BY AG	DATE 8-5-03 TIME 1:30 AM (PM)
REASON FOR SURVEY Asst	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 5 (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	(5) 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 (1) 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score _____

grate/concrete slab on RB

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME CEDAR Run	LOCATION Hartdale (Trail) 200ft ds bridge	
STATION # CR4 RIVERMILE	STREAM CLASS 3	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, MB		
FORM COMPLETED BY AG	DATE 8-5-03 TIME 10:30 (AM) PM	REASON FOR SURVEY ASST

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 7 (LB)	Left Bank 10 9	8 (8) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Cold Spring Run	LOCATION 100 upstr. Pine Rd./E. YB Rd X
STATION # CSR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-22-03 TIME 12 AM (PM)
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 **(7)** 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 3 (LB)	Left Bank 10 9	8 7 6	5 4 **(3)**	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 **(6)**	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 6 (LB)	Left Bank 10 9	8 7 **(6)**	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	[illegible] **(4)** 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 **(3)**	2 1 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 **(1)** [illegible]

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Cold Spring Run	LOCATION 100 ft. upst. ColdSpring Rd X
STATION # CRS2 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-22-03 TIME 1:30 AM (PM)
REASON FOR SURVEY Asst	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 9 (LB)	Left Bank 10 (9)	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 (9)	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 (1) 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Dogwood Run	LOCATION 150' upstr. from YB confluence
STATION # DR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-19 TIME 12:30 AM (PM)
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 7 (LB)	Left Bank 10 9	8 **(7)** 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 **(3)**	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 7 (LB)	Left Bank 10 9	8 **(7)** 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **(7)** 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	**(5)** 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 **(6)**	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Dogwood Run	LOCATION 100 ds Rt. 74
STATION # DR2 RIVERMILE	STREAM CLASS IV
LAT _____ LONG _____	RIVER BASIN VB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-19 TIME 11 (AM) PM
REASON FOR SURVEY Asst	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Dogwood Run	LOCATION 100' upstr. from Green Rd. X
STATION # DR3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY GF, HRG
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-19-03 TIME 9:15 (AM) PM
	REASON FOR SURVEY Asst

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Hairy Spring Holl.	LOCATION 100' upstr. Furnace Hollow Rd. X
STATION # HSH1 RIVERMILE	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9-15-03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Irishtown Gap	LOCATION behind residence on Irishtown Gap Rd.
STATION # 1G1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9-15-03 TIME 2 AM (PM)
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 6 (LB)	Left Bank 10 9	8 7 **(6)**	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 **(6)**	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 4 (LB)	Left Bank 10 9	8 7 6	5 **(4)** 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 **(7)** 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 **(1)** 0
SCORE 8 (RB)	Right Bank 10 9	**(8)** 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME King's Gap Hollow	LOCATION 100 ft. upstr. King's Gap Rd. X
STATION # KH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-25-03 TIME 10 (AM) PM — REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Little Dogwood Run	LOCATION 100 ft upstr. behind Waynesboro
STATION # LD1 RIVERMILE	STREAM CLASS H
LAT LONG	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-21-03 TIME 1:30 AM (PM)
REASON FOR SURVEY Assmt	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Mt. Creek	LOCATION 500 ft from confluence - Mt. Holly - Ladnor Lane	
STATION # MN1 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN Yellow Breeches	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-22-03 TIME 10 (AM) PM	REASON FOR SURVEY Asst

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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 (7) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	[illegible] (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 5 (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Mountain Creek	LOCATION Across from Pendot main/34
STATION # MN2 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 10/1/03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 5 (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 4 (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Mt. Creek	LOCATION 400' upstr. of 233 X (Michaux Rd vicinity)
STATION # MN3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, BD, AG	
FORM COMPLETED BY AG	DATE 9-17-03 TIME 12 AM (PM)
	REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Old Town Run 1	LOCATION 100 dstr. Targer Rd. X	
STATION # OR1 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN Yellow Breeches	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-21-03 TIME 2:30 AM (PM)	REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Old Town Run	LOCATION Downstream Whiskey Spring Rd Crossing
STATION # OR2 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG GF
INVESTIGATORS HC AG BD	
FORM COMPLETED BY Brian Dunlap	DATE 5/21/13 TIME 1440 (AM) PM
	REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 4 (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 (1) 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 (1) 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Peach Orchard Holl.	LOCATION Peach Orchard Hollow Rd.
STATION # PH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG/GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-28-03 TIME 2 AM (PM)
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 (1) 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE (10) (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Pippins Run	LOCATION Lewisberry Rd X, 150'ds bridge
STATION # PR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF,
INVESTIGATORS HC, AMG, MB	
FORM COMPLETED BY AG	DATE 8-12-03 TIME 9:15 (AM) PM
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Stony Run	LOCATION 100' upstream of Grantham X	
STATION # SR1 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY GF, HRG	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-18-03 TIME 10 (AM) PM	REASON FOR SURVEY ASS'T

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 (3)	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Stony Run	LOCATION 100 dS/ Old York Rd X
STATION # SR2 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-18 TIME 1 AM (PM)
	REASON FOR SURVEY ASST

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 4 (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Stony Run	LOCATION 100 ᵛpst. Fleys Rd X
STATION # SR3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS AG, HC, BD	
FORM COMPLETED BY AG	DATE 8-18-03 TIME 12 AM PM
REASON FOR SURVEY ASS't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 4 (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 5 (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Stromers Hollow	LOCATION 200' upstr. Sand Hill Rd - X
STATION # STH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9/9/03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 4 (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Toms Run		LOCATION 200' downstr. of 233 X	
STATION # TR1	RIVERMILE	STREAM CLASS III	
LAT	LONG	RIVER BASIN YB	
STORET #		AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD			
FORM COMPLETED BY AG	DATE 9-17-03 TIME 10 (AM) PM	REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Frequency of Riffles (or bends)	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; distance 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
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 in 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 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank (10)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Unnamed trib to Yellow Breeches	LOCATION 2000ft upstream of Lisburn xsection	
STATION # UNT 1 RIVERMILE	STREAM CLASS 3	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY DEP	
INVESTIGATORS HL, EC		
FORM COMPLETED BY EC	DATE 9-18-03 TIME 1:30 (AM) PM	REASON FOR SURVEY Asst

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 **18** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 **1** 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 **4** 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 6 (LB)	Left Bank 10 9	8 7 **6**	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 **6**	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank **10** 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank **10** 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME YB1	LOCATION Main - N. Cumb./Bridge St.
STATION # YB1 RIVERMILE	STREAM CLASS II
LAT / LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF,
INVESTIGATORS HC, AG, MB	
FORM COMPLETED BY AG	DATE 8-7-03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 4 (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE 4 (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 5 (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Yellow Breeches	LOCATION 300' upstr. Enck's Mill Rd. X
STATION # YB2 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS AG, HC, BD	
FORM COMPLETED BY AG	DATE 8/25/03 TIME 12 AM (PM)
REASON FOR SURVEY Asst	

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 9 (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 (9)	8 7 6	(5) 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Yellow Breech-Main	LOCATION 100' upstr. Hays Grove Rd. X
STATION # YB3 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9-15-03 TIME 12 AM (PM)
REASON FOR SURVEY Ass't	

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
	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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Yellow Br.	LOCATION 200' ~~down~~ upstr. of Sheepford Rd. X
STATION # YB4 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 10/1/03 TIME 1 AM (PM)
	REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 3 (LB)	Left Bank 10 9	8 7 6	5 4 (3)	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 6 (LB)	Left Bank 10 9	8 7 (6)	(5) 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME YB-Main	LOCATION 500'ds - mc	
STATION # YB5 RIVERMILE	STREAM CLASS II	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, MB		
FORM COMPLETED BY AG	DATE 8-7 TIME 12 AM (PM)	REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 **3** 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 6 (LB)	Left Bank 10 9	8 7 **6**	5 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	**5** 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 8 (LB)	Left Bank 10 9	**8** 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	**8** 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 **1** 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 **1** 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Yellow Breeches-M	LOCATION 150 upstream of Creek Rd / 74	
STATION # YB6 RIVERMILE	STREAM CLASS II	
LAT LONG	RIVER BASIN Yellow Breeches	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-21-03 TIME 9:30 (AM) PM	REASON FOR SURVEY Asst

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 **(9)** 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 5 (LB)	Left Bank 10 9	8 7 6	**(5)** 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	**(8)** 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 4 (LB)	Left Bank 10 9	8 7 6	5 **(4)** 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	**(5)** 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	**(2)** 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	**(2)** 1 0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Yellow Breeches	LOCATION BS	
STATION # YB7 RIVERMILE	STREAM CLASS II	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-28-03 TIME 10 (AM) PM	REASON FOR SURVEY Ass't

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 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
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 (7) 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in 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 7 (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative 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 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 6 (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0

Total Score _____

APPENDIX E

HABITAT ASSESSMENT SCORES & CONDITION CATEGORY DETERMINATION

Habitat Assessment Scores/Condition Category worksheet

Low-gradient tributary site:	CR1	CR2	CR3	CR4	CSR1	DR2	LD1	MN1	OR1	SR1	SR2	SR3	UNT1
Habitat Feature													
Epifaunal Substrate/Available Cover	15	11	10	9	17	3	8	8	**18**	14	4	9	10
Pool Substrate Characterization	15	13	13	13	14	11	12	10	**16**	18	12	12	10
Pool Variability	5	3	2	7	13	2	3	1	**3**	4	12	11	14
Sediment Deposition	10	8	5	8	9	3	15	8	**17**	19	6	9	7
Channel Flow Status	19	14	15	18	13	8	11	16	**17**	12	14	19	13
Channel Alteration	14	18	19	16	8	5	18	7	**18**	19	17	14	17
Channel Sinuosity	10	14	7	2	7	8	15	2	**13**	6	7	15	18
Left Bank Stability	4	8	5	7	3	2	8	7	**6**	9	4	4	1
Right Bank Stability	6	8	6	7	6	2	8	7	**6**	3	5	4	4
Left Bank Vegetative Protection	3	7	7	9	6	3	6	8	**6**	8	7	5	6
Right Bank Vegetative Protection	8	2	3	9	4	3	6	7	**6**	5	7	5	6
Left Bank Riparian Vegetative Zone	1	3	1	8	3	3	8	5	**7**	8	7	2	10
Right Bank Riparian Vegetative Zone	8	1	2	9	1	8	6	6	**8**	2	7	2	10
Total Habitat Score	118	110	95	122	104	61	124	92	**141**	127	109	111	126
Habitat Assessment Score (HAS)	**84**	**78**	**67**	**87**	**74**	**43**	**88**	**65**	**100**	**90**	**77**	**79**	**89**
(Percent Comparability to Reference)													
Habitat Condition Category	**S**	**S**	**PS**	**S**	**PS**	**N**	**S**	**PS**	**E**	**E**	**S**	**S**	**S**
Reference Site (REF)									**REF**				

E = Excellent
S = Supporting
PS = Partially Supporting
N = Not supporting

Category	HAS
Excellent	>90
Supporting	89-75
Partially Supporting	74-60
Not supporting	<60

Habitat Assessment Scores/Condition Category worksheet

High-gradient tributary site:	CSR2	DR1	DR3	HSH1	IRG1	KH1	MN2	MN3	OR2	PH1	PR1	STH1	TR1
Habitat Feature													
Epifaunal Substrate/Available Cover	16	18	15	19	18	19	19	19	17	12	16	12	**20**
Pool Substrate Characterization	16	17	18	18	13	14	17	18	18	18	16	12	**17**
Pool Variability	12	15	14	13	9	16	14	16	10	1	13	8	**17**
Sediment Deposition	18	6	10	17	10	15	13	17	12	19	18	16	**14**
Channel Flow Status	13	12	7	13	14	12	18	18	7	5	19	9	**16**
Channel Alteration	18	13	18	19	14	19	19	19	11	20	18	16	**19**
Channel Sinuosity	18	17	18	18	15	19	18	18	18	16	19	17	**19**
Left Bank Stability	9	7	2	8	6	9	5	8	4	8	7	2	**6**
Right Bank Stability	9	3	2	8	6	9	7	7	4	8	7	2	**8**
Left Bank Vegetative Protection	9	7	7	7	4	8	4	9	1	7	8	4	**8**
Right Bank Vegetative Protection	8	7	7	7	7	8	6	9	1	7	8	4	**10**
Left Bank Riparian Vegetative Zone	1	5	7	7	1	10	10	10	7	8	10	7	**10**
Right Bank Riparian Vegetative Zone	9	6	9	10	8	10	10	10	10	10	10	7	**7**
Total Habitat Score	156	133	134	164	125	168	160	178	120	139	169	116	**171**
Habitat Assessment Score (HAS)	**91**	**78**	**78**	**96**	**73**	**98**	**94**	**104**	**70**	**81**	**99**	**68**	**100**
(Percent Comparability to Reference)													
Habitat Condition Category	**E**	**S**	**S**	**E**	**PS**	**E**	**E**	**E**	**PS**	**S**	**E**	**PS**	**E**
Reference Site (REF)													**REF**

E = Excellent
S = Supporting
PS = Partially Supporting
N = Not supporting

Category	HAS
Excellent	>90
Supporting	89-75
Partially Supporting	74-60
Not supporting	<60

Habitat Assessment Scores/Condition Category worksheet

Mainstem site:	YB1	YB2	YB3	YB4	YB5	YB6	YB7
Habitat Feature							
Epifaunal Substrate/Available Cover	7	17	11	15	19	14	**14**
Pool Substrate Characterization	10	17	12	8	13	11	**14**
Pool Variability	13	11	3	3	4	4	**14**
Sediment Deposition	14	17	8	13	6	13	**16**
Channel Flow Status	18	19	16	18	14	16	**19**
Channel Alteration	14	18	15	19	18	16	**19**
Channel Sinuosity	6	7	3	7	3	9	**7**
Left Bank Stability	4	9	6	2	6	5	**7**
Right Bank Stability	4	9	5	7	5	8	**8**
Left Bank Vegetative Protection	5	9	6	3	8	4	**8**
Right Bank Vegetative Protection	5	9	6	7	8	5	**8**
Left Bank Riparian Vegetative Zone	2	9	7	6	1	2	**6**
Right Bank Riparian Vegetative Zone	2	5	5	5	1	2	**6**
Total Habitat Score	104	156	103	113	106	109	**146**
Habitat Assessment Score (HAS)	**71**	**107**	**71**	**77**	**73**	**75**	**100**
(Percent Comparability to Reference)							
Habitat Condition Category	**PS**	**E**	**PS**	**S**	**PS**	**S**	**E**
Reference Site (REF)							**REF**

E = Excellent
S = Supporting
PS = Partially Supporting
N = Not supporting

Category	HAS
Excellent	>90
Supporting	89-75
Partially Supporting	74-60
Not supporting	<60

APPENDIX F

BIOLOGICAL METRIC SCORING & CONDITION CATEGORY DETERMINATION

Biological Assessment Scores/Condition Category worksheet

Low-gradient tributary site:	CR1	CR2	CR3	CR4	CSR1	DR2	LD1	MN1	OR1	SR1	SR2	SR3	UNT1
Applicable Calculated Metrics													
Total # taxa	7	5	6	9	13	18	13	15	**13**	13	14	13	11
Shannon Diversity	0.52	0.50	1.48	1.74	1.54	1.86	1.44	1.72	**2.19**	1.79	1.97	2.04	1.61
Hilsenhoff	4.30	5.75	5.86	6.40	5.43	5.93	6.07	5.57	**4.66**	5.47	6.15	5.23	4.88
# EPT taxa	0	0	0	1	5	3	1	6	**8**	5	1	6	2
% Ephemeroptera org.	0.0	0.0	0.0	0.0	0.0	3.7	0.0	13.0	**28.4**	36.0	21.2	40.3	2.9
% Chironomidae	1.0	0.8	37.5	19.4	49.6	55.6	60.0	54.3	**22.1**	35.1	30.3	21.8	5.8
% Dominance	89.3	85.9	37.5	39.8	49.6	55.6	60.0	54.3	**22.1**	35.1	30.3	26.9	38.5
Percentage Score (of reference)													
Total # taxa[1]	54	38	46	69	100	138	100	115	**100**	100	108	100	85
Shannon Diversity[1]	24	23	68	79	70	85	66	78	**100**	82	90	93	73
Hilsenhoff[2]	108	81	80	73	86	79	77	84	**100**	85	76	89	95
# EPT taxa[1]	0	0	0	13	63	38	13	75	**100**	63	13	75	25
% Ephemeroptera	0	0	0	0	0	4	0	13	**28**	36	21	40	3
% Chironomidae	1	1	38	19	50	56	60	54	**22**	35	30	22	6
% Dominant Taxa	89	86	38	40	50	56	60	54	**22**	35	30	27	38
Biological Condition Scores													
Total # taxa	2	0	2	4	6	6	6	6	**6**	6	6	6	6
Shannon Diversity	0	0	4	6	4	6	4	6	**6**	6	6	6	4
Hilsenhoff	6	4	4	4	6	4	4	4	**6**	6	4	6	6
# EPT taxa	0	0	0	0	0	0	0	2	**6**	0	0	2	0
% Ephemeroptera	0	0	0	0	0	2	0	4	**6**	6	4	6	2
% Chironomidae	6	6	0	4	0	0	0	0	**2**	2	2	2	4
% Dominant Taxa	0	0	2	0	0	0	0	0	**4**	2	4	4	2
Total Biological Score	14	10	12	18	16	18	14	22	**36**	28	26	32	24
Biological Assessment Score (BAS) (Percent Comparability to Reference)	**39**	**28**	**33**	**50**	**44**	**50**	**39**	**61**	**100**	**78**	**72**	**89**	**67**
Biological Condition Category	**MOD**	**MOD**	**MOD**	**MOD**	**MOD**	**MOD**	**MOD**	**SLIGHT**	**NON**	**SLIGHT**	**SLIGHT**	**NON**	**SLIGHT**
Reference Site (REF)									**REF**				

[1] (site value/reference site value) x 100

[2] (reference site value/site value) x 100

NON = Nonimpaired
SLIGHT = Slightly impaired
MOD = Moderately impaired
SEV = Severely impaired

Biological Assessment Scores/Condition Category worksheet

High-gradient tributary site:	CSR2	DR1	DR3	HSH1	IRG1	KH1	MN2	MN3	OR2	PH1	PR1	STH1	TR1
Applicable Calculated Metrics													
Total # taxa	10	14	15	16	13	15	16	16	14	7	16	9	**20**
Shannon Diversity	1.88	1.93	2.02	2.10	1.48	2.03	2.22	2.04	1.82	0.78	2.19	1.65	**2.49**
Hilsenhoff	3.63	5.18	5.07	4.58	5.25	4.09	4.54	4.49	4.98	4.84	5.09	5.16	**4.61**
# EPT taxa	4	4	8	7	6	7	9	9	7	1	5	3	**13**
% Ephemeroptera org.	1.8	4.1	6.6	0.0	0.8	3.5	27.0	1.6	2.0	0.0	29.2	0.0	**21.9**
% Chironomidae	10.1	35.1	34.1	22.5	57.4	31.9	27.8	36.5	45.0	76.5	23.0	20.7	**28.9**
% Dominance	22.0	35.1	34.1	22.5	57.4	31.9	27.8	36.5	45.0	76.5	23.0	38.0	**28.9**
Percentage Score (of reference)													
Total # taxa[1]	50	70	75	80	65	75	80	80	70	35	80	45	**100**
Shannon Diversity[1]	75	77	81	84	59	82	89	82	73	31	88	66	**100**
Hilsenhoff[2]	127	89	91	101	88	113	102	103	93	95	91	89	**100**
# EPT taxa[1]	31	31	62	54	46	54	69	69	54	8	38	23	**100**
% Ephemeroptera	2	4	7	0	1	4	27	2	2	0	29	0	**22**
% Chironomidae	10	35	34	23	57	32	28	37	45	77	23	21	**29**
% Dominant Taxa	22	35	34	23	57	32	28	37	45	77	23	38	**29**
Biological Condition Scores													
Total # taxa	2	4	4	6	4	4	6	6	4	0	6	2	**6**
Shannon Diversity	6	6	6	6	4	6	6	6	4	0	6	4	**6**
Hilsenhoff	6	6	6	6	6	6	6	6	6	6	6	6	**6**
# EPT taxa	0	0	0	0	0	0	0	0	0	0	0	0	**6**
% Ephemeroptera	2	2	2	0	0	2	6	2	2	0	6	0	**4**
% Chironomidae	4	2	2	2	0	2	2	0	0	0	2	2	**2**
% Dominant Taxa	4	2	2	4	0	2	4	2	0	0	4	2	**4**
Total Biological Score	24	22	22	24	14	22	30	22	16	6	30	16	**34**
Biological Assessment Score (BAS) (Percent Comparability to Reference)	**71**	**65**	**65**	**71**	**41**	**65**	**88**	**65**	**47**	**18**	**88**	**47**	**100**
Biological Condition Category	**SLIGHT**	**SLIGHT**	**SLIGHT**	**SLIGHT**	**MOD**	**SLIGHT**	**SLIGHT**	**SLIGHT**	**MOD**	**MOD**	**NON**	**MOD**	**NON**
Reference Site (REF)													**REF**

[1] (site value/reference site value) x 100

[2] (reference site value/site value) x 100

NON = Nonimpaired
SLIGHT = Slightly impaired
MOD = Moderately impaired
SEV = Severely impaired

Biological Assessment Scores/Condition Category worksheet

Mainstem site:	YB1	YB2	YB3	YB4	YB5	YB6	YB7
Applicable Calculated Metrics							
Total # taxa	13	8	10	14	14	16	18
Shannon Diversity	1.94	1.44	1.29	2.11	2.03	2.16	2.22
Hilsenhoff	5.86	5.37	5.62	5.09	5.41	6.23	5.42
# EPT taxa	4	3	4	5	6	7	8
% Ephemeroptera org.	4.1	2.5	15.0	30.2	23.5	26.7	29.4
% Chironomidae	22.4	5.7	67.0	3.5	4.3	10.5	33.0
% Dominance	26.5	48.4	67.0	33.7	33.0	23.8	33.0
Percentage Score (of reference)							
Total # taxa[1]	72	44	56	78	78	89	100
Shannon Diversity[1]	87	65	58	95	91	97	100
Hilsenhoff[2]	93	101	96	106	100	87	100
# EPT taxa[1]	50	38	50	63	75	88	100
% Ephemeroptera	4	3	15	30	23	27	29
% Chironomidae	22	6	67	3	4	10	33
% Dominant Taxa	27	48	67	34	33	24	33
Biological Condition Scores							
Total # taxa	4	2	2	4	4	6	6
Shannon Diversity	6	4	4	6	6	6	6
Hilsenhoff	6	6	6	6	6	6	6
# EPT taxa	0	0	0	0	2	4	6
% Ephemeroptera	2	2	4	6	4	6	6
% Chironomidae	2	4	4	2	2	2	2
% Dominant Taxa	4	0	0	2	2	4	2
Total Biological Score	24	18	20	26	26	34	34
Biological Assessment Score (BAS)	**71**	**53**	**59**	**76**	**76**	**100**	**100**
(Percent Comparability to Reference)							
Biological Condition Category	**SLIGHT**	**SLIGHT**	**SLIGHT**	**SLIGHT**	**SLIGHT**	**NON**	**NON**
Reference Site (REF)							**REF**

[1] (site value/reference site value) x 100

[2] (reference site value/site value) x 100

NON = Nonimpaired
SLIGHT = Slightly impaired
MOD = Moderately impaired
SEV = Severely impaired

Biological Assessment Scores/Condition Category worksheet

Applicable Calculated Metrics **Total # taxa** **Shannon Diversity** **Hilsenhoff** **# EPT taxa** **% Ephemeroptera org.** **% Chironomidae** **% Dominance**	CALCULATE FOR EACH SITE			
	Points Earned			
Percentage Score (of reference)	0	2	4	6
Total # taxa[1]	<40%	59-40%	79-60%	>80%
Shannon Diversity[1]	<25%	49-25%	74-50%	>75%
Hilsenhoff[2]	<50%	69-50%	84-70%	>85%
# EPT taxa[1]	<70%	79-70%	89-80%	>90%
% Ephemeroptera	<1%	1-9%	10-25%	>25%
% Chironomidae	>36%	21-35%	5-20%	<5%
% Dominant Taxa	>40%	31-40%	20-30%	<20%
Total Biological Score (TBS)	Sum of Points Earned for each of the six metrics.			
Biological Assessment Score (BAS) **(Percent Comparability to Reference)**	(TBS for each site/ TBS for reference site) x 100			
Biological Condition Category	**Category**	**BAS**		
	Nonimpaired	>83		
	Slightly impaired	54-79		
	Moderately impaired	21-50		
	Severely impaired	<17		

[1] (site value/reference site value) x 100

[2] (reference site value/site value) x 100

APPENDIX G

SITE CHARACTERIZATION
FIELD DATA SHEETS

CR1

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Cedar Run	LOCATION 17th St Camp Hill USGS site
STATION # CR1 RIVERMILE	STREAM CLASS 3
LAT ____ LONG ____	RIVER BASIN Yellow Br.
STORET #	AGENCY HRG-GE
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY HC	DATE 8/1 TIME 9:00 (AM) PM
REASON FOR SURVEY Assessment	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
~~☐~~	showers (intermittent)	☒
~~100%~~	%cloud cover	☐ 50%
☐	clear/sunny	☐

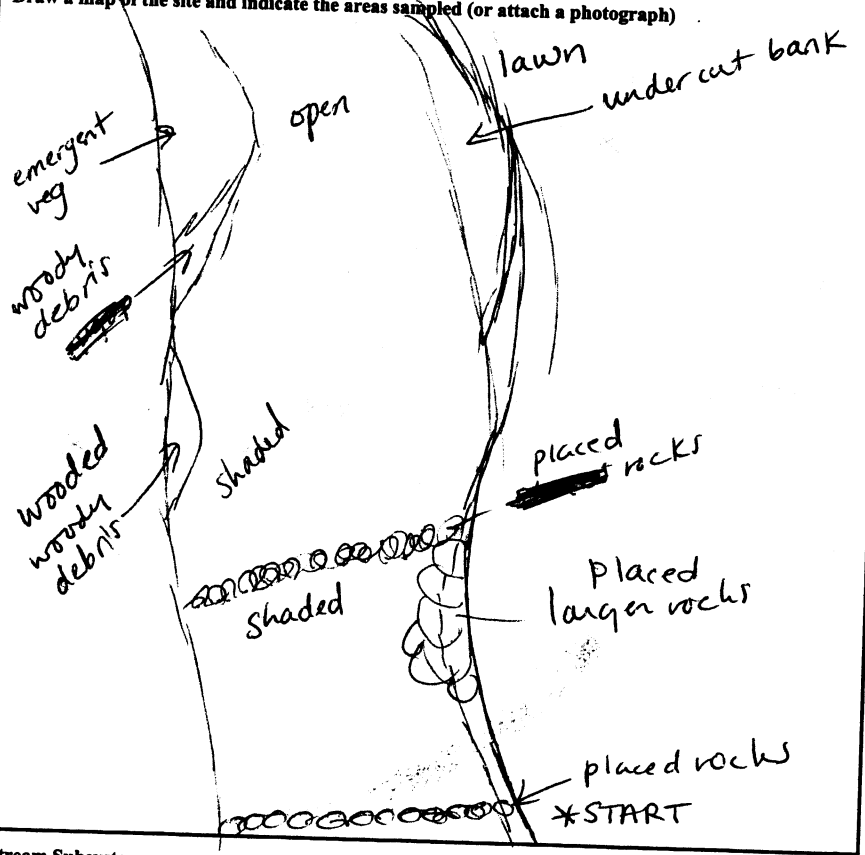
Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 75 °C

Other Humid

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☒ Mixture of origins
☐ Other____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
- ☐ Forest
- ☐ Field/Pasture
- ☐ Agricultural
- ☒ Residential
- ☐ Commercial
- ☐ Industrial
- ☐ Other _____

Local Watershed NPS Pollution
- ☐ No evidence
- ☒ Some potential sources
- ☐ Obvious sources

Local Watershed Erosion
- ☐ None
- ☒ Moderate
- ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
- ☒ Trees
- ☐ Shrubs
- ☐ Grasses
- ☐ Herbaceous

dominant species present Sugar Berry, Walnut, Elm, Sycamore, Maple

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width 15 m

Sampling Reach Area 1500 m²

Area in km² (m²x1000) _____ km²

Estimated Stream Depth .35 m

Surface Velocity (at thalweg) _____ m/sec — See Sheet

Canopy Cover
- ☐ Partly open
- ☐ Partly shaded
- ☒ Shaded

High Water Mark 1.5 m

Proportion of Reach Represented by Stream Morphology Types
- ☐ Riffle 5 %
- ☐ Run 95 %
- ☐ Pool 0 %

Channelized ☒ Yes ☐ No

Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 1 m²

Density of LWD _____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
- ☒ Rooted emergent
- ☐ Rooted submergent
- ☐ Rooted floating
- ☐ Free floating
- ☐ Floating Algae
- ☐ Attached Algae

dominant species present Reed Canary

Portion of the reach with aquatic vegetation 5 %

WATER QUALITY

LEW → REW

pH Test #2 →

Temperature 17, 17, 17° C

Specific Conductance 617, 618, 618

Dissolved Oxygen ppm (%) 6.44 (67%), 6.48 (67%), 6.35 (66%)

pH 8.1, 7.8, 7.8

Turbidity _____

WQ Instrument Used YSI DO meter, Flowmate / HACH cond. meter

Water Odors
- ☒ Normal/None
- ☐ Sewage
- ☐ Petroleum
- ☐ Chemical
- ☐ Fishy
- ☐ Other _____

Water Surface Oils
- ☐ Slick
- ☐ Sheen
- ☐ Globs
- ☐ Flecks
- ☒ None
- ☐ Other _____

Turbidity (if not measured)
- ☐ Clear
- ☒ Slightly turbid
- ☐ Turbid
- ☐ Opaque
- ☐ Stained
- ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
- ☐ Normal
- ☐ Sewage
- ☐ Petroleum
- ☐ Chemical
- ☐ Anaerobic
- ☒ None
- ☐ Other _____

Oils
- ☒ Absent
- ☐ Slight
- ☐ Moderate
- ☐ Profuse

Deposits
- ☐ Sludge
- ☐ Sawdust
- ☐ Paper fiber
- ☐ Sand
- ☐ Relict shells
- ☐ Other Algae

Looking at stones which are not deeply embedded, are the undersides black in color?
- ☐ Yes
- ☒ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		—
Boulder	> 256 mm (10")	—
Cobble	64-256 mm (2.5"-10")	10
Gravel	2-64 mm (0.1"-2.5")	30
Sand	0.06-2mm (gritty)	60
Silt	0.004-0.06 mm	—
Clay	< 0.004 mm (slick)	—

ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)

Substrate Type	Characteristic	% Composition in Sampling Area
Detritus	sticks, wood, coarse plant materials (CPOM)	100
Muck-Mud	black, very fine organic (FPOM)	
Marl	grey, shell fragments	

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Cedar Run		LOCATION 17th St. USGS Site	
STATION # CR1	RIVERMILE	STREAM CLASS 3	
LAT	LONG	RIVER BASIN Yellow Breeches	
STORET #		AGENCY HRG/GF	
INVESTIGATORS HC, BD, AG			LOT NUMBER
FORM COMPLETED BY AG		DATE 8/1/03 TIME 10:30 (AM) PM	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☒ Cobble 80 % ☒ Snags 4 % ☐ Vegetated Banks ____ % ☒ Sand 15 % ☐ Submerged Macrophytes 1 % ☐ Other ( ) ____ %
SAMPLE COLLECTION	**Gear used** ☒ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☒ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble ///// ☐ Snags /// ☐ Vegetated Banks / ☐ Sand ____ ☐ Submerged Macrophytes / ☒ Other (gravel) //// //
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0 1 2 3 4	Slimes	0 1 2 3 4
Filamentous Algae	0 1 2 3 4	Macroinvertebrates	0 1 2 3 4
Macrophytes	0 1 2 3 4	Fish	0 1 2 3 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera 0 1 2 3 4	Anisoptera 0 1 2 3 4	Chironomidae 0 1 2 3 4
Hydrozoa 0 1 2 3 4	Zygoptera 0 1 2 3 4	Ephemeroptera 0 1 2 3 4
Platyhelminthes 0 1 2 3 4	Hemiptera 0 1 2 3 4	Trichoptera 0 1 2 3 4
Turbellaria 0 1 2 3 4	Coleoptera 0 1 2 3 4	Other 0 1 2 3 4
Hirudinea 0 1 2 3 4	Lepidoptera 0 1 2 3 4	
Oligochaeta 0 1 2 3 4	Sialidae 0 1 2 3 4	
Isopoda 0 1 2 3 4	Corydalidae 0 1 2 3 4	
Amphipoda 0 1 2 3 4	Tipulidae 0 1 2 3 4	
Decapoda 0 1 2 3 4	Empididae 0 1 2 3 4	
Gastropoda 0 1 2 3 4	Simuliidae 0 1 2 3 4	
Bivalvia 0 1 2 3 4	Tabinidae 0 1 2 3 4	
	Culcidae 0 1 2 3 4	

CR2

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Unamed Trib. Cedar Run	LOCATION Rossmoyne Rd crossing, 100 ft.
STATION # CR2 RIVERMILE	STREAM CLASS 4
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, MB	
FORM COMPLETED BY AG	DATE 8-4-03 TIME 11:30 (AM) PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
100 % ☑	%cloud cover	☐ ___ %
☐	clear/sunny	☐

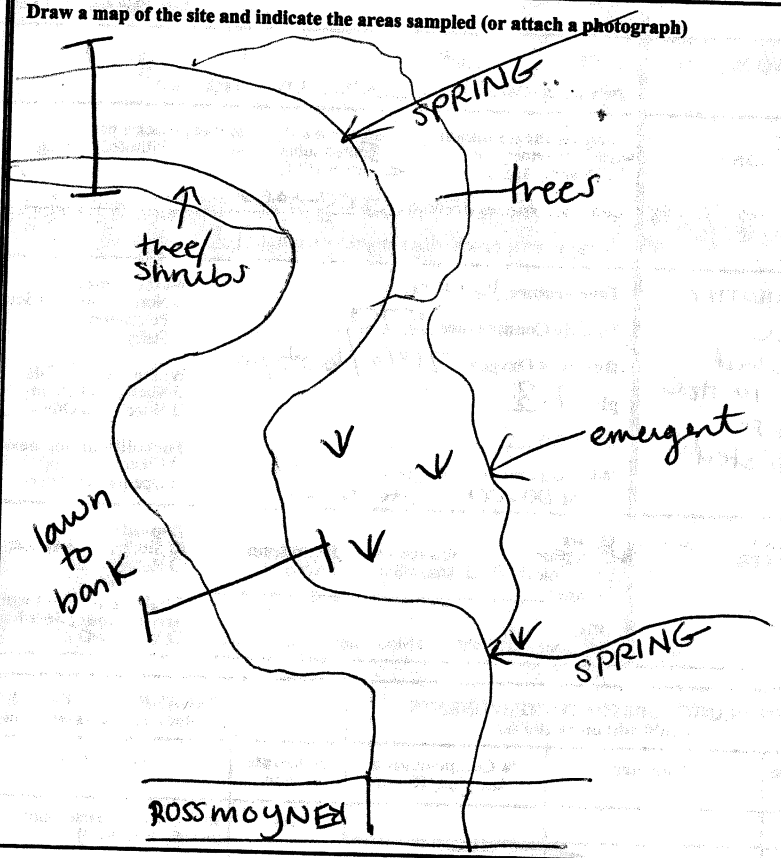
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 80 ° C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☑ Spring-fed
☐ Mixture of origins
☐ Other _____

Catchment Area _____ km²

S9D

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☑ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☐ Grasses ☑ Herbaceous
dominant species present Grasses

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 1 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .10 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded
High Water Mark _____ m
Proportion of Reach Represented by Stream Morphology Types
☐ Riffle _____ % ☑ Run 100 %
☐ Pool _____ %
Channelized ☑ Yes ☐ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 0 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☑ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae
dominant species present Grasses
Portion of the reach with aquatic vegetation 90 %

WATER QUALITY

*Area disturbed prior to H_2O samples collected

Temperature 16.2 °C
Specific Conductance 570
Dissolved Oxygen 71% / 6.8ppm
pH 7.3
Turbidity _____
WQ Instrument Used HACH cond YSI D0200 PHtestr 2

Water Odors
☐ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☐ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	40% cobble
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	~~50% cobble~~ 50% gravel
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	10% sand
Silt	0.004-0.06 mm				10% clay
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME unnamed trib tocR	LOCATION Rossmoyne Rd., crossing 100 ft	
STATION # CR2 RIVERMILE	STREAM CLASS 4	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, EF	
INVESTIGATORS HC, AG, mB		LOT NUMBER
FORM COMPLETED BY AG	DATE 8/5/03 TIME 12 AM (PM)	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Cobble 30 % ☐ Snags 0 % ☐ Vegetated Banks 20 % ☐ Sand ____ % ☐ Submerged Macrophytes 50 % ☐ Other ( ) ____ %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble 𝍸 𝍸 ☐ Snags ____ ☐ Vegetated Banks 𝍸 ☐ Sand ____ ☐ Submerged Macrophytes 𝍸 ☐ Other ( ) ____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	0	1	(2)	3	4	Fish	0	(1)	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	0	1	(2)	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	1	2	3	(4)	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	(2)	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

CR3

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME ~~UNNAMED TO CR~~ CedAr Run	LOCATION Hartzdale @ Yamaha 100'us X
STATION # CR3 RIVERMILE	STREAM CLASS ~~1~~ 3
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, MB	
FORM COMPLETED BY AG	DATE 8/5/03 TIME 2:00 AM (PM)
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
80% ☒	%cloud cover	☐ ___%
☐	clear/sunny	☐

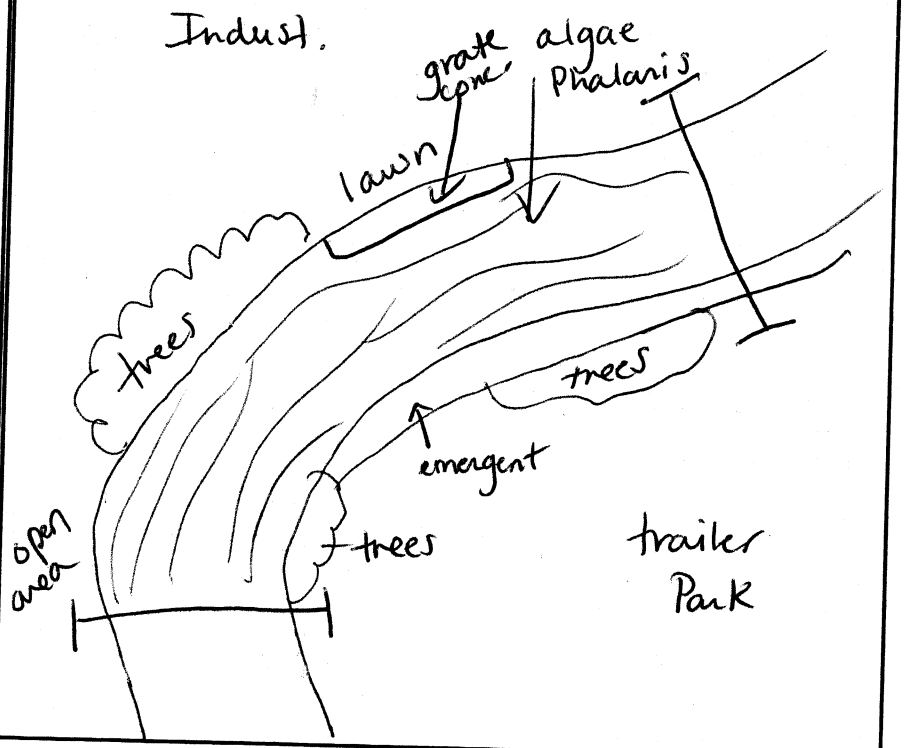
Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No

Air Temperature 80 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem: ☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type: ☒ Coldwater ☐ Warmwater

Stream Origin: ☐ Glacial ☐ Non-glacial montane ☐ Swamp and bog ☐ Spring-fed ☒ Mixture of origins ☐ Other_____

Catchment Area_____km²

E80

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☑ Industrial
☐ Agricultural ☐ Other _____
☑ Residential (trailer Park)

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☑ Herbaceous
dominant species present Maple / Sycamore / Jewelweed

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 8 m
Sampling Reach Area _____ m²
Area in km² (m²x1000) _____ km²
Estimated Stream Depth _____ m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded
High Water Mark 2 m
Proportion of Reach Represented by Stream Morphology Types
☐ Riffle _____ % ☑ Run 100 %
☐ Pool _____ %
Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 0 m²
Density of LWD _____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☑ Rooted submergent ☑ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae
dominant species present Reed Canary / filimentis algae
Portion of the reach with aquatic vegetation _____ %

WATER QUALITY

Temperature 14.7 °C
Specific Conductance 639
Dissolved Oxygen 78% / 7.75
pH 7.6
Turbidity _____
WQ Instrument Used pHtestr HACH Cond YSI DO

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☑ Sheen ☐ Globs ☐ Flecks
☐ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	50
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	5
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Unnamed to CR	LOCATION Yamaha @ Hartzdale 100 asx	
STATION # CR3 RIVERMILE	STREAM CLASS 4	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, MB		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-5-03 TIME 1:30 AM (PM)	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Cobble____% ☐ Snags____% ☐ Vegetated Banks 5 % ☐ Sand____% ☐ Submerged Macrophytes 87 % ☑ Other (clay/mud) 5 % ☑ root wads ~3%
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble____ ☐ Snags____ ☐ Vegetated Banks 1 ☐ Sand____ ☐ Submerged Macrophytes ~~IIII~~ III ☑ Other (filaments) III
GENERAL COMMENTS	☑ (clay/mud) ~~IIII~~ ☑ root wads II

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	(1)	2	3	4	Slimes	0	(1)	2	3	4
Filamentous Algae	0	1	2	3	(4)	Macroinvertebrates	0	(1)	2	3	4
Macrophytes	0	1	2	(3)	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	0	(1)	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	1	(2)	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	(2)	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	0	(1)	2	(3)	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

CR4

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME UNT CEDAR RUN	LOCATION HARTZDALE, (THEOS) 200'ds bridge
STATION # CR4 RIVERMILE	STREAM CLASS ~~3~~ 4
LAT LONG	RIVER BASIN YELLOW BREECHES
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, MB	
FORM COMPLETED BY	DATE 8/5/03 TIME 9:10 (AM) PM / REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☑
100 % ☑	%cloud cover	☐ ___ %
☐	clear/sunny	☐

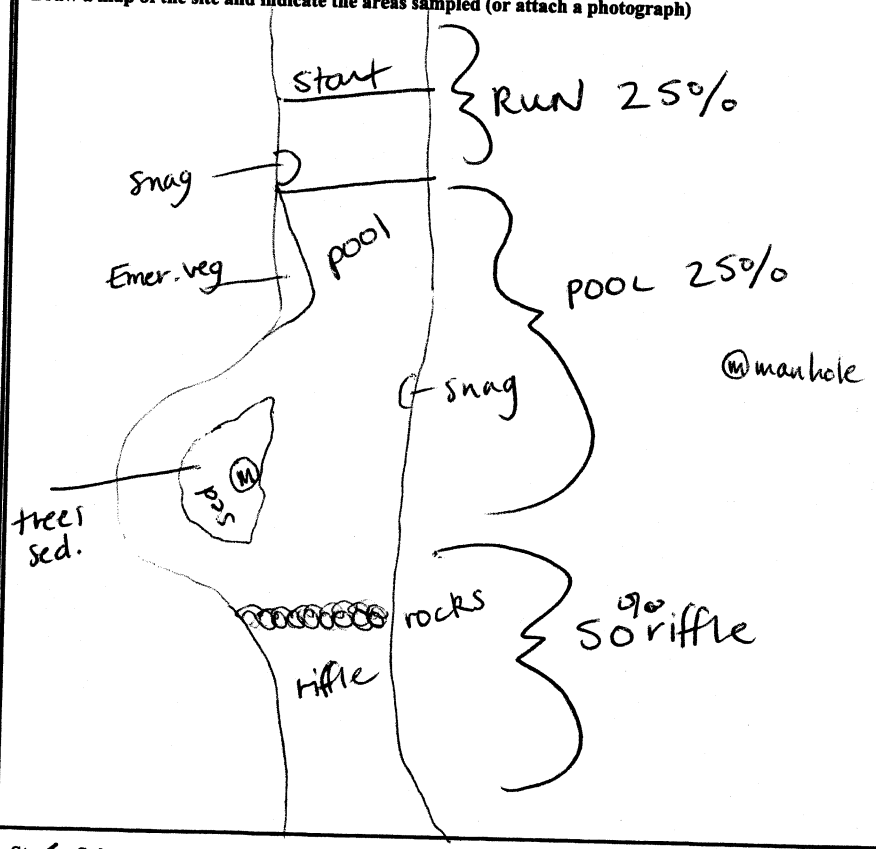
Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No

Air Temperature 80 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

H 8 0

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☐ Grasses ☑ Herbaceous

dominant species present Boxelder Jewelweed

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 3 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .15 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☐ Partly shaded ☑ Shaded

High Water Mark .5 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle 50 % ☐ Run _____ %
☐ Pool 50 %

Channelized ☑ Yes ☐ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 0 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☑ Rooted submergent ☑ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present filaments

Portion of the reach with aquatic vegetation 75%-80

WATER QUALITY

riffle area
PH 7.6
cond 794
DO 76%/12.5
temp. 16.8

Temperature 16.8 °C
Specific Conductance 794
Dissolved Oxygen 70%/6.8ppm
pH 7.8
Turbidity _____
WQ Instrument Used pHtestr 2 Hach Cond

Water Odors
☐ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☐ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☑ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		0	Detritus	sticks, wood, coarse plant materials (CPOM)	0
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	~~40~~ 5			
Sand	0.06-2mm (gritty)	40	Marl	grey, shell fragments	0
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME UNT Cabin	LOCATION Hartsdale (Theo's) 200' ds
STATION # CR4 RIVERMILE	STREAM CLASS
LAT LONG	RIVER BASIN
STORET #	AGENCY NRCS, GF
INVESTIGATORS KC, AG, MB	LOT NUMBER
FORM COMPLETED BY	DATE 8/15/05 TIME 9:30 AM PM / REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Cobble____% ☐ Snags____% ☐ Vegetated Banks____% ☐ Sand____% ☐ Submerged Macrophytes____% ☐ Other ( )____%
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble 𝍸 𝍸 𝍸 𝍸 ☐ Snags I ☐ Vegetated Banks____ ☐ Sand III ☐ Submerged Macrophytes III ☑ Other (root wad) II
GENERAL COMMENTS	fish Pres.

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	(1)	2	3	4
Macrophytes	0	1	(2)	3	4	Fish	0	1	2	(3)	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	(2)	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	(1)	2	3	4	Corydalidae	0	(1)	2	3	4						
Amphipoda	0	(1)	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Cold Spring Run	LOCATION 100 ft. upst. Pine Rd. X (near E YB RD)
STATION # CSR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY ~~HRG~~ GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-22-03 TIME 12 AM (PM)
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Hazy

Now: ☐ storm (heavy rain) ☐ rain (steady rain) ☐ showers (intermittent) ☑ 10 % cloud cover ☐ clear/sunny

Past 24 hours: ☐ ☐ ☐ ☐ ☐ ____ % ☐

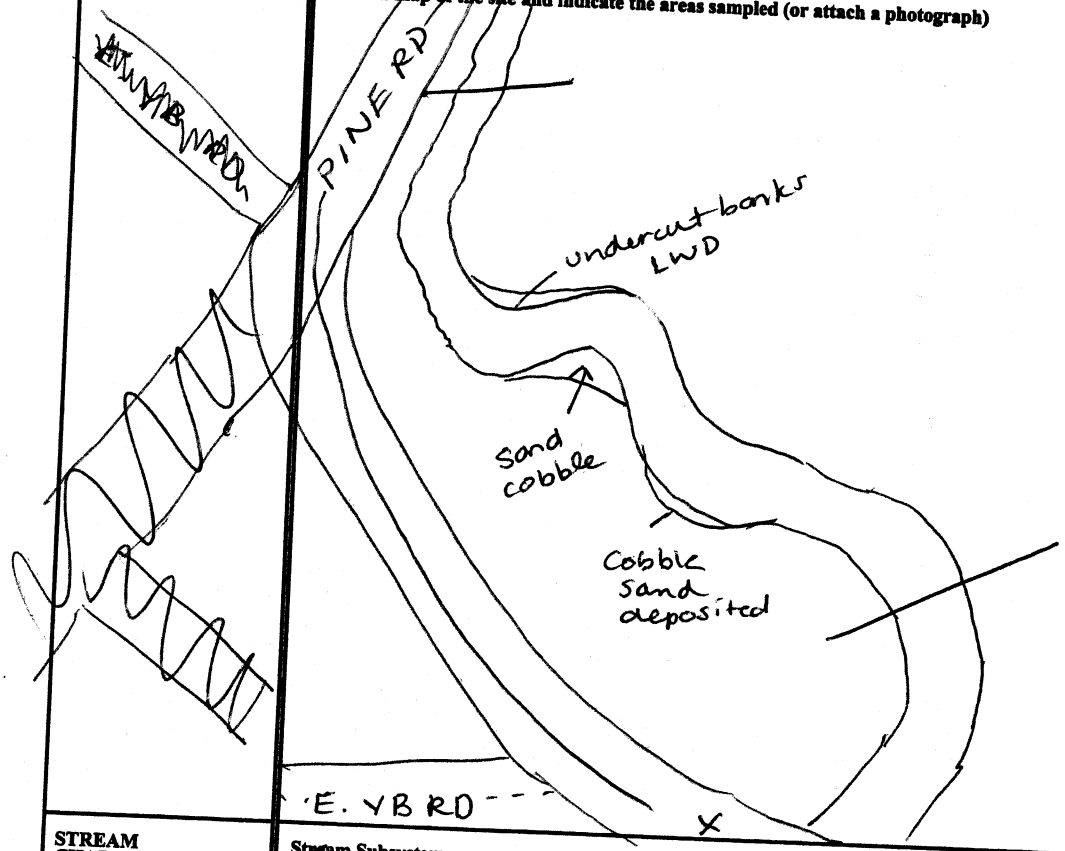
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 85+ °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem: ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type: ☑ Coldwater ☐ Warmwater

Stream Origin: ☐ Glacial ☐ Non-glacial montane ☐ Swamp and bog ☐ Spring-fed ☑ Mixture of origins ☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Red Maple

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth *10 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☐ Partly shaded ☑ Shaded

High Water Mark 1.5 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle _____ % ☑ Run _____ %
☐ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD _____ m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☑ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation 30 %

WATER QUALITY

Temperature 20.4 °C
Specific Conductance 28
Dissolved Oxygen 96.9/8.71
pH 6.9
Turbidity _____
WQ Instrument Used HACH COND
YSI DO pHtestr2

Water Odors
☑ Normal/None ☐ Sewage ☐ Chemical
☐ Petroleum ☐ Other _____
☐ Fishy

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	70	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	25			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Cold Spring Run	LOCATION 100 ft upst. Pine Rd. X (near EYB Road)	
STATION # CSR1 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-22-03 TIME 12 AM (PM)	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 85 % ☐ Snags 10 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☑ Submerged Macrophytes 5 % ☐ Other (detritus) 5 % (root wad 15%
SAMPLE COLLECTION (13)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble ~~IIII IIII~~ ☐ Snags II ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes I ☐ Other (root wad) III
GENERAL COMMENTS	detritus I

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0 1 (2) 3 4	Slimes	(0) 1 2 3 4
Filamentous Algae	0 (1) 2 3 4	Macroinvertebrates	0 (1) 2 3 4
Macrophytes	0 (1) 2 3 4	Fish	0 (1) 2 3 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera (0) 1 2 3 4	Anisoptera 0 (1) 2 3 4	Chironomidae (0) 1 2 3 4
Hydrozoa (0) 1 2 3 4	Zygoptera (0) 1 2 3 4	Ephemeroptera (0) 1 2 3 4
Platyhelminthes (0) 1 2 3 4	Hemiptera (0) 1 2 3 4	Trichoptera (0) 1 2 3 4
Turbellaria (0) 1 2 3 4	Coleoptera (0) 1 2 3 4	Other (0) 1 2 3 4
Hirudinea (0) 1 2 3 4	Lepidoptera (0) 1 2 3 4	
Oligochaeta (0) 1 2 3 4	Sialidae (0) 1 2 3 4	
Isopoda (0) 1 2 3 4	Corydalidae (0) 1 2 3 4	
Amphipoda (0) 1 2 3 4	Tipulidae (0) 1 2 3 4	
Decapoda (0) 1 2 3 4	Empididae (0) 1 2 3 4	
Gastropoda (0) 1 2 3 4	Simuliidae (0) 1 2 3 4	
Bivalvia (0) 1 2 3 4	Tabinidae (0) 1 2 3 4	
	Culcidae (0) 1 2 3 4	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Cold Spring Run	LOCATION 100 ft upst. Cold Spring Rd.
STATION # CSR2 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-22-03 TIME AM PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10 % ☐	%cloud cover	☐ ___ %
☐	clear/sunny	☐

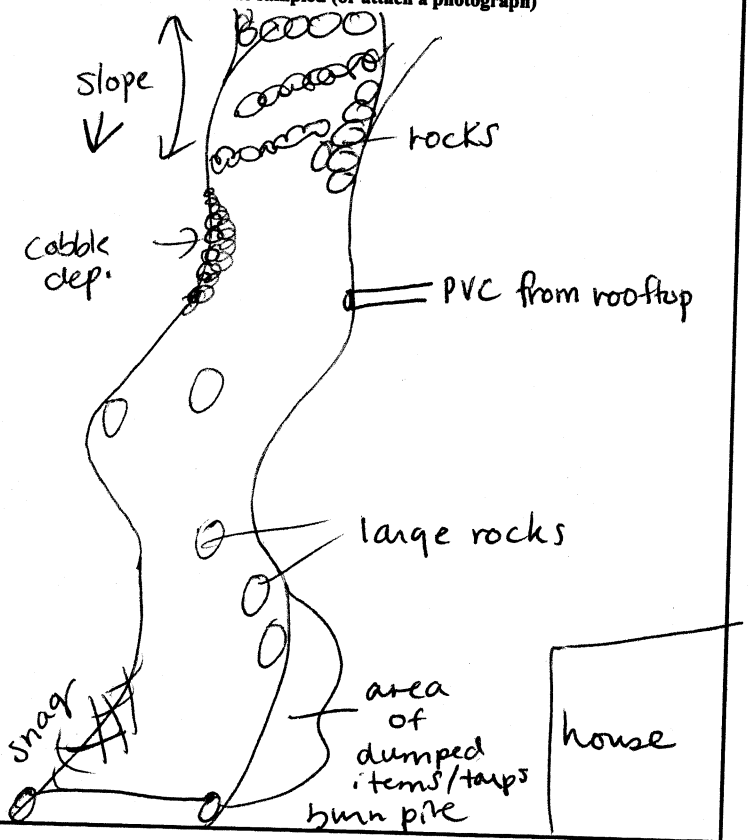
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 85 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☑ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Alder, Silktree

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .10 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 0.3 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle _____ % ☑ Run _____ %
☐ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 1 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present —

Portion of the reach with aquatic vegetation _____ %

WATER QUALITY

Temperature 20.0 °C
Specific Conductance _____
Dissolved Oxygen 99/9.05
pH 6.6
Turbidity _____
WQ Instrument Used HACH Cond. pHtestr2 YSI DO

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	90	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	5			
Sand	0.06-2mm (gritty)	—	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Cold Spring Run	LOCATION 100 ft. upst. Cold Spring Rd. ✓
STATION # CSR2 RIVERMILE_____	STREAM CLASS III
LAT_____ LONG_____	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-22-03 TIME 1:30 AM (PM)
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 80 % ☑ Snags 10 % ☐ Vegetated Banks____% ☐ Sand____% ☐ Submerged Macrophytes____% ☑ Other (root wad) 10 %
SAMPLE COLLECTION (10)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other_____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble ☑ Snags 11 (2) ☐ Vegetated Banks____ ☐ Sand____ ☐ Submerged Macrophytes____ ☑ Other (root wad) 11 (2)
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	(0)	1	2	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	(1)	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Dogwood Run	LOCATION 130 ft upstr, YB confluence
STATION # DR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-19-03 TIME 12:30 AM (PM)
	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
5 % ☑	%cloud cover	☐ ___ %
☐	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

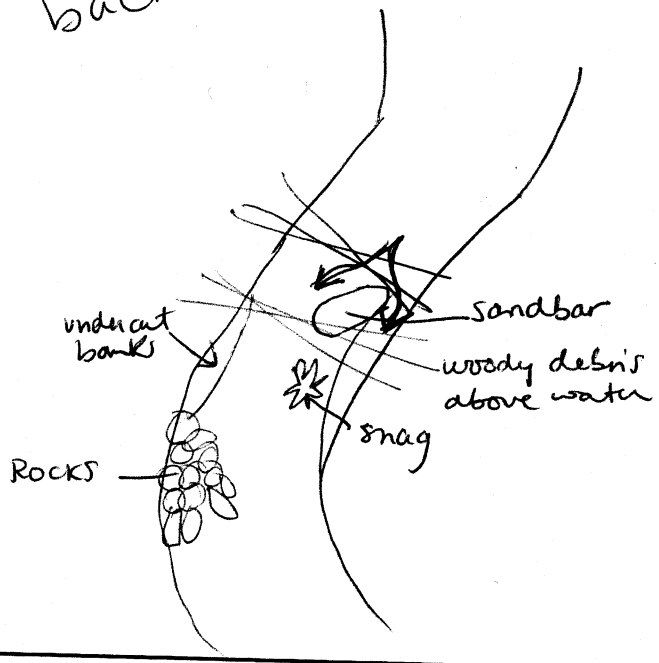
Air Temperature 83 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

Sketch on back of benthic sheet



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

REB - clearing taking place (200 ft or so beyond bank)

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous
dominant species present Hickory, maple (Norway)

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 3.5 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .20 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded
High Water Mark 2 m
Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 50 % ☑ Run 30 %
☑ Pool 20 %
Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 10 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae
dominant species present Jewelweed
Portion of the reach with aquatic vegetation 1 %

WATER QUALITY

Temperature 17.2 °C
Specific Conductance 324
Dissolved Oxygen 90/8.50
pH 8.2
Turbidity _____
WQ Instrument Used HACH Cond

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		10	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	10			
Cobble	64-256 mm (2.5"-10")	70	Muck-Mud	black, very fine organic (FPOM)	2
Gravel	2-64 mm (0.1"-2.5")	10			
Sand	0.06-2mm (gritty)	—	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Dogwood Run	LOCATION 130 ft. upstr. YB confluence
STATION # DR1 RIVERMILE_____	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY GF, HRG
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-19-03 TIME 12:30 AM (PM)
	REASON FOR SURVEY Asst

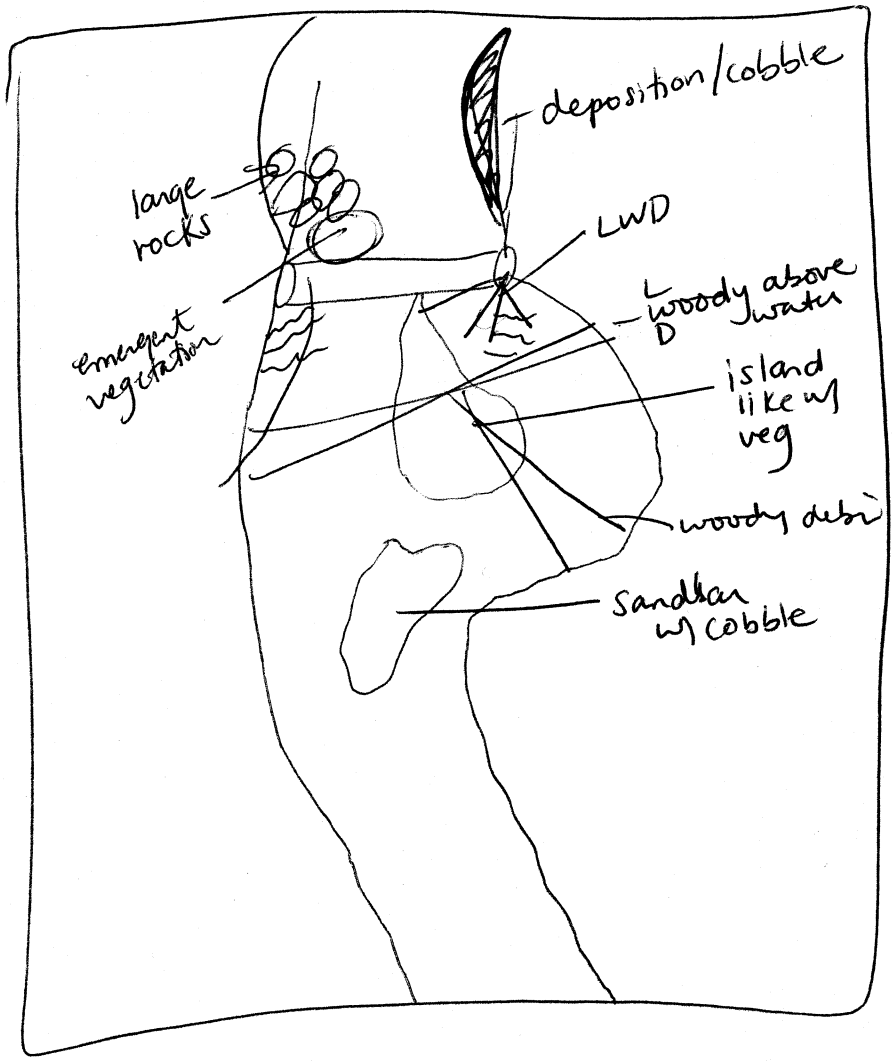
HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 85 % ☐ Snags____% ☐ Vegetated Banks____% ☐ Sand____% ☑ Submerged Macrophytes 1 % ☑ Other (root wad) 2 % ☑ LWD 12%
SAMPLE COLLECTION (15)	**Gear used** ☐ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble IIII IIII II ☐ Snags (1) ☐ Vegetated Banks____ ☐ Sand____ ☐ Submerged Macrophytes____ ☑ Other (root wad) II (2) ☑ other (woody debris II (2)
GENERAL COMMENTS	Slimy Sculpin

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	0	(1)	2	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	0	(1)	2	3	4	Lepidoptera	(0)	1	2	3	4	~~Plecoptera~~					
Oligochaeta	(0)	1	2	3	4	Sialidae	0	1	(2)	3	4						
Isopoda	0	1	(2)	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	(2)	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	(1)	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						


deposition/cobble
large rocks
LWD
emergent vegetation
woody above water
island like w/ veg
woody debri
Sandbar w/ cobble

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Dogwood Run	LOCATION 100'ds. Rt 74 X	
STATION # DR2 RIVERMILE	STREAM CLASS ~~III~~ IV	
LAT LONG	RIVER BASIN ~/B	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-19-03 TIME 11 (AM) PM	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
0 % ☑	%cloud cover	☐ ___ %
☐	clear/sunny	☐

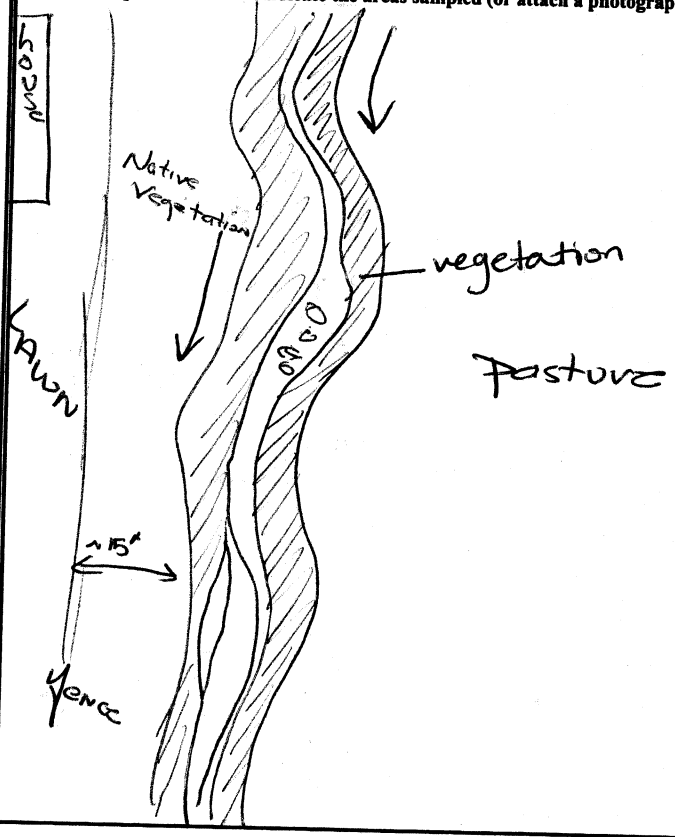
Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air Temperature 80 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☑ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☑ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☑ Grasses ☐ Herbaceous

dominant species present Phalaris

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width 1 m

Sampling Reach Area _____ m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth _____ m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 2 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle _____ %
☑ Run 100 %
☐ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 0 m^2

Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present Phalaris

Portion of the reach with aquatic vegetation 80 %

WATER QUALITY

Temperature 19.9 °C

Specific Conductance 511/~~511~~

Dissolved Oxygen 78.2/6.95

pH 7.8

Turbidity _____

WQ Instrument Used HACH Cond YSI DO pHtestr2

Water Odors
☐ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☑ Other Sulphuric

Water Surface Oils
☐ Slick ☑ Sheen ☐ Globs ☐ Flecks
☐ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☐ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☑ Anaerobic ☐ None
☐ Other _____

Oils
☐ Absent ☑ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	—
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	5	Muck-Mud	black, very fine organic (FPOM)	80
Gravel	2-64 mm (0.1"-2.5")	—			
Sand	0.06-2mm (gritty)	—	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	90			
Clay	< 0.004 mm (slick)	5			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Dogwood Run	LOCATION 100' ds Rt 74
STATION # DR2 RIVERMILE_____	STREAM CLASS ~~III~~ IV
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY HRG, GF,
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-19-03 TIME 11 (AM) PM
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 20 % ☐ Snags____% ☑ Vegetated Banks 30 % ☐ Sand____% ☑ Submerged Macrophytes____% ☑ Other (muck 50 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble IIII ☐ Snags____ ☑ Vegetated Banks ~~IIII~~ ☐ Submerged Macrophytes____ ☑ Other (muck) ~~IIII~~ IIII
GENERAL COMMENTS	tadpoles dace abundant

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	(1)	2	3	4
Macrophytes	(0)	1	2	3	4	Fish	0	1	2	(3)	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Dogwood Run	LOCATION 100' upstr. of Green Rd. X
STATION # DR3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY GF, HRG
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-19-03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10 % ☑	%cloud cover	☐ ___ %
☐	clear/sunny	☐

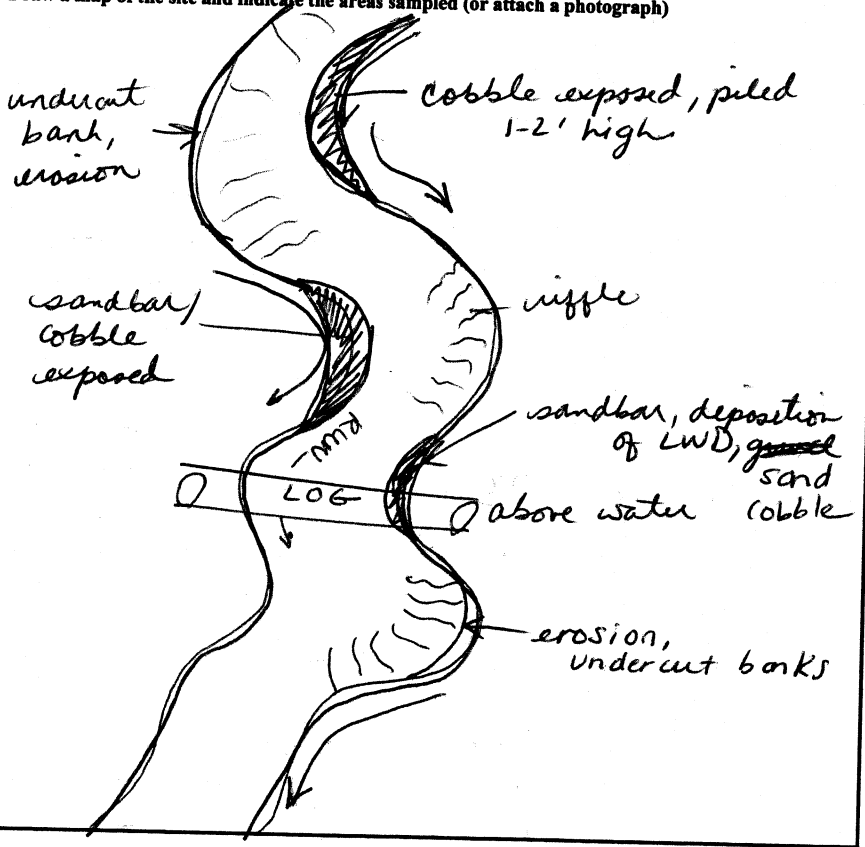
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 70° C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Poplar, Red Maple

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2 m
Sampling Reach Area e ____ m²
Area in km² (m²x1000) ____ km²
Estimated Stream Depth .25 m
Surface Velocity (at thalweg) ____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark ____ m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 98 % ☑ Run 2 %
☐ Pool ____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 1 m²
Density of LWD ____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present N/A

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 19.4 °C
Specific Conductance 50.3
Dissolved Oxygen 98.0
pH 7.8
Turbidity ____
WQ Instrument Used HACH COND. YSI/DO PHTestr2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	—
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	80	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	—			
Sand	0.06-2mm (gritty)	20	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Dogwood Run	LOCATION 100 upst. Green Rd. X
STATION # DR3 RIVERMILE_____	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY GF, HRG
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-19-03 TIME 9:15 (AM) PM
	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 98 % ☑ Snags 1 % ☐ Vegetated Banks____% ☐ Sand____% ☐ Submerged Macrophytes____% ☑ Other (Rootwad) 1 %
SAMPLE COLLECTION (18)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble IIII IIII IIII ☑ Snags 1 ☐ Vegetated Banks____ ☐ Sand____ ☐ Submerged Macrophytes____ ☑ Other (rootwad 1)
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	(0)	1	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	0	(1)	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	(1)	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera	0	(1)	2	3	4
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4	Helgrimites	(2)				
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Hairy Spring Holl.	LOCATION 100 ft. upst. Furnace Holl. Rd.
STATION # HSH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9-15-03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☑
90 % ☑	%cloud cover	☐ ___ %
☐	clear/sunny	☐

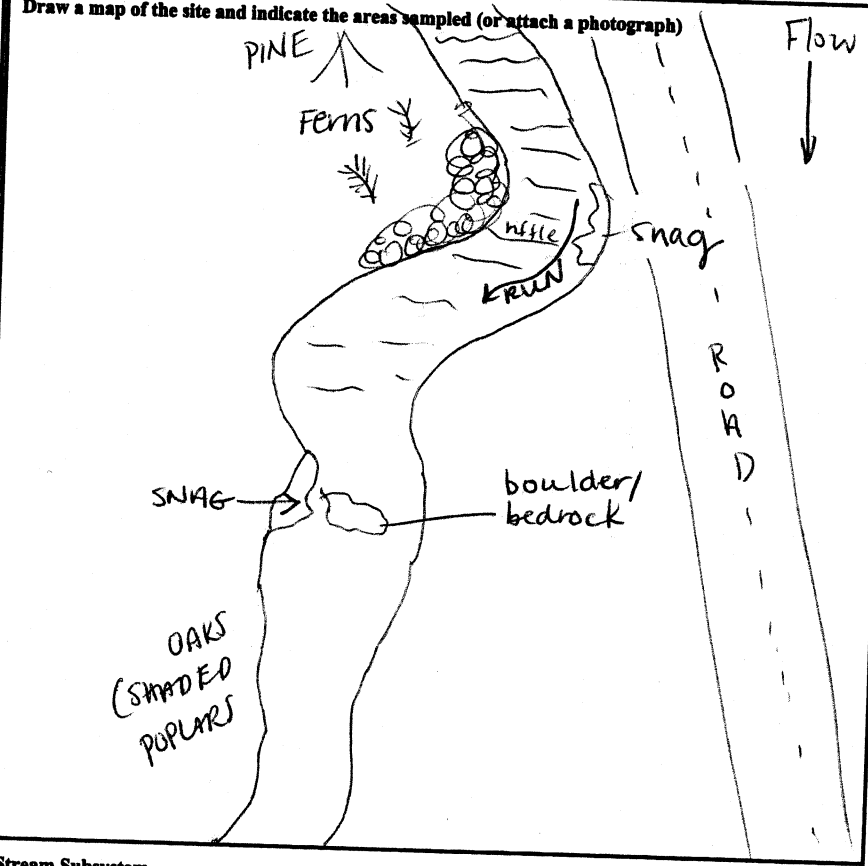
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 70 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☑ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Poplar, Oak

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width _____ m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth _____ m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☐ Partly shaded ☑ Shaded

High Water Mark 0.5 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 94 % ☑ Run 4 %
☑ Pool 2 %

Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD _____ m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present periphyton on rocks

Portion of the reach with aquatic vegetation _____ %

WATER QUALITY

Temperature 16.7 °C
Specific Conductance 28.1
Dissolved Oxygen 97/9.41 ppm
pH 5.1
Turbidity _____
WQ Instrument Used HACH Cond., YSI DO, Oakton pH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		1	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	85	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	5			
Sand	0.06-2mm (gritty)	4	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Hairy Spring Holl.	LOCATION 100' upst. Furnace Hollow Rd. X
STATION # HSH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 9-15-03 TIME 10 (AM) PM
	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 65 % ☑ Snags 15 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☑ Other (root wad) 20 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble IIII IIII IIII ☑ Snags III ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☑ Other (root wad) IIII
GENERAL COMMENTS	Small salamander

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	(1)	2	3	4
Macrophytes	(0)	1	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	(1)	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	(1)	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	0	(1)	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	(1)	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Irishtown Gap	LOCATION behind residence - Irishtown Gap
STATION # IG1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9-15-03 TIME 1 AM (PM)
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now: ☐ storm (heavy rain) ☐ rain (steady rain) ☐ showers (intermittent) ☑ 80% %cloud cover ☐ clear/sunny

Past 24 hours: ☐ ☐ ☐ ☑ ☐ ____%

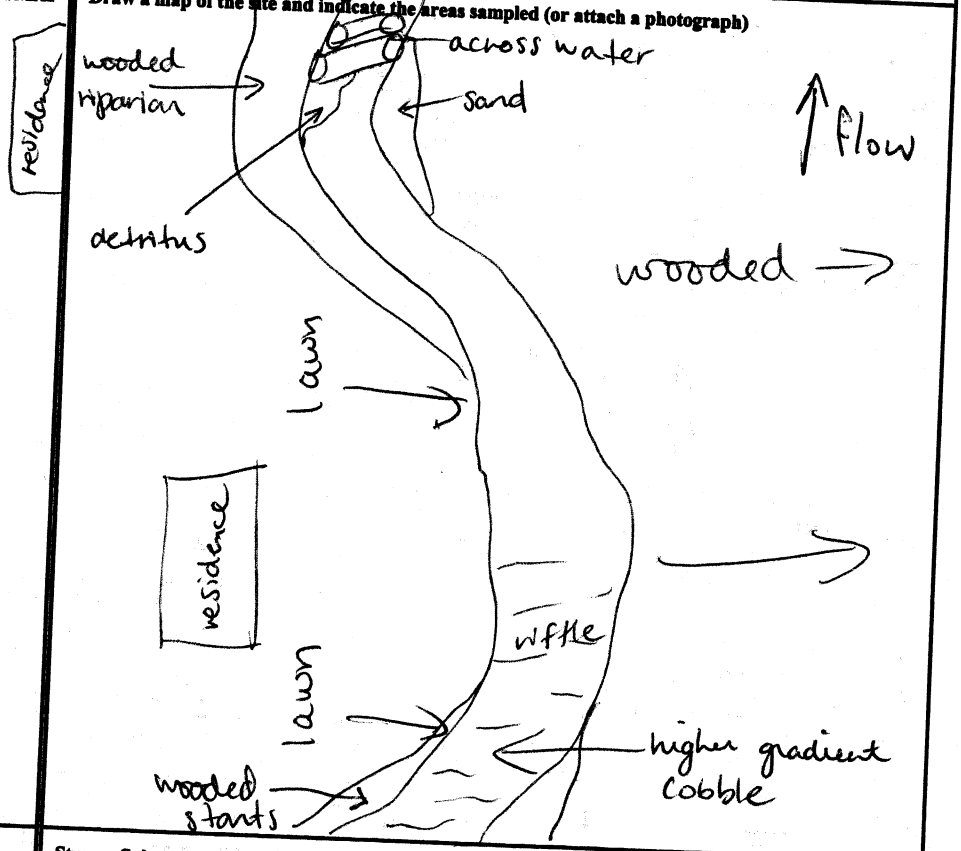
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 75 °C

Other ____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem: ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type: ☑ Coldwater ☐ Warmwater

Stream Origin: ☐ Glacial ☐ Non-glacial montane ☐ Swamp and bog ☐ Spring-fed ☑ Mixture of origins ☐ Other____

Catchment Area ____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☑ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present _____

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .20 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☐ Partly shaded ☑ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 80 % ☑ Run 15 %
☑ Pool 5 %

Channelized ☐ Yes ☐ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 7 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present on rocks

Portion of the reach with aquatic vegetation 100 %

WATER QUALITY

Temperature 18.3 °C
Specific Conductance 21.9
Dissolved Oxygen 98/9.12
pH 7.1
Turbidity _____
WQ Instrument Used HACH cond, YSI DO, Oakton pH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	70	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	15			
Sand	0.06-2mm (gritty)	25	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Irishtown Gap	LOCATION behind residence - Irishtown Gap Rd
STATION # ~~IRG1~~ IG1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 9-15-03 TIME 1 AM (PM)
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 70 % ☑ Snags 20 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☑ Other (root wad) 10 %
SAMPLE COLLECTION (14)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble ☑ Snags III ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☑ Other (root wad) II
GENERAL COMMENTS	Residents State Creek Never goes dry. Floods during spring.

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	0	1	(2)	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	(0)	1	2	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	1	(2)	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	0	1	(2)	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	1	(2)	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera	0	1	2	(3)	4
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	(2)	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	0	1	(2)	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	1	(2)	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME King's Gap Hollow	LOCATION 100 ft. upstr. of King's Gap Rd x
STATION # KH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE ~~10-25-03~~ 10 TIME AM PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☐ ___%
☑	clear/sunny	☐

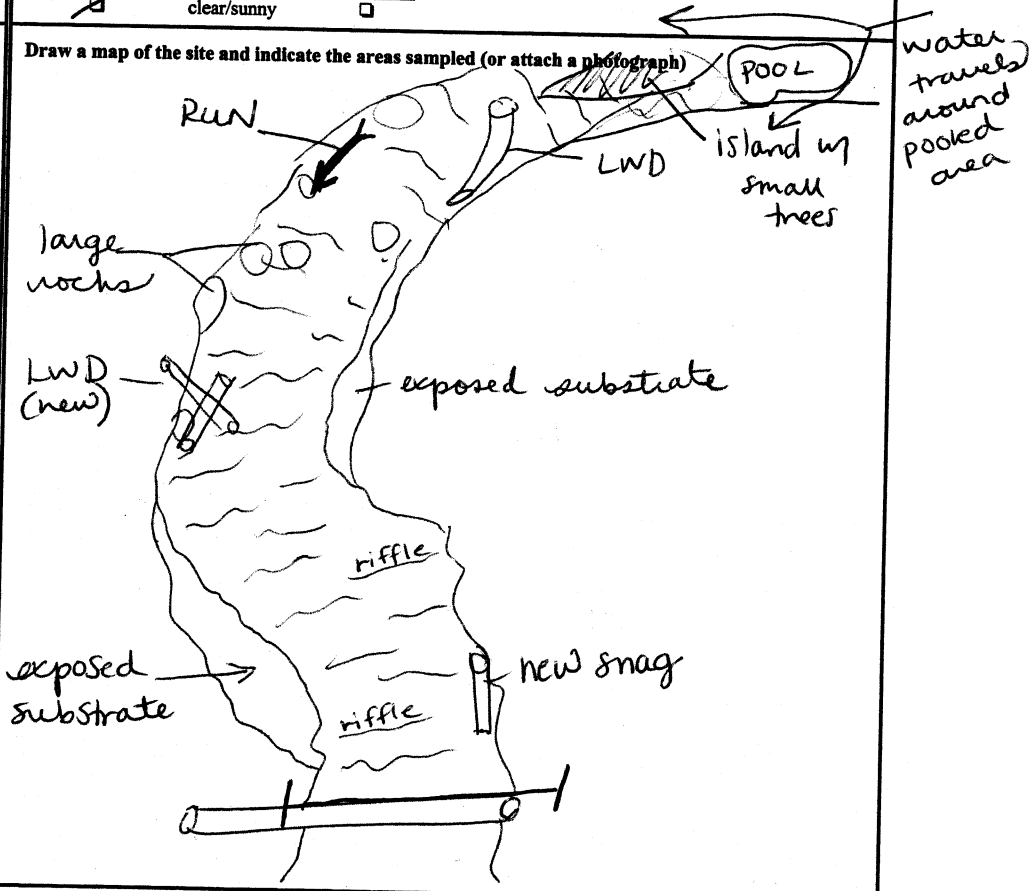
Has there been a heavy rain in the last 7 days? ☐ Yes ☑ No

Air Temperature 15 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Oak, Cherry

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth 0.20 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☐ Partly shaded ☑ Shaded

High Water Mark .50 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 95 % ☑ Run 2 %
☐ Pool 3 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 8 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation 60 %

WATER QUALITY

Temperature 15.8 °C
Specific Conductance 24
Dissolved Oxygen 103/10.03
pH 7.8
Turbidity _____
WQ Instrument Used HACH-COND, YSI DO pHtestr2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	70
Boulder	> 256 mm (10")	3			
Cobble	64-256 mm (2.5"-10")	85	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	12			
Sand	0.06-2mm (gritty)	—	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Kings Gap Hollow	LOCATION 100 ft upstr. Kings Gap Rd. X	
STATION # KH1 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-25-03 TIME 10 (AM) PM	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 80 % ☑ Snags 15 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☑ Other (root wad) 5 %
SAMPLE COLLECTION (16)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble 11111111111 ☑ Snags 111 (3) ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☑ Other (root wad (1)
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	(0)	1	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	(1)	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	(1)	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera	0	1	(2)	3	4
Oligochaeta	(0)	1	2	3	4	Sialidae	0	(1)	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	(1)	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Little Dogwood Run	LOCATION 100' upstream Wayne Noss Flowers
STATION # LD1 RIVERMILE	STREAM CLASS
LAT LONG	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-21-03 TIME 1:30 AM (PM)
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10 % ☒	%cloud cover	☐ ___ %
☐	clear/sunny	☐

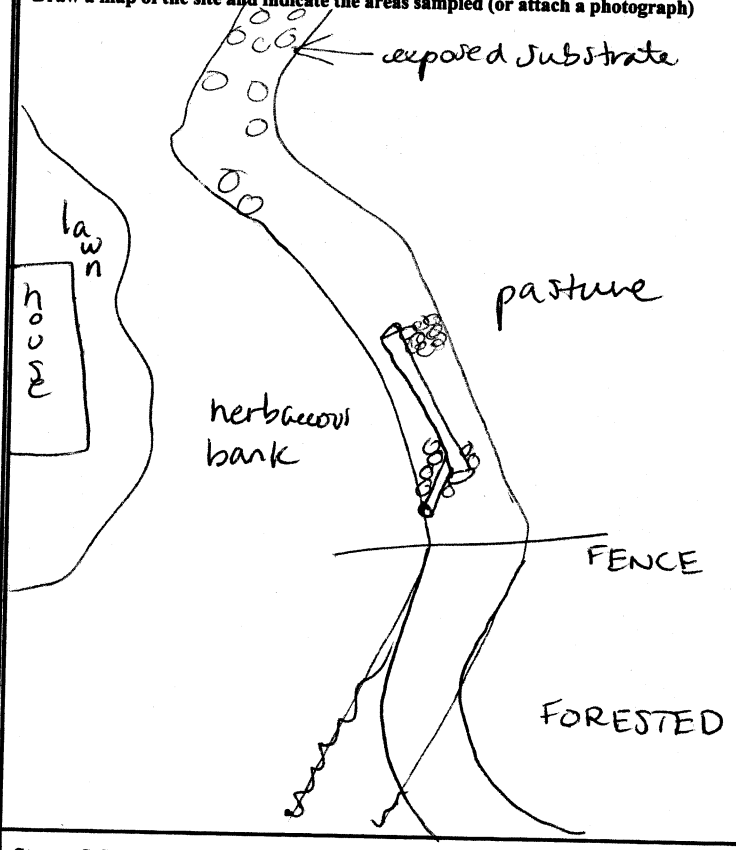
Has there been a heavy rain in the last 7 days? ☒ Yes ☐ No

Air Temperature 80 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☒ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☒ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☑ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential both *

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present _____

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 1 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .05 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark .50 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 94 % ☑ Run 1 %
☑ Pool 5 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 2 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present Filimentous algae

Portion of the reach with aquatic vegetation 70 %

WATER QUALITY

Temperature 21.7 °C
Specific Conductance 33.4
Dissolved Oxygen 97.6/8.53
pH 8.4
Turbidity _____
WQ Instrument Used HACH COND YSI DO pHtestr2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	2			
Cobble	64-256 mm (2.5"-10")	95	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	3			
Sand	0.06-2mm (gritty)	—	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Little Dogwood Run	LOCATION 100' upstream @ Wayne Noss Flowers	
STATION # LD1 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN YELLOW BREECHES	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-21-03 TIME 1:30 AM (PM)	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 85 % ☑ Snags 15 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☐ Other ( ) ____ %
SAMPLE COLLECTION (11)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble ~~IIII~~ IIII, ☑ Snags III ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☐ Other ( ) ____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(2)	1	(2)	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	(0)	1	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Mountain Creek	LOCATION 500 ft from confluence - Mt. Holly
STATION # MN1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-22 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now
- ☐ storm (heavy rain)
- ☐ rain (steady rain)
- ☐ showers (intermittent)
- 70% ☑ %cloud cover
- ☐ clear/sunny

Past 24 hours
- ☐
- ☐
- ☐
- ☐ ___ %
- ☐

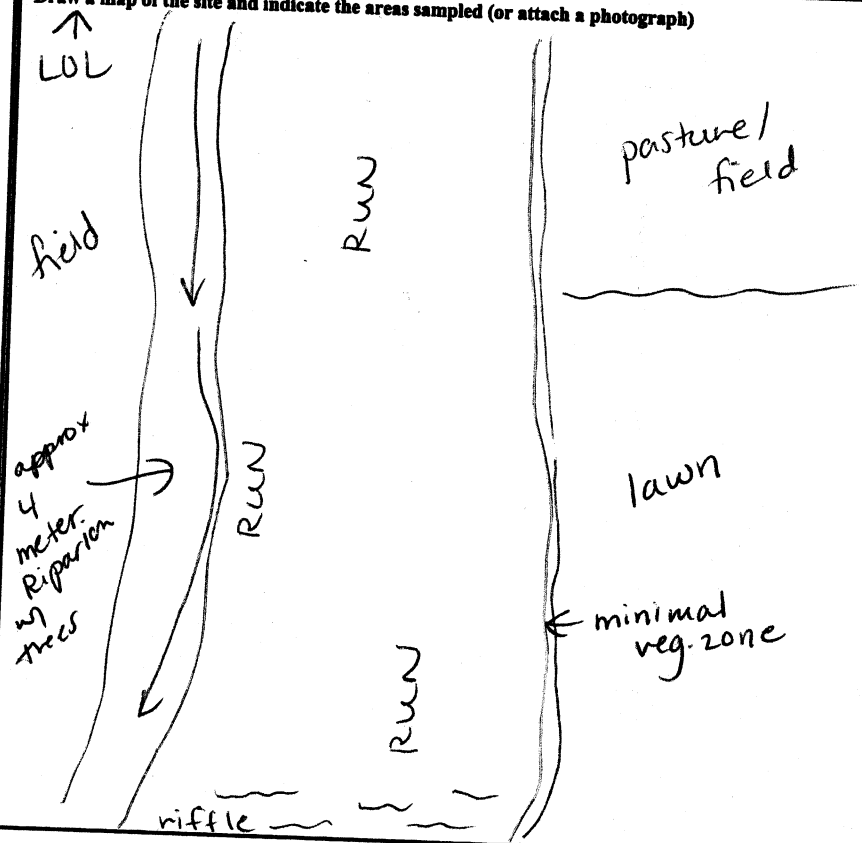
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 75 °C

Other ___

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
- ☑ Perennial
- ☐ Intermittent
- ☐ Tidal

Stream Type
- ☑ Coldwater
- ☐ Warmwater

Stream Origin
- ☐ Glacial
- ☐ Non-glacial montane
- ☐ Swamp and bog
- ☐ Spring-fed
- ☑ Mixture of origins
- ☐ Other ___

Catchment Area ___ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☑ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☑ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Silver Maple, Oak, Walnut

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 11 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .20 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 2 % ☑ Run 98 %
☐ Pool _____ %

Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 3 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present —

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 19.0 °C
Specific Conductance ~~153~~ 153
Dissolved Oxygen 105 / 9.75
pH 8.3
Turbidity _____
WQ Instrument Used Cond-Hach YSI DO pH test

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	35	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	60			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Mt. Creek

STREAM NAME ~~Yellow Breeches~~	LOCATION 500'ft from confluence-mt. Holly
STATION # MN1 RIVERMILE_____	STREAM CLASS III
LAT_____ LONG_____	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-22-03 TIME 10 (AM) PM / REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 70 % ☑ Snags 20 % ☐ Vegetated Banks____% ☐ Sand____% ☐ Submerged Macrophytes____% ☑ Other (root wad) 10 %
SAMPLE COLLECTION (14)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other_____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble ~~HHH HHH~~ ☑ Snags III (4) ☐ Vegetated Banks____ ☐ Sand____ ☐ Submerged Macrophytes____ ☑ Other (root wad) (11) (2)
GENERAL COMMENTS	fish crayfish

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	(0)	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	0	1	(2)	3	4	Macroinvertebrates	0	(1)	2	3	4
Macrophytes	0	1	(2)	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	(1)	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	(1)	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	(1)	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	1	2	(3)	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Mountain Creek	LOCATION Route 34, across from Penndot main	
STATION # MN2 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 10/1/03 TIME 10 (AM) PM	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☑	rain (steady rain)	☐
☐	showers (intermittent)	☐
___% ☐	%cloud cover	☐ ___%
☐	clear/sunny	☐

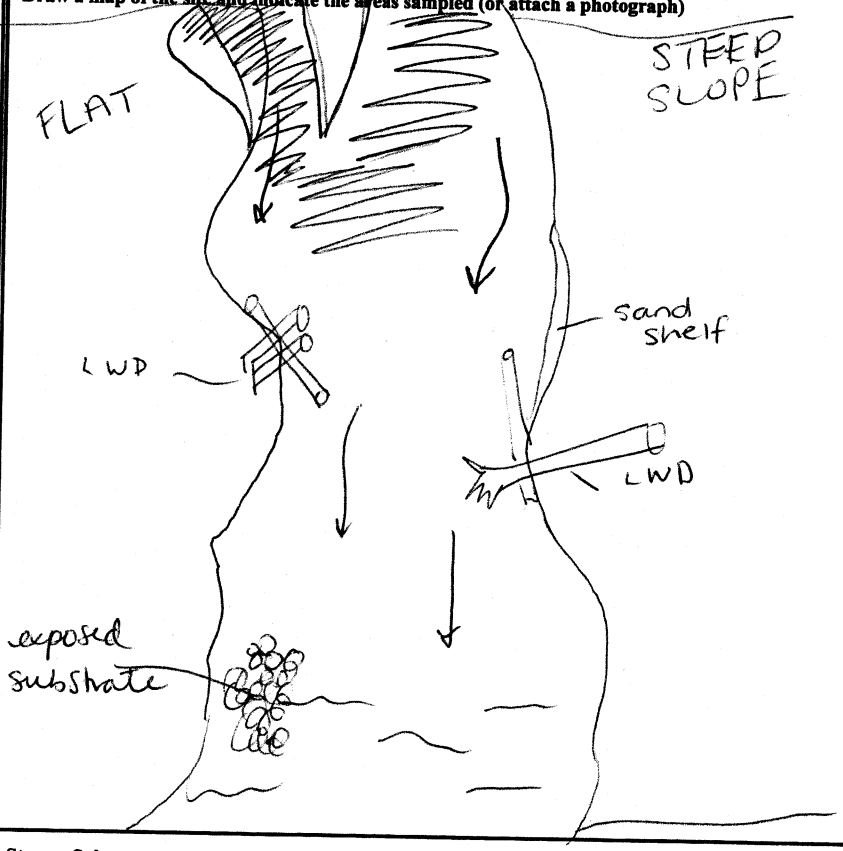
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 60 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

LEW - steep slope
REW - floodplain/flat

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☑ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Elm, Hemlock

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width _____ m

Sampling Reach Area _____ m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth _____ m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 1.5 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle 34 % ☐ Run 65 %
☐ Pool 1 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 5 m^2

Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present periphyton

Portion of the reach with aquatic vegetation 100 %

WATER QUALITY

Temperature 12.5 °C

Specific Conductance 72.0

Dissolved Oxygen 103/10.59

pH 8.5

Turbidity _____

WQ Instrument Used HACH Cond. YSI DO Oakton pH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	~~30~~ 35			
Sand	0.06-2mm (gritty)	~~10~~ 13	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	~~5~~ 2			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Mountain Creek	LOCATION Route 34, across from Penndot main. pull off
STATION # MN2 RIVERMILE_____	STREAM CLASS III
LAT_____ LONG_____	RIVER BASIN YB
STORET #	AGENCY HR6, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 10/1/03 TIME 10 (AM) PM — REASON FOR SURVEY ASS 4

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 65 % ☑ Snags 25 % ☐ Vegetated Banks____% ☐ Sand____% ☐ Submerged Macrophytes____% ☑ Other (root wad) 10 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other_____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble ☑ Snags ☐ Vegetated Banks____ ☐ Sand____ ☐ Submerged Macrophytes____ ☑ Other (root wad) 11
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	2	(3)	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	(0)	1	(2)	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	(1)	2	3	4	Ephemeroptera	0	1	2	(3)	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	2	(3)	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera				(3)	
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	0	(1)	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	(1)	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

over for flow

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Mt. Creek	LOCATION 400 ft upstr. of 233 x (Michaux Rd. vicinity)
STATION # MN3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS AC, AG, BD	
FORM COMPLETED BY AG	DATE 9-12-03 TIME 12 AM (PM)
	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now
- ☐ storm (heavy rain)
- ☐ rain (steady rain)
- ☐ showers (intermittent)
- ☐ %cloud cover
- ☒ clear/sunny

Past 24 hours
- ☐
- ☐
- ☐
- ☐ %
- ☐

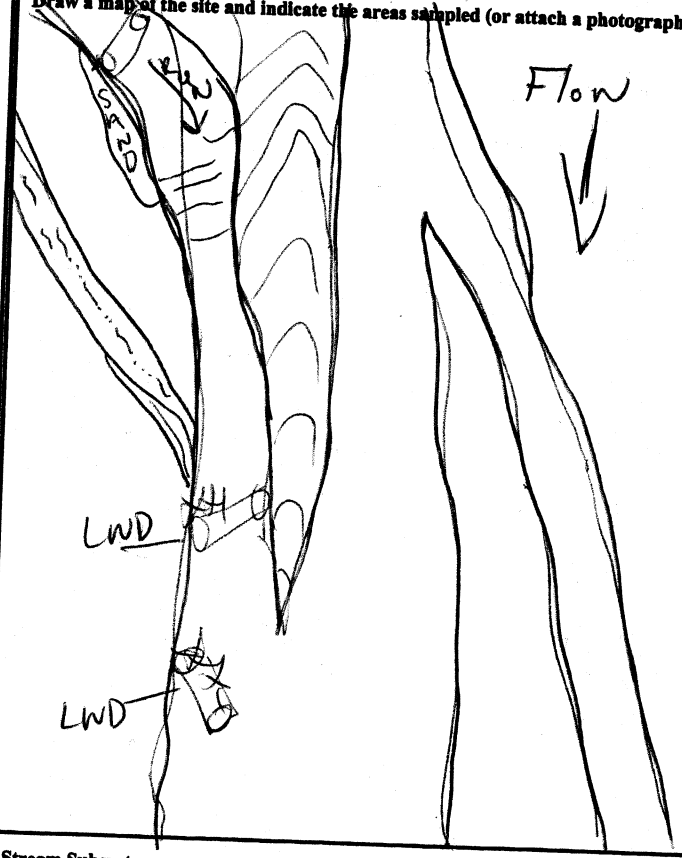
Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 70 °C

Other

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☒ Coldwater ☐ Warmwater

Stream Origin
- ☐ Glacial
- ☐ Non-glacial montane
- ☐ Swamp and bog
- ☒ Spring-fed
- ☐ Mixture of origins
- ☐ Other

Catchment Area km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☑ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Oak

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 3.5 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth 0.40 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 60 % ☐ Run 35 %
☐ Pool 5 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 10 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present periphyton

Portion of the reach with aquatic vegetation 100 %

WATER QUALITY

Temperature 14 °C
Specific Conductance 25.4
Dissolved Oxygen 102/10.45
pH 8.1
Turbidity _____
WQ Instrument Used HACH Cond. YSI DO, Oakton pH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	30
Boulder	> 256 mm (10")	2			
Cobble	64-256 mm (2.5"-10")	85	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	7			
Sand	0.06-2mm (gritty)	6	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Mt. Creek	LOCATION 400'ft upstr. of 233 X (Michaux Rd. X)
STATION # MN3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 9-17-03 TIME 12 AM (PM)
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑LWD 5 ☑Cobble 70 % ☑Snags 10 % ☐Vegetated Banks ____% ☐Sand ____% ☐Submerged Macrophytes ____% ☑Other (root wad) 15 %
SAMPLE COLLECTION	**Gear used** ☑D-frame ☐kick-net ☐Other ____ **How were the samples collected?** ☑wading ☐from bank ☐from boat (14) **Indicate the number of jabs/kicks taken in each habitat type.** ☑Cobble IIII IIII IIII ☑Snags II ☐Vegetated Banks ____ ☐Sand ____ ☐Submerged Macrophytes ____ ☑Other (root wad) III ☑LWD I
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	2	(3)	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	0	(1)	2	3	4	Fish	0	(1)	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	(1)	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	0	1	(2)	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	(1)	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera	0	1	(2)	(3)	4
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Old Town Run	LOCATION 100' dstr. Tangers Rd. X
STATION # OR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-21-03 TIME 2:40 AM (PM)
	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
0 % ☐	%cloud cover	☐ ___ %
☐	clear/sunny	☐

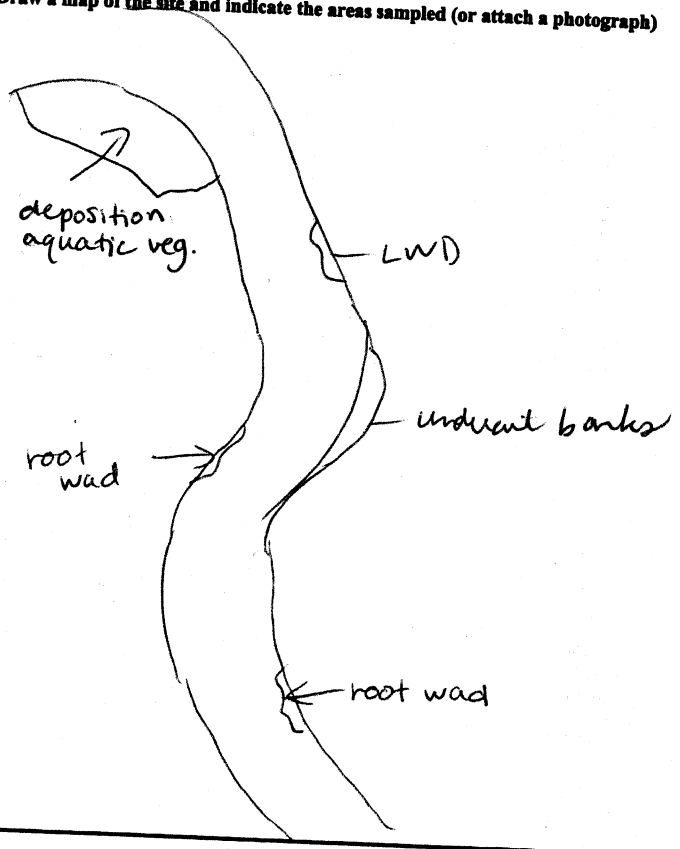
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 87 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Oak, Hickory, Willow

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .20 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle _____ % ☑ Run _____ %
☐ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 2 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☑ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present filimentous, water lily

Portion of the reach with aquatic vegetation _____ %

WATER QUALITY

Temperature 20.4 °C
Specific Conductance 128
Dissolved Oxygen 102/9.19
pH 8.1
Turbidity _____
WQ Instrument Used HACH COND. YSI DO PHTestr2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	80	Muck-Mud	black, very fine organic (FPOM)	5
Gravel	2-64 mm (0.1"-2.5")	15			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Old Town Run 1	LOCATION 100 dstr. Tanger Rd. X
STATION # OR 1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG, GF
INVESTIGATORS	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-21-03 TIME 2:30 AM (PM)
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Cobble ___% ☑ Snags ___% ☐ Vegetated Banks ___% ☑ Sand ___% ☐ Submerged Macrophytes 1 % ☑ Other (root wad) ___%
SAMPLE COLLECTION (14)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ___ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble ☑ Snags ☐ Vegetated Banks ☑ Sand 11 (2) ☐ Submerged Macrophytes 1 ☑ Other (root wad) 111 (3)
GENERAL COMMENTS	*Cardinal flower *frog *darter *crayfish

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	(1)	2	3	4	Fish	0	(1)	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	0	1	(2)	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera 0 1 2 (3) 4					
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	1	2	(3)	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Old Town Run	LOCATION Downstream Whiskey Spring Rd. Crossing
STATION # OR2 RIVERMILE _____	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG/GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY Brian Dunlap	DATE 8/21/13 TIME 1140 (AM) PM
REASON FOR SURVEY Asst	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10 % ☒	%cloud cover	☐ ____ %
☐	clear/sunny	☐

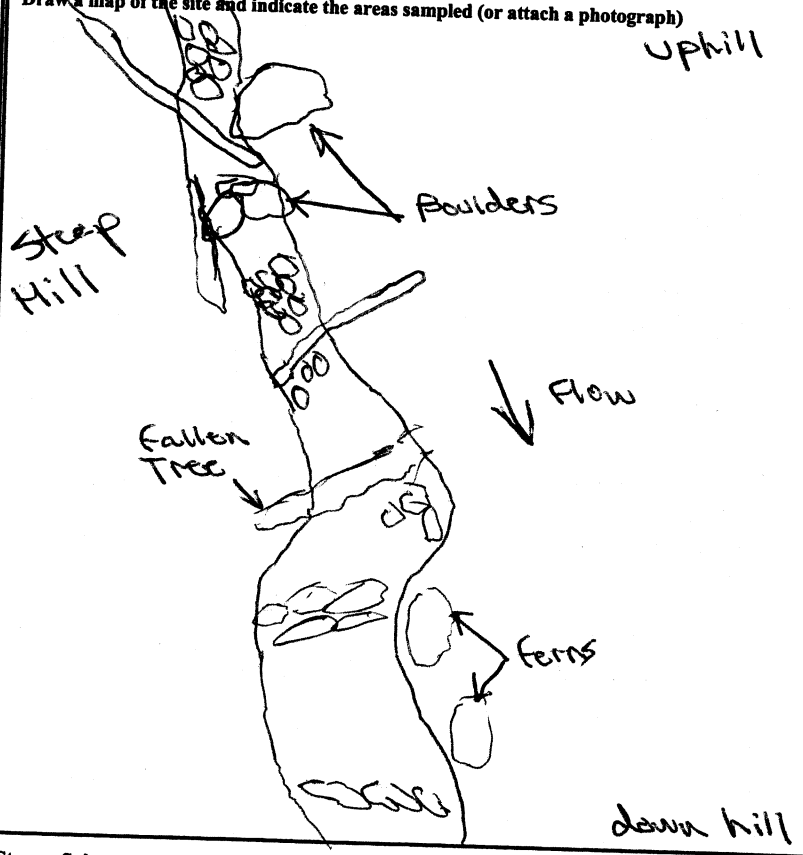
Has there been a heavy rain in the last 7 days? ☒ Yes ☐ No

Air Temperature 19 ° C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☒ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☒ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

OR-2

WATERSHED FEATURES

Predominant Surrounding Landuse
☒ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☒ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☒ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Red Maple, Elm, Cherry

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 1 m
Sampling Reach Area _____ m²
Area in km² (m²x1000) _____ km²
Estimated Stream Depth .05 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☐ Partly shaded ☒ Shaded

High Water Mark 1.5 m

Proportion of Reach Represented by Stream Morphology Types
☒ Riffle 90 % ☐ Run _____ %
☒ Pool 10 %

Channelized ☒ Yes ☐ No

Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 5 m²

Density of LWD _____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 17.9 °C
Specific Conductance 46.3
Dissolved Oxygen 100.5 9.53
pH 8.5
Turbidity _____
WQ Instrument Used _____

Water Odors
☐ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☒ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other _____

Turbidity (if not measured)
☒ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☒ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		20	Detritus	sticks, wood, coarse plant materials (CPOM)	25
Boulder	>256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	0
Gravel	2-64 mm (0.1"-2.5")	15			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	0
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Old Town Run	LOCATION downstream Whiskey Spring Rd Crsg.
STATION # OR2 RIVERMILE _____	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY Brian Dunlap	DATE 6/21/3 TIME 1440 (AM) PM
	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 75 % ☑ Snags 15 % ☐ Vegetated Banks 0 % ☐ Sand 0 % ☐ Submerged Macrophytes 0 % ☑ Other (Root wad) 10%
SAMPLE COLLECTION	**Gear used** ☒ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☒ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble ~~HH~~ HH ☑ Snags III ☐ Vegetated Banks _____ ☐ Sand _____ ☐ Submerged Macrophytes _____ ☑ Other (Root Wad) II
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	(0) 1 2 3 4	Slimes	(0) 1 2 3 4
Filamentous Algae	(0) 1 2 3 4	Macroinvertebrates	0 (1) 2 3 4
Macrophytes	(0) 1 2 3 4	Fish	(0) 1 2 3 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera (0) 1 2 3 4	Anisoptera (0) 1 2 3 4	Chironomidae (0) 1 2 3 4
Hydrozoa (0) 1 2 3 4	Zygoptera 0 1 (2) 3 4	Ephemeroptera (0) 1 2 3 4
Platyhelminthes (0) 1 2 3 4	Hemiptera (0) 1 2 3 4	Trichoptera (0) 1 2 3 4
Turbellaria (0) 1 2 3 4	Coleoptera (0) 1 2 3 4	Other (0) 1 2 3 4
Hirudinea (0) 1 2 3 4	Lepidoptera (0) 1 2 3 4	
Oligochaeta (0) 1 2 3 4	Sialidae (0) 1 2 3 4	
Isopoda (0) 1 2 3 4	Corydalidae (0) 1 2 3 4	
Amphipoda (0) 1 2 3 4	Tipulidae (0) 1 2 3 4	
Decapoda 0 (1) 2 3 4	Empididae (0) 1 2 3 4	
Gastropoda (0) 1 2 3 4	Simuliidae (0) 1 2 3 4	
Bivalvia (0) 1 2 3 4	Tabinidae (0) 1 2 3 4	
	Culcidae (0) 1 2 3 4	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Peach Orchard Hol	LOCATION Peach Orchard Hollow Rd.
STATION # PH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY	DATE 8-28-03 TIME 2 AM (PM)
	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10 % ☑	%cloud cover	☐ ___ %
☐	clear/sunny	☐

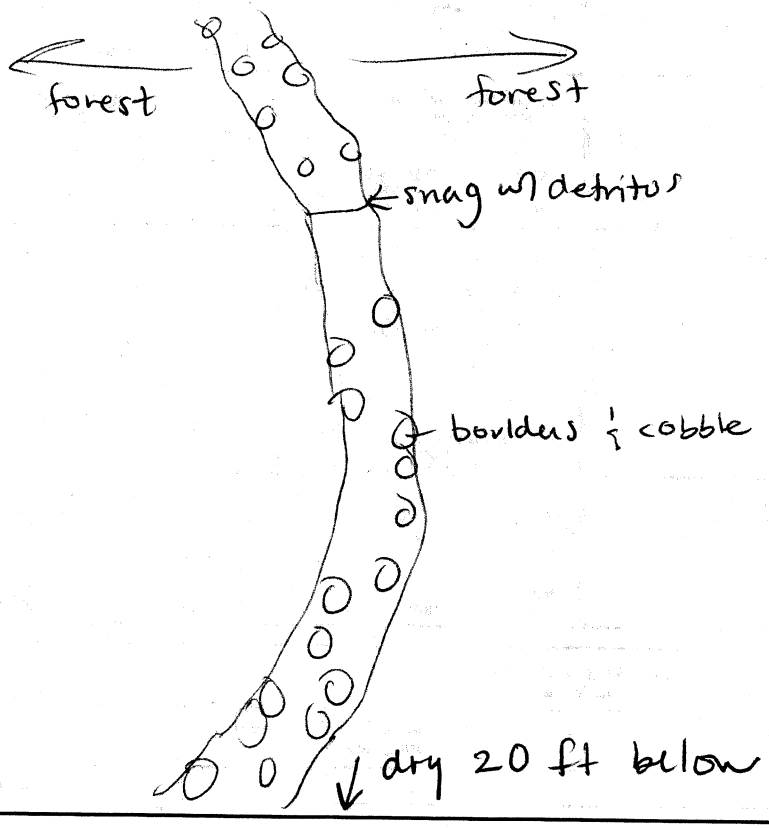
Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No

Air Temperature 83 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☑ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Oak, maple

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width 50 m

Sampling Reach Area _____ m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth 0.20 m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 98 % ☐ Run _____ %
☑ Pool 2 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 0 m^2

Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 21.2 °C

Specific Conductance 29.3

Dissolved Oxygen 86/7.67

pH 8.1

Turbidity _____

WQ Instrument Used HACH COND. YSI DO, Oakton pH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	90	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	5			
Sand	0.06-2mm (gritty)	—	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Peach Orchard Hol	LOCATION Peach Orchard Hollow Rd.	
STATION # PH1 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG/GF	
INVESTIGATORS HC, AG, BD		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-28-03 TIME 2 AM (PM)	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 85 % ☑ Snags 10 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☑ Other (detritus) 5 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** (17) ☑ Cobble ☑ Snags (12) ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☑ Other (detritus (1)
GENERAL COMMENTS	Very low flow, str dry s up/pcs underground, remains so to discharge w/ YB

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	(0)	1	2	3	4		Slimes	(0)	1	2	3	4				
Filamentous Algae	(0)	1	2	3	4		Macroinvertebrates	(0)	1	2	3	4				
Macrophytes	(0)	1	2	3	4		Fish	(0)	1	2	3	4				

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4		Anisoptera	(0)	1	2	3	4		Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4		Zygoptera	(0)	1	2	3	4		Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4		Hemiptera	(0)	1	2	3	4		Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4		Coleoptera	(0)	1	2	3	4		Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4		Lepidoptera	(0)	1	2	3	4							
Oligochaeta	(0)	1	2	3	4		Sialidae	(0)	1	2	3	4							
Isopoda	(0)	1	2	3	4		Corydalidae	(0)	1	2	3	4							
Amphipoda	(0)	1	2	3	4		Tipulidae	(0)	1	2	3	4							
Decapoda	0	(1)	2	3	4		Empididae	(0)	1	2	3	4							
Gastropoda	(0)	1	2	3	4		Simuliidae	(0)	1	2	3	4							
Bivalvia	(0)	1	2	3	4		Tabinidae	(0)	1	2	3	4							
							Culcidae	(0)	1	2	3	4							

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Pippins Run	LOCATION Lewisberry Rd. X, 150'ds bridge
STATION # PR1 RIVERMILE_____	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AM & MB	
FORM COMPLETED BY AG	DATE 8-12-03 TIME 9:15 (AM) PM / REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☑	storm (heavy rain)	☑
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
100% ☑	%cloud cover	☑ 100%
☐	clear/sunny	☐

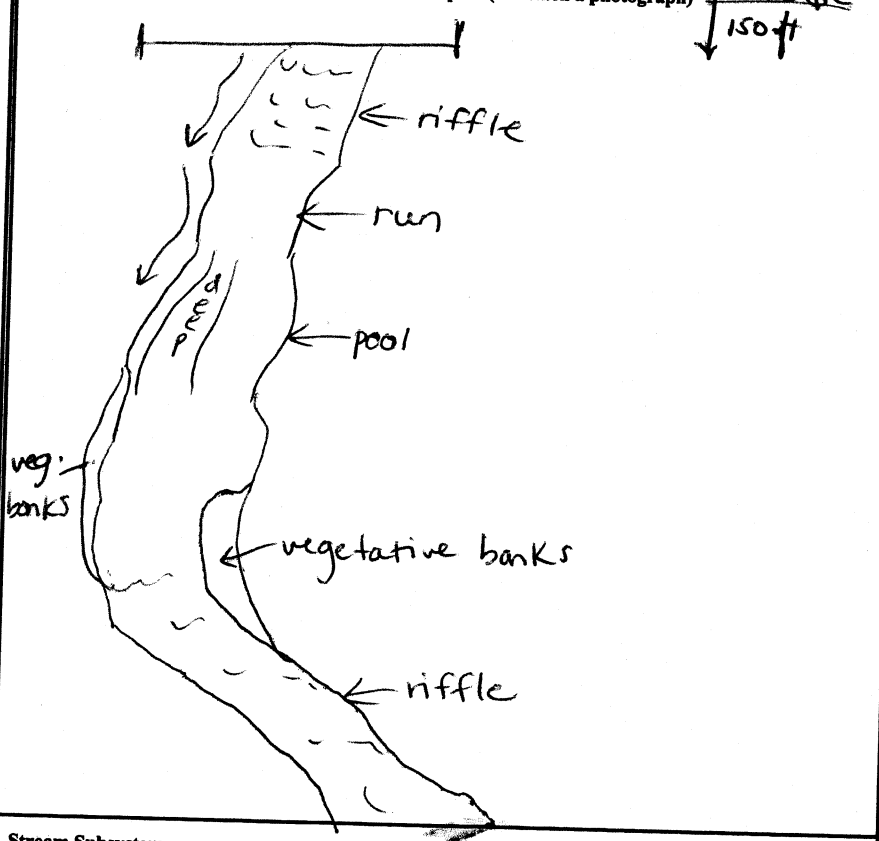
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 77 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☑ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Sycamore, locust, Poplar

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width 2 m

Sampling Reach Area [illegible] m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth .2 m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 70 % ☑ Run 10 %
☑ Pool 20 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 0 m^2

Density of LWD 0 m^2/km^2 **(LWD/ reach area)**

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present Carex sp.

Portion of the reach with aquatic vegetation 90 %

WATER QUALITY

Temperature 19.C °C

Specific Conductance 211

Dissolved Oxygen 109.3 / 10.03

pH 8.1

Turbidity _____

WQ Instrument Used HACH cond
YSI DO / pH tester 2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		10	Detritus	sticks, wood, coarse plant materials (CPOM)	—
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	80	Muck-Mud	black, very fine organic (FPOM)	15
Gravel	2-64 mm (0.1"-2.5")	5			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Pippin Run	LOCATION Lewisberry Rd X, 150'd
STATION # PR1 RIVERMILE	STREAM CLASS TIII
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AmG, MB	LOT NUMBER
FORM COMPLETED BY AmG	DATE 8-12-03 TIME 9:15 (AM) PM
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 80 % ☐ Snags ____ % ☑ Vegetated Banks 15 % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☑ Other (root wad) 5 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** (10) ☑ Cobble ☐ Snags ____ ☐ Vegetated Banks III (3) ☐ Sand ____ ☐ Submerged Macrophytes ____ (1) ☑ Other (root wad) 1
GENERAL COMMENTS	fish present – black-nose dace

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	(0)	1	2	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	0	1	(2)	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	0	1	(2)	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	0	1	(2)	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	1	(2)	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	1	(2)	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	(2)	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	1	2	(3)	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Stony Run	LOCATION 100' upstr. Grantham Rd X	
STATION # SR1 RIVERMILE	STREAM CLASS III	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-18-03 TIME 10 (AM) PM	REASON FOR SURVEY Asst

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☑
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
100% ☑	%cloud cover	☐ ___%
☐	clear/sunny	☐

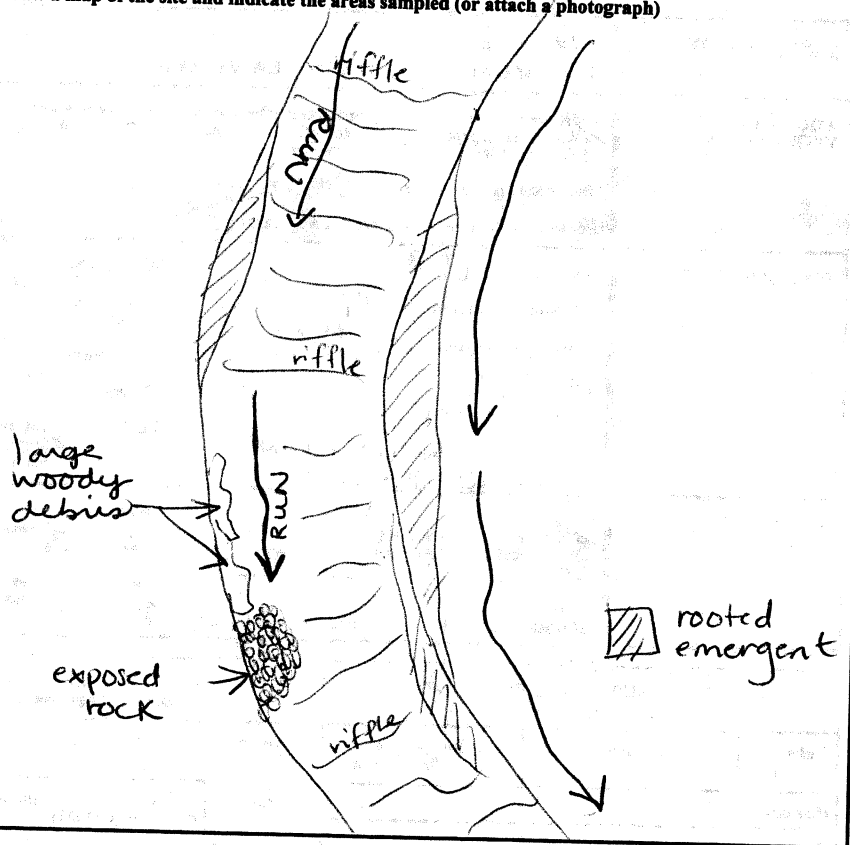
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 70 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Sycamore, Oak, Boxelder

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width 6 m

Sampling Reach Area _____ m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth _____ m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle 98 % ☐ Run 2 %
☐ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 1 m^2

Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present Carex sp.

Portion of the reach with aquatic vegetation ≥5 %

WATER QUALITY

Temperature 19.8 °C

Specific Conductance 294

Dissolved Oxygen 98.9/9.01

pH 8.3

Turbidity .3 m

WQ Instrument Used HACH COND. YSI DO PHtestr2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	3
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")	90	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	10			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	—
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Stony Run	LOCATION 100' upstream Grantham Rd X
STATION # SR1 RIVERMILE_____	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-18-03 TIME 10 (AM) PM
	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 95 % ☐ Snags____% ☑ Vegetated Banks 4 % ☐ Sand____% ☐ Submerged Macrophytes____% ☑ Other (rootwad) 1 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble ☐ Snags____ ☑ Vegetated Banks 11 ☐ Sand____ ☐ Submerged Macrophytes____ ☑ Other (root wad) 1
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	(0)	1	2	3	4	Fish	0	(1)	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	0	(1)	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	0	(1)	2	3	4	Ephemeroptera	0	1	(2)	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	(1)	2	3	4	Other *	0	1	(2)	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera *					
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	1	(2)	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Stony Run	LOCATION 100 dS Old York Rd X
STATION # SR2 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-18-03 TIME 1 AM (PM)
REASON FOR SURVEY Asst	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☒
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
20 % ☒	%cloud cover	☐ ___ %
☐	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☒ Yes ☐ No

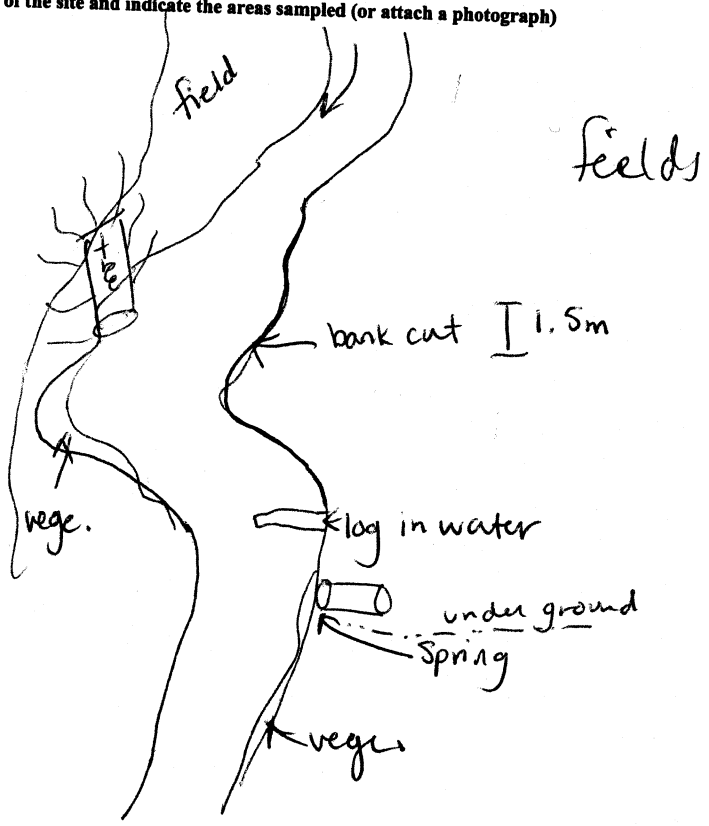
Air Temperature 83 ° C

Other _____

SITE LOCATION/MAP

-large trees, but not many, grassy, shrub scrub riparian surrounded by furrow fields

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☐ Perennial ☐ Intermittent ☐ Tidal

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☐ Mixture of origins
☐ Other _____

Stream Type
☐ Coldwater ☐ Warmwater

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☑ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☑ Grasses ☐ Herbaceous

dominant species present _____

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 3 m
Sampling Reach Area 100 m²
Area in km² (m²x1000) _____ km²
Estimated Stream Depth _____ m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 2 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 20 % ☑ Run 80 %
☑ Pool 18 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 2 m²
Density of LWD _____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☑ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present Juncus effusus - Soft Rush

Portion of the reach with aquatic vegetation 15 %

WATER QUALITY

Temperature 20.6 °C
Specific Conductance 339
Dissolved Oxygen 92/8.3
pH 7.6
Turbidity _____
WQ Instrument Used HACH COND YSI DO pHtestr2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☐ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☑ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	3
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	20	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	—			
Sand	0.06-2mm (gritty)	80	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Stony Run		LOCATION 100 ds Old York Rd X	
STATION # SR2	RIVERMILE	STREAM CLASS III	
LAT	LONG	RIVER BASIN YB	
STORET #		AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD			LOT NUMBER
FORM COMPLETED BY AG	DATE 8-19 TIME 1 AM (PM)		REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 15 % ☑ Snags 5 % ☑ Vegetated Banks 10 % ☑ Sand 60 % ☑ Submerged Macrophytes 5 % ☑ Other (root wad) 5 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble 6 ☑ Snags ____ ☑ Vegetated Banks 11 ☑ Sand 9 ☑ Submerged Macrophytes 11 ☑ Other (root wad) 1
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	0	(1)	2	3	4	Macroinvertebrates	0	(1)	2	3	4
Macrophytes	0	1	(2)	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	0	(1)	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	0	1	(2)	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	1	(2)	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	0	1	(2)	3	4						
Oligochaeta	(0)	1	(2)	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	1	(2)	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Stony Run	LOCATION 100 ft up Filey's Rd. X
STATION # SR3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-18 TIME 11:30 (AM) PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☑
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
40 % ☐	%cloud cover	☐ ___ %
☐	clear/sunny	☐

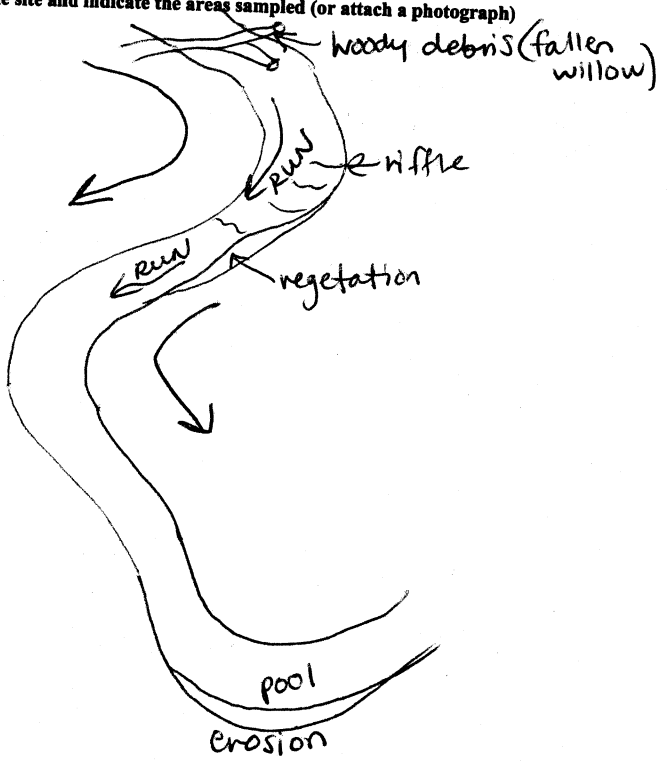
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 20 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☑ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☐ Grasses ☑ Herbaceous

dominant species present multiflora Rose

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 1.5 m
Sampling Reach Area 100 m²
Area in km² (m²x1000) _____ km²
Estimated Stream Depth .25 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 1.5 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 60 % ☑ Run 30 %
☑ Pool 10 %

Channelized ☑ Yes ☐ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 3 m²
Density of LWD _____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present Jewelweed, Carex sp.

Portion of the reach with aquatic vegetation 40 %

WATER QUALITY

Temperature 19.3 °C
Specific Conductance 192
Dissolved Oxygen 102/9.40
pH 8.3
Turbidity _____
WQ Instrument Used HACH cond. YSI DO pHester

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	20
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	20	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	50			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	20			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Stony Run	LOCATION 100 upst. Filey Rd X
STATION # SR3 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY GF, HRG
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-18 TIME 1130 (AM) PM
	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 79 % ☑ Snags 1 % ☑ Vegetated Banks 15 % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☑ Other (root wad) 14 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** (16) ☑ Cobble ~~HHT HHT HHT~~ ☑ Snags 1 ☑ Vegetated Banks 11 ☐ Sand ____ ☐ Submerged Macrophytes ____ ☑ Other (Root wad) 11
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	0	(1)	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	0	1	(2)	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	0	1	(2)	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	(1)	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera (1)					
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4	Aquatic salamander					
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	0	1	2	(3)	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Sthromes Hollow	LOCATION 200' upstr. Sand Hill Rd. X
STATION # STH1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9/9/03 TIME 10 AM PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☑
90% ☑	%cloud cover	☐ ___%
☐	clear/sunny	☐

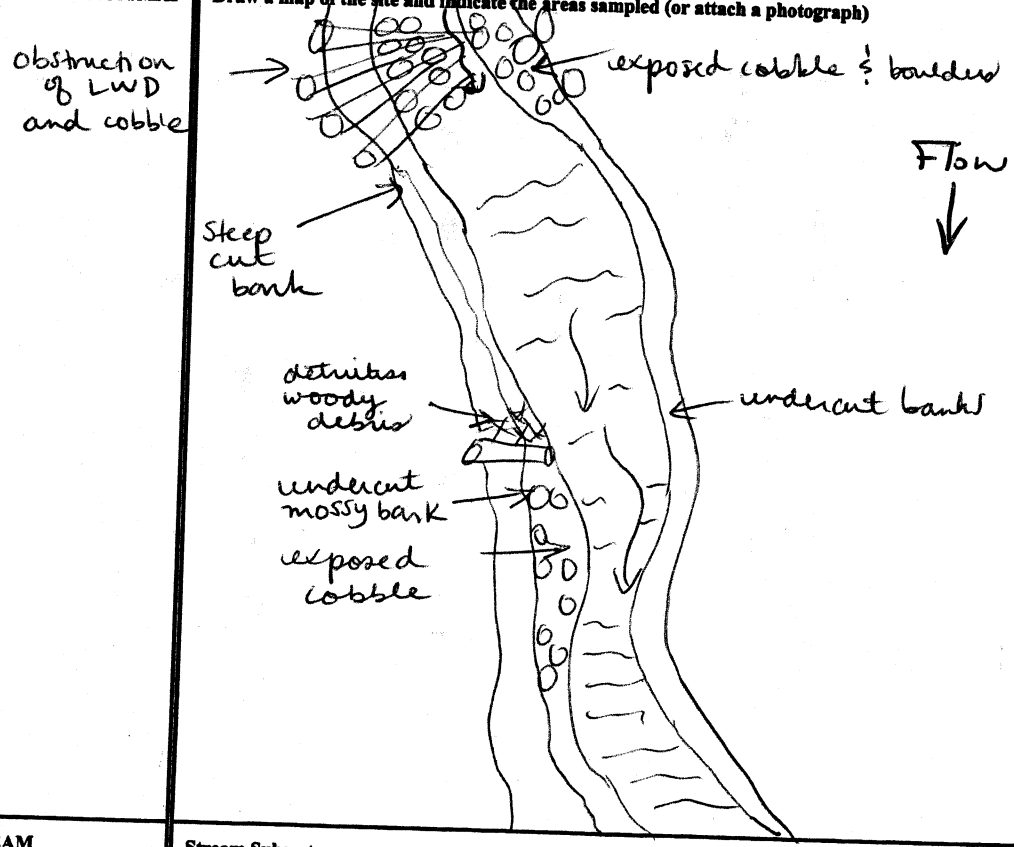
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 70 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☑ Shrubs ☐ Grasses ☐ Herbaceous
dominant species present Mt. Laurel (banks) Sycamore (overhead)

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2.5 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth 0.42 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded
High Water Mark 1.5 m
Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 98 % ☑ Run 2 %
☐ Pool _____ %
Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 5 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae
dominant species present periphyton
Portion of the reach with aquatic vegetation 90%

WATER QUALITY

Temperature 16.5 °C
Specific Conductance 29.0
Dissolved Oxygen 96 / 9.36 ppm
pH 8.7
Turbidity _____
WQ Instrument Used HACH COND YSI DO / pH test - Oakton

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	3			
Cobble	64-256 mm (2.5"-10")	87	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	5			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Shoomes Hollow	LOCATION 200' upstr. of Sand Bank Rd. XC
STATION # STH1 RIVERMILE _____	STREAM CLASS III
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY HRG
INVESTIGATORS AG, HC, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 9/9/03 TIME 10 (AM) PM
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 98 % ☑ Snags 2 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☐ Other ( ) ____ %
SAMPLE COLLECTION (18)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble IIII IIII IIII ☐ Snags II (2) ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☐ Other ( ) ____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0 1 2 (3) 4	Slimes	(0) 1 2 3 4
Filamentous Algae	(0) 1 2 3 4	Macroinvertebrates	0 (1) 2 3 4
Macrophytes	0 (1) 2 3 4	Fish	(0) 1 2 3 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera (0) 1 2 3 4	Anisoptera (0) 1 2 3 4	Chironomidae (0) 1 2 3 4
Hydrozoa (0) 1 2 3 4	Zygoptera (0) 1 2 3 4	Ephemeroptera (0) 1 2 3 4
Platyhelminthes (0) 1 2 3 4	Hemiptera 0 1 (2) 3 4	Trichoptera 0 (1) 2 3 4
Turbellaria (0) 1 2 3 4	Coleoptera (0) 1 2 3 4	Other (0) 1 2 3 4
Hirudinea (0) 1 2 3 4	Lepidoptera (0) 1 2 3 4	
Oligochaeta (0) 1 2 3 4	Sialidae 0 (1) 2 3 4	
Isopoda (0) 1 2 3 4	Corydalidae (0) 1 2 3 4	
Amphipoda (0) 1 2 3 4	Tipulidae (0) 1 2 3 4	
Decapoda 0 1 (2) 3 4	Empididae (0) 1 2 3 4	
Gastropoda (0) 1 2 3 4	Simuliidae (0) 1 2 3 4	
Bivalvia (0) 1 2 3 4	Tabinidae (0) 1 2 3 4	
	Culcidae (0) 1 2 3 4	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Toms Run	LOCATION 200' downstr. 233 X
STATION # TR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9-17-03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10% ☐	%cloud cover	☐ ___%
☒	clear/sunny	☐

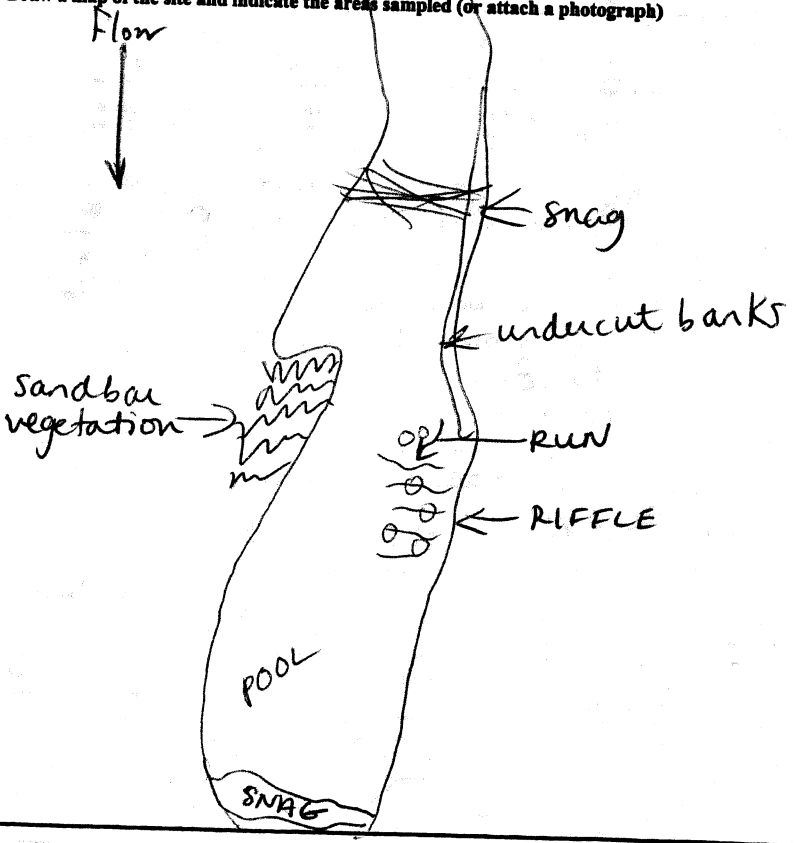
Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 65 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem: ☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type: ☒ Coldwater ☐ Warmwater

Stream Origin: ☐ Glacial ☐ Non-glacial montane ☐ Swamp and bog ☒ Spring-fed ☐ Mixture of origins ☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☑ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☑ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Pine (white?)

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 2.5 m
Sampling Reach Area _____ m²
Area in km² (m²x1000) _____ km²
Estimated Stream Depth .30 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 70 % ☑ Run 5 %
☑ Pool 25 %

Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 15 m²
Density of LWD _____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present Carex sp. (grass like)

Portion of the reach with aquatic vegetation 80%

WATER QUALITY

Temperature 13.5 °C
Specific Conductance 30.5
Dissolved Oxygen 99/10.29
pH 8.8
Turbidity _____
WQ Instrument Used HACH Cond. Oakton pH, YSI DO

Water Odors
☑ Normal/None ☐ Sewage ☐ Chemical
☐ Petroleum ☐ Other _____
☐ Fishy

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	40
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	60	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)	20	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Toms Run	LOCATION 200' downstr. of 233 X
STATION # TR1 RIVERMILE	STREAM CLASS III
LAT LONG	RIVER BASIN Yellow Breech.
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 9-17-03 TIME 10 (AM) PM
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 65 % ☑ Snags 20 % ☐ Vegetated Banks 5 % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☑ Other (root wad) 10 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble ☑ Snags IIII ☑ Vegetated Banks 1 ☐ Sand ____ ☐ Submerged Macrophytes ____ ☑ Other (root wad) 11
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0 1 (2) 3 4	Slimes	(0) 1 2 3 4
Filamentous Algae	(0) 1 2 3 4	Macroinvertebrates	0 1 2 (3) 4
Macrophytes	0 1 2 (3) 4	Fish	0 1 2 (3) 4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0) 1 2 3 4	Anisoptera	(0) 1 2 3 4	Chironomidae	(0) 1 2 3 4
Hydrozoa	(0) 1 2 3 4	Zygoptera	0 (1) 2 3 4	Ephemeroptera	(0) 1 2 3 4 - mayflg
Platyhelminthes	(0) 1 2 3 4	Hemiptera	0 (1) 2 3 4	Trichoptera	0 1 (2) 3 4 - caddisfly
Turbellaria	(0) 1 2 3 4	Coleoptera	0 1 (2) 3 4	Other	0 1 2 3 4
Hirudinea	(0) 1 2 3 4	Lepidoptera	(0) 1 2 3 4	Plecoptera	0 1 2 (3) 4
Oligochaeta	(0) 1 2 3 4	Sialidae	(0) 1 2 3 4		
Isopoda	(0) 1 2 3 4	Corydalidae	0 1 (2) 3 4		
Amphipoda	(0) 1 2 3 4	Tipulidae	(0) 1 2 3 4		
Decapoda	0 (1) 2 3 4	Empididae	(0) 1 2 3 4		
Gastropoda	(0) 1 2 3 4	Simuliidae	(0) 1 2 3 4		
Bivalvia	(0) 1 2 3 4	Tabinidae	(0) 1 2 3 4		
		Culcidae	(0) 1 2 3 4		

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME (Unnamed) Trib to YB	LOCATION 2,000 Ft upStrm of Lisburn X-section
STATION # UNT1 RIVERMILE	STREAM CLASS 3
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY G/F
INVESTIGATORS EC, EC	
FORM COMPLETED BY EC	DATE 9/18/03 TIME 11:35 AM PM / REASON FOR SURVEY Asst

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
100% ☒	%cloud cover	☐ ___%
☐	clear/sunny	OR

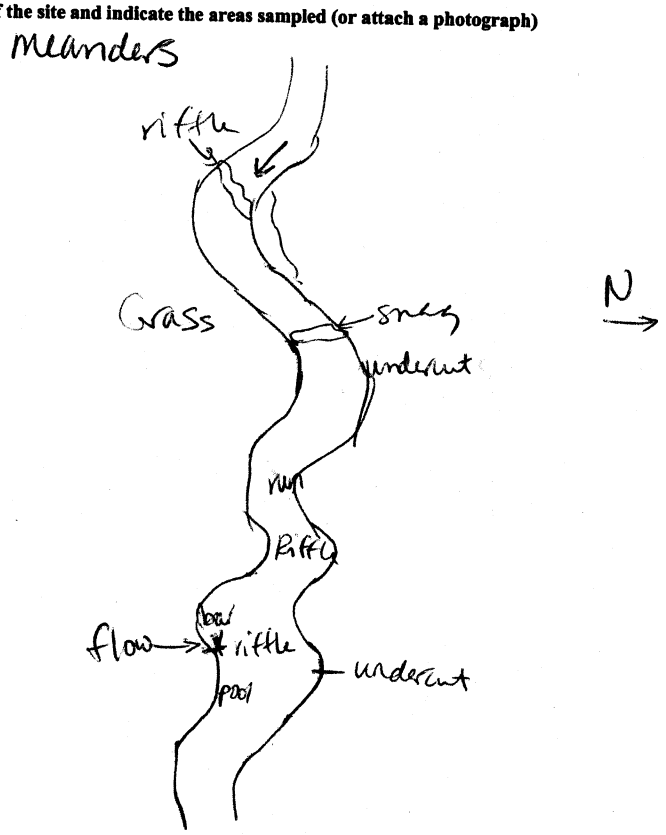
Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 70 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☒ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☒ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☒ Forest ☐ Commercial
☒ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☒ Residential

Local Watershed NPS Pollution
☐ No evidence ☒ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☒ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☒ Trees ☒ Shrubs ☐ Grasses ☒ Herbaceous
dominant species present Oaks, sycamore, dogwood

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 3 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth 0.3 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☒ Partly shaded ☐ Shaded
High Water Mark 2 m
Proportion of Reach Represented by Stream Morphology Types
☐ Riffle 30 % ☐ Run 70 %
☐ Pool 10 %
Channelized ☐ Yes ☒ No
Dam Present ☐ Yes ☒ No

LARGE WOODY DEBRIS

LWD 5 m^2
Density of LWD _____ m^2/km^2 **(LWD/ reach area)**

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☒ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae
dominant species present shrubs
Portion of the reach with aquatic vegetation 30 %

WATER QUALITY

Temperature 14.2 °C
Specific Conductance 10.59 ppm 103.3% (Apt pH Each Season)
Dissolved Oxygen 555 mg/cm
pH 8.3
Turbidity _____
WQ Instrument Used YSI DO200

Water Odors
☒ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☒ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☒ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☒ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☒ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☒ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	15
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")	50	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)	20			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME UNT to Yellow Br.	LOCATION ~2,000 ft upstrm w/ Lisburn Rd Xing	
STATION # UNT1 RIVERMILE	STREAM CLASS 3	
LAT _____ LONG _____	RIVER BASIN Y B	
STORET #	AGENCY GF	
INVESTIGATORS HC, EC		LOT NUMBER
FORM COMPLETED BY EC	DATE 9-18-03 TIME 11:30 (AM) PM	REASON FOR SURVEY Asst.

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☒ Cobble 50 % ☒ Snags 20 % ☒ Vegetated Banks 15 % ☒ Sand 5 % ☒ Submerged Macrophytes 5 % ☒ Other (root wad) 5 %
SAMPLE COLLECTION	**Gear used** ☒ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☒ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☒ Cobble IIII IIII ☒ Snags IIII ☒ Vegetated Banks III ☒ Sand I ☒ Submerged Macrophytes I ☒ Other (root wad) I
GENERAL COMMENTS	Riffle/run stream, some deep pools in eroded areas & bends, undercut clay banks, unvegetated

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	0	(1)	2	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	(1)	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	0	(1)	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	2	(3)	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	0	(1)	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME YB main	LOCATION main, New Cumb. / Bridge St.
STATION # YB1 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, MB	
FORM COMPLETED BY AG	DATE 8-7-03 TIME 10 (AM) PM
REASON FOR SURVEY Ass't	

200 u/s of bridge

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
100% ☐	%cloud cover	☐ ___%
☐	clear/sunny	☐

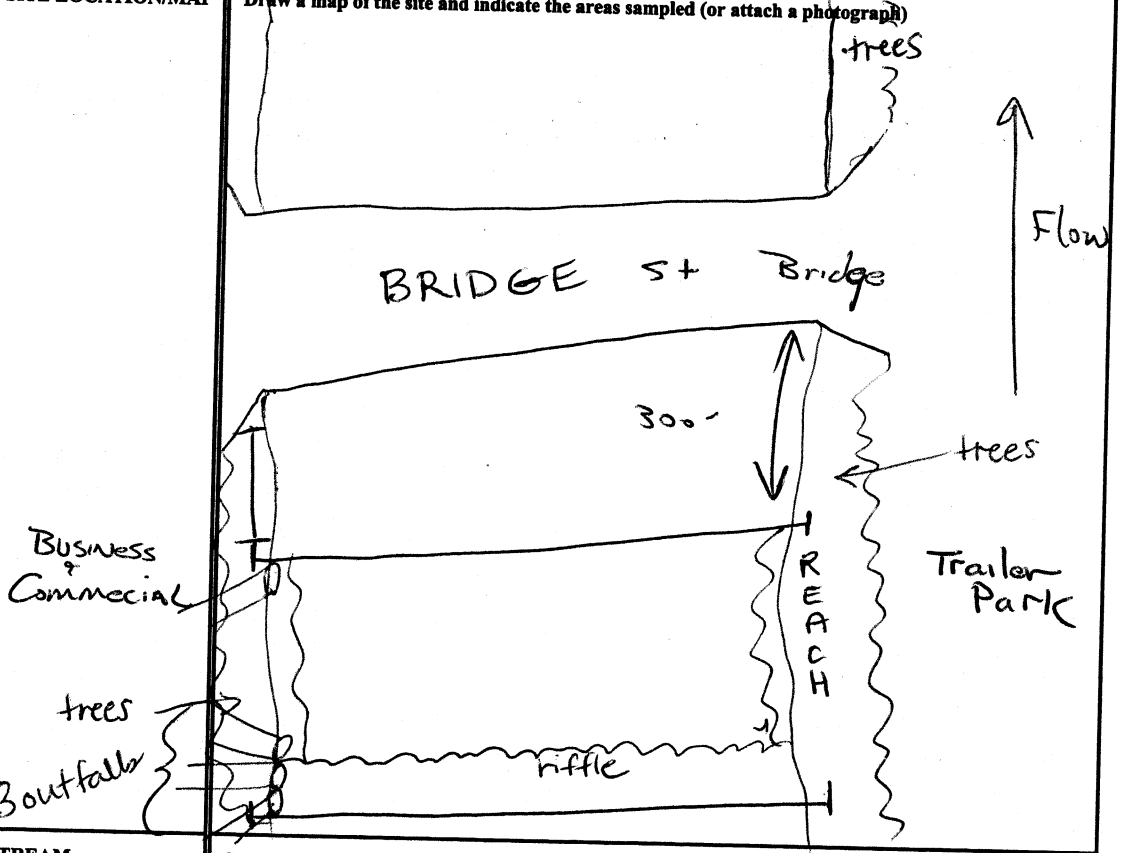
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 80 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☑ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☑ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☑ Residential
trailer

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☑ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Boxelder, mulberry, Sugarberry

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width 25 m

Sampling Reach Area _____ m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth _____ m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover along edges
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 3.5 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 5 % ☑ Run 95 %
☐ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 2 m^2

Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation _____ %

WATER QUALITY

Temperature 20.3 °C

Specific Conductance 359

Dissolved Oxygen [illegible] / 93.3% / 6.67 ppm

pH 8.2

Turbidity _____

WQ Instrument Used pHtestr2
YSI DO / HACH Cond

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☑ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☐ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☑ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	10%
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	—
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME YB	LOCATION Main - N. Cumb/Bridge St - 200 us	
STATION # YB1 RIVERMILE_____	STREAM CLASS II	
LAT_____ LONG_____	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, MB		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-7-03 TIME 9:45 (AM) PM	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Cobble 95 % ☐ Snags____% ☐ Vegetated Banks 3 % ☐ Sand 2 % ☐ Submerged Macrophytes____% ☐ Other ( )____%
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble 17 ☐ Snags____ ☑ Vegetated Banks 1 ☑ Sand 2 ☐ Submerged Macrophytes____ ☐ Other ( )____
GENERAL COMMENTS	Pair of Blue Herons

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	(1)	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	(0)	1	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	0	(1)	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	(0)	1	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	(1)	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	(1)	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	0	1	(2)	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Yellow Breech	LOCATION 300' upstr. Enck's Mill Rd. - X
STATION # YB2 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-25-03 TIME 12 AM (PM)
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now
- ☐ storm (heavy rain)
- ☐ rain (steady rain)
- ☐ showers (intermittent)
- ☐ %
- ☒ clear/sunny

Past 24 hours
- ☐
- ☐
- ☐
- ☐ %
- ☐

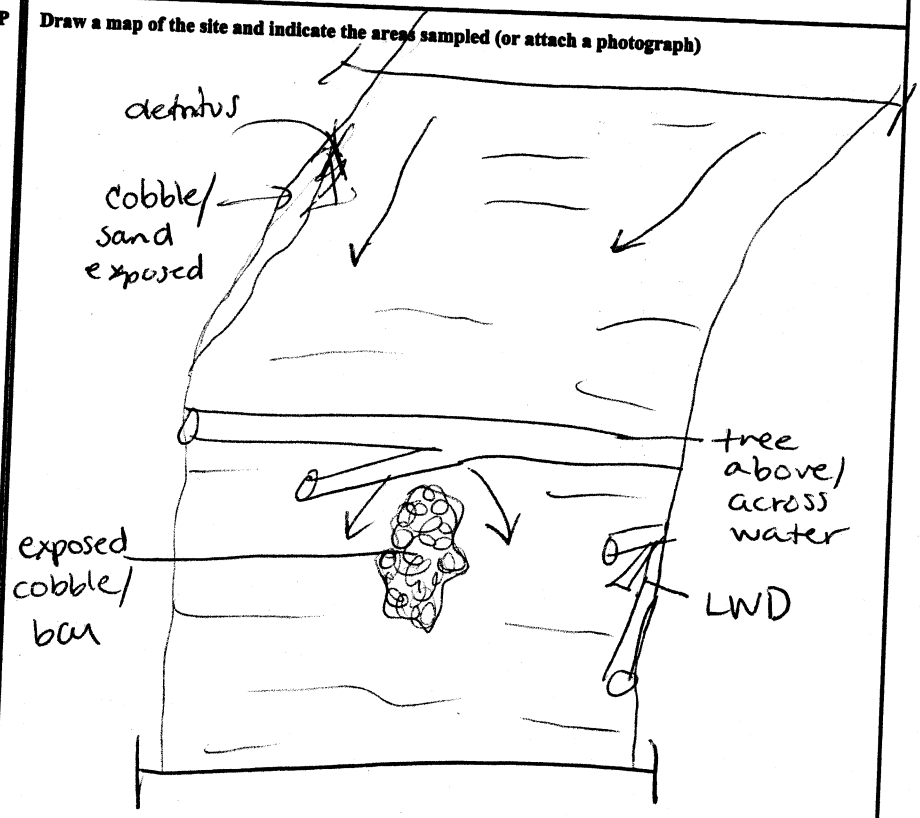
Has there been a heavy rain in the last 7 days? ☐ Yes ☒ No

Air Temperature 80 C

Other

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☒ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☒ Coldwater ☐ Warmwater

Stream Origin
- ☐ Glacial
- ☐ Non-glacial montane
- ☐ Swamp and bog
- ☐ Spring-fed
- ☒ Mixture of origins
- ☐ Other

Catchment Area km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential Downstream of Hatchery

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☑ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous
dominant species present Oak, Sycamore

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 13 m
Sampling Reach Area _____ m²
Area in km² (m²x1000) _____ km²
Estimated Stream Depth .30 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded
High Water Mark 0.30 m
Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 45 % ☑ Run 50 %
☑ Pool 2005 %
Channelized ☐ Yes ☑ No
Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 15 m²
Density of LWD _____ m²/km² (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae
dominant species present _____
Portion of the reach with aquatic vegetation 20 %

WATER QUALITY

Temperature 16.3 °C
Specific Conductance 224
Dissolved Oxygen ~~10.2/110~~ 101/10.01
pH 8.1
Turbidity _____
WQ Instrument Used HACH COND YSI DO

Water Odors
☑ Normal/None ☐ Sewage ☐ Chemical
☐ Petroleum ☐ Other _____
☐ Fishy

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	20
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	20	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	77			
Sand	0.06-2mm (gritty)	3	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Yellow Breech. M	LOCATION 300ft. upst. Erk's Mill Rd X
STATION # YB2 RIVERMILE_____	STREAM CLASS ~~III~~ II
LAT _____ LONG _____	RIVER BASIN YB
STORET #	AGENCY HR6, GF, BD
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 8/25/03 TIME 12 AM (PM)
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 60 % ☑ Snags 20 % ☐ Vegetated Banks____% ☑ Sand 5 % ☐ Submerged Macrophytes____% ☑ Other (root wad) 15 %
SAMPLE COLLECTION (12)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other _____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble IIII IIII ☐ Snags IIII (4) ☐ Vegetated Banks____ ☑ Sand 1 ☐ Submerged Macrophytes____ ☑ Other (root wad) III (3)
GENERAL COMMENTS	ducks

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	1	2	(3)	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	(0)	1	2	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	(1)	2	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4						
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	1	2	3	(4)	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	2	3	(4)	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Yellow Breech. M	LOCATION 100' ft upstr. Hays Grove Rd. X
STATION # YB3 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 9-15-03 TIME 12 AM (PM)
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
90 %	%cloud cover	☐ %
☐	clear/sunny	☐

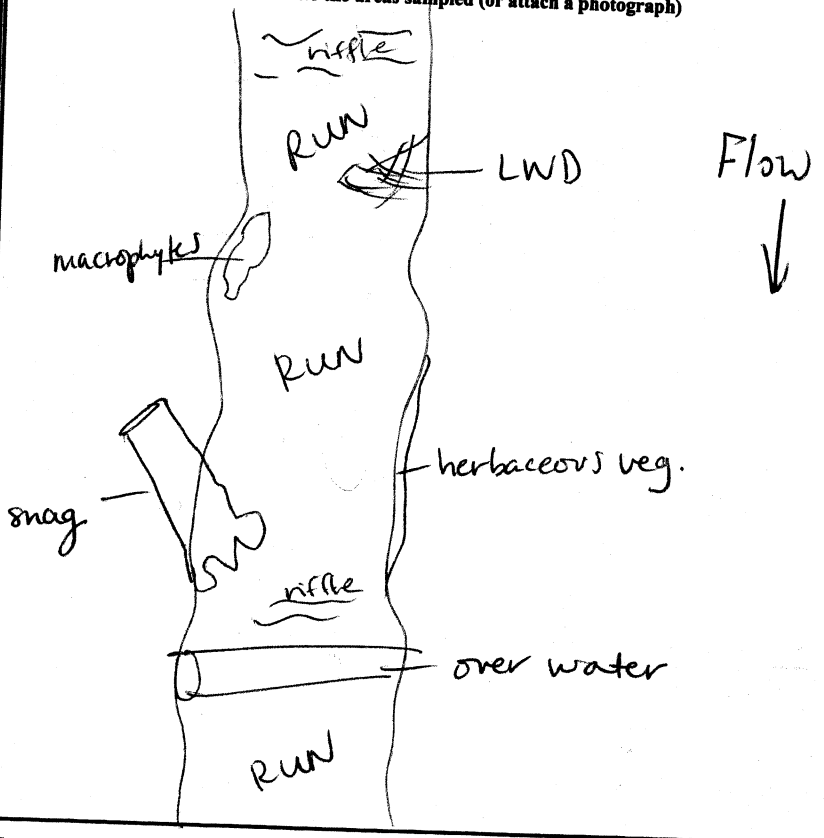
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 70 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☐ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☐ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☑ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Red maple

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 3 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .15 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☐ Partly shaded ☑ Shaded

High Water Mark 1 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 20 % ☑ Run 80 %
☐ Pool _____ %

Channelized ☐ Yes ☑ No somewhat

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 5 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present Impatiens capensis (Jewelweed)

Portion of the reach with aquatic vegetation _____ %

WATER QUALITY

Temperature 15.1 °C
Specific Conductance 298
Dissolved Oxygen 97.5 / 9.8 ppm
pH 8.1
Turbidity _____
WQ Instrument Used HACH COND YSI 00 2 Oakton pH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other _____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other _____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other _____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other _____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other _____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	30
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	40	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	40			
Sand	0.06-2mm (gritty)	20	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Yellow Breech-M	LOCATION 100' upstr. Hays Grove Rd. X
STATION # YB3 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	LOT NUMBER
FORM COMPLETED BY AG	DATE 9-15-03 TIME 12 AM (PM)
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☐ Cobble 75 % ☒ Snags 15 % ☐ Vegetated Banks ____ % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☒ Other (root wad) 5 % ☒ LWD 5
SAMPLE COLLECTION (15)	**Gear used** ☒ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☒ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☐ Cobble 11 ☒ Snags 3 ☐ Vegetated Banks ____ ☐ Sand ____ ☐ Submerged Macrophytes ____ ☒ Other (root wad) 1 ☐ LWD 1
GENERAL COMMENTS	fine, litter in stream to P 55-gal. drum @ ~~end~~ of reach (empty)

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	(0)	(1)	2	3	4	Fish	0	(1)	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	(0)	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera	0	1	(2)	3	4
Oligochaeta	(0)	1	2	3	4	Sialidae	0	(1)	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	(0)	1	2	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	(0)	1	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION Sheepford Rd. 200ft upstr. Bridge
STATION # YB4 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 10/1 TIME 1 AM (PM)
REASON FOR SURVEY Ass't	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
100 % ☐	%cloud cover	☐ ___ %
☐	clear/sunny	☐

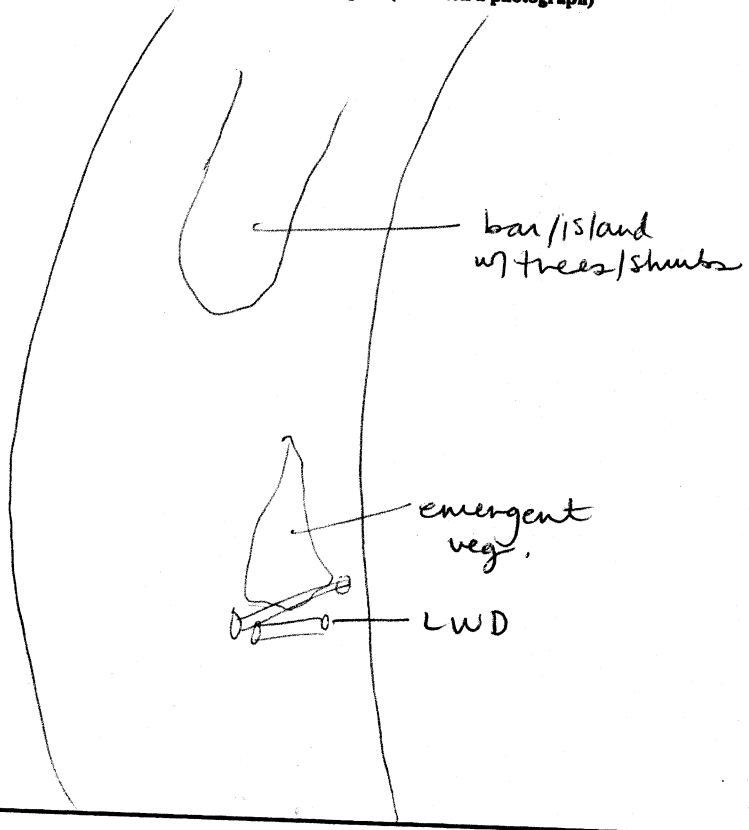
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 60 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other _____

Catchment Area _____ km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☑ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Hemlock, Boxelder

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width _____ m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth _____ m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☑ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark 3 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 5 % ☑ Run 95 %
☐ Pool 0 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 20 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☑ Attached Algae

dominant species present grasses

Portion of the reach with aquatic vegetation 10 %

WATER QUALITY

Temperature 13.3 °C
Specific Conductance 288
Dissolved Oxygen 10.3/10.8
pH 8.1
Turbidity _____
WQ Instrument Used HACH COND YSI DO Oakton pH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☑ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	5 10
Boulder	> 256 mm (10")	—			
Cobble	64-256 mm (2.5"-10")	70	Muck-Mud	black, very fine organic (FPOM)	5
Gravel	2-64 mm (0.1"-2.5")	20			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Yellow Breeches		LOCATION Sheepford Rd., 200 ft upstr. Bridge	
STATION YB4	RIVERMILE	STREAM CLASS II	
LAT	LONG	RIVER BASIN YB	
STORET #		AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD			LOT NUMBER
FORM COMPLETED BY AG	DATE 10/1/03 TIME 1 AM (PM)		REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 70 % ☑ Snags 25 % ☑ Vegetated Banks 5 % ☐ Sand ____ % ☐ Submerged Macrophytes ____ % ☐ Other ( ) ____ %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble 𝍸 Snags 𝍸 ☑ Vegetated Banks 1 ☐ Sand ____ ☐ Submerged Macrophytes ____ ☐ Other ( ) ____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	(1)	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	(2)	3	4
Macrophytes	0	(1)	2	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	(0)	1	2	3	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera	0	1	(2)	3	4
Oligochaeta	(0)	1	2	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	(0)	1	2	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	(2)	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	0	1	2	(3)	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME YB-main	LOCATION 500' ds - McCormick Rd. west of Lisbon
STATION # YB5 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AE, MB	
FORM COMPLETED BY	DATE 8-7 TIME 1 AM (PM) / REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
50% ☑	%cloud cover	☐ ___%
☐	clear/sunny	☐

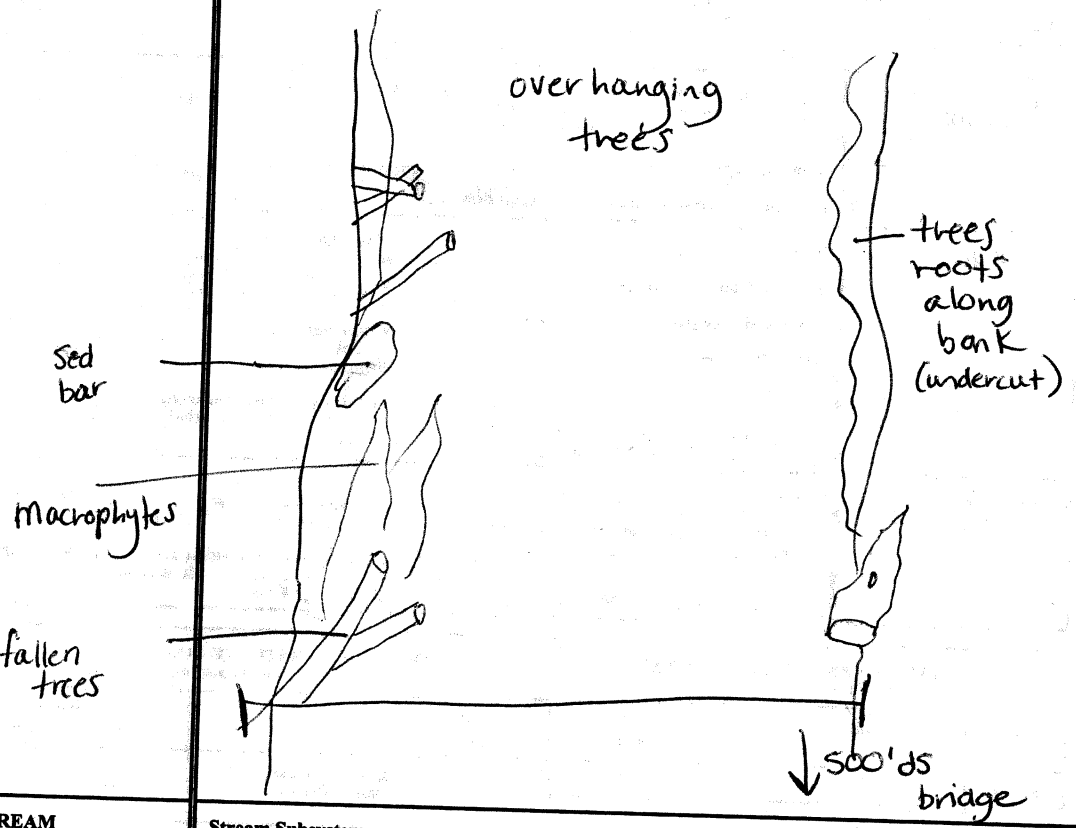
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 80 °C

Other _____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☐ Coldwater ☑ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☑ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Sycamore

INSTREAM FEATURES

Estimated Reach Length 100 m

Estimated Stream Width 21 m

Sampling Reach Area _____ m^2

Area in km^2 (m^2x1000) _____ km^2

Estimated Stream Depth _____ m

Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 3.5 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 80 % ☑ Run 20 %
☐ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 3 m^2

Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☑ Rooted emergent ☑ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation 15 %

WATER QUALITY

Temperature 19.3 °C

Specific Conductance 291

Dissolved Oxygen 103% / 7.27ppm

pH 8.2

Turbidity _____

WQ Instrument Used HACH-cond YSI DO; pHtestr 2

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME YB-Main	LOCATION 500'ds-McCormick Rd., W. of Lisbun (top of reach)
STATION # YB5 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN YB
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, MB	LOT NUMBER
FORM COMPLETED BY AG	DATE 8-7-03 TIME 12 AM (PM)
	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 85 % ☐ Snags ____ % ☑ Vegetated Banks 10 % ☐ Sand ____ % ☑ Submerged Macrophytes 5 % ☐ Other ( ) ____ %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** (17) (2) ☑ Cobble ☐ Snags ____ ☑ Vegetated Banks ☐ Sand ____ ☑ Submerged Macrophytes (1) ☐ Other ( ) ____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	1	(2)	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	0	1	(2)	3	4	Fish	0	1	(2)	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	0	(1)	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	0	(1)	2	3	4	Ephemeroptera	0	(3)	(2)	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	0	(1)	2	3	4	Trichoptera	0	1	(2)	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	(2)	3	4	Other	0	1	(2)	3	4
Hirudinea	0	(1)	2	3	4	Lepidoptera	0	(1)	2	3	4						
Oligochaeta	0	1	(2)	3	4	Sialidae	(0)	1	2	3	4						
Isopoda	0	(1)	(3)	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	(2)	3	4	Tipulidae	0	(1)	2	3	4						
Decapoda	0	1	2	(3)	4	Empididae	(0)	1	2	3	4						
Gastropoda	0	(1)	(3)	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	0	1	(2)	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Yellow Breech-M	LOCATION 150' upst. Creek Rd./Rt. 74
STATION # YB6 RIVERMILE	STREAM CLASS II
LAT LONG	RIVER BASIN Yellow Breeches
STORET #	AGENCY HRG, GF
INVESTIGATORS HC, AG, BD	
FORM COMPLETED BY AG	DATE 8-21-03 TIME 9:30 (AM) PM
REASON FOR SURVEY Asst	

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
30% ☐	%cloud cover	☐ ___%
☐	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

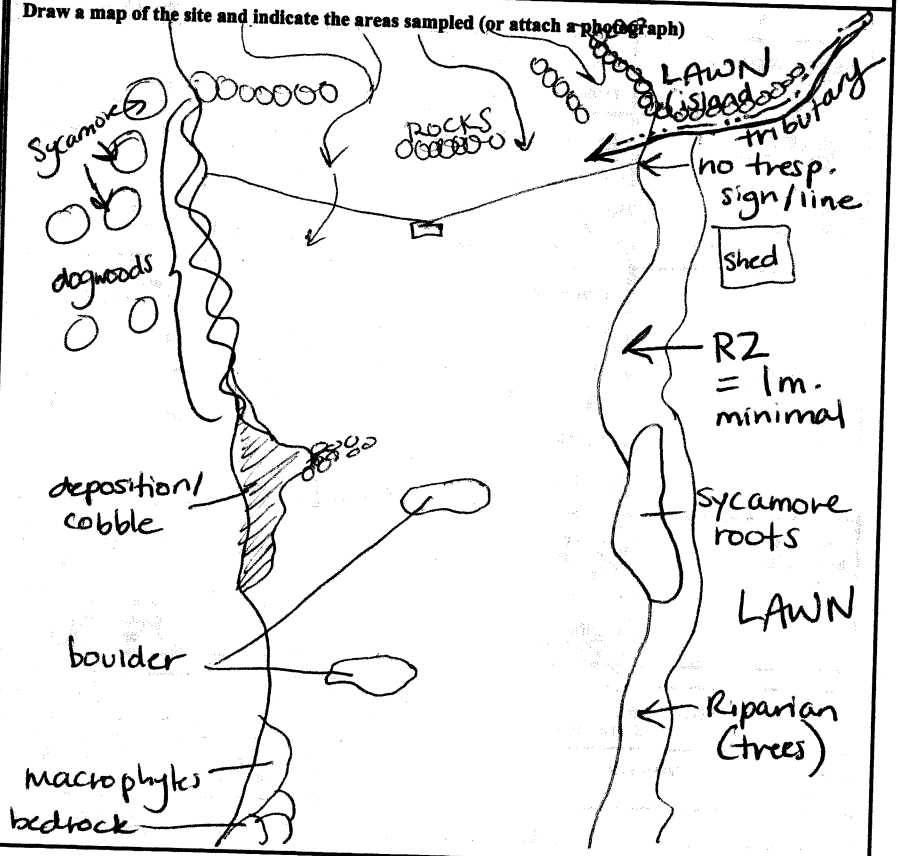
Air Temperature 75 °C

Other_____

SITE LOCATION/MAP

* no other readily avail; wadeable access point, Reach below trib...

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem ☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type ☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☑ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Sycamore, willow, Silver Maple

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 18 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth .25 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 1.25 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 80 % ☑ Run 20 %
☑ Pool _____ %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 1 m^2
Density of LWD _____ m^2/km^2 **(LWD/ reach area)**

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☑ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation 1 %

WATER QUALITY

Temperature 16.9 °C
Specific Conductance 258
Dissolved Oxygen 100.5 9.23 ppm
pH 8.4
Turbidity _____
WQ Instrument Used HACH COND. pHtestr2, YSI DO

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☑ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☑ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	—
Boulder	> 256 mm (10")	1			
Cobble	64-256 mm (2.5"-10")	97	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	2			
Sand	0.06-2mm (gritty)	—	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Yellow Breech M	LOCATION 150' upstr.	
STATION # YB6 RIVERMILE	STREAM CLASS II	
LAT LONG	RIVER BASIN Yellow Breeches	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-21-03 TIME 9:30 (AM) PM	REASON FOR SURVEY Asst

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 97 % ☐ Snags ____ % ☑ Vegetated Banks 1 % ☐ Sand ____ % ☑ Submerged Macrophytes 1 % ☑ Other (root wad) 1 %
SAMPLE COLLECTION (17)	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble ☐ Snags ☑ Vegetated Banks (1) ☐ Sand ☑ Submerged Macrophytes (1) ☑ Other (rootwad (1)
GENERAL COMMENTS	Killdeer on rocks

QUALITATIVE LISTING OF AQUATIC BIOTA
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	(0)	1	2	3	4	Slimes	(0)	1	2	3	4
Filamentous Algae	(0)	1	2	3	4	Macroinvertebrates	0	1	2	(3)	4
Macrophytes	0	(1)	2	3	4	Fish	(0)	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS
Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	(0)	1	2	3	4	Anisoptera	(0)	1	2	3	4	Chironomidae	(0)	1	2	3	4
Hydrozoa	(0)	1	2	3	4	Zygoptera	(0)	1	2	3	4	Ephemeroptera	(0)	1	2	3	4
Platyhelminthes	(0)	1	2	3	4	Hemiptera	(0)	1	2	3	4	Trichoptera	0	1	2	(3)	4
Turbellaria	(0)	1	2	(3)	4	Coleoptera	(0)	1	2	3	4	Other	0	1	2	3	4
Hirudinea	(0)	1	2	3	4	Lepidoptera	(0)	1	2	3	4	Plecoptera	0	1	2	(3)	4
Oligochaeta	0	1	2	(3)	4	Sialidae	(0)	1	(2)	3	4						
Isopoda	0	1	(2)	3	4	Corydalidae	(0)	1	2	3	4						
Amphipoda	0	1	(2)	3	4	Tipulidae	(0)	1	2	3	4						
Decapoda	(0)	1	2	3	4	Empididae	(0)	1	2	3	4						
Gastropoda	(0)	1	2	3	4	Simuliidae	(0)	1	2	3	4						
Bivalvia	0	(1)	2	3	4	Tabinidae	(0)	1	2	3	4						
						Culcidae	(0)	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION BS	
STATION # YB7 RIVERMILE	STREAM CLASS II	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-28-03 TIME 10 (AM) PM	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10 % ☐	%cloud cover	☐ ___ %
☐	clear/sunny	☐

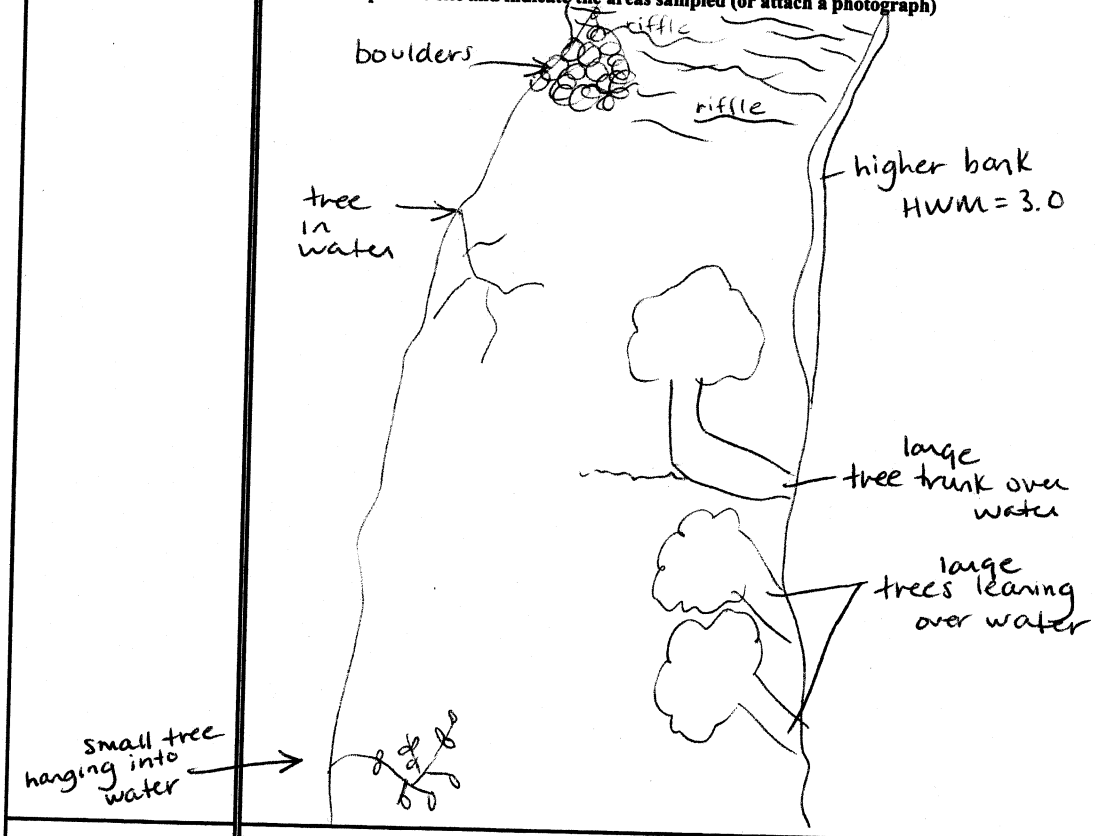
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 75 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Yellow Breeches	LOCATION BS	
STATION # YB7 RIVERMILE	STREAM CLASS II	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		
FORM COMPLETED BY AG	DATE 8-28-03 TIME 10 (AM) PM	REASON FOR SURVEY Ass't

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
10 % ☐	%cloud cover	☐ ___ %
☐	clear/sunny	☐

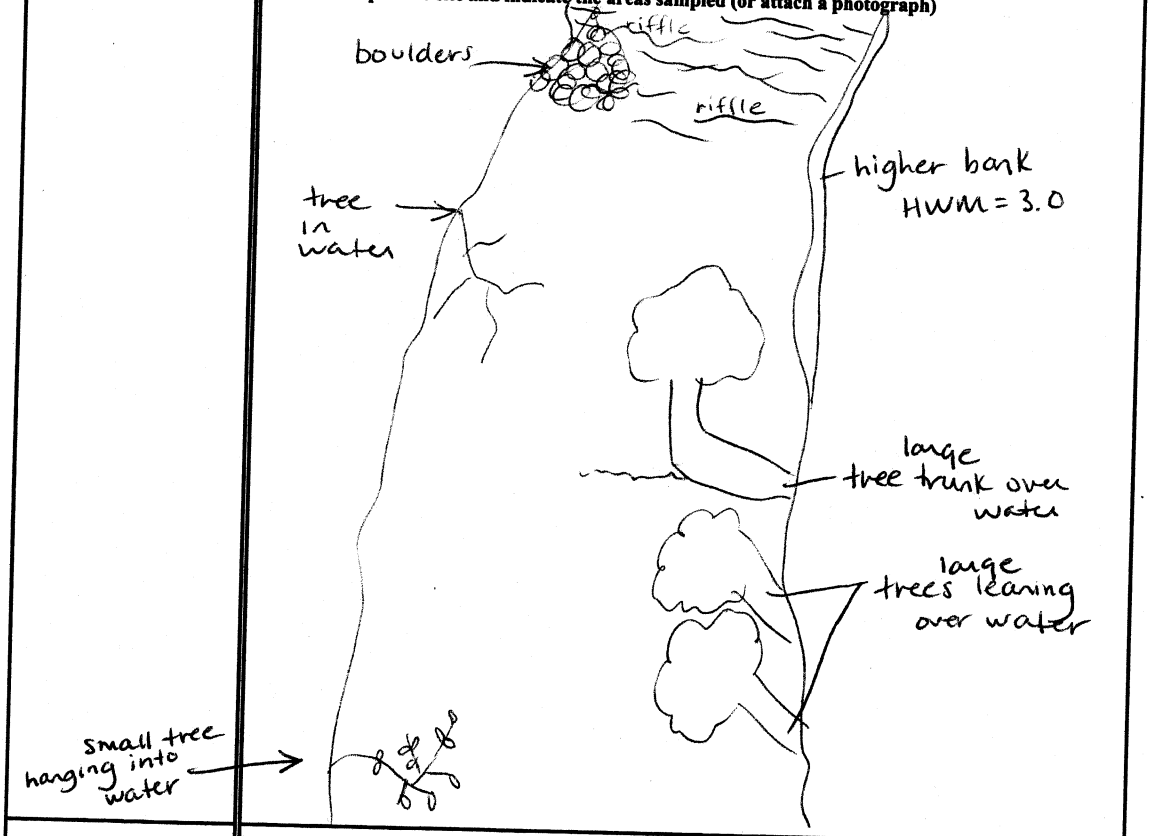
Has there been a heavy rain in the last 7 days? ☑ Yes ☐ No

Air Temperature 75 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)



STREAM CHARACTERIZATION

Stream Subsystem
☑ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☑ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☑ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☑ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☑ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☑ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☑ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present Sycamore, Norway Maple

INSTREAM FEATURES

Estimated Reach Length 100 m
Estimated Stream Width 14 m
Sampling Reach Area _____ m^2
Area in km^2 (m^2x1000) _____ km^2
Estimated Stream Depth 25 m
Surface Velocity (at thalweg) _____ m/sec

Canopy Cover
☐ Partly open ☑ Partly shaded ☐ Shaded

High Water Mark 3.0 m

Proportion of Reach Represented by Stream Morphology Types
☑ Riffle 5 % ☑ Run 75 %
☑ Pool 20 %

Channelized ☐ Yes ☑ No

Dam Present ☐ Yes ☑ No

LARGE WOODY DEBRIS

LWD 4 m^2
Density of LWD _____ m^2/km^2 (LWD/ reach area)

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation 0 %

WATER QUALITY

Temperature 18.4 °C
Specific Conductance 219
Dissolved Oxygen 98/9.7
pH 8
Turbidity _____
WQ Instrument Used HACH COND/YSI DO Oakton PH

Water Odors
☑ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☑ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☑ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☑ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☑ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☑ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock		—	Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	10			
Cobble	64-256 mm (2.5"-10")	30	Muck-Mud	black, very fine organic (FPOM)	—
Gravel	2-64 mm (0.1"-2.5")	50			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	—
Silt	0.004-0.06 mm	—			
Clay	< 0.004 mm (slick)	—			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME Yellow Breeches	LOCATION BS	
STATION # YB7 RIVERMILE	STREAM CLASS II	
LAT LONG	RIVER BASIN YB	
STORET #	AGENCY HRG, GF	
INVESTIGATORS HC, AG, BD		LOT NUMBER
FORM COMPLETED BY AG	DATE 8-28-03 TIME 10 (AM) PM	REASON FOR SURVEY Ass't

HABITAT TYPES	**Indicate the percentage of each habitat type present** ☑ Cobble 75 % ☐ Snags ____ % ☐ Vegetated Banks ____ % ☑ Sand 10 % ☐ Submerged Macrophytes ____ % ☑ Other (root wad) 15 %
SAMPLE COLLECTION	**Gear used** ☑ D-frame ☐ kick-net ☐ Other ____ **How were the samples collected?** ☑ wading ☐ from bank ☐ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ☑ Cobble IIII IIII IIII ☐ Snags ____ ☐ Vegetated Banks ____ ☑ Sand 11 ☐ Submerged Macrophytes ____ ☑ Other (root wad) III
GENERAL COMMENTS	fish abundant - small sized bass in net

QUALITATIVE LISTING OF AQUATIC BIOTA

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

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4	Plecoptera	0	1	2	3	4
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

APPENDIX H

BEST MANAGEMENT PRACTICES

(SELECTED BEST MANAGEMENT PRACTICES PROVIDED COURTESY OF CENTER OF WATERSHED PROTECTION, 2004)

C-1	Stream Cleanups	
	STREAM CLEANUPS	

Description

Stream cleanups are a simple practice to enhance the appearance of a stream corridor by removing unsightly trash, litter and debris. In some cases, mechanical equipment is needed to remove large quantities of rubble, appliance and trash that have been illegally dumped in the stream or its corridor. Cleanups make the stream a more attractive place for anglers, canoers, hikers and landowners. In some cases, stream cleanups can prevent pollutants from being released, if drums, tires, appliances, medical waste or other potentially hazardous materials are present (Figure 1).

Typically, stream cleanups are accomplished using volunteers from the community or schools that are led by a local watershed group and/or supported by municipal agencies. Stream cleanups have great value in educating volunteers and increasing community awareness about watershed restoration, and are also an effective recruiting tool for local watershed groups. Repeated stream cleanups can often make a real difference in the appearance of impacted and non-supporting streams, but may not always be able to keep up with the severe trash and debris loads experienced in urban drainage streams. In addition, the volume of illegal dumping in the corridor of urban drainage subwatersheds tends to be much higher.

Feasibility

The Trash and Debris (TR) form of the Unified Stream Assessment is an excellent tool to use when choosing potential cleanup sites in a subwatershed, as it pinpoints locations of greatest trash accumulation along the entire stream corridor, and evaluates accessibility and other factors (Manual 10). Several feasibility factors should be considered when scouting potential stream cleanup sites. The first factor is access, which usually means finding a bridge, road crossing or easement that makes it possible to reach the stream. Next, safety should be considered. Stream corridors with steep slopes, steep eroding banks, or overgrown thorny vegetation can all pose access problems. Third, an adjacent trash stockpiling area is needed to temporarily store trash and debris collected until it can be removed a few days later. This usually means finding a nearby parking lot or roadside area accessible by a dump or garbage truck. The fourth factor is the water quality of the stream itself. The main concern here is skin contact with bacteria and pathogens. It can generally be assumed that if the cleanup site is located in a non-supporting or urban drainage subwatershed, dry weather stream flows may contain bacteria. In these situations, plastic gloves, waterproof waders and other protective equipment should always be worn (Figure 2). Stream cleanups can be done in all kinds of urban subwatersheds, but are most effective in impacted and non-supporting streams.



Figure 1: Example of potentially hazardous materials and conditions in an urban stream



Figure 2: Stream cleanup effort in an urban Maryland stream

Implementation

Implementing a cleanup entails three steps: planning and organizing, conducting the cleanup, and performing follow-up activities.

Planning a Cleanup - Planning and organizing are the most time-consuming component of a successful stream cleanups, and several details should be considered for a smooth effort, including:

- Selecting an appropriate site(s)
- Choosing the cleanup date, and a rain date
- Assessing safety needs at the site
- Recruiting volunteers and organizing teams
- Acquiring landowner permission
- Arranging for trash hauling
- Buying supplies
- Publicizing the cleanup event

Choosing and publicizing the stream cleanup date should be done months in advance to provide ample time for volunteers and workers to include it in their busy schedules. Stream cleanups should be scheduled to avoid poor weather conditions, such as extreme heat or cold, rainy periods that might cause flooding, and snow. Good scheduling can reduce the risk of a low turnout or cancellation of the cleanup due to poor weather. Typically late spring or early fall is the best season to schedule stream cleanups in most regions of the country.

Safety is an essential responsibility for the cleanup organizer, and potential risks should be thoroughly evaluated. Since volunteers will be handling trash and debris and be in and around water, they may be susceptible to injury. The following safety factors should be evaluated:

Clothing – Advise volunteers to wear thick pants, sturdy shoes/boots, and gloves

First Aid Kit – A good first aid kit should be provided, along with someone who has training in its use. The kit should contain items to address common outdoor injuries (e.g., bee stings, cuts, poison ivy, and ankle sprains)

Stockpile Sites – These sites should be marked with orange warning cones or flags to alert pedestrians and traffic

Daily weather reports - Forecasts should be consulted to be aware of potentially threatening weather events, such as thunderstorms

Safety plan – This plan should show the nearest phone and list important emergency phone numbers and the closest medical center

Water – Stream cleanups can be strenuous, so make sure ample water is available to volunteers to prevent dehydration

Liability Waiver – Make sure volunteers sign liability forms and provide medical information about allergies and medications

Cleanup organizers should organize recruits into teams of six to eight to work in specific areas of the stream. Each team should be assigned a team leader that has scouted the stream reach and knows where debris should be stockpiled.

Parents or guardians must give written permission if minors wish to participate in the stream cleanup. This should include an emergency phone contact and permission to administer medical care. Organizers should consider requiring a minimum age for volunteers.

Arrangements for removing trash and debris should be made in advance with the local public works department. It is also helpful to coordinate with local recycling centers on how to recycle materials collected during the cleanup (e.g., plastics, aluminum, glass).

The length of the stream cleanup determines how many supplies are needed. For example, a small project may only require a borrowed truck, while a larger project may require use of a large dump truck. Typical supplies needed for a stream cleanup include: trash bags, waders, plastic gloves, refreshments, shovels, wheelbarrows, t-shirts, first aid kits, and other equipment (Kumble and Bernstein, 1991). For larger projects, the cost of trash removal and hauling debris should be taken into consideration.

Organizers should notify local newspapers, and radio and television stations about the cleanup, with an emphasis on progress made, the watershed restoration effort, and recognition of volunteers.

The Cleanup - Cleanups are typically done in a single day. All trash and debris collected during the cleanup should be organized into piles of recyclables (e.g., plastic, glass, aluminum, etc.) and non-recyclable garbage. Municipal recycling and trash removal agencies should coordinate trash hauling. It is helpful to track the amount and type of garbage collected during the cleanup. Also, try to plan some kind of stream education event to educate volunteers on the larger watershed restoration effort. Before and after photographs help document how much was accomplished (Figure 3). Finally, thank all who participated in the cleanup effort or contributed in some way to the project.

After the cleanup, the site should be monitored to determine the source of the trash, and efforts to continue trash pick-up should be made. Summaries of the type and volume of trash collected should be reported to the press and local agencies.



Figure 3: Trash removed during a stream cleanup

Costs - The overall cost of a stream cleanup is highly dependent on the amount of donated supplies and services. Trash and debris hauling and landfill disposal fees can be significant, although most municipal agencies are usually happy to provide them for free. Donation of services, corporate sponsors, waiving of fees, and the use of publicly-owned equipment can reduce cleanup costs. Most cleanups use volunteer labor, but organizers must supply equipment, such as hand tools, waders and safety equipment (e.g., gloves, goggles, etc.). Efforts should be made to obtain these materials as donations or at a reduced cost. Additional costs include volunteer appreciation materials, disposable cameras, film and developing, refreshments for volunteers, promotional materials, printing costs, and educational materials.

Further Resources

Stream cleanup guidance from U.S. Environmental Protection Agency
http://www.epa.gov/adopt/patch/html/streambeach.html

Water Action Volunteers. *Stream and River Cleanup*. http://clean-water.uwex.edu/wav/river/cleanup.pdf

National River Cleanup
http://www.nationarivercleanup.com

C-2	Stream Cleanups STREAM ADOPTION	

Description

A stream adoption program encourages individual citizens to become involved in the assessment, monitoring and stewardship for specific urban stream reaches. Stream adoption is normally organized as a volunteer program, in which participants "adopt" an urban stream segment to routinely clean up trash, perform monitoring, report water quality violations and implement smaller stream repair and stewardship projects (Figure 1). Volunteers become the eyes and ears for the stream and act as the primary caretaker of an individual stream segment within a subwatershed. The goal is to walk and assess the stream segment during every season of the year.

Stream adoption is best done in impacted and non-supporting watersheds. The extensive enclosure and interruption that occurs in urban drainage subwatersheds makes them very difficult to adopt. Stream adopters play a very important role in reporting problems in the subwatersheds, including dumping, sanitary sewer overflows, fish kills, erosion and sediment control violations, spills, and illegal discharges. In addition, they can play a valuable role in providing direct retail homeowner education.

Feasibility

Stream adoption programs can be difficult to implement in urban watersheds if access is poor to the stream network. Access may be restricted by fences, commercial and industrial uses, overgrown vegetation, or because streams are enclosed or culverted. Urban stream adoption has unique cleanup and safety issues and is typically more complex compared to rural streams.



Figure 1: Advertising of a local adopt-a-stream program

Implementation

Implementing a stream adoption program involves many tasks to recruit, train and retain a large number of volunteers across a subwatershed. These tasks include identifying viable stream reaches to adopt, recruiting and training volunteers, and providing incentives for those volunteers to continue their stewardship activities.

Watershed Delineation and Stream Selection – Watershed delineation is used to find stream reaches that are practical for volunteers to adopt and manage. This is usually done after the stream network in a subwatershed has been systematically walked using the Unified Stream Assessment (USA) technique (Manual 10). Generally, all "walkable" streams in a subwatershed are open for adoption, but these should be divided into smaller, more manageable units for actual adoption. According to Zielinski (2004), "adopted" reaches should meet the following criteria:

- Be about 1,000 to 2,000 feet long
- Have at least one easy access point to the stream from a road or open area
- Be located between major road crossings or major land use changes (include culvert with downstream section)
- Major confluences should be used as breaks between reaches
- Have public access along at least one side of the floodplain

Once streams reaches are identified, it is helpful to give each one a unique subwatershed address. Using a simple stream address system allows organizers to create less cluttered maps and reduces potential confusion among volunteers.

Once all adoptable reaches have been identified, a map of the stream reach should be generated, depicting watershed boundaries, roads, structures, streams, parks, neighborhoods, landmarks and adoption sections. This map can be printed in brochure format and distributed throughout the watershed (map on one side, program details on the other). The watershed address should also be posted on the watershed organization's website. Volunteers can then choose which reaches they would like to adopt by looking at the maps.

Designing the Program and Recruiting Volunteers – Zielinski (2004) interviewed adopt-a-stream programs around the country and presents some tips to design effective programs in Table 1. The critical element of any program is to recruit, train and retain volunteers. While individuals choose to volunteer for many reasons, it seems that satisfaction goes hand-in-hand with recognition as the motivation to practice stewardship. Incentives are benefits that entice individuals to participate in an activity and may include, but are not limited to:

- Improve the quality of life in the community
- Have fun
- Take the first steps of environmental activism
- Acquire new skills
- Fulfill the community service requirements for a club, school, church
- Make new friends and network
- Contribute to a cause that is important to them

Table 1: Tips on Developing an Effective Stream Adoption Program (from Zielinski, 2004)

- Provide progressive levels of stream adoption to meet the different skills and interests of the volunteer pool. For example, one stream watch program has five different levels of adoption: s*tream cleaners* that monitor trash levels in the corridor, *stream walkers* that perform a visual survey of stream problems, *stream watchers* that regularly conduct the USA on each reach, *bug pickers* that collect aquatic insect data at fixed stations, and *snapshot samplers* that collect regular grab samples to characterize water quality.
- Educate potential volunteers about water quality issues to get them interested in volunteering.
- Recruit volunteers through newsletters, newspaper ads, websites, flyers, and word-of-mouth
- Make adoption fun, educational and family-oriented
- Continuously recruit and train new volunteers, and develop an updated contact database. Try to outreach to volunteers at least five times a year
- Conduct regular "hands on" training workshops for both new and existing volunteers
- Choose previously tested and standardized monitoring methods and develop quality control plans
- Assign some local technical staff to support field activities and be liaison to the volunteers
- Continuously monitor volunteer satisfaction and modify program to maintain it at a high level
- Provide direct and timely response when volunteers discover water quality problems
- Work with volunteers to implement small-scale stream repair projects within adopted stream segments
- Address potential liability issues with standard waiver forms and safety training
- Use a newsletter or website to regularly communicate with volunteers and get data out to the public

Since many other volunteer opportunities exist, and residents have many other competing demands on their time, it is important to recognize the meaningful contribution that volunteers make in the community. Many low-cost options to encourage and recognize volunteers include:

- A recognition event: dinner, lunch, or other gathering
- Awards
- Certificates
- Drawings for prizes
- Gift Certificates to restaurants
- Gifts of photos of the watershed
- Most hours of service
- Number of years of service
- Outstanding service
- Recognition at regularly scheduled events
- Thank you letters and other acknowledgements
- T-shirts
- Volunteer of the month/year

The selection of incentives and recognition should reflect the nature of the expected volunteers or organizations. For example, volunteer groups composed of college students will be motivated by different incentives and benefits than one comprised mostly of elderly or adolescent volunteers.

Monitoring the Adopted Stream - Stream adoption programs can collect volunteer monitoring data. Monitoring may include water quality testing, habitat and aquatic insect sampling, pH, outfall testing, and physical stream assessments (Figure 2). The monitoring frequency for stream assessments can range from one to five times per year, depending on the type of assessment. This data should be incorporated into a database so that trends in the stream can be tracked. This information helps the stream managers and volunteers better understand the state of the streams and subwatershed.

Reporting Water Quality Violations – A major role of a stream adopter is to act as the eyes and ears or the stream and report problems. The stream adopter should be trained to identify, document, and quickly report any of the following: dumping, fish kills, erosion and sediment control violations, suspicious outfalls, sanitary sewer overflows, buffer encroachment, illicit discharges, or other water quality violations.

Other Roles – Stream adopters can play many roles in other stewardship activities. They can monitor trash levels along the stream and its corridor and arrange regular stream cleanups (Profile Sheet C-1). In addition, they can be the "retail" watershed education distributor in the subwatershed to civic groups, garden clubs, and neighborhood associations.

Cost – The costs to organize and implement a stream adoption program is typically moderate, depending on whether or not paid staff are needed to administer the program. According to Zielinski (2004), the annual cost to adopt a mile of stream ranges from $200 to $1,000. If paid staff are needed, annual costs can run from $5,000 to $10,000 per subwatershed, not including plans to secure sponsors, assemble outreach materials, or acquire monitoring and cleanup equipment and database systems. It is important to note that much of the monitoring and cleanup equipment can be donated by local businesses and institutions.



Figure 2: Aquatic insect sampling

Further Resources

Many states, communities or watershed organizations have developed stream adoption or citizen monitoring program to involve citizens in stream assessment. The goals and methods of adoption programs can differ considerably (Zielinski, 2004). The following list of resources is not meant to be exhaustive, but provides good examples of national organizations and regional programs that may be helpful.

Adopt-a-Stream http://www.adopt-a-stream.org, including a Teachers guide: http://www.adopt-a-stream.org/about_the_teachers_guides.html

Izaak Walton League http://www.iwla.org/

Streamkeepers
http://www.streamkeeper.org/tools

Assabet River Stream Watch Program (MA)
http://assabetriver.org/streamwatch/

Delaware Stream Watch
http://www.delawarenaturesociety.org/streamwatch.htm

Huron River Watershed Council Adopt-a-Stream (MI)
http://comnet.org/local/orgs/hrwc/adopt/adopt.htm

Maryland Stream Waders
http://www.dnr.state.md.us/streams/mbss/waders2.html
This also has excellent volunteer stream monitoring manual:
http://dnrweb.dnr.state.md.us/download/bays/streams/2002waders.pdf

North Carolina Stream Watch
http://www.ee.enr/state.nc.us/

Adopt-a-Stream Programs
http://www.fws.gov/r5cneafp/adopt2.htm
(Atlantic)

http://www.wdfw.wa.gov/outreach/education/salclass.htm (Pacific)

Restoration BMPs

BMP 6.17: Riparian Buffer Restoration



A riparian forest buffer is a permanent area of trees and shrubs located adjacent to streams, lakes, ponds, and wetlands. Riparian forests are the most beneficial type of buffer for they provide ecological and water quality benefits. Restoration of this ecologically sensitive habitat is a responsive action from past activities that may have eliminated any vegetation.

Key Design Elements

- Reestablish buffer perennial, intermittent, and ephemeral streams
- Plant native, diverse tree and shrub vegetation
- Buffer width is dependant on project preferred function (water quality, habitat creation, etc.)
- **Minimum** recommended buffer width is 35' from top of stream bank, with 100' preferred.
- Create a short-term maintenance and long-term maintenance plan
- Mature forest as a vegetative target
- Clear, well-marked boundary

Potential Applications

Residential: YES
Commercial: YES
Ultra Urban: YES
Industrial: YES
Retrofit: YES
Highway/Road: Limited

Stormwater Functions

Volume Reduction: Medium
Recharge: Medium
Peak Rate Control: Low/Med.
Water Quality: Med./High

Pollutant Removal

TSS: 65%
TP: 50%
NO_3: 50%

Description

The USDA Forest Service estimates that over one-third of the rivers and streams in Pennsylvania have had their riparian areas degraded or altered. This fact is sobering when one considers the important stormwater functions that riparian buffer provides. The non-structural BMP, Riparian Forest Buffer Protection, addresses the importance of protecting the three-zone system of existing riparian buffers.

The values of riparian buffers – economic, environmental, recreational, aesthetic, etc. – are well documented in scientific literature and numerous reports and thus will not be restated here in this BMP sheet. Rather, this BMP serves to provide a starting point for the designer that seeks to restore the riparian buffer. Important reports are cited consistently throughout this section and should be mentioned upfront as sources for additional information to a designer seeking to restore a riparian buffer. The first, the *Chesapeake Bay Riparian Handbook: a Guide for Establishing and Maintaining Riparian Forest Buffers* was prepared by the US Department of Agriculture (USDA) Forest Service for the Chesapeake Bay Program in 1997. The second, the *Pennsylvania Stream ReLeaf Forest Buffer Toolkit* was developed by the Alliance for the Chesapeake Bay specifically for the Pennsylvania streams in 1998. A third and often-referenced report, is the *Riparian Forest Buffers* series written by Robert Tjaden for the Maryland Cooperative Extension Service in 1998.

Riparian buffers are scientifically proven to provide a number of economic and environmental values. Buffers are characterized by high species density, high species diversity, and high bio-productivity as a transition between aquatic and upland environments. Project designer should take into account the benefits or services provided by the buffer and apply these to their project goals. Priorities for riparian buffer use must be established early on in the planning stages. Some important considerations when establishing priorities are:

- **Habitat** – Restoring a buffer for habitat enhancement will require a different restoration strategy than for restoring a buffer for increased water quality.
- **Stream Size** – A majority of Pennsylvania's stream miles is comprised of small streams (first, second, and third order), which may be priority areas to reduce nutrients. Establishing riparian buffers along these headwater streams will reduce the high nutrient loads relative to flow volumes typical of small streams.
- **Continuous Buffers** - Establishing continuous riparian forest buffers in the landscape should be given a higher priority than establishing larger but fragmented buffers. Continuous buffers provide better stream shading and water quality protection, as well as corridors for the movement of wildlife.
- **Degree of Degradation** – Urban streams are usually buried or piped. Streams in areas without forests, such as pastures, may benefit the most from buffer restoration, as sources of headwater streams. Highly urbanized/altered streams may not be able to provide high levels of pollution control.
- **Loading Rates** - The removal of pollutants may be highest where nutrient and sediment loading are the highest.
- **Land Use** – Adjacent land uses will influence Buffer Width and Vegetation types used to establish a riparian buffer. While the three-zone riparian-forested buffers described earlier are the ideal, they may not always be feasible to establish, especially in urban situations.

Preparation of a *Riparian Buffer Restoration Plan* is critical to ensuring long-term success of the project and should be completed before any planting is to occur. It is essential that site conditions

are well understood, objectives of the landowner are considered, and the appropriate plants chosen for the site, tasks that are completed in the planning stages. Below is a summary of the nine steps that PADEP/PADCNR advocates groups/designers/engineers/volunteers/etc., undertake during the planning stages of a buffer restoration project.

1. Obtain Landowner Permission and Support

Landowner commitment is essential for the success of the project. Landowner must be aware of all maintenance activities that will occur once buffer is planted.

2. Make Sure Site is Suitable for Restoration

If streambanks are extensively eroded, consider alternative location. Rapidly eroding streambanks may undermine seedlings. Streambank restoration may need to occur prior to riparian buffer restoration. Obtain professional help in evaluating need for streambank restoration.

3. Analyze Site's Physical Conditions

The most important physical condition of the site is the soil, which will control plant selection. Evaluate the soil using the County soil survey book to determine important soil characteristics such as flooding potential, seasonal high water table, topography, soil pH, soil moisture, etc. Also, a simple field test can suffice, with direct observation of soil conditions.

4. Analyze Site's Vegetative Features

Existing vegetation present at the restoration site should be examined to determine the strategy for buffer establishment. Strategies will differ whether pre-restoration conditions are pasture, overgrown abandoned field, mid-succession forest, or any other setting.

- *Identify Desirable Species*: Native tree and shrub species that thrive in riparian habitats in Pennsylvania should be used. These species should be identified in the restoration site and protected for their seed bank potential. Several native vines and shrubs (blackberry, greenbriar, poison ivy, Virginia creeper, and spicebush) can provide an effective ground cover during establishment of the buffer, though should be selectively controlled for herbaceous competition.
- *Identify Undesirable Species:* Consider utilizing undesirable species such as the black locust for their shade function during buffer establishment. Consider controlling invasive plants prior to buffer planting.
- *Identify Sensitive Species*: Since riparian zones are rich in wildlife habitat and wetland plant species to be aware of any rare, threatened or endangered plant (or animal) species.

5. Draw a Map of the Site (Data collection)

Prepare a sketch of the site that denotes important existing features, including stream width, length, streambank condition, adjacent land uses and stream activities, desired width of buffer, discharge pipes, obstructions, etc.

6. Create a Design that Meets Multiple Objectives

Ideally, the three-zone system should be incorporated into the design, in a flexible manner to obtain water quality and landowner objectives.

- *Consider landowner objectives*: Consider the current use of the buffer by the landowner, especially if the buffer will be protected in perpetuity. Consider linking the buffer to an existing (or planned trail system).
- *Buffer width*: Riparian buffer areas do not have a fixed linear boundary, but vary in shape, width, and vegetative type and character. The function of the buffer (habitat, water quality, etc) is the overriding criterion in determining buffer width (Figure 1). Many factors including slope, soil type, adjacent land uses, floodplain, vegetative type, and water shed condition influence what can be planted. The most commonly approved minimum buffer widths for water quality and habitat maintenance are 35 – 100 feet. Buffers less than 35 feet do not protect aquatic resources long term.

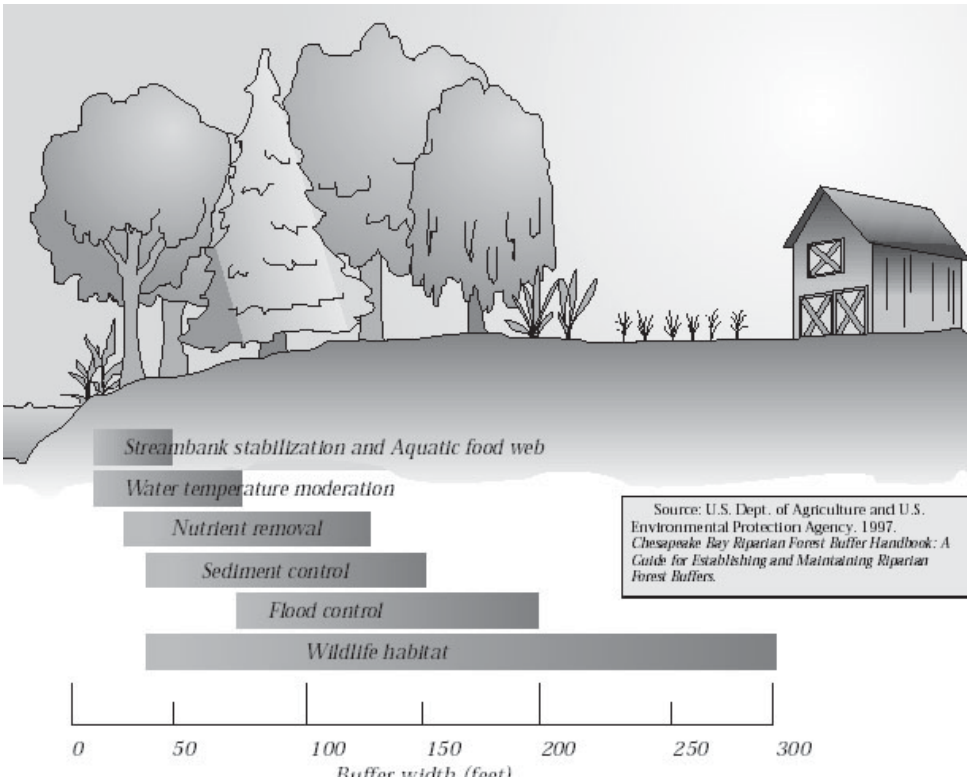


Figure 6.17-1. Range of minimum widths for meeting specific buffer objectives (Maryland Cooperative Extension, Fact Sheet 725)

- *Consider costs:* The planting design (density, type, mix, etc.) will ultimately be based on the financial constraints of the project. See discussion below for estimating direct costs for planting and maintenance.
- *Choose the appropriate plants:* This manual encourages the use of native plants in stormwater management facilities. Since they are best suited to our local climate, native species have distinct genetic advantages over non-native species. Ultimately using native plants translates into greater survivorship with less replacement and maintenance – a cost benefit to the landowner. Please refer to the plant list in Appendix B for a comprehensive list of native trees and shrubs available for stormwater management facility planting.

Plant Size: Choice of planting stock (seeds, container seedling, bare-root seedlings, plugs, etc.) is ultimately determined by funding resources. Larger material will generally cost more, though will generally establish more rapidly.

7. Draw a Planting Plan

Planting Density: Trees should be planted at a density sufficient to provide 320 trees per acres at maturity. To achieve this density, approximately 436 (10 x 10 feet spacing) to 681 (8 x 8 feet spacing) trees per acre should be planted initially. Some rules of thumb for tree spacing and density based on plant size at installation:

Seedlings	6-10 feet spacing (~700 seedlings / acre)
Bare Root Stock	14-16 feet spacing (~200 plants / acre)
Larger & Container	16 – 18 feet spacing (~150 plants/acre)

Formula for Estimating Number of Trees and Shrubs:
Plants = length x width of corridor (ft) / 50 square feet

This formula assumes each tree will occupy an average of 50 sq. ft., random placement of plants approximately 10 feet apart, and mortality rate of up to 40% that can be absorbed by the growing forest system.

Alternatively, Table 1 below can be utilized to estimate the number of trees per acre needed for various methods of spacing.

Table 6.17-1. Number of Trees per Acre by Various Methods of Spacing (USDA Forest Service)

Spacing (feet)	Trees (number)	Spacing (feet)	Trees (number)	Spacing (feet)	Trees (number)
2x2	10,890	7x9	691	12x15	242
3x3	4,840	7x10	622	12x18	202
4x4	2,722	7x12	519	12x20	182
4x5	2,178	7x15	415	12x25	145
4x6	1,815	8x8	681	13x13	258
4x7	1,556	8x9	605	13x15	223
4x8	1,361	8x10	544	13x20	168
4x9	1,210	8x12	454	13x25	134
4x10	1,089	8x15	363	14x14	222
5x5	1,742	8x25	218	14x15	207
5x6	1,452	9x9	538	14x20	156
5x7	1,245	9x10	484	14x25	124
5x8	1,089	9x12	403	15x15	194
5x9	968	9x15	323	15x20	145
5x10	871	10x10	436	15x25	116
6x6	1,210	10x12	363	16x16	170
6x7	1,037	10x15	290	16x20	136
6x8	908	10x18	242	16x25	109
6x9	807	11x11	360	18x18	134
6x10	726	11x12	330	18x20	121
6x12	605	11x15	264	18x25	97
6x15	484	11x20	198	20x20	109
7x7	889	11x25	158	20x25	87
7x8	778	12x12	302	25x25	70

Planting Layout: Given planting density and mix, drawing the planting plan is fairly straightforward. The plan can vary from a highly technical drawn to scale plan, or a simple line drawing of the site. Any plan must show the site with areas denoted for trees and shrub species with notes for plant spacing and buffer width.

8. Prepare Site Ahead of Time

   Existing site conditions will determine the degree of preparation needed prior to planting. Invasive infestation and vegetative competition are extremely variable, and therefore must be considered in the planning stages. Site preparation should begin in the fall prior to planting. Enlist professional to determine whether use of chemical controls are necessary to prepare site for planting. Release desired existing saplings from competition by undesired species with either herbicide application (consult a professional) or physical removal. If utilizing a highly designed planting layout, mark site ahead of time with flags, spray paint, or other markers so that the appropriate plant is put in the right place.

9. Determine Maintenance Needs

   An effective buffer restoration project should include management and maintenance guidelines, as well as distinctions of allowable and unallowable uses in the buffer. Buffer boundaries should be well defined with clear signs or markers. Weed control is essential for the survival and rapid growth of trees and shrubs, and can include any of the following:

   - Organic mulch
   - Weed control fabrics
   - Shallow cultivation
   - Pre-emergent herbicides
   - Mowing

Non-chemical weed control methods are preferred since chemicals can easily enter the water system. If possible, avoid working in the riparian area between April 15 and August 15, the mating and newborn period for local wildlife.

Variations

See Applications

Applications

- **Forested Landscape**



Figure 6.17-2 Recently planted riparian buffer in a forested landscape (image courtesy of Rutgers Cooperative Extension)

- **Agricultural Landscape**

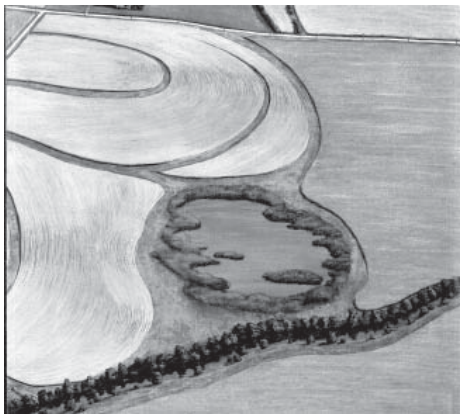


Figure 6.17-3 Riparian buffer shown in an agricultural setting (image courtesy of North Carolina Cooperative Extension)

- **Suburban / Developing Landscap**

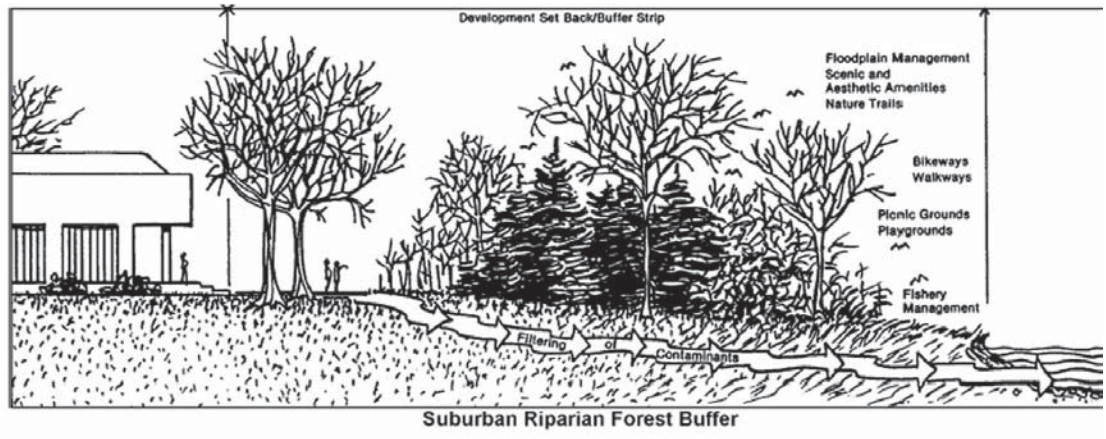


Figure 6.17-4 Cross section showing suburban riparian forest buffer and functions provided (image courtesy of Chesapeake Bay Program: Riparian Buffer Manual)



Figure 6.17-5 Recently planted riparian buffer in Hackettstown, New Jersey (image courtesy of Rutgers Cooperative Extension)

- **Urban Landscape**

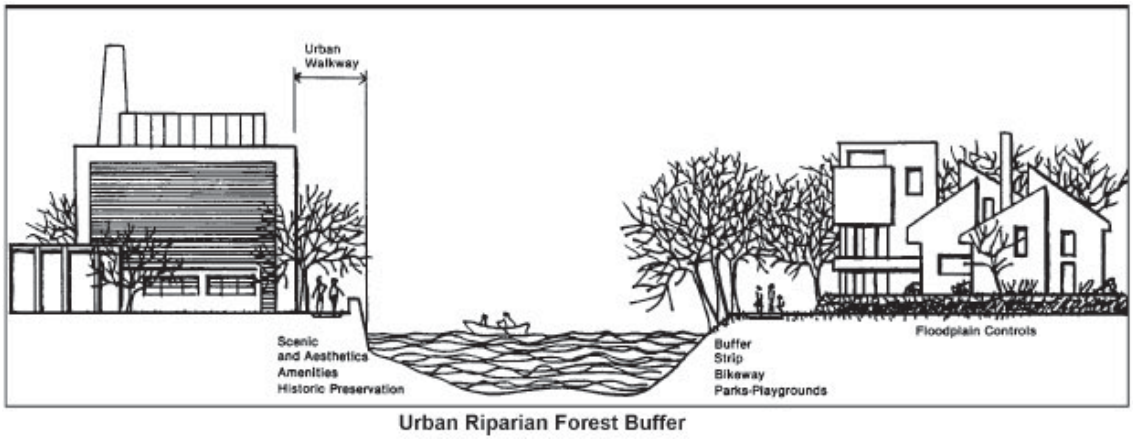


Figure 6.17-6 Urban riparian forest buffer (image courtesy of Chesapeake Bay Riparian Handbook)

Design Considerations

The considerations listed below should all be taken into account during the planning stage. There are many potential threats to the long-term viability of riparian plant establishment and with proper foresight, these problems can be eliminated or addressed.

1. Deer Control

    a. Look for signs of high deer densities, including an overgrazed understory with a browse line 5-6 feet above the ground.

2. Tree Shelters

    a. Recommended for riparian plantings where deer predation or human intrusion may be a problem.
    b. Plastic tubes that fit over newly planted trees that are extremely successful in protecting seedlings.
    c. Protect trees from accidental strikes from mowing or trimming
    d. Create favorable microclimate for seedlings
    e. Secure with wooden stake and place netting over top of tree tube
    f. Remove tree shelters 2 to 3 years after plants emerge

3. Stream Buffer Fencing

    a. Deer can jump fences up to 10 feet high, preferring to go under barriers.
    b. Farm animals cause greatest damage to stream banks – consider permanent fencing like high-tensile smooth wire fencing or barbed fencing.
    c. The least expensive is 8 foot plastic fencing, which are effective against deer and easily repaired.

4. Vegetation

    a. Consider using plants that are able to survive frequent or prolonged flooding conditions. Plant trees that can withstand high water table conditions. Figure 7 shows tree species that fit into the moisture conditions of a streamside area.
    b. Soil disturbance can allow for unanticipated infestation by invasive plants.

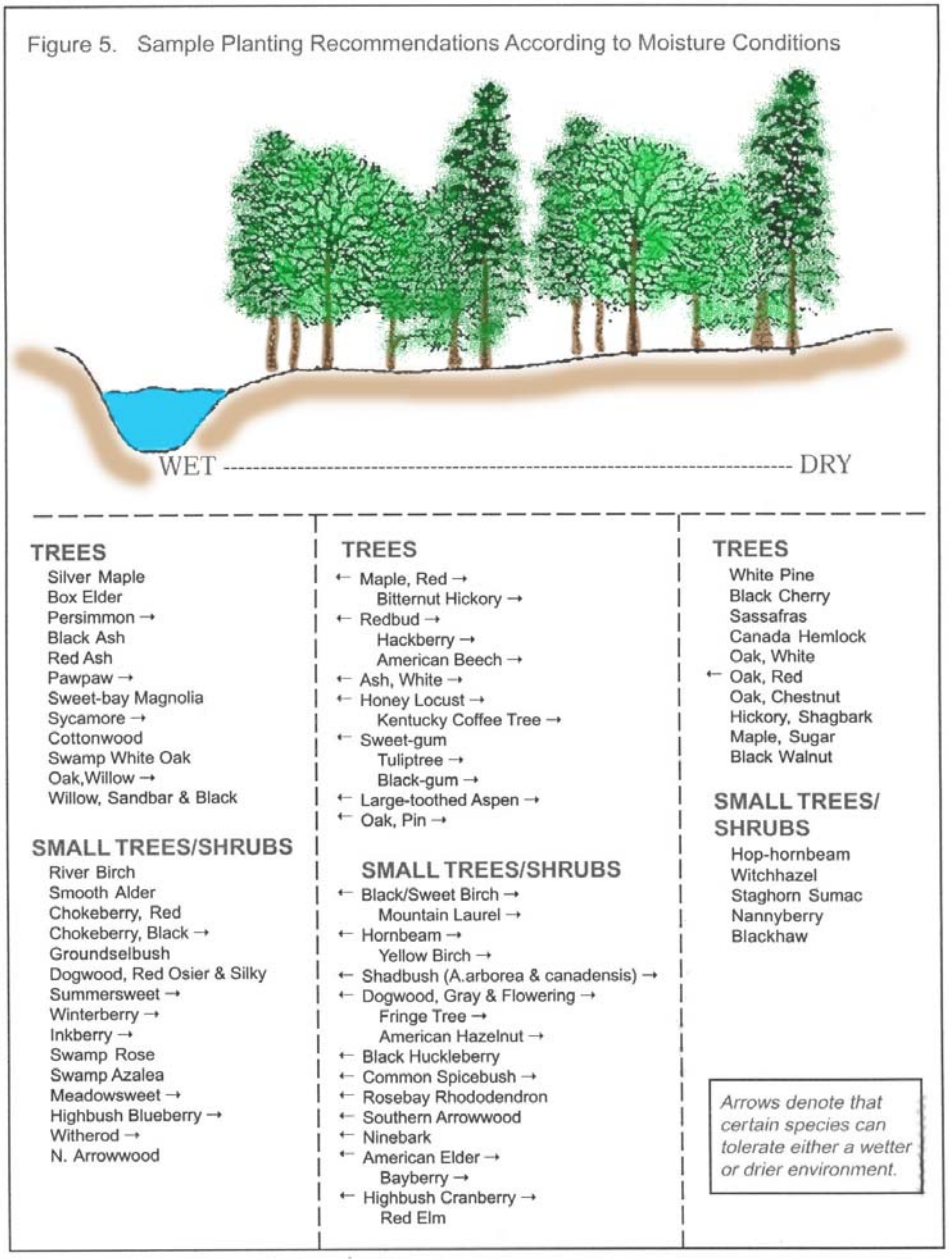


Figure 6.17-7 Sample planting recommendations according to moisture conditions (Source: PA Stream ReLeaf Forest Buffer Toolkit)

Construction Sequence

The PA Stream ReLeaf project provides a checklist that can substitute for a construction sequence for riparian buffer restoration. A slightly modified version follows:

1. SELECT SITE

    - Confirm site is suitable for restoration
    - Obtain landowner permission

2. ANALYSE SITE

    - Evaluate site's physical conditions (soil attributes, geology, terrain)
    - Evaluate site's vegetative features (desirable and undesirable species, native species, sensitive habitats)
    - Sketch or map site feature

3. DESIGN BUFFER

    - Consider landowner objectives in creating buffer design
    - Determine desired functions of buffer in determining buffer width
    - Match plant species to site conditions (hardiness zone, moisture, soil pH)
    - Match plant Species to objectives of buffer functions (water quality, wildlife, recreation, etc.)
    - Match plant sizes to meet budget limitations
    - Develop sketch of planting plan

4. PREPARE SITE

    - Eliminate undesirable species ahead of planting date
    - Mark planting layout at the site
    - Purchase plants and planting materials (mulch, tree shelters)

5. SITE PLAN SHOULD INCLUDE:

    - Site map with marked planting zones
    - Plant species list
    - Planting directions (spacing, pattern of planting)
    - Equipment/tool list
    - Site preparation directions
    - Maintenance schedule

6. PLANTING DAY

    - Keep plants moist and shaded
    - Provide adequate number of tools
    - Document with photos of site during planting

7. SITE MAINTENANCE (additional information below)

    - Assign responsibilities watering, weeding, mowing, and maintenance
    - Monitor site regularly for growth and potential problems

Maintenance Issues

The riparian buffer is subject to many threats, including:

- Herbivory
- Invasion by exotic species
- Competition for nutrients by adjacent herbaceous vegetation
- Human disturbance

Proper awareness of these issues is critical to ensure the long-term effectiveness of a restored riparian buffer.

The most critical period during buffer establishment is maintenance of the newly planted trees during canopy closure, typically the first 3 to 5 years. Ongoing maintenance practices are necessary for both small seedlings and larger plant materials. Maintenance and monitoring plans should be prepared for the specific site and caretakers need to be advised of required duties during the regular maintenance period.

Maintenance measures that should be performed regularly:

Watering

- Plantings need deep regular watering during the first growing season, either natural watering via rainfall, or planned watering, via caretaker.
- Planting in the fall increases the likelihood of sufficient rain during planting establishment.

Mulching

- Mulch will assist in moisture retention in the root zone of plantings, moderate soil temperature, provide some weed suppression, and retard evaporation
- Use coarse, organic mulch that is slow to decompose in order minimize repeat application
- Apply 2-4 inch layer, leaving air space around tree trunk to prevent fungus growth.
- Use combination of woodchips, leaves, and twigs that are stockpiled for six months to a year.

Weed control

- Weed competition limits buffer growth and survival, therefore weeds should be controlled by either herbicides, mowing, or weed mats:

    Herbicides

    This is a short-term maintenance technique (2-3 years) that is generally considered less expensive and more flexible than mowing, and will result in a quicker establishment of the

buffer. Herbicide use is regulated by the PA Department of Agriculture. Proper care should be taken to ensure that proximity to water features is considered.

Mowing

Mowing controls the height of the existing grasses, yet increases nutrient uptake, therefore competition for nutrients will persist until the canopy closure shades out lower layers. A planting layout similar to a grid format will facilitate ease of mowing yet yield an unnaturally spaced community. Mowing may result in strikes on the trunk unless protective measures are utilized. Mowing should occur twice each growing season. Mower height should be set between 8 –12 inches.

Weed Mats

Weed mats are geo-textile fabrics that are used to suppress weed growth around newly planted vegetation by providing shade and preventing seed deposition. Weed mats are installed after planting, and should be removed once the trees have developed a canopy that will naturally shade out weeds.

Deer damage

- Deer will browse all vegetation within reach, generally between 5-6 feet above the ground
- Approaches to minimize damage include: 1) selecting plants that deer do not prefer (ex. Paper Birch, Beech, Ash, Common Elderberry) 2) homemade deer repellants 3) tree shelters

Tree shelters

- Repair broken stakes
- Tighten stake lines
- Straighten leaning tubes
- Clean debris from tube
- Remove netting as tree grows
- Remove when tree is approximately 2 inches wide

Invasive Plants

- Monitor restoration sight regularly for any signs of invasive plants.
- Appendix B contains common invasive plants found in Pennsylvania.
- Choice of control method is based on a variety of considerations, but falls into three general categories:
    - Mechanical
    - Mechanical with application of herbicide
    - Herbicide

Special Maintenance Considerations

Riparian buffer restoration sites should be monitored to maximize wildlife habitat and water quality benefits, and to discover emerging threats to the project. During the first four years, the new buffer should be monitored four times annually (February, May, August, and November are recommended) and inspected after any severe storm. Repairs should be made as soon as possible.

Depending on restoration site size, the buffer area should be sampled to approximate survival rate. Data derived should consider survival of the planted material and natural regeneration to determine if in-fill planting should occur to supplement plant density.

Survival rates of up to 70% area deemed to be successful. Calculate percent survival by the following equation:

(# of live plants / # of installed plants) 100 = % survival

Cost Issues

Establishment and maintenance costs should be considered up front in the riparian buffer plan design. Installing a forest riparian buffer involves site preparation, tree planting, second year reinforcement planting, and additional maintenance. Both the USDA Riparian Handbook and the PADEP/PADCNR Stream ReLeaf Forest Buffer Toolkit utilize the following basic outline for estimating costs for establishment and maintenance:

Costs may fluctuate based on numerous variables including whether or not volunteer labor is utilized, whether plantings and other supplies are donated or provided at a reduced cost.

Specifications

The USDA Forest Service developed a riparian forest buffer specification, which outlines three distinct zones and establishes the minimally acceptable requirements for reforestation by landowners.

Definition

An area of trees and other vegetation located in areas adjoining and upgradient from surface water bodies and designed to intercept surface runoff, wastewater, subsurface flow, and deeper groundwater flows from upland sources for the purpose of removing or buffering the effects of associated nutrients, sediment, organic matter, pesticides, or other pollutants prior to entry into surface waters and ground water recharge areas.

Scope

This specification establishes the minimally acceptable requirements for the reforestation of open lands, and renovation of existing forest to be managed as Riparian Forest Buffers for the purposes stated.

Purpose

To remove nutrients, sediment, animal-derived organic matter, and some pesticides from surface runoff, subsurface flow, and near root zone groundwater by deposition, absorption, adsorption, plant uptake, denitrification, and other processes, thereby reducing pollution and protecting surface water and groundwater quality.

Conditions Where Practice Applies

Subsurface nutrient buffering processes, such as denitrification, can take place in the soil wherever carbon energy, bacteria, oxygen, temperature, and soil moisture is adequate. Nutrient uptake by plants occurs where the water table is within the root zone. Surficial filtration occurs anywhere surface vegetation and forest litter are adequate.

The riparian forest buffer will be most effective when used as a component of a sound land management system including nutrient management and runoff, and sediment and erosion control

practices. Use of this practice without other nutrient and runoff, sediment and erosion control practices can result in adverse impacts on buffer vegetation and hydraulics including high maintenance costs, the need for periodic replanting, and the carrying of excess nutrients and sediment through the buffer by concentrated flows.

This practice applies on lands:

1. adjacent to permanent or intermittent streams which occur at the lower edge of upslope cropland, grassland or pasture;

2. at the margins of lakes or ponds which occur at the lower edge of upslope cropland, grassland or pasture;

3. at the margin of any intermittent or permanently flooded, environmentally sensitive, open water wetlands which occur at the lower edge of upslope cropland, grassland or pasture;

4. on karst formations at the margin of sinkholes and other small groundwater recharge areas occurring on cropland, grassland, or pasture.

Note: In high sediment production areas (8-20 in./100 yrs.), severe sheet, rill, and gully erosion must be brought under control on upslope areas for this practice to function correctly.

Riparian Buffer Installation Costs - Estimation per Acre

			Cost, ea.	Number	Cost, Total
Phase 1: Establishment					
Preparation					
	Light site preparation (mow, disking)		-	-	$ 12.00
Planting					
	Tree Seedlings (12" - 18" Hardwoods)		$ 1.15	430	$ 494.50
	Tree Shelters	(optional)	$ 5.00	430	$ 2,150.00
	Fencing (1 ac = 282 ft)	(optional)			$ 564.00
		Subtotal			**$ 3,220.50**
Phase 2: Maintenance					
Reinforcement Planting					
	Tree Seedlings in Year 2		$ 1.15	50	$ 57.50
	Herbicide Treatment	(optional)			$ 54.00
	Mowing	(optional)			$ 12.00
		Subtotal			**$ 123.50**
Total Costs, no options					**$ 564.00**
Total Costs, with options					**$ 3,344.00**

Design Criteria

Riparian Forest Buffers

Riparian forest buffers will consist of three distinct zones and be designed to filter surface runoff as sheet flow and downslope subsurface flow, which occurs as shallow groundwater. For the purposes

of these buffer strips, shallow groundwater is defined as: saturated conditions which occur near or within the root zone of trees, and other woody vegetation and at relatively shallow depths where bacteria, oxygen, and soil temperature contribute to denitrification. Streamside Forest Buffers will be designed to encourage sheet flow and infiltration and impede concentrated flow.

Zone 1

Location

Zone 1 will begin at the top of the streambank and occupy a strip of land with a fixed width of fifteen feet measured horizontally on a line perpendicular to the streambank.

Purpose

The purpose of Zone 1 is to create a stable ecosystem adjacent to the water's edge, provide soil/water contact area to facilitate nutrient buffering processes, provide shade to moderate and stabilize water temperature encouraging the production of beneficial algal forms, and to contribute necessary detritus and large woody debris to the stream ecosystem.

Requirements

Runoff and wastewater to be buffered or filtered by Zone 1 will be limited to sheet flow or subsurface flow only. Concentrated flows must be converted to sheet flow or subsurface flows prior to entering Zone 1. Outflow from subsurface drains must not be allowed to pass through the riparian forest in pipes or tile, thus circumventing the treatment processes. Subsurface drain outflow must be converted to sheet flow for treatment by the riparian forest buffer, or treated elsewhere in the system prior to entering the surface water.

Dominant vegetation will be composed of a variety of native riparian tree and shrub species and such plantings as necessary for streambank stabilization during the establishment period. A mix of species will provide the prolonged stable leaf fall and variety of leaves necessary to meet the energy and pupation needs of aquatic insects.

Large overmature trees are valued for their detritus and large woody debris. Zone 1 will be limited to bank stabilization and removal of potential problem vegetation. Occasional removal of extreme high value trees may be permitted where water quality values are not compromised. Logging and other overland equipment shall be excluded except for stream crossings and stabilization work.

Livestock will be excluded from Zone 1 except for designed stream crossings.

Zone 2

Location

Zone 2 will begin at the edge of Zone 1 and occupy an additional strip of land with a minimum width of 60 feet measured horizontally on a line perpendicular to the streambank. Total minimum width of Zones 1 & 2 is therefore 75 feet. Note that this is the minimum width of Zone 2 and that the width of Zone 2 may have to be increased as described in the section "Determining the Total Width of Buffer" to create a greater combined width for Zones 1 & 2.

Purpose

The purpose of Zone 2 is to provide necessary contact time and carbon energy source for buffering processes to take place, and to provide for long term sequestering of nutrients in the form of forest

trees. Outflow from subsurface drains must not be allowed to pass through the riparian forest in pipe or tile, thus circumventing the treatment processes. Subsurface drain outflow must be converted to sheet flow for treatment by the riparian forest buffer, or treated elsewhere in the system prior to entering the surface water.

Requirements
Runoff and wastewater to be buffered or filtered by Zone 2 will be limited to sheet flow or subsurface flow only. Concentrated flows must be converted to sheet flow or subsurface flows prior to entering Zone 2.

Predominant vegetation will be composed of riparian trees and shrubs suitable to the site, with emphasis on native species, and such plantings as necessary to stabilize soil during the establishment period. Nitrogen-fixing species should be discouraged where nitrogen removal or buffering is desired. Species suitability information should be developed in consultation with state and federal forestry agencies, Natural Resources Conservation Service, and USDI Fish and Wildlife Service.

Specifications should include periodic harvesting and timber stand improvement (TSI) to maintain vigorous growth and leaf litter replacement, and to remove nutrients and pollutants sequestered in the form of wood in tree boles and large branches. Management for wildlife habitat, aesthetics, and timber are not incompatible with riparian forest buffer objectives as long as shade levels and production of leaf litter, detritus, and large woody debris are maintained. Appropriate logging equipment recommendations shall be determined in consultation with the state and federal forestry agencies.

Livestock shall be excluded from Zone 2 except for necessary designed stream crossings.

Zone 3

Location
Zone 3 will begin at the outer edge of Zone 2 and have a minimum width of 20 feet. Additional width may be desirable to accommodate land-shaping and mowing machinery. Grazed or ungrazed grassland meeting the purpose and requirements stated below may serve as Zone 3.

Purpose
The purpose of Zone 3 is to provide sediment filtering, nutrient uptake, and the space necessary to convert concentrated flow to uniform, shallow, sheet flow through the use of techniques such as grading and shaping, and devices such as diversions, basins, and level lip spreaders.

Requirements
Vegetation will be composed of dense grasses and forbs for structure stabilization, sediment control, and nutrient uptake. Mowing and removal of clippings are necessary to recycle sequestered nutrients, promote vigorous sod, and control weed growth.

Vegetation must be maintained in a vigorous condition. The vegetative growth must be hayed, grazed, or otherwise removed from Zone 3. Maintaining vigorous growth of Zone 3 vegetation must take precedence and may not be consistent with wildlife needs.

Zone 3 may be used for controlled intensive grazing when conditions are such that earthen water control structures will not be damaged.

Zone 3 may require periodic reshaping of earth structures, removal or grading of accumulated sediment, and reestablishment of vegetation to maintain effectiveness of the riparian buffer.

Determining Need For Protection

Buffers should be used to protect any body of water which will not be:

- treated by routing through a natural or artificial wetland determined to be adequate treatment;

- treated by converting the flow to sheet flow and routing it through a forest buffer at a point lower in the watershed.

Determining Total Width of the Buffer

Note that while not specifically addressed, slope and soil permeability are components of the following buffer width criteria.

Each of the following criteria is based on methods developed, or used by persons conducting research on riparian forests.

Streamside Buffers

The minimum width of streamside buffer areas can be determined by any number of methods suitable to the geographic area.

1. Based on soil hydrologic groups as shown in the county soil survey report, the width of Zone 2 will be increased to occupy any soils designated as Hydrologic Group D and those soils of Hydrologic Group C which are subject to frequent flooding. If soils of Hydrologic Groups A or B occur adjacent to intermittent or perennial streams, the combined width of Zones 1 & 2 may be limited to the 75 foot minimum.

2. Based on area, the width of Zone 2 should be increased to provide a combined width of Zones 1 & 2 equal to one third of the slope distance from the streambank to the top of the pollutant source area. The effect is to create a buffer strip between field and stream which occupies approximately one third of the source area.

3. Based on the Land Capability Class of the buffer site as shown in the county soil survey, the width of Zone 2 should be increased to provide a combined width of Zones 1 & 2 as shown below.

Capability Class	Buffer Width
Cap. I, II e/s, V	75'
Cap. III e/s, IV e/s	100'
Cap. VI e/s, VII e/s	150'

Pond and Lake-Side Buffer Strips

The area of pond or lake-side buffer strips should be at least one-fifth the drainage area of the cropland and pastureland source area. The width of the buffer strip is determined by creating a

uniform width buffer of the required area between field and pond. Hydrologic Group and Capability Class methods of determining width remain the same as for streamside buffers. Minimum widths apply in all cases.

Environmentally Sensitive Wetlands

Some wetlands function as nutrient sinks. When they occur in fields or at field margins, they can be used for renovation of agricultural surface runoff and/or drainage. However, most wetlands adjoining open water are subject to periodic flushing of nutrient-laden sediments and, therefore, require riparian buffers to protect water quality.

Where open water wetlands are roughly ellipsoid in shape, they should receive the same protection as ponds.

Where open water wetlands exist in fields as seeps along hillslopes, buffers should consist of Zones 1, 2 & 3 on sides receiving runoff and Zones 1 & 3 on the remaining sides. Livestock must be excluded from Zones 1 & 2 at all times and controlled in Zone 3. Where Zones 1 & 3 only are used, livestock must be excluded from both zones at all times, but hay removal is desirable in Zone 3.

Vegetation Selection

Zone 1 & 2 vegetation will consist of native streamside tree species on soils of Hydrologic Groups D and C and native upland tree species on soils of Hydrologic Groups A and B.

Deciduous species are important in Zone 2 due to the production of carbon leachate from leaf litter which drives bacterial processes that remove nitrogen, as well as, the sequestering of nutrients in the growth processes. In warmer climates, evergreens are also important due to the potential for nutrient uptake during the winter months. In both cases, a variety of species is important to meet the habitat needs of insects important to the aquatic food chain.

Zone 3 vegetation should consist of perennial grasses and forbs.

Species recommendations for vegetated buffer areas depend on the geographic location of the buffer. Suggested species lists should be developed in collaboration with appropriate state and federal forestry agencies, the Natural Resources Conservation Service, and the USDI Fish and Wildlife Service. Species lists should include trees, shrubs, grasses, legumes, forbs, as well as site preparation techniques. Fertilizer and lime, helpful in establishing buffer vegetation, must be used with caution and are not recommended in Zone 1.

Maintenance Guidelines

General

Buffers must be inspected annually and immediately following severe storms for evidence of sediment deposit, and erosion, or concentrated flow channels. Prompt corrective action must be taken to stop erosion and restore sheet flow.

The following should be avoided within the buffer areas: excess use of fertilizers, pesticides, or other chemicals; vehicular traffic or excessive pedestrian traffic; and removal or disturbance of vegetation and litter inconsistent with erosion control and buffering objectives.

Zone 1 vegetation should remain undisturbed except for removal of individual trees of extremely high value or trees presenting unusual hazards such as potentially blocking culverts.

Zone 2 vegetation, undergrowth, forest floor, duff layer, and leaf litter shall remain undisturbed except for periodic cutting of trees to remove sequestered nutrients; to maintain an efficient filter by fostering vigorous growth; and for spot site preparation for regeneration purposes. Controlled burning for site preparation, consistent with good forest management practices, could also be used in Zone 2.

Zone 3 vegetation should be mowed and the clippings removed as necessary to remove sequestered nutrients and promote dense growth for optimum soil stabilization. Hay or pasture uses can be made compatible with the objectives of Zone 3.

Zone 3 vegetation should be inspected twice annually, and remedial measures taken as necessary to maintain vegetation density and remove problem sediment accumulations.

Stable Debris

As Zone 1 reaches 60 years of age, it will begin to produce large stable debris. Large debris, such as logs, create small dams which trap and hold detritus for processing by aquatic insects, thus adding energy to the stream ecosystem, strengthening the food chain, and improving aquatic habitat. Wherever possible, stable debris should be conserved.

Where debris dams must be removed, try to retain useful, stable portions which provide detritus storage.

Deposit removed material a sufficient distance from the stream so that it will not be refloated by high water.

Planning Considerations

1. Evaluate the type and quantity of potential pollutants that will be derived from the drainage area.

2. Select species adapted to the zones based on soil, site factors, and possible commercial goals such as timber and forage.

3. Plan to establish trees early in the dormant season for maximum viability.

4. Be aware of visual aspects and plan for wildlife habitat improvement if desired.

5. Consider provisions for mowing and removing vegetation from Zone 3. Controlled grazing may be satisfactory in Zone 3 when the filter area is dry and firm.

References

Natural Resources Conservation Service. 1997. USDA Natural Resources Conservation Practice Standard Riparian Forest Buffer. USDA Natural Resources Conservation Service.

Palone, R.S. and A.H. Todd (editors.) 1997. Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers. USDA Forest Service. NA-TP-02-97. Radnor, PA. http://www.chesapeakebay.net/pubs/subcommittee/nsc/forest or *order from: U.S. EPA Chesapeake Bay Program. 410 Severn Ave. Suite 109. Annapolis, MD. 1-800-968-7229*.

PA Department of Environmental Protection. 1998. *Pennsylvania Stream ReLeaf – Forest Buffer Toolkit*, http://www.dep.state.pa.us/dep/deputate/watermgt/WC/Subjects/StreamReLeaf/default.htm

Tjaden, R.L. and G.M. Weber. 1997. An Introduction to the Riparian Forest Buffer. Maryland Cooperative Extension Fact Sheet 724. College Park, MD. 2 pages. http://www.riparianbuffers.umd.edu/PDFs/FS724.pdf.

Tjaden, R.L. and G.M. Weber. 1997. Riparian Buffer Systems. Maryland Cooperative Extension Fact Sheet 733. College Park, MD. 2 pages. http://www.riparianbuffers.umd.edu/PDFs/FS733.pdf.

R-3	Stream Repair: Hard Bank Stabilization	
	BOULDER REVETMENT	

Description

A boulder revetment is a stream repair practice used to stabilize eroding streambanks. The revetment consists of a series of boulders placed in varying configurations along an eroding streambank to prevent erosion at the toe and in some cases, the middle and upper streambank zone (Figure 1).

Habitat Features Created – Boulder revetments have only a limited potential to enhance stream habitat. As most boulder revetments are made of irregularly shaped boulders, there is limited potential to create void space below the water surface. Boulder revetments have a more indirect role in habitat enhancement by reducing streambank erosion and subsequent sediment influx to the stream.

Feasibility

The toe of the streambank is the most erosion prone area of an urban stream, with the lowest third of the bank experiencing the greatest erosive forces. Erosion at the toe of the streambank often results in failure of the entire bank, which greatly increases sediment delivery to the stream. Boulder revetments help protect vulnerable streambanks in situations where softer bioengineering practices are not practical because of high flow velocities and shear stress.

Boulder revetments are an effective bank stabilization method when the cause of bank failure is toe erosion, bank scouring, or urban stream enlargement. Boulder revetments are not recommended for streambanks that are failing due to active downcutting (i.e., stream degradation). In these situations, revetments can be undermined as the streambed drops, unless the underlying grade control problem is addressed.

Boulder revetments often serve as the foundation for bank shaping and other bioengineering measures on the middle and upper banks (Figure 2). Boulder revetments can provide complete bank protection on smaller streams with bank heights of less than two feet.

Boulder revetments are a hard and non-deformable practice that prevents the normal processes of lateral channel adjustment and meander migration from occurring.



Figure 1: Boulder revetment along a meander in an urban park



Figure 2: Boulder revetment with willow plantings along an urban stream

As such, their use should be confined to the outer edges of the meander corridor to protect valley side slopes and terraces from further erosion. Deformable bioengineering practices are generally preferred within the meander corridor, where feasible (Figure 3). Over-reliance on boulder revetments in an urban stream may simply transfer future channel adjustments to upstream and downstream areas that are presently stable.

If the bank substrate is composed of sandy, silty or organic materials, scour may cause the revetment to settle or fail. Designers should ensure that the stream substrate can support the weight of the revetment and that the revetment extends below the potential depth of scour (Figure 4). Boulder revetments require good access for heavy equipment, and a staging area to stockpile boulders and equipment. Additional construction costs are incurred when the staging area is distant from the bank repair site, and smaller, lighter equipment is needed to access the site.

Implementation

Most boulder revetments consist of a course of footer boulders and one or two courses of revetment boulders. Figure 5 depicts double boulder and large boulder revetment configurations. Unlike imbricated rip-rap revetments, boulder revetments are not intended to be self-supporting walls, and may use smaller, less blocky boulders. The size of the boulders should be set so they will not move during flow velocities expected for the 50 or 100-year flood level. Boulder revetments are suitable on straight reaches or meander curves, as long as the potential depth of scour is accounted for. Use of native rock is recommended where practical. Bright white or off-colored stone may not be aesthetically pleasing in regions where native stone is dark.

Another design variation is the deformable toe revetment. This new streambank treatment is designed to be stable for the time it takes to establish streambank vegetation, after which the boulders are allowed to move. Deformable toe revetment designs use boulder sizes that will be stable for more frequent design floods (5- to 10-year return frequency) and wrap them in biodegradable erosion control fabrics. The fabric ensures that the boulders will be stable for the life of the fabrics (about 2 to 5 years), which gives enough time for vegetation to take hold. At that time, the streambank is allowed to laterally adjust and the meander can migrate.
At times, a single row of three to four foot diameter boulders may be used to create a revetment. When large boulders are used, it is important that they be entrenched deeply enough to prevent channel scour from dislodging them. Otherwise, the construction of a large boulder revetment is very similar to single and double boulder revetments, minus the footer stones.

Construction – A single boulder revetment is created by first excavating a trench below the invert of the stream and extending it along the toe of the eroding streambank. Filter cloth is

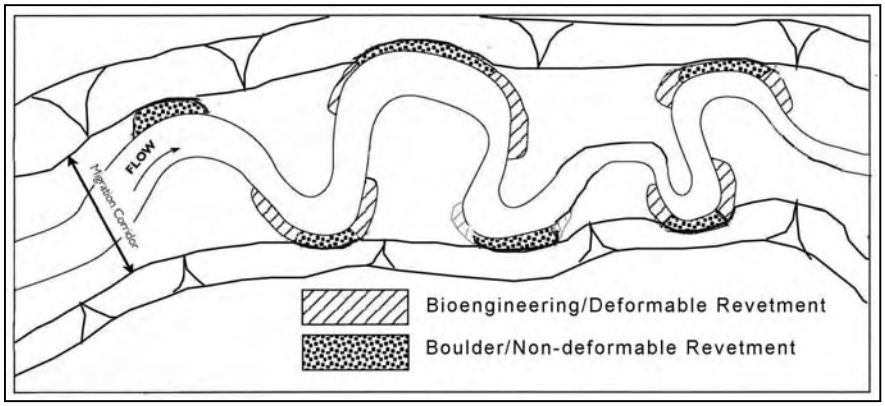


Figure 3: Appropriate use of deformable (soft) and non-deformable (hard) bank protection practices
Source: Miller and Skidmore, 2000



Figure 4: Boulder revetment failure due to toe scour

then placed in the trench and extended up the streambank. A series of large flat/rectangular boulders are then placed in the trench as footers. The bottom of the footer boulders must be below the expected depth of scour. Once the footer boulders have been installed, revetment boulders are placed on top. If protection is needed higher on the bank, a second course of stones may be placed on top of the first, forming a double boulder revetment. The face of the revetment should be made as rough as possible to decrease current velocities on the streambank. The revetment should generally extend at least one-third of the streambank height to protect the most erosion prone area. Once the revetment is installed, the upper streambank should be graded and shaped to transition into the top of the revetment. Streambed vegetation and erosion control mats are then installed on exposed soils.

Other streambank stabilization practices are often placed above the boulder revetment. Soil lifts and bioengineering practices are often combined with toe revetments to protect the upper streambank. In these cases, the boulder revetment should extend to a height above which vigorous perennial vegetation can survive.

Maintenance/Monitoring – Initially, inspections of the boulder revetment should be undertaken after the first few large storms to ensure that the boulders are stable and upper bank plantings are surviving. Once this has been confirmed, annual inspections are warranted. No special maintenance is needed for boulder revetments, except for occasional replacement of dead/dying vegetation.

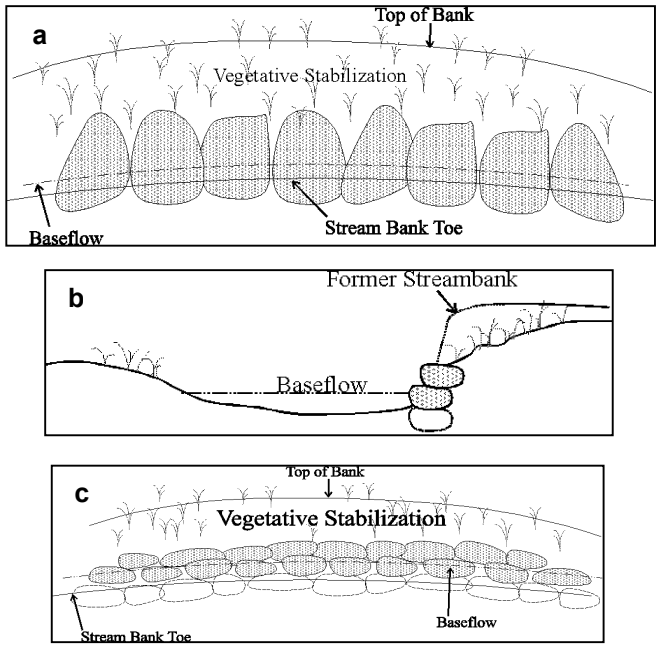


Figure 5: (a) Large boulder revetment, (b) Profile of boulder revetment, (c) Plan view of boulder revetment

Cost – The unit cost to install a single boulder revetment ranges from $20 to $40 per linear foot of eroding streambank. Cost for boulder revetments increases when double layer treatments are used and additional treatments are needed on the upper bank.

Further Resources

Washington State Integrated Streambank Protection Guidelines (2002)
http://www.wa.gov/wdfw/hab/ahg/ispg_chap06_all.pdf (roughened rock toes)

Maryland Guidelines to Waterway Construction (2000)
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec2-11.pdf

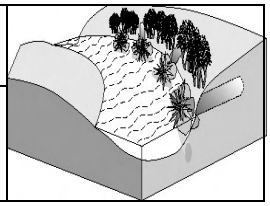
NRCS Engineering Field Handbook - Chapter 16 Streambank and Shoreline Protection
http://www.nrcs.usda.gov/technical/ENG/efh.html

Ohio Stream Management Guide
http://www.ohiodnr.com/water/pubs/fs_st/streamsfs.htm

R-4

Stream Repair: Hard Bank Stabilization

ROOTWAD REVETMENT



Description

A rootwad is the lower trunk and root fan of a large tree. Rootwad revetments are a stream repair practice intended to stabilize eroding streambanks. Individual rootwads are installed in series along meander bends to protect the streambank from erosion. A rootwad revetment can consist of just one or two rootwads, or more than 20, depending on the size of the stream. The root mass of the rootwads reduces current velocities along the streambank, which helps minimize erosion.

Habitat Features Created – Rootwad revetments have moderate potential to enhance in-stream habitat by providing overhead cover and resting areas for fish along meander bends.

Feasibility

Rootwads have emerged as both a common and reliable practice to protect streambanks along meander bends (Figure 1). While more complicated to design and install than traditional, hard bank protection practices, rootwad revetments offer several advantages. Rootwads are cost effective, if rootwad material can be obtained on site or locally. Rootwad revetments are also deformable in the long term (5-15 years) and can create substantial aquatic habitat.

These advantages come with a somewhat higher risk of failure and certain limitations on where rootwads are appropriate. Rootwads work best along streams that are not expected to experience severe channel incision. In some larger streams, rootwads may pose a safety hazard to boaters and their application may not be advisable in streams that can be paddled or experience heavy recreational use. Rootwads must also be combined with bank shaping and vegetative stabilization in order to prevent erosion and soil loss between individual rootwads (Figure 2). Without effective upper bank stabilization, rootwads are prone to failure.

Regional Considerations – In arid or semi-arid regions, availability of rootwads may be limited. In addition, ice can damage/dislodge rootwads during spring melt in colder climates.

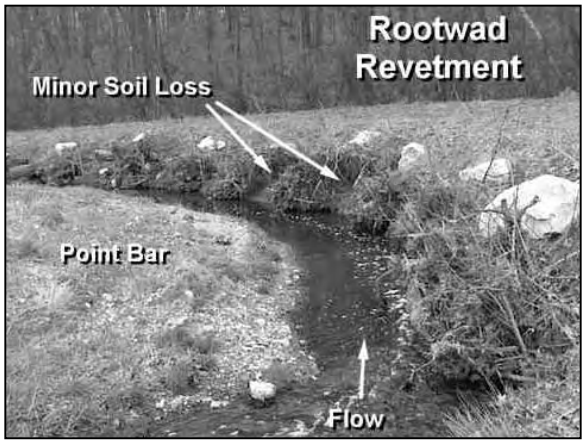


Figure 1: Well-constructed rootwad revetment installed along a small piedmont stream

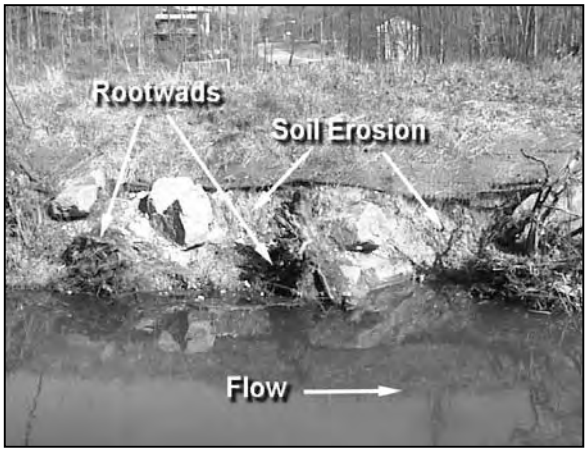


Figure 2: Soil erosion due to a lack of vegetation along a rootwad revetment

Rootwad revetments are recommended to stabilize meander bends along streams in older urban watersheds that have had time to adjust their geometry (e.g., radius, cross section and grade) to altered hydrology and are no longer rapidly adjusting (Figure 3). Since rootwads are fixed, they cannot adjust to rapid geomorphic change, and are prone to failure when major vertical and/or horizontal channel adjustments occur.

Rootwad revetments may work on meander bends that have not fully adjusted or are newly adjusted, but they have a much higher potential to fail under these conditions (Figure 4). Using rootwads in stream channels that are still adjusting can also cause erosion and channel instability upstream or downstream. When rootwads are used in these situations, designers should carefully predict the direction and dimensions of expected stream channel adjustments (i.e., design the meander bend to expected future dimensions and not just the current ones).



Figure 3: Stable rootwad revetment along an urban stream

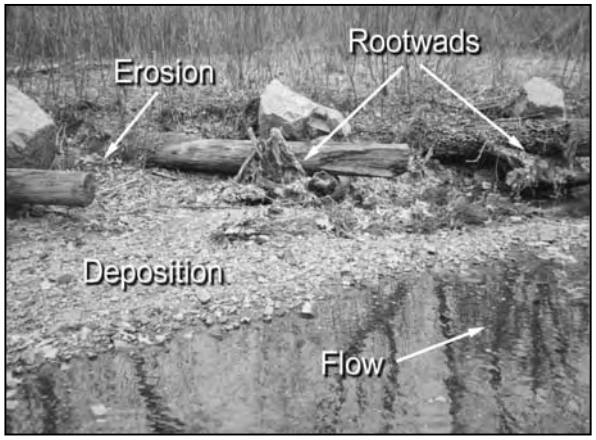


Figure 4: Rootwad revetment installed on an adjusting stream reach

Rootwads should not be installed in highly entrenched channels (i.e., deeply incised). Storm flows that exceed the height of the rootwad fan must be able to flow to an overbank floodplain area to dissipate the energy of the current. Floodwaters can erode the area above and behind the rootwad revetment with the potential to scour the rootwads out from above and behind (Figure 5).

Implementation

Individual rootwads are not intended to armor the streambank, but rather to deflect the thalweg away from the streambank. Spacing of the rootwads along the revetment and the orientation of the root fans to the flow are critical to this deflection. The key design parameter for rootwads is the diameter of the root fan, which should extend from the maximum depth of scour on the streambed up to the bankfull height of the bank. Doll *et al*. (2003) recommend that the tree trunk above the wad should have a diameter of ten to 24 inches, and the trunk should be at least 10 to 15 feet long to extend into the bank.

Root fans of individual rootwads should be oriented perpendicular to the current ($\pm$ 15 degrees) at the installation point along the meander bend (Figure 6). Individual rootwads should be spaced so that the current deflected by one rootwad will not hit the streambank before encountering the next downstream rootwad. As a general spacing rule, rootwads should be placed no more than three to four times the distance the root fan extends out from the streambank. This rule is appropriate on streams where the ratio of the radius of the meander curve to the channel top width (Rc/W) is 3.0 or greater. When this ratio approaches 2.5, individual rootwads are no longer effective at deflecting flows and must essentially be touching to protect the streambank (Sylte and Fischenich, 2000). At this density, the revetment is essentially “root-rap” and other hard bank stabilization practices may be more appropriate (e.g., R-3, R-5).



Figure 5: Failed rootwad revetment along a confined meander

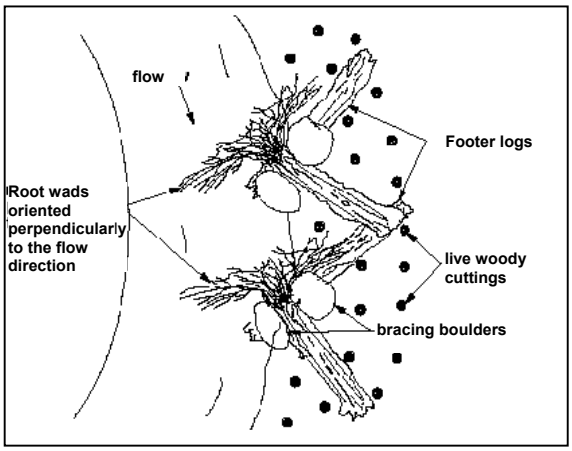


Figure 6: Plan view of rootwad revetment

Generally, the trunk of each rootwad should be at least 10-15 feet long with 75% of the length embedded in the streambank. The rootwad fan width should extend from the maximum expected depth of scour to near the bankfull height. This height can be difficult to achieve in many highly entrenched urban streams. Rootwads can be interlocked or stacked to achieve the necessary height, but care must be taken to make sure the arrangement is stable.

According to Harman *et al*. (2001), rootwads cannot be installed too low, but can fail if installed too high above the stream invert. In addition, at least half of the rootwad fan should extend below the normal baseflow water elevation to maximize habitat value.

Construction – Rootwad construction begins at the downstream end of the revetment. Harman *et al*. (2001) describe two basic methods for rootwad construction— drivepoint and trenching. The drivepoint method uses a track hoe with a hydraulic thumb to insert the sharpened rootwad directly into the bank without trenching. The drivepoint method is considered by Harman *et al*. (2001) to be more cost effective, and involves the least soil disturbance. The trenching method is described below.

First, excavate a trench in the streambank for the first footer log. This trench should be roughly perpendicular to the desired orientation of the rootwad. The footer trench should be excavated so that two-thirds of the footer log will extend into the streambank and at a depth to allow the root fan to extend down to the maximum depth of scour.

After the first footer trench has been excavated, dig a second trench for the rootwad that is perpendicular to the footer trench. The rootwad trench should be excavated so that two-thirds of the trunk will extend into the streambank and to a depth that will allow the rootwad to sit roughly level on top of the footer log. Install the footer and rootwad. The trunk of the rootwad should rest firmly on the footer log so that the root fan faces into the current at the desired orientation. Where rootwads are closely spaced, an upstream rootwad trunk can be placed on top of the downstream footer log. After installing the footer and rootwad, place large rocks on the top and sides of the rootwad trunk, behind the footer log, to hold it in place. Once the rootwad is installed, backfill the trenches with compacted rock/fill. This process continues until all rootwads have been installed.

After all of the rootwads are installed, the top of the streambank should be graded to transition into the rootwads. Stabilize the streambank with a combination of erosion control fabric and vegetation. Transplanted shrubs and trees are preferable to provide dense live root mass for long-term bank stabilization. If transplants are not available, then brush mattresses or live fascines may be used to provide bank protection.

Generally, the gap between the rootwads is considered the weakest point along the entire revetment and requires vigorous revegetation to minimize any soil loss.

Maintenance/Monitoring – It is important to closely monitor plantings around rootwads since scour can cause premature failure if vegetative stability is not achieved. The installation should be inspected after each significant storm during the first two growing seasons. Any loss of plant materials should be immediately addressed. Once plantings are well established, rootwads can be inspected annually (Figure 7).

Cost – Costs to install a rootwad revetment depend on whether there is an on-site source of rootwads or they must be brought in from off-site. Good designers will often scavenge log material during clearing of access roads or from nearby construction sites. Unit costs for rootwads obtained on-site range from $50 to $330 each, whereas unit costs to install a rootwad obtained off-site range from $250 to over $600 each.

Further Resources

Maryland Guidelines to Waterway Construction
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec2-10.pdf

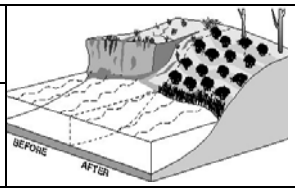
Rootwad Composites for Streambank Erosion Control and Fish Habitat Enhancement
http://www.wes.army.mil/el/emrrp/pdf/sr21.pdf

Stream Restoration- A Natural Channel Design Handbook, Chapter 8.1
http://www.bae.ncsu.edu/programs/extension/wqg/sri/stream_rest_guidebook/guidebook.html

Ontario Stream Rehabilitation Manual
http://www.ontariostreams.on.ca/OSRM/toc.htm



Figure 7: Root-rapping in Pacific Northwest

R-8	Stream Repair: Soft Bank Stabilization STREAMBANK SHAPING	

Description

Streambank shaping is a stream repair practice used to achieve a more stable bank slope. It consists of changing the contours of an eroding streambank without changing the streambank toe or the planform of the stream. Streambank shaping can be used as a stand-alone practice when streambank instability is the primary cause of bank failure, or it can be combined with toe protection practices when toe erosion or channel degradation are causing the bank to erode.

Habitat Features Created - Streambank shaping does not directly enhance in-stream habitat, but can reduce fine sediments delivered to the stream.

Feasibility

As a stand-alone practice, streambank shaping can be applied to urban streams that are incised but have relatively stable longitudinal slope and channel width. Incised streams are often in the process of creating a new floodplain at a lower elevation in the stream channel, and have tall, vertical, and unstable streambanks, which far exceed the root zones of riparian vegetation. In other cases, riparian vegetation has been removed by grazing or mowing, making the banks prone to failure. If the streambank toe is not actively eroding, streambank shaping in combination with riparian plantings may be sufficient to restore streambank stability (Figure 1). In these cases, designers simply remove bank material that will likely be eroded in the future and transported downstream. Careful streambank shaping helps an urban stream adjust its cross-section to the increased hydrology produced by upstream watershed development.

If toe erosion is the primary cause of bank failure, additional hard streambank treatments, such as boulder revetments, coir logs or A-jacks, need to be installed to protect the toe before bank shaping can begin (Figure 2).

The bank angles and channel dimensions of urban streams often depend on stream classification and regional stream geometry (Rosgen, 1997). The type of soil and vegetation at the streambank also dictate stable streambank angles. Also, the potential increase in channel cross-section may improve the capacity of the channel to pass floodwaters. Adequate room must be available within the stream corridor to lay the bank back to a stable angle. Constraints such as trails, utilities and other infrastructure in the corridor should be carefully evaluated.

Implementation

The feasibility of streambank shaping as a stand-alone practice requires a thorough assessment of channel cross-section and planform. The existing and future channel cross-section should be stable and show no evidence of active enlargement or degradation. Some planform or lateral adjustment is allowable, if it occurs within the meander corridor. However, if the lateral adjustment is expected to extend outside the meander corridor and erode valley side slopes or infrastructure, other bank protection measures should be substituted. It is also important to note that streambank shaping alone will not arrest active widening or degradation of the stream



Figure 1: Streambank shaping along an urban midwest stream



Figure 2: Streambank shaping in combination with boulder revetment and rock vortex weirs

Therefore, designers need to carefully analyze the stream reach to determine the rate of toe erosion and whether the streambed is actively cutting down. Useful evidence to confirm slow toe erosion rates is build up of failed upper bank sediment along the toe. Conversely, fallen upper bank sediments tend to be quickly transported downstream from actively eroding toes.

A longitudinal gradient field survey may be needed to determine if the stream is actively downcutting. The most notable indicator of downcutting is the presence of a knickpoint below the streambank shaping site. Knick points migrate upstream and are a strong indicator of active streambed degradation. Absence of sediment deposits or bars in the stream channel may also indicate excessive channel erosion and potential bed degradation. If fallen upper bank material is present along the streambank toe and there is no evidence of active bed degradation, then shaping and re-vegetating the streambanks alone may restore bank stability. This is often the case along older urban streams where the channel has adjusted to altered hydrology and the process of channel adjustment has slowed.

Additional toe protection and grade control practices may be needed if the field assessment indicates active toe erosion and/or bed degradation are occurring. Shaping of the upper streambank can begin once other stream repair practices have addressed these problems (Figure 3).

Streambank shaping is something of an art. Designers should examine urban reference streams with stable vegetated streambanks to get an idea of locally appropriate streambank angles and vegetation types. Hydraulic analysis can be helpful to determine the type of bank material that can withstand the shear stress produced by bankfull discharges. Fischenich (2001a) has developed useful equations to determine bank stability of different bank materials based on the velocity of projected flows.

The grading plan should clearly specify where and at what angle the streambank is to be graded, the limits of grading and disturbance, and specifications for re-vegetation. Streambank shaping can generate large volumes of excess soil that need to be removed from the project area. Adequate access to the streambank shaping for dump trucks and heavy equipment may be needed.

Construction –The limits of grading and disturbance should be clearly marked in the field, and the designer should be present at the site during all grading operations. The success of streambank shaping is highly dependent on the skills of the heavy equipment operators. The designer and equipment operators must clearly understand each other and the project's

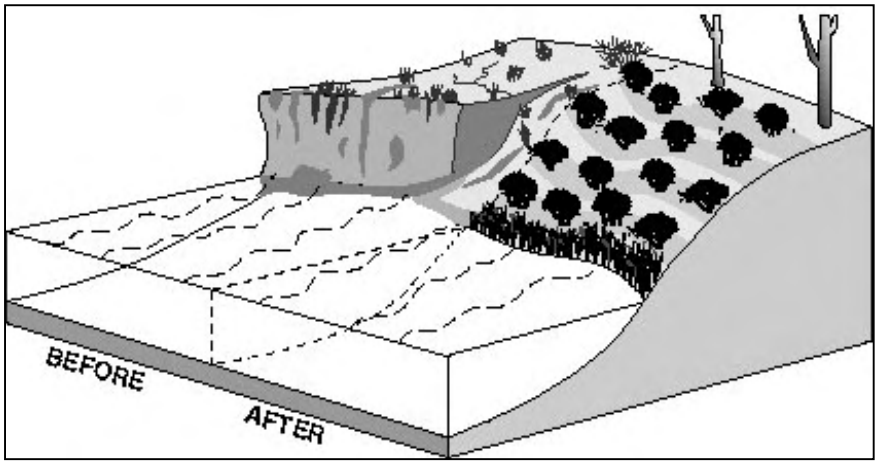


Figure 3: Before and after a streambank shaping project
Source: FISWRG, 1998

objectives. Erosion control practices should be installed along the toe of the streambank, prior to any grading. When grading is complete, streambanks should be re-vegetated with native trees, shrubs and ground cover, in accordance with the revegetation plan (see Profile Sheet R-15).

Hydro-seeding is the most efficient means to quickly establish a ground cover on relatively flat floodplain areas disturbed during construction operations. The newly shaped streambank, however, should be seeded by hand or mechanically seeded, with the seed tamped or rolled to ensure good soil contact. Erosion control fabric should be applied to lower bank areas exposed to streamflow (i.e., coir fiber, jute, straw). Additional planting can then be installed in accordance with the revegetation plans.

Maintenance/Monitoring – Newly-shaped streambanks should be monitored frequently during the first two weeks to ensure that adequate moisture is available for seed germination and growth. If not, supplemental watering must be provided. The streambanks should be inspected after the first significant storm event for erosion and soil loss. Any erosion should be immediately repaired.

Cost – The cost of streambank shaping depends on the volume of soil removed, and associated hauling and disposal costs. Typical grading costs can run from $5.00 to $15.00 per cubic yard. Project costs increase when the project site requires specialized equipment, access is difficult, or if sediment disposal sites are distant. In addition to grading costs, designers should consider revegetation and erosion control costs. Seeding costs can range from $0.16 to $1.65 (specialized seed mixes) per square yard. Erosion control fabric costs range from $3.00 to $10.00 per square yard, installed.

Further Resources

Useful guidance and specifications for bank shaping can be found at the following online resources:

Washington State Integrated Streambank Protection Guidelines.
http://www.wa.gov/wdfw/hab/ahg/ispg_chap06_all.pdf (Bank Reshaping)

Stream Corridor Restoration: Principles, Processes, and Practices
http://www.usda.gov/stream_restoration/PDFFILES/APPENDIX.pdf

Water Related Best Management Practices in the Landscape - Stream System Protection, Restoration, and Reestablishment
http://abe.msstate.edu/csd/NRCS-BMPs/pdf/streams/bank/bankshaping.pdf

R-10	Stream Repair: Soft Bank Stabilization EROSION CONTROL FABRICS	

Description

Erosion control fabrics (ECF) are a repair technique applied to prevent soil erosion, reinforce soil structure, and help establish vegetation on newly graded or shaped streambanks. The fabrics come in a variety of weights and types ranging from open weave netting to dense non-woven mats (Figure 1). Many of these fabrics are made of biodegradable materials, such as coconut husk fiber (coir), jute or straw, while others incorporate synthetic reinforcing materials, which may not biodegrade. The most resilient ECF is known as turf reinforcement mat (TRM). These mats are made entirely of non-biodegradable materials and essentially become a permanent installation. TRMs are generally used to stabilize drainageways and conveyance channels, but have limited application for urban stream repair.

Feasibility

ECFs that are made of straw and jute may be suitable for upland slopes and floodplains, but are generally not resilient enough to protect streambanks exposed to flowing water (Fischenich, 2001a). Biodegradable coir fiber and reinforced coir fiber fabrics are recommended for most streambank applications.

Some manufacturers specify that coir ECFs can be installed on slopes as steep as 1H:1V, but this only applied to upland slopes not exposed to flowing water. Coir ECFs are generally recommended on streambank slopes of 2H:1V or gentler. The proper streambank slope is a function of the streambank protection practices employed, soil type, and exposure to erosive stream flows.



Figure 1: Three different ECF weave types

Biodegradable coir fabrics are classified into two basic categories:

Non-woven blankets consist of coir fibers that are sandwiched between natural or biodegradable netting. Non-woven blankets are very effective at preventing the loss of fine soil particles but do not have the tensile strength of woven fabrics. These fabrics have an average expected lifespan of one to two years in the field.

Woven fabrics consist of coir yarns that are woven into fabric/netting with a wide range of mesh sizes. They can be tightly woven (similar to burlap), or have a more open weave netting. Woven fabrics are commonly used for streambank erosion control applications. Designers need to consider the mesh size of the weave and the thickness of the yarn when selecting the type of woven fabric needed for the project. The high tensile strength of woven fabrics provides excellent reinforcement for streambank slopes and offers an average lifespan of one to four years in the field.

Designers should keep in mind that the manufacturer's estimates of the useful product life should only be used to compare different products and may not always represent the actual lifespan of the product installed at a streambank stabilization site. Numerous real-world factors determine how long ECFs will persist, including exposure to ultraviolet radiation (sunlight), microbial decay, humidity, vegetative cover, sediment deposition,

alternating cycles of wetting and drying, sediment movement/scour, human or animal foot traffic, and wildlife damage (Miller *et al*., 1998). Fabrics can decay at highly variable rates even within the same project reach.

ECFs are used to temporarily stabilize and reinforce soil on newly graded streambanks until vegetation can become established. On larger, higher gradient streams, ECFs are generally applied to the upper streambank portion to enable perennial/woody vegetation to grow. The lower portion of the streambank is seldom an appropriate area for ECFs and is usually reserved for more structural streambank toe protection measures (e.g., boulder revetments, rootwad revetments, A-jacks). On smaller, lower gradient streams, where vegetation and roots may be sufficient to stabilize both the upper and lower streambanks, ECF are often combined with softer bioengineering treatments, such as live fascines and coir fiber logs to protect the entire streambank. Combinations of woven and non-woven ECFs are also used to construct soil lifts (see Profile Sheet R-11).

Five key questions need to be answered when choosing the most appropriate ECF for streambank application:

Should the ECF be biodegradable, non-biodegradable, or a combination of both? Many ECF incorporate synthetic reinforcing materials (threads or mesh). Synthetic reinforcing materials increases the longevity and strength of coir fiber fabrics, but the product will persist for many years and the netting may pose a hazard to wildlife.

How long can you wait until vegetation is established? Biodegradable materials are intended to temporarily stabilize and reinforce soils until vegetation is established that can replace these functions. The goal in most applications will be to rapidly establish a vigorous cover before the bank will be exposed to erosive storm flows. Stronger fabrics, with tighter weaves, provide greater insurance that the ECF will last until the vegetation can take over. Fabric strength is defined by the manufacturer and is usually expressed in grams per square meter of fabric.

How cohesive are streambank soils? Sandy or fine-grained soils with low cohesion often require a more robust fabric, reinforced fabric, a tighter fabric weave, or a combination of woven and non-woven fabrics. Conversely, more cohesive bank soils, such as silts and clays, may not require as strong an ECF.

How frequently will the streambank be exposed to erosive conditions? ECF can provide significant protection to newly constructed streambanks but may fail if they experience frequent floods. Designers should analyze the likely flow conditions expected at the site and select the appropriate grade of ECF.

To what climatic factors will the ECF be exposed? Designers should anticipate the climatic factors that influence the longevity of fabrics, such as the length of the growing season, solar exposure, drought, wet seasons, ice flows and freeze-thaw conditions.

Implementation

For most installations, the perimeter of the ECF and any seams parallel to stream flow are staked in trenches that are then backfilled with soil/rock. The interior area of the fabric is staked or pinned at intervals across the face of the slope. Seeding of the streambank must be completed before ECF installation. Supplemental plantings of live stakes, bare root cuttings, or container grown stock can be installed through the fabric, taking care not to jeopardize the integrity of the fabric (Figure 2).

Most ECFs are available in rolls of various widths and lengths. Wider ECF rolls often have seams that can become weak points in certain streambank applications. The design should specify whether seams are acceptable, and if so, what orientation they should have in relation to the streambank. The fabric can be applied in a parallel or perpendicular orientation to the stream. A parallel orientation is recommended when the streambank height is less than the



Figure 2: Biodegradable coir fabric with live stakes

width of the fabric, since it minimizes the number of overlapping connections that are parallel to streamflow. If the streambank height is greater than the width of the ECF roll, the fabric can be placed either perpendicular or parallel to the flow. A perpendicular orientation increases the number of overlapping seams, while a parallel orientation will require the parallel seams to be secured in a trench (Figure 3).

Construction - There are many different ways to employ ECF for streambank stabilization, but a typical installation sequence is provided below. Seed should be applied and lightly compacted into the soil prior to ECF installation. Next, a six to 12 inch deep trench is dug around the perimeter of the ECF installation area, and the fabric is laid out, leaving enough extra fabric to secure in the trenches. Normally, ECF is rolled out downstream to upstream directions. If multiple rolls are needed, the upstream fabric must be overlapped or shingled over the downstream fabric with an overlap of at least two feet.

Once the fabric has been laid out, wedge-shaped stakes are used to secure the fabric to the bottom of the trenches and the trenches are backfilled with a mixture of soil and rock. It is important that the fabric lay tight and smooth to the soil surface. If toe protection practice is used, ECF should be secured along the fabric's lower edge under and behind the toe protection (e.g., boulder revetment, coir fiber log, or fascine). The interior portion of the ECF is secured to the slope with pins or stakes, according to the manufacturer's specifications. The upstream end of the ECF fabric and any transitions between the fabric and toe protection practices are always potential weak points, and special care should be taken to adequately secure them.

Maintenance/Monitoring – ECF installation and the seeding/plantings should be inspected frequently during the first growing season and after significant storm events. Inspections should examine whether stakes and trenches continue to securely hold the fabric in place. Any tears in the ECF or soil erosion should be repaired immediately. Seeding/plantings may require supplemental watering or irrigation during the first growing season to ensure survival.

Cost – Reported unit cost for ECF ranges from one to five dollars per square yard, installed, with the variation based on the type of fabric selected.

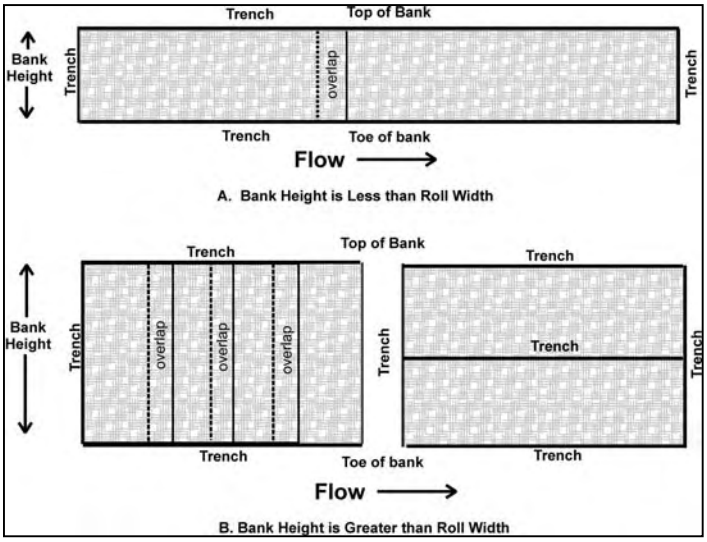


Figure 3: Erosion control fabric installation

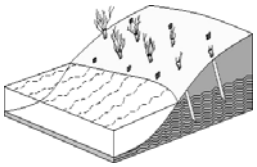
Further Resources

Some guidance on the proper selection and installation of erosion control fabrics can be accessed at the following websites:

Washington State Integrated Streambank Protection Guidelines
http://www.wa.gov/wdfw/hab/ahg/ispg_app_h_plantingconsid.pdf and
http://www.wa.gov/wdfw/hab/ahg/ispg_chap06_all.pdf (manufactured retention systems)

The Practical Streambank Bioengineering Guide - Arid and Semi-Arid Intermountain West
http://plant-materials.nrcs.usda.gov/pubs/idpmcpustguid-appA.pdf (erosion control fabric)

Natural Resources Conservation Service. Streambank and Shoreline Erosion. Chapter 16
http://www.nrcs.usda.gov/technical/ENG/efh.html

R-12	Stream Repair: Soft Bank Stabilization	
	LIVE STAKES	

Description

Live stakes are a bioengineering technique used to stabilize eroding streambanks. Also known as dormant woody cuttings or pole plantings, live stakes consist of dormant, unrooted cuttings of riparian tree and shrub species that are installed in streambanks (Figure 1). As the stakes take root and grow, they provide vegetative cover and improve streambank stability. The roots of planted live stakes help stabilize the streambank by reinforcing and binding soil particles together and by extracting excess soil moisture. Live stakes can also improve and extend the performance of both hard and soft streambank stabilization practices.

Habitat Features Created – While live stakes do not directly enhance in-stream habitat, they do create stable vegetated streambanks, which delivers less sediment to the stream, and provide overhanging vegetation.

Feasibility

Live stakes are a cost effective technique to vegetate and reinforce unstable streambanks, especially when used in combination with other toe protection treatments for the lower streambank. Live stakes can be used as a stand-alone practice for wide, shallow urban streams that experience low to moderate toe erosion and have poor bank vegetation. Live stakes are also effective on aggrading streams, since they promote sediment deposition and stabilize bar formations. They are not generally recommended as a bank treatment for actively degrading streams.

Live stakes can be installed during any season, but greater success is achieved if they are installed close to the beginning of the growing season (e.g., early spring). Designers should remember that live stakes will not provide full bank protection for at least one growing season until the stakes develop a vigorous root system.

Plant materials should be acquired from local sources and adapted to the local climate. Planting times should take into account regional conditions, such as possible ice damage, flooding, high water table, and herbivory. In addition, survival rates for live stakes are generally higher in humid climates, compared to arid or semi-arid regions.

Implementation

Adequate moisture, soil fertility and sunlight must be available for live stakes to grow. In particular, designers should check to see whether the stakes will reach the water table, which can be many feet below the bank surface in many urban streams. Also, streambank erosion rates need to be relatively low so that live stakes have enough time to take root and grow.



Figure 1: Live stake

Live stakes can be purchased from a native plant materials supplier, or harvested during the dormant season from local stands of vegetation exhibiting little or no evidence of disease or insect infestation. Typical tree and shrub species used for live stakes include various species of willows (*Salix spp.*) and cottonwood (*Populus spp.*), and more rarely, alders (*Alnus spp.*). Each of these common riparian species root easily from cuttings and have fibrous root systems that are ideal for reinforcing soils.

A study of live stake survival found tree-type willows had lower survival rates compared to shrub-type willows (Zierke and Hoag, 1995). Tree-type willows and cottonwoods may initially develop with multiple stems, but over time, some stems will exert dominance and a single or multi-trunk tree will develop. Over time, large trees can shade out other plants that stabilize the streambank, ultimately reducing their stability. The multiple stems and spreading nature of shrub-type species, on the other hand, make them better candidates to reinforce and stabilize streambank soils. Tree-type willows and cottonwoods are best planted at the top of the bank or in the floodplain.

In general, harvested cuttings should have a minimum diameter of one inch and preferably exceed 1-1/2 inches. Figure 2 depicts the results of live stake survival in terms of length and diameter of cuttings. The recommended cutting diameter depends on the tree or shrub species selected. For example, stems from some shrub-form alders and willows never grow more than one to two inches in diameter, whereas tree-form willows and cottonwood cuttings can easily be three to four inches diameter. These larger diameter cuttings are often referred to as "pole plantings," and are generally four to six feet long and may require a mechanical auger to install (Hoag and Ogle, 1994).

Live stakes need to be long enough so that about two-thirds of the stake is below ground, with one to three lateral buds extending above the ground. Each stake should be tall enough so that it will not be shaded or overgrown by adjacent vegetation, and deep enough to reach the water table in the summer months, particularly in drier climates. Generally, 1-1/2 inch diameter cuttings should be at least two to three feet long, while three to four inch cuttings should be four to six feet long.

Terminal buds should be removed when cuttings are harvested, and all side branches should be cut off flush with the stake. Lateral buds should be preserved. Cuttings should be bundled and transported to the planting site for immediate installation or stored for later use; stored cuttings

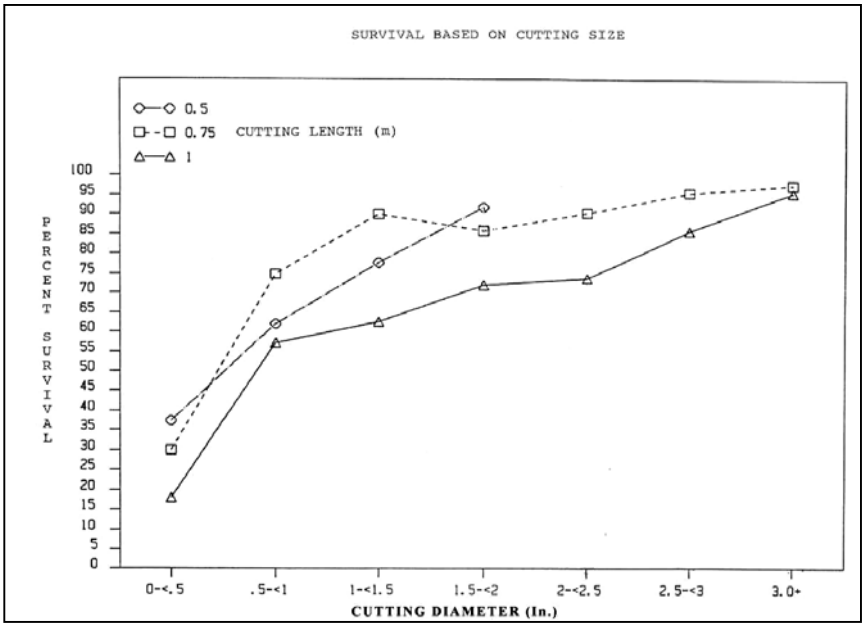


Figure 2: Live stake survival in terms of length and diameter
Source: Zierke and Hoag, 1995

must be kept in a cool, dark environment (32-35^{o} F). Prior to storage, the terminal ends of stored cuttings should be dipped in a 50/50 mixture of white latex paint and water, to prevent desiccation during storage and allow easy identification of the terminal end during installation.

Hoag and Short (1992) evaluated four methods to plant live stakes. Direct insertion by hand was found to be the most successful method, followed closely by the use of a hand auger or a planting bar. Direct insertion using hammers tended to shatter the tops of the cutting, even when a rubber cap was used to absorb some of the force generated by the sledgehammer, and is not recommended as a planting method. The most important factor in live stake survival is close contact between the surface of the cutting and soil. Fertilizers and soil amendments were not found to increase stake survival. In fact, Hoag and Short (1992) reported establishment rates for untreated live stakes that were as good or better than live stakes treated with fertilizers and/or soil amendments.

Hoag and Short also evaluated whether fresh or stored cuttings fared better in field trials. They found no significant difference in planting success between cuttings that were harvested in the dormant season and stored in a cooler until summer, and fresh cutting harvested the day before planting. However, fresh cuttings may not be as tolerant to adverse site conditions, such as hot temperatures, low moisture, and insect infestations. Stored cuttings also have the advantage of providing more flexibility in regards to scheduling harvesting, site preparation, and planting operations. Cuttings can be stored for extended periods of time (e.g., six months) without much decrease in sprouting success.

Construction - Cuttings should be soaked in water for a few days to initiate root growth before planting. Live stakes can be pushed directly into the bank by hand at streambanks with soft soil. A metal bar, soil probe, or auger may be needed to drill a pilot hole for live stakes planted in denser streambanks. The planting tool used should have a diameter that is slightly smaller than the live stakes to ensure adequate contact between the stake and the soil. Stakes should be driven into the pilot holes with a dead-hammer, taking care not to damage the stakes. Driving stakes without a pilot holes is not recommended.

Live stake cuttings should be placed in the streambank in a random pattern with a density of about two to five cuttings per square yard, depending on the species. Different planting techniques are used if live stakes are used in combination with other streambank stabilization practices (see Profile Sheets R-3, R-6, and R-8 through R-11).

Several factors contribute to live stake mortality, with desiccation of the stakes before and after installation the most common one. Failure to reach the summer water table and poor contact between the cutting and soil can also cause poor survival (Zierke and Hoag, 1995).

Maintenance/Monitoring – Live stakes should be inspected frequently during the first two growing seasons to check for survival and loss of integrity due to bank erosion. Live stakes that fail to root and grow should be replaced. Once live stakes are established, they require little maintenance.

Cost – The unit cost to install a single live stake ranges from one to three dollars, depending on the cost/availability of plant materials and labor rates. Use of locally harvested plant materials and volunteer labor can greatly reduce live stake installation costs.

Further Resources

Additional guidance on the use of live stakes in streambank stabilization can be accessed at the following websites:

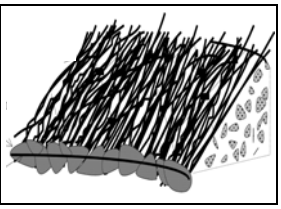
The Practical Streambank Bioengineering Guide - Arid and Semi-Arid Intermountain West (pole plantings)
http://plant-materials.nrcs.usda.gov/pubs/idpmcpustguid-appA.pdf

Maryland Guidelines to Waterway Construction (live stakes)
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec2-4.pdf

Washington State Integrated Streambank Protection Guidelines (woody plantings)
http://www.wa.gov/wdfw/hab/ahg/ispg_chap06_all.pdf

NRCS Engineering Field Handbook: Stream and Shoreline Protection
http://www.rnrcs.usda.gov/technical/ENG/efh.html

Ontario Stream Rehabilitation Manual (live stakes)
http://www.ontariostreams.on.ca/OSRM/toc.htm

R-14	Stream Repair: Soft Bank Stabilization **BRUSH MATTRESSES**	

Description

Brush mattresses are used to stabilize eroding streambanks and consist of a layer or thick mat of dormant cuttings of riparian woody species placed directly on the streambank and secured by wire and stakes (Figure 1). The purpose of a brush mattress is to create immediate structural streambank protection that will root and grow over time into permanent vegetative stabilization.

Habitat Features Created – Brush mattresses indirectly enhance stream habitat by creating a more stable streambank that reduces sediment delivered to the stream.

Applications

Brush mattresses utilize dormant branch cuttings that are typically 1/2 to 1-1/2 inches in diameter and four to eight feet long. The ideal bank slope for brush mattresses is 3H:1V, although some have been effectively installed on slopes as steep as 2H:1V that possess cohesive soils and adequate soil moisture. Brush mattresses are a few inches to a foot thick and are placed along the streambank perpendicular to stream flow. Larger streams usually require a thick mattress. Dormant cuttings must be placed in direct contact with bank soil in order to take root and grow. The lowest portion of the mattress is buried in a trench and protected by a toe practice, such as coir fiber log, live fascine, or boulder revetment. The mattress is secured to the streambank by stakes with wire connecting the stakes in a grid pattern. Soil is tamped down into the cuttings to fill void spaces and ensure good soil/cutting contact before the mattress is secured. Brush mattresses provide an immediate structural protection to the streambank, with long-term protection provided by the growth of the dormant cuttings. Since brush mattresses utilize dormant cuttings, they must be installed during the non-growing season, usually in early spring.



Figure 1: Brush mattress

Brush mattresses can be assembled and installed using only hand tools, unless major streambank shaping is needed. As a result, mattresses are ideal for stream reaches with limited access for heavy equipment. Adequate soil moisture is essential for plant growth. Mattresses are not recommended for shaded streambanks or reaches with beaver activity. Brush mattresses are also not recommended for lower banks within meander bends or in streams that are rapidly incising.

Regional Considerations - Plant species and planting times used for brush mattresses should be appropriate for the local climate and conditions. Brush mattresses require moderate to high soil moisture conditions at the soil surface. Consequently, they may not be feasible in arid/semi-arid climates where soil moisture is lacking, unless supplemental irrigation/watering is provided.

Implementation

The first step in the construction sequence for brush mattresses is to grade the streambank to an appropriate angle (ideally 3H:1V or gentler; 2H:1V maximum). If the streambank needs no grading, woody debris/litter should be removed from the bank surface to allow the mattress full contact with the soil. Next, an 8-12 inch trench is excavated behind the toe protection practice (e.g., live fascine, coir fiber log, boulder revetment) to help ensure adequate soil moisture and contact for rooting and growth.

The mattress sections are then placed along the streambank perpendicular to the stream flow, with the bottom ends of the cuttings laid in the trench. Layers of cuttings should continue to be placed until the streambank is barely visible. The normal depth of the mattress is four to 12 inches. Thicker mattresses are needed when streams carry large amounts of debris, ice, or sediment at higher flows (Figure 2).

Once the cuttings are in place, two to three foot stakes are partially driven into the brush mattress on three to four foot centers. Stakes can be purchased or made from diagonally cut 2 x 4 lumber, but should have a groove or notch to securely attach the wire. Ten to 12 gauge bailing wire is used to connect the stakes, first horizontally and then diagonally to form a grid pattern. The wire should be wrapped around each stake so that if a wire breaks between two stakes, the remaining connections will not fail.

Loose soils should be tamped into the mattress to fill void space and ensure good soil contact. After this is done, the stakes can be fully driven in to tightly press the mattress against the streambank. When finished, only the top portion of the brush mattress should be visible, with the rest hidden by soil. The upstream end of the mattress should be checked to ensure that it is tightly secured to the streambank and will not be undermined during high flows. Rock or logs may be needed as additional protection.

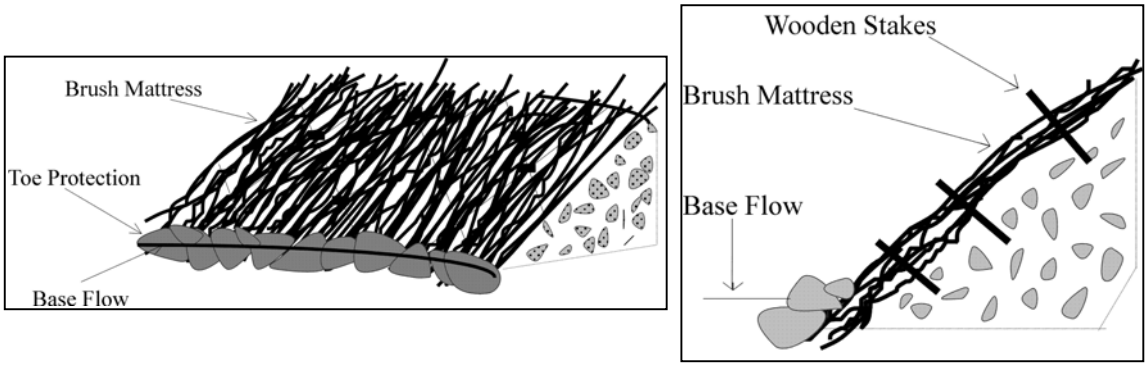


Figure 2: Brush mattress schematic (left) and cross-section (right)

Maintenance/Monitoring – Frequent inspections should be made during the first growing season to check plant growth and make sure the brush mattress is secure. If low soil moisture is encountered, supplemental watering or irrigation should be provided immediately. After woody cuttings become established, little maintenance is required.

Cost – Reported unit costs for installed brush mattresses range from $30 to $50 per linear foot and depend upon labor rates and the availability of dormant plant material.

Further Resources

The following resources can be consulted for more information on the design and installation of live fascines.

Maryland Guidelines to Waterway Construction
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec2-8.pdf

The Practical Streambank Bioengineering Guide - Arid and Semi-Arid Intermountain West (Brush Mattress)
http://plant-materials.nrcs.usda.gov/pubs/idpmcpustguid-appA.pdf

Washington State Integrated Streambank Protection Guidelines (woody plantings)http://www.wa.gov/wdfw/hab/ahg/ispg_chap06_all.pdf

Engineering Field Handbook - Chapter 16 Streambank and Shoreline Protection (Brush Mattress)
http://www.nrcs.usda.gov/technical/ENG/efh.html

Brush Mattresses for Streambank Erosion Control
http://www.wes.army.mil/el/emrrp/tnotes.html

Ontario Stream Rehabilitation Manual
http://www.ontariostreams.on.ca/OSRM/toc.htm

R-17	Stream Repair: Flow Deflection Techniques LOG, ROCK AND J-ROCK VANES	

Description

Vanes are a stream repair practice used to redirect flow in urban streams. They consist of a linear rock or log structure that extends out from the streambank and points upstream. The purpose of vanes is to reduce erosion along the streambank toe by redirecting stream flow toward the center of the stream channel. They are generally used in urban streams where toe erosion and scour is the dominant erosion process (Figure 1).

J-rock vanes are a simple variation on the rock vane, which extends outward from the streambank as an upstream pointing "J" that acts to enhance downstream scour pool formation.

Habitat Features Created - Rock, log and J-rock vanes enhance stream habitat by creating downstream scour pools, narrowing and deepening of the baseflow channel, and enhancing riffle habitat.

Feasibility

Vanes are a useful practice for both small and large streams with low to moderate bedload transport (Figure 2). Vanes are less effective in high gradient streams and in streams with highly mobile, fine substrates (e.g., sand bed streams). Vanes are effective along both straight reaches and meander bends.

Vanes are not recommended for urban streams that are actively degrading or incising. Vanes are more suitable for urban streams that are undergoing channel widening and are experiencing lateral instability. Other streambank protection techniques should be considered for streams with immobile bed materials (e.g., bedrock or boulders).

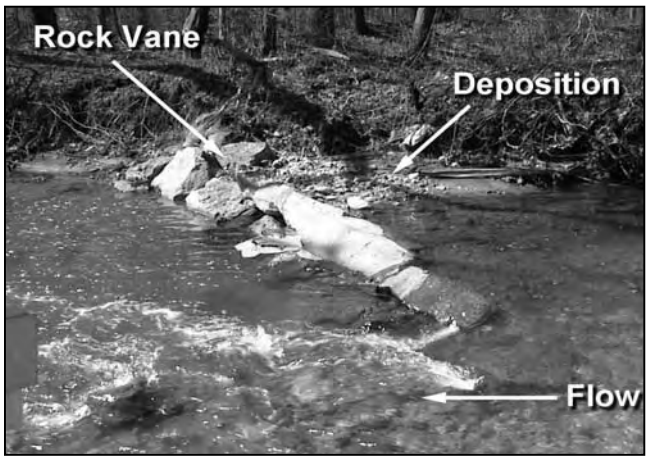


Figure 1: Example of rock vane



Figure 2: Log vane structure providing in-stream habitat and streambank stability

Implementation

Rock and log vanes grade from the bankfull elevation of the streambank down to the stream channel invert. Vanes generally extend into the stream about one-fourth to one-third the bankfull width and point upstream at a 20 to 30 degree angle (Figure 3).

Harman *et al.* (2001) recommends that vanes have no more than a 2-7% slope from the bankfull elevation to the stream invert in smaller streams of the southern piedmont. Vanes should be carefully located so as not to produce additional bank erosion on the upstream side where they join the bank, where eddy scour can often be a problem. Also, stream flow should not be permitted to outflank the vane and cause further bank erosion problems. Vanes should extend two to four rock lengths into the bank (rock vane) or one-third of the log length (log vane) to prevent erosion during overbank flows. Large rocks should also be used to stabilize the area where the log enters the streambank. Rocks or boulders used to construct the vane should be sized to be immobile at the bankfull discharge, and should be rectangular or flat in shape. Jennings and Harman (2001) suggest that larger boulders (40" x 24" x 18") work best in many North Carolina streams.

Construction - Rock vanes are constructed by excavating a trench in the streambed below the expected depth of scour. Footer boulders are placed in the trench touching end to end. It is extremely important to prevent gaps between boulders that allow streamflow to pass through the structure (Jennings and Harman, 2001). Vane stones are then placed on top of the footer boulders in a staggered fashion (i.e., over two adjacent footer boulders and skewed slightly upstream of the footer boulders), once again taking care to make the joints between boulders as tight as possible. As the vane is built out and slopes down from the bank, the last footer stones may become unnecessary, as the vane stones can be placed in the trench and extend up to achieve the desired elevation. A vane may consist of two tiers of stone in small to medium sized streams, or fashioned into a triangular cross section to withstand higher flows on large streams (Figure 4). Geotextile liners should be placed upstream of the vane to prevent piping of fine sediments between rocks.

Log vanes are constructed in much the same way. The first step is to excavate a trench in the streambed, below the expected depth of scour. Two logs are usually required, one embedded in the substrate and the other placed on top of it and fixed to the other with rebar (Figure 5). In

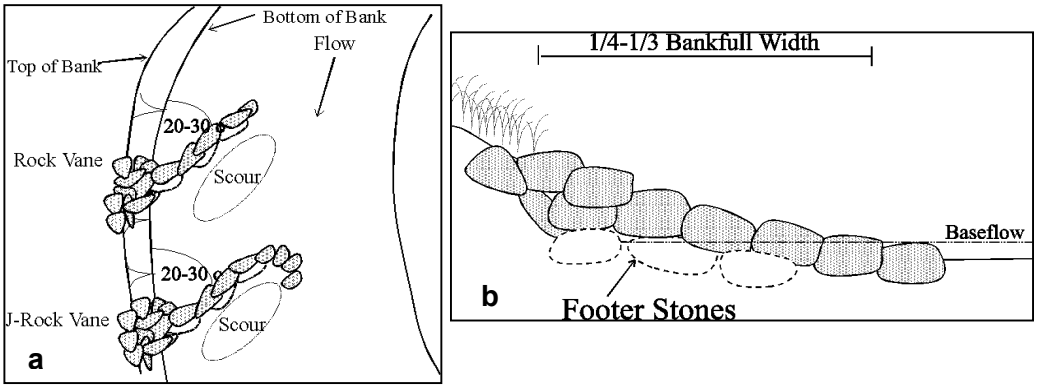


Figure 3: Plan view of rock vanes (a); Cross-section view of a rock vane (b)

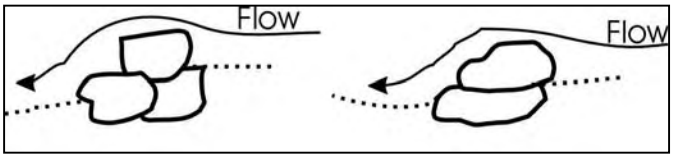


Figure 4: Cutaway views of rock vane

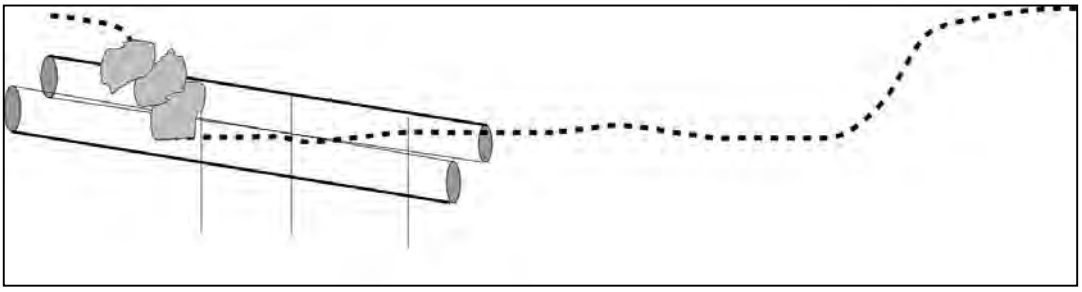


Figure 5: Cross-section view of log vane

smaller streams, vanes can be formed with a single large diameter log (18-24").

Maintenance/Monitoring – Vanes should be inspected after large storms during the first year to check for stability. The most common problem is erosion at the point where the vane joins the streambank, and any outflanking should be repaired immediately.

Costs – Reported unit costs for log vanes range from $400 to $1,200 each. The unit cost to install a rock vane ranges from $400 to $1,400 each.

Further Resources

Several online resources can be consulted for more information on rock vanes:

Maryland Guidelines to Waterway Construction (J-rock vanes, rock vanes, and log vanes)
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec3-4.pdf
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec3-3.pdf
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec3-2.pdf

North Carolina Stream Restoration: A Natural Channel Design Handbook
http://www.bae.ncsu.edu/programs/extension/wqg/sri/stream_rest_guidebook/guidebook.html

Ontario Stream Rehabilitation Manual (low-stage weirs)
http://www.ontariostreams.on.ca/OSRM/toc.htm

Virginia Stream Restoration and Stabilization Best Management Practices Guide (rock and J-rock vanes)
http://www.dcra/state/va.us/sw/docs/streamguide.pdf

Washington State Integrated Streambank Protection Guidelines (barbs, pg. 6-23)
http://wdfw.wa.gov/hab/ahg/ispg_chap06_all.pdf

R-19	Stream Repair: Grade Control ROCK CROSS VANE	

Description

A rock cross vane (RCV) is similar to the rock vortex weir, but differs in that the rocks barely extend above the stream invert. The RCV consists of a rock sill located perpendicular to stream flow that is situated at the invert elevation of the stream channel (Figure 1). The two arms of the sill extend downstream, rising in elevation until they meet the streambank at bankfull height. The low profile of a RCV makes it less vulnerable to scouring and upstream sediment deposition. The RCV is generally used to provide grade control, narrow the baseflow channel, and reduce local bank erosion. RCVs are often located at the top and bottom of meander bends to establish invert elevations for pool/riffle formation (Figure 2).

Habitat Features Created – Rock cross vanes have a modest potential to enhance in-stream habitat through the maintenance of stream grade and the enhancement of riffle habitats.

Feasibility

RCVs are most appropriate in low to moderate gradient cobble or gravel bed streams and should be avoided in sand-bed streams. While RCVs provide grade control, they generally cannot stop a significant knickpoint from migrating upstream. In these situations, a step pool or other hard grade control structure may be needed. Construction requires access by heavy equipment and adequate room to stockpile materials. Construction may also require dewatering, flow diversion, or cofferdams.

Implementation

RCVs consist of a low weir section with two adjacent arms extending downstream into the streambanks that rise to bankfull elevation of the stream (Figure 3). Care must be taken to ensure that the arms are keyed far enough into the streambanks to prevent outflanking during high flows.

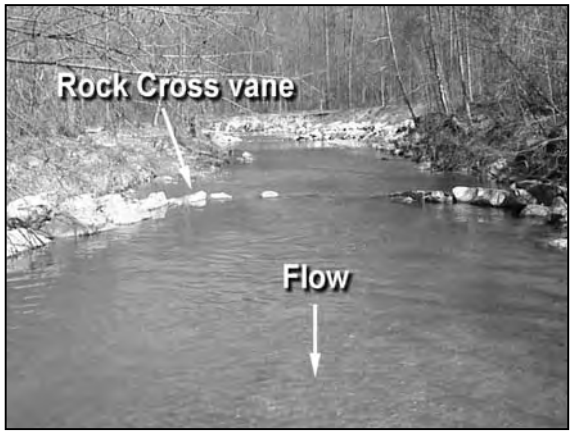


Figure 1: A well designed rock cross vane

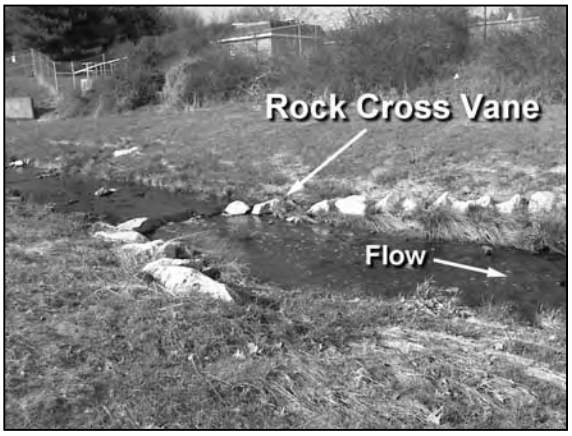


Figure 2: A rock cross vane used to establish stream invert

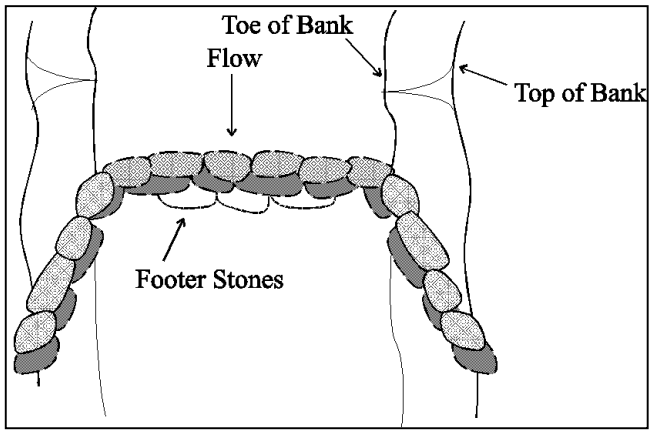


Figure 3: Plan view of a rock cross vane

Construction – RCVs are constructed of large angular rocks that are typically two to three feet in diameter. Each rock must be heavy enough to remain immobile during the highest flows expected for the streambed.

The sequence of construction starts with a rock sill that is formed by excavating a trench perpendicular to stream flow in the center third or half of the stream. As a general rule, the trench should be two or three times deeper than the rocks are high (depending on the number of rock footer courses) and just wide enough to accommodate the rocks. Large, flat rectangular rocks are then placed end to end in the trench so that they are touching each other. One or two stone footer courses are usually used, depending on the width of the channel and the erosive capacity of the stream (Figure 4). Once the first footer course is installed, the trench is then extended upstream of the course so that a second layer of rocks can be placed in a shingle formation (e.g., half on the streambed and half of the rock overlapping rock course).
The trench needs to be extended the entire width of the bankfull channel in the form of an inverted "U" with the arms at a 20 to 30 degree angle to the streambank. The U-shaped trench is then extended upstream once again, and a third set of rocks is placed so that it overlaps the second course. Once again, a shingle pattern is used such that about a third of each rock is on the streambeds and two-thirds overlaps (See Figure 3 above). The tops should be even or slightly above the desired stream invert within the baseflow channel of the stream (Note: only two courses of rock may be needed in smaller streams).

The RCV's arms should rise to bankfull elevation and be anchored several feet into the streambank to prevent outflanking. The number of courses and the size of the stone will depend on the size of the stream, the potential for scouring, and the type of stream substrate (Castro and Sampson, 2001). Geotextile liners should be placed upstream of the vane to prevent fine sediments from piping through the rock structure.

Maintenance/Monitoring - If the RCV is properly constructed, little maintenance is needed. Each RCV should be inspected after the first large storm event to check for rock movement, and after the first growing season to check for adequate vegetative stabilization along the streambanks.

Cost - Average unit costs to install a single RCV range from $1,200 to $1,700, although they can increase to $4,000 to $5,000 in wider streams. These were derived from four different sources and do not reflect costs related to design, project access, mobilization and complex flow diversion or dewatering techniques during construction.

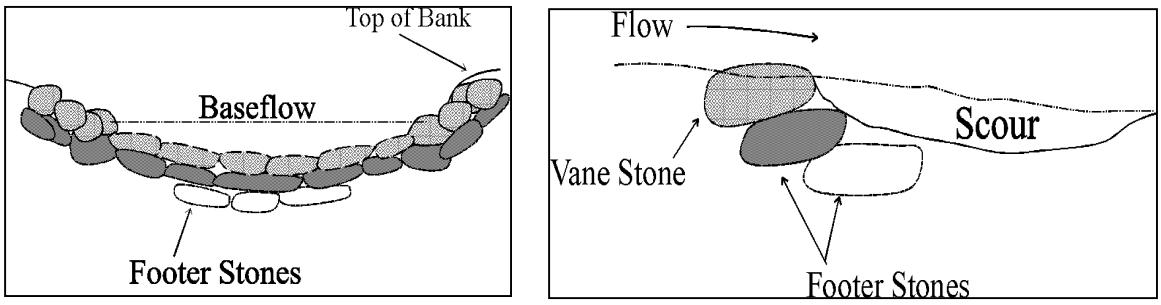


Figure 4: RCV profile (a) and Cross-section (b)

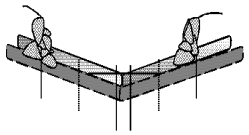
Further Resources

Additional guidance on design and construction of rock cross vanes can be found in the following sources:

Maryland Guidelines to Waterway Construction
http://www.mde.state.md.us/assets/document/wetlandswaterways/sec3-8.pdf

North Carolina Stream Restoration: A Natural Channel Design Handbook (rock cross vane)
http://www.bae.ncsu.edu/programs/extension/wqg/sri/stream_rest_guidebook/guidebook.html

Design of Stream Barbs (Technical Note 12)
http://www.id.nrcs.usda.gov/technical/engineering/

R-21	Stream Repair: Grade Control V-LOG DROPS	

Description

A V-log drop is a stream repair practice used to provide grade control in urban streams. It consists of two logs joined at an angle with its apex pointing upstream. The apex is installed at or below the invert of the streambed. The arms extend downstream and gradually rise to join with each streambank. The V-log drop functions in the same manner as a rock cross vane, concentrating the flow in the center of the stream channel, promoting downstream pool formation, and reducing upstream bank erosion caused by channel incision.

Habitat Features Created – The V-log drop has a significant potential to enhance habitat through the maintenance of stream grade and the creation of downstream scour pools.

Feasibility

V-log drops are most appropriate on smaller streams that have mobile bed sediments (e.g., cobble or gravel), and are less effective on streams with highly mobile bed sediments (e.g., sand bed streams). V-log drops are not recommended for streams that have a high gradient, are actively degrading, or have a boulder or bedrock substrate. V-log drops are not likely to obstruct fish passage because the low point of the structure is located at or below the stream invert.

In many ways, V-log drops mimic the effect of large woody debris (LWD) in streams. Indeed, log drops are most appropriate in streams where LWD was historically a major stream habitat element but is currently missing. Urban streams tend to lack LWD (CWP, 2003). V-log drops also offer a more natural alternative to boulder structures. In most cases, logs can be obtained from tree clearing for access roads or nearby construction sites. Lastly, installation of V-log drops can sometimes be installed without heavy equipment access, although a backhoe will make the job faster.

Implementation

The most important design parameter for the V-log drop is the diameter of the log in relation to the size of the stream. Logs that are eight to ten inches in diameter can be used for small, first order streams, while one to two foot diameter logs are needed for second and third order streams. In larger streams, each arm may be formed by stacking two logs to prevent undermining by scour. Designers should always estimate the potential depth of scour, and make sure the structure does not obstruct much of the channel cross-section.

Each log must be long enough so that one third of its total length is anchored in the streambank. Each leg of the V should extend up to the bankfull elevation. If this is not possible, large rock should be placed over and around the logs to armour them and prevent scour during larger storms. Figure 1 illustrates typical design details for a V-log drop structure.

Construction – Each log should be cut to length so that they will join at the center of the stream. Each log extends downstream and rises at a five to 15 degree angle, heading into the streambank. At least one-third of the log's length should be securely anchored in the streambank. The angle of the V can vary from 75 to 105 degrees depending on stream width. A wider angle is appropriate for third order streams, while first order streams should have an angle of 90 degrees or less. The angle that the logs rise from the streambed up to the streambank should not exceed 10 to 15%.

Maintenance/Monitoring – V-log drops should be inspected after significant storm events during the first year. The frequency of inspection after the first year depends on the risks and costs should the structure fail. If failure of the structure will not result in damage to public infrastructure, private property, or stream impacts, then an annual inspection may be all that is needed. Quarterly inspections may be warranted if these conditions exist at the site.

Costs – The unit cost to install a single V-log drop structure ranges from $800 to $2600.

Further Resources

Basic design and construction specifications for V-log drop structures can be accessed at:

Washington State Integrated Streambank Protection Guidelines.
http://www.wa.gov/wdfw/hab/ahg/ispg_chap06_all.pdf

Virginia Stream Restoration and Stabilization Best Management Practices Guide
http://www.dcra/state/va.us/sw/docs/streamguide.pdf

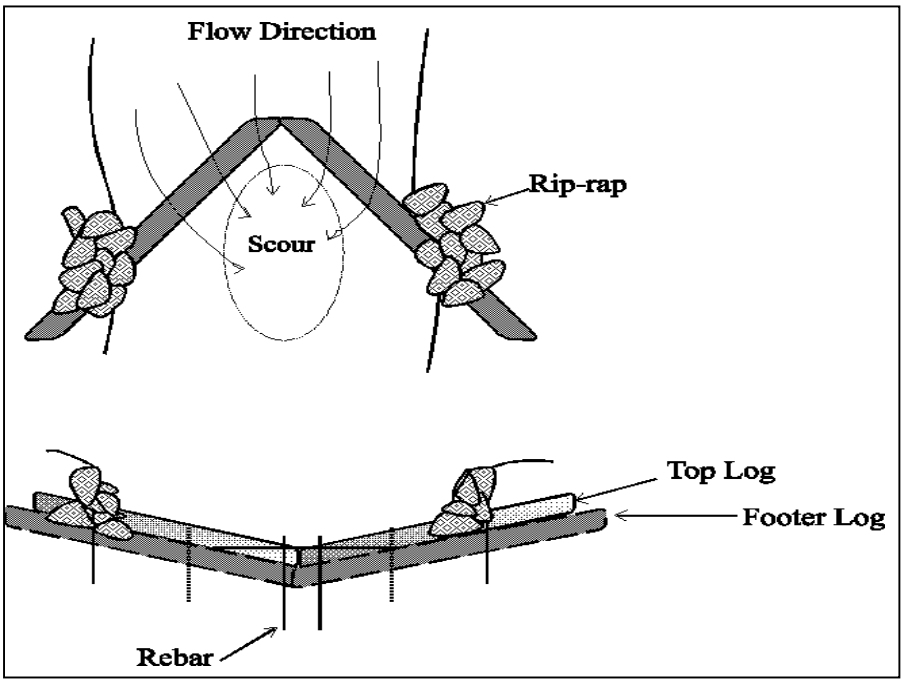


Figure 1: V-log drop design

N-1	Neighborhood Source Area: Yard	
	REDUCED FERTILIZER USE	

Description

The ideal behavior is to not apply fertilizer to lawns. The next best thing for homeowners who feel they must fertilize is to practice natural lawn care: using low inputs of organic or slow release fertilizers that are based on actual needs as determined by a soil test. The obvious negative watershed behavior is improper fertilization, whether in terms of the timing, frequency or rate of fertilizer applications, or a combination of all three. The other important variable to define is who is applying fertilizer in the neighborhood. Nationally, about 75% of lawn fertilization is done by homeowners, with the remaining 25% applied by lawn care companies (Figure 1). This split, however, tends to be highly variable within individual neighborhoods, depending on its income and demographics.

How Fertilizer Influences Water Quality

Recent research has demonstrated that lawn over-fertilization produces nutrient runoff with the potential to cause downstream eutrophication in streams, lakes, and estuaries (Barth, 1995a and 1995b). Scientists have also discovered that nitrogen and phosphorus levels in lawn runoff are about two to 10 times higher than any other part of the urban landscape such as streets, rooftops, driveways or parking lots (Bannerman *et al.*, 1993; Steuer *et al*., 1997; Waschbusch *et al*., 2000; Garn, 2002).



Figure 1: Lawn Care Company Truck

Percentage of People Engaging in Fertilizer Use

Lawn fertilization is among the most widespread watershed behaviors in which residents engage. A survey of lawn care practices in the Chesapeake Bay indicated that 89% of citizens owned a yard, and of these, 50% applied fertilizer every year (Swann, 1999). The average rate of fertilization in 10 other regional lawn care surveys was even higher (78%), although this may reflect the fact that these surveys were biased towards predominantly suburban neighborhoods and excluded non-lawn owners. Several studies have measured the frequency of lawn fertilization, and have found that lawns are fertilized about twice a year, with spring and fall being the most common season for applications (Swann, 1999).

A significant fraction of homeowners can be classified as "over-fertilizers" who apply fertilizers above recommended rates. Surveys indicate the number of over-fertilizers at 50% to 70% of all fertilizers (Morris and Traxler, 1996; Swann, 1999; Knox *et al*., 1995). Clearly, many homeowners, in a quest for quick results or a bright green lawn, are applying more nutrients to their lawns than they actually need.

Variation in Fertilization Behavior

Many regional and neighborhood factors influence local fertilization behavior. From a regional standpoint, climate is a very important factor, as it determines the length of the growing season, type of grass, and the irrigation needed to maintain a lawn. A detailed discussion of the role these factors play in fertilization can be

found in Barth (1995a). A host of factors also comes into play at the individual neighborhood scale. Some of the more important variables include average income, market value of houses, soil quality, and the age of the development (Law *et al.*, 2004). Higher rates of fertilization appear to be very common in new suburban neighborhoods where residents seek to establish lawns and landscaping. Also, lawn irrigation systems and fertilization are strongly associated.

Difficulty in Changing Behavior

Changing fertilization behaviors can be hard since the desire for green lawns is deeply rooted in our culture (Jenkins, 1994; Teyssott, 1999). For example, the primary fertilizer is a man in the 45 to 54 year age group (BHI, 1997) who feels that "a green attractive lawn is an important asset in a neighborhood" (De Young, 1997). According to surveys, less than 10% of lawn owners take the trouble to take soil tests to determine whether fertilization is even needed (Swann, 1999; Law *et al.*, 2004). Most lawn owners are ignorant of the phosphorus or nitrogen content of the fertilizer they apply (Morris and Traxler, 1996), and are unaware that grass-cycling can sharply reduce fertilizer needs.

Most residents rely on commercial sources of information when making their fertilization decisions. The average consumer relies on product labels, store attendants, and lawn care companies as their primary, and often exclusive, sources of lawn care information. Consumers are also influenced by direct mail and word of mouth when they choose a lawn care company (Swann, 1999 and AMR, 1997).

Two approaches have shown promise in changing fertilization behaviors within a neighborhood, and both involve direct contact with individual homeowners. The first relies on using neighbors to spread the message to other residents, through master gardening programs. Individuals tend to be very receptive to advice from their peers, particularly if it relates to a common interest in healthy lawns. The second approach is similar in that it involves direct assistance to individuals at their homes (e.g., soil tests and lawn advice) or at the point of sale.

Techniques to Change Behavior

Most communities have primarily relied on carrots to change fertilization behaviors, although sticks are occasionally used in phosphorus-sensitive areas. The following are some of the most common techniques for changing fertilization behaviors:

- Seasonal media awareness campaigns
- Distribution of lawn care outreach materials (brochures, newsletters, posters, etc.; Figure 2)
- Direct homeowner assistance and training
- Master gardener program
- Exhibits and demonstration at point-of-sale retail outlets
- Free or reduced cost for soil testing
- Training and/or certification of lawn care professionals
- Lawn and garden shows on radio
- Local restrictions on phosphorus content in fertilizer

Good Examples

King County, Washington- Northwest Natural Yard Days. This month-long program offers discounts on natural yard care products and educational information about natural yard care in local stores throughout King County and Tacoma. Education specialists came to Saturday and Sunday events at some stores and spent time with buyers to help them make good choices and learn about natural yard care, including the use of organic fertilizers that don't wash off into streams and lakes as easily as "quick release" chemical fertilizers. For more details, consult: http://dnr.metrokc.gov/swd/ResRecy/events/naturalyard.shtml

North Carolina Department of Agriculture Free Residential Lawn Soil Testing. Residents can get a free soil test to determine the exact fertilizer and lime needs for their lawn, as well as for the garden, landscape plants and fruit trees. Information sheets and soil boxes are available from various government agencies, or local garden shops and other businesses. For more information, consult:
http://www.ncagr.com/agronomi/stfaqs.htm

Minnesota Department of Agriculture Phosphorus Lawn Fertilizer Use Restrictions. Starting in 2004, these restrictions limit the concentration of phosphorus in lawn care products and restrict its application at higher rates to specific situations based on need.
http://www.mda.state.mn.us/appd/ace/lawncwaterq.htm

Top Resources

Cornell Cooperative Extension. The Homeowner's Lawn Care Water Quality Almanac.
http://www.hort.cornell.edu/gardening/lawn/almanac/index.html

*University of Rhode Island Cooperative Extension Home*A*Syst Healthy Landscapes Program*
http://www.healthylandscapes.org/

University of Maryland Cooperative Extension - Home and Garden Information Center.
http://www.agnr.umd.edu/users/hgic/

Turf and Landscape Best Management Practices. South Florida Water Management District and the Broward County Extension Education Division
http://www.sfwmd.gov/org/exo/broward/c11bmp/fertmgt.html

Florida Yards and Neighborhoods Handbook: A Guide to Environmentally Friendly Landscaping
http://hort.ufl.edu/fyn/hand.htm

University of Minnesota Extension Service Low-Input Lawn Care (LILaC)
http://www.extension.umn.edu/distribution/horticulture/DG7552.html

Austin TX, Stillhouse Spring Cleaning
http://www.ci.austin.tx.us/growgreen/stillhouse.htm

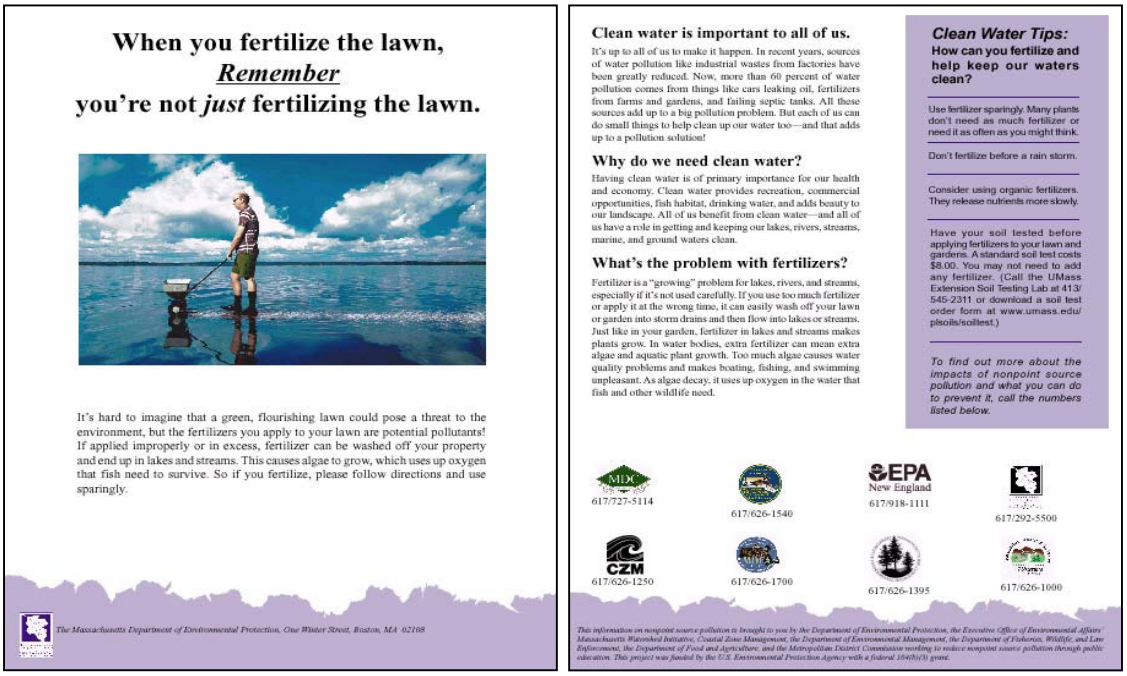


Figure 2: Educational Brochure on Fertilizer
Source: http://www.state.ma.us/dep/brp/wm/files/fertiliz.pdf

N-4	Neighborhood Source Area: Yard NATURAL LANDSCAPING	

Description

The ideal watershed behavior is to replace existing turf cover with native species of annuals, perennials, shrub and forest cover in mulched beds that produce less runoff and create backyard habitat. The negative watershed behavior is exclusive reliance on turf cover in the yard and/or use of non-native invasive species that can spread from the yard into adjacent stream corridors or natural area remnants.

How Natural Landscaping Influences Subwatershed Quality

The cumulative effect of natural landscaping practices on subwatershed quality are hard to quantify, but can provide some clear benefits. First, reduced turf area produces more natural hydrologic conditions in the yard, since mulched beds intercept and adsorb rainfall and can produce less runoff (Figure 1). Natural landscaping also creates native habitats, increases forest cover, and creates a natural seed bank of native plant species in subwatersheds. Natural landscaping can also prevent the spread of invasive non-native plant species into the stream corridor, which is an increasing problem in many urban subwatersheds. English ivy, bamboo, and other fast-spreading non-native species can quickly dominate the plant community of the urban stream corridor.

Percentage of Homeowners Engaging in Natural Landscaping

The proportion of homeowners that engage in natural landscaping is poorly understood at both the national and neighborhood level. About half of Americans report that home gardening and landscaping is one of their major hobbies (Figure 1), but the proportion using native plants or landscape for wildlife or watershed appears to constitute a much smaller niche market.

Variation in Landscaping Behavior

Native plant species are adapted to local differences in soil, rainfall and temperature conditions. Neighborhood factors such as neighborhood age, lot size, income level and watershed awareness appear to influence the promotion of natural landscaping.



Figure 1: Before (a) and After (b) Natural Landscaping

Difficulty in Changing Landscaping Behavior

While natural landscaping practices have been growing in recent years, there are a number of barriers to more widespread implementation. The first barrier is that many homeowners are not aware of which plant species are native or non-native, and they do not know the benefits of natural landscaping. Second, native plant materials are not always widely available at garden centers and nurseries. Third, some communities still have weed and vegetation control ordinances that discourage natural landscaping.

Techniques to Promote Natural Landscaping

A range of carrots and sticks can help promote more widespread use of natural landscaping in a subwatershed, including:

- Conventional outreach on natural landscaping (brochures, newsletters, plant guides)
- Backyard habitat programs
- Free or reduced mulch
- Distribution of free or discounted native plant material
- Repeal of local weed ordinances with natural landscaping criteria
- Support of garden clubs and native plant societies
- Demonstration gardens (e.g. Bayscapes)
- Invasive species alerts
- Promotion of native plant nurseries
- Homeowner award/recognition programs
- Xeriscaping rebates

Good Examples

City of Austin, TX - WaterWise Program. Owners of new and existing homes may qualify for rebates up to $500 for Water Wise plantings of trees and shrubs. The goal of this program is to install a quality, low water use, low maintenance native landscape.
http://www.ci.austin.tx.us/watercon/wwlandscape.htm

Village of Long Grove, IL - Village Code. Natural landscaping is encouraged in the city code, which states “impervious surfaces, shall not exceed forty percent (40%) of the total lot area. The remaining minimum sixty percent (60%) of the lot area shall be mai\ntained as a ‘green area’ and shall consist of native wild areas, grass, trees, ponds or other natural vegetation.” The code also does not limit residential vegetation height, which in other communities can limit use of natural plant species.
http://www.longgrove.net/

Top Resources

National Wildlife Federation - Natural Back Yard Habitat Program. The Backyard Wildlife Habitat program educates people about the benefits and techniques of creating and restoring natural landscapes. Through a backyard wildlife “certification” process, guided efforts of homeowners and other community members to improve wildlife habitat where they live and work are formally acknowledged.
http://www.nwf.org/backyardwildlifehabitat/

Alliance for the Chesapeake Bay - Bayscapes. This website provides practical guidance on how to design a “Bayscape,” which is a watershed friendly form of natural landscaping.
http://alliancechesbay.org/bayscapes.cfm

Wild-Ones- Native Plants, Natural Landscaping Publications and Model Ordinances. Website contains a wealth of information on natural landscaping, including the *Wild Ones Handbook* - a compendium of useful information for the native plant landscaper and wildflower gardener, appropriate for all bioregions. The site also provides vegetation and weed control model municipal ordinances that encourage the use of native plant communities as an alternative in urban landscape design. http://www.for-wild.org/

N-6	Neighborhood Source Area: Yard	
	YARD WASTE COMPOSTING	

Description

The ideal watershed behavior is to recycle or compost yard waste entirely within the yard, so that it stays out of the solid waste stream and the storm drain system. The next best behavior is curbside yard waste collection that keeps organic matter from the storm drain system (Figure 1). The negative behavior is to blow or rake yard waste into the gutter and storm drain system or dump it into the stream corridor or natural areas.

How Yard Waste Influences Watershed and Subwatershed Quality

The major benefit of managing yard waste is realized at the regional or watershed level, where it can preserve local landfill capacity by keeping organic waste out of the trash stream. Yard waste normally comprises about 10% of the annual waste stream during the year, but this rises to almost 70% during the fall. The impact of yard waste at the subwatershed level is poorly defined, but can be significant, at least on a seasonal basis. The major concern is the potential for nutrient and organic matter to wash off to the storm drain system, whether it consists of grass clippings, fallen leaves or organic debris accumulating on impervious surfaces and street gutters. The second concern is dumping yard wastes in the stream corridor itself.



Figure 1: Curbside Yard Waste Pick-up

Percentage of Residents Engaging in Yard Waste Composting

Based on municipal surveys, the average rate of backyard composting of yard waste ranges from one to 5% of households, although participation rates as high as 10% have been observed after intensive municipal education and subsidy programs. Much higher rates have been reported for recycling of grass clippings, whether by composting or use of grass-cycling mowers. Surveys indicate about 40 to 70% of households currently recycle grass clippings, with higher rates reported in communities that prohibit grass-clippings in regular trash pickup (Smith, 1996; DeYoung, 1997; Morris and Traxler, 1996; and Knox *et al*., 1995). The highest homeowner participation rates are noted for curbside leaf and yard waste collection (50 to 70%), which is not surprising given the convenient nature of this municipal service. It is worth noting that communities need to educate homeowners to keep leaves out of streets and gutters during seasonal curbside pick-up where they can easily reach the storm drain system.

Variation in Yard Waste Behavior

Regional factors influencing the generation and disposal of yard waste include the length of growing season, the presence of deciduous trees, and annual rainfall. Neighborhood factors contributing to the generation of yard waste are large lot size or turf area, high forest canopy, low usage of lawn care or landscaping companies, and older neighborhoods. The actual rate of participation in various yard waste

programs depends largely on their ease and convenience, as well as the degree of outreach, notification and education employed by the municipality.

Techniques to Change the Behavior

To promote better management of yard wastes, communities can facilitate backyard composting and "grass-cycling" lawnmowers, arrange seasonal curbside yard waste collection, and/or prohibit yard waste from regularly scheduled trash pickup. Other techniques include:

- Conventional outreach methods (bill inserts, brochures, newsletters, neighborhood meetings)
- Regular yard waste collection
- Fall leaf collection
- Seasonal collection (e.g., Christmas trees)
- Distribution of free or discounted compost bins
- Ban on lawn clipping pickup
- Promotion of grass-cycling
- Notification about keeping leaves out of gutters during fall leaf pick-up

Good Examples

Fort Worth, TX. Division of Environmental Management -"Don't Bag it" Program
The City of Fort Worth requires that, if grass clippings are put out for pick-up, they be contained in paper yard bags to be sent to a composting facility instead of the landfill. Under the "Don't Bag It" program homeowners are encouraged to leave lawn clippings on the grass to allow them to work themselves back into the soil. Residents that have followed this lawn care plan report that they mow their lawns in 38% less time than when they bagged their grass clippings. They also found that their lawns are 30% better than they were before the "Don't Bag It campaign.
http://www.fortworthgov.org/dem/dontbag.htm

The Village of Niles, IL - Yard Waste Collection
The Village of Niles offers an optional yard waste collection service to help residents comply with an Illinois law that requires the separation of yard waste from regular garbage. To participate in the curbside yard waste collection homeowners need to purchase stickers for a nominal fee to place on yard waste bags. Mulching is recommended as an alternative no-cost disposal method. Free leaf pick up is provided in the fall.
http://www.vniles.com/Pages/yard%20waste%20collection.asp

City of Gresham, OR Yard Debris Exemption Program - Residents can receive a $3.65 reduction on their garbage bill when they agree to compost yard waste instead of having it picked up by the curbside yard-debris collection program. The approval process requires an application and a site inspection by a Master Gardener and composting expert who inspects the homeowner composting system before granting the exemption.
http://www.ci.gresham.or.us/departments/des/solidwaste/yarddebris/

Top Resources

USEPA- Composting Materials - *Waste Prevention, Recycling, and Composting Options: Lessons from 30 Communities; Composting, Yard Trimmings, and Municipal Solid Waste; and Innovative Uses of Compost: Erosion Control, Turf Remediation, and Landscaping*
http://www.epa.gov/compost/

Master Composter
http://www.mastercomposter.com/

Compost Guide Web Page
http://www.compostguide.com/

Recycle Your Grass Clippings
http://ucce.ucdavis.edu/files/filelibrary/1808/3868.doc

"Don't Bag It" Lawn Care
http://muextension.missouri.edu/xplor/agguides/hort/g06959.htm

Washington County, Minnesota, Recycling & Yard Waste
http://www.co.washington.mn.us/info_for_residents/environment/recycling__yard_waste/

N-9	Neighborhood Source Area: Yard	
	SEPTIC SYSTEM MAINTENANCE	

Description

While most urban subwatersheds are served by sewers, some still rely on septic systems for sewage disposal, particularly in less developed subwatersheds that may lie outside of the sewer service envelope. The ideal watershed behavior is to regularly inspect and maintain septic systems, make repairs as needed, and prevent disposal of household chemicals through the leach field. The accepted practice is to inspect the tank and leach field once every two years to make sure it is working properly, and to pump out the tank (Ohrel, 1995; Figure 1). The negative watershed behavior is to ignore regular inspections and pumpouts to the point that the septic system becomes a subwatershed pollution source.

How Septic Systems Influence Subwatershed Quality

Failing septic systems can be a major source of bacteria, nitrogen, and phosphorus, depending on the overall density of systems present in a subwatershed (Swann, 2001). Failure results in surface or subsurface movement of nutrients and bacteria into the stream. According to the U.S. EPA (2002), more than half of all existing septic systems are more than 30 years old, which is well past their design life. The same study estimates that about 10% of all septic systems are not functioning properly at any given time, with even higher failure rates in some regions and soil conditions. It is extremely important to understand resident behavior in regard to inspection, pump out and repair, particularly if septic system density in a subwatershed is high.



Figure 1: Septic System Inspection/Cleaning Truck

Percentage of Homeowners Engaging in Septic System Maintenance

Until recently, homeowner awareness about septic system maintenance was poorly understood. Swann (1999) conducted one of the first surveys to examine how frequently homeowners maintain their septic systems. Roughly half of the owners were classified as "septic slackers," since they indicated that they had not inspected or cleaned out their systems in the past three years. A small, but significant, fraction (12%) of septic system owners had no idea where their septic system was located on their property. In addition, only 42% of septic system owners had ever requested advice on how to maintain their septic system, and they relied primarily on the private sector for advice (e.g., pumping service, contractors, and plumbers).

Variation in Septic System Maintenance

Septic system failure rates appear to vary regionally, ranging from five to 40% (Swann, 2001). In most regions, failure rates are tied to current or past design, construction and maintenance regulations, which are set by local or state public health authorities. Failing systems are often clustered together. At the neighborhood level, many factors can influence septic system problems. Key factors linked to failure include small lot size, aging systems, poor soil or water table conditions, and close proximity to streams, lake fronts or ditches. In other cases, failure rates are tied to experimental septic system technologies, and seasonal use of properties.

Difficulty in Improving Septic System Maintenance

Septic systems are a classic case of "out of sight, out of mind." Many owners take their septic systems for granted, until they back up or break out on the surface of their lawn. Subsurface failures, which are the most common, go unnoticed. In addition, inspections, pump outs, and repair can be costly, so many homeowners tend to put off these expenditures until there is a real problem. Lastly, many septic system owners lack basic awareness about the link between septic systems and water quality at the subwatershed level.

Techniques to Increase Septic System Maintenance

Many carrots and sticks have been developed in recent years to improve resident behaviors in regard to septic system maintenance, including:

- Media campaigns to increase awareness about septic system and water quality (e.g., billboards, radio, newspaper)
- Conventional outreach materials on maintenance (e.g., brochures, bill inserts, newsletters)
- Free or mandatory inspections
- Discount coupons for septic system maintenance
- Low interest loans for septic system repairs
- Performance certification upon property transfer
- Creation of septic management districts
- Certification and training of operation/maintenance professionals
- Termination of public services for failing systems

Good Examples

Swann (2001) describes a series of case studies of effective local programs to improve septic system maintenance. Some additional examples are provided below:

Washtenaw County, Michigan Time-Of-Sale Program: The County's septic system regulation requires the inspection of all residential septic systems by private evaluators at the time of sale of a property. Evaluations must be done by a certified inspector who has received a license after training and an exam.
http://www.rougeriver.com/pdfs/illicit/OSS-02.pdf

Yarmouth, Maine Free Pumpouts (Septic Tank Pumping Ordinance) - The town offers free septic system pump-outs to residents once every three years.
http://www.yarmouth.me.us/vertical/Sites/%7B13958773-A779-4444-B6CF-0925DFE46122%7D/uploads/%7B363C4270-0879-43BC-8639-55BFA419AC12%7D.PDF

Cannon Township, MI Septic Inspections and Testing - The township used school children to conduct dye tests to identify failing septic systems. This program doubled as an education campaign to increase awareness of septic system owners.
http://peer.tamu.edu/curriculum_modules/Water_Quality/module_1/Kids%20Dye%20Project.htm

Top Resources

Many excellent resources are available to educate homeowners about septic systems and water quality. Some of the better reference websites are provided below, and many contain additional educational links.

On-site Wastewater Treatment Systems Manual
http://www.epa.gov/ord/NRMRL/Pubs/625R00008/html/625R00008.htm

A Homeowner's Guide to Septic Systems
http://www.epa.gov/npdes/pubs/homeowner_guide_long.pdf

National Small Flows Clearinghouse
http://www.nesc.wvu.edu/nsfc/nsfc_septicnews.htm

On-site Septic Systems: Educating the Homeowner
http://www.nesc.wvu.edu/nsfc/Articles/SFQ/SFQw02_web/SFQw02_Onsite Education.html

University of Minnesota Onsite Sewage Treatment Program
http://septic.coafes.umn.edu/

*North Carolina Coast*A*Syst*
http://www.soil.ncsu.edu/assist/cas/septic/index.htm

N-10	Neighborhood Source Area: Yard	
	SAFE POOL DISCHARGES	

Description

Routine and end-of-season pool maintenance can cause chlorinated water or filter back flush water to be discharged into the storm drain system or the stream. The ideal watershed behavior is to discharge chlorinated pool water to the sanitary sewer system, or hold it for a week or more before spreading over a suitable pervious surface. The negative watershed behavior is to drain pool water directly into the storm drain system or stream where it may be toxic to aquatic life (Figure 1). Public and community pools can also be a subwatershed hotspot; details on controlling these pollution sources can be found in Profile Sheet H-14.

How Swimming Pool Maintenance Influences Subwatershed Water Quality

Pool water typically contains two to four parts per million of chlorine, as well as other chemicals to reduce bacteria and algae, and control pH. Consequently, the direct discharge of pool water can be toxic to aquatic life in small streams. Not much research has been done to characterize the precise impact of pool discharges on aquatic systems, but there is anecdotal evidence of fish kills and other problems. Part of the problem is the size of pool discharges: the average in-ground pool is estimated to have a capacity of nearly 20,000 gallons.



Figure 1: Swimming Pool Discharging to Street and into Storm Drain

Percentage of Homeowners Engaging in Pool Maintenance

The density of swimming pools in a subwatershed is extremely variable, but can be determined through inspection of low-altitude aerial photographs or the USSR survey (Figure 2). The number of in-ground or above-ground swimming pools in the United States is estimated at 7.5 million (Pool and Spa Marketing, 2003), or about 7% of all households. The actual operational and discharge behaviors of pool owners remains poorly understood, so it is difficult to characterize the magnitude of the pool discharge problem.



Figure 2: Aerial Photo Showing High Density of Swimming Pools (~30%) in a Neighborhood

Variation in Pool Discharge

While the greatest pool density is found in warmer regions, the actual discharge problem may be more acute in northern regions where pools must be drained before the onset of winter. Key neighborhood factors include local plumbing codes that govern how discharge water is handled, the overall density of pools in the subwatershed, and their age.

Techniques to Change the Behavior

Most pool owners understand that regular maintenance is essential to keep a pool safe and clean, and they probably conduct more water quality monitoring as a group than any other segment of society. Therefore, they may be more receptive to changing discharge behaviors with proper education. Some techniques include:

- Conventional outreach techniques on proper discharge (pamphlets, water bill inserts, posters)
- Educational kiosks at the retail outlets where they purchase pool chemicals
- Changes in local plumbing codes to require discharge to sanitary sewer systems
- Adoption of water quality ordinances that allow for fines/enforcement for unsafe pool discharges
- Inspections (done in conjunction with regular local health and safety inspections)

Good Examples

State of Maryland Pool Permit. The State has developed a general permit to govern pool discharges. The general discharge permit, developed by the Maryland Department of the Environment, addresses discharges from both swimming pools and spas. It can be found at: http://www.mde.state.md.us/assets/document/permit/MDE-WMA-PER070-SI.pdf

Top Resources

Guidelines for Swimming Pool and Spa Owners and Operators
http://www.montgomerycountymd.gov/mc/services/dep/Enforcement/pools.htm

Oregon Department of Environmental Quality (ODEQ). 1997. Water Quality Permit Program: Guidance for Swimming Pool and Hot Tub Discharges.
http://www.deq.state.or.us/wq/wqpermit/swimpools.pdf

US EPA National Menu of Best Management Practices for Storm Water Phase II: Alternative Discharge Options for Chlorinated Water. Office of Wastewater Management
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_1.cfm

Sacramento County Stormwater Utility. Proper Disposal of Pool Water.
http://www.sactostormwater.org/documents/pool_brochure_03.pdf

N-12	Neighborhood Source Area: Driveway	
	DRIVEWAY SWEEPING	

Description

The ideal watershed behavior is to regularly sweep driveways and sidewalks and dispose of sweepings in the trash. The negative behavior is to use hoses or leaf blowers to clean off driveways and sidewalks that direct dirt and organic matter into the street or storm drain system.

How Driveway Cleaning Influences Water Quality

Source area research has indicated that driveways are a significant source of sediment, nutrients and metals in urban neighborhoods (CWP, 2003). Broom sweeping and disposal can reduce wash-off of accumulated pollutants during subsequent storms. On the other hand, hosing and blowing tend to move pollutants to the street and gutters, where they have a greater chance of reaching the stream (Figure 1).



Figure 1: Power Washing of a Driveway

Percentage of Homeowners Engaging in Driveway Cleaning

Residential driveway and sidewalk cleaning behaviors are poorly understood. Rough estimates that show 15% of residents using hoses and an additional 10% using leaf blowers to clean driveways and sidewalks appear to be conservative. The recent growth in the use of motorized leaf blowers has been quite rapid. The Outdoor Power Equipment Institute (2003) reports annual sales of more than 1.5 million units and indicates that leaf blowers are the fastest growing segment of the industry. To date, most environmental concerns about leaf blowers have focused on noise and air quality emissions; their role in re-suspending pollutants is poorly understood.

Variation in Driveway Cleaning

Regional and climatic factors play a strong role in determining the frequency of driveway cleaning. Since storms occur more rarely in regions with arid and semi-arid climates, particles and organic matter accumulate longer on driveway and sidewalk surfaces, which often prompts more frequent cleaning. By contrast, frequent storms in more humid regions often clean off driveway and sidewalk surfaces themselves. A number of neighborhood factors also influence driveway cleaning behaviors, including driveway dimensions, the nature of driveway surfaces, forest canopy coverage, and the nature of the storm water conveyance system. If a neighborhood has open section roads with grass swales, the impact of driveway cleaning may be less.

Difficulty in Changing Driveway Cleaning Behavior

Driveway cleaning is also a hard behavior to change, since hosing and leaf blowing are often faster and more convenient ways to get the job done. Few residents understand that their driveway is often directly connected to street gutters, and eventually, the urban stream. Lastly, few communities have emphasized the importance of educating residents and landscape contractors about the water quality impacts of driveway cleaning behaviors. Consequently, greater effort is needed to increase residential awareness about the water quality consequence of hosing and leafblowing.

Techniques to Change Car Washing Behavior

Not many communities have targeted driveway cleaning as an important residential watershed behavior. As a result, only a few innovative techniques have been developed for driveway cleaning behavior so far, including:

- Media campaigns to increase awareness about water quality impacts of driveway cleaning (billboards, posters, etc.)
- Conventional outreach materials (brochures, posters, water bill inserts)
- Landscaping contractor training or certification programs that emphasize proper leaf blower use

Top Resources

Tips on Cleaning Driveways, Decks, Sidewalks and Patios
http://www.thinkbluesd.org/brochures/Impervious_Surfaces.pdf

Stormwater Management for Homeowners
http://legacy.eos.ncsu.edu/eos/info/bae/cont_ed/bmp/readings/stormwaternov05.pdf.

N-15	Neighborhood Source Area: Driveway	
	CAR FLUID RECYCLING	

Description

The ideal watershed behavior is to have automotive fluids changed at a commercial operation where stringent pollution source controls and fluid recycling practices are in place. The next best alternative is to perform car maintenance under cover within the garage, and carefully dispose of all oil, antifreeze and other fluids at approved recycling facilities. The negative behavior is to improperly store, dump or otherwise dispose of car fluids into the storm drain system.

How Fluid Changing Influences Water Quality

Dumping automotive fluids down storm drains can be a major water quality problem, since only a few quarts of oil or a few gallons of antifreeze can have a major impact on small streams. Dumping can be a major source of hydrocarbons, oil/grease, metals, xylene and other pollutants to a stream, and are potentially toxic if dumped during dry-weather conditions when existing flow cannot dilute these discharges. The major culprit has been the backyard mechanic who changes his or her own automotive fluids (Figure 1). It has been estimated that do-it-yourself mechanics improperly dispose of 192 million gallons of used oil into the environment each year (University of Missouri, 1994). It remains unclear what fraction of the improper disposal of motor oil occurs within the storm drain system.



Figure 1: Fluid Changing on Driveway

Percentage of People Engaging in Improper Disposal

The number of backyard mechanics who change their own oil and antifreeze has been dropping steadily in recent decades. With the advent of the $20 oil change, only about 30% of car owners still change their own oil or antifreeze (Swann, 2001). Backyard mechanics have traditionally been the target of community oil recycling and storm drain marking programs. These programs appear to have been quite effective, since more than 80% of backyard mechanics claim to dispose of or recycle these fluids properly (Smith, 1996; PRG, 1998; Assing, 1994). Most backyard mechanics were more prone to recycle oil than antifreeze. Backyard mechanics that indicated they had improperly disposed of automotive fluids reported that they dumped it into trashcans rather than the storm drain system. Oil and antifreeze dumping is considered socially unacceptable in many communities, and, according to Swann (2001), less than 5% of backyard mechanics report that they illegally dump oil.

Variation in Car Fluid Disposal

Neighborhood demographic and income levels appear to be important factors governing the number of "do-it-yourselfers" in a given subwatershed. As with other residential behaviors, proper disposal of oil and anti-freeze is primarily influenced by the ease, convenience and costs for accepting these fluids at local service stations or municipal collection stations.

Techniques to Change Car Fluid Disposal

While used oil collection has been a common municipal service for many years, some communities are continuously refining their programs to increase participation (Figure 2). These techniques include:

- Conventional outreach materials provided at point of sale (e.g., auto parts stores, service stations)
- Multilingual outreach materials
- Community oil recycling
- Directories of used oil collection stations
- Free or discounted oil disposal containers
- Storm drain marking



Figure 2: Frisbee Advertising Oil Recycling

Good Examples

King County Kiosks (Washington). Thirty interactive kiosks on oil recycling were placed in King County licensing offices, county buildings and other locations. In addition, a direct mail campaign to 6,000 households and three newspaper ads were used to distribute coupons good for product or service discounts that could be used when dropping off oil at participating sites.

California's Used Oil Recycling Program Incentive Program. Residents can receive incentives from certified centers that recycle used oil. Certified centers must accept used oil from the public at no charge during business hours and offer a $0.16 per gallon recycling incentive. In turn, only certified used oil collection centers can file a claim for recovery of the $0.16 per gallon it pays out. Certified centers can also claim the recycling incentive for all used oil generated on site from their business as an inducement to take oil from the public. http://www.ciwmb.ca.gov/BoardInfo/ProgramResp/SpecialWaste/HHW.htm - Public%20Info

Top Resources

Car Care for Do-It-Yourselfers
http://www.monterey.org/publicworks/carcare.html

Car Care for Cleaner Water
http://www1.uwex.edu/ces/pubs/pdf/GWQ019.PDF

Motor Vehicle Maintenance
http://www2.ctahr.hawaii.edu/oc/freepubs/pdf/HH-15.pdf

How To Set Up a Local Program to Recycle Used Oil - Explains the organization, design, implementation, and promotion of a used oil program, as well as administrative issues. Includes sample brochures and letters.
http://www.epa.gov/epaoswer/non-hw/recycle/89039a.pdf

N-16	Neighborhood Source Area: Rooftop	
	DOWNSPOUT DISCONNECTION	

Description

Downspout disconnection spreads rooftop runoff from individual downspouts across the lawn or yard where it filters or infiltrates into the ground. While some disconnections are simple, most require the installation of an on-site storm water retrofit practice. These simple practices capture, store and infiltrate storm water runoff from residential lots, and include rain barrels, rain gardens, French drains or dry wells. *Rain barrels* capture runoff from rooftops and are typically installed on individual roof leaders. Runoff captured in the barrel is stored for later use as supplemental irrigation. *Rain gardens* are shallow, landscaped depressions in the yard used to store and infiltrate runoff from rooftops and other impervious surfaces on the lot. *French drains and dry wells* are shallow small stone trenches used to infiltrate rooftop runoff into the ground, where soils are permeable. More details about on-site retrofit practices can be found in Profile Sheets 0S-15 through 0S-17 in Manual 3.

The ideal watershed behavior is to disconnect all downspouts so individual rooftops deliver no runoff to the storm drain system or stream. The negative watershed behavior is to pipe downspouts across the yard and into the curb or street in order to promote positive drainage (Figure 1).

How Downspout Disconnection Influences Subwatershed Quality

Downspout disconnection reduces the amount of impervious cover on a developed lot that can generate stormwater runoff. In addition to reducing the volume of runoff, downspout disconnection promotes groundwater recharge, reduces storm water runoff volumes, and filters out pollutants through the lawn soil. Since each individual retrofit for downspout disconnection treats only a few hundred or thousand square feet of impervious cover, dozens or hundreds are needed to make a measurable difference at the subwatershed level. Consequently, an intensive campaign to target education, technical assistance, and financial resources within a neighborhood or subwatershed to encourage widespread adoption of disconnection is needed.

Percentage of Residents Engaging in Downspout Disconnection

Data is not currently available to estimate the rate at which homeowners voluntarily disconnect downspouts. The frequency of this behavior is thought to be extremely low in most neighborhoods unless a community aggressively promotes and subsidizes disconnections. If this occurs, homeowner participation rates of 20 to 30% have been reported in pilot projects (Environment Canada, 2001).



Figure 1: Downspout Intentionally Bypassing Landscaped Area and Draining onto Driveway

Variation in Downspout Disconnection

The potential to disconnect downspouts is normally evaluated as part of the Neighborhood Source Assessment component of the USSR survey (see Manual 11). The most important neighborhood factor is the proportion of existing homes directly connected to the storm drain system. Negative neighborhood factors include the presence of basements, compacted soils, and poor neighborhood awareness or involvement. Positive factors are large rooftop areas that are directly connected to the storm drain system, lots with extensive tree canopy, and good neighborhood housekeeping. In general, large residential lots are most suitable for most disconnection retrofits (1/4 acre lots and larger), although rain barrels can be used on lots as small as 4,000 square feet (Figure 2).

To date, the impetus for most disconnection retrofit programs has been to separate residential storm water from sewer flows in older neighborhoods in order to minimize basement sewer backups or combined sewer overflows.

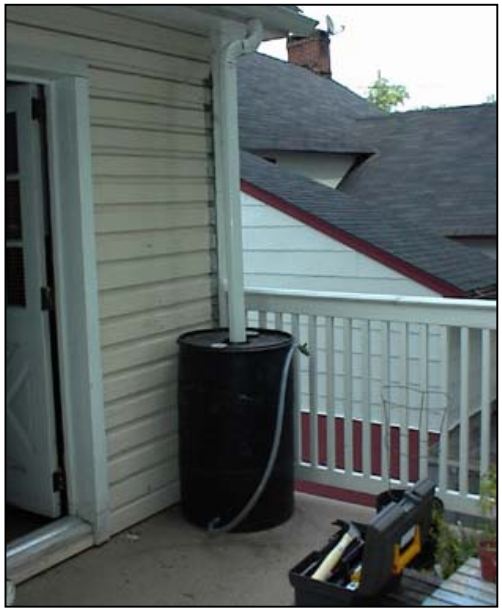


Figure 2: Rain Barrel Used on a Back, Second Floor Balcony

Techniques to Promote Downspout Disconnection

Communities are experimenting with many different carrots to promote disconnection retrofits, including:

- Conventional outreach materials (flyers, brochures, posters)
- Free or discounted rain barrel distribution
- Municipal or schoolyard demonstration projects
- Credits or subsidies for disconnection retrofits
- Direct technical assistance
- Provision of discounted mulch, piping or plant materials
- Modification of sewer and storm water ordinances to promote disconnection
- Mandatory disconnection for targeted subwatersheds

Good Examples

Downspout Disconnection Program (Portland, OR). The City offers residents a credit of $53 per disconnection in the form of a check or a one-time lump sum credit toward their sewer bill after inspection and approval of the work. In addition, neighborhood associations and other civic groups (churches, schools, etc.) can earn $13 for every downspout they disconnect. http://www.cleanrivers-pdx.org/get_involved/downspout_disconnection.htm

Rain Blocker Program (*City of Chicago)*. The Rain Blocker pilot program is specifically designed to eliminate or greatly reduce the amount of basement flooding caused by sewer surcharge. The program works by restricting the rate of storm water flow into the city sewer system, via installing vortex restrictors within the catch basins of city streets and through downspout disconnection from buildings. http://www.cityofchicago.org/WaterManagement/sewers.html

Pilot Disconnection Program (Toronto) http://www.ene.gov.on.ca/envision/gp/4224e_3.htm

Neighborhood Rain Gardens (Minneapolis, MN). This program works with neighborhood associations to encourage landscaping for rainwater management. The Fulton Neighborhood Association has worked with eight homeowners to install rain gardens, rain barrels, gutter downspout redirection, and infiltration systems that reduce runoff delivered from individual properties to streets, alleys and sidewalks.
http://www.fultonneighborhood.org/lfrwm.htm

Top Resources

How to Disconnect Your Downspouts (Portland Oregon)
http://www.cleanrivers-pdx.org/get_involved/downspout_disconnection.htm

Milwaukee Downspout Disconnection Program
http://www.mmsd.com/projects/downspout.cfm

Boston Water and Sewer Commission's Downspout Disconnection Program
http://www.bwsc.org/Customer_Service/Programs/downspout.htm

RainGardens.org
http://www.raingardens.org/

Rain Gardens: A how-to manual for homeowners
http://www.dnr.state.wi.us/org/water/wm/dsfm/shore/documents/rgmanual.pdf

Rain Garden Applications and Simple Calculations
http://www.cwp.org/Community_Watersheds/Rain_Garden.htm

How to Build and Install a Rain Barrel
http://www.cwp.org/Community_Watersheds/brochure.pdf

Transitions Landscape and Design: Constructing a French Drain
http://www.transitionslandscape.com/grading_drainage.html

Skills for Protecting Your Stream: Retrofitting Your Own Backyard
http://www.cwp.org/Community_Watersheds/Retrofitting_Backyard.pdf

N-21	Neighborhood Source Area: Common Areas	
	STORM DRAIN MARKING	

Description

The ideal watershed behavior is to get residents to fully understand the connection between storm drains and downstream waters and avoid any activity that discharges pollutants. This awareness is most often created by marking or stenciling storm drain inlets with a "Don't dump, drains to..." message (Figure 1). The negative watershed behavior is to use storm drains as a means of disposal for trash, yard waste and household products.

How Storm Drain Marking Influences Water Quality

Storm drain marking sends a clear message to keep trash and debris, leaf litter and organic matter out of the storm drain system. Stencils may also reduce residential spills and illicit discharges. Marking is also a direct and local way to increase watershed awareness and practice neighborhood stewardship. The actual water quality benefits of storm drain marking have yet to be demonstrated through field research or monitoring. Still, marking is always a sign of good neighborhood housekeeping. Santa Monica, CA also marks the hotline phone number on storm drains to report water quality problems and illegal dumping.

Percentage of Residents Engaging in Storm Drain Marking

This behavior does not require extensive resident participation; only a few trained volunteers are needed to thoroughly mark storm drains within a neighborhood. Volunteers can include scouts, service groups, high school students, neighborhood associations, and other volunteers. Normally, marking is "sanctioned" by the local public works authority or environmental agency, so it is important to coordinate closely with them (Figure 2). Table 1 provides guidance for marking storm drains.

Factors to Consider in Storm Drain Marking

The only significant impediment to storm drain marking is when a neighborhood is primarily served by open channels or grassed channels, rather than enclosed storm drains.



Figure 1: Storm Drain Marking



STORMWATER POLLUTION —WHAT IS IT?

Runoff from rainstorms is called stormwater. Stormwater becomes polluted by flowing over dirty surfaces, like parking lots, or when someone dumps materials, like oil or paint, directly into the storm drain. Polluted stormwater flows without treatment directly to creeks and rivers, where it can be harmful to aquatic life.

IT'S ILLEGAL TO DISCHARGE POLLUTANTS

Intentionally or unintentionally causing materials to enter the storm drain system is illegal and can result in corrective penalties. The following is a partial list of materials that are prohibited for discharge into the storm drain:

Paint
Concrete mix
Motor oil
Antifreeze
Yard waste
Chlorinated pool water
Rinse water from clothes washers

CURB WHAT FLOWS TO THE CREEKS

HOW TO GET A FREE STENCILING KIT

To obtain a stenciling kit, or for more information about controlling stormwater pollution, contact your local stormwater agency or check out their website:

County of Sacramento www.sactostormwater.org	(916) 874-6851
City of Sacramento www.sacstormwater.org	(916) 433-6369
City of Elk Grove	(916) 478-2232
City of Citrus Heights	(916) 727-4769
City of Folsom	(916) 355-7272
City of Elk Grove	(916) 478-2232
City of Galt	(209) 366-7260

To report illegal discharge to the storm drain or creeks in your area, call:

NON-EMERGENCY	
County of Sacramento	(916) 875-RAIN (7246)
City of Sacramento	(916) 264-5011
City of Citrus Heights	(916) 875-RAIN (7246)
City of Elk Grove	(916) 875-RAIN (7246)
City of Folsom	(916) 355-7230
City of Galt	(209) 366-7260

EMERGENCY ONLY	911

PROTECT *the* ENVIRONMENT

PAINT-A-DRAIN CAMPAIGN

Storm drain stenciling sends a clear "No Dumping" message

SACRAMENTO STORMWATER MANAGEMENT PROGRAM

Figure 2: Educational Brochure on Storm Drain Marking/Stenciling

Source: http://www.sactostormwater.org/documents/stencil_brochure_03.pdf

Table 1: Storm Drain Marking Guidance
• Enlist one person to serve as the team leader, and make sure he/she knows all marking rules and safety procedures. • Review all safety procedures before marking. • Marking should be performed by at least two people, so one can be on the lookout for oncoming vehicles. Safety vests and traffic cones can be used to alert vehicles. • Remember to wear old cloths and shoes. • Bring paper towels or a rag to wipe up and two trash bags – one for the wet stencil (when necessary), which is not garbage, and one to pick-up garbage along the way. • Keep track of all storm drain stencils and turn this information over to the team leader or the appropriate local government agency. • Do not mark any storm drains with vehicles parked nearby. • Record the locations of any storm drains that have leaves, grass clippings, oil, or other pollutants. • Properly dispose of all trash at the end of the day, and return all empty paint cans and supplies to the team leader.
Information adapted from the following websites: *http://www.deq.state.la.us/assistance/litter/stormdrain.htm* *http://www.tnrcc.state.tx.us/admin/topdoc/gi/212.pdf*

Top Resources

Texas Natural Resource Conservation Commission's Storm Drain Stenciling: A Guide for Communities. This extensive guide includes information on how to get volunteers involved, guidelines and materials for marking, reviews of five marking programs, and sample recognition certificates, press releases, door hangers, and public service announcements.
http://www.tnrcc.state.tx.us/exec/sbea/education.html

The Urban Dweller's Guide To Watersheds
http://www.museumca.org/creeks/umbrella.html

University of Wisconsin-Extension Water Resources Program Storm Drain Stenciling Web Page
http://clean-water.uwex.edu/wav/stormdrain/index.htm

Earthwater Stencils Home Page
http://www.earthwater-stencils.com/

Storm Drain Stenciling Project Guidelines
http://www.epa.gov/adopt/patch/html/guidelines.html
The Ocean Conservancy's Storm Drain Sentries
http://www.oceanconservancy.org/dynamic/learn/programs/sentries/sentries.htm

South Carolina Department of Health and Environmental Control's Water Watch Campaign: Conducting a Storm Drain Tagging Project
http://www.scdhec.net/water/pubs/wwtag2.pdf

Multilingual Storm Drain Stenciling GreenSpace Partners worked with local watershed groups and volunteers to stencil storm drains with messages in English, Somali and Spanish.
http://www.greeninstitute.org/GSP/programs/stormwater/stencils/stencils.html

North Carolina's Storm Drain Stenciling Project This project was piloted in 1994 along coastal NC watersheds and has received support from many state and national organizations and has received the "Take Pride in North Carolina" Award.
http://www.bae.ncsu.edu/bae/programs/extension/wqg/smp-18/stormdrain/

H-3	Hotspot Source Area: Vehicles	
	VEHICLE WASHING	

Description

Vehicle washing pollution prevention practices apply to many commercial, industrial, institutional, municipal and transport-related operations. Vehicle wash water may contain sediments, phosphorus, metals, oil and grease, and other pollutants that can degrade water quality. When vehicles are washed on impervious surfaces such as parking lots or industrial areas, dirty wash water can contaminate storm water that ends up in streams.

Application

Improved washing practices can be used at any facility that routinely washes vehicles. Examples include commercial car washes, bus depots, car dealerships, rental car companies, trucking companies, and fleet operations. In addition, washing dump trucks and other construction equipment can be a problem. Washing operations tend to be unevenly distributed within urban subwatersheds. Vehicle washing also occurs in neighborhoods, and techniques to keep wash water out of the storm drain system are discussed in the car washing profile sheet (N-11). Table 1 reviews some of the pollution prevention techniques available for hotspot vehicle washing operations.

Primary Training Targets

Owners, fleet managers, and employees of operations that include car washes are the primary training target.

Feasibility

Vehicle washing practices can be applied to all regions and climates. Vehicle washing tends to occur more frequently in summer months and in drier regions of the country. Sound vehicle washing practices are not always used at many sites because operators are reluctant to change traditional cleaning methods. In addition, the cost of specialized equipment to manage high volumes of wash water can be too expensive for small businesses.

Improved vehicle washing practices are relatively simple to implement and are very effective at preventing storm water contamination. Training is essential to get owners and employees to adopt these practices, and should be designed to overcome cultural and social barriers to improved washing practices.

Table 1: Pollution Prevention Practices for Vehicle Washing

- Wash vehicles at indoor car washes that recycle, treat or convey wash water to the sanitary sewer system
- Use biodegradable, phosphate-free, water-based soaps
- Use flow-restricted hose nozzles that automatically turn off when left unattended
- Wash vehicles on a permeable surface or a washpad that has a containment system
- Prohibit discharge of wash water into the storm drain system or ground by using temporary berms, storm drain covers, drain plugs or other containment system
- Label storm drains with “No Dumping” signs to deter disposal of wash water in the storm drain system
- Pressure and steam clean off-site to avoid runoff with high pollutant concentrations
- Obtain permission from sewage treatment facilities to discharge to the sanitary sewer

Implementation Considerations

The ideal practice is to wash all vehicles at commercial car washes or indoor facilities that are specially designed for washing operations. Table 2 offers some tips for indoor car wash sites. When washing operations are conducted outside, a designated wash area should having the following characteristics:

- Paved with an impervious surface, such as Portland cement concrete
- Bermed to contain wash water
- Sloped so that wash water is collected and discharged to the sanitary sewer system, holding tank or dead-end sump
- Operated by trained workers to confine washing operations to the designated wash area

Outdoor vehicle washing facilities should use pressurized hoses without detergents to remove most dirt and grime. If detergents are used, they should be phosphate-free to reduce nutrient loading. If acids, bases, metal brighteners, or degreasing agents are used, wash water should be discharged to a treatment facility, sanitary sewer, or a sump. In addition, waters from the pressure washing of engines and vehicle undercarriages must be disposed of using the same options.

Table 2: Tips for Indoor Car Wash Sites
(Adapted from U.S. EPA, 2003)

- Facilities should have designated areas for indoor vehicle washing where no other activities are performed (e.g. fluid changes or repair services)
- Indoor vehicle wash areas should have floor drains that receive only vehicle washing wastewater (not floor washdown or spill removal wash waters) and be connected to a holding tank with a gravity discharge pipe, to a sump that pumps to a holding tank, or to an oil/grit separator that discharges to a municipal sanitary sewer
- The floor of indoor vehicle wash bays should be completely bermed to collect wash water
- Aromatic and chlorinated hydrocarbon solvents should be eliminated from vehicle-washing operations
- Vehicle-washing operations should use vehicle rinsewater to create new wash water through the use of recycling systems that filter and remove grit.

Discharge to pervious areas may be an option for washing operations that generate small amounts of relatively clean wash water (water only - no soaps, no steam cleaning). The clean wash water should be directed as sheet flow across a vegetated area to infiltrate or evaporate before it enters the storm drain system. This option should be exercised with caution, especially in environmentally sensitive areas or protected groundwater recharge areas.

The best way to avoid stormwater contamination during washing operations is to drain the wash water to the sanitary sewer system. Operations that produce high volumes of wash water should consider installing systems that connect to the sewer. Other options for large and small operations include containment units to capture the wash water prior to transport away for proper disposal (Figure 1). If vehicles must be washed on an impervious surface, a storm drain filter should be used to capture solid contaminants.

Cost - The cost of using vehicle-washing practices can vary greatly and depends on the size of the operation (Table 3). The cost of constructing a commercial grade system connected to the sanitary sewer can exceed $100,000. Disposal fees and frequency of washing can also influence the cost. Training costs can be minimized by using educational



Figure 1: Containment System Preventing Wash Water from Entering the Storm Drain

materials available from local governments, professional associations or EPA's National Compliance Assistance Centers (http://www.assistancecenters.net/). Temporary, portable containment systems can be shared by several companies that cannot afford specialized equipment independently.

Table 3: Sample Equipment Costs for Vehicle Washing Practices

Item	Cost
Bubble Buster	$2,000 –2,500*
Catch basin insert	$65*
Containment mat	$480-5,840**
Storm drain cover (24" drain)	$120.00 **
Water dike/ berm (20 ft)	$100.00 **
Pump	$75-3,000**
Wastewater storage container	$50-1,000+**

*Source: *U.S. EPA, 1992 **Robinson, 2003*

Resources

EPA FedSite Virtual Facility Regulatory Tour, Vehicle Maintenance Facility Tour. Vehicle Washing - P2 Opportunities http://www.epa.gov/fedsite/vmf/p2vehwash.html

Alachua County Pollution Prevention Fact Sheet: Best Management Practices for Controlling Runoff from Commercial Outdoor Car Washing. http://environment.alachua-county.org/Natural_Resources/Water_Quality/Documents/Commercial Outdoor Car Wash.pdf.

Kitsap County Sound Car Wash Program. http://www.kitsapgov.com/sswm/carwash.htm.

Washington Department of Ecology. 1995. Vehicle and Equipment Wash Water Discharges: Best Management Practices Manual. Olympia, Washington. http://www.ecy.wa.gov/pubs/95056.pdf

U.S. Environmental Protection Agency. Pollution Prevention/Good Housekeeping for Municipal Operations. http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/poll_18.cfm. Website Accessed 2004.

California Stormwater Quality Association. 2003 California Stormwater BMP Handbook: Industrial and Commercial. http://www.cabmphandbooks.com/

H-11	Hotspot Source Area: Physical Plant	
	PARKING LOT MAINTENANCE	

Description

Parking lots are associated with nearly every commercial, industrial, institutional, municipal and transport-related operation in a subwatershed. Each lot requires annual maintenance, including litter pickup, sweeping, pothole repair, power-washing, steam cleaning, de-greasing, re-striping, and re-surfacing. Several maintenance operations have the potential to pollute storm water runoff if sensible pollution prevention practices are not employed. This is particularly true for power washing, which can deliver sediment, nutrients, hydrocarbons, and other pollutants to the storm drain system. Less is known about the storm water impacts of parking lot re-sealing and re-surfacing operations, but anecdotal data suggests that they could be a significant source of polycyclic aromatic hydrocarbons under certain conditions.

Application

In general, power washing and steam cleaning are conducted more frequently at commercial and retail parking lots in high visibility locations, airport runways and some industrial parking lots. When evaluating these operations, it is helpful to interview mobile vendors about the kinds of parking lots they maintain most often. Several factors help determine whether this pollution prevention practice should be applied to a parking lot, including the size and usage of the lot, the pavement condition, and whether it is directly connected to the storm drain system.

Primary Training Targets

Training targets include property managers; facility engineers; and sweeping, steam cleaning, power-washing, asphalt re-surfacing, and sealing contractors.

Table 1: Pollution Prevention Practices for Parking Lot Maintenance

- Use dry methods such as absorbents, brooms, or wire brushes to clean pavement surfaces where possible
- Mechanically remove loose debris before washing or power washing the lot
- Pressure wash pavement only when needed, and avoid using acids, soaps, solvents and other cleaning agents. Also, block adjacent storm drains, contain and collect wash water for disposal in the sanitary sewer or other appropriate disposal method
- Filtering of wash water at the storm drain inlet may be acceptable if no soaps are used. Direct runoff from pressure washing operations over a grassy area or to a bermed area where it can be collected for disposal in the sanitary sewer system
- Cover and seal nearby storm drain inlets and manholes before applying sealant to parking lot surfaces, and only apply sealants when no precipitation is forecast
- Conduct surface repair work during dry weather, where possible
- Post signs in parking areas to control litter and prohibit automobile maintenance or washing in the parking lot
- Inspect and cleanout catch basins and storm water treatment practices routinely to remove sediment and pollutants (see Profile Sheet M-2 in Manual 9)

Feasibility

Parking lot maintenance practices can be applied in all regions of the country, and sweeping and power washing are commonly used for aesthetic reasons in many large parking areas. Many facilities contract out their parking lot maintenance work to small businesses, such as mobile washers and sweeping companies. These contractors should be the primary target of training and education on parking lot pollution prevention practices.

Changing the mindset of contractual maintenance employees and facility managers can be a challenge to implementing this practice, so some communities have included specific language in their storm water ordinances regulating pavement cleaning to prevent discharges to the storm drain.

Implementation Considerations

Parking lot pollution prevention focuses mainly on two maintenance practices: power washing and sweeping. Dry cleanup of parking lots is preferred to any wash down activity, since washing can introduce oils and heavy metals into the storm drain system (Figure 1). For small and medium-sized lots, dry cleanup can be done using a broom, or a mop and a bucket of warm water (which is disposed of in the sanitary sewer). Larger lots can be cleaned using sweeper technologies (see Profile Sheet M-1 in Manual 9). The frequency of parking lot sweeping should be based on usage and field observations of waste accumulation.



Figure 1: Parking Lot Power Washing

Cost - Parking lot pollution prevention is generally a low-cost practice, focused on simple operational changes to reduce discharges to the storm drain system. The main cost associated with this practice is employee training.

Resources

Alameda Countywide, CA Clean Water Program: Parking Lots
http://www.cleanwaterprogram.com/parking_lots_fact_sht.pdf

Fort Worth, TX Mobile Commercial Cosmetic Cleaning Fact Sheet for Power Washers
http://www.fortworthgov.org/DEM/factsheet.htm

City of Carlsbad, CA Best Management Practices for Power Washing
http://www.ci.carlsbad.ca.us/cserv/publicworks/comstormpdf/mobilewashing.pdf

North Central Texas Council of Governments Building Maintenance BMP Fact Sheet
http://www.dfwstormwater.com/P2/PDF/p2bldg_bmps.pdf

REGIONAL STORMWATER MANAGEMENT

Stormwater, especially polluted or contaminated stormwater, is always a key area for concern in the management of a watershed. Anything that enters a stormwater drain, be it a pipe or an open swale, goes directly into the water without any filtration or treatment. While it is possible to control many of the impacts of stormwater by structural methods (See below), there are a great many non-structural best management practices, which can positively impact overall water quality. Raising public awareness of stormwater issues is possibly one of the most effective ways to improve water quality within the watershed. Some of the non-structural measures which can be useful in watershed management include:

- Protect and enhance existing riparian buffer areas.
- Revegetate disturbed areas using native species (See below).
- Minimize soil disturbance associated with construction and agriculture.
- Minimize use of pesticides and herbicides near watercourses.
- Encourage use of commercial car washes as they treat and/or recycle water.
- Encourage recycling of automotive fluids such as oil and antifreeze.



Structural Stormwater Measure



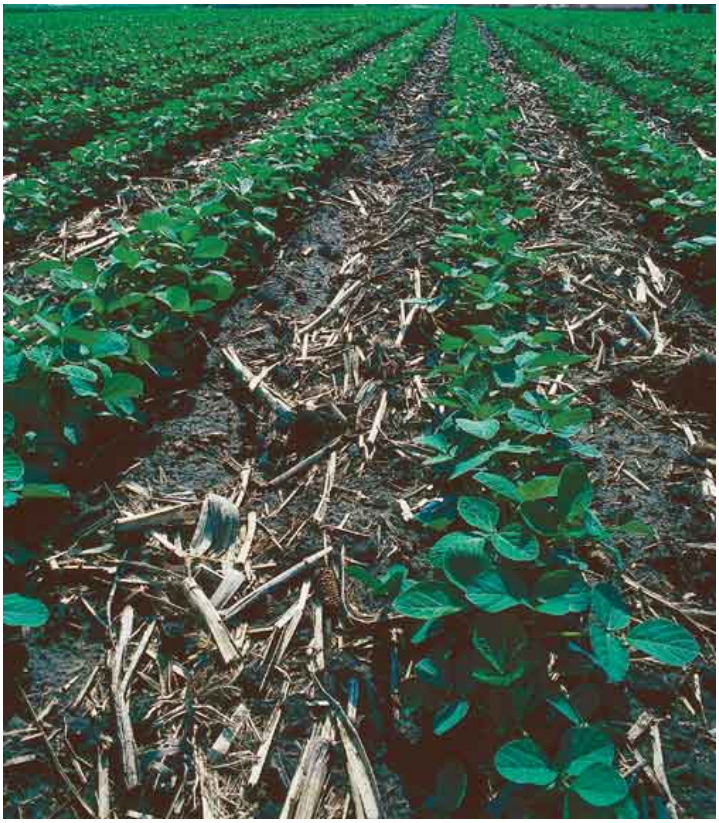
Revegetation

CONSERVATION TILLAGE

Sediment is the number one non-point source pollutant in the United States. Traditional cropping practices leave the soil surface exposed and more prone to erosion and sediment-laden runoff. Conservation tillage and residue management practices provide benefits in terms of reduced soil erosion, increased infiltration and a reduction in the amount of sediment transported to surface waters.

The three most common conservation tillage practices used are:

- No till / Strip till – in which all crop residues remain on the surface and no more than 10 percent of the soil surface is disturbed during planting.
- Mulch till – in which at least 30 percent of crop residue cover remains after planting. (See below).
- Ridge till – the practice in which crops are planted into ridges alternated with furrows protected by crop residues.



Mulch Tilling

GRAZING MANAGEMENT

One of the major sources of impacts on water quality can be poor grazing management practices within the stream corridor. Areas of impact can include stream bank stability, riparian vegetation, stream habitat, nutrient loading and sedimentation. Potential measures to minimize the impacts include:

- Stabilized stream crossings
- Exclusion fencing (See below).
- Provision of water and salt supplements away from the stream
- Encourage use of upland pastures



Exclusion Fencing

ANIMAL FEEDING OPERATIONS

Animal feeding operations have the potential to significantly impact water quality within a watershed through surface runoff, accumulated animal wastes and facility wastewater disposal. Management techniques useful for minimizing the associated impacts include:

- Proper location of facilities away from watercourses
- Diversion of clean water away from operations & generally keeping clean water separate from dirty water
- Appropriate waste storage practices which may include dikes, sediment basins or treatment lagoons
- Use of constructed treatment wetlands for purposes of water quality improvement
- Protecting heavy use areas by means of vegetative cover, structures or suitable surfacing



APPENDIX I

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTEES

APPENDIX I
NPDES PERMITTEES - NON-MUNICIPAL SEWAGE (PA DEP, 2005)

Permit No.	Facility	County	Municipality	Facility ID	Stream
PA0030473	FAIRVIEW ELEM	York	Fairview Township	SN	Yellow Breeches Creek
PA0081060	MEADOWBROOK MHP	York	Fairview Township	SN	Yellow Breeches Creek
PA0081361	MEMPHORD ESTATES	York	Monaghan Township	SN	Stony Run
PA0081795	WILLIAMS GROVE MHP	Cumberland	Monroe Township	SN	Yellow Breeches Creek
PA0081876	AUDUBON VILLAGE MHP	York	Monaghan Township	SN	Yellow Breeches Creek
PA0082911	WELLINGTON HEIGHTS	York	Monaghan Township	SN	Yellow Breeches Creek
PA0087114	CALVO, MANOLO & ROSALIE	York	Carroll Township	SN	Stony Run

APPENDIX I
NPDES PERMITTEES - STORMWATER DISCHARGES (PA DEP, 2005)

Permit No.	Facility	County	Municipality	Facility ID	Stream
PAR123503	QUAKER OATS	Cumberland	Hampden Township	SWI	Cedar Run
PAR123546	ADM ALLIANCE NUTRITION	Cumberland	Camp Hill Borough	SWI	Not Available
PAR123556	DAIRY FARMERS OF AMERICA	Cumberland	Lower Allen Township	SWI	Cedar Run
PAR123557	KEEBLER DISTR CTR 465	Cumberland	Mechanicsburg Borough	SWI	Cedar Run
PAR203519	KEYSTONE RAILWAY EQUIP	Cumberland	Lower Allen Township	SWI	Cedar Run
PAR203521	TRUE TEMPER HARDWARE	Cumberland	Hampden Township	SWI	Not Available
PAR213510	ATLAS ENERGY ROOFING PLT CAMP HILL	Cumberland	Camp Hill Borough	SWI	Not Available
PAR233530	LOWER ALLEN TWP LEAF COMPOSTING	Cumberland	Lower Allen Township	SWI	Cedar Run
PAR503505	WASTE MGMT CAMP HILL TRANSF	Cumberland	Hampden Township	SWI	Cedar Run
PAR603568	NEW CUMBERLAND AUTO PARTS	York	Fairview Township	SWI	Not Available
PAR803512	ARNOLD TRUCKING TERMINAL	Cumberland	Camp Hill Borough	SWI	Not Available
PAR803514	WARD TRUCKING CAMP HILL	Cumberland	Lower Allen Township	SWI	Cedar Run
PAR803647	NEW PENN TRUCKING TERM CAMP HILL	Cumberland	Camp Hill Borough	SWI	Not Available

APPENDIX I
NPDES PERMITTEES - MUNICIPAL SEWAGE (PA DEP, 2005)

Permit No.	Facility	County	Municipality	Facility ID	Stream
PA0023183	MT HOLLY SPRINGS STP	Cumberland	Mount Holly Springs Borough	SP	Mountain Creek
PA0024431	DILLSBURG STP	York	Dillsburg Borough	SP	Dogwood Run
PA0024902	UPPER ALLEN TWP STP	Cumberland	Upper Allen Township	SP	Yellow Breeches Creek
PA0027189	LOWER ALLEN STP	York	Lower Allen Township	SP	Susquehanna River
PA0044113	SOUTH MIDDLETON STP	Cumberland	South Middleton Township	SP	Yellow Breeches Creek
PA0024287	FAIRVIEW TOWNSHIP STP	York	Fairview Township	SP	Susquehanna River

APPENDIX I

NPDES PERMITTEES - INDUSTRIAL WASTE DISCHARGES (PA DEP, 2005)

Permit No.	Facility	County	Municipality	Facility ID	Stream
PA0007862	PA AMER W CO YELLOW BREECHES WS	York	Fairview Township	IW	Yellow Breeches Creek
PA0008150	MH TECHNOLOGIES, LLC	Cumberland	Mount Holly Springs Borough	IW	Mountain Creek
PA0008486	AHLSTROM FILTRATION	Cumberland	Mount Holly Springs Borough	IW	Mountain Creek
PA0014605	UNITED WATER-MECH RC RABOLD WS	York	Fairview Township	IW	Yellow Breeches Creek
PA0037141	PA FISH COMM HUNTSDALE IW	Cumberland	Penn Township	IW	Yellow Breeches Creek
PA0037141	PA FISH COMM HUNTSDALE IW	Cumberland	Penn Township	IW	Irishtown Gap Hollow
PA0044911	LAND O LAKES	Cumberland	South Middleton Township	IW	Mountain Creek
PA0080632	B & W HUNTSDALE	Cumberland	Penn Township	IW	Yellow Breeches Creek
PA0084395	CAMP HILL ST CORR INST	Cumberland	Lower Allen Township	IW	Cedar Run
PA0086487	PPG MT HOLLY STORM	Cumberland	South Middleton Township	IW	Yellow Breeches Creek
PA0086711	SUN OIL / MECHANICSBURG	Cumberland	Hampden Township	IW	Not Available
PA0086801	EXXON RAS #2-7395 GWCU	Cumberland	Upper Allen Township	IW	Yellow Breeches Creek
PA0247162	PA AMER WEST SHORE REG WATER SYS	York	Fairview Township	IW	Yellow Breeches Creek

APPENDIX J

KNOWN FLOODING AND STORMWATER PROBLEM AREAS

APPENDIX J - KNOWN STORMWATER AND FLOODING PROBLEM AREAS

Municipality	Location	Description
CarrollTownship	Gettysburg Pike	Channel and stream flooding
CarrollTownship	Spring Lane Road	Channel and stream flooding
CarrollTownship	Stony Run Road	Channel and stream flooding
Dickinson Township	Alexander Spring Road	Channel and stream flooding
Dickinson Township	Stuart Road	Channel and stream flooding
Dickinson Township	West Yellow Breeches Creek Road/Dickinson School Road	Channel and stream flooding
Dickinson Township	Encks Mill Road	Channel and stream flooding
Dickinson Township	Mont Sera Road	Channel and stream flooding
Lemoyne Borough	Hummel Avenue	Street flooding
Lower Allen Township	Windsor Park Area	Stormwater drainage
Lower Allen Township	Bethany Village (White Field Road Area)	Stormwater drainage/runoff
Lower Allen Township	Windsor Place Area	Stormwater drainage/runoff
Lower Allen Township	Cumberland Road Area	Stormwater drainage/runoff
Lower Allen Township	Linda Lane	Channel and stream flooding
Lower Allen Township	Schuylkill Ave.	Channel and stream flooding
Lower Allen Township	Cedar Cliff Mall Area	Stormwater drainage/runoff
Lower Allen Township	Lisburn Road Bridge	Floodplain resulting in road closure
Lower Allen Township	Sheepford Road Bridge	Floodplain resulting in road closure
Lower Allen Township	Spanglers Mill Road Bridge	Floodplain resulting in road closure
Lower Allen Township	Green Lane Bridge Area	Floodplain resulting in road closure
Lower Allen Township	Sheepford Road	Floodplain resulting in road closure
Lower Allen Township	Yellow Breeches Creek & Cedar Run	Floodplain - entire stream corridor
Lower Allen Township	Hummel Avenue	Street and intersection flooding
Lower Allen Township	Highland Circle to Carlisle Road	Channel stream flooding
Lower Allen Township	Carlisle Road (Railroad Underpass)	Street and intersection flooding
Lower Allen Township	Rosemont Avenue	Channel and stream flooding
Lower Allen Township	Orchard Avenue	Street and intersection flooding
Lower Allen Township	St. John's Road	Street and intersection flooding
Lower Allen Township	Rockaway Drive	Discharge to sinkhole
Lower Allen Township	Bethany Village	Street and intersection flooding
Lower Allen Township	Gettysburg Road (4800 Block)	Street and intersection flooding
Lower Allen Township	Simpson Ferry Road (5100 Block)	Street and intersection flooding
Lower Allen Township	Gettysburg Road/Sheely Lane	Channel and stream flooding
Monroe Township	Criswell Drive	Channel and stream flooding
Monroe Township	Cockley's Meadow Drive	Channel and stream flooding
Monroe Township	Creek Road	Channel and stream flooding
Monroe Township	Park Place	Channel and stream flooding

APPENDIX J - KNOWN STORMWATER AND FLOODING PROBLEM AREAS (Cont'd.)

Municipality	Location	Description
Monroe Township	William's Grove Mobile Home Park	Channel and stream flooding
Monroe Township	Spring Circle	Channel and stream flooding
Monroe Township	Heisey Road	Stormwater drainage
New Cumberland Borough	New Cumberland Borough Park	Channel and stream flooding
New Cumberland Borough	Second Street	Channel and stream flooding
New Cumberland Borough	Maple Alley	Channel and stream flooding
New Cumberland Borough	Locust Alley	Channel and stream flooding
New Cumberland Borough	Maple Alley/Second Street	Stormwater drainage
Upper Allen Township	Bumble Bee Hollow Road	Street flooding
Upper Allen Township	Shingus Circle/Grantham Road	Stormwater drainage
Upper Allen Township	Gettysburg Road	Channel and stream flooding
Upper Allen Township	Allendale Road	Channel and stream flooding
Upper Allen Township	Eric Avenue	Stormwater drainage/sinkhole
Upper Allen Township	East Winding Hill Road	Channel and stream flooding
Upper Allen Township	Route 114/PA Turnpike	Channel and stream flooding
Upper Allen Township	Georgetown Road/Elmwood Avenue	Stormwater drainage
Upper Allen Township	Webercraft Development	Channel and stream flooding
Upper Allen Township	South York Street	Stormwater drainage
Upper Allen Township	York Street	Channel and stream flooding
Upper Allen Township	Diehl Road	Stormwater drainage

Sources: CCPC, 2000
CCPC, 2002
Municipalities, 2005

APPENDIX K

PENNSYLVANIA FISH AND BOAT COMMISSION STREAM SURVEYS

Fish species occurrence/fish collected from YELLOW BREECHES CK Section 2, 07E. Current Section date 7/1/1978. This list reflective of all sites surveyed through time.

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROOK TROUT	SALVELINUS FONTINALIS
BROWN BULLHEAD	AMEIURUS NEBULOSUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
FATHEAD MINNOW	PIMEPHALES PROMELAS
GOLDEN SHINER	NOTEMIGONUS CRYSOLEUCAS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
MARGINED MADTOM	NOTURUS INSIGNIS
MOTTLED SCULPIN	COTTUS BAIRDI
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTFIN SHINER	CYPRINELLA SPILOPTERA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI
YELLOW BULLHEAD	AMEIURUS NATALIS

Fish collected from YELLOW BREECHES CK at site rivermile 43.5 with Site Latitude 400617 Longitude 771932 using Electrotowboat gear. Site established 7/28/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
LONGNOSE DACE	RHINICHTHYS CATARACTAE
MOTTLED SCULPIN	COTTUS BAIRDI
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
ROCK BASS	AMBLOPLITES RUPESTRIS
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI
YELLOW BULLHEAD	AMEIURUS NATALIS

Fish collected from YELLOW BREECHES CK at site rivermile 40.1 with Site Latitude 400644 Longitude 771608 using Electrotowboat gear. Site established 7/28/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLUEGILL	LEPOMIS MACROCHIRUS
BROWN TROUT	SALMO TRUTTA
CHAIN PICKEREL	ESOX NIGER
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
MOTTLED SCULPIN	COTTUS BAIRDI
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 38.2 with Site Latitude 400709 Longitude 771446 using Electrotowboat gear. Site established 7/24/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BROWN TROUT	SALMO TRUTTA
CHAIN PICKEREL	ESOX NIGER
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
ROCK BASS	AMBLOPLITES RUPESTRIS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 36.3 with Site Latitude 400719 Longitude 771339 using Electrotowboat gear. Site established 7/24/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BROOK TROUT	SALVELINUS FONTINALIS
BROWN TROUT	SALMO TRUTTA
CHAIN PICKEREL	ESOX NIGER
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
ROCK BASS	AMBLOPLITES RUPESTRIS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 35.7 with Site Latitude 400734 Longitude 771310 using Electrotowboat gear. Site established 7/24/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BROWN TROUT	SALMO TRUTTA
CHAIN PICKEREL	ESOX NIGER
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
FATHEAD MINNOW	PIMEPHALES PROMELAS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 33.6 with Site Latitude 400815 Longitude 771132 using Electrotowboat gear. Site established 7/28/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTFIN SHINER	CYPRINELLA SPILOPTERA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 32.3 with Site Latitude 400848 Longitude 771022 using Electrotowboat gear. Site established 7/29/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BROWN BULLHEAD	AMEIURUS NEBULOSUS
BROWN TROUT	SALMO TRUTTA
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
MARGINED MADTOM	NOTURUS INSIGNIS
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI
YELLOW BULLHEAD	AMEIURUS NATALIS

Fish collected from YELLOW BREECHES CK at site rivermile 30.9 with Site Latitude 400817 Longitude 770856 using Electrotowboat gear. Site established 7/29/1980 by Fisheries Management Area 7. This site is currently located within Section Number 2, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN TROUT	SALMO TRUTTA
CHAIN PICKEREL	ESOX NIGER
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
GOLDEN SHINER	NOTEMIGONUS CRYSOLEUCAS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTFIN SHINER	CYPRINELLA SPILOPTERA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI
YELLOW BULLHEAD	AMEIURUS NATALIS

Fish species occurrence/fish collected from YELLOW BREECHES CK Section 3, 07E. Current Section date 7/1/1978. This list reflective of all sites surveyed through time.

Common Name	Scientific Name
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROOK TROUT	SALVELINUS FONTINALIS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PALOMINO TROUT	NONE
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 27.9 with Site Latitude 400857 Longitude 770640 using Electrotowboat gear. Site established 7/30/1980 by Fisheries Management Area 7. This site is currently located within Section Number 3, 07E

Common Name	Scientific Name
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROOK TROUT	SALVELINUS FONTINALIS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PALOMINO TROUT	NONE
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish species occurrence/fish collected from YELLOW BREECHES CK Section 4, 07E. Current Section date 7/1/1978. This list reflective of all sites surveyed through time.

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN BULLHEAD	AMEIURUS NEBULOSUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
FANTAIL DARTER	ETHEOSTOMA FLABELLARE
GOLDEN SHINER	NOTEMIGONUS CRYSOLEUCAS
GREEN SUNFISH	LEPOMIS CYANELLUS
LARGEMOUTH BASS	MICROPTERUS SALMOIDES
LONGNOSE DACE	RHINICHTHYS CATARACTAE
MARGINED MADTOM	NOTURUS INSIGNIS
MOTTLED SCULPIN	COTTUS BAIRDI
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
REDBREAST SUNFISH	LEPOMIS AURITUS
RIVER CHUB	NOCOMIS MICROPOGON
ROCK BASS	AMBLOPLITES RUPESTRIS
ROSYFACE SHINER	NOTROPIS RUBELLUS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTFIN SHINER	CYPRINELLA SPILOPTERA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
SWALLOWTAIL SHINER	NOTROPIS PROCNE
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI
YELLOW BULLHEAD	AMEIURUS NATALIS

Fish collected from YELLOW BREECHES CK at site rivermile 26 with Site Latitude 400828 Longitude 770521 using Electrotowboat gear. Site established 8/4/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 23.2 with Site Latitude 400850 Longitude 770252 using Electrotowboat gear. Site established 7/23/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BROWN TROUT	SALMO TRUTTA
CHAIN PICKEREL	ESOX NIGER
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
GREEN SUNFISH	LEPOMIS CYANELLUS
LARGEMOUTH BASS	MICROPTERUS SALMOIDES
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
REDBREAST SUNFISH	LEPOMIS AURITUS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 20.5 with Site Latitude 400903 Longitude 770022 using Electrotowboat gear. Site established 7/23/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LARGEMOUTH BASS	MICROPTERUS SALMOIDES
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
REDBREAST SUNFISH	LEPOMIS AURITUS
ROCK BASS	AMBLOPLITES RUPESTRIS
ROSYFACE SHINER	NOTROPIS RUBELLUS
SHIELD DARTER	PERCINA PELTATA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
SWALLOWTAIL SHINER	NOTROPIS PROCNE
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 19.4 with Site Latitude 400915 Longitude 765909 using Electrotowboat gear. Site established 7/22/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
CHAIN PICKEREL	ESOX NIGER
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 16 with Site Latitude 400956 Longitude 765709 using Electrotowboat gear. Site established 7/22/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
FANTAIL DARTER	ETHEOSTOMA FLABELLARE
LONGNOSE DACE	RHINICHTHYS CATARACTAE
MOTTLED SCULPIN	COTTUS BAIRDI
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
ROCK BASS	AMBLOPLITES RUPESTRIS
ROSYFACE SHINER	NOTROPIS RUBELLUS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 14.1 with Site Latitude 400945 Longitude 765509 using Electrotowboat gear. Site established 8/1/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LARGEMOUTH BASS	MICROPTERUS SALMOIDES
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 13 with Site Latitude 401010 Longitude 765430 using Electrotowboat gear. Site established 7/22/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
MOTTLED SCULPIN	COTTUS BAIRDI
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 11.8 with Site Latitude 401050 Longitude 765534 using Electrotowboat gear. Site established 8/1/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN TROUT	SALMO TRUTTA
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
RAINBOW TROUT	ONCORHYNCHUS MYKISS
ROCK BASS	AMBLOPLITES RUPESTRIS
SHIELD DARTER	PERCINA PELTATA
SPOTFIN SHINER	CYPRINELLA SPILOPTERA
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
WHITE SUCKER	CATOSTOMUS COMMERSONI
YELLOW BULLHEAD	AMEIURUS NATALIS

Fish collected from YELLOW BREECHES CK at site rivermile 10.1 with Site Latitude 401109 Longitude 765445 using Electrotowboat gear. Site established 8/1/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
GREEN SUNFISH	LEPOMIS CYANELLUS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
ROCK BASS	AMBLOPLITES RUPESTRIS
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 7.4 with Site Latitude 401208 Longitude 765535 using Electrotowboat gear. Site established 7/21/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN TROUT	SALMO TRUTTA
COMMON CARP	CYPRINUS CARPIO
COMMON SHINER	LUXILUS CORNUTUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
GREEN SUNFISH	LEPOMIS CYANELLUS
LONGNOSE DACE	RHINICHTHYS CATARACTAE
MARGINED MADTOM	NOTURUS INSIGNIS
MOTTLED SCULPIN	COTTUS BAIRDI
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
ROCK BASS	AMBLOPLITES RUPESTRIS
ROSYFACE SHINER	NOTROPIS RUBELLUS
SHIELD DARTER	PERCINA PELTATA
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 6.3 with Site Latitude 401222 Longitude 765456 using Electrotowboat gear. Site established 7/21/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLACKNOSE DACE	RHINICHTHYS ATRATULUS
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
CENTRAL STONEROLLER	CAMPOSTOMA ANOMALUM
COMMON SHINER	LUXILUS CORNUTUS
CREEK CHUB	SEMOTILUS ATROMACULATUS
CUTLIPS MINNOW	EXOGLOSSUM MAXILLINGUA
FALLFISH	SEMOTILUS CORPORALIS
NORTHERN HOG SUCKER	HYPENTELIUM NIGRICANS
PUMPKINSEED	LEPOMIS GIBBOSUS
REDBREAST SUNFISH	LEPOMIS AURITUS
ROCK BASS	AMBLOPLITES RUPESTRIS
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTFIN SHINER	CYPRINELLA SPILOPTERA
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI
WHITE SUCKER	CATOSTOMUS COMMERSONI

Fish collected from YELLOW BREECHES CK at site rivermile 0.4 with Site Latitude 401315 Longitude 765142 using Day Electroboat gear. Site established 8/5/1980 by Fisheries Management Area 7. This site is currently located within Section Number 4, 07E

Common Name	Scientific Name
BLUEGILL	LEPOMIS MACROCHIRUS
BLUNTNOSE MINNOW	PIMEPHALES NOTATUS
BROWN BULLHEAD	AMEIURUS NEBULOSUS
COMMON SHINER	LUXILUS CORNUTUS
FALLFISH	SEMOTILUS CORPORALIS
GOLDEN SHINER	NOTEMIGONUS CRYSOLEUCAS
GREEN SUNFISH	LEPOMIS CYANELLUS
LARGEMOUTH BASS	MICROPTERUS SALMOIDES
PUMPKINSEED	LEPOMIS GIBBOSUS
REDBREAST SUNFISH	LEPOMIS AURITUS
RIVER CHUB	NOCOMIS MICROPOGON
ROCK BASS	AMBLOPLITES RUPESTRIS
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI
SPOTTAIL SHINER	NOTROPIS HUDSONIUS
TESSELLATED DARTER	ETHEOSTOMA OLMSTEDI