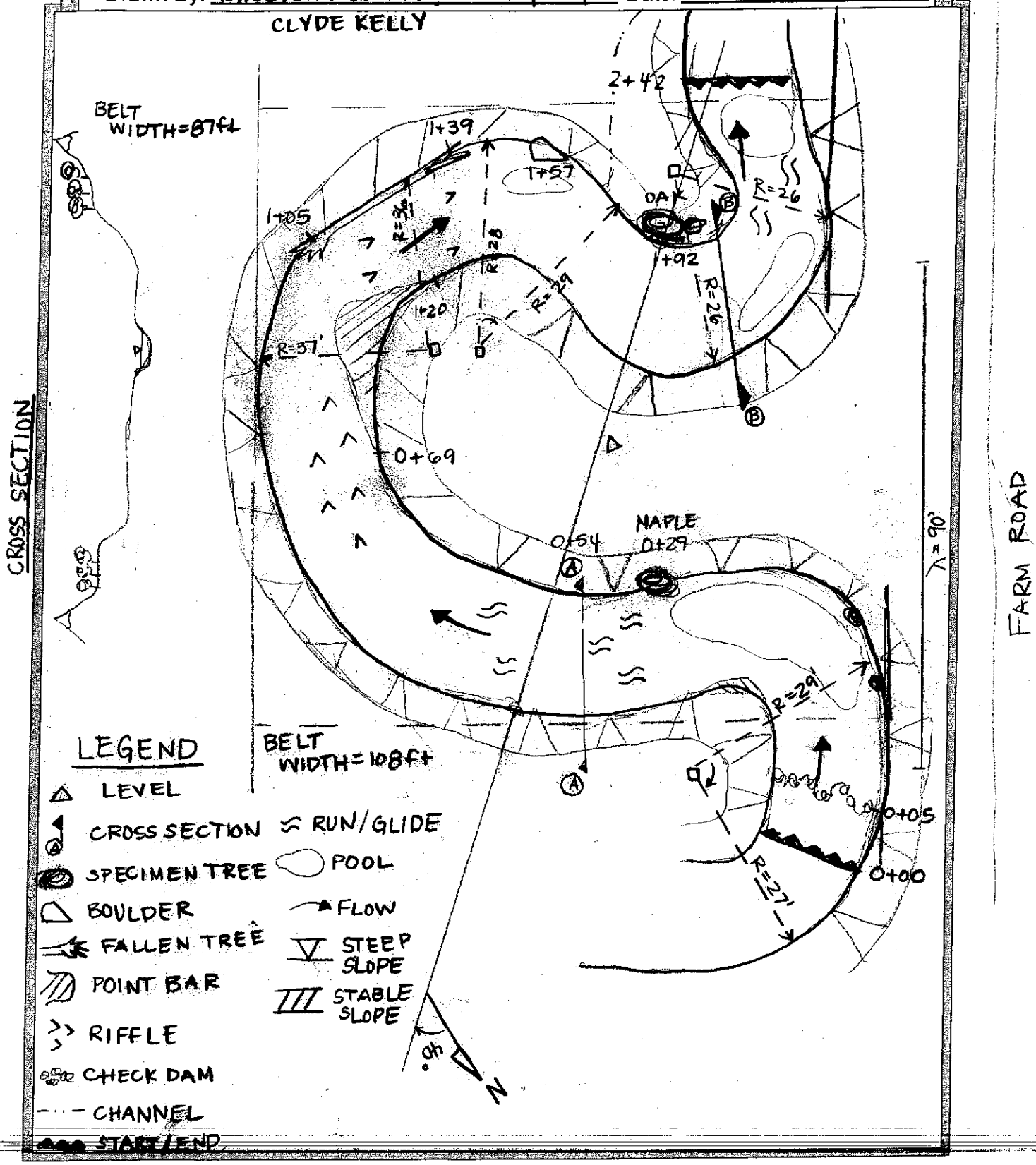
AREA-SITE LOCATION...REACH MAP

Stream: ISRAEL CREEK Reach:

Drawn By: ASHLEIGH HUBER & TEAM #4 Date: 20 APRIL 2010



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FP WIDTH = 132'

SURVEY DATA → CROSS - SECTION 1

SITE: ISRAEL CREEK Date: 4.20.10

Location: RIFFLE XS – STA

Party / Notes: TEAM #4 HUC:

Item	Distance, Point, or STATION ft	Back-Sight BS ft	Height of Instrument HI ft	Fore-Sight FS ft	Elevation ft	REMARKS / COMMENTS / NOTES	
1	0+00			4.88	95.12	LOW BANK STATIONING START	
2	4.1			5.04	94.96	TERRACE BREAK	
3	5.8			5.33	94.67	L SLOPE BREAK (BANK)	
4	6.7			5.73	94.27	L SLOPE BREAK (BANK)	
5	7.7			6.26	93.74	R	
6	8.8		.53	7.01	92.99		
7	9.7		1.52	8.53	91.47	LEFT EDGE WATER SURFACE	LEW
8	9.8		0.38	8.91	91.09	L CHANNEL EDGE	2.43
9	11.7			8.86	91.14	L CHANNEL	2.38
10	12.3			8.98	91.02	L CHANNEL SCOUR FROM DEBRIS	2.5
11	12.8			9.04	90.96	L THALWEG	2.56
12	13.5			8.94	91.06	L CHANNEL SLOPE BREAK	2.46
13	14.8			8.87	91.18	CHANNEL	2.34
14	16.9			8.82	91.18	CHANNEL	2.34
15	19.8			8.90	91.1	R CHANNEL BREAK	2.42
16	20.8			8.95	91.5	R CHANNEL	
17	21.7			9.1	90.9	R THALWEG	2.62
18	22.8			8.87	91.13	R CHANNEL BREAK	2.39
19	~~23.0~~			~~8.48~~	~~91.52~~	~~R EDGE WATER SURFACE~~	REW 2.44
20	23.4			7.0	93	R BANK SLOPE BREAK	AVERAGE BF DEPTH
21	23.9	15.7 BF		6.48	93.52	R BANK FULL	
22	8.2		.08	6.48	93.52	L BANK FULL	
23	24.7			6.01	93.99	R BANK SLOPE BREAK	
24	25.7			5.65	94.35	R BANK SLOPE BREAK	
25	26.7			5.40	94.6	R BANK SLOPE BREAK	
26	27.5			5.27	94.73	R BANK SLOPE BREAK	
27	~~28.0~~			~~5.19~~	~~94.81~~	~~R TERRACE BREAK~~	
28							

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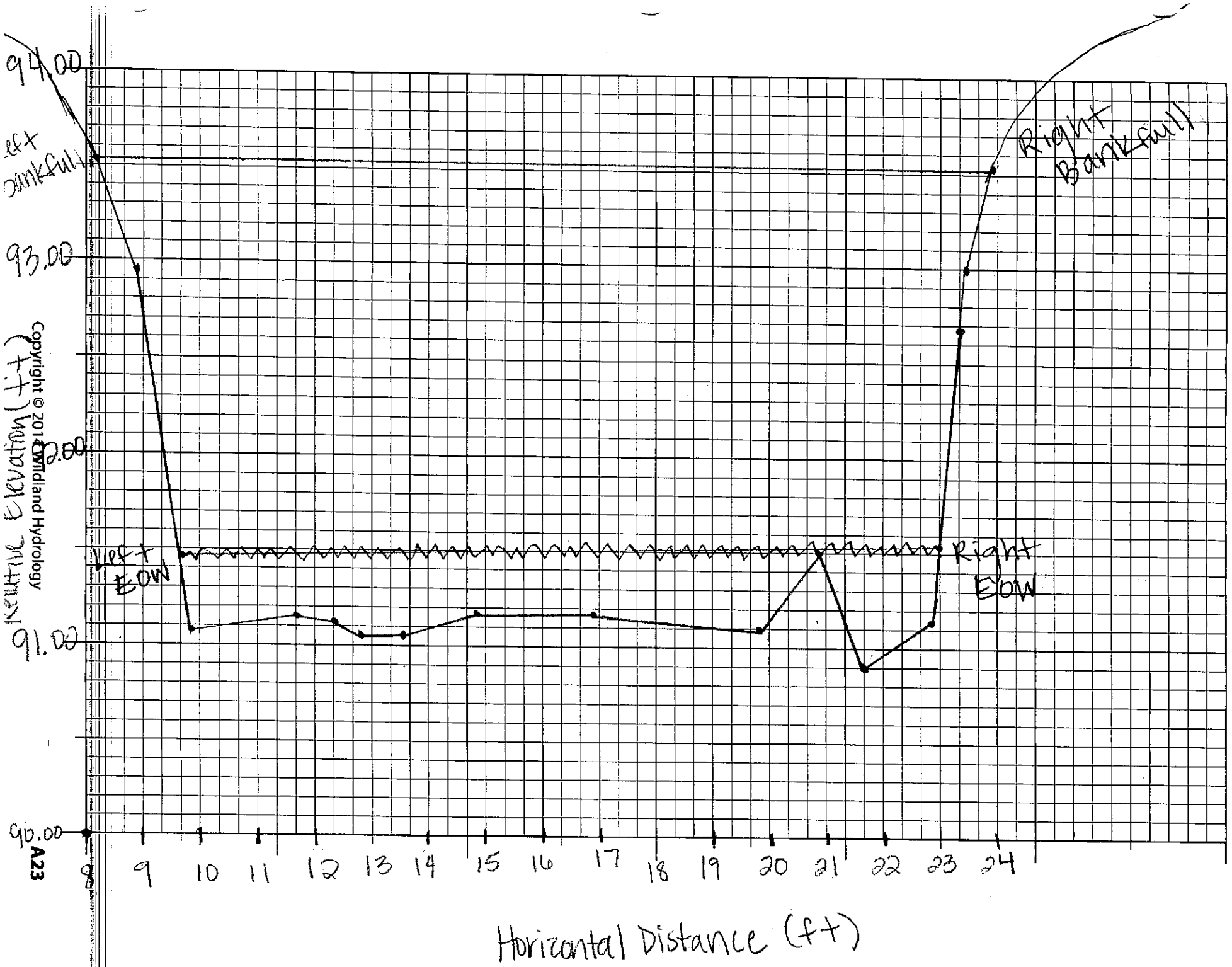
132' FLOOD PRONE WIDTH



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X EAM 4

SURVEY DATA ⟶ LONGITUDINAL PROFILE 1

SITE: ISRAEL CREEK Date: APRIL 2011

Location:

Party / Notes: 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	0+00	~~8.83~~	~~100.83~~	8.83	~~92.17~~	8.12	91.88	5.96	94.04	5.30	94.70	RIFFLE
2	0+12			9.53	90.47	8.30	91.70	6.37	93.63	5.31	94.69	TOP POOL
3	0+22			10.9	89.1	8.44	91.56			5.32	94.68	
4	0+37			9.51	90.49	8.63	91.37	6.50	93.50	5.31	94.69	TOP GLIDE
5	0+55			9.01	90.99	8.56	91.44			5.22	94.78	TOP OF RIFFLE
6	0+75			9.13	90.87	8.61	91.39	6.73	93.27			TOP OF RUN
7	1+05			9.27	90.73	8.68	91.32			5.82	94.18	TOP POOL
8	1+22			10.1	89.9	8.70	91.30			6.14	93.86	
9	1+37			9.64	90.36	8.69	91.31	6.68	93.32	6.04	93.96	TOP RIFFLE
10	1+68			9.54	90.46	8.79	91.21		93.10	6.90	93.10	TOP POOL 2
11	2+02			11.21	88.79	8.80	91.20	6.46	93.54	5.80	94.20	
12	2+14			9.68	90.32	8.80	91.20			5.91	94.09	END COMPOUND POOL
13	2+18			9.53	90.47	8.79	91.21			5.91	94.09	RUN
14	2+23			10.47	89.53	8.81	91.19	6.60	93.40	6.02	93.98	POOL
15	2+42			9.66	90.34	8.85	91.15			5.71	94.12	
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												

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TEAM 4 Raw Data

SURVEY DATA → LONGITUDINAL PROFILE 2

SITE: Israel Creek, MD Date: 04-21-2010

Location: Nick-notes / Amy-Notes / Andy-Rod / Travis - Rod

Party / Notes: Andy Amy Nick Travis 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	0+00		100		8.83		8.12		5.96		5.30	RIFFLE	BEGIN REACH
29	0+12				9.53		8.30		6.37		5.31	TOP OF POOL	
30	0+22				10.9		8.44				5.32	10.9	MAX D
31	0+37				9.51		8.63		6.50		5.31	TOP OF GLIDE	91.37
32	0+55				9.01		8.56				5.22	TOP OF RIFFLE X SECTION	
33	0+75				9.13		8.61		6.73			TOP OF RUN	
34	1+05				9.27		8.68				5.82	9.27	TOP OF POOL
35	1+22				10.10		8.70				6.14	10.10	MAX D.
36	1+37				9.64		8.69		6.68		6.09	TOP OF RIFFLE	
37	1+68				9.54		8.79				6.10	TOP OF (SWALE	POOL @ LOW BANK
38	2+02				11.21		8.80		6.46		5.80	11.21 MAX D	
39	2+14				9.68		8.80				5.91	END OF POOL (1)	COMPOUND
40	2+18				9.53		8.79				5.91	BEGINNING RUN	
41	2+23				10.47		8.81		6.60		6.02	MAX D	COMPOUND POOL (2)
42	2+42				9.66		8.85				5.71		END OF REACH
43													
44													
45													
46													
47	1+99.4		POOL	X section									
48													
49													
50													
51													
52													
53													
54													

Water surface slope .003

Sbkf = .0026

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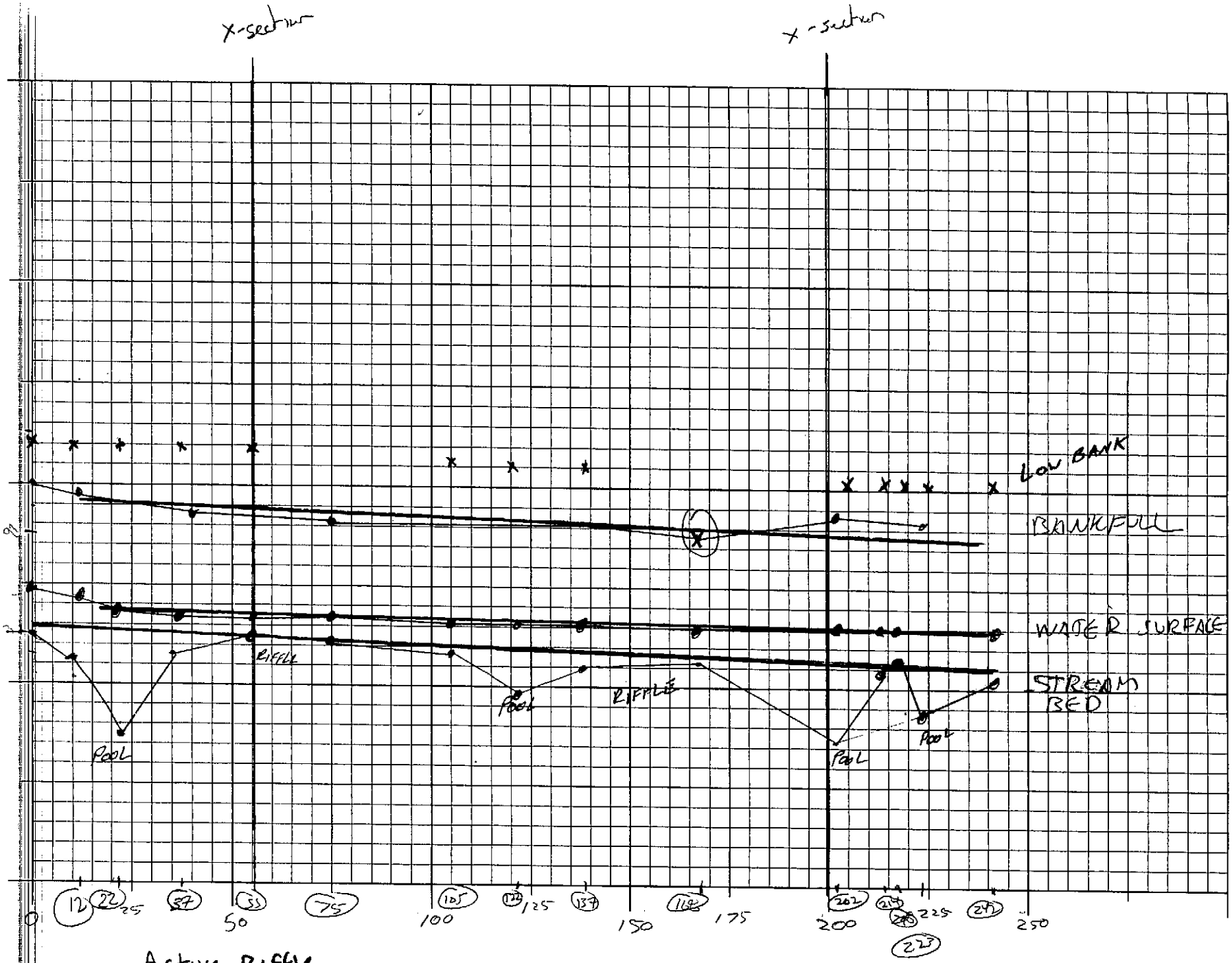

BKF 0.002

0.0036

Active Riffle
Station 54

Team 4 April 2011

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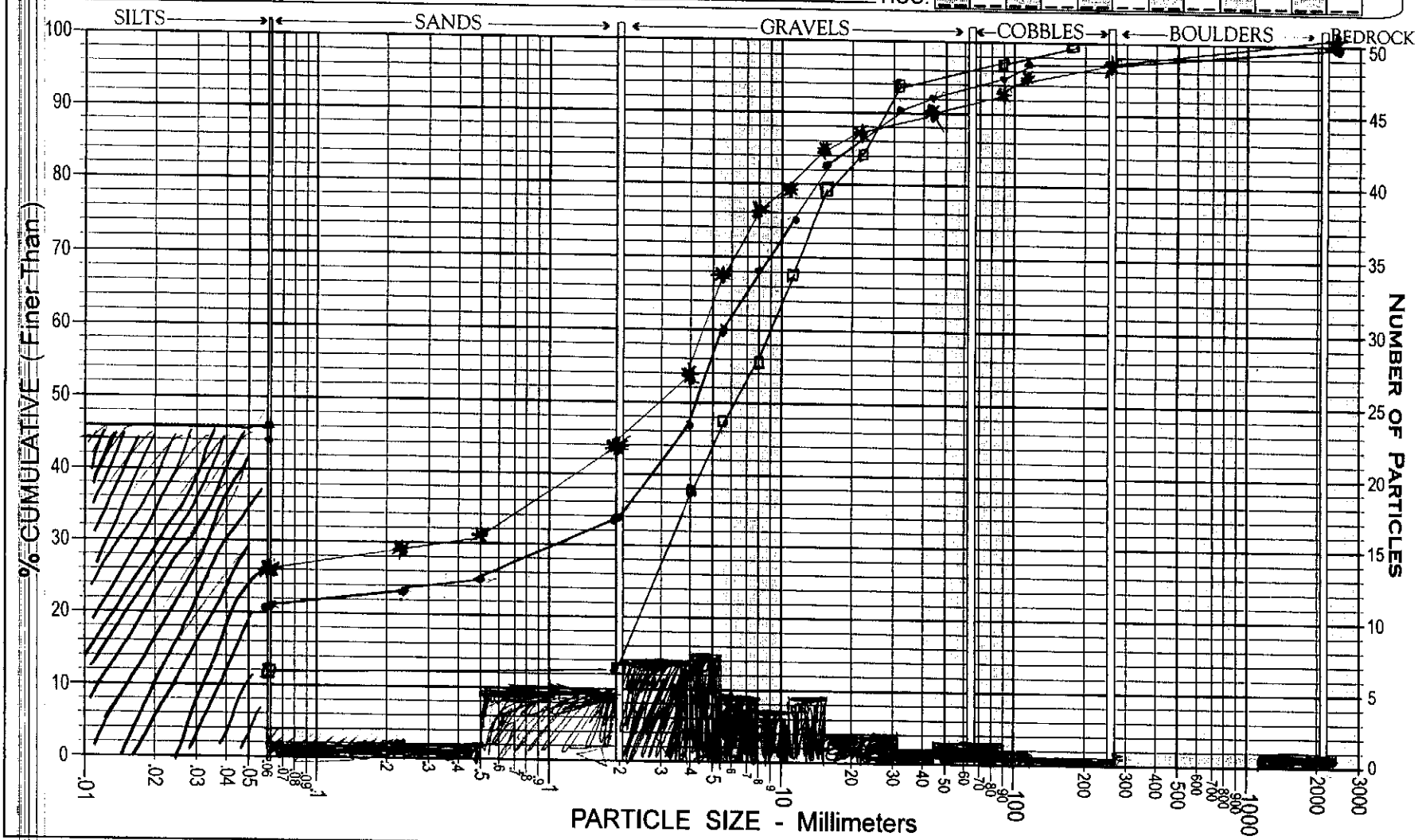
TEAM 4 APRIL 2011

PEBBLE COUNT DATA

LOCATION:
REACH:
Stream Type:
PARTY: TEAM 4 Composite Riffle Pool
Valley Type:
HUC:
Date: 4/19/11



● - Composite
□ - Riffle
✱ - Pool

Composite $D_{50} = 4.2$ mm

$D_{95} = 150$

$D_{100} = 2200$

$D_{84} = 20$ mm

$D_{35} = 2.44$ mm

Riffle $D_{84} = 22$ mm

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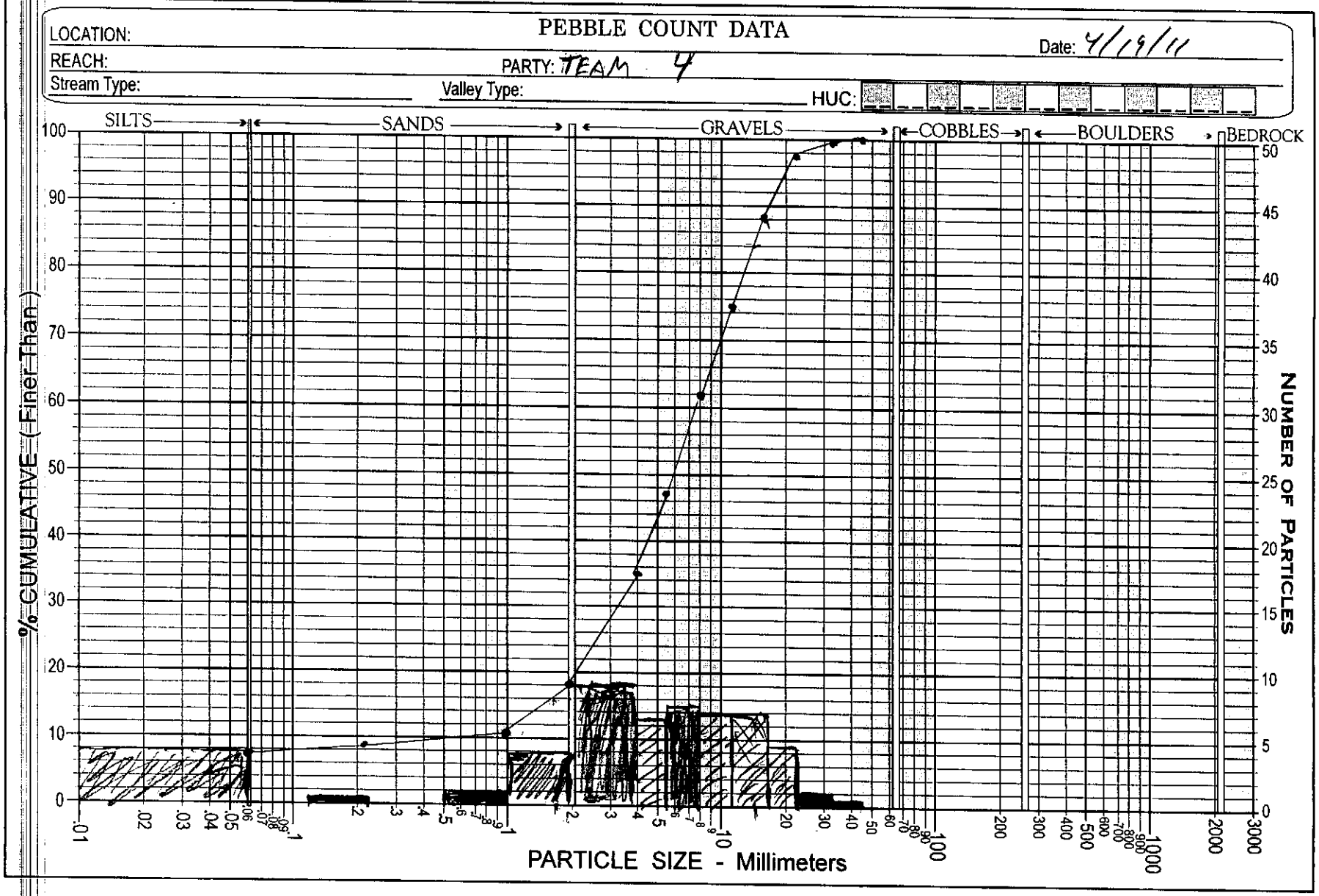
Active Bed Count Station 54



D_{84} = 15 mm

Team 4 2011 April

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CLASSIFICATION COUNT

Site: Team 4 Date: 4.20.10
Location: ISRAEL CREEK HUC:
Party: RV / YA

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) Reach: Date: TOT #	ITEM %	% CUM	POOL (2) Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C			23	5	12.5	12.5	18	25.7	26	23	20.9	21
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25	SAND							2	2.8	28.8	2	1.8	23
	Medium	.25 - .50	SAND							2	2.8	30.8	2	1.8	25
	Coarse	.50 - 1.0	SAND												
.04 - .08	Very Coarse	1.0 - 2	SAND				2	5	17.5	8	11.4	44.2	10	9	34
.08 - .16	Very Fine	2 - 4	GRAVEL				8	20	37.5	6	8.[illegible]		14	12.7	46.7
.16 - .22	Fine	4 - 5.7	GRAVEL				4	10	47.5	11	15.7		15	13.6	60.3
.22 - .31	Fine	5.7 - 8	GRAVEL				3	7.5	55.0	6	8.6		9	8.2	68.5
.31 - .44	Medium	8 - 11.3	GRAVEL				5	12.5	67.5	2	2.8		7	6.4	74.9
.44 - .63	Medium	11.3 - 16	GRAVEL				5	12.5	79.0	4	5.7		9	8.2	83.1
.63 - .89	Coarse	16 - 22.6	GRAVEL				2	5	84.0	2	2.8		4	3.6	86.7
.89 - 1.3	Coarse	22.6 - 32	GRAVEL				4	10	94.0				4	3.6	90.3
1.3 - 1.8	Very Coarse	32 - 45								2	2.8		2	1.8	92.1
1.8 - 2.5	Very Coarse	45 - 64													
2.5 - 3.5	Small	64 - 90	COBBLE				1	2.5	96.5	2	2.8		3	2.7	94.8
3.5 - 5.0	Small	90 - 128	COBBLE							2	2.8		2	1.8	96.6
5.0 - 7.1	Large	128 - 180	COBBLE				1	2.5	99.0						
7.1 - 10.1	Large	180 - 256	COBBLE							1	1.4		1	.9	97
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512	BOULDER												
20 - 40	Medium	512 - 1024	BOULDER												
40 - 80	Large-Vry Large	1024 - 2048	BOULDER							2	2.8		2	1.8	99
	Bedrock		DRK												
Stream Type:			Valley Type:			TOTAL→	40	100	100	70	99.5 100		110	98.8 100	100

Pool 1/1/1/1
Riffle 1/1/1

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ACTIVE BED COUNT

Site: TEAM 4 Date: 4.20.10
Location: Spiral Cr HUC:
Party: RU/YA

Inches	PARTICLE	Millimeters		Dot Count for RIFFLE 1	POOL 2	COMP. 3	RIFFLE (1) Reach: Date: TOT #	ITEM %	% CUM	POOL (2) Reach: Date: TOT #	ITEM %	% CUM	COMPOSITE (3) Reach: Date: TOT #	ITEM %	% CUM
	Silt / Clay	< .062	S/C				8	7.62	7.62						
	Very Fine	.062 - .125	SAND												
	Fine	.125 - .25	SAND				1	0.95	8.57						
	Medium	.25 - .50	SAND												
	Coarse	.50 - 1.0	SAND				2	1.9	10.47						
.04 - .08	Very Coarse	1.0 - 2	SAND				8	7.62	18.09						
.08 - .16	Very Fine	2 - 4	GRAVEL				18	17.14	35.23						
.16 - .22	Fine	4 - 5.7	GRAVEL				13	12.38	47.61						
.22 - .31	Fine	5.7 - 8	GRAVEL				15	14.29	61.9						
.31 - .44	Medium	8 - 11.3	GRAVEL				14	13.33	75.23						
.44 - .63	Medium	11.3 - 16	GRAVEL				14	13.33	88.56						
.63 - .89	Coarse	16 - 22.6	GRAVEL				9	8.57	97.13						
.89 - 1.3	Coarse	22.6 - 32	GRAVEL				2	1.9	99.03						
1.3 - 1.8	Very Coarse	32 - 45	GRAVEL				1	0.95	99.98						
1.8 - 2.5	Very Coarse	45 - 64	GRAVEL												
2.5 - 3.5	Small	64 - 90	COBBLE												
3.5 - 5.0	Small	90 - 128	COBBLE												
5.0 - 7.1	Large	128 - 180	COBBLE												
7.1 - 10.1	Large	180 - 256	COBBLE												
10.1 - 14.3	Small	256 - 362	BOULDER												
14.3 - 20	Small	362 - 512	BOULDER												
20 - 40	Medium	512 - 1024	BOULDER												
40 - 80	Large-Vry Large	1024 - 2048	BOULDER												
	Bedrock		DRK												
Stream Type:			Valley Type:			TOTAL→	105	100	100						

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TEAM 4 APRIL 2011

Worksheet A-2. Computations of velocity and discharge using various methods.

Bankfull VELOCITY & DISCHARGE Estimates

Stream:		Location:	
Date:	Stream Type:	Valley Type:	
Observers:		HUC:	

INPUT VARIABLES			OUTPUT VARIABLES		
Bankfull Riffle Cross-Sectional AREA	34,7	A_{bkf} (ft^2)	Bankfull Riffle Mean DEPTH	2,2	d_{bkf} (ft)
Bankfull Riffle WIDTH	15,7	W_{bkf} (ft)	Wetted PERMIMETER ~ $(2 * d_{bkf}) + W_{bkf}$	20,1	W_p (ft)
D_{84} at Riffle	15	Dia. (mm)	D_{84} (mm) / 304.8	0,0492	D_{84} (ft)
Bankfull SLOPE	.0029	S_{bkf} (ft / ft)	Hydraulic RADIUS A_{bkf} / W_p	1,72	R (ft)
Gravitational Acceleration	32.2	g (ft / sec^2)	Relative Roughness R(ft) / D_{84} (ft)	34,95	R / D_{84}
Drainage Area	5,4	DA (mi^2)	Shear Velocity $u^* = (gRS)^{½}$	0,4	u^* (ft/sec)

ESTIMATION METHODS	Bankfull VELOCITY		Bankfull DISCHARGE	
1. Friction Factor / Relative Roughness $u = [2.83 + 5.66 * Log\{R / D_{84}\}] u^*$	4,6	ft / sec	160	cfs
2. Roughness Coefficient: a) Manning's n from Friction Factor / Relative Roughness (Figs. A-27, A-28) $u = 1.49*R^{2/3}*S^{1/2}/n$ $n =$ 0,028 (11,5)	4,13	ft / sec	143	cfs
2. Roughness Coefficient: b) Manning's n from Stream Type (Fig. A-29) $u = 1.49*R^{2/3}*S^{1/2}/n$ 0,045 $n =$ 0,043	2,68	ft / sec	93	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 $n =$ 1039	2,96	ft / sec	103	cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
3. Other Methods (Hey, Darcy-Weisbach, Chezy C, etc.)		ft / sec		cfs
4. Continuity Equations: a) Regional Curves $u = Q / A$ Return Period for Bankfull Discharge Q = ' year	5,0	ft / sec	175	cfs
4. Continuity Equations: b) USGS Gage Data $u = Q / A$		ft / sec		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 **"protrusion 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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TEAM 4 APRIL 2011

Worksheet A-1. Field Form for Level II Stream Classification.

Stream: ISRAEL CREEK		04/19/2011	
Basin:	Drainage Area:	acres 514	mi^2
Location:			
Twp.&Rge: N/A	Sec.&Qtr.:		
Cross-Section Monuments (Lat./Long.):		Date: 4/19/2011	
Observers: TEAM 4		Valley Type:	

Bankfull WIDTH (W_{bkf}) WIDTH of the stream channel at bankfull stage elevation, in a riffle section.	15.7	ft
Bankfull DEPTH (d_{bkf}) Mean DEPTH of the stream channel cross-section, at bankfull stage elevation, in a riffle section ($d_{bkf} = A_{bkf} / W_{bkf}$).	2.21	ft
Bankfull X-Section AREA (A_{bkf}) AREA of the stream channel cross-section, at bankfull stage elevation, in a riffle section.	34.7	ft^2
Width/Depth Ratio (W_{bkf} / d_{bkf}) Bankfull WIDTH divided by bankfull mean DEPTH, in a riffle section.	7.1	ft/ft
Maximum DEPTH (d_{max}) Maximum depth of the bankfull channel cross-section, or distance between the bankfull stage and Thalweg elevations, in a riffle section.	2.6	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.	132	ft
Entrenchment Ratio (ER) The ratio of flood-prone area WIDTH divided by bankfull channel WIDTH (W_{fpa} / W_{bkf}) (riffle section).	8.4	ft/ft
Channel Materials (Particle Size Index) D_{50} The D_{50} particle size index represents the median or dominant diameter of channel materials, as sampled proportionately from the channel surface, between the bankfull stage and Thalweg elevations.	4.2	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.	0.003	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 (S_{val} / S).	1.91	

Stream Type E4-5 **See Classification Key (Figure A-2)**

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Group 4 April 2011

Worksheet A-3. Summary of Morphological Variables.

Stream:		Location:	
Team:	Date:	Drainage Area:	

Riffle Channel Dimensions

1. Bankfull Width (W_{bkf}) (ft)	15.7	2. Bankfull Mean Depth (d_{bkf}) (ft)	2.21
3. Width/Depth Ratio (W_{bkf} / d_{bkf})	7.1	4. Bankfull Cross-Sectional Area (A_{bkf}) (ft^2)	34.7
5. Bankfull Maximum Depth (d_{max}) (ft)	2.6	6. Width of Flood-Prone Area (W_{fpa}) (ft)	132
7. Entrenchment Ratio (ER) (W_{fpa} / W_{bkf})	8.4		

Channel Pattern / Dimensionless Ratios

8. Belt Width (W_{blt}) (ft)	Mean	98	9. Meander Width Ratio (MWR) (W_{blt} / W_{bkf})	Mean	2.8
	Min	87		Min	2.5
	Max	108		Max	3.11
10. Stream Meander Length (L_m) (ft)	Mean	152	11. Meander Length Ratio (MLR) (L_m / W_{bkf})	Mean	4.4
	Min			Min	
	Max			Max	
12. Linear Wavelength (λ) (ft)	Mean	90	13. Linear Wavelength to Bankfull Width (λ / W_{bkf})	Mean	2.6
	Min			Min	
	Max			Max	
14. Radius of Curvature (R_c) (ft)	Mean	29.7	15. Radius of Curvature to Bankfull Width (R_c / W_{bkf})	Mean	0.86
	Min	26		Min	0.75
	Max	37		Max	1.07

Channel Particles

Representative Pebble Count Composite

16. D_{16} (mm)	0.025	17. D_{35} (mm)	2.4	18. D_{50} (mm)	4.2
19. D_{84} (mm)	20	20. D_{95} (mm)	100	21. D_{100} (mm)	2200

Active Bed Riffle Pebble Count

22. D_{16} (mm)	1.8	23. D_{35} (mm)	3.8	24. D_{50} (mm)	6
25. D_{84} (mm)	15	26. D_{95} (mm)	20	27. D_{100} (mm)	32

Classification

28. Sinuosity (k)	1.91	29. Average Water Surface Slope (S)	.003
30. Stream Type	E4	31. Valley Type	8

Velocity & Discharge

32. Friction Factor (u / u*)	11.5	33. Relative Roughness (R / D_{84})	35.0
34. Manning's "n" from Friction Factor / Relative Roughness	0.028	35. Manning's "n" from Stream Type	0.039
36. Estimated Mean Velocity (u_{bkf}) (ft/sec)	4.6	37. Estimated Bankfull Discharge (cfs)	159.6
38. Estimation Method Selected for Velocity & Discharge	(1) Friction Factor / Relative Roughness		

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