Presentation Order – *First Field Day*

As a team, prepare to present the following items in order:

✓ 1. Sketch Map

✓ 2. Cross-Section Graphs:
   - Riffle Cross-Section(s)
   - Pool Cross-Section(s)
   - Run Cross-Section(s) (if applicable)
   - Glide Cross-Section(s) (if applicable)

✓ 3. Longitudinal Profile Graph

4. Representative Pebble Count for Stream Classification (Graph)
5. Active Bed Riffle Pebble Count for Hydraulic Calculations (Graph)
6. Velocity Computation Form (**Worksheet B-2**)
7. Stream Classification Form (**Worksheet B-1**)
8. Morphological Relations & Dimensionless Ratios Form (**Worksheet B-3**)
9. Pool Dimensionless Ratios Form (**Worksheet B-4**)

Checklist for Team Folder – *First Field Day*

Folder Holder: Please collect the following items from your team members and insert into your team folder in the order listed below. Please make sure all corrections have been made following your team presentation and give your completed team folder to Dave.

- ☐ Sketch Map
- ☒ Cross-Section Raw Data and Graphs for all Cross-sections Measured
- ☒ Longitudinal Profile Raw Data and Graph
- ☒ Representative Pebble Count Raw Data and Graph
- ☒ Active Bed Riffle Pebble Count Raw Data and Graph
- ☒ Stream Classification Form (**Worksheet B-1**)
- ☒ Velocity Computation Form (**Worksheet B-2**)
- ☒ Morphological Relations & Dimensionless Ratios Form (**Worksheet B-3**)
- ☐ Pool Dimensionless Ratios Form (**Worksheet B-4**)

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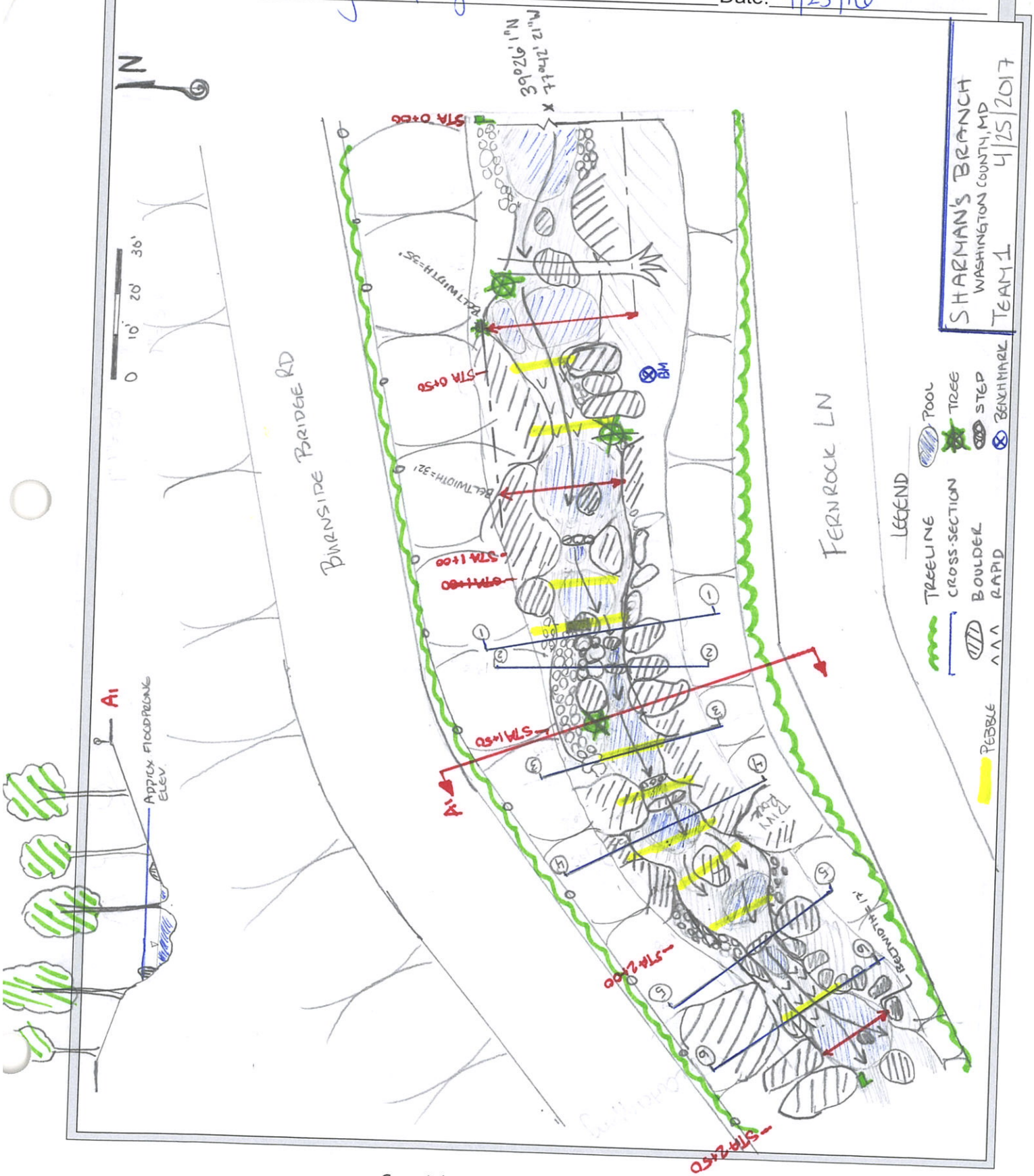
AREA-SITE LOCATION....REACH MAP

Stream/Drainage: Reach 1/Team1 - 3.6SQMi

Site/Reach: 1

Drawn By: Bailey Willfong

Date: 4/25/16



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SURVEY DATA → **CROSS - SECTION 1**

SITE: Sharman's Branch Reach 1 Date: 4/25/17

Location: STA 1+25, Rapid

Observers: MM, MP HUC:

Item	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Fore-Sight FS ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	0.0	7.49	107.49	3.87	100	Monument
2	0.0			3.87		LEP, OG
3	1.7			6.14		FOS
4	4.9			7.36		FOS
5	8.3			10.20		~~BKFL~~ TOS
6	11.8			12.06		LEW, WS
7	12.7			12.34		Bed
8	15.0			12.68		Bed WS=0.65
9	17.9			12.71		TW max depth=0.70
10	19.2			12.53		Bed
11	21.1			12.36		Bed
12	22.8			12.09		Left edge sed bar REW
13	23.8			11.54		top sed bar
14	24.9			12.19		Right edge sed bar, mouth side channel
15	27.2			11.89		REW, WS Left edge sed
16	28.7			11.63		sed bar
17	30.0			11.9		side channel
18	31.4			11.73		side channel
19	32.2			11.41		toe of fldplain
20	35.0			10.97		fldpln
21	38.3			10.52		fldpln
22	39.5			10.43		bkfl? 1.63
23	41.2			10.01		bkfl? 2.05
24	44.4			8.82		fos
25	47.8			7.62		fos
26	52.0			5.51		LEP, OG
27	7.9			10.10		bkfl? 1.94
28	9.1			10.97		bkfl? 1.14

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SURVEY DATA → **CROSS - SECTION 2**

SITE: Sharmin's Branch / Step STA 1+36 Date: 4/25/17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	0.0			4.26		LEP
2	3.5			4.77		Terrace
3	5.9			5.35		
4	7.8			6.03		LTOB
5	9.2			7.58		FOS
6	10.1			8.40		FOS
7	10.7			9.78		FOS
8	12.0			10.68		FOS
9	12.4			11.33		Lateral Scour BF?
10	13.1			11.81		FOS
11	14.6			12.05		FOS
12	16.0			12.55		TOS / Beginning of step
13	17.3			12.73		BR (Rock blocks flow)
14	17.6			12.33		Step
15	19.9			12.53		LEW WS
16	20.9			12.85		BED
17	21.9			13.17		TW, WS = 0.62
18	23.4			13.01		BED 10.95
19	24.3			12.99		BED
20	24.9			12.58		REW WS
21	27.1			10.82		Rock Outcropping
22	30.3			9.55		" "
23	30.7			11.88		LE side channel (dry)
24	32.2			12.19		Side
25	34.5			12.33		Side
26	37.2			12.32		Side
27	39.5			11.87		RE side channel (~~TOS~~)
28	43.0			10.98		~~BF~~ BKF 1.57
29	46.6			10.18		
30	52.0			9.08		TOS
31	59.2			5.41		FOS

65.0 2.83 REP

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SURVEY DATA → **CROSS - SECTION** 3

SITE: Sherman's Branch, STA 1+58 Pool (Contraction Scour) Date: 4/25/17

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	0.0			5.09		LEP
2	2.0			5.15		Terrace
3	4.8			5.86		~~B~~ LTOB
4	5.9			8.31		FOS
5	8.4			10.62		FOS
6	10.2			10.92		FOS (BR)
7	12.2			12.33		FOS
8	15.5			13.09		LEW WS
9	15.8			13.55		TOS
10	17.8			13.91		Bed
11	19.3			14.16		~~TH WD = 1.10~~ Bed
12	21.0			14.22		TH WB = 1.16
13	22.4			13.80		Bed
14	23.8			13.48		Bed
15	25.9			13.05		REW WS
16	27.1			12.61		Sed Bar
17	30.5			12.91		Bed Rock, bottom of side channel
18	39.3			12.98		TOS
19	41.9			12.09		FOS
20	43.7			11.38		BkF
21	48.3			9.87		FOS
22	51.2			8.75		FOS
23	53.8			7.71		FOS
24	57.3			5.91		REP
25		7.32			100	Monument
26						
27						
28						
29						
30						
31						

Goal 11.45

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Reach #1

SURVEY DATA → **CROSS - SECTION** 5 4

SITE: POOL STA 178

Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	0				6.25	-.25
2	2				7.94	
3	5.5				10.56	
4	9				11.84	BKF?
5	11				12.98	LEW
6	13.5				13.34	0.43
7	14.1				13.00	
8	15				12.42	
9	16.5				11.72	TOP BOULDER
10	20.3				12.65	EW
11	20.6				13.63	TWG 1.16
12	22				13.18	0.51
13	24				13.16	0.51
14	27				13.09	0.44
15	30				12.68	REW
16	33				12.73	
17	35.3				12.32	
18	38.6				11.00	BKF
19	42				10.69	
20	45				9.89	
21	50				7.22	
22	54				5.20	
23						
24						
25						
26						
27						
28						
29						
30						
31						

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SURVEY DATA → **CROSS - SECTION** 4 5

SITE: STEP STA 213 Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES COMMENTS REMARKS
1	0	~~10.59~~ 6.57		7.7°	7.79	
2	1				8.48	
3	3				11.51	
4	4				12.02	BKF ?
5	5				12.98	
6	6				13.37	
7	8.3				13.79	LEW
8	10.2				13.87	0.10
9	13				13.88	0.17
10	16				14.03	0.35
11	18.6				14.12	0.38
12	20.1				14.38	0.32
13	21.8				14.48	0.53 TWG
14	23.4				14.49	0.42
15	26.2				14.08	REW
16	28				13.98	
17	30				13.94	
18	32.2				11.92	BKF
19	34.7				11.60	
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

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SURVEY DATA → **CROSS - SECTION** 6

SITE: RAPID STA 238 Date:

Item	STATION ft	B S ft	H I ft	F S ft	Elevation ft	NOTES / COMMENTS / REMARKS
1	0				6.05	
2	4				6.84	
3	7				8.23	
4	9				9.29	
5	12.5				12.84	BKF
6	14.5				13.54	
7	16				14.03	
8	20				13.43	TOP BOULDER
9	22.6				14.65	LEW
10	24				14.86	.38
11	25				15.02	.49 ~~TWG~~
12	26				15.27	.58 TWG
13	27.2				14.61	.14
14	28.7				15.28	.53
15	29.2				14.71	REW
16	30.7				13.92	
17	34				12.85	
18	~~38~~ 40				11.89	
19	42				11.46	
20	45				10.74	
21	49				9.97	
22	54				7.75	
23						
24						
25						
26						
27						
28						
29						
30						
31						

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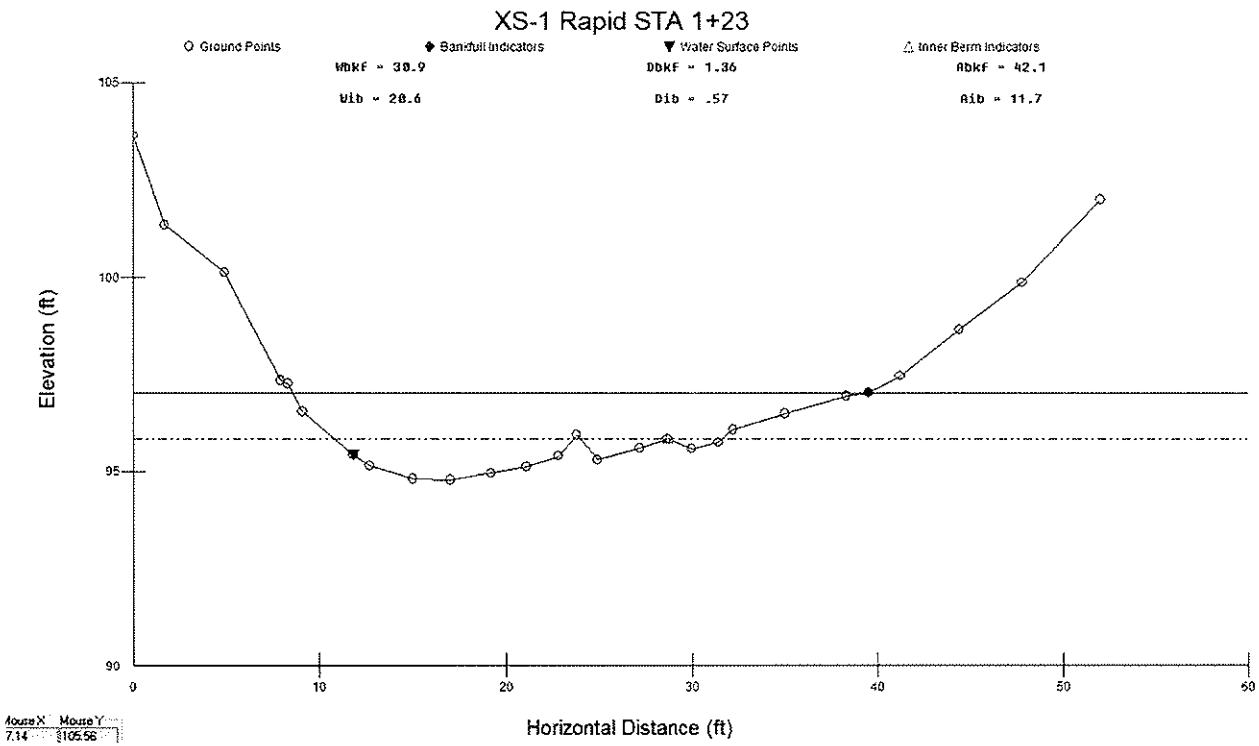
Reach #1 - Sherman's - 4/25/17



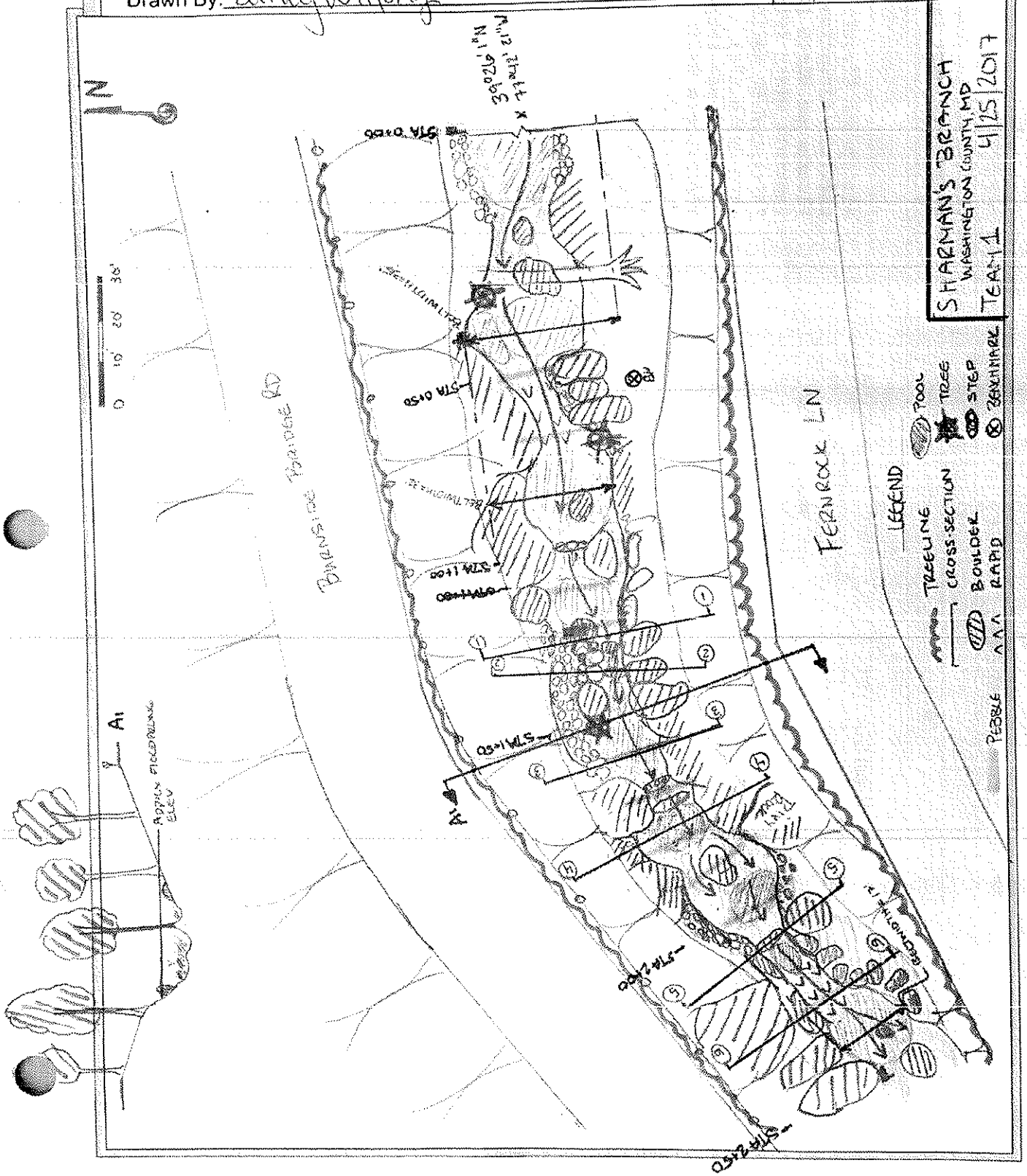
Cross Sectional Geometry

	Channel
Floodprone Elevation (ft)	99.34
Bankfull Elevation (ft)	97.06
Floodprone Width (ft)	40.54
Bankfull Width (ft)	30.94
Entrenchment Ratio	1.31
Mean Depth (ft)	1.36
Maximum Depth (ft)	2.28
Width/Depth Ratio	22.75
Bankfull Area (sq ft)	42.07
Wetted Perimeter (ft)	32
Hydraulic Radius (ft)	1.31
Begin BKF Station	8.56
End BKF Station	39.5

AREA-SITE LOCATION....REACH MAP

Stream/Drainage: Reach 1/Team1 - 3.6 SQ Mi Site/Reach: 1

Drawn By: Bailey Wilfeng Date: 4/25/16



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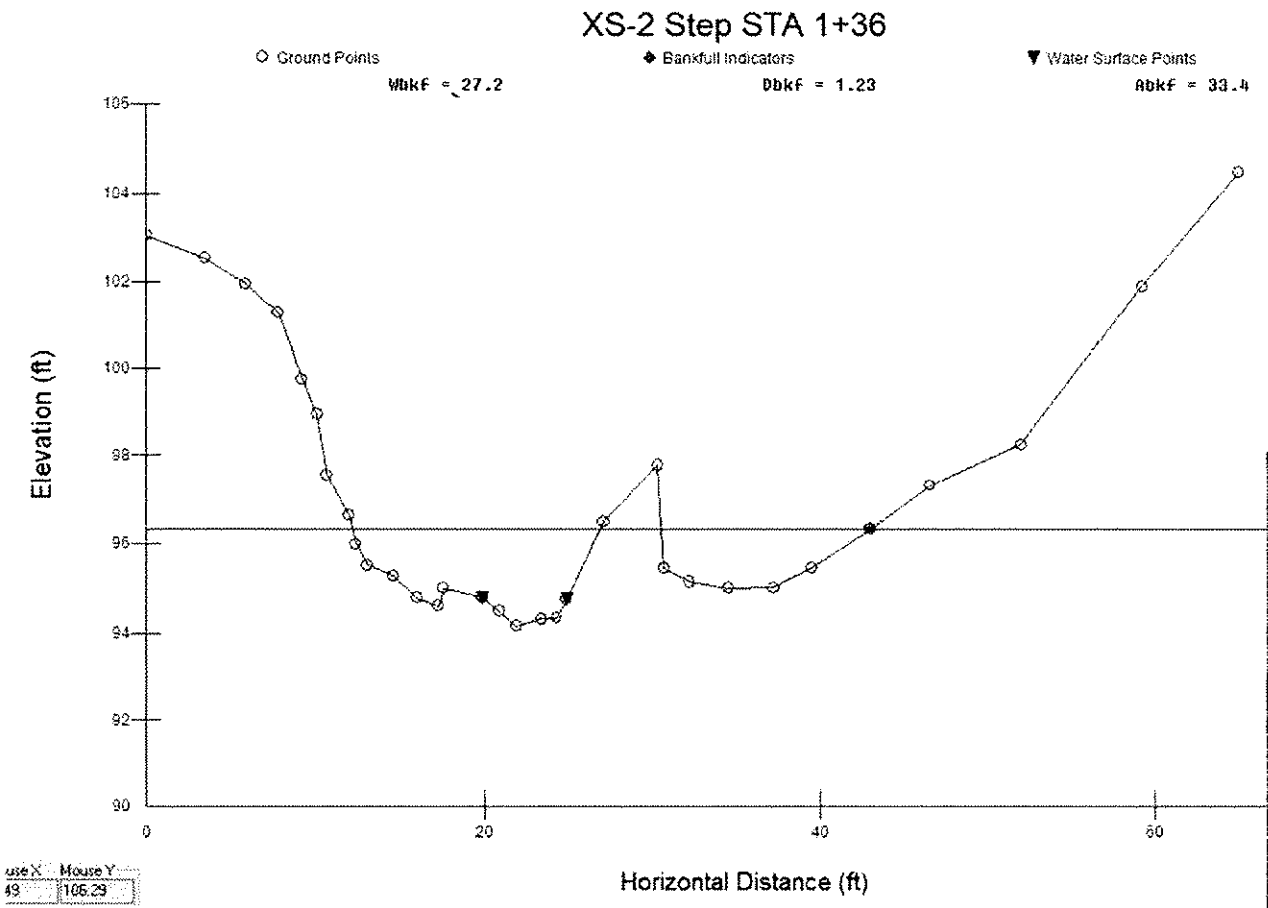
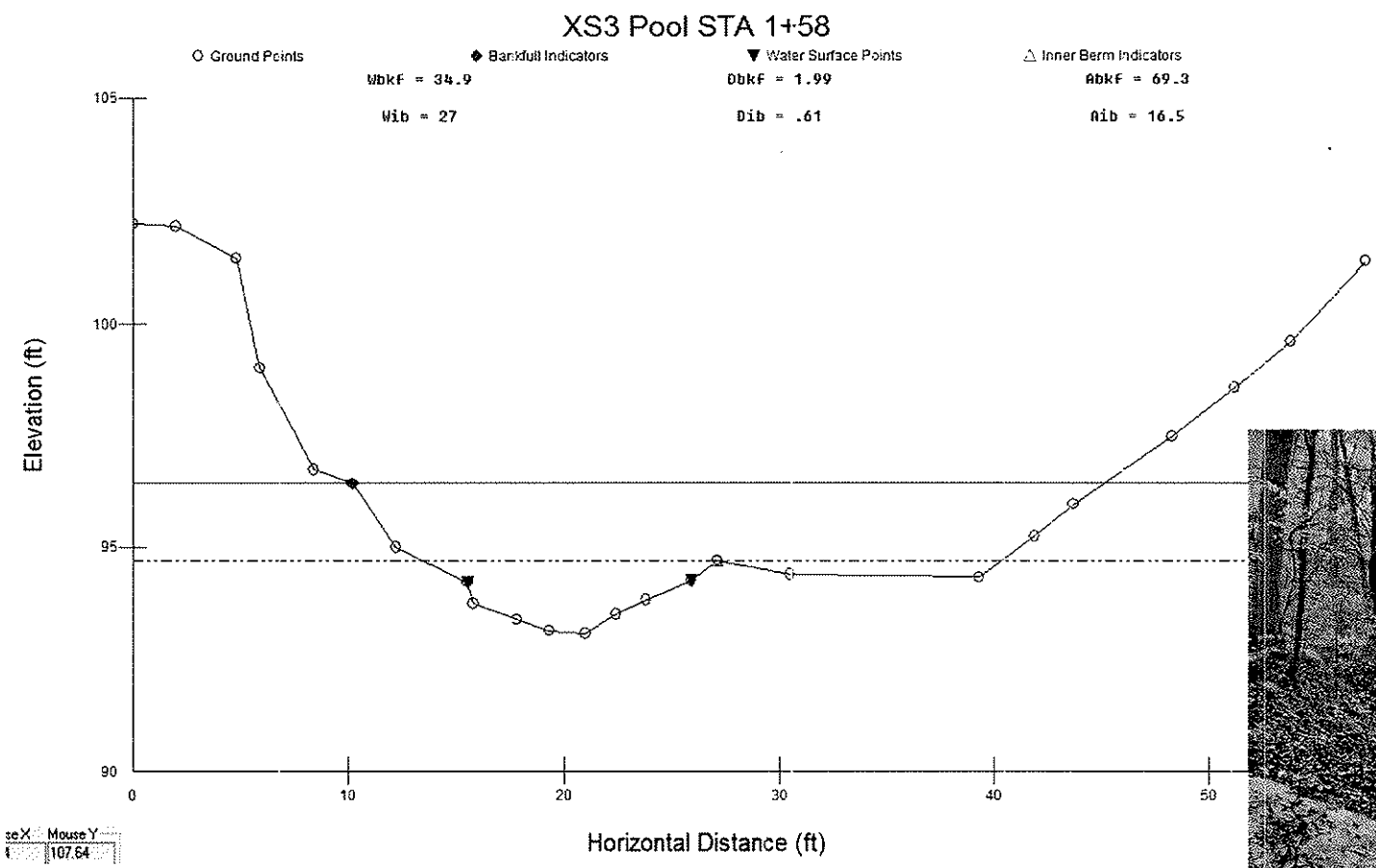
Reach #1 - Sharman's - 4/25/17



Cross Sectional Geometry

	Channel
Floodprone Elevation (ft)	98.53
Bankfull Elevation (ft)	96.34
Floodprone Width (ft)	42.3
Bankfull Width (ft)	27.17
Entrenchment Ratio	1.56
Mean Depth (ft)	1.23
Maximum Depth (ft)	2.19
Width/Depth Ratio	22.09
Bankfull Area (sq ft)	33.44
Wetted Perimeter (ft)	29.59
Hydraulic Radius (ft)	1.13
Begin BKF Station	12.18
End BKF Station	43

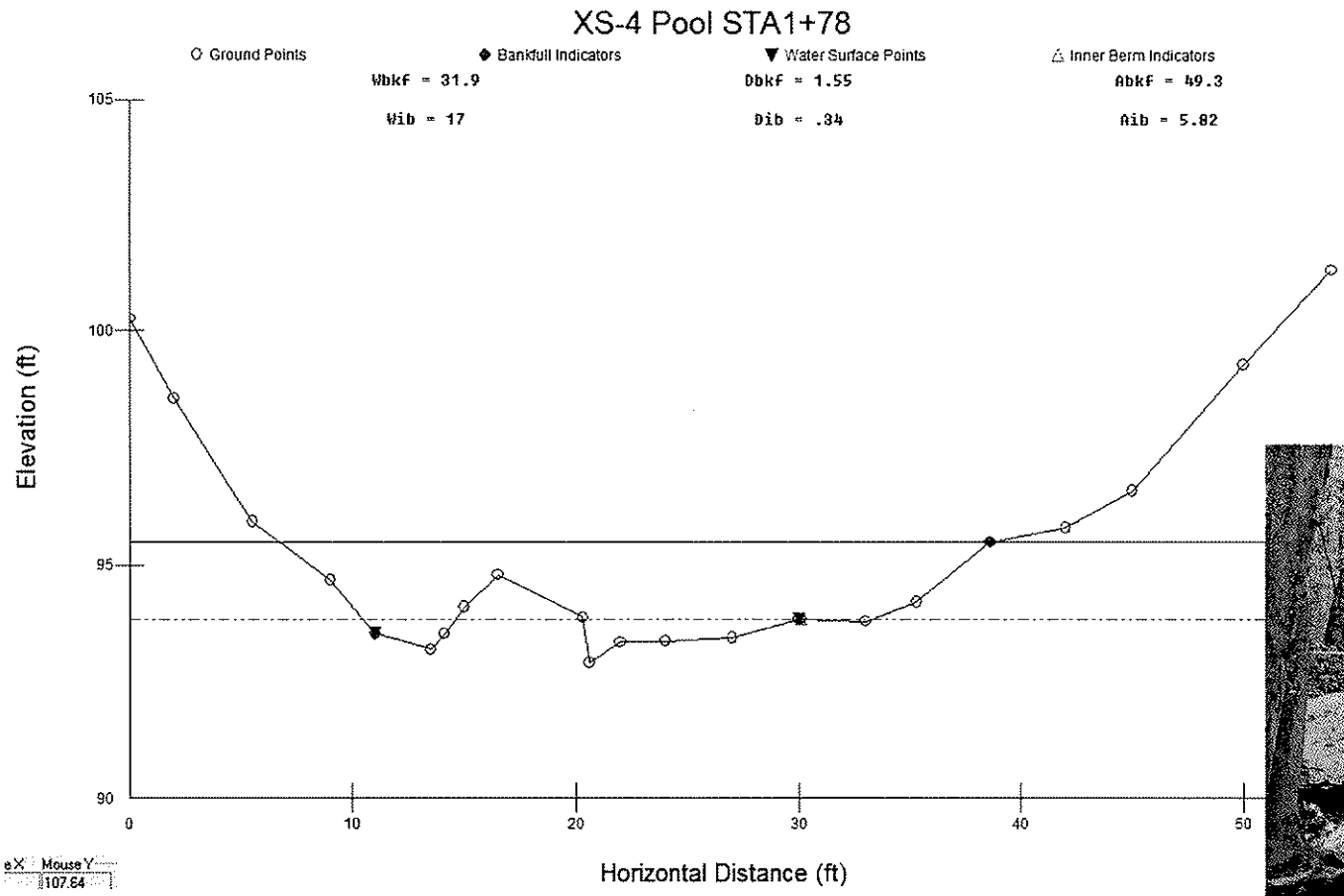
Reach #1 - Sharman's - 4/25/17



Cross Sectional Geometry

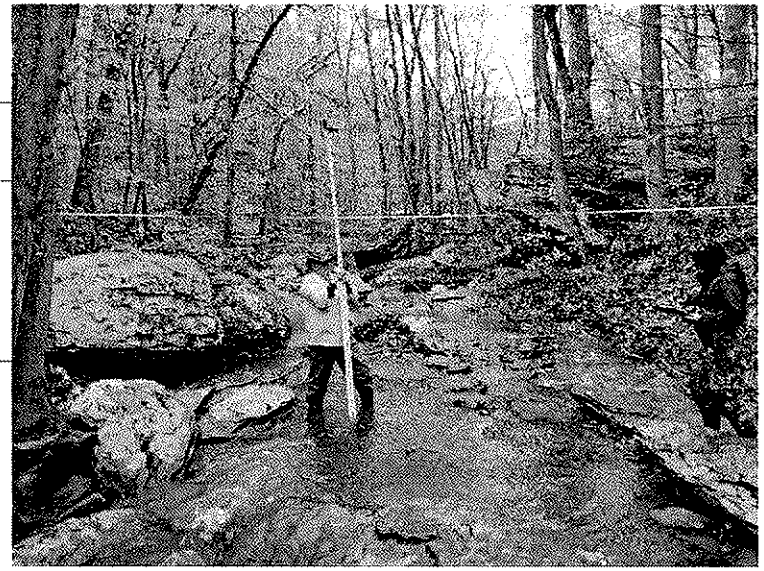
	Channel
Floodprone Elevation (ft)	98.78
Bankfull Elevation (ft)	95.94
Floodprone Width (ft)	45.58
Bankfull Width (ft)	32.85
Entrenchment Ratio	1.39
Mean Depth (ft)	1.64
Maximum Depth (ft)	2.84
Width/Depth Ratio	20.03
Bankfull Area (sq ft)	53.72
Wetted Perimeter (ft)	34.05
Hydraulic Radius (ft)	1.58
Begin BKF Station	10.85
End BKF Station	43.7

Reach #1 - Sherman's 4/25/17

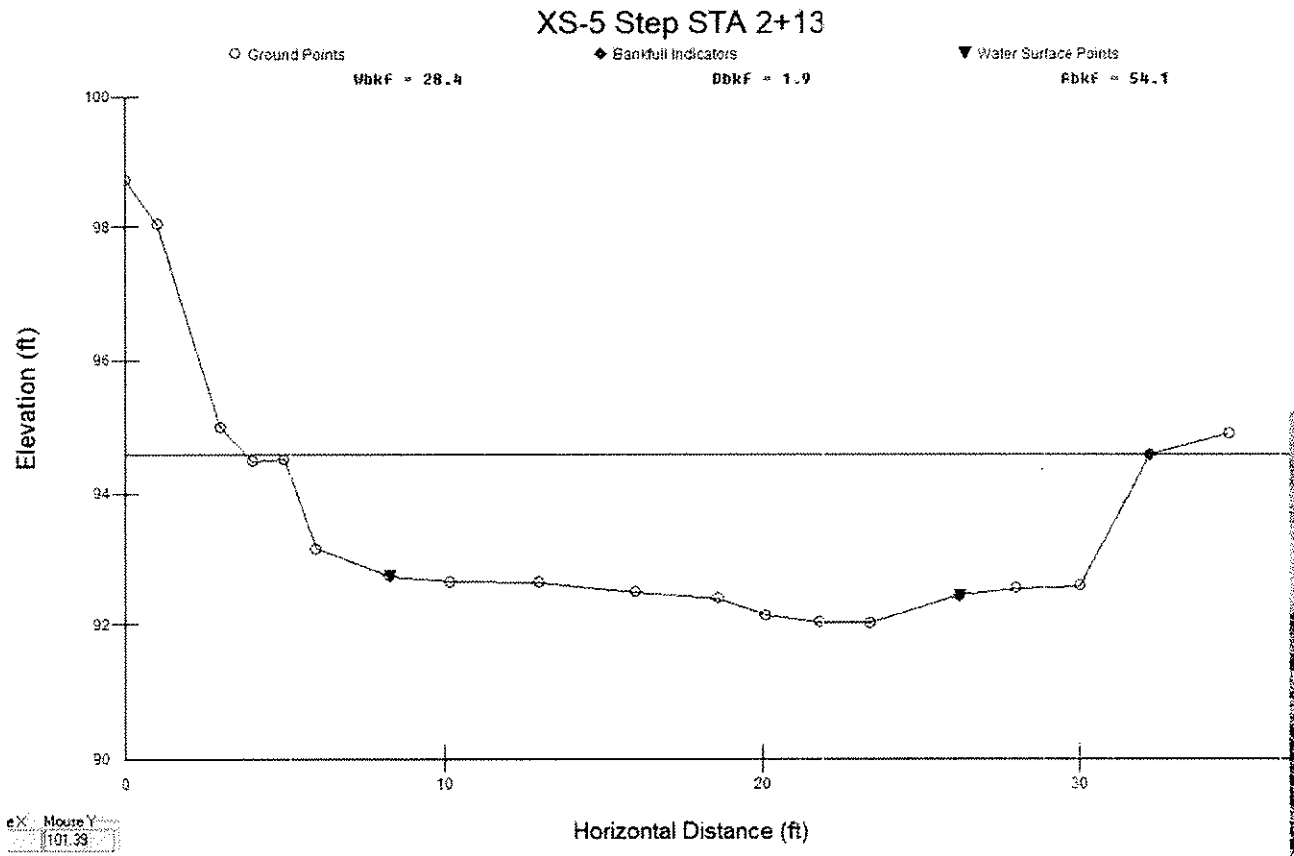


Cross Sectional Geometry

	Channel
Floodprone Elevation (ft)	98.14
Bankfull Elevation (ft)	95.51
Floodprone Width (ft)	45.27
Bankfull Width (ft)	31.9
Entrenchment Ratio	1.42
Mean Depth (ft)	1.55
Maximum Depth (ft)	2.63
Width/Depth Ratio	20.58
Bankfull Area (sq ft)	49.31
Wetted Perimeter (ft)	34.02
Hydraulic Radius (ft)	1.45
Begin BKF Station	6.7
End BKF Station	38.6



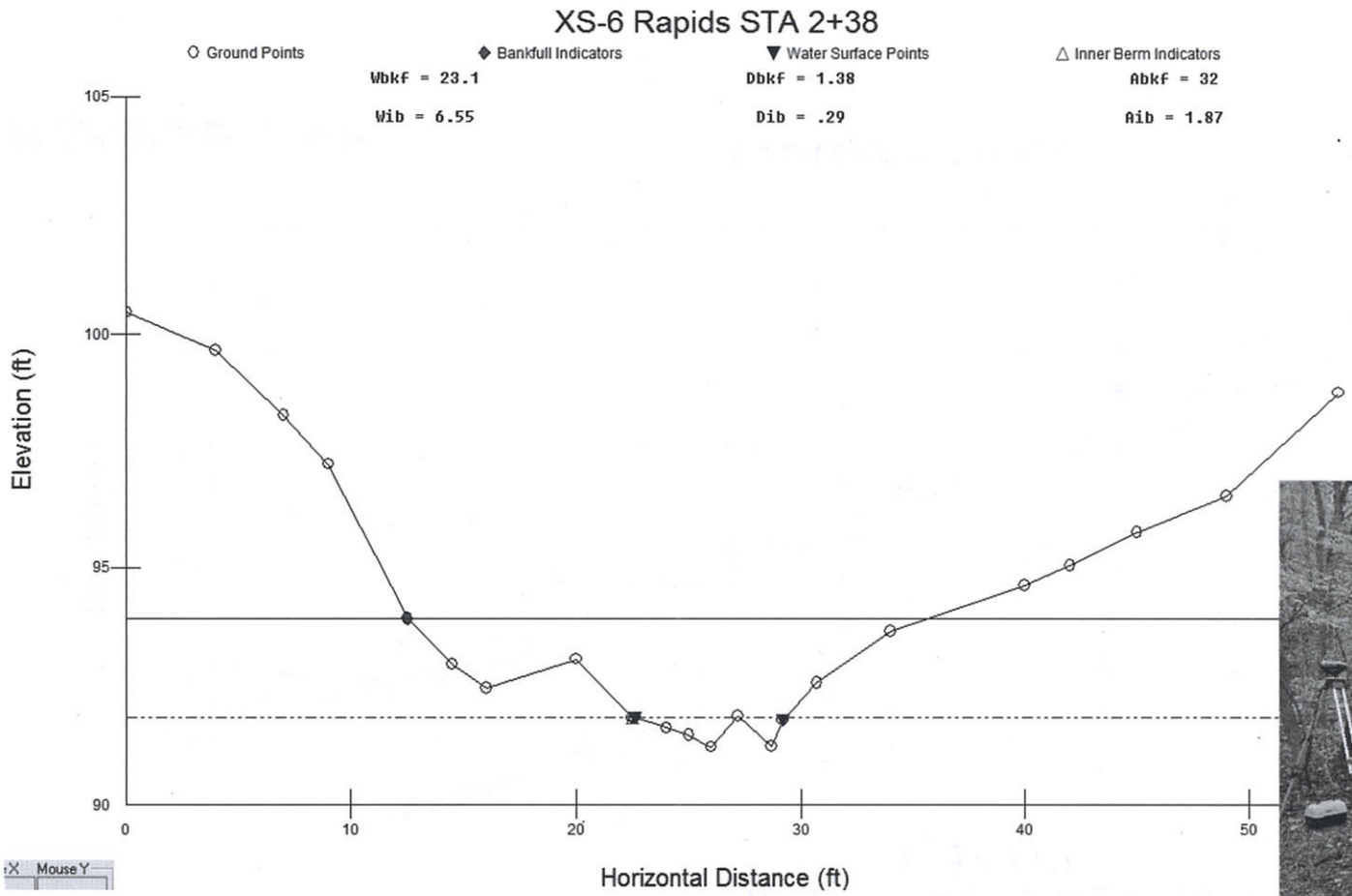
Reach #1 - Sharman's - 4/25/17



Cross Sectional Geometry

	Channel
Floodprone Elevation (ft)	97.16
Bankfull Elevation (ft)	94.59
Floodprone Width (ft)	33.13
Bankfull Width (ft)	28.4
Entrenchment Ratio	1.17
Mean Depth (ft)	1.9
Maximum Depth (ft)	2.57
Width/Depth Ratio	14.95
Bankfull Area (sq ft)	54.08
Wetted Perimeter (ft)	30.01
Hydraulic Radius (ft)	1.8
Begin BKF Station	3.8
End BKF Station	32.2

Reach #1 - Sharonan's - 4/25/17

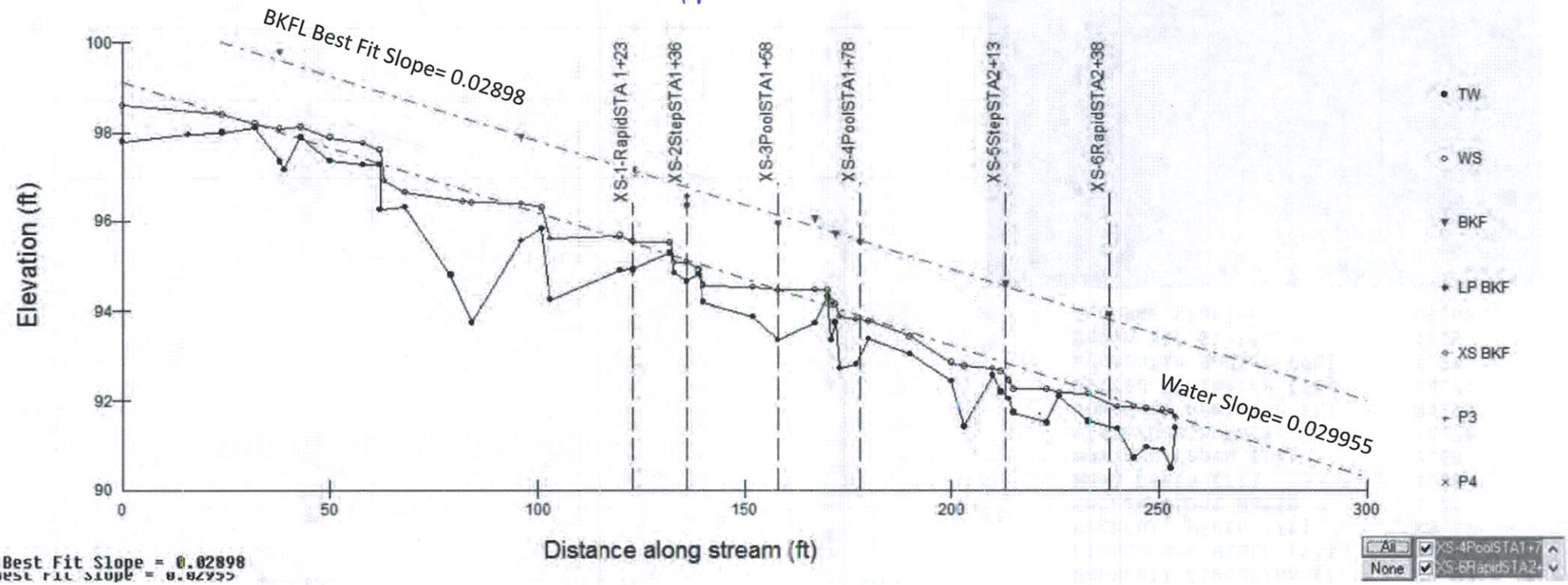


Cross Sectional Geometry

	Channel
Floodprone Elevation (ft)	96.6
Bankfull Elevation (ft)	93.92
Floodprone Width (ft)	39.48
Bankfull Width (ft)	23.13
Entrenchment Ratio	1.71
Mean Depth (ft)	1.38
Maximum Depth (ft)	2.68
Width/Depth Ratio	16.76
Bankfull Area (sq ft)	31.96
Wetted Perimeter (ft)	24.71
Hydraulic Radius (ft)	1.29
Begin BKF Station	12.5
End BKF Station	35.63

SHARMAN'S BRANCH
LONGITUDINAL PROFILE – Team 1 – Reach 1

4/25/17



BKF Best Fit Slope = 0.02898
P3 Best Fit Slope = 0.02955

Sheet 1 of 2

SURVEY DATA → **LONGITUDINAL PROFILE 1** 254'

SITE: SHARMAN'S CREEK Reach 1 Date: 4/25/2017

Location:

Observers: HUC:

	Distance, Point, or STATION (ft)	Back-Sight BS (ft)	Height of Instrument HI (ft)	Thalweg Fore-Sight FS (ft)	Thalweg Elevation Elev. (ft)	Water Surface Fore-Sight FS (ft)	Water Surface Elevation Elev. (ft)	Bankfull Fore-Sight FS (ft)	Bankfull Elevation Elev. (ft)	Low Bank HI Fore-Sight FS (ft)	Low Bank HI Elevation Elev. (ft)	NOTES e.g. Riffle Run Pool Glide
1	100	2.90	102.9									BM
2	0			5.1	97.8	4.3	98.6					TOP OF REACH
3	16		END OF POOL	4.9	97.96							END OF POOL
4	24		MID PT RAPID	4.9	98	4.5	98.4					MID POINT RAPID
5	32		END OF RAPID	4.8	98.1							END OF RAPID
6	38		DEEPEST POOL	5.55	97.35	4.82	98.62	3.12	99.78			BKFL
7	39			5.74	97.16							DEEPEST POOL
8	43			5.01	97.89	4.78	98.12					END OF POOL
9	50			5.54	97.36	5.02	97.88					CENTER OF RAPID
10	58		TOP STEP	5.62	97.28	5.14	97.76					END RAPID
11	62		TOP STEP	5.63	97.27	5.3	97.6					
12	62		BOTTOM STEP	6.65	96.25	6.						TOP RAPID
13	63					6.0	96.9					
14	68		CENT. CONST.	6.59	96.31	6.25	96.65					~~CALIBRATION OF ROD = 5.85~~
15	79		END OF CONST	8.12	94.78							BEGIN POOL ~~5.47~~ ~~0.38~~
16	82				6.46	6.57	96.44					
17	84		DEEP POOL	9.16	93.74	6.49	[illegible]	96.41				DEEP POOL
18	96			7.36	95.54	6.51	96.39	5.01	97.89			
19	101			7.08	95.82	6.6	96.3					TOP STEP / RAPID
20	103			8.66	94.24	7.30	95.6					BOTTOM STEP / RAPID
21	120			8.02	94.88	7.24	95.66	5.64	97.26			
22	132			7.63	95.27	7.4	95.5					TOP RAPID / STEP
23	133			8.08	94.82	7.84	95.06					BOTTOM STEP
24	136			8.26	94.64	7.83	95.07	6.33	96.57			XS
25	139			8.1	94.8	8.00	94.91					TOP STEP
26	140			8.72	94.18	8.35	94.55					BOTTOM STEP
27	152			9.04	93.86	8.39	94.51					BOTTOM RAPID

6.94
6.93
0.01

123 XS PIN 5.75
123 THL 8.00
123 WS 7.38

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SURVEY DATA → **LONGITUDINAL PROFILE 2**

SITE: Sharmans Reach 1 Date: 4/25/17

Location:

Observers: HUC:

	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Thalweg Fore-Sight FS ft	Thalweg Elevation Elev. ft	Water Surface Fore-Sight FS ft	Water Surface Elevation Elev. ft	Bankfull Fore-Sight FS ft	Bankfull Elevation Elev. ft	Low Bank HI Fore-Sight FS ft	Low Bank HI Elevation Elev. ft	NOTES e.g. Riffle Run Pool Glide
28	158			9.55	93.35	8.45	94.45					POOL
29	170			8.58	94.32	8.45	94.45					TOP OF STEP/RAPID
30	171			9.55	93.35	8.72	94.18					BOTTOM STEP/RAPID
31	172			9.16	93.74	8.78	94.12	7.2	95.7			TOP STEP
32	173			10.18	92.72	9.04	93.86					BOTTOM STEP .3
33	~~177~~			~~10.09~~	~~92.81~~							POOL MAX 1.10
34	177			10.09	92.81	9.10	93.8					POOL MAX
35	180			9.53	93.37	9.05	93.85					END POOL
36	167			9.19	93.71	8.44	94.46	6.86				
37	190			9.87	93.03	9.48	93.42					CENTER RAPID
38	200			10.47	92.43	10.06	92.84					END RAPID
39	203			11.47	91.43	10.02	92.88					MAX POOL -1.10
40	210			10.34	92.56	10.27	92.63					TOP STEP 8.99
41	212			10.7	92.2	10.25	92.65					MIDDLE STEP
42	214			10.87	92.03	10.44	92.46					TOP LAST STEP
43	215			11.16	91.74	10.65	92.25					BOTTOM OF BOTTOM STEP
44	223			11.38	91.52	10.65	92.25					BOTTOM OF POOL
45	226			10.81	92.09	10.72	92.18					TOP OF RAPID
46	233			11.36	91.54	10.75	92.15					MIDDLE RAPID
47	240			11.52	91.38	11.04	91.86					BOTTOM OF RAPID
48	244			12.18	90.72	11.04	91.86					BOTTOM MAX POOL
49	247			11.94	90.96	11.08	91.82					BEDROCK POINT BTW 2 POOL
50	251			12.0	90.9	11.11	91.79					" " "
51	253			12.41	90.49	11.15	91.75					BOTTOM POOL
52	254			11.50	91.4	11.27	91.63					TOP OF STEP
53	BM	2.90	100									BM
54												

OK

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Protrusion Rep. Rapid 2+38 (mid Point)

Site: Shaymans
Location: Reach #1 HUC:
Party:
Date: 4/25/17

RIFFLE (1)	POOL (2)	COMPOSITE (3)
Reach:	Reach:	Reach:
Date:	Date:	Date:
TOT # ITEM % % CUM	TOT # ITEM % % CUM	TOT # ITEM % % CUM

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3
	Silt / Clay	< .062	S/C			
	Very Fine	.062 - .125	SAND			
	Fine	.125 - .25				
	Medium	.25 - .50				
	Coarse	.50 - 1.0				
.04 - .08	Very Coarse	1.0 - 2				
.08 - .16	Very Fine	2 - 4	GRAVEL			
.16 - .22	Fine	4 - 5.7				
.22 - .31	Fine	5.7 - 8				
.31 - .44	Medium	8 - 11.3				
.44 - .63	Medium	11.3 - 16				
.63 - .89	Coarse	16 - 22.6				
.89 - 1.3	Coarse	22.6 - 32				
1.3 - 1.8	Very Coarse	32 - 45				
1.8 - 2.5	Very Coarse	45 - 64				1
2.5 - 3.5	Small	64 - 90	COBBLE			2
3.5 - 5.0	Small	90 - 128				8
5.0 - 7.1	Large	128 - 180				13
7.1 - 10.1	Large	180 - 256				19
10.1 - 14.3	Small	256 - 362	BOULDER			25
14.3 - 20	Small	362 - 512				16
20 - 40	Medium	512 - 1024				15
40 - 80	Large-Vry Large	1024 - 2048				5
	Bedrock					
						TOTAL →

Stream Type: **Valley Type:**

Representative Pebble Count

Non-Pool length = 139/254 = 55% = 6 XS
Pool length = 115/254 = 45% = 4 XS

Site: Shumans Branch
Location: Site 1 - Reach 1 HUC:
Observers: 4/25/17

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3
	Silt / Clay	< .062	S/C			
	Very Fine	.062 - .125	SAND			
	Fine	.125 - .25				
	Medium	.25 - .50				
	Coarse	.50 - 1.0				
.04 - .08	Very Coarse	1.0 - 2				
.08 - .16	Very Fine	2 - 4	GRAVEL			
.16 - .22	Fine	4 - 5.7				
.22 - .31	Fine	5.7 - 8				
.31 - .44	Medium	8 - 11.3				
.44 - .63	Medium	11.3 - 16				
.63 - .89	Coarse	16 - 22.6				
.89 - 1.3	Coarse	22.6 - 32				
1.3 - 1.8	Very Coarse	32 - 45				
1.8 - 2.5	Very Coarse	45 - 64				
2.5 - 3.5	Small	64 - 90	COBBLE			
3.5 - 5.0	Small	90 - 128				
5.0 - 7.1	Large	128 - 180				
7.1 - 10.1	Large	180 - 256				
10.1 - 14.3	Small	256 - 362	BOULDER			
14.3 - 20	Small	362 - 512				
20 - 40	Medium	512 - 1024				
40 - 80	Large-Vry Large	1024 - 2048				
	Bedrock		BDRK			
						TOTAL→

	RIFFLE (1)			POOL (2)			COMPOSITE (3)		
Reach:									
Date:									
	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM	TOT #	ITEM %	% CUM

Stream Type:

1+89 (5)
2+38 (6)

Landscape Type:

0+48 (1)
0+71 (2)
1+20 (3)
1+70 (4)

(1) 1+10
(2) 1+58
(3) 1+82
(4) 2+05

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Protrusion

Site: Shamans - Team 1 Reach 1

Location: Rep. Rapid HUC: _ _ _ _ _ _ _ _ _ _ _ _

Observers: 4/25/17

				Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) TOT #	ITEM %	% CUM	POOL (2) TOT #	ITEM %	% CUM	COMPOSITE (3) TOT #	ITEM %	% CUM
							Reach:			Reach:			Reach:		
							Date:			Date:			Date:		
Inches	PARTICLE	Millimeters													
	Silt / Clay	< .062	S/C												
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25													
	Medium	.25 - .50													
	Coarse	.50 - 1.0													
.04 - .08	Very Coarse	1.0 - 2													
.08 - .16	Very Fine	2 - 4	GRAVEL												
.16 - .22	Fine	4 - 5.7													
.22 - .31	Fine	5.7 - 8													
.31 - .44	Medium	8 - 11.3													
.44 - .63	Medium	11.3 - 16													
.63 - .89	Coarse	16 - 22.6													
.89 - 1.3	Coarse	22.6 - 32													
1.3 - 1.8	Very Coarse	32 - 45													
1.8 - 2.5	Very Coarse	45 - 64													
2.5 - 3.5	Small	64 - 90	COBBLE												
3.5 - 5.0	Small	90 - 128				3	3								
5.0 - 7.1	Large	128 - 180				2	2								
7.1 - 10.1	Large	180 - 256				14	14								
10.1 - 14.3	Small	256 - 362	BOULDER			23	23								
14.3 - 20	Small	362 - 512				23	23								
20 - 40	Medium	512 - 1024				39	39								
40 - 80	Large-Vry Large	1024 - 2048				3	3								
	Bedrock		BDRK												
Stream Type:			Landscape Type:			TOTAL→									

Upstream rep. ~~step~~ rapid station 124
start of protrusion meas. -64
end of protrusion meas -184

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Reach Pebble Count - Reach 1 - Sharmans - 4/25/17

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	1	0.98	0.98
0.062 - 0.125	0	0.00	0.98
0.125 - 0.25	0	0.00	0.98
0.25 - 0.50	0	0.00	0.98
0.50 - 1.0	2	1.96	2.94
1.0 - 2.0	0	0.00	2.94
2.0 - 4.0	1	0.98	3.92
4.0 - 5.7	2	1.96	5.88
5.7 - 8.0	0	0.00	5.88
8.0 - 11.3	7	6.86	12.75
11.3 - 16.0	5	4.90	17.65
16.0 - 22.6	6	5.88	23.53
22.6 - 32.0	3	2.94	26.47
32 - 45	2	1.96	28.43
45 - 64	4	3.92	32.35
64 - 90	10	9.80	42.16
90 - 128	13	12.75	54.90
128 - 180	3	2.94	57.84
180 - 256	5	4.90	62.75
256 - 362	5	4.90	67.65
362 - 512	3	2.94	70.59
512 - 1024	9	8.82	79.41
1024 - 2048	3	2.94	82.35
Bedrock	18	17.65	100.00

Particle Size Analysis

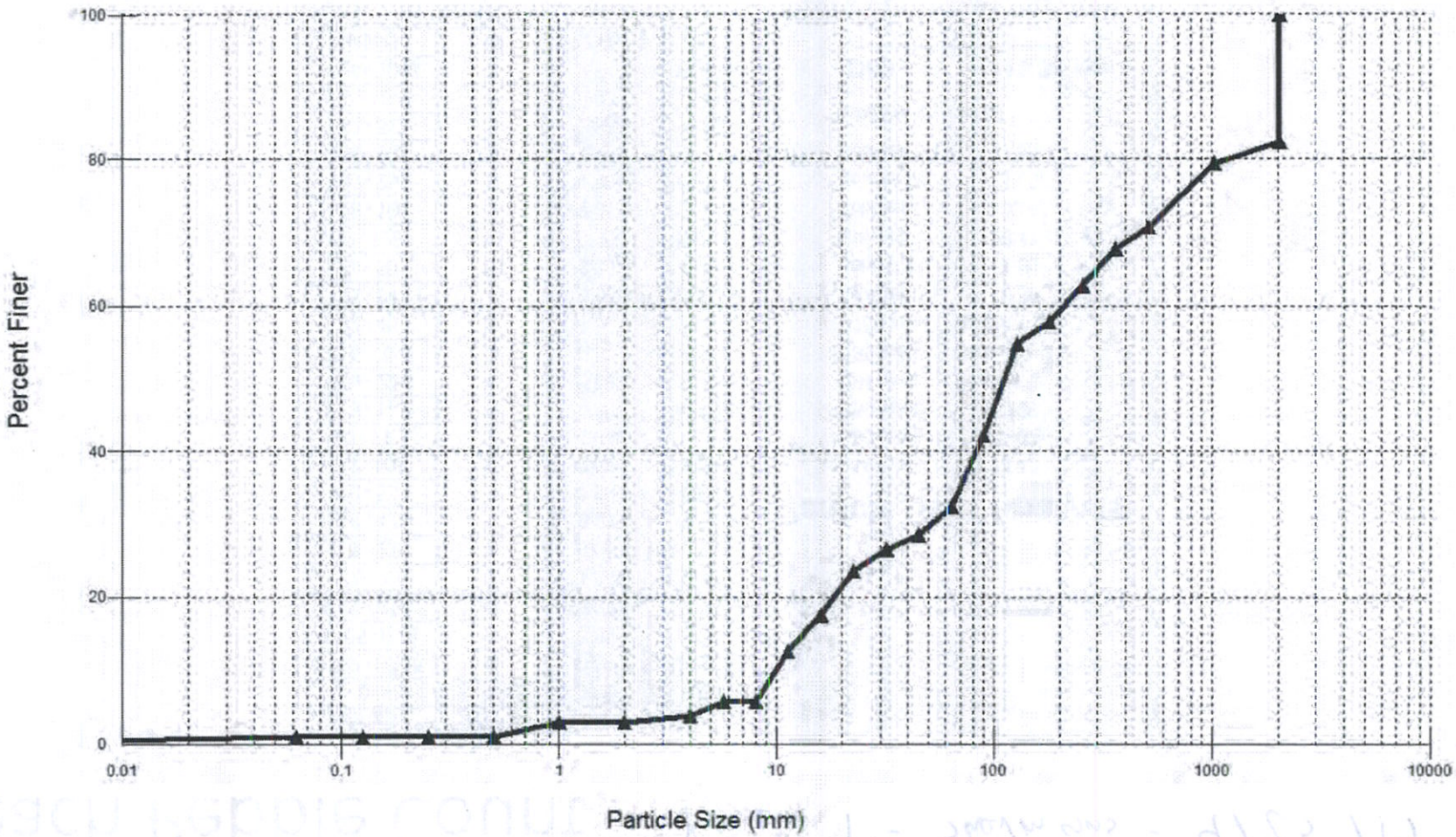
D16 (mm)	14.42
D35 (mm)	71.02
D50 (mm)	113.38
D84 (mm)	Bedrock
D95 (mm)	Bedrock
D100 (mm)	Bedrock
Silt/Clay (%)	0.98
Sand (%)	1.96
Gravel (%)	29.41
Cobble (%)	30.4
Boulder (%)	19.6
Bedrock (%)	17.65

Total Particles = 102

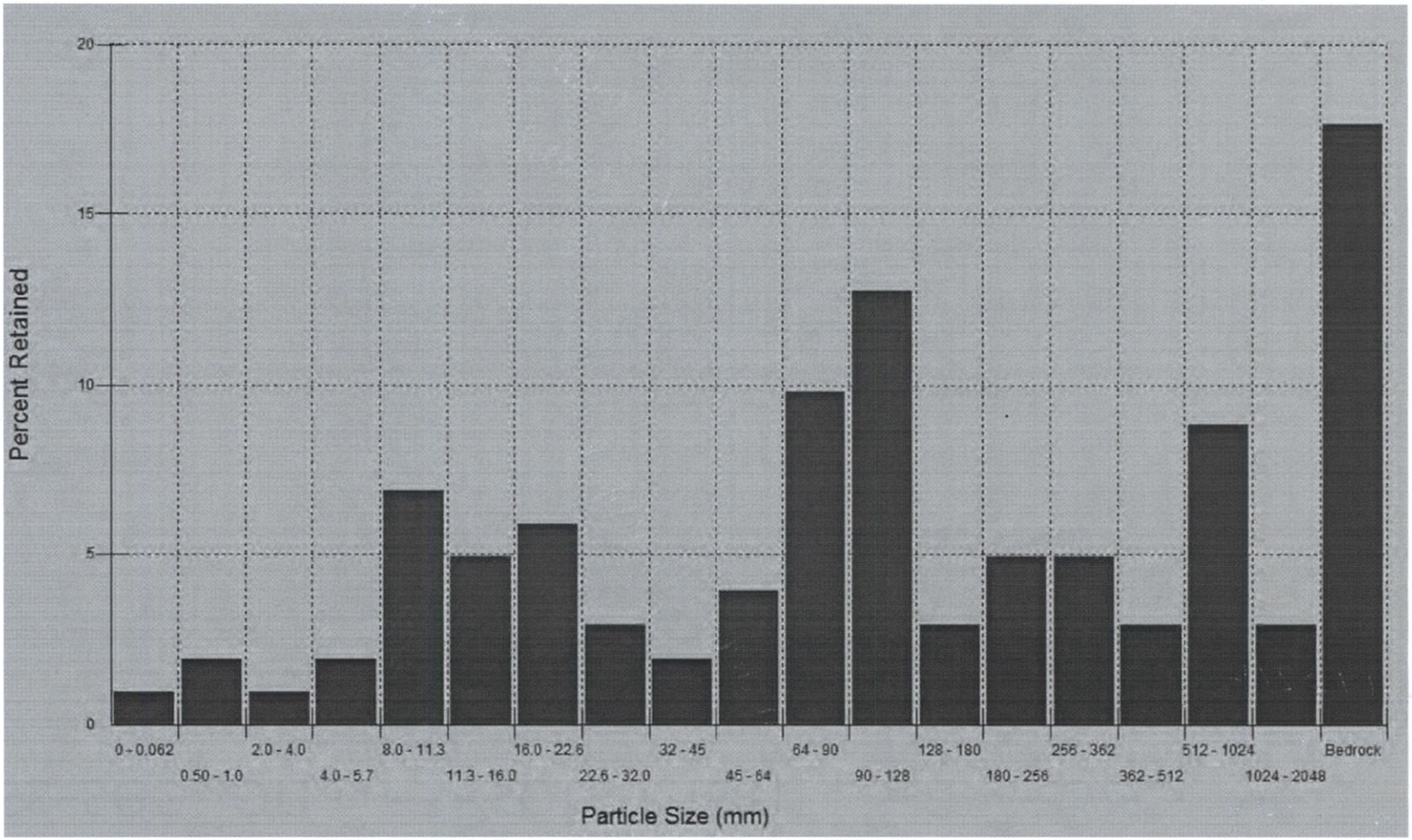
D50 113.38 mm

D84 2048 mm

Reach Pebble Count - Reach 1 - Sharman's - Station 2+38



Reach Pebble Count - Reach 1 - Sharman's - St. 2+38



Cross-section 6 – Protrusion Sta 2+38 – Reach #1

Shermans
4/25/17

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	0	0.00	0.00
0.50 - 1.0	0	0.00	0.00
1.0 - 2.0	0	0.00	0.00
2.0 - 4.0	0	0.00	0.00
4.0 - 5.7	0	0.00	0.00
5.7 - 8.0	0	0.00	0.00
8.0 - 11.3	0	0.00	0.00
11.3 - 16.0	0	0.00	0.00
16.0 - 22.6	0	0.00	0.00
22.6 - 32.0	0	0.00	0.00
32 - 45	0	0.00	0.00
45 - 64	1	0.96	0.96
64 - 90	2	1.92	2.88
90 - 128	8	7.69	10.58
128 - 180	13	12.50	23.08
180 - 256	19	18.27	41.35
256 - 362	25	24.04	65.38
362 - 512	16	15.38	80.77
512 - 1024	15	14.42	95.19
1024 - 2048	5	4.81	100.00
Bedrock	0	0.00	100.00

Particle Size Analysis

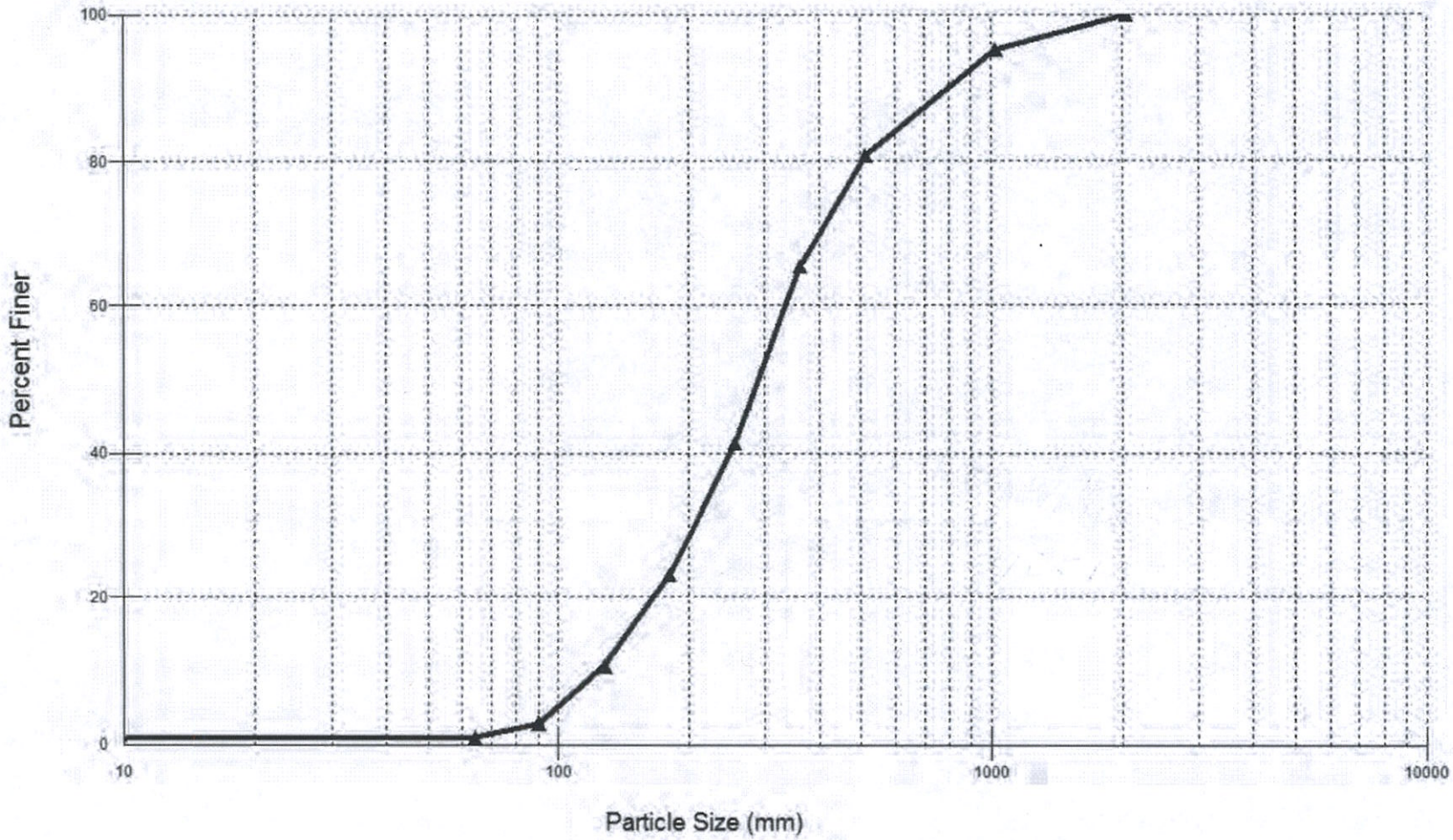
D16 (mm)	150.55
D35 (mm)	229.59
D50 (mm)	294.16
D84 (mm)	626.69
D95 (mm)	1017.25
D100 (mm)	2047.98
Silt/Clay (%)	0
Sand (%)	0
Gravel (%)	0.96
Cobble (%)	40.39
Boulder (%)	58.65
Bedrock (%)	0

Total Particles = 104

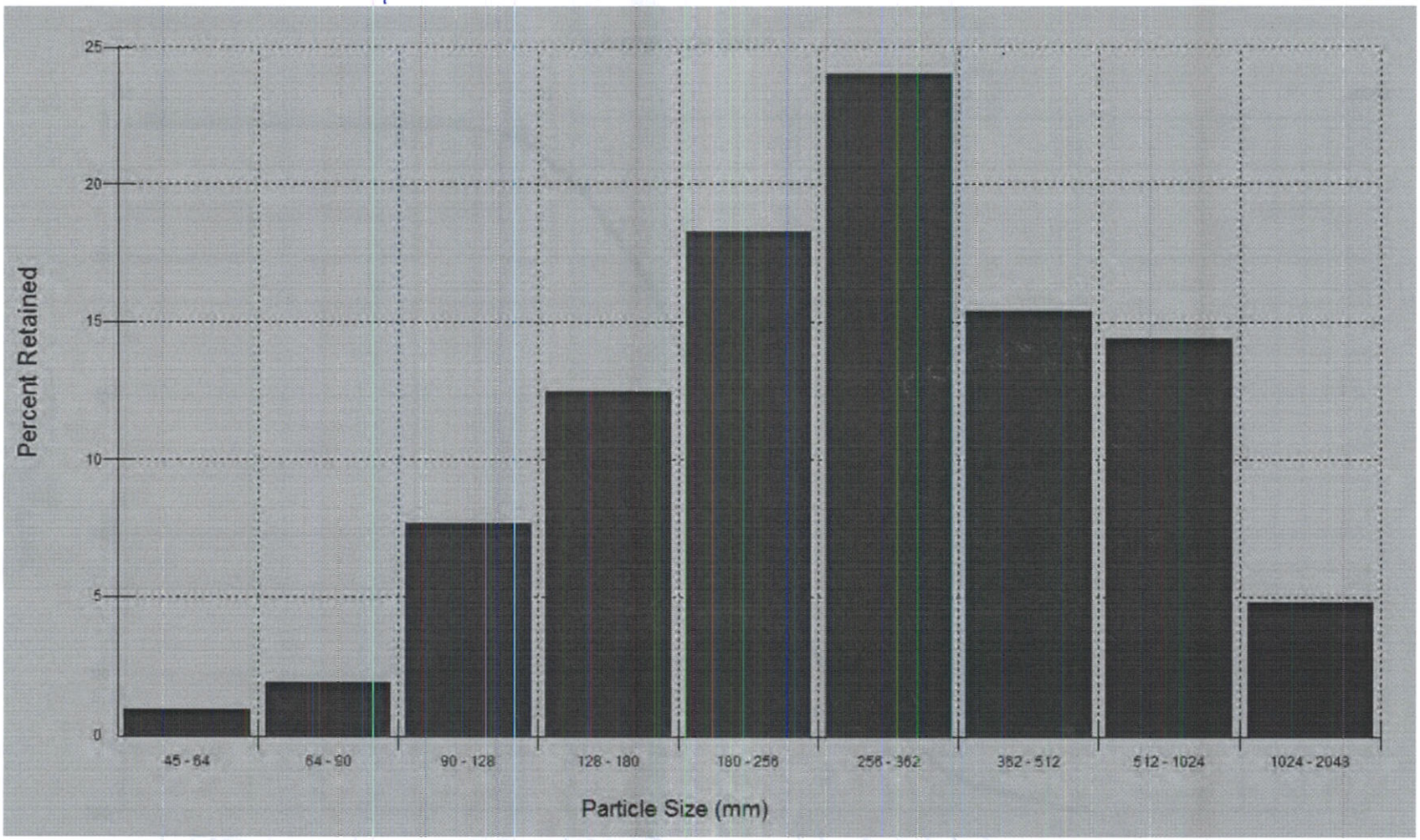
D50 294.16 mm

D84 626.69 mm

Cross section 6 - Protrusion Stat 2+38
Reach #1 - Sharman's - 4/25/17



Cross section 6 - Protrusion Stat 2+38
Reach #1, Sharmans 4/25/17



Cross-section 6- Pebble Count - Reach 1 - Sharman's

4/25/17

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	2	2.00	2.00
0.062 - 0.125	0	0.00	2.00
0.125 - 0.25	0	0.00	2.00
0.25 - 0.50	1	1.00	3.00
0.50 - 1.0	0	0.00	3.00
1.0 - 2.0	0	0.00	3.00
2.0 - 4.0	1	1.00	4.00
4.0 - 5.7	3	3.00	7.00
5.7 - 8.0	1	1.00	8.00
8.0 - 11.3	1	1.00	9.00
11.3 - 16.0	6	6.00	15.00
16.0 - 22.6	0	0.00	15.00
22.6 - 32.0	9	9.00	24.00
32 - 45	3	3.00	27.00
45 - 64	7	7.00	34.00
64 - 90	11	11.00	45.00
90 - 128	11	11.00	56.00
128 - 180	2	2.00	58.00
180 - 256	9	9.00	67.00
256 - 362	6	6.00	73.00
362 - 512	3	3.00	76.00
512 - 1024	5	5.00	81.00
1024 - 2048	2	2.00	83.00
Bedrock	17	17.00	100.00

Particle Size Analysis

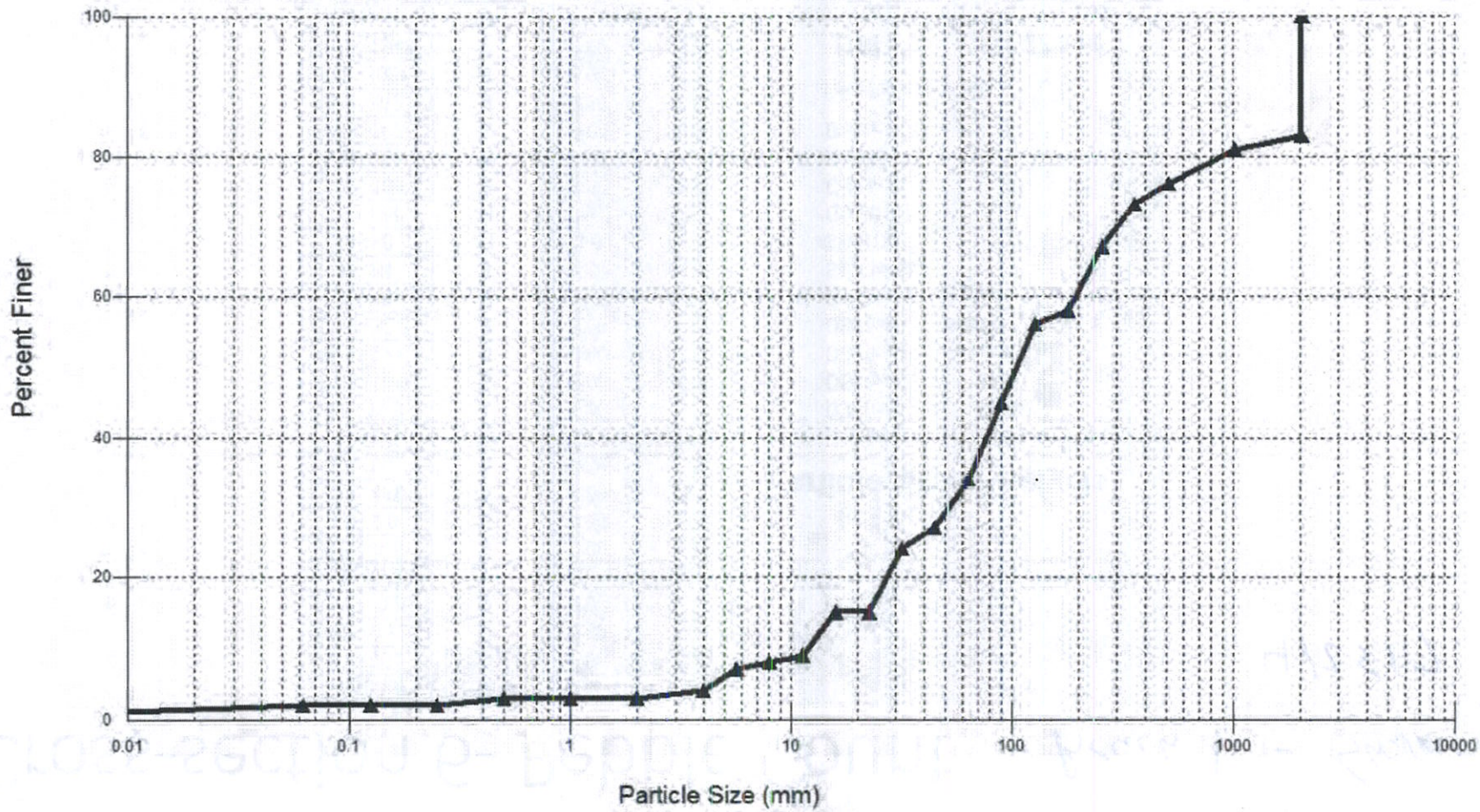
D16 (mm)	23.64
D35 (mm)	66.36
D50 (mm)	107.27
D84 (mm)	Bedrock
D95 (mm)	Bedrock
D100 (mm)	Bedrock
Silt/Clay (%)	2
Sand (%)	1
Gravel (%)	31
Cobble (%)	33
Boulder (%)	16
Bedrock (%)	17

Total Particles = 100

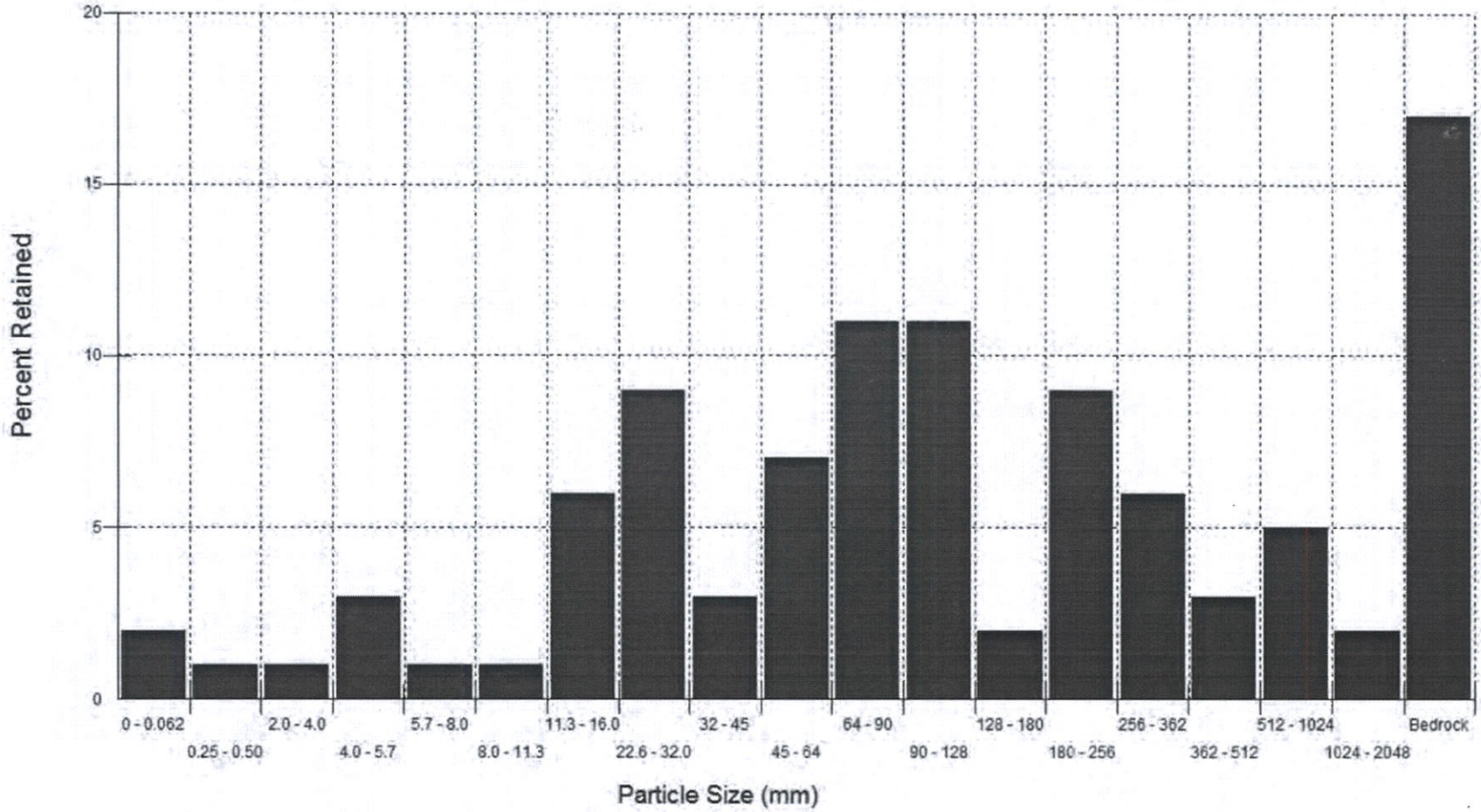
D50 **107.27 mm**

D84 **2048 mm**

XS-6 Pebble Count - Reach I Sharman's - 4/25/17



XS-6 Pebble Count - Reach 1 - Sharman's 4/25/17



Worksheet 2-2. Computations of velocity and bankfull discharge using various methods (Rosgen, 2006b; Rosgen and Silvey, 2007).

Bankfull VELOCITY & DISCHARGE Estimates

Stream:	Sharman's Branch			Location:	Reach - Reach 1
Date:	4/25/2017	Stream Type:	B3/2/1	Valley Type:	C-CO-US
Observers:				HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	31.96	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	1.38	d_{bkf} (ft)
Bankfull Riffle WIDTH	23.13	W_{bkf} (ft)	Wetted PERMIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	24.71	W_p (ft)
D_{84} at Riffle	294.16	Dia. (mm)	D_{84} (mm) / 304.8	0.97	D_{84} (ft)
Bankfull SLOPE	0.0291	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1.29	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	1.34	R / D_{84}
Drainage Area	3.6	DA (mi^2)	Shear Velocity $u^* = (gRS)^{1/2}$	1.099	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [\ 2.83 + 5.66 * Log\ \{ R / D_{84} \}\ ]\ u^*$	3.91	ft / sec	124.83	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. 2-18, 2-19) $u = 1.49*R^{2/3}*S^{1/2} / n$ $n =$ 0.08	3.76	ft / sec	120.20	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. 2-20) $u = 1.49*R^{2/3}*S^{1/2} / n$ $n =$ 0.074	4.07	ft / sec	129.95	cfs
2. Roughness Coefficient: c) Manning's n from Jarrett (USGS): $u = 1.49*R^{2/3}*S^{1/2} / n$ $n = 0.39*S^{0.38}*R^{-0.16}$ Note: This equation is applicable to steep, step/pool, high boundary roughness, cobble- and boulder-dominated stream systems; i.e., for Stream Types A1, A2, A3, B1, B2, B3, C2 & E3 $n =$ 0.098	3.08	ft / sec	98.53	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Darcy-Weisbach (Leopold, Wolman and Miller)	4.23	ft / sec	135.17	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.) Chezy C	0.00	ft / sec	0.00	cfs
4. Continuity Equations: a) Regional Curves $u = Q / A$ Return Period for Bankfull Discharge Q = 0.0 year	3.54	ft / sec	113.00	cfs
4. Continuity Equations: b) USGS Gage Data $u = Q / A$	0.00	ft / sec	0.00	cfs

Protrusion Height Options for the D_{84} Term in the Relative Roughness Relation (R/D_{84}) – Estimation Method 1

Option 1.	For **sand-bed** channels: Measure 100 **"protrusion heights"** of sand dunes from the downstream side of feature to the top of feature. Substitute the D_{84} sand dune protrusion height in ft for the D_{84} term in method 1.
Option 2.	For **boulder-dominated** channels: Measure 100 **"protrusion heights"** of boulders on the sides from the bed elevation to the top of the rock on that side. Substitute the D_{84} boulder protrusion height in ft for the D_{84} term in method 1.
Option 3.	For **bedrock-dominated** channels: Measure 100 **"protrusion heights"** of rock separations, steps, joints or uplifted surfaces above channel bed elevation. Substitute the D_{84} bedrock protrusion height in ft for the D_{84} term in method 1.
Option 4.	For **log-influenced** channels: Measure **"protrustion heights"** proportionate to channel width of log diameters or the height of the log on upstream side if embedded. Substitute the D_{84} protrusion height in ft for the D_{84} term in method 1.

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Worksheet 2-3. Field form for Level II stream classification (Rosgen, 1996; Rosgen and Silvey, 2005).

Stream:	**Sharman's Branch, Reach - Reach 1**			
Basin:	Drainage Area:	**2304** acres	**3.6**	mi^2
Location:				
Twp.&Rge: ;	Sec.&Qtr.: ;			
Cross-Section Monuments (Lat./Long.):	**39.43365 Lat / -77.7062 Long**		Date: **04/25/17**	
Observers:			Valley Type: C-CO-U	

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	**23.13**	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A / W_{bkf}$).	**1.38**	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	**31.96**	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	**16.76**	ft/ft
Maximum DEPTH (d_{mbkf}) Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section.	**2.68**	ft
WIDTH of Flood-Prone Area (W_{fpa}) Twice maximum DEPTH, or ($2 \times d_{mbkf}$) = the stage/elevation at which flood-prone area WIDTH is determined in a riffle section.	**39.48**	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	**1.71**	ft/ft
Channel Materials (Particle Size Index) D_{50} The D_{50} particle size index represents the mean diameter of channel materials, as sampled from the channel surface, between the bankfull stage and Thalweg elevations.	**113.38**	mm
Water Surface SLOPE (S) Channel slope = "rise over run" for a reach approximately 20–30 bankfull channel widths in length, with the "riffle-to-riffle" water surface slope representing the gradient at bankfull stage.	**0.02879**	ft/ft
Channel SINUOSITY (k) Sinuosity is an index of channel pattern, determined from a ratio of stream length divided by valley length (SL / VL); or estimated from a ratio of valley slope divided by channel slope (VS / S).	**1.107**	

Stream Type **B/3/2/1** (See **Figure 2-14**)

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Worksheet 2-4a. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

Stream: **Sharman's Branch** Location: **Reach - Reach 1**

Observers: Date: **04/25/17** Valley Type: **C-CO-US** Stream Type: **B/3/2/1**

River Reach Dimension Summary Data.....1

Riffle Dimensions*, **, ***	Mean	Min	Max		Riffle Dimensions & Dimensionless Ratios****	Mean	Min	Max
Riffle Width (W_{bkf})	27	23.1	30.9	ft	Riffle Cross-Sectional Area (A_{bkf}) (ft^2)	37.05	32.02	42.07
Mean Riffle Depth (d_{bkf})	1.37	1.36	1.38	ft	Riffle Width/Depth Ratio (W_{bkf} / d_{bkf})	19.76	16.76	22.75
Maximum Riffle Depth (d_{max})	2.48	2.28	2.68	ft	Max Riffle Depth to Mean Riffle Depth (d_{max} / d_{bkf})	1.809	1.676	1.942
Width of Flood-Prone Area (W_{fpa})	40	39.5	40.5	ft	Entrenchment Ratio (W_{fpa} / W_{bkf})	1.509	1.310	1.707
Riffle Inner Berm Width (W_{ib})	13.6	6.55	20.6	ft	Riffle Inner Berm Width to Riffle Width (W_{ib} / W_{bkf})	0.474	0.283	0.664
Riffle Inner Berm Depth (d_{ib})	0.43	0.29	0.57	ft	Riffle Inner Berm Depth to Mean Depth (d_{ib} / d_{bkf})	0.312	0.207	0.417
Riffle Inner Berm Area (A_{ib})	6.77	1.87	11.7	ft^2	Riffle Inner Berm Area to Riffle Area (A_{ib} / A_{bkf})	0.168	0.058	0.277
Riffle Inner Berm W/D Ratio (W_{ib} / d_{ib})	29.6	22.9	36.2					

Pool Dimensions*, **, ***	Mean	Min	Max		Pool Dimensions & Dimensionless Ratios****	Mean	Min	Max
Pool Width (W_{bkfp})	33.4	31.9	34.9	ft	Pool Width to Riffle Width (W_{bkfp} / W_{bkf})	1.235	1.180	1.291
Mean Pool Depth (d_{bkfp})	1.77	1.55	1.99	ft	Mean Pool Depth to Mean Riffle Depth (d_{bkfp} / d_{bkf})	1.292	1.131	1.453
Pool Cross-Sectional Area (A_{bkfp})	59.3	49.3	69.3	ft	Pool Area to Riffle Area (A_{bkfp} / A_{bkf})	1.601	1.331	1.870
Maximum Pool Depth (d_{maxp})	2.97	2.63	3.3	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.168	1.920	2.409
Pool Inner Berm Width (W_{ibp})	22	17	27	ft	Pool Inner Berm Width to Pool Width (W_{ibp} / W_{bkfp})	0.653	0.533	0.773
Pool Inner Berm Depth (d_{ibp})	0.48	0.34	0.61	ft	Pool Inner Berm Depth to Pool Depth (d_{ibp} / d_{bkfp})	0.264	0.221	0.307
Pool Inner Berm Area (A_{ibp})	11.2	5.82	16.5	ft^2	Pool Inner Berm Area to Pool Area (A_{ibp} / A_{bkfp})	0.178	0.118	0.238
Point Bar Slope (S_{pb})	0.000	0.000	0.000	ft/ft	Pool Inner Berm Width/Depth Ratio (W_{ibp} / d_{ibp})	46.898	44.133	49.662

Run Dimensions*	Mean	Min	Max		Run Dimensionless Ratios****	Mean	Min	Max
Run Width (W_{bkfr})	0	0	0	ft	Run Width to Riffle Width (W_{bkfr} / W_{bkf})	0.000	0.000	0.000
Mean Run Depth (d_{bkfr})	0	0	0	ft	Mean Run Depth to Mean Riffle Depth (d_{bkfr} / d_{bkf})	0.000	0.000	0.000
Run Cross-Sectional Area (A_{bkfr})	0	0	0	ft	Run Area to Riffle Area (A_{bkfr} / A_{bkf})	0.000	0.000	0.000
Maximum Run Depth (d_{maxr})	0	0	0	ft	Max Run Depth to Mean Riffle Depth (d_{maxr} / d_{bkf})	0.000	0.000	0.000
Run Width/Depth Ratio (W_{bkfr} / d_{bkfr})	0	0	0	ft				

Glide Dimensions*	Mean	Min	Max		Glide Dimensions & Dimensionless Ratios****	Mean	Min	Max
Glide Width (W_{bkfg})	0	0	0	ft	Glide Width to Riffle Width (W_{bkfg} / W_{bkf})	0.000	0.000	0.000
Mean Glide Depth (d_{bkfg})	0	0	0	ft	Mean Glide Depth to Mean Riffle Depth (d_{bkfg} / d_{bkf})	0.000	0.000	0.000
Glide Cross-Sectional Area (A_{bkfg})	0	0	0	ft	Glide Area to Riffle Area (A_{bkfg} / A_{bkf})	0.000	0.000	0.000
Maximum Glide Depth (d_{maxg})	0	0	0	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	0.000	0.000	0.000
Glide Width/Depth Ratio (W_{bkfg} / d_{bkfg})	0	0	0	ft/ft	Glide Inner Berm Width/Depth Ratio (W_{ibg} / d_{ibg})	0.000	0.000	0.000
Glide Inner Berm Width (W_{ibg})	0	0	0	ft	Glide Inner Berm Width to Glide Width (W_{ibg}/W_{bkfg})	0.000	0.000	0.000
Glide Inner Berm Depth (d_{ibg})	0	0	0	ft	Glide Inner Berm Depth to Glide Depth (d_{ibg} / d_{bkfg})	0.000	0.000	0.000
Glide Inner Berm Area (A_{ibg})	0	0	0	ft^2	Glide Inner Berm Area to Glide Area (A_{ibg} / A_{bkfg})	0.000	0.000	0.000

Step**	Mean	Min	Max		Step Dimensionless Ratios****	Mean	Min	Max
Step Width (W_{bkfs})	27.8	27.2	28.4	ft	Step Width to Riffle Width (W_{bkfs} / W_{bkf})	1.028	1.005	1.050
Mean Step Depth (d_{bkfs})	1.57	1.23	1.9	ft	Mean Step Depth to Riffle Depth (d_{bkfs} / d_{bkf})	1.146	0.898	1.387
Step Cross-Sectional Area (A_{bkfs})	43.8	33.4	54.1	ft	Step Area to Riffle Area (A_{bkfs} / A_{bkf})	1.181	0.903	1.460
Maximum Step Depth (d_{maxs})	2.38	2.19	2.57	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	1.737	1.599	1.876
Step Width/Depth Ratio (W_{bkfs} / d_{bkfs})	18.5	15	22.1					

*Riffle–Pool system (i.e., C, E, F stream types) bed features include riffles, runs, pools and glides.

**Step–Pool system (i.e., A, B, G stream types) bed features include riffles, rapids, chutes, pools and steps (note: include rapids and chutes in riffle category).

***Convergence-Divergence system (i.e., D stream types) bed features include riffles and pools; cross-sections taken at riffles for classification purposes.

****Mean values are used as the normalization parameter for all dimensionless ratios; e.g., minimum pool width to riffle width ratio uses the *mean* riffle width value.

Worksheet 2-4b. Morphological relations, including dimensionless ratios of river reach sites (Rosgen and Silvey, 2007; Rosgen, 2008).

Stream: **Sharman's Branch**		Location: **Reach - Reach 1**	
Observers:	Date: **04/25/17**	Valley Type: **C-CO-US**	Stream Type: **B/3/2/1**

River Reach Summary Data.....2

Hydraulics

Streamflow: Estimated Mean Velocity at Bankfull Stage (u_{bkf})	3.91	ft/sec	Estimation Method	u/u*	
Streamflow: Estimated Discharge at Bankfull Stage (Q_{bkf})	124.83	cfs	Drainage Area	3.6	mi^2

Channel Pattern

Geometry	Mean	Min	Max		Dimensionless Geometry Ratios	Mean	Min	Max
Linear Wavelength (λ)	0	0	0	ft	Linear Wavelength to Riffle Width (λ / W_{bkf})	0.000	0.000	0.000
Stream Meander Length (L_m)	0	0	0	ft	Stream Meander Length Ratio (L_m / W_{bkf})	0.000	0.000	0.000
Radius of Curvature (R_c)	0	0	0	ft	Radius of Curvature to Riffle Width (R_c / W_{bkf})	0.000	0.000	0.000
Belt Width (W_{blt})	26.4	17.2	35.5	ft	Meander Width Ratio (W_{blt} / W_{bkf})	0.976	0.637	1.315
Arc Length (L_a)	0	0	0	ft	Arc Length to Riffle Width (L_a / W_{bkf})	0.000	0.000	0.000
Riffle Length (L_r)	12.8	6.39	20.7	ft	Riffle Length to Riffle Width (L_r / W_{bkf})	0.473	0.236	0.766
Individual Pool Length (L_p)	13.5	7.3	20.4	ft	Individual Pool Length to Riffle Width (L_p / W_{bkf})	0.501	0.270	0.754
Pool to Pool Spacing (P_s)	21.4	4.57	49.3	ft	Pool to Pool Spacing to Riffle Width (P_s / W_{bkf})	0.791	0.169	1.823

Channel Profile

Valley Slope (S_{val})	0.0352	ft/ft	Average Water Surface Slope (S)	0.02879	ft/ft	Sinuosity (S_{val} / S)	1.107
Stream Length (SL)	254	ft	Valley Length (VL)	229.4	ft	Sinuosity (SL / VL)	1.107

Low Bank Height (LBH)	start	0	ft	Max Depth (d_{max})	start	0	ft	Bank-Height Ratio (BHR) (LBH / d_{max}) start
	end	0	ft		end	0	ft	end

Facet Slopes	Mean	Min	Max		Dimensionless Facet Slope Ratios	Mean	Min	Max
Riffle Slope (S_{rif})	0.037	0.022	0.045	ft/ft	Riffle Slope to Average Water Surface Slope (S_{rif} / S)	1.278	0.774	1.559
Run Slope (S_{run})	0.000	0.000	0.000	ft/ft	Run Slope to Average Water Surface Slope (S_{run} / S)	0.000	0.000	0.000
Pool Slope (S_p)	0.008	0.002	0.015	ft/ft	Pool Slope to Average Water Surface Slope (S_p / S)	0.280	0.084	0.537
Glide Slope (S_g)	0.000	0.000	0.000	ft/ft	Glide Slope to Average Water Surface Slope (S_g / S)	0.000	0.000	0.000
Step Slope (S_s)	0.214	0.096	0.371	ft/ft	Step Slope to Average Water Surface Slope (S_s / S)	7.450	3.341	12.889

Max Depths[a]	Mean	Min	Max		Dimensionless Depth Ratios	Mean	Min	Max
Max Riffle Depth (d_{maxrif})	2.13	1.69	2.58	ft	Max Riffle Depth to Mean Riffle Depth (d_{maxrif} / d_{bkf})	1.55	1.234	1.883211679
Max Run Depth (d_{maxrun})	0	0	0	ft	Max Run Depth to Mean Riffle Depth (d_{maxrun} / d_{bkf})	0	0	0
Max Pool Depth (d_{maxp})	3.18	2.38	4.66	ft	Max Pool Depth to Mean Riffle Depth (d_{maxp} / d_{bkf})	2.32	1.737	3.401459854
Max Glide Depth (d_{maxg})	0	0	0	ft	Max Glide Depth to Mean Riffle Depth (d_{maxg} / d_{bkf})	0	0	0
Max Step Depth (d_{maxs})	2.22	2.03	2.42	ft	Max Step Depth to Mean Riffle Depth (d_{maxs} / d_{bkf})	1.62	1.482	1.766423358

Channel Materials

	Reach[b]	Riffle[c]	Bar		Reach[b]	Riffle[c]	Bar	Protrusion Height[d]	
% Silt/Clay	0.98	2		D_{16}	14.42	23.64		150.55	mm
% Sand	1.96	1		D_{35}	71.02	66.36		229.59	mm
% Gravel	29.41	31		D_{50}	113.38	107.27		294.16	mm
% Cobble	30.4	33		D_{84}	Bedrock	Bedrock		626.69	mm
% Boulder	19.6	16		D_{95}	Bedrock	Bedrock		1017.25	mm
% Bedrock	17.65	17		D_{100}	Bedrock	Bedrock		2047.98	mm

[a] Min, max & mean depths are measured from Thalweg to bankfull at mid-point of feature for riffles and runs, the deepest part of pools, & at the tail-out of glides.
[b] Composite sample of riffles and pools within the designated reach. [c] Active bed of a riffle. [d] Height of roughness feature above bed.

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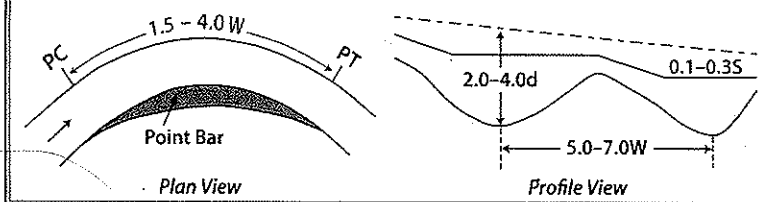
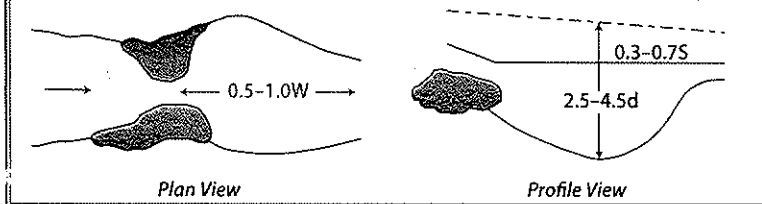
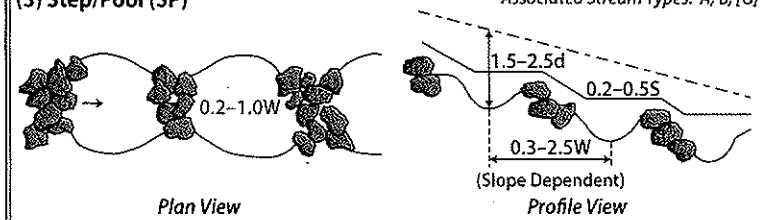
(1) Lateral Scour Pool (LSP) *Associated Stream Types: C, DA, E*



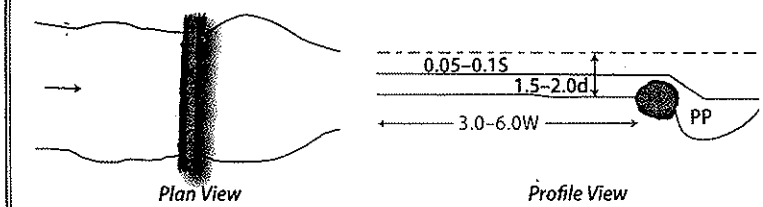
(2) Contraction Scour Pool (CSP) *Associated Stream Types: A, B, C, [F, G]*



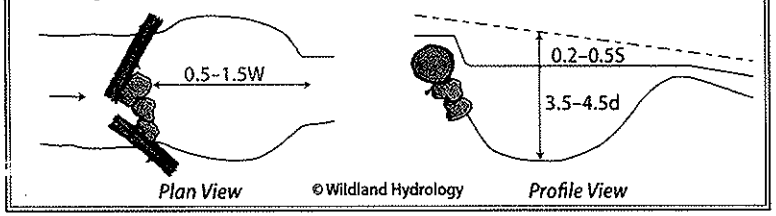
(3) Step/Pool (SP) *Associated Stream Types: A, B, [G]*



(4) Backwater Pool (BWP) *Associated Stream Types: A, B, C, D, E, [F, G]*



(5) Plunge Pool (PP) *Associated Stream Types: A, B, C, E, [F, G]*



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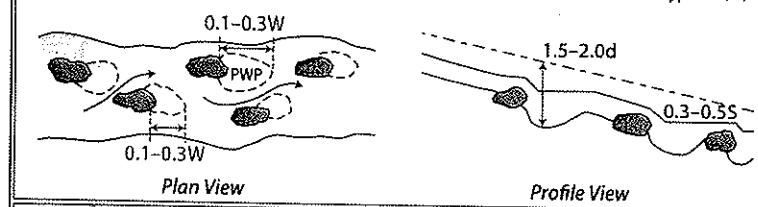
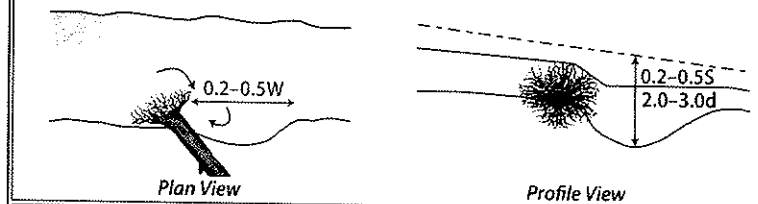
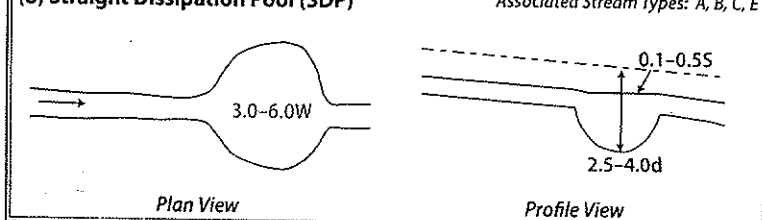
(6) Pocket Water Pool (PWP) *Associated Stream Types: A, B, C*



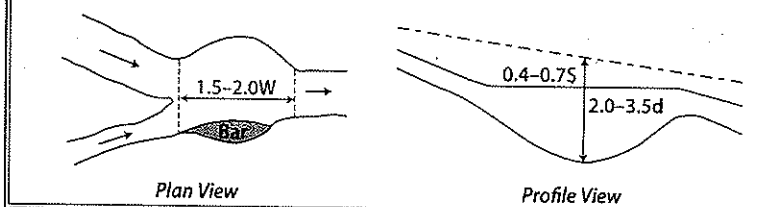
(7) Lateral Protrusion Pool (LPP) *Associated Stream Types: A, B, C, E*



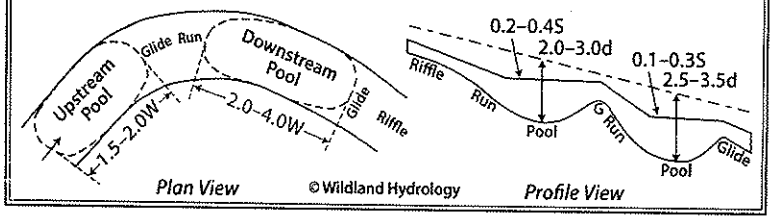
(8) Straight Dissipation Pool (SDP) *Associated Stream Types: A, B, C, E*



(9) Converging Confluence Pool (CCP) *Associated Stream Types: A, B, C, E, [F, G]*



(10) Compound Pool (CP) *Associated Stream Types: C, E*



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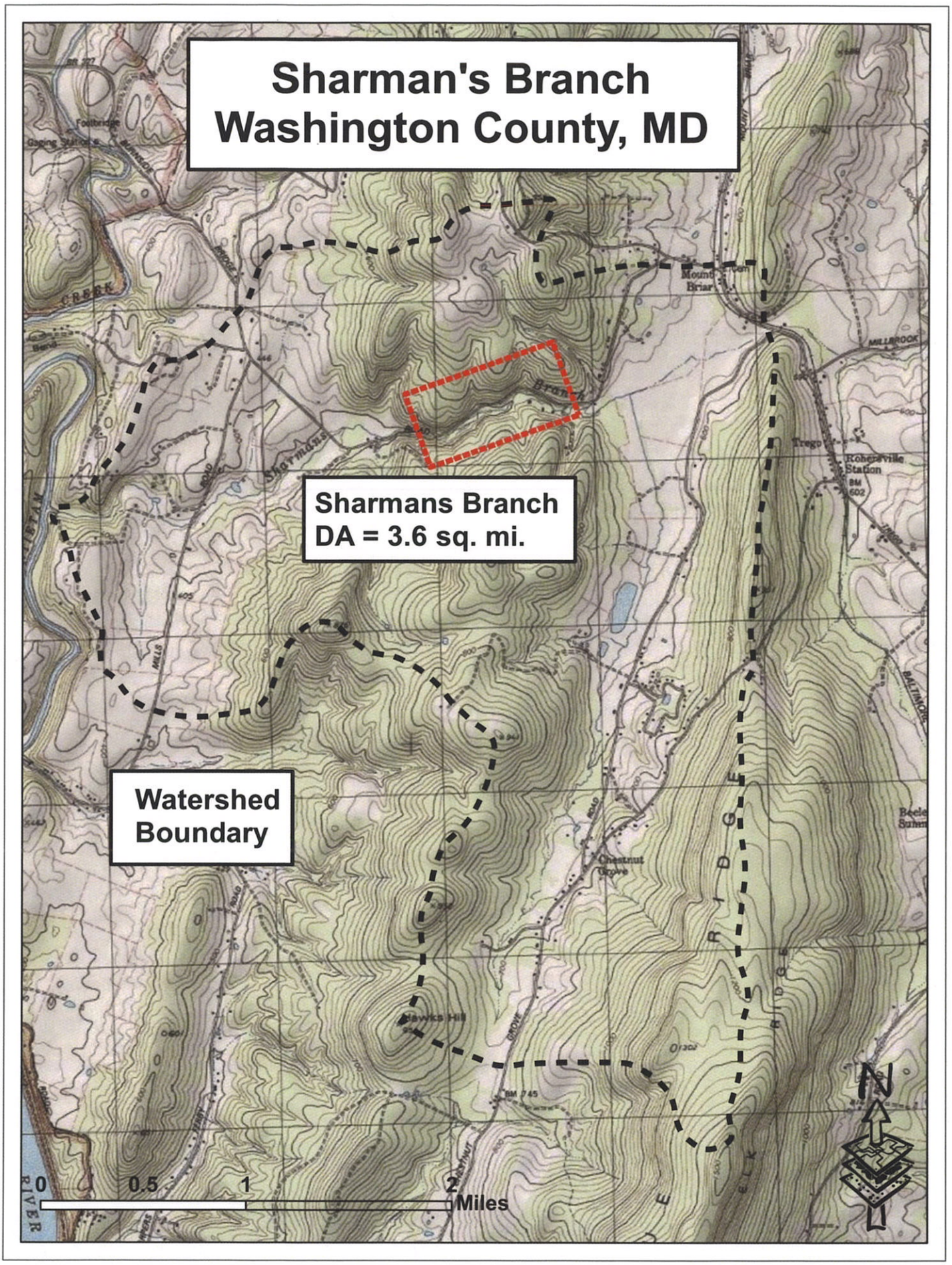
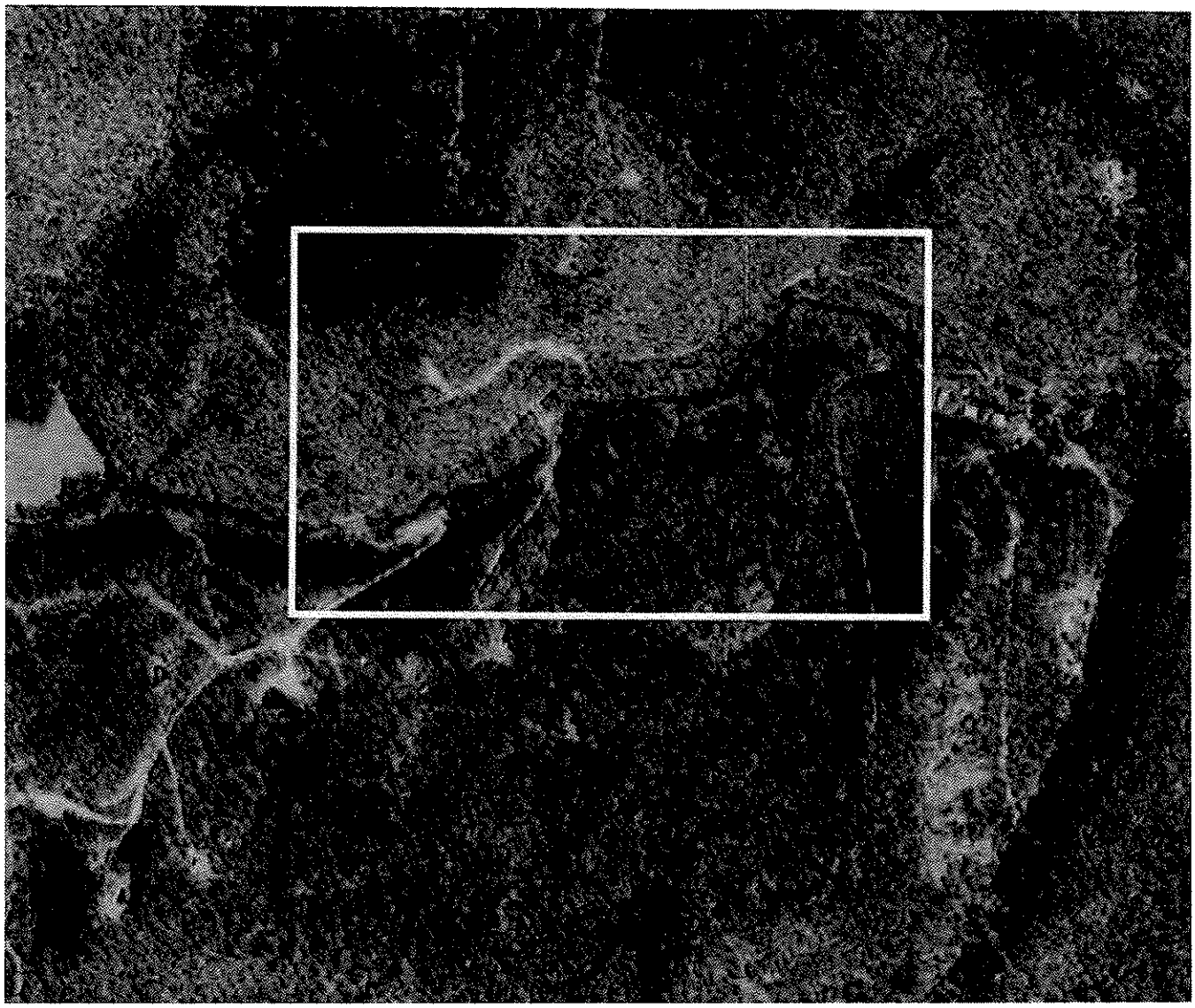

Sharman's Branch
Washington County, MD
Sharmans Branch
DA = 3.6 sq. mi.
Watershed
Boundary
0
0.5
1
2
Miles
N

Sharman's Branch
Washington County, MD



300 0 300 600 900 Feet

N
W E
S

Longitudinal Profile

The longitudinal profile characterizes average stream slopes and depths of riffles, pools, runs, glides, rapids, and steps. The average water surface slope is required for delineating stream types and is used as a normalization parameter for dimensionless ratios (**Figure B-13**). The water surface slopes of individual bed features (facet slopes) can be compared using longitudinal profile data (e.g., riffle facet slope *vs.* pool facet slope). In addition, the longitudinal profile can be used to obtain maximum depths of individual bed features and bed feature spacing.

The average water surface slope is measured between two bed features of the same type (e.g., top of riffle to top of riffle) over a distance of 20 to 30 bankfull channel widths. To calculate average slope, divide the change in water surface elevation by the stream length between the two features.

Longitudinal profiles require basic surveying skills and equipment. Because longitudinal profiles cover a large distance (20 to 30 bankfull channel widths), multiple instrument setups are often required.

Longitudinal profiles are measured in the downstream direction. Typically, a 300-foot tape is laid along the centerline of the channel (not thalweg) to obtain stream length stationing. If the flow velocity or depth does not allow the tape to be stable at the channel mid-point, then station the tape along one side of channel at low flow edge of water.

An elevation measurement and the associated distance along the tape (station) are taken at major breaks in the bed topography and generally at the start, mid-point and end of features (e.g., start, mid-point and end of riffle). Four types of features are measured at each station: 1. Thalweg (deepest part of channel) (THL), 2. Water Surface (WS), 3. Bankfull (BKF) (if a good indicator), and 4. Low Bank Height (LBH) (if the lowest bank height is greater than bankfull stage to indicate degree of incision). The thalweg and water surface measurements should reflect bed elevation and water surface slope changes as the stream progresses through a bed feature sequence (e.g., riffle, run, pool, glide). Note the stationing of the cross-section locations along the profile. An example profile survey with survey notes and a plotted profile are shown in **Table B-8** and **Figure B-14**.

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Longitudinal Profile Instructions

1. Setup the instrument with a clear line of sight to a benchmark. The first setup should reference (backsight) a benchmark (BM) of known elevation. Approximate the number and location of each setup needed based on potential line-of-sight limitations. The instrument should be placed at an elevation higher than the highest feature required for the survey.

2. Backsight (BS) the benchmark (place the rod on the benchmark and obtain a rod reading). Determine the height of the instrument (HI). HI = BM elevation + BS rod reading.

3. Starting at the upstream end of the reach, position a 300-foot tape along the centerline of the channel if flow permits or along edge of water to obtain stream length stationing.

4. Place the rod at the thalweg at station 0 on the tape. Obtain the rod reading and record the value in the foresight (FS) column as shown in **Table B-8**. Record water surface, bankfull, and lowest bank height measurements (if lowest bank height is greater than bankfull stage) perpendicular to the tape at station 0 as shown in **Figure B-13**. (**Note:** LBH in **Figure B-13** at station 0+00 is the same as BKF).

5. Continue the same sequence downstream to the start, mid-point, and end of major bed features and repeat the same measurements at the new stations.

6. At cross-section intersection locations, note the distance (station) on the longitudinal profile tape. When using multiple instrument setups, take a measurement on top of both cross-section end points to obtain common elevations of the cross-section and longitudinal profile.

7. Profile your entire reach (20 to 30 bankfull channel widths is normally used as a minimum longitudinal profile length guideline).

8. Plot the longitudinal profile (**Figure B-14**); plot the cross-section locations and the corresponding bankfull elevations on the longitudinal profile.

9. Draw a line through the water surface data points of the same bed feature (e.g., top of riffle to top of riffle) to represent the average water surface slope. Draw a best-fit line through the bankfull data points (be sure that all bankfull data points are good indicators). Determine the average water surface slope and bankfull slope. **Note:** The average water surface slope and the bankfull slope should be parallel.

10. Measure the water surface facet slopes and bankfull maximum depths by individual bed feature from the plotted longitudinal profile (**Figure B-15**) and calculate the corresponding dimensionless ratios (**Table B-9**); enter the mean, minimum and maximum values in **Worksheet B-3b**.

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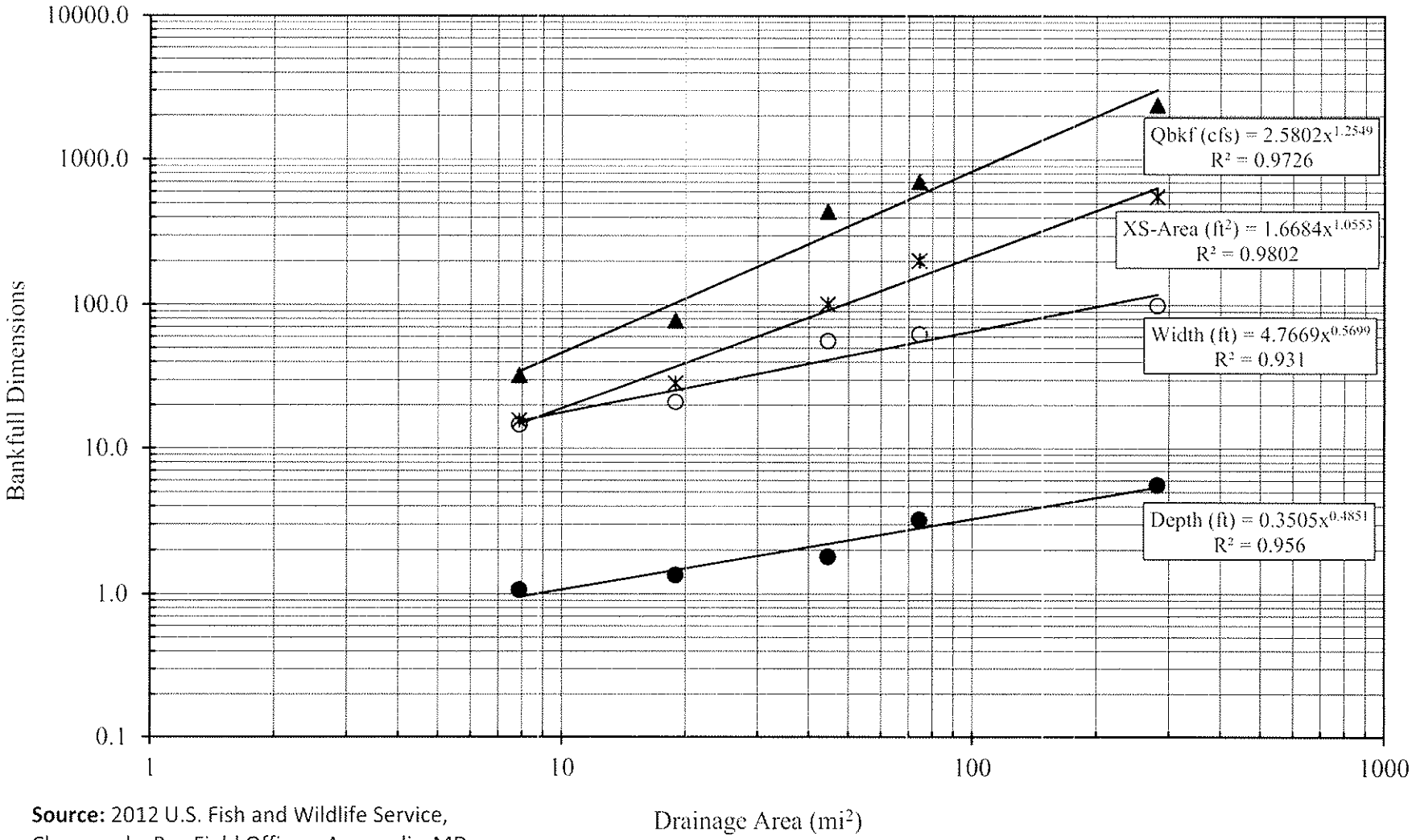
Bankfull Characteristics for Selected USGS Gages in the PA and MD Carbonate Great Valley Section of the Ridge and Valley Province							
USGS Gage Site	**Width (ft)**	**XS-Area (ft^2)**	**Mean Depth (ft)**	**Drainage Area (mi^2)**	**Bankfull Q (cfs)**	**Velocity (ft/s)**	**% of watershed underlain by carbonate rock from USGS 2005**
Beck Creek near Cleona, PA 01573086	14.6	15.58	1.07	7.87	32.32	2.07	80%
Monocacy Creek at Bethlehem, PA 01452500	56.20	101.08	1.80	44.5	441.00	4.36	69%
Quittapahilla Creek near Bellegrove PA 01573160	62.5	201.71	3.23	74.2	706.20	3.50	74%
Marsh Run @ Grimes, MD 0167800	21.00	28.42	1.35	18.9	78.00	2.91	100%
Antietam Creek at Sharpsburg, MD 01619500	99.43	556.85	5.6	281	2388.89	4.29	73%

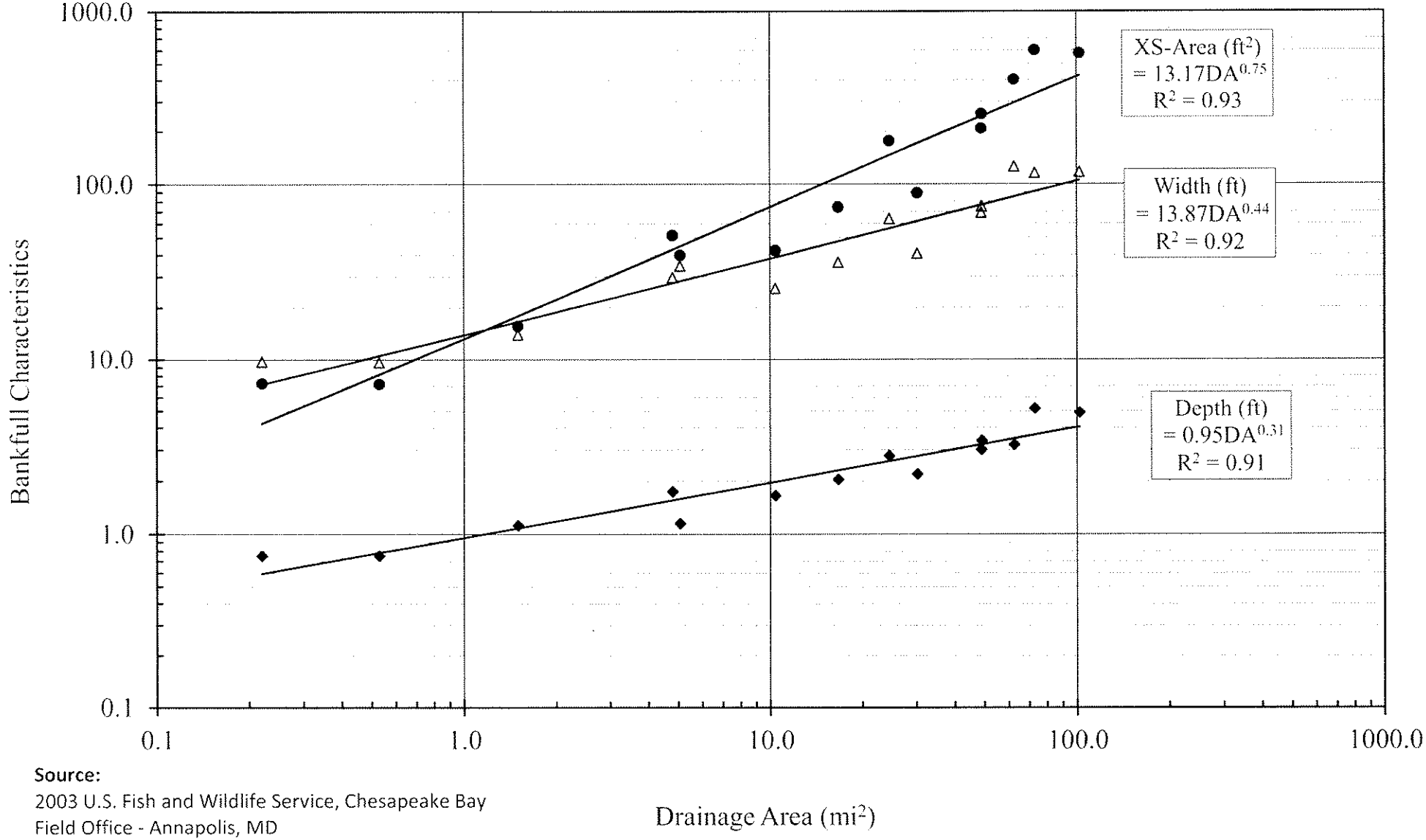
Source:
2012 U.S. Fish and Wildlife Service, Chesapeake Bay Field Office - Annapolis, MD

Bankfull Characteristics for Selected USGS Gages in the PA and MD Carbonate Great Valley Section of the Ridge and Valley Province



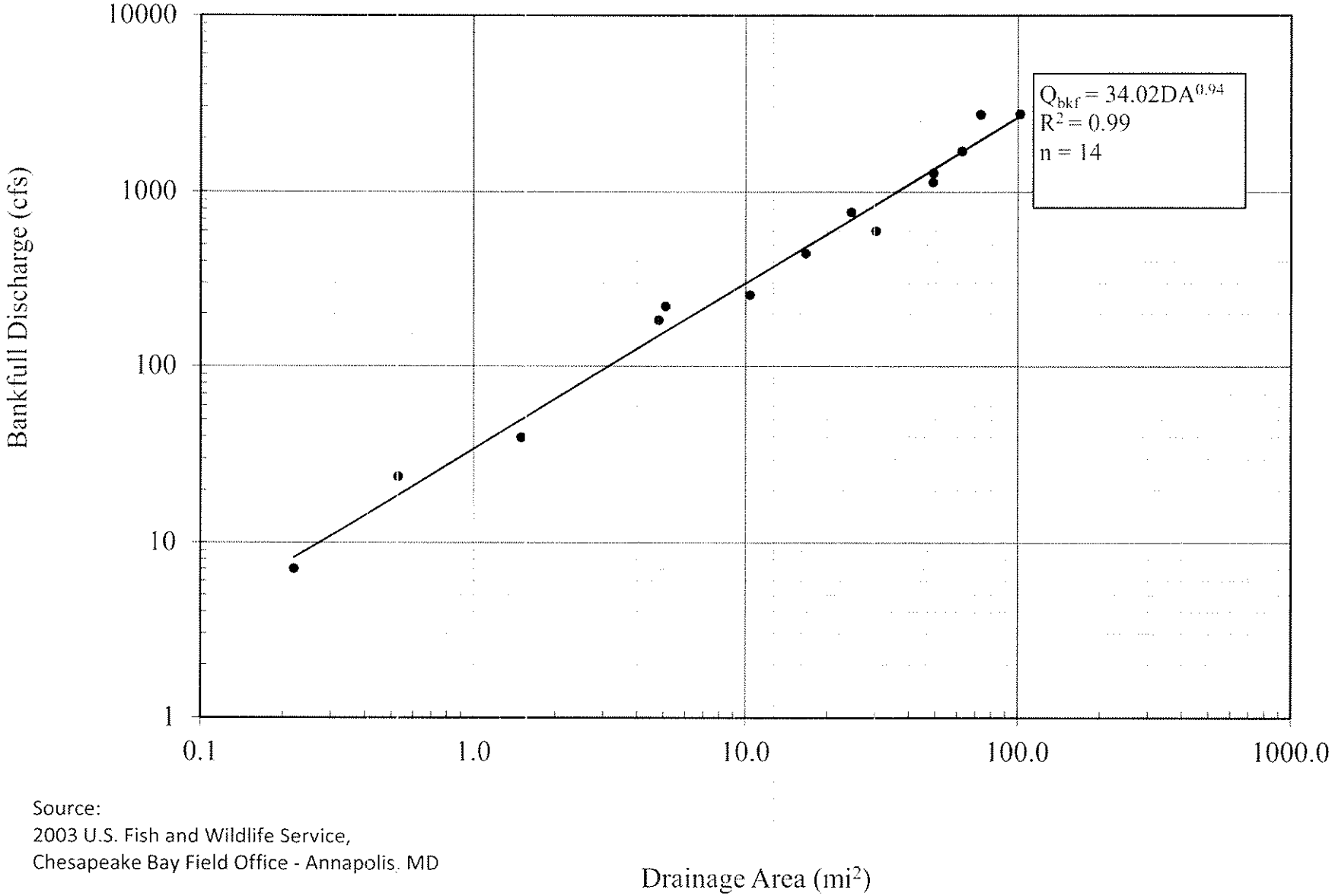
Source: 2012 U.S. Fish and Wildlife Service, Chesapeake Bay Field Office - Annapolis, MD

Bankfull Characteristics for Selected USGS Gage Sites in the Maryland Allegheny Plateau/Valley Ridge Hydro-physiographic Region



Source:
2003 U.S. Fish and Wildlife Service, Chesapeake Bay Field Office - Annapolis, MD

Bankfull Discharge as a Function of Drainage Area for the
Maryland Allegheny Plateau/Valley Ridge Hydro-physiographic Region



Source:
2003 U.S. Fish and Wildlife Service,
Chesapeake Bay Field Office - Annapolis, MD

Note:Non-urban Valley and Ridge Province of MD, VA, and WV

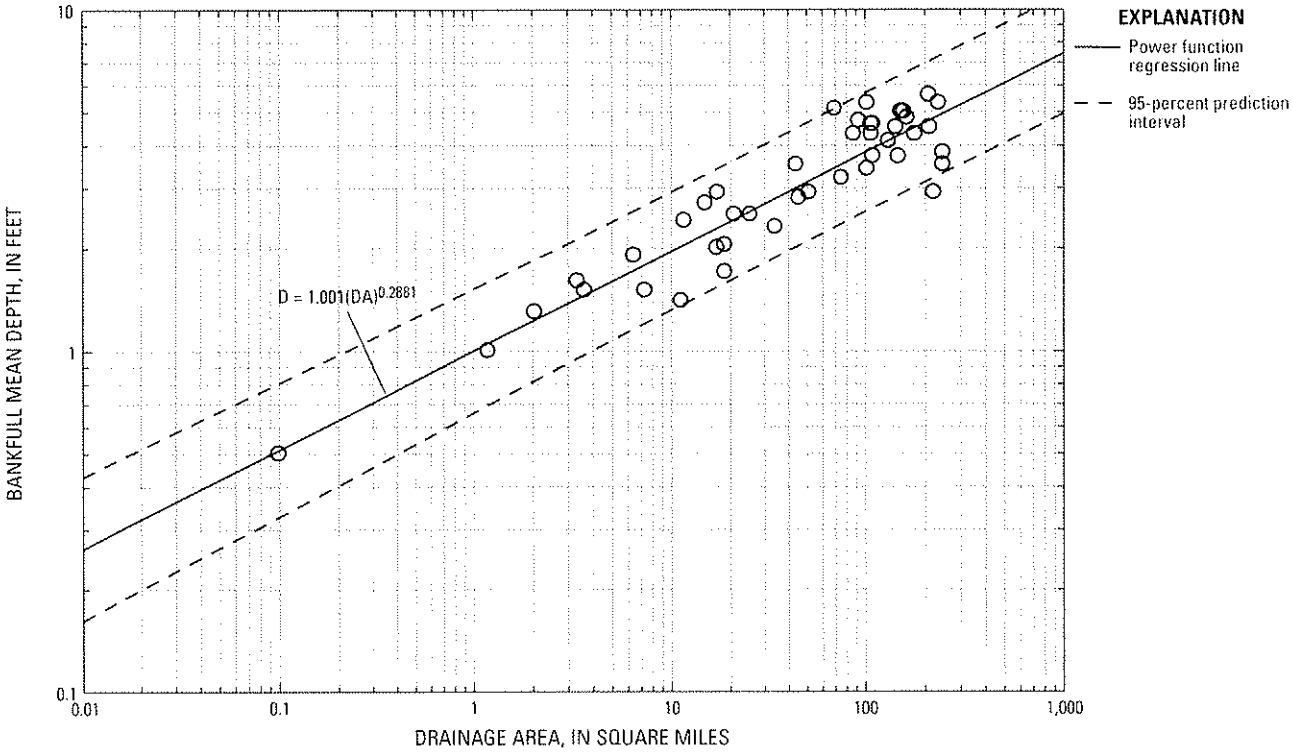


Figure 5. Regional curve relating bankfull mean depth (D) to drainage area (DA) in the non-urban Valley and Ridge Physiographic Province in Maryland, Virginia, and West Virginia.

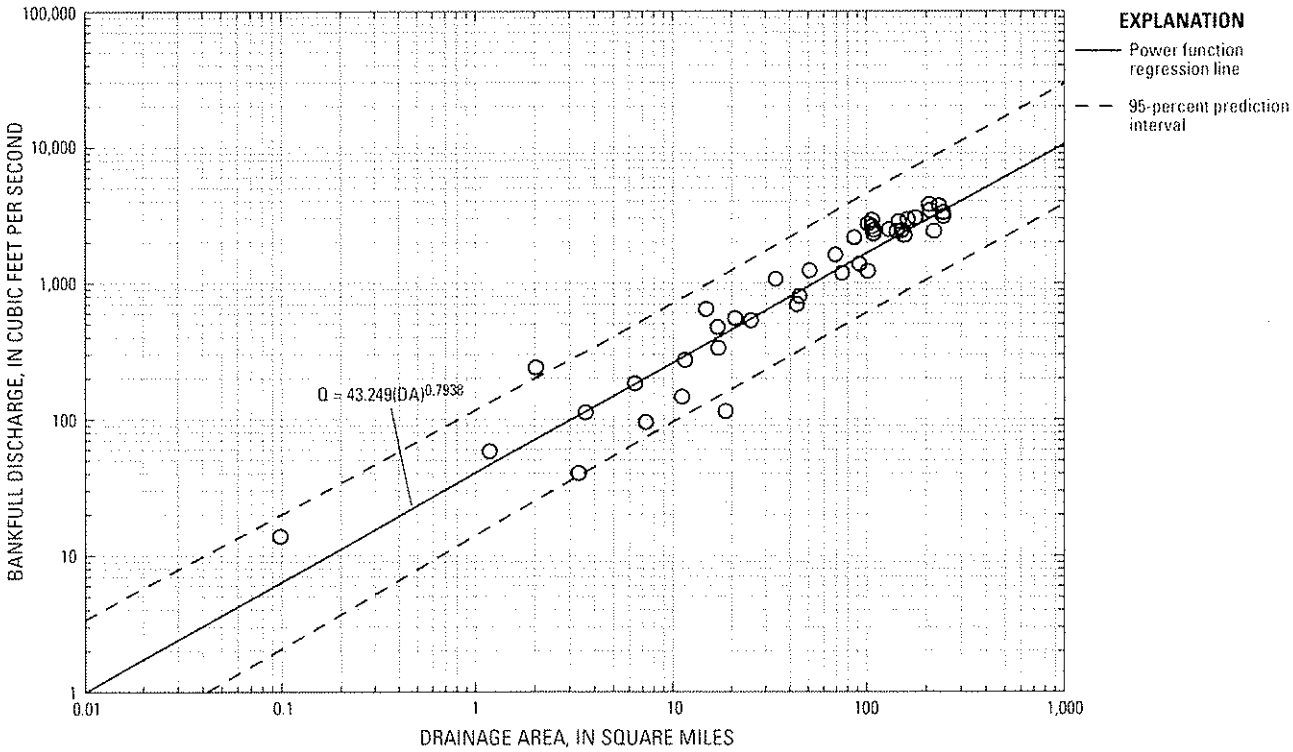
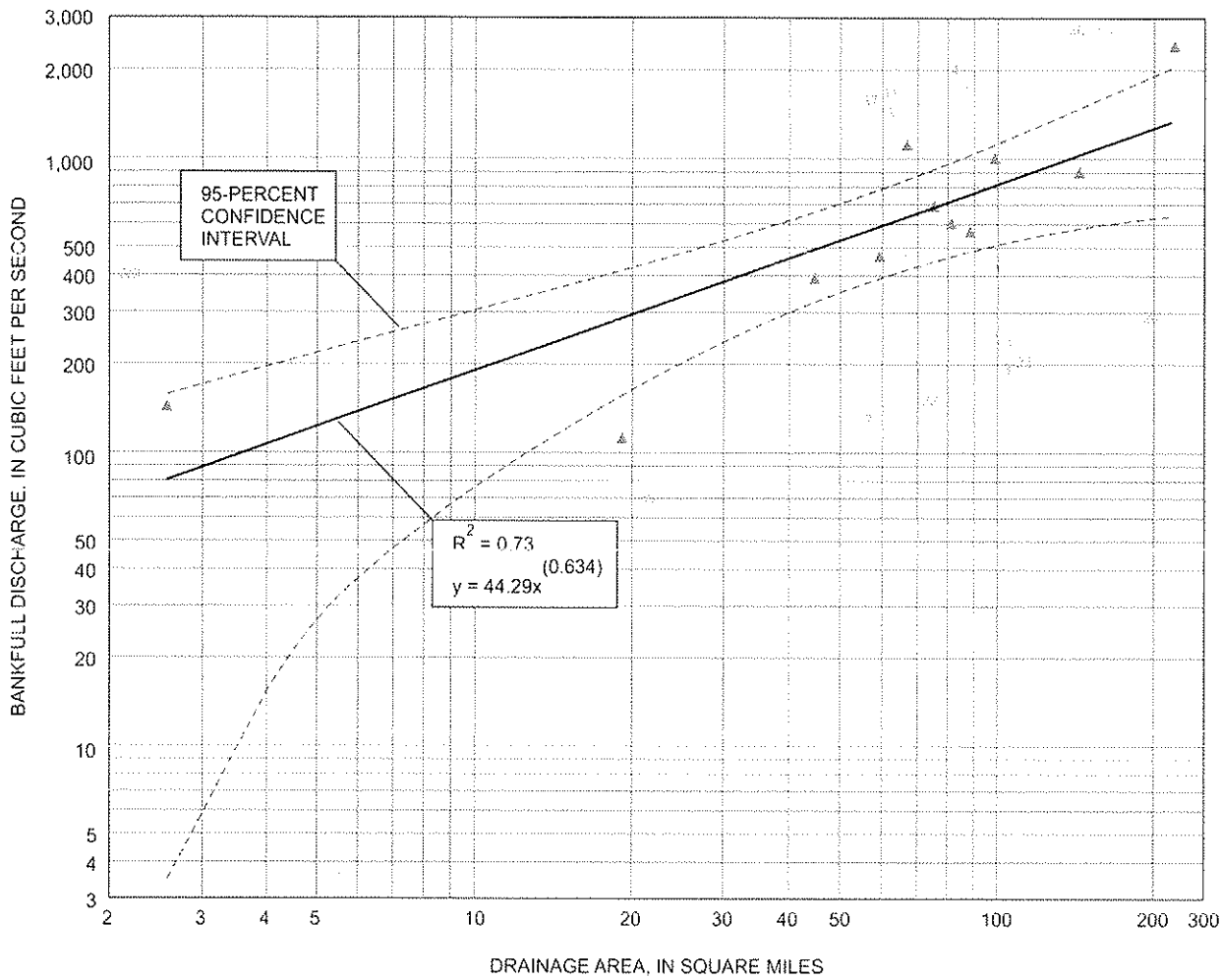


Figure 6. Regional curve relating estimated bankfull discharge (Q) to drainage area (DA) in the non-urban Valley and Ridge Physiographic Province in Maryland, Virginia, and West Virginia.

Source:
2005 USGS Report 2005-5076
Keaton, J.N., etal.

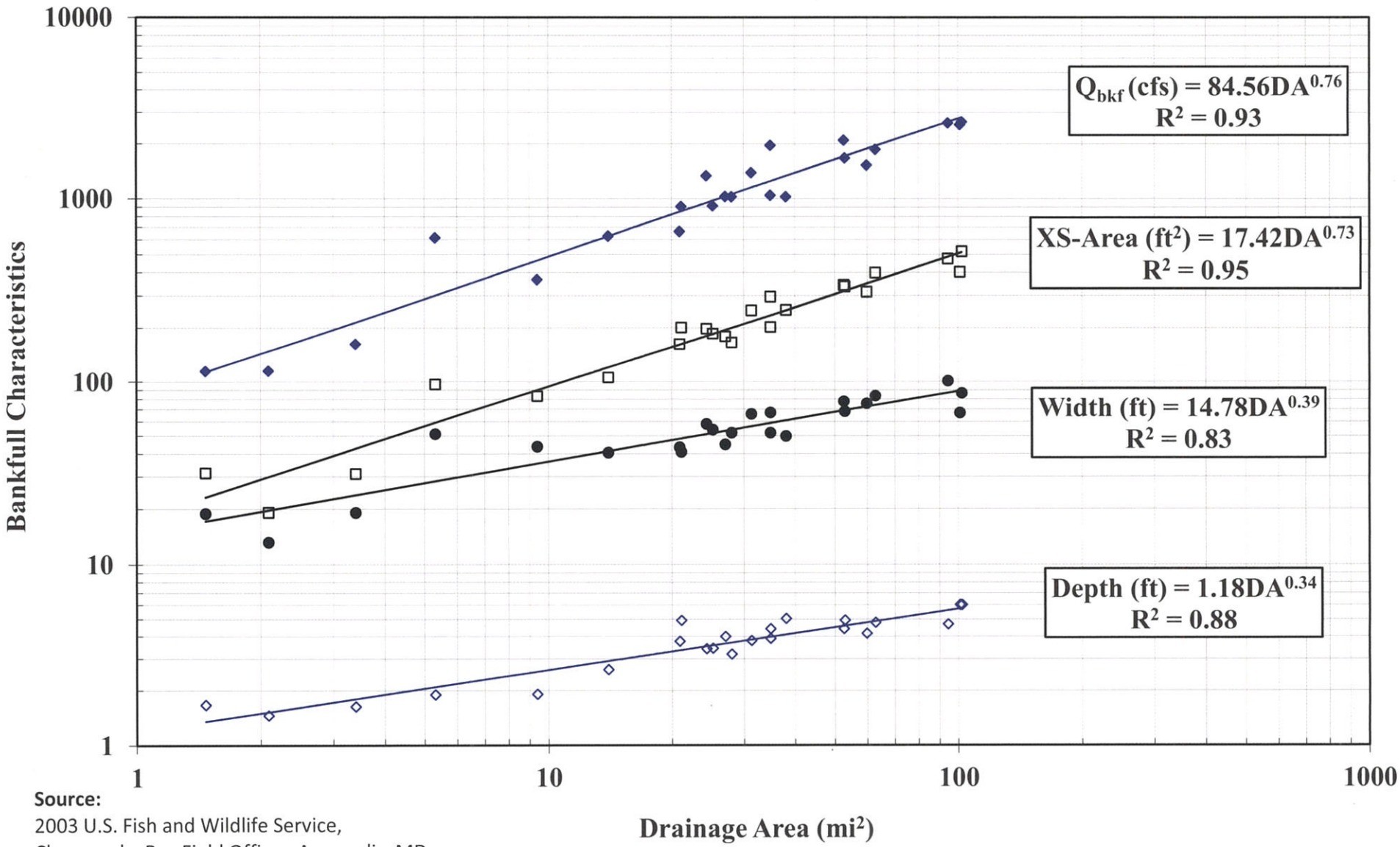


EXPLANATION

▲	STATION REPRESENTING THE PIEDMONT PHYSIOGRAPHIC PROVINCE	1 STATION
▲	STATION REPRESENTING THE RIDGE AND VALLEY PHYSIOGRAPHIC PROVINCE	10 STATIONS

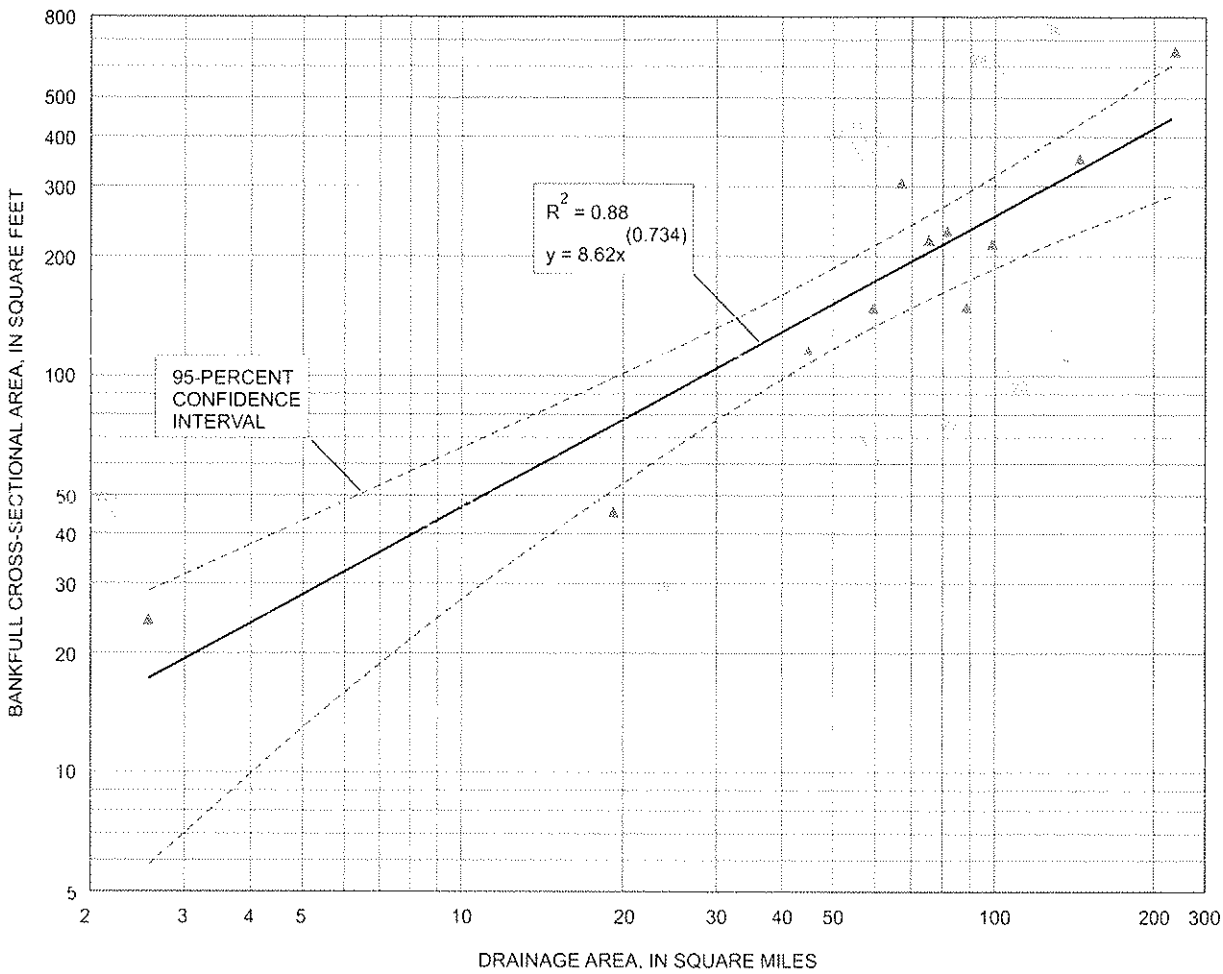
Figure 10. Regional curve representing the relation between bankfull discharge and drainage area for carbonate settings of Pennsylvania and selected areas of Maryland. See table 1 for information associated with cross-reference numbers identifying each station shown in this figure.

Bankfull Characteristics for Selected USGS Gage Sites in the Maryland Piedmont Hydro-physiographic Region



Source:
2003 U.S. Fish and Wildlife Service,
Chesapeake Bay Field Office - Annapolis, MD

Note: Carbonate Settings for Pennyslvania and Selected Areas of Maryland



EXPLANATION

▲	STATION REPRESENTING THE PIEDMONT PHYSIOGRAPHIC PROVINCE	1 STATION
▲	STATION REPRESENTING THE RIDGE AND VALLEY PHYSIOGRAPHIC PROVINCE	10 STATIONS

Source:

2005 USGS Report 2005-5147

Chaplin, J.J.

Figure 9. Regional curve representing the relation between bankfull cross-sectional area and drainage area for carbonate settings of Pennsylvania and selected areas of Maryland. See table 1 for information associated with cross-reference numbers identifying each station shown in this figure.