Stony Clove Creek 2001 Stream Morphology Data

The following is a list to define the terminology, methodology and equations underlying the Stony Clove Creek 2001 Stream Morphology Data. Unless otherwise noted, The Reference Reach Spreadsheet, created by Dan Mecklenburg and distributed by The Ohio Department of Natural Resources, was used to calculate variables derived from field collected data. The cross-sections were surveyed at riffle or step features which typified the reach, and whose general cross-sectional symmetry supports assumptions underlying calculation of some of the variables (e.g., bed averaged shear stress).

Date - The date the cross-section was surveyed.

Drainage Area - The area that drains to a common outlet. For a stream, it is all the land that drains to it or its tributaries, at any particular point along the stream. ArcView 3.3 with Spatial Analyst was used to delineate the drainage area at each cross-section. This process used the 30m Digital Elevation Model (DEM) and cross-section locations taken with the Trimble GeoExplorer3 GPS unit.

Width (W or W_{bkf}) - The width of the stream channel at bankfull stage.

Area (A or A_{bkf}) - The stream channel cross-sectional area, at bankfull stage.

d max (d_{mbkf}) - Maximum depth of the bankfull channel cross-section, or the difference between the bankfull stage and thalweg (deepest point of a cross section) elevations.

d mean (d_{bkf}) - The mean depth of the stream channel cross-section, at bankfull stage.

$d_{bkf} = A/W_{bkf}$

W/d ratio (W/d) - The width to depth ratio is a measure of the shape of the channel cross-section. This ratio measures the bankfull width divided by mean bankfull depth. W/d ratio is one of the criteria used to classify stream types in the Rosgen Classification System for Natural Channels (see **Rosgen Stream Type**, below).

$W/d = W_{bkf} / d_{bkf}$

W flood prone area (W_{fpa}) - The Flood-Prone Area Width is an arbitrary measure, coined by D. Rosgen, and used to calculate Entrenchment Ratio (see below). **W_{fpa}** is described as the width of the flow whose stage is twice the maximum depth of flow at the bankfull discharge.

Entrenchment Ratio (ER) - The entrenchment ratio is another of the criteria used to classify stream types in the Rosgen classification system, and is described as the Flood Prone Width (see above) divided by the Bankfull Width (W_{fpa}/W_{bkf}). This ratio, coined by D. Rosgen, is used to describe the "entrenchment" of the stream in its valley, or more specifically, the extent to which a stream increases its width to depth ratio at an arbitrary flow above the bankfull stage. The Rosgen classification system uses three categories of **ER**: if the ER is less than 1.4, the stream is

said to be highly entrenched, if between 1.4 and 2.2 it is moderately entrenched, and greater than 2.2 it is slightly entrenched.

Slope (S) - The channel slope is described as the water surface gradient at bankfull stage. It is approximated by measuring slope across similar bed features, in this case as from head of pool to head of pool. Channel slope is another of the criteria used to classify stream types in the Rosgen classification system.

Wet P (WP) - Wetted Perimeter is the perimeter of the channel cross section formed by the bed and banks. It is calculated here at bankfull stage, and is used to determine **Hydraulic Radius**.

Hydraulic Radius (R) - The hydraulic radius is the cross-sectional area divided by the wetted perimeter.

R = hydraulic radius (ft) = A_{bkf} / wetted perimeter

Shear stress (J) - The force (in lbs./ft^2 or kgs/m^2) exerted by stream flow parallel to (rather than normal to) the bed or banks of a stream. The tractive force that removes material from a stream bank as flow moves over the surface. Shear stress may be estimated as the product of mean flow depth or hydraulic radius, channel slope, and the density of water.

Shear Stress = 62.4 * R * S

62.4 = density of water (lbs/cu.ft.)
R = hydraulic radius (ft) = area / wetted perimeter
S = slope (ft/ft)

D50 - A pebble count (PC) is a method used to characterize the size distribution of channel bed materials (Wolman 1954). In a modified Wolman pebble count, a minimum of 100 particles are selected randomly as a representative subset from the channel bed between the bankfull stage and thalweg elevations. Each particle is measured along its intermediate ("B") axis, which is approximately the smallest size of a sieve opening through which the particle might pass. The median particle size (or D50) represents the median intermediate axis length (in mm) of channel materials (50% of the particles measured are smaller than this). In our count, ten particles were randomly selected along ten transects evenly spaced throughout each stream reach, with a random starting station. The pebble count data is then plotted on a log-normal graph as a cumulative percent to determine the median particle size. D50 is another of the criteria used to classify stream types in the Rosgen classification system.

D84 - A pebble count (PC) is a method used to characterize the size distribution of channel bed materials (Wolman 1954, see **D50** above). The D84 represents the size (in mm) of the particle, of which 84% of particles measured are smaller. D84 is often used as an indicator of stream power, based on the assumption that the critical shear stress of the D84 is roughly equivalent to the bed averaged shear stress associated with the bankfull flow in stream reaches that are "stable" or "in regime".

Feature PC D50 - A pebble count (PC) is a method used to characterize the size distribution of channel bed materials (Wolman 1954, see **D50** above). In a feature pebble count, all 100 measured particles are taken from a single stream feature, in this case at the riffle at which the cross-section was taken.

Feature PC D84 - A pebble count (PC) is a method used to characterize the size distribution of channel bed materials (Wolman 1954, see **D50** above). In a feature pebble count, all 100 measured particles are taken from a single stream feature, in this case at the riffle at which the cross-section was taken.

Rosgen Stream Type – A short-hand notation describing local stream channel morphology at the cross section, as defined in the classification system created by hydrologist Dave Rosgen (1996). The Rosgen classification system gives letter and number designations to different stream types, depending on their combination of five characteristics: entrenchment ratio, width to depth ratio, slope, sinuosity, and the median size (D50) of the particles on the streambed. (see SC SMP Volume I pg. 3.2.11 for stream classification chart)

Reference – Ninety-two cross-sections were selected, based on their clearly identifiable bankfull indicators, as a subset to develop local **hydraulic geometry** curves, which describe how width, depth and cross-sectional area increase as the drainage area increases from the headwaters to the mouth of the Stony Clove. These curves helped in the identification and/or verification of bankfull stage at cross-sections with less obvious bankfull indicators.

Stony Clove Creek Watershed 2001 Stream Morphology Data

Stony Clove Creek 2001 Stream Morphology Data															
Cross-Section	Date	Drainage Area (mi^2)	width (ft)	area (ft^2)	d max (ft)	d mean (ft)	w/d ratio	W flood prone area (ft)	entrechment ratio	slope (%)	wet P (ft)	Hydraulic Radius (ft)	Shear Stress (lbs/ft^2)	D50 (mm)	
1	5/29/01	1.94	35.0	47.90	2.60	1.37	26	40.0	1.14	N/A	37.18	1.29	0.00	69	
2	5/29/01	1.96	42.5	48.88	2.30	1.15	37	128.0	3.01	3.7	43.99	1.11	2.57	132	
3	5/29/01	2.00	26.0	21.75	1.50	0.84	31	52.0	2.00	2.6	25.48	0.85	1.38	95	
4	5/29/01	2.05	22.5	26.45	1.80	1.18	19	36.0	1.60	2.1	23.54	1.12	1.47	72	
5	5/29/01	2.06	30.0	33.65	1.90	1.12	27	65.0	2.17	3.9	31.78	1.06	2.58	101	
6	5/30/01	2.08	26.0	33.97	2.42	1.31	20	61.0	2.35	2.9	25.80	1.32	2.38	124	
7	5/30/01	2.13	41.5	56.55	2.25	1.36	30	71.0	1.71	2.0	42.93	1.32	1.64	95	
8	5/30/01	2.19	28.9	27.83	1.77	0.96	30	60.0	2.08	3.7	29.50	0.94	2.18	111	
9	5/30/01	2.21	26.0	24.39	1.88	0.94	28	44.0	1.69	4.1	26.95	0.90	2.32	99	
10	5/30/01	2.21	32.5	38.26	2.44	1.18	28	60.0	1.85	3.6	33.82	1.13	2.54	99	
11	5/30/01	2.22	36.0	42.24	1.73	1.17	31	59.0	1.64	3.0	36.56	1.16	2.16	99	
12	5/30/01	2.22	35.0	50.54	2.28	1.44	24	61.0	1.74	4.7	35.57	1.42	4.17	64	
13	5/30/01	2.23	27.5	46.38	2.26	1.69	16	30.0	1.09	2.6	28.24	1.64	2.66	2383	
14	5/30/01	2.23	19.2	26.63	2.13	1.39	14	23.0	1.20	0.8	20.17	1.32	0.66	87	
15	5/30/01	2.24	25.5	37.50	2.67	1.47	17	N/A	N/A	0.8	25.77	1.45	0.73	71	
16	6/5/01	2.24	23.2	39.27	2.56	1.69	14	29.0	1.25	4.9	23.75	1.65	5.05	101	
17	6/5/01	2.24	21.8	28.07	2.28	1.29	17	29.0	1.33	7.3	23.01	1.22	5.56	172	
18	6/5/01	2.25	34.0	64.11	2.31	1.89	18	40.0	1.18	12.0	37.88	1.69	12.67	2896	
19	6/5/01	3.30	46.0	75.29	2.36	1.64	28	49.0	1.07	6.6	49.74	1.51	6.23	143	
20	6/5/01	3.30	30.0	44.78	2.72	1.49	20	35.0	1.17	5.8	31.08	1.44	5.22	143	
21	6/5/01	3.31	28.0	43.27	2.64	1.55	18	33.5	1.20	4.4	28.75	1.51	4.13	158	
22	6/5/01	3.31	31.0	44.83	2.55	1.45	21	37.0	1.19	5.3	32.89	1.36	4.51	180	
23	6/5/01	3.40	36.5	75.31	3.04	2.06	18	50.0	1.37	5.9	36.23	2.08	7.65	180	
24	6/5/01	3.48	24.0	43.60	2.63	1.82	13	29.0	1.21	4.3	21.53	2.02	5.43	180	
25	6/5/01	3.49	44.0	62.20	3.43	1.41	31	51.0	1.16	2.7	44.62	1.39	2.35	180	
26	6/5/01	3.50	39.5	77.44	2.61	1.96	20	46.0	1.16	3.3	42.05	1.84	3.79	147	
27	6/5/01	3.51	35.0	33.04	1.95	0.94	37	57.0	1.63	3.1	36.86	0.90	1.73	154	
28	6/5/01	3.52	44.5	62.80	2.25	1.41	32	54.0	1.21	2.6	45.27	1.39	2.25	94	
29	6/6/01	3.60	30.5	57.04	2.83	1.87	16	47.0	1.54	4.7	31.40	1.82	5.33	99	
30	6/6/01	3.69	29.5	45.80	2.30	1.55	19	59.2	2.01	2.8	31.99	1.43	2.50	99	
31	6/6/01	3.70	34.1	32.41	1.80	0.95	36	53.4	1.57	2.8	36.33	0.89	1.56	99	
32	6/6/01	3.71	37.0	54.59	2.20	1.48	25	44.3	1.20	2.0	36.52	1.50	1.87	92	
33	6/6/01	3.72	35.0	37.04	1.84	1.06	33	41.0	1.17	2.7	34.28	1.08	1.82	133	
34	6/6/01	3.73	32.0	42.61	2.30	1.33	24	55.0	1.72	0.9	33.73	1.26	0.71	114	
35	6/6/01	3.75	33.0	34.18	2.21	1.04	32	43.0	1.30	2.2	34.27	1.00	1.37	2855	
36	6/6/01	3.78	25.0	18.49	2.08	0.74	34	32.0	1.28	2.0	20.47	0.90	1.13	2855	
37	6/6/01	3.80	65.0	66.78	2.59	1.03	63	97.0	1.49	1.9	66.47	1.00	1.19	114	
38	6/6/01	3.83	43.5	38.71	2.32	0.89	49	50.0	1.15	2.6	43.69	0.89	1.44	241	
39	6/6/01	3.85	31.0	35.34	1.92	1.14	27	63.5	2.05	4.6	28.50	1.24	3.56	2611	
40	6/6/01	3.87	30.0	41.76	2.26	1.39	22	38.0	1.27	3.6	29.66	1.41	3.16	84	
41	6/6/01	3.87	29.7	44.73	2.41	1.51	20	34.0	1.14	2.8	30.28	1.48	2.58	145	
42	6/6/01	3.88	42.0	66.31	3.15	1.58	27	52.0	1.24	2.2	46.52	1.43	1.96	155	
43	6/6/01	3.89	25.0	35.61	2.64	1.42	18	32.0	1.28	5.1	25.83	1.38	4.36	2276	
44	6/7/01	3.90	37.5	49.84	3.44	1.33	28	44.5	1.19	4.0	39.19	1.27	3.17	256	
45	6/7/01	3.92	30.5	44.82	3.04	1.47	21	43.5	1.43	3.0	33.62	1.33	2.50	101	
46	6/7/01	3.94	39.5	68.60	2.53	1.74	23	49.9	1.26	1.3	38.57	1.78	1.44	84	
47	6/7/01	3.96	45.0	82.50	3.17	1.83	25	79.5	1.77	0.3	47.80	1.73	0.32	101	
48	6/7/01	3.97	36.0	65.52	3.33	1.82	20	62.0	1.72	3.5	36.84	1.78	3.88	101	
49	6/7/01	3.98	37.5	57.13	2.48	1.52	25	52.3	1.39	1.7	37.67	1.52	1.61	101	
50	6/7/01	3.99	38.0	62.26	3.38	1.64	23	55.0	1.45	5.4	37.80	1.65	5.55	101	
51	6/7/01	4.00	38.0	67.33	3.20	1.77	21	45.5	1.20	3.6	40.07	1.68	3.77	124	
52	6/7/01	4.01	37.0	49.64	2.13	1.34	28	47.0	1.27	2.3	37.76	1.31	1.89	124	
53	6/7/01	4.02	47.0	67.59	2.16	1.44	33	66.5	1.41	2.8	47.18	1.43	2.50	124	

Stony Clove Creek Watershed 2001 Stream Morphology Data

Cross-Section	D84 (mm)	Feature PC D50 (mm)	Feature PC D84 (mm)	Rosgen Stream Type	Reference
1	208			F3	
2	441			C3b	
3	226	57	192	B3	YES
4	267	50	183	B3	YES
5	319			B3	
6	348	46	176	C3b	YES
7	243			B3	
8	251	68	168	B3	YES
9	478	75	206	B3a	YES
10	478			B3	
11	478	46	167	B3	YES
12	209	50	170	B4a	YES
13	3444			F1b	
14	318			F3	
15	347			B3c	
16	2133			A3	
17	724			A3	
18	3666			A1a+	
19	813			A3	
20	813	65	358	A3	YES
21	1123	89	543	B3a	YES
22	1188			B3a	
23	1188	57	246	B3a	YES
24	1188	76	288	B3a	YES
25	1188			B3	
26	570			B3	
27	474	43	158	B3	YES
28	248	56	164	F3b	YES
29	431			B3a	
30	431	59	184	B3	YES
31	431	67	163	B3	YES
32	391	61	156	F3b	YES
33	345			F3b	
34	630	111	2037	B3c	YES
35	3649			F1b	
36	3649			F1b	
37	2212			B3c	
38	3201			F3b	
39	3547			B1a	
40	575	65	412	B3	YES
41	478	62	284	F3b	YES
42	597			F3b	
43	3394	1536	2461	B1a	YES
44	2474			F3b	
45	579			B3	
46	540			F3	
47	431			B3c	
48	431			B3	YES
49	431	54	170	B3c	
50	431			B3a	
51	474			F3b	
52	388			B3	
53	388	82	214	B3	YES
54	388	66	238	B3	YES
55	388			B3	

Stony Clove Creek Watershed 2001 Stream Morphology Data

Cross-Section	Date	Drainage Area (mi^2)	width (ft)	area (ft^2)	d max (ft)	d mean (ft)	w/d ratio	W flood prone area (ft)	entrechment ratio	slope (%)	wet P (ft)	Hydraulic Radius (ft)	Shear Stress (lbs/ft^2)	D50 (mm)
56	6/7/01	4.05	32.0	43.10	1.88	1.35	24	49.0	1.53	2.6	32.63	1.32	2.14	124
57	6/7/01	4.06	45.0	60.03	2.10	1.33	34	110.0	2.44	3.6	45.62	1.32	2.96	104
58	6/7/01	4.09	38.0	68.22	2.55	1.80	21	77.0	2.03	3.3	40.60	1.68	3.46	98
59	6/7/01	4.11	57.5	78.20	2.61	1.40	42	80.1	1.39	3.1	59.10	1.32	2.56	98
60	6/7/01	4.13	33.5	62.55	2.74	1.87	18	72.0	2.15	1.2	33.19	1.88	1.41	100
61	6/12/01	4.14	45.5	39.27	2.31	1.63	28	90.5	1.99	2.7	75.29	0.52	1.66	101
62	6/12/01	4.16	39.5	58.87	2.53	1.49	27	69.0	1.75	3.0	35.52	1.66	3.10	101
63	6/12/01	4.17	29.5	58.38	2.98	1.98	15	88.0	2.98	4.5	34.11	1.71	4.81	107
64	6/12/01	4.19	90.0	92.98	1.72	1.03	87	99.5	1.11	1.3	93.97	0.99	0.80	67
65	6/12/01	4.20	57.0	53.90	1.97	0.95	60	97.0	1.70	3.3	55.09	0.98	2.01	102
66	6/12/01	4.21	28.5	35.99	2.16	1.26	23	48.5	1.70	5.3	29.20	1.23	4.08	102
67	6/12/01	4.22	32.5	39.50	1.93	1.22	27	36.5	1.12	1.7	33.04	1.20	1.27	73
68	6/12/01	4.33	38.5	85.28	3.59	2.22	17	62.5	1.62	3.2	40.79	2.09	4.17	152
69	6/12/01	4.34	38.0	39.09	1.96	1.03	37	46.5	1.22	3.4	38.42	1.02	2.16	142
70	6/12/01	4.36	32.0	42.77	2.04	1.34	24	58.5	1.83	4.6	31.65	1.35	3.88	57
71	6/12/01	4.37	33.0	36.97	2.30	1.12	29	50.0	1.52	3.3	35.43	1.04	2.15	57
72	6/12/01	6.15	37.0	59.51	2.44	1.61	23	46.0	1.24	2.5	37.47	1.59	2.48	86
73	6/12/01	6.16	25.0	35.82	3.30	1.43	17	44.0	1.76	4.8	24.08	1.49	4.46	180
74	6/13/01	6.17	45.0	79.25	2.82	1.76	26	51.0	1.13	1.7	46.56	1.70	1.81	120
75	6/13/01	6.18	45.5	54.76	1.74	1.20	38	54.5	1.20	4.1	46.06	1.19	3.04	137
76	6/13/01	6.19	35.0	50.75	2.26	1.45	24	40.0	1.14	2.3	35.80	1.42	2.03	86
77	6/13/01	6.20	40.1	55.51	2.36	1.38	29	49.0	1.22	2.5	40.60	1.37	2.13	128
78	6/13/01	6.21	37.5	59.74	2.41	1.59	24	46.5	1.24	2.0	39.52	1.51	1.89	122
79	6/13/01	6.22	32.5	43.03	2.30	1.32	25	72.0	2.22	3.1	32.46	1.33	2.56	180
80	6/13/01	6.27	37.0	57.44	2.29	1.55	24	43.5	1.18	3.0	39.17	1.47	2.74	105
81	6/13/01	6.31	52.0	97.83	2.77	1.88	28	113.0	2.17	1.7	53.97	1.81	1.92	66
82	6/13/01	6.34	44.5	60.96	2.08	1.37	32	60.0	1.35	2.1	50.26	1.21	1.59	85
83	6/13/01	6.38	44.0	68.75	2.44	1.56	28	56.0	1.27	3.2	45.16	1.52	3.04	93
84	6/13/01	6.40	40.0	58.66	2.28	1.47	27	61.0	1.53	2.6	39.29	1.49	2.42	124
85	6/14/01	6.70	38.0	77.42	3.02	2.04	19	77.0	2.03	3.1	40.38	1.92	3.71	128
86	6/14/01	7.00	45.0	58.88	2.01	1.31	34	66.0	1.47	1.6	44.50	1.32	1.32	97
87	6/14/01	7.15	70.0	78.89	2.53	1.13	62	85.0	1.21	2.4	78.72	1.00	1.50	118
88	6/13/01	7.30	33.0	57.66	2.48	1.75	19	62.0	1.88	3.0	47.07	1.22	2.29	121
89	6/14/01	7.48	40.0	78.41	3.50	1.96	20	62.0	1.55	3.1	39.80	1.97	3.81	145
90	6/14/01	7.51	33.5	44.37	2.30	1.32	25	43.0	1.28	1.7	34.84	1.27	1.35	98
91	6/14/01	7.55	32.4	44.81	2.41	1.38	23	43.0	1.33	2.2	33.63	1.33	1.83	119
92	6/14/01	7.60	42.5	80.19	3.83	1.89	23	107.0	2.52	2.0	53.55	1.50	1.87	180
93	6/14/01	7.65	37.5	58.58	2.64	1.56	24	65.0	1.73	2.8	39.19	1.49	2.61	136
94	6/14/01	7.70	42.0	73.98	2.75	1.76	24	56.0	1.33	4.9	42.94	1.72	5.27	128
95	6/14/01	7.77	51.0	69.47	2.37	1.36	37	63.0	1.24	2.8	50.69	1.37	2.39	90
96	6/14/01	7.81	47.0	98.20	3.45	2.09	22	58.0	1.23	3.5	48.40	2.03	4.43	90
97	6/14/01	7.85	46.0	64.71	2.81	1.41	33	62.0	1.35	4.7	52.83	1.22	3.59	90
98	6/14/01	7.87	38.0	42.06	2.86	1.11	34	52.0	1.37	7.7	41.97	1.00	4.82	174
99	8/8/01	7.94	36.0	81.59	3.55	2.27	16	62.0	1.70	3.8	39.80	2.05	4.86	218
100	9/26/01	7.96	28.0	56.42	3.06	2.01	14	34.0	1.21	2.1	39.68	1.42	1.90	131
101	9/26/01	8.00	33.0	72.50	3.27	2.20	15	45.0	1.36	2.4	34.77	2.09	3.12	131
102	8/22/01	8.02	37.0	50.45	2.37	1.36	27	44.0	1.19	1.5	39.06	1.29	1.24	104
103	8/22/01	8.04	50.0	66.08	2.15	1.32	38	57.0	1.14	1.9	49.31	1.34	1.57	122
104	9/26/01	8.09	51.0	60.93	1.99	1.19	43	65.0	1.27	1.7	51.01	1.19	1.27	78
105	8/22/01	8.10	38.8	76.04	2.93	1.96	20	72.0	1.86	2.1	41.72	1.82	2.42	118
106	8/22/01	8.18	83.0	99.21	2.58	1.20	69	98.0	1.18	1.7	75.21	1.32	1.43	99
107	9/26/01	8.23	44.0	44.72	2.37	1.02	43	109.0	2.48	1.8	47.18	0.95	0.00	99
108	9/26/01	8.31	38.5	87.07	3.13	2.26	17	49.0	1.27	3.1	43.54	2.00	3.86	88
109	8/22/01	8.34	50.0	123.14	3.58	2.46	20	272.0	5.44	1.4	55.02	2.24	2.00	74
110	9/26/01	8.48	48.0	104.32	3.19	2.17	22	192.0	4.00	1.8	62.29	1.67	1.90	74

Stony Clove Creek Watershed 2001 Stream Morphology Data

Cross-Section	D84 (mm)	Feature PC D50 (mm)	Feature PC D84 (mm)	Rosgen Stream Type	Reference
56	388	71	242	B3	YES
57	1123	72	327	C3b	YES
58	326			B3	
59	326			B3	
60	380			B3c	
61	319			B3	
62	319			B3	
63	350			C3b	
64	202			D3	
65	347			B3	
66	347	70	211	B3a	YES
67	400	63	221	F3	YES
68	583			B3	
69	388	60	171	F3b	YES
70	294			B4a	
71	294			B4	
72	512	56	156	F3b	YES
73	861			B3a	
74	724			F3	
75	388			F3b	
76	335	71	247	F3b	YES
77	483			F3b	
78	412	51	158	F3b	YES
79	512			B3	
80	378			F3b	
81	342	61	278	C3	YES
82	294	54	184	F3b	YES
83	335	92	289	F3b	YES
84	431	63	176	B3	YES
85	469	54	228	B3	YES
86	271	46	161	B3c	YES
87	406			B3c	
88	362			F3b	
89	512	79	261	B3	YES
90	297			F3	
91	487	69	225	F3b	YES
92	1176			C3b	
93	761	44	192	B3	YES
94	1024	73	365	F3b	YES
95	827			F3b	
96	558	80	313	F3b	YES
97	558			F3b	
98	1106			B3a	
99	739	51	294	B3	YES
100	304			F3b	
101	304			F3b	
102	328	84	428	F3	YES
103	335	61	146	F3	YES
104	202			F3	
105	304	59	203	B3	YES
106	230	50	154	F3	YES
107	238			C3	
108	256			F3b	
109	199	41	152	C3	YES
110	199			C3	

Stony Clove Creek Watershed 2001 Stream Morphology Data

Cross-Section	Date	Drainage Area (mi^2)	width (ft)	area (ft^2)	d max (ft)	d mean (ft)	w/d ratio	W flood prone area (ft)	entrechment ratio	slope (%)	wet P (ft)	Hydraulic Radius (ft)	Shear Stress (lbs/ft^2)	D50 (mm)
111	9/27/01	8.50	47.0	89.53	2.35	1.90	25	125.0	2.66	2.1	57.31	1.56	2.10	130
112	9/27/01	8.54	56.0	134.05	4.55	2.39	23	154.0	2.75	3.8	63.96	2.10	5.03	130
113	9/27/01	8.78	64.5	168.90	3.91	2.62	25	345.0	5.35	2.0	66.88	2.53	3.10	79
114	9/27/01	8.83	30.5	110.08	2.36	3.61	8	122.0	4.00	1.2	74.54	1.48	1.11	79
115	8/22/01	8.85	41.2	56.58	2.28	1.37	30	79.0	1.92	1.9	42.16	1.34	1.59	109
116	8/22/01	8.86	53.0	148.60	5.27	2.80	19	200.0	3.77	2.4	54.30	2.74	4.10	109
117	9/27/01	9.04	68.0	148.71	3.49	2.19	31	82.0	1.21	1.5	70.43	2.11	1.94	121
118	9/27/01	9.14	66.4	139.01	2.63	2.09	32	76.0	1.14	1.7	69.94	1.99	2.13	121
119	9/27/01	9.19	49.0	100.90	3.14	2.06	24	92.0	1.88	2.4	50.72	1.99	2.98	128
120	8/22/01	13.85	43.0	81.71	3.68	1.90	23	83.0	1.93	1.9	42.74	1.91	2.27	128
121	9/27/01	13.88	69.0	123.71	2.82	1.79	38	87.0	1.26	1.7	70.92	1.74	1.85	96
122	9/28/01	13.89	43.0	82.95	3.22	1.93	22	55.0	1.28	1.4	46.20	1.80	1.57	113
123	9/28/01	14.03	79.5	166.15	2.94	2.09	38	91.0	1.14	1.4	82.23	2.02	1.80	114
124	9/28/01	14.17	75.0	96.78	3.16	1.29	58	172.0	2.29	1.6	126.99	0.76	0.77	105
125	8/23/01	14.21	62.5	137.08	2.86	2.19	28	263.0	4.21	0.9	65.54	2.09	1.13	90
126	8/23/01	14.26	67.0	171.49	3.46	2.56	26	135.0	2.01	1.4	85.06	2.02	1.70	82
127	8/23/01	14.29	71.0	77.73	1.95	1.09	65	79.0	1.11	1.9	70.57	1.10	1.31	104
128	8/23/01	14.32	61.0	152.57	3.59	2.50	24	169.0	2.77	1.9	65.05	2.35	2.34	109
129	8/23/01	14.36	80.0	125.85	2.80	1.57	51	99.0	1.24	1.3	74.68	1.69	1.37	95
130	8/23/01	15.33	71.0	97.87	2.98	1.38	52	98.0	1.38	1.9	74.07	1.32	1.57	111
131	8/23/01	15.38	45.0	68.68	2.82	1.53	29	58.0	1.29	1.9	45.68	1.50	1.78	112
132	8/23/01	15.39	40.0	58.09	2.65	1.45	28	62.0	1.55	2.8	41.79	1.39	2.41	176
133	9/28/01	15.42	57.0	140.34	3.26	2.46	23	75.0	1.32	0.9	59.87	2.34	1.32	115
134	8/23/01	15.45	57.0	154.43	3.49	2.71	21	70.0	1.23	1.5	60.71	2.54	2.38	115
135	8/23/01	15.52	64.0	67.58	2.00	1.06	61	78.0	1.22	1.4	60.97	1.11	0.98	115
136	8/23/01	15.62	57.0	122.27	3.04	2.15	27	96.0	1.68	0.9	66.27	1.84	1.08	77
137	9/28/01	15.68	64.0	101.37	3.03	1.58	40	553.0	8.64	1.7	65.84	1.54	1.60	121
138	10/24/01	15.70	93.5	235.51	3.91	2.52	37	396.0	4.24	1.3	91.96	2.56	2.00	121
139	8/23/01	15.81	42.0	70.05	2.98	1.67	25	184.0	4.38	1.4	39.74	1.76	1.54	121
140	8/23/01	16.15	66.0	119.92	2.70	1.82	36	80.0	1.21	1.4	72.50	1.65	1.44	128
141	10/24/01	16.27	52.0	108.29	3.65	2.08	25	80.0	1.54	2.0	53.51	2.02	2.53	128
142	10/24/01	16.34	58.0	107.66	2.81	1.86	31	102.0	1.76	0.9	59.25	1.82	1.02	128
143	8/28/01	16.39	57.0	93.04	3.01	1.63	35	85.0	1.49	1.4	55.51	1.68	1.46	128
144	8/28/01	16.42	54.5	96.27	2.45	1.77	31	74.0	1.36	1.4	55.03	1.75	1.51	128
145	10/24/01	16.47	66.0	134.34	4.17	2.04	32	78.0	1.18	1.5	66.23	2.03	1.87	81
146	10/24/01	16.56	82.0	105.39	2.59	1.29	64	230.0	2.80	1.1	83.60	1.26	0.87	70
147	10/24/01	16.60	50.5	77.95	3.22	1.54	33	81.0	1.60	1.6	50.80	1.53	1.53	122
148	10/24/01	16.63	79.0	124.26	3.42	1.57	50	96.0	1.22	1.2	81.83	1.52	1.13	142
149	10/24/01	16.68	52.0	116.49	3.12	2.24	23	56.0	1.08	1.9	51.52	2.26	2.72	142
150	8/28/01	16.76	45.0	77.55	3.24	1.72	26	70.0	1.56	2.1	51.08	1.52	1.97	116
151	8/28/01	16.81	65.0	134.24	3.16	2.07	31	73.0	1.12	1.5	64.66	2.08	1.92	95
152	10/24/01	16.83	69.5	131.30	2.53	1.89	37	77.5	1.12	1.2	71.14	1.85	1.38	95
153	10/24/01	16.90	68.5	106.25	3.07	1.55	44	104.0	1.52	1.4	71.30	1.49	1.29	86
154	10/24/01	16.99	63.5	96.18	2.32	1.51	42	93.0	1.46	0.5	65.09	1.48	0.47	86
155	8/28/01	17.02	68.0	105.62	3.29	1.55	44	140.0	2.06	2.2	61.03	1.73	2.37	117
156	8/28/01	17.04	51.8	79.65	2.38	1.54	34	62.0	1.20	1.0	52.84	1.51	0.92	105
157	10/24/01	17.16	50.5	123.60	3.61	2.45	21	60.0	1.19	1.7	53.40	2.31	2.49	105
158	10/24/01	17.43	63.0	125.43	3.31	1.99	32	168.0	2.67	1.1	64.88	1.93	1.29	109
159	8/28/01	17.48	71.0	104.40	2.37	1.47	48	96.0	1.35	1.6	73.39	1.42	1.39	98
160	8/28/01	17.49	54.0	52.80	2.66	0.98	55	66.5	1.23	2.8	53.77	0.98	1.69	175
161	8/28/01	17.51	50.0	89.72	2.55	1.79	28	73.0	1.46	2.1	46.36	1.94	2.53	202
162	8/28/01	17.53	67.0	139.37	3.88	2.08	32	114.0	1.70	2.6	65.39	2.13	3.46	202
163	8/28/01	26.53	63.0	173.49	3.83	2.75	23	72.0	1.14	4.1	64.01	2.71	6.93	246
164	10/24/01	26.55	82.0	203.32	4.93	2.48	33	124.0	1.51	3.5	88.30	2.30	5.03	332
165	8/29/01	26.59	55.0	117.70	3.30	2.14	26	60.0	1.09	2.5	57.13	2.06	3.21	256

Stony Clove Creek Watershed 2001 Stream Morphology Data

Cross-Section	D84 (mm)	Feature PC D50 (mm)	Feature PC D84 (mm)	Rosgen Stream Type	Reference
111	276			C3b	
112	276			C3b	
113	187			C3	
114	187			C3	
115	269	73	208	B3	YES
116	269	96	242	C3b	YES
117	326			F3	
118	326			F3	
119	340			B3	
120	340	84	184	B3c	YES
121	236			F3	
122	231			F3	
123	273			F3	
124	202			C3	
125	197	61	146	C3	YES
126	172	60	133	B3c	YES
127	256	62	160	F3	YES
128	342	56	168	C3	YES
129	228	53	129	B3c	YES
130	256	42	107	B3c	YES
131	245	49	237	F3	YES
132	619	88	409	B3	YES
133	362			F3	
134	362	38	96	F3	YES
135	362	38	85	F3	YES
136	177	67	192	B3c	YES
137	304			C3	
138	304			C3	
139	304	89	201	C3	YES
140	328	33	137	F3	YES
141	328			B3c	
142	328			B3c	
143	328	64	151	B3c	YES
144	328	48	159	B3c	YES
145	234			F3	
146	125			C3	
147	296			B3c	
148	450			F3	
149	450			F3	
150	456	73	291	B3	YES
151	362	52	163	F3	YES
152	362			F3	
153	237			B3c	
154	237			B3c	
155	256	66	140	B3	YES
156	294	88	192	F3	YES
157	294			F3	
158	446			C3	
159	304	44	139	B3c	YES
160	813	112	448	F3b	YES
161	939	65	212	B3	YES
162	939	51	163	B3	YES
163	996	82	575	F3b	YES
164	1699			B2	
165	948	40	176	F3b	YES

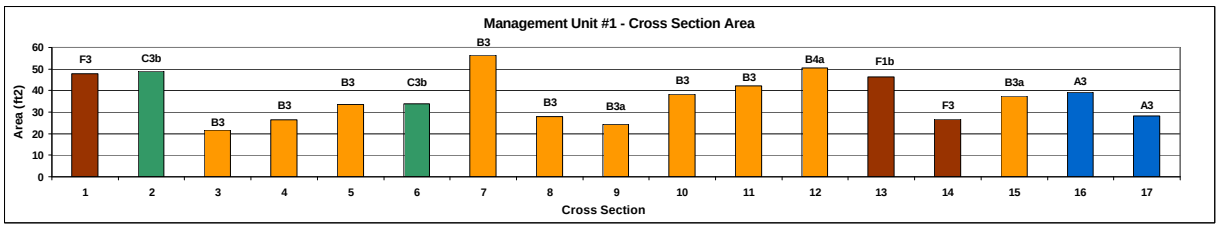
Stony Clove Creek Watershed 2001 Stream Morphology Data

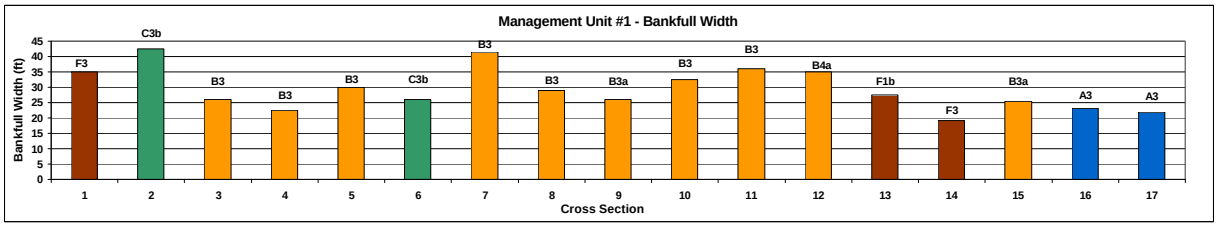
Cross-Section	Date	Drainage Area (mi^2)	width (ft)	area (ft^2)	d max (ft)	d mean (ft)	w/d ratio	W flood prone area (ft)	entrechment ratio	slope (%)	wet P (ft)	Hydraulic Radius (ft)	Shear Stress (lbs/ft^2)	D50 (mm)
166	10/25/01	26.70	66.0	176.09	4.38	2.67	25	120.0	1.82	1.4	71.40	2.47	2.15	128
167	8/29/01	26.72	71.0	142.77	2.96	2.01	35	96.0	1.35	1.9	71.88	1.99	2.35	128
168	10/25/01	26.74	98.0	175.73	5.26	1.79	55	340.0	3.47	3.0	100.72	1.74	3.26	195
169	8/29/01	26.75	58.0	177.62	5.22	3.06	19	98.0	1.69	3.0	61.14	2.90	5.36	220
170	10/25/01	26.77	75.0	217.46	4.42	2.90	26	600.0	8.00	1.1	75.64	2.88	1.89	114
171	10/25/01	26.78	85.0	164.29	3.06	1.93	44	112.0	1.32	1.9	86.16	1.91	2.22	99
172	8/29/01	26.88	62.0	128.18	5.61	2.07	30	172.0	2.77	1.9	73.03	1.76	2.07	70
173	10/25/01	26.98	40.0	133.41	3.97	3.34	12	57.0	1.43	1.9	47.84	2.79	3.35	156
174	8/29/01	26.99	68.5	188.36	4.15	2.75	25	122.0	1.78	1.3	70.90	2.66	2.18	111
175	10/25/01	27.30	92.0	168.46	3.45	1.83	50	120.0	1.30	1.9	93.06	1.81	2.20	90
176	8/29/01	30.90	68.0	164.12	4.01	2.41	28	96.0	1.41	2.0	70.84	2.32	2.82	97
177	10/25/01	30.91	59.0	156.28	5.16	2.65	22	139.0	2.36	2.6	62.72	2.49	3.99	256
178	10/25/01	30.92	75.0	288.52	6.58	3.85	19	194.0	2.59	1.8	83.98	3.44	3.89	312
179	8/29/01	30.93	53.0	172.69	4.76	3.26	16	88.0	1.66	1.3	57.25	3.02	2.47	128
180	8/29/01	30.94	96.0	295.33	4.30	3.08	31	124.0	1.29	0.4	96.61	3.06	0.78	185
181	8/29/01	31.40	89.5	249.95	4.02	2.79	32	106.0	1.18	2.0	90.75	2.75	3.39	185
182	8/29/01	31.41	71.0	337.86	7.90	4.76	15	123.0	1.73	3.3	71.32	4.74	9.83	400
183	8/29/01	31.42	54.0	315.19	7.02	5.84	9	100.0	1.85	1.2	61.69	5.11	3.85	400
184	8/30/01	31.53	62.5	161.40	4.84	2.58	24	75.0	1.20	1.4	63.14	2.56	2.17	342
185	10/25/01	31.56	65.0	175.69	5.08	2.70	24	86.0	1.32	2.7	71.38	2.46	4.21	215
186	8/30/01	31.67	67.0	198.22	4.13	2.96	23	80.0	1.19	1.0	70.54	2.81	1.78	186
187	10/25/01	31.85	90.0	157.37	3.05	1.75	51	173.0	1.92	0.8	94.89	1.66	0.82	106
188	10/25/01	31.93	67.0	246.11	5.16	3.67	18	450.0	6.72	1.7	76.82	3.20	3.44	134
189	10/30/01	32.00	78.0	255.78	6.37	3.28	24	99.0	1.27	1.8	85.10	3.01	3.35	164
190	8/30/01	32.06	71.0	140.36	3.33	1.98	36	83.0	1.17	1.3	70.65	1.99	1.63	167
191	8/30/01	32.09	73.0	209.19	4.07	2.87	25	92.0	1.26	0.9	74.71	2.80	1.60	128
192	8/30/01	32.12	76.0	252.93	4.93	3.33	23	108.0	1.42	1.4	83.75	3.02	2.66	180
193	10/30/01	32.15	74.0	263.84	6.09	3.57	21	134.0	1.81	2.3	80.48	3.28	4.69	191
194	8/30/01	32.23	121.0	427.09	4.68	3.53	34	232.0	1.92	0.4	123.43	3.46	0.97	76
195	10/30/01	32.29	87.0	165.79	4.18	1.91	46	160.0	1.84	1.7	87.10	1.90	2.02	125
196	10/30/01	32.31	72.0	274.92	5.74	3.82	19	200.0	2.78	2.1	76.74	3.58	4.65	172
197	10/30/01	32.35	71.0	236.84	4.75	3.34	21	94.0	1.32	1.0	71.84	3.30	2.00	145
198	10/30/01	32.40	96.0	158.60	2.82	1.65	58	128.5	1.34	0.9	99.31	1.60	0.92	82
199	10/30/01	32.42	88.0	365.58	5.74	4.15	21	300.0	3.41	1.2	90.03	4.06	3.11	115

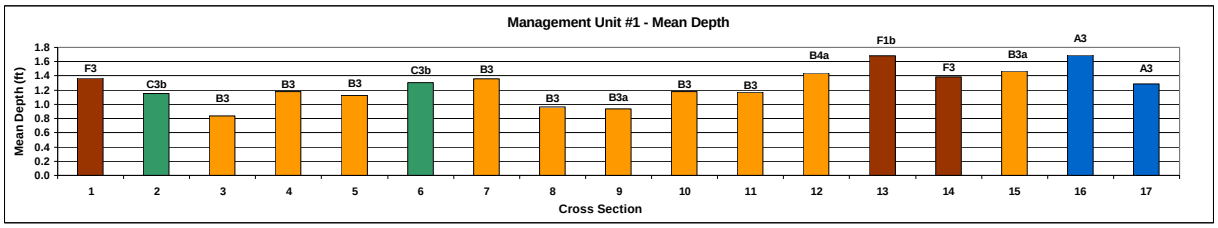
Stony Clove Creek Watershed 2001 Stream Morphology Data

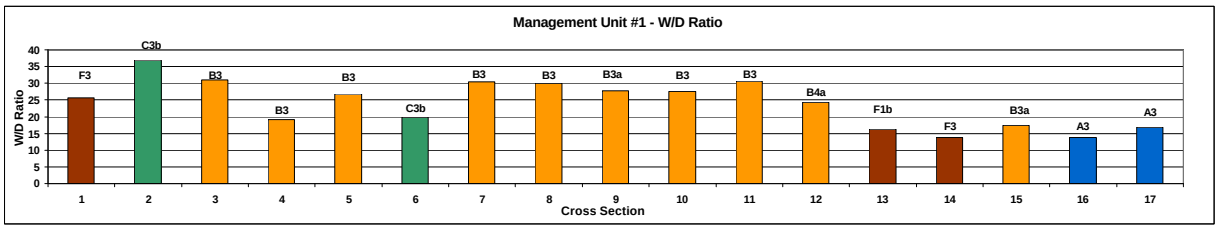
Cross-Section	D84 (mm)	Feature PC D50 (mm)	Feature PC D84 (mm)	Rosgen Stream Type	Reference
166	487			B3c	
167	487	90	322	B3c	YES
168	813			C3b	
169	878	84	311	B3	YES
170	416			C3	
171	292			F3	
172	287	96	642	C3	YES
173	478			F3	
174	456	67	281	B3c	YES
175	512			F3	
176	594	79	272	B3	YES
177	2716			C3b	
178	2415			C2	
179	431	63	263	B3c	YES
180	753	37	114	F3	YES
181	753	59	192	F3b	YES
182	2474	29	768	B2	YES
183	2474	149	1935	B2c	YES
184	3145	348	2414	F2	YES
185	2048			F3b	
186	793	147	493	F3	YES
187	304			B3c	
188	474			C3	
189	478			F3	
190	784	60	261	F3	YES
191	594	25	85	F3	YES
192	861	78	315	B3c	YES
193	790			B3	
194	348	43	145	B3c	YES
195	645			B3c	
196	594			C3b	
197	848			F3	
198	347			F3	
199	326			C3	

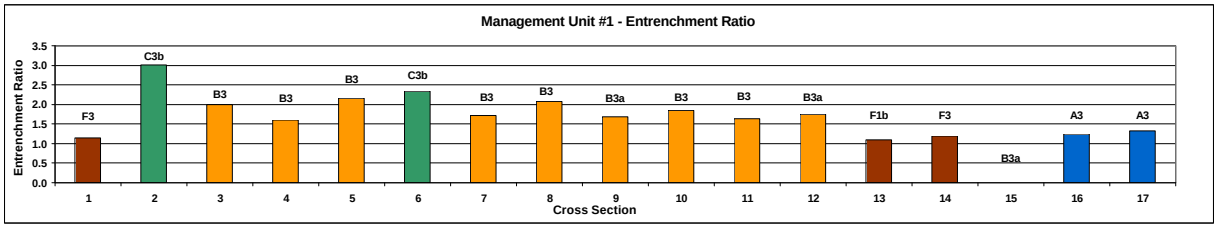
Stony Clove Creek Management Unit #1 - 2001 Stream Morphology Data

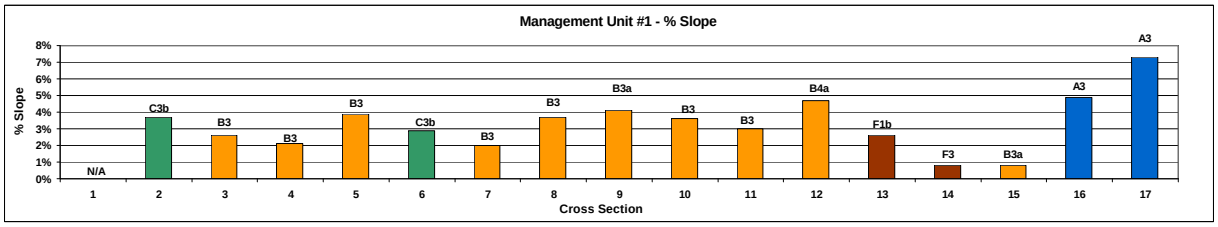


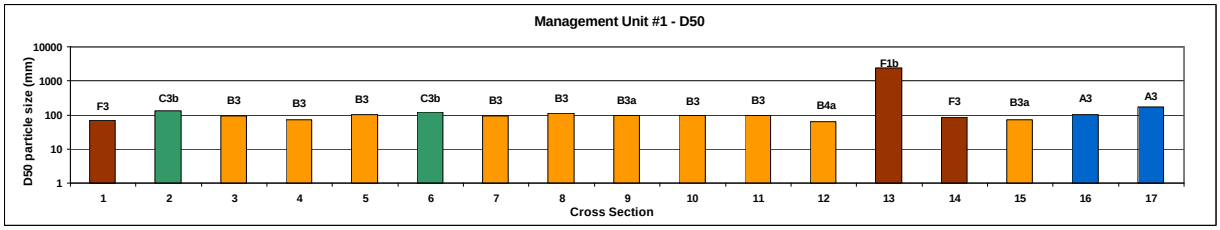


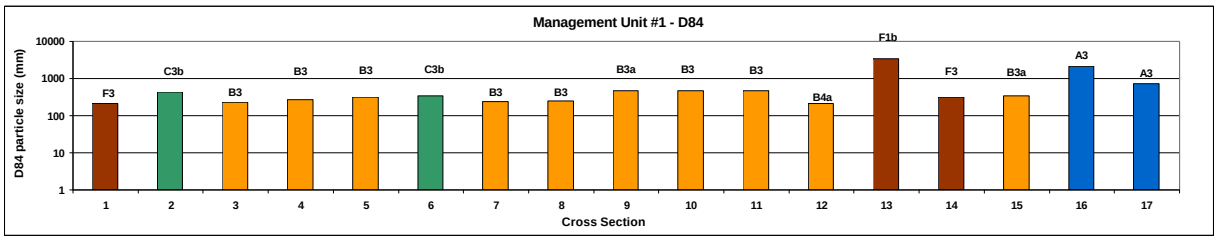




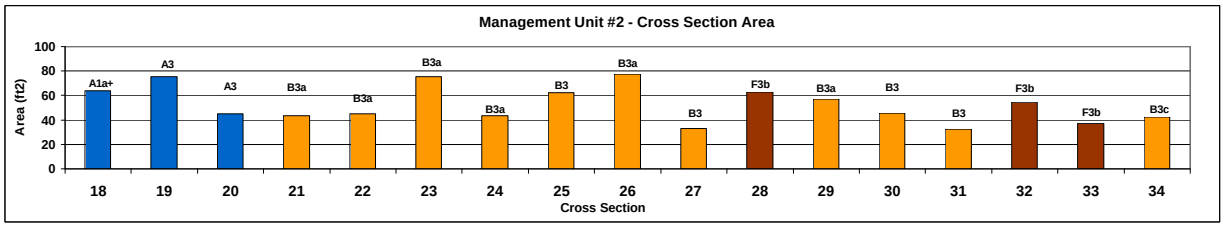


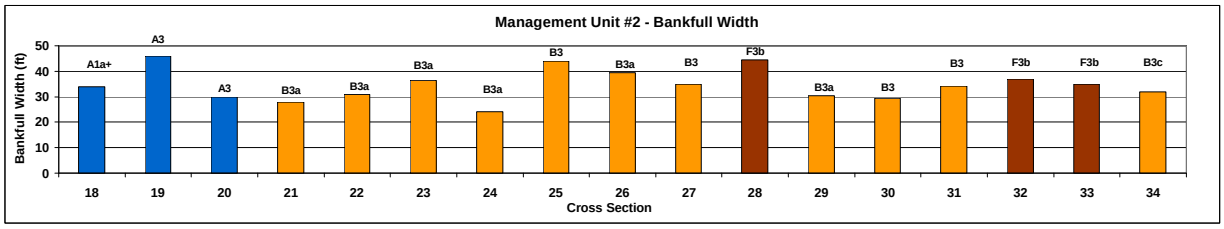


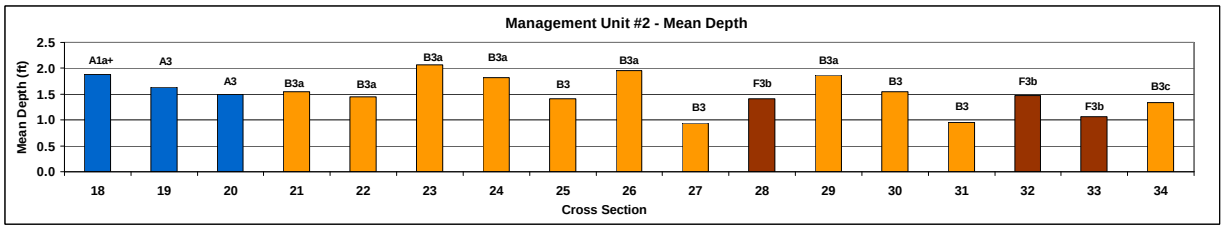


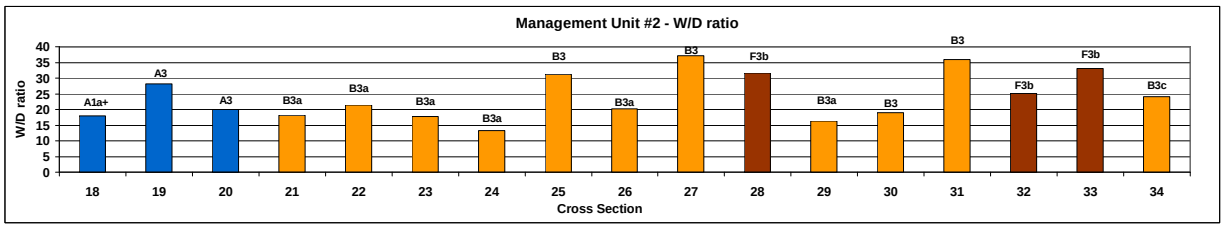


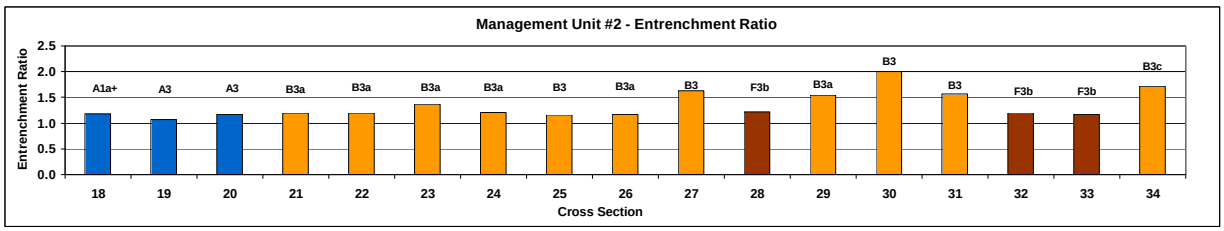
Stony Clove Creek Management Unit #2 - 2001 Stream Morphology Data

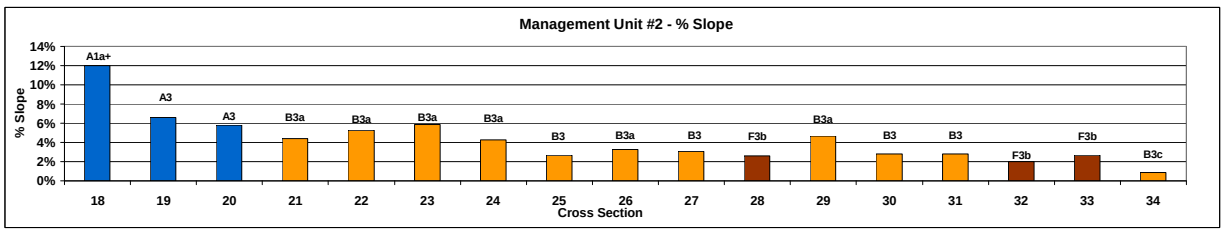


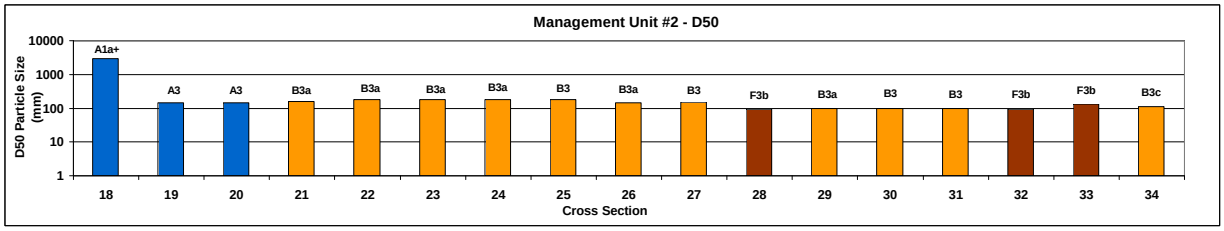


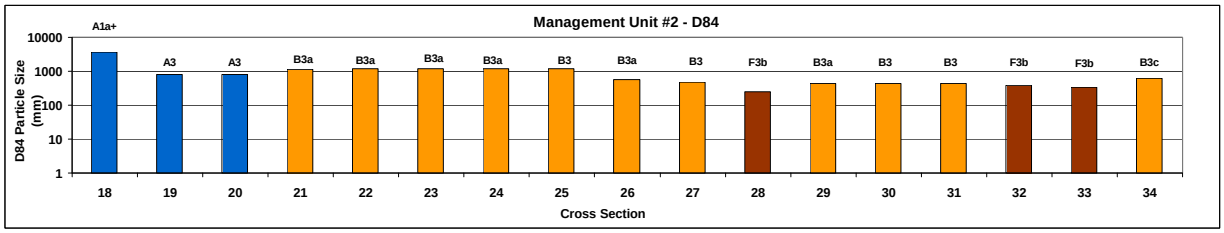




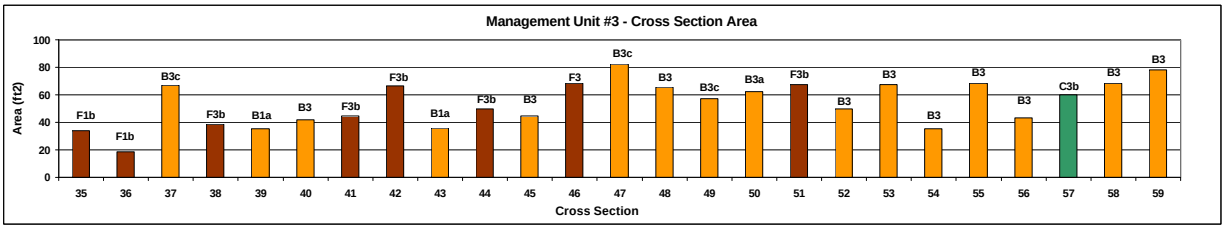


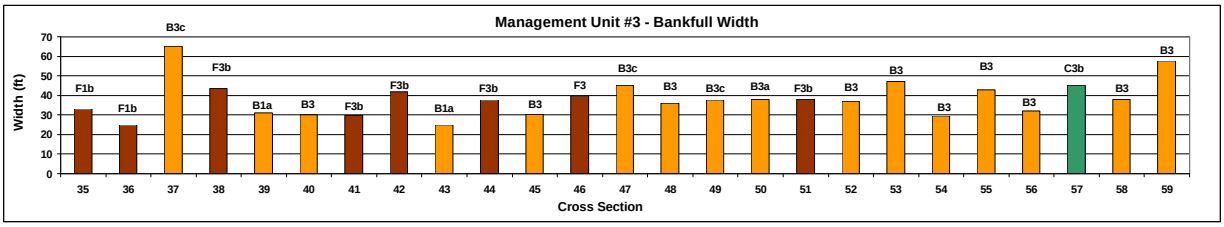


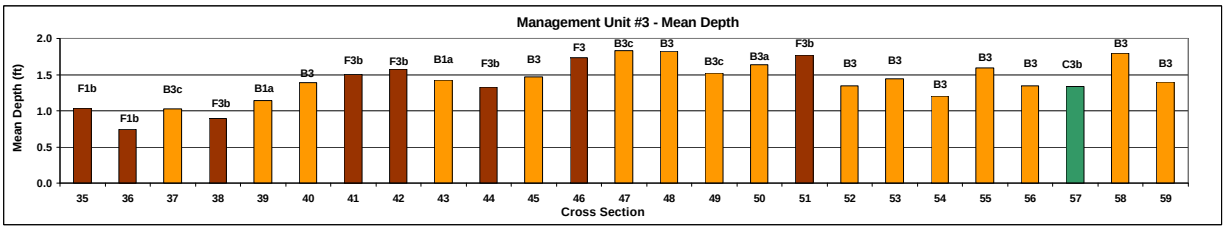


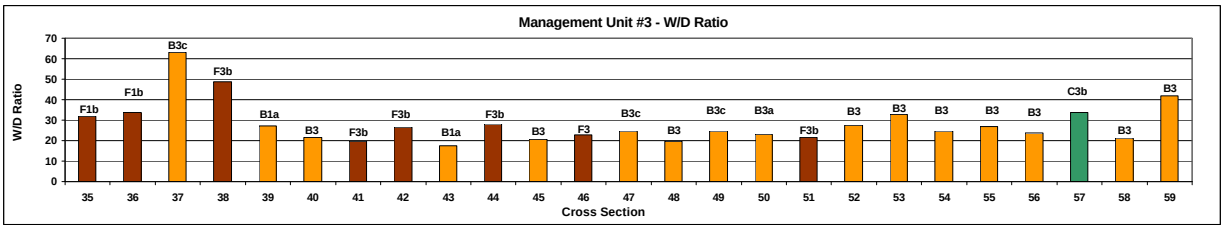


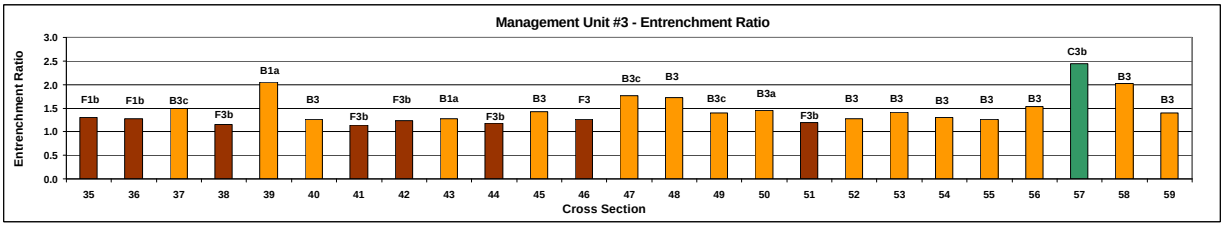
Stony Clove Creek Management Unit #3 - 2001 Stream Morphology Data

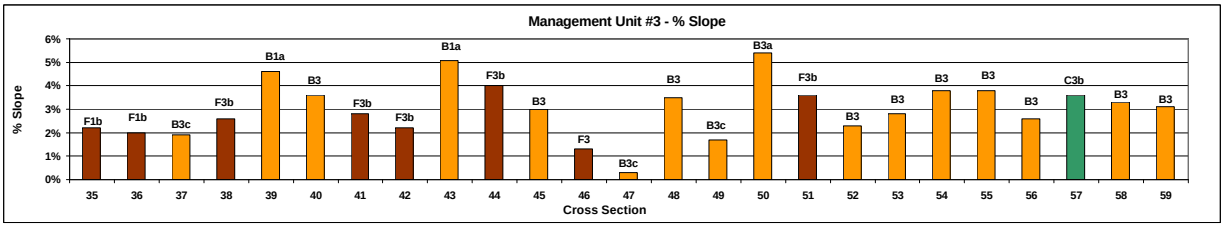


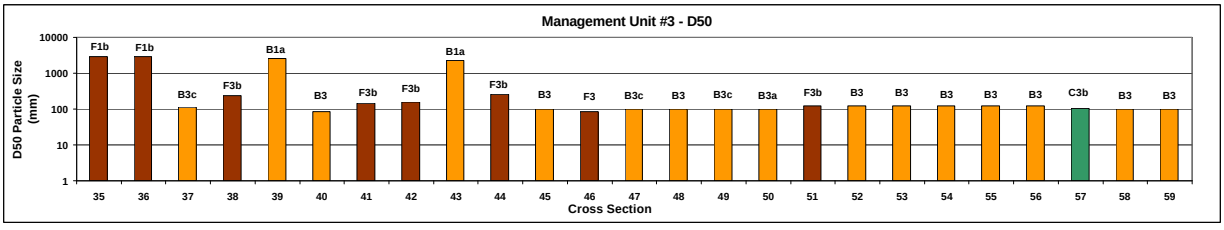


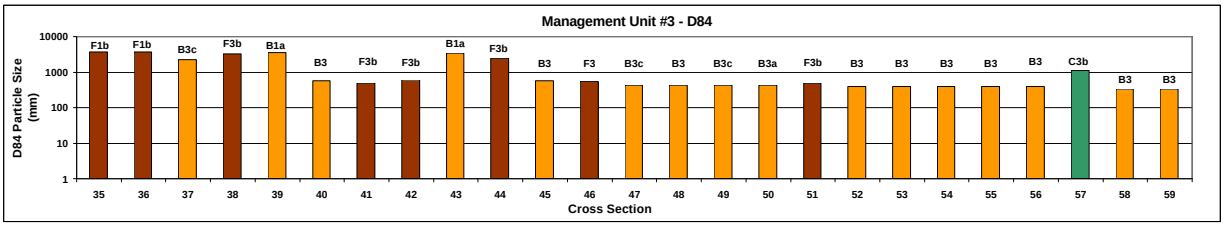




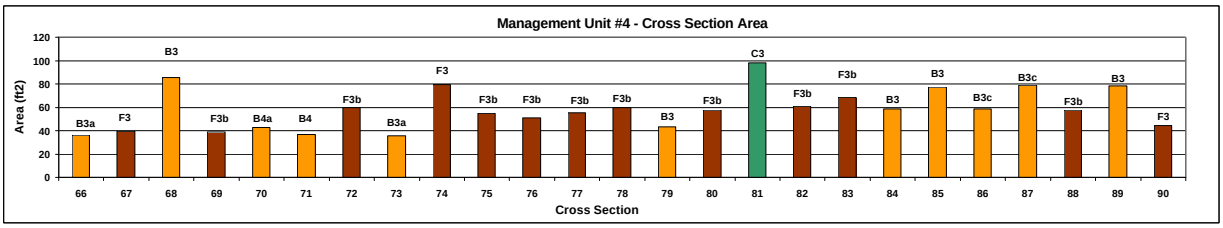


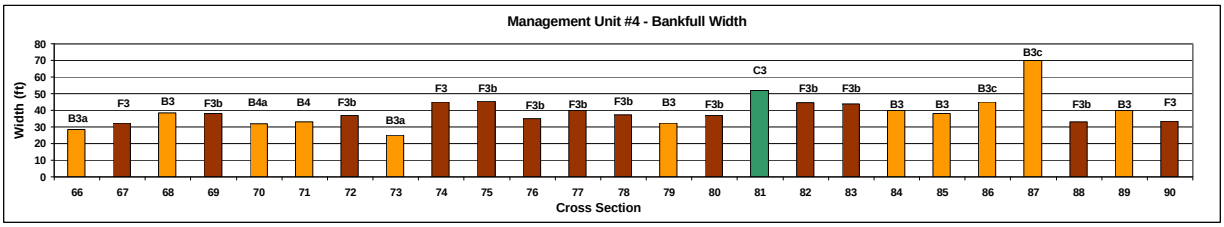


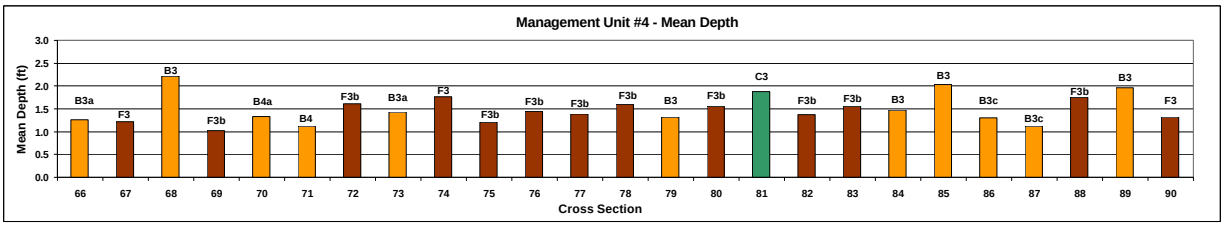


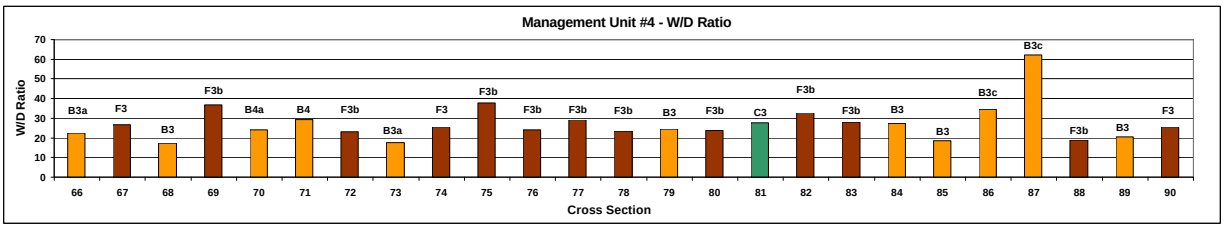


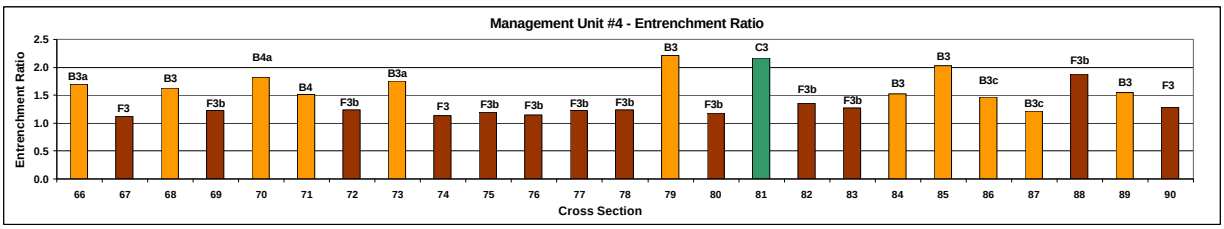
Stony Clove Creek Management Unit #4 - 2001 Stream Morphology Data

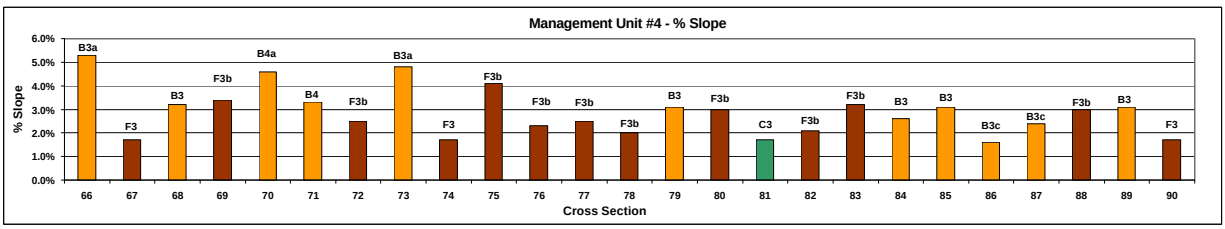


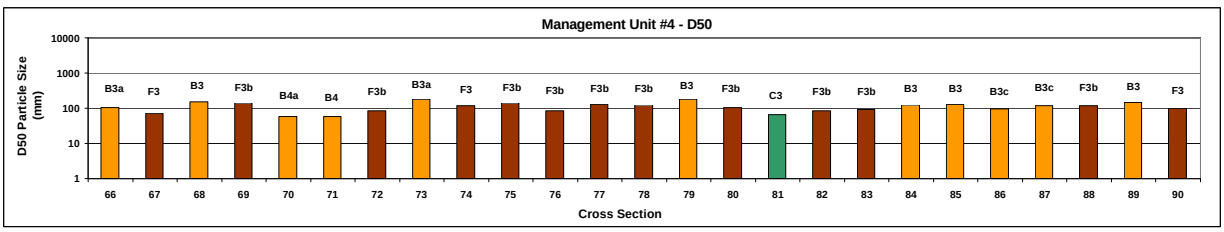


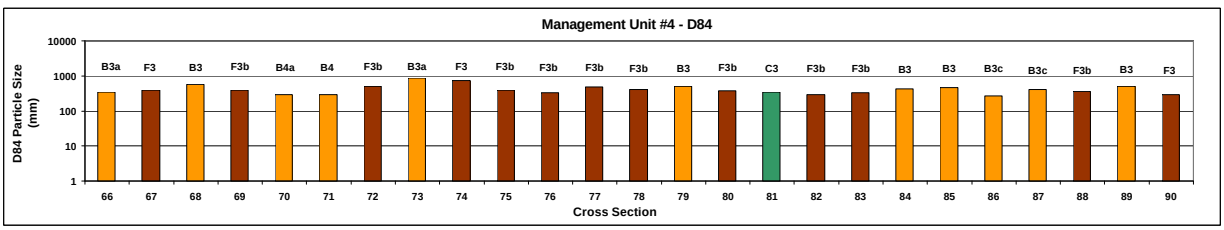




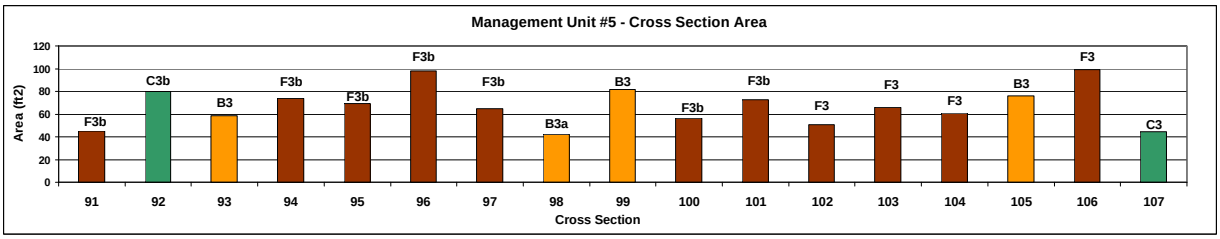


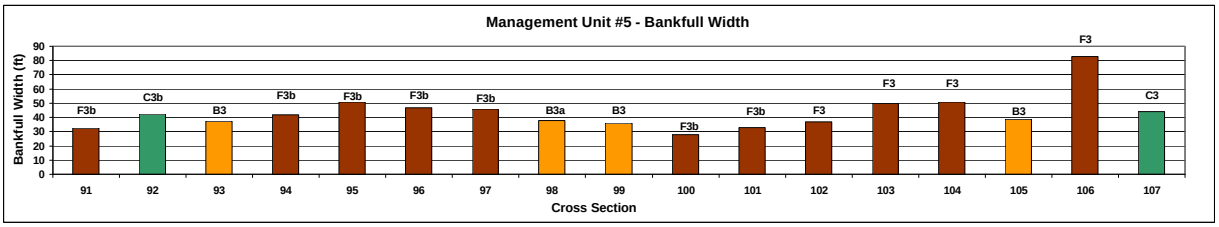


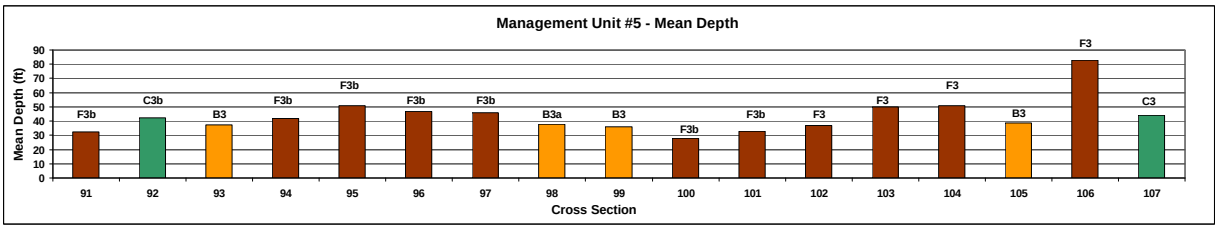


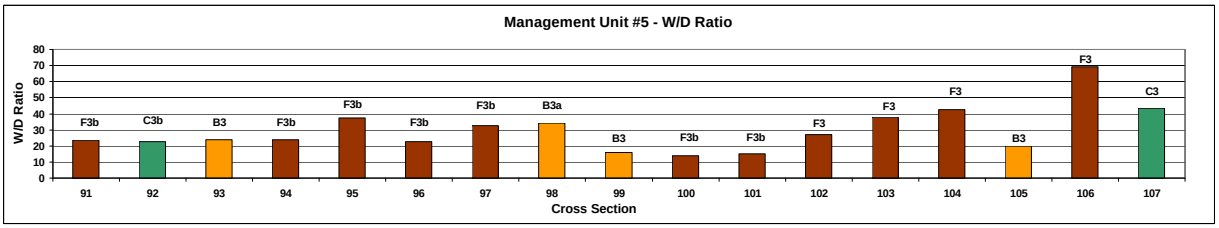


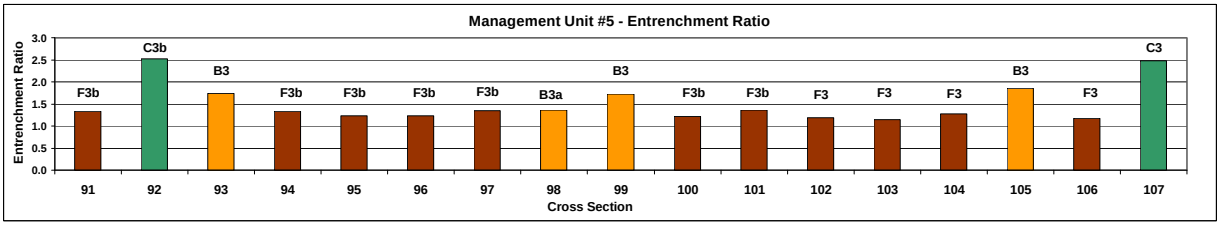
Stony Clove Creek Management Unit #5 - 2001 Stream Morphology Data

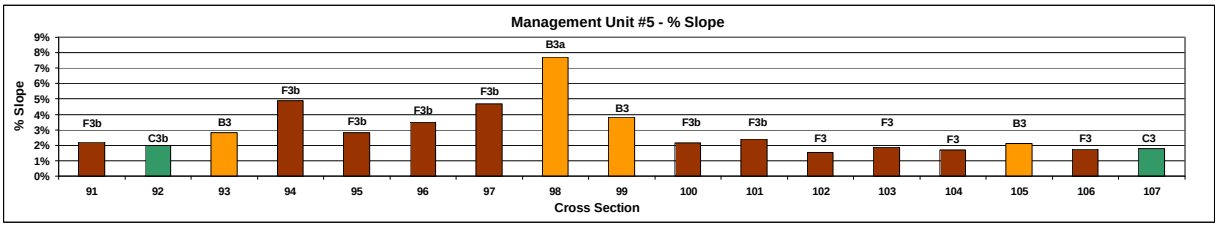


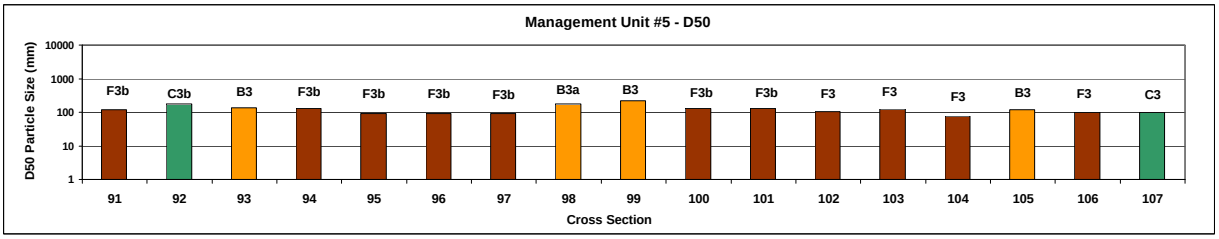


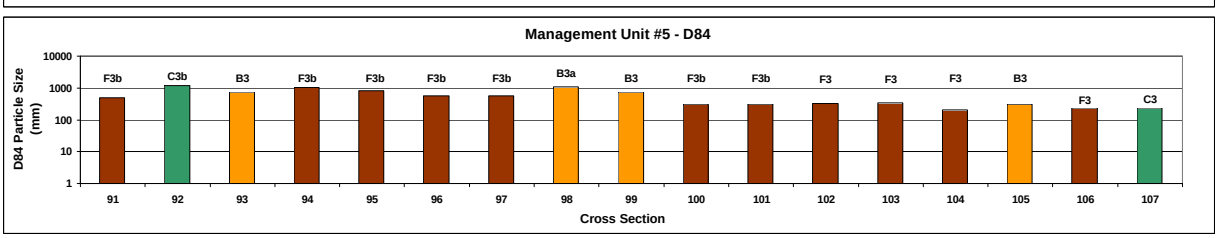




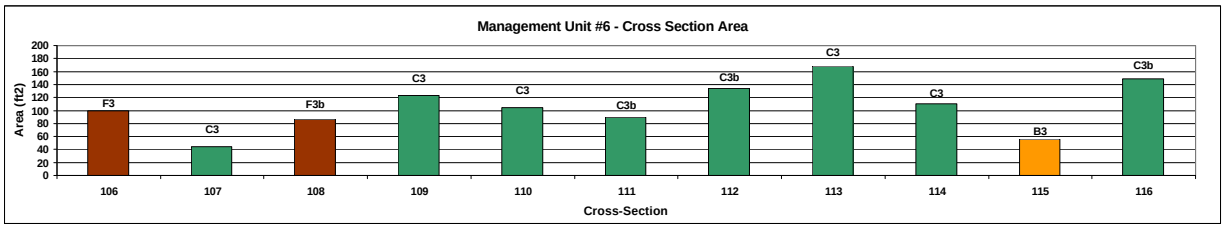


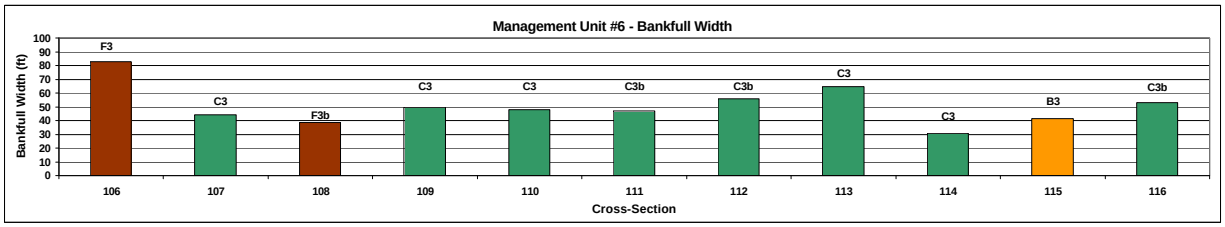


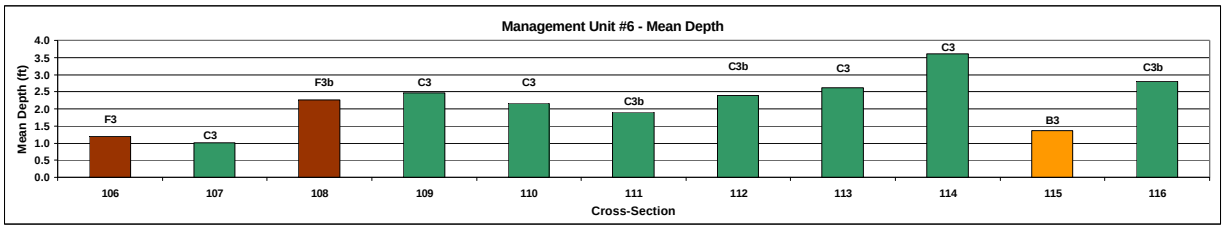


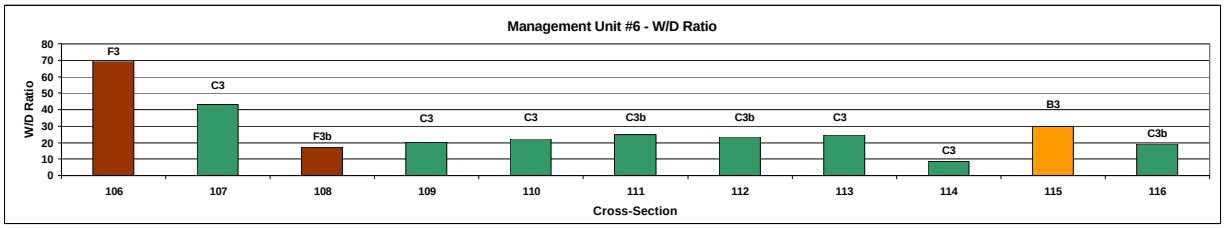


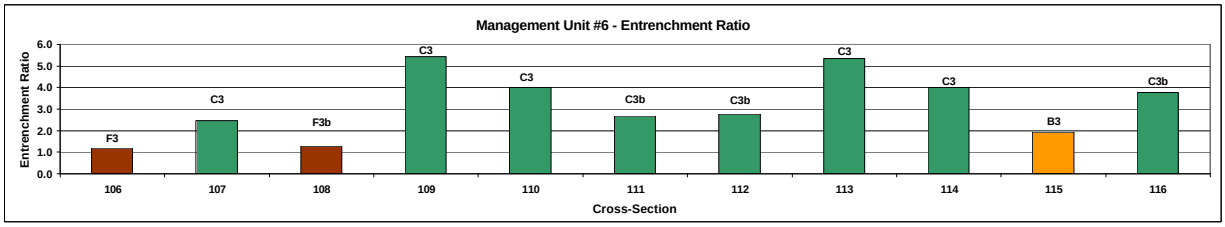
Stony Clove Creek Management Unit #6 - 2001 Stream Morphology Data

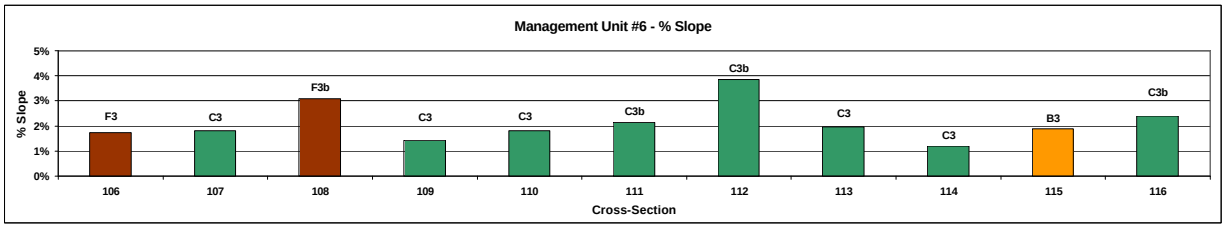


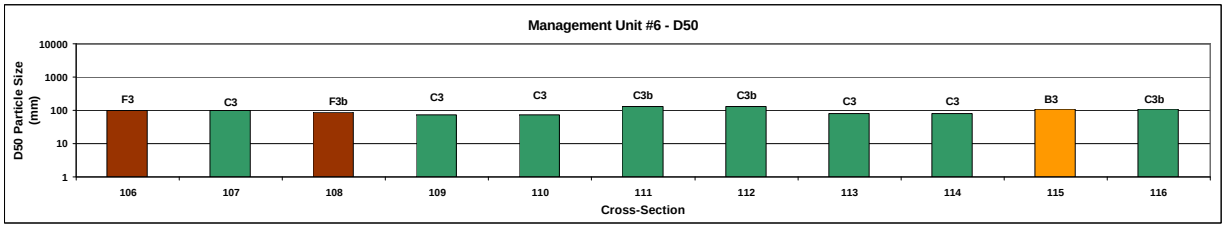


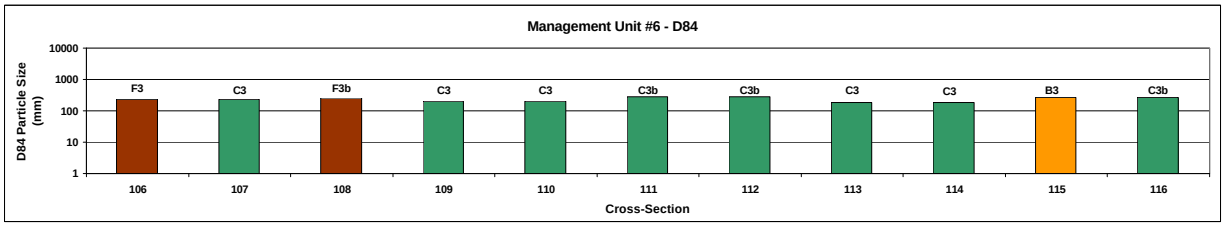




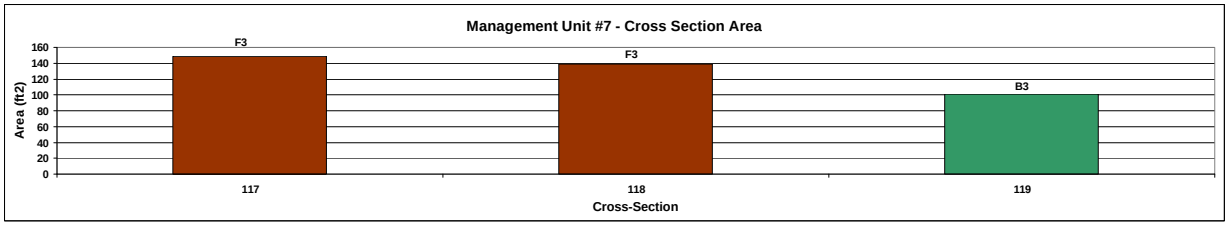


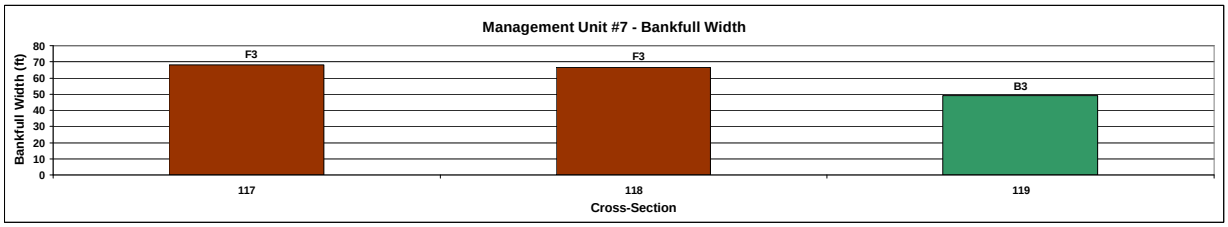


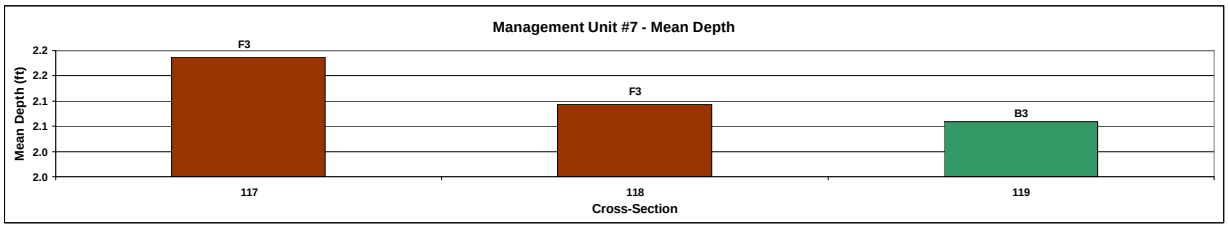


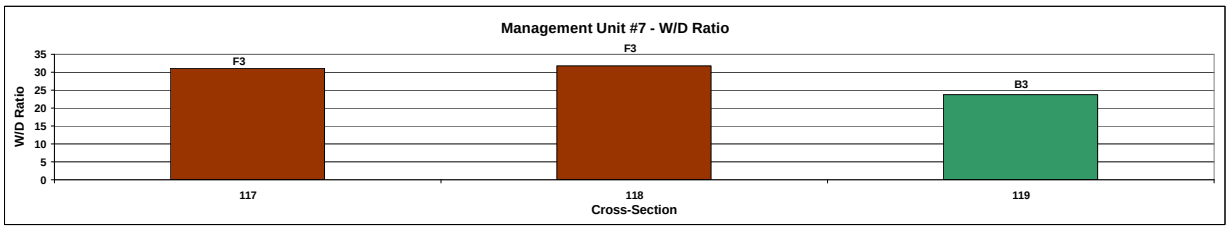


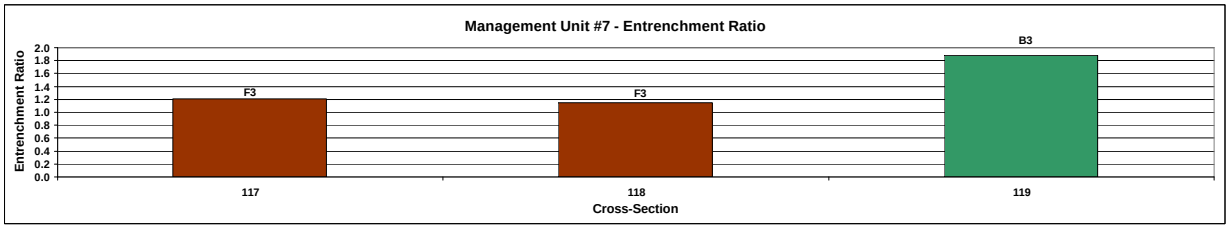
Stony Clove Creek Management Unit #7 - 2001 Stream Morphology Data

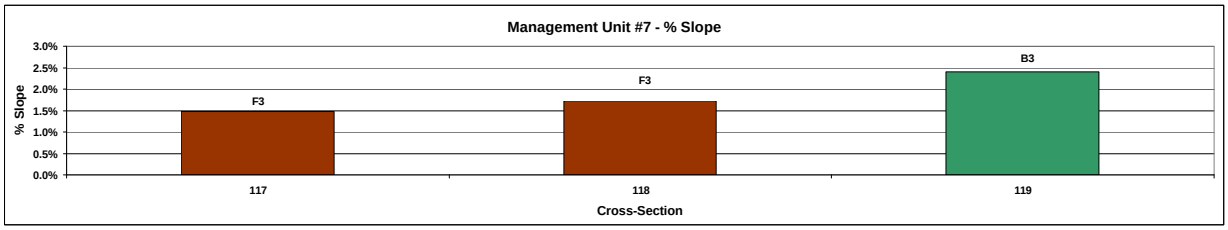


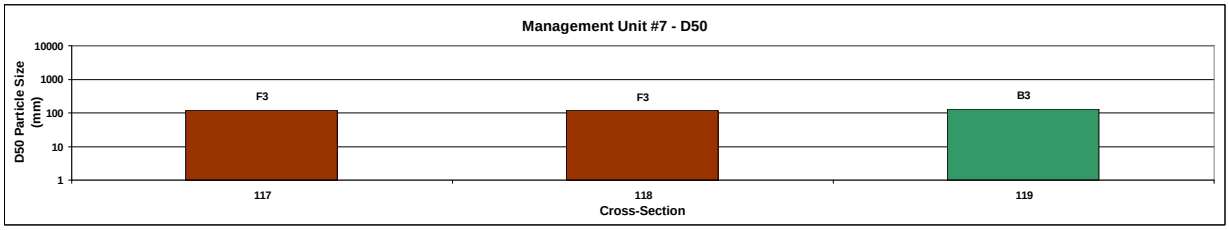


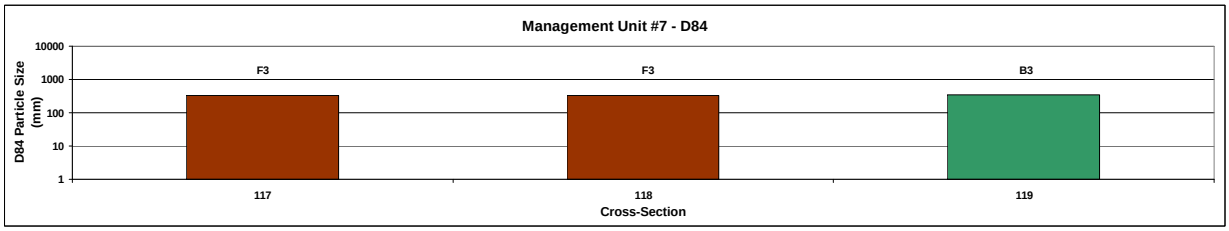




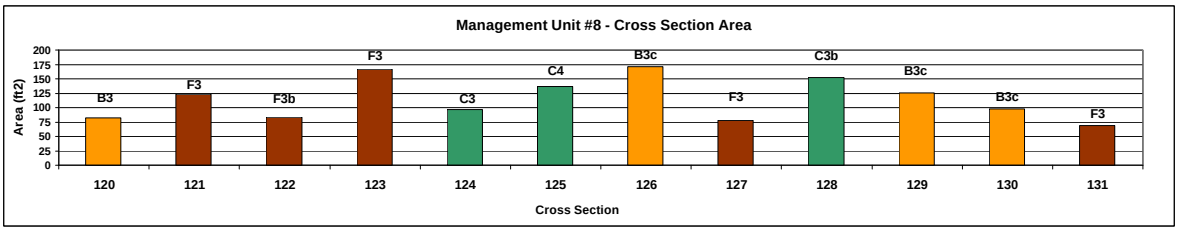


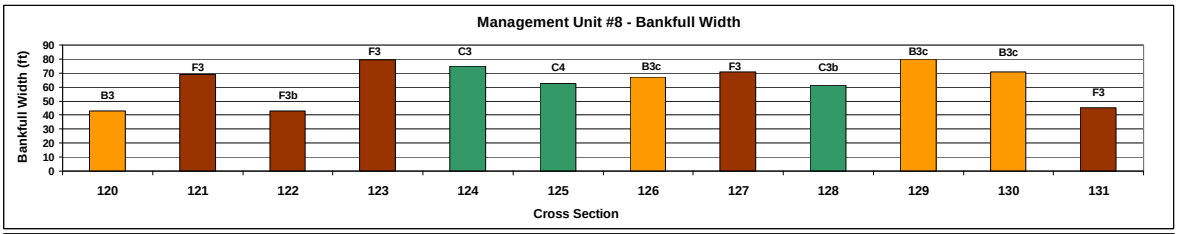


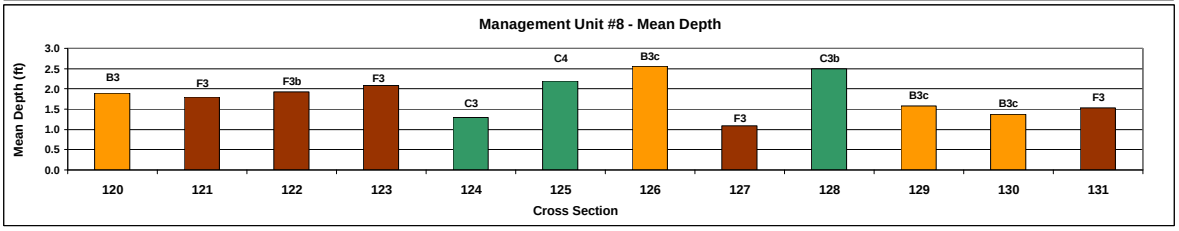


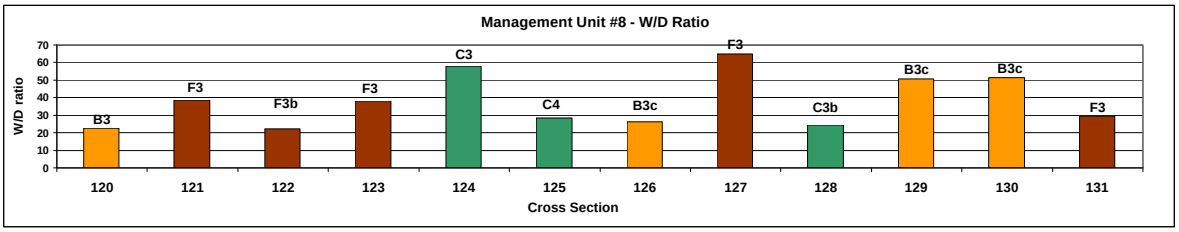


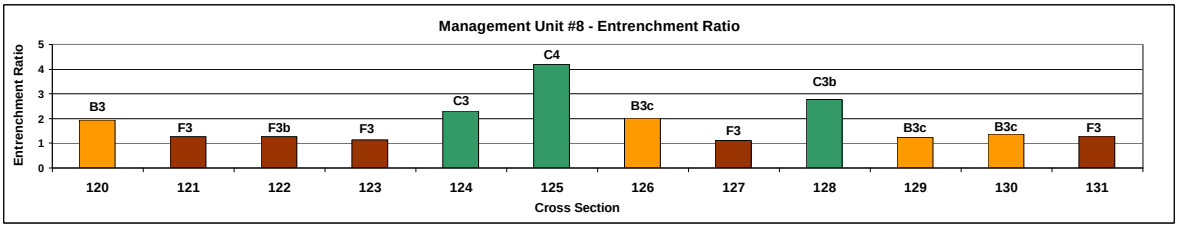
Stony Clove Creek Management Unit #8 - 2001 Stream Morphology Data

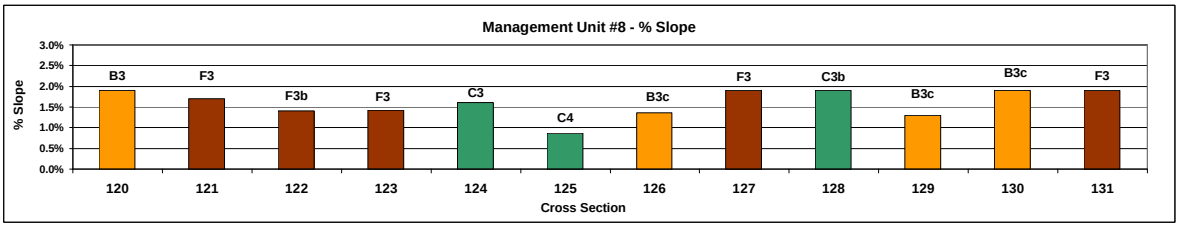


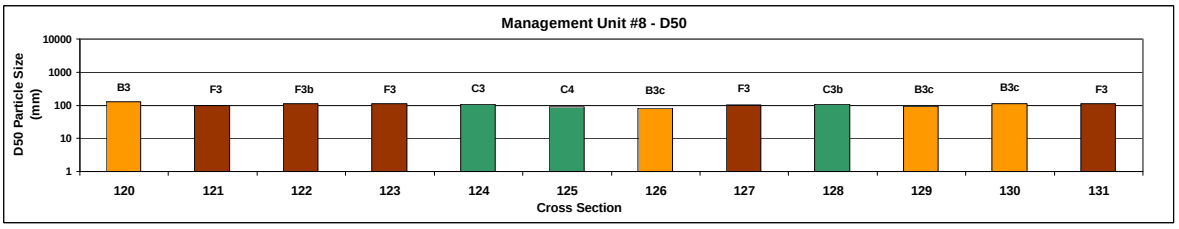


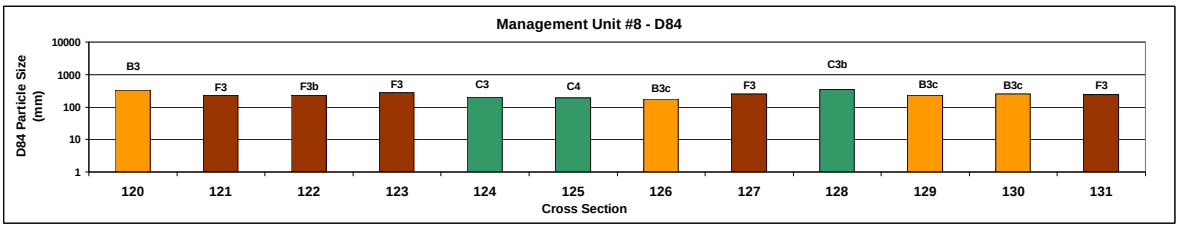




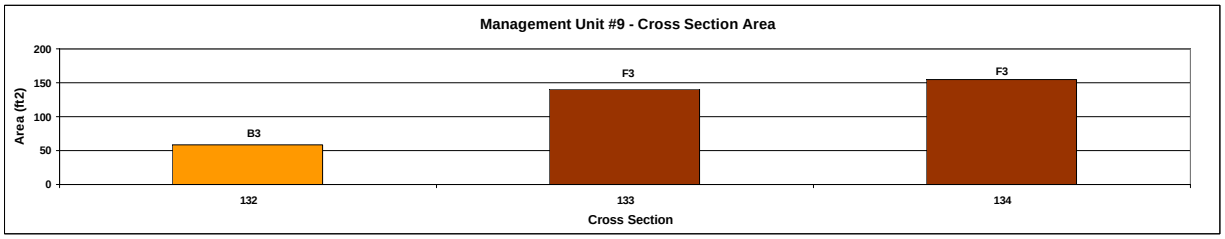


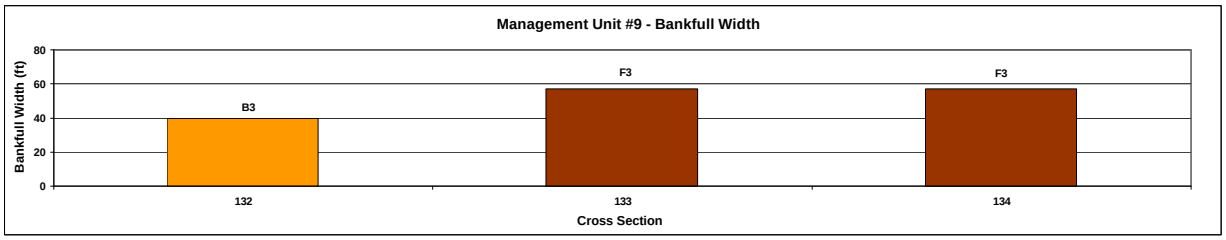


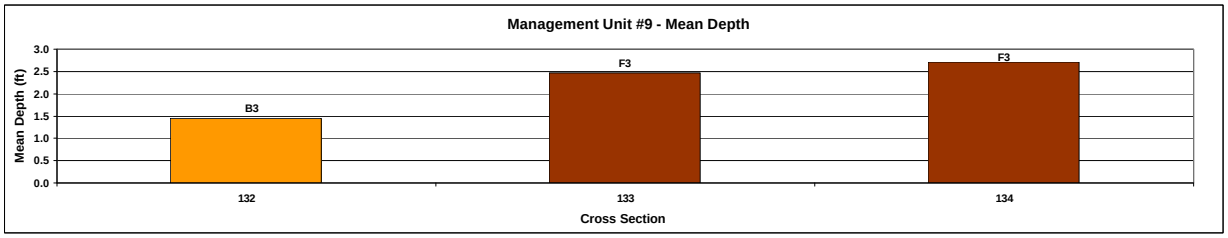


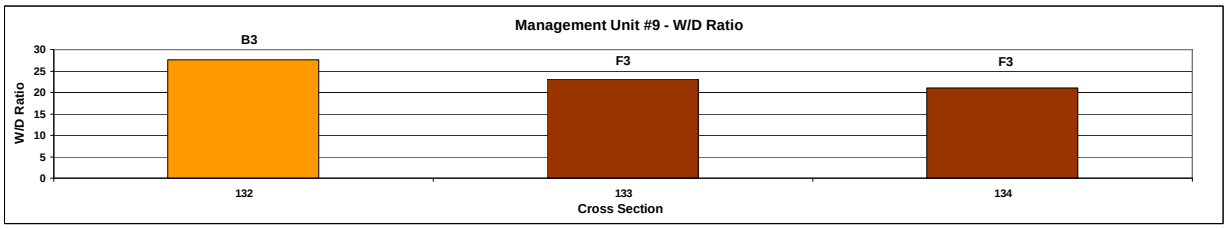


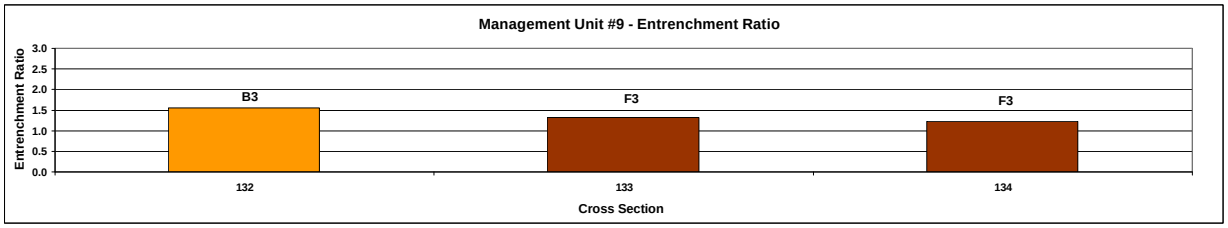
Stony Clove Creek Management Unit #9 - 2001 Stream Morphology Data

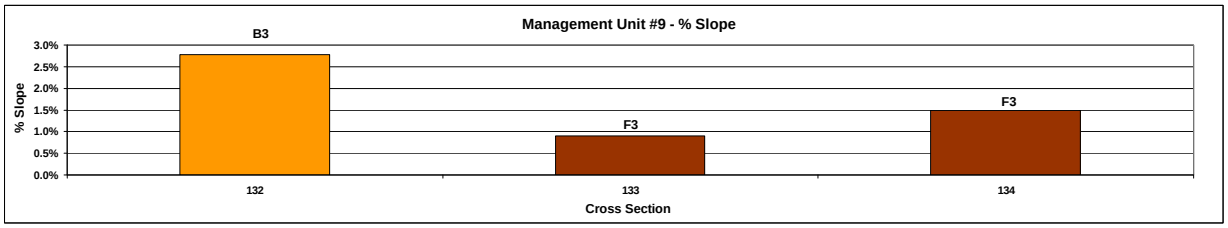


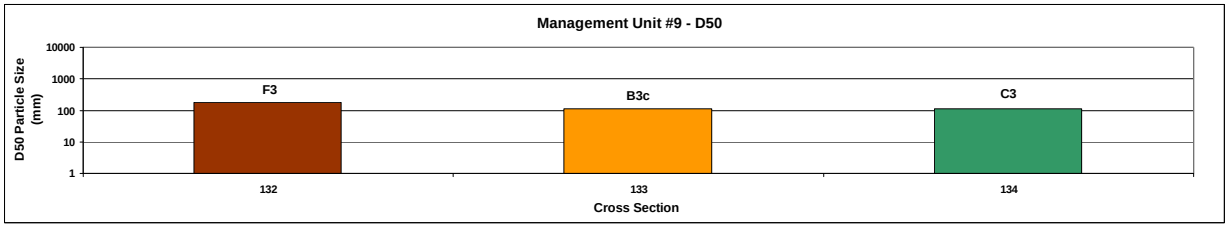


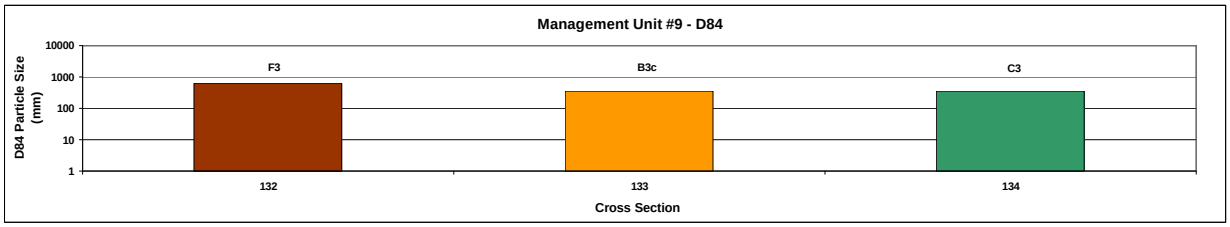




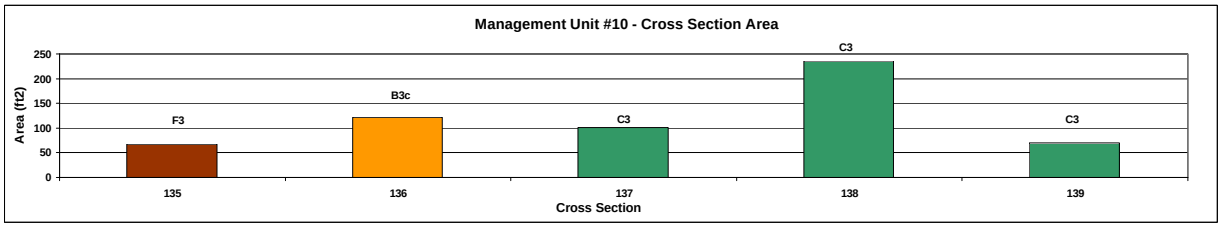


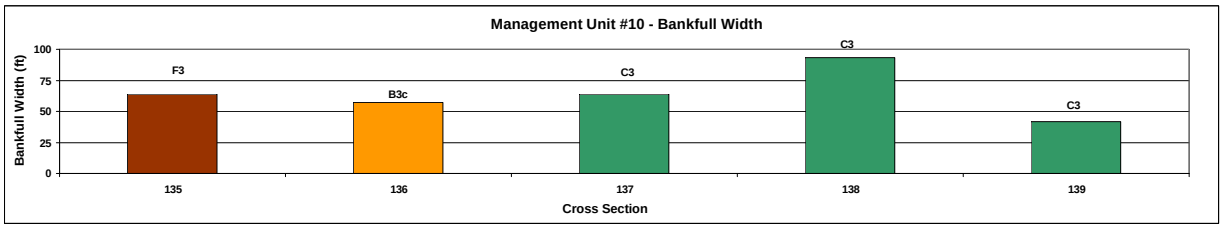


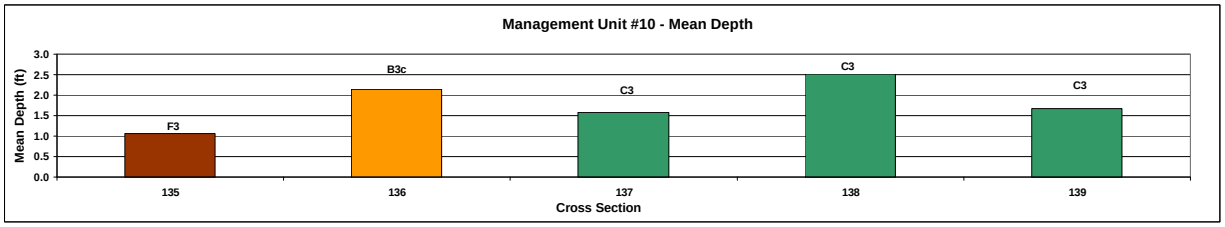


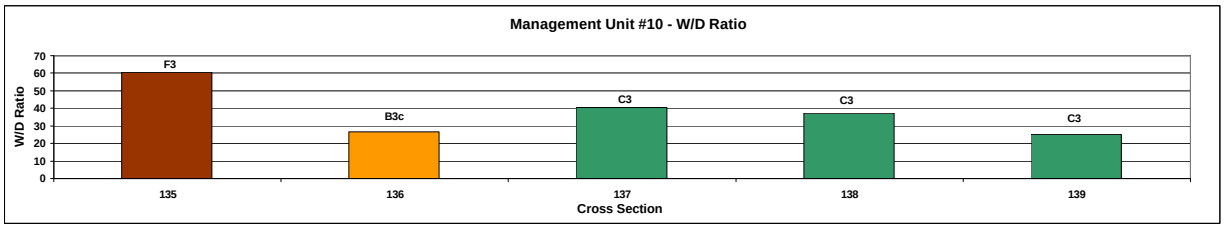


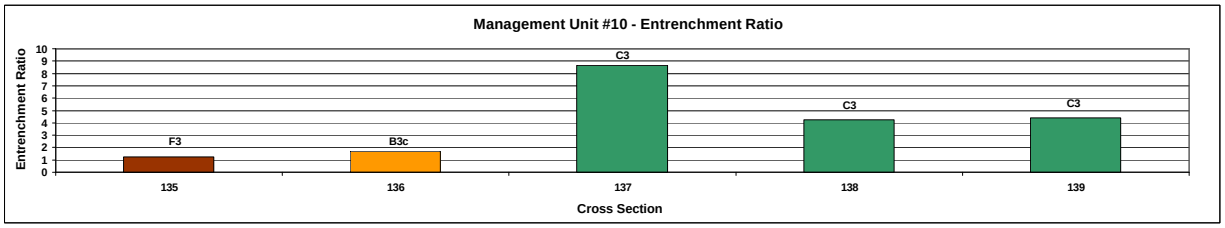
Stony Clove Creek Management Unit #10 - 2001 Stream Morphology Data

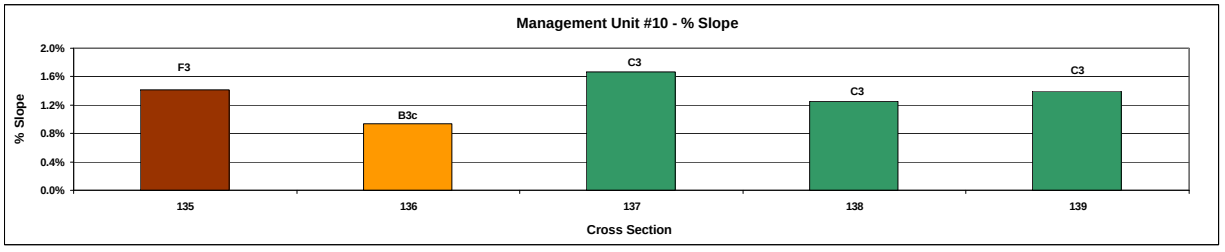


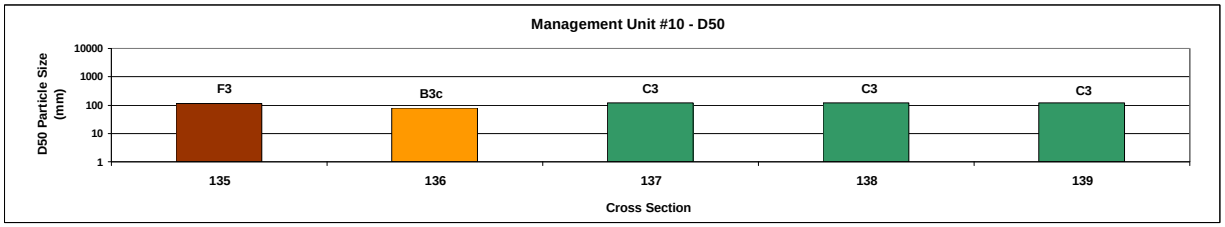


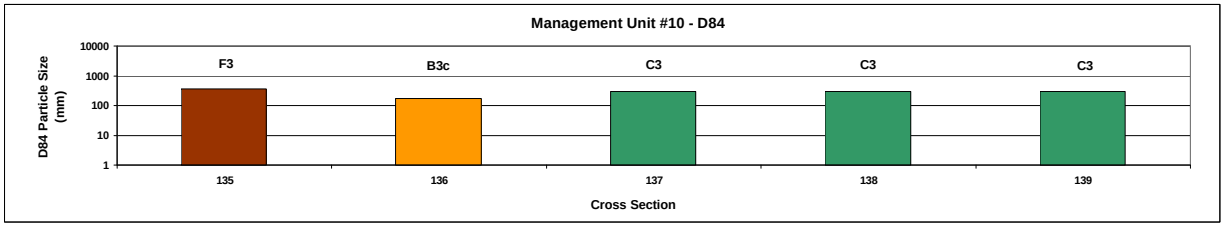




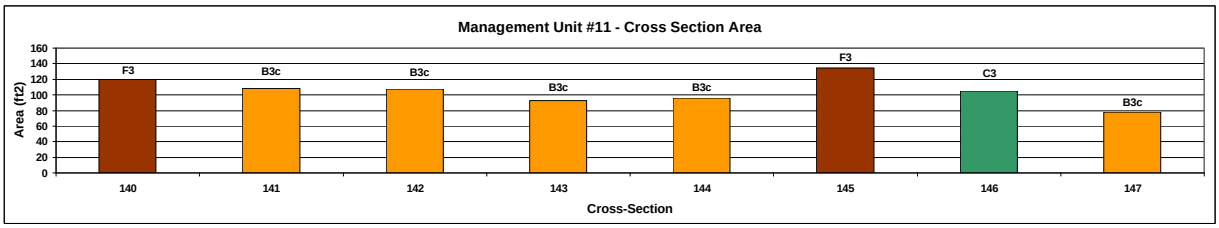


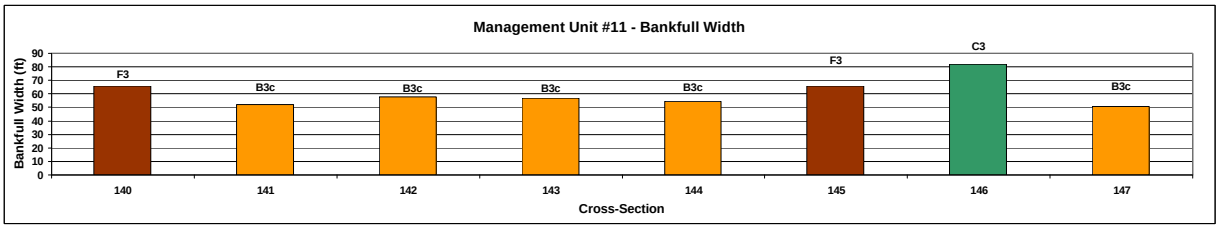


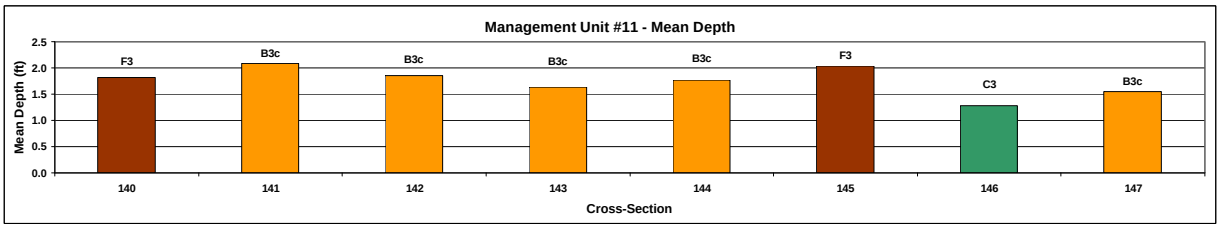


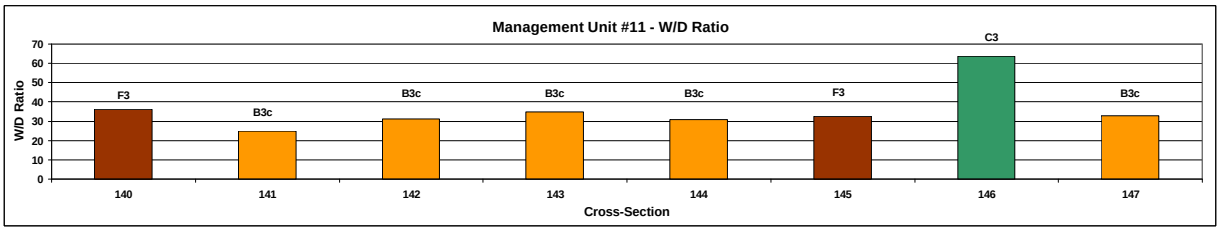


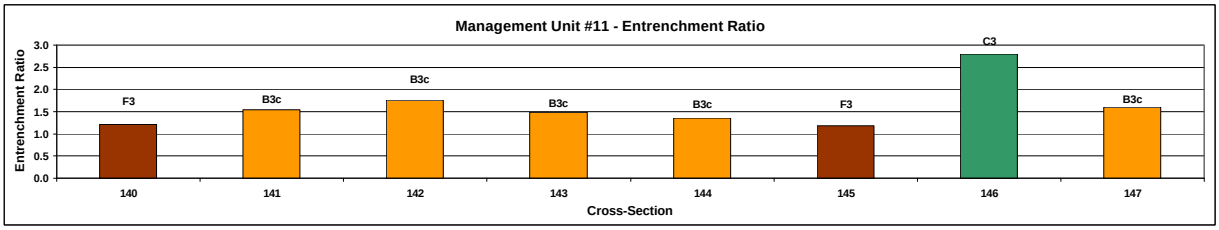
Stony Clove Creek Management Unit #11 - 2001 Stream Morphology Data

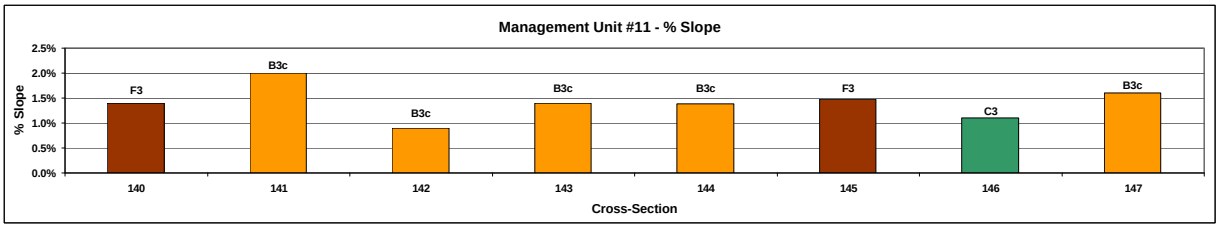


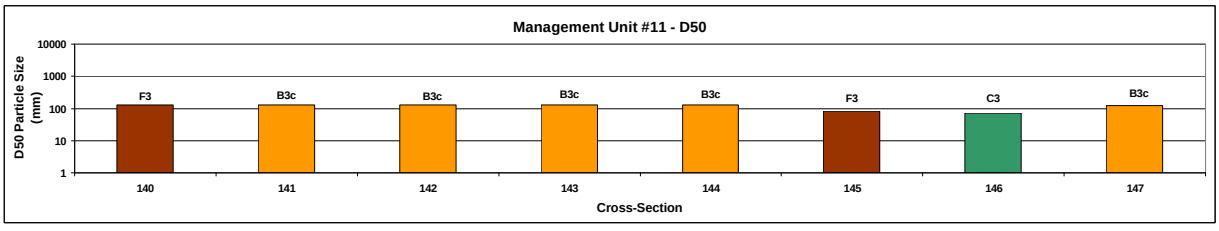


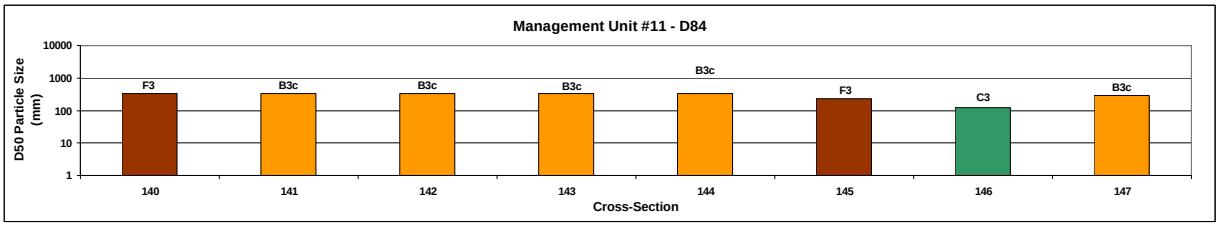




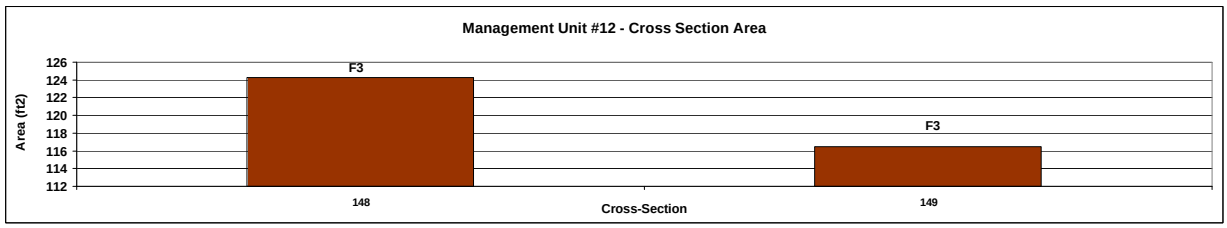


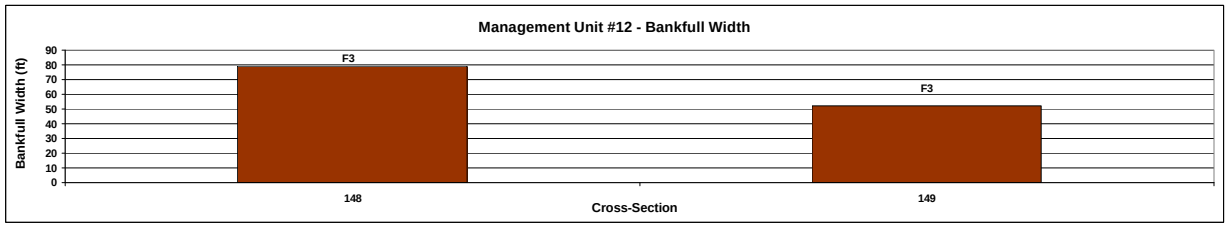


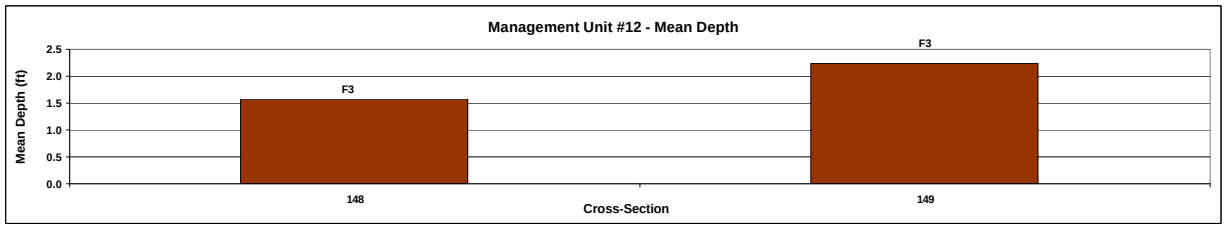


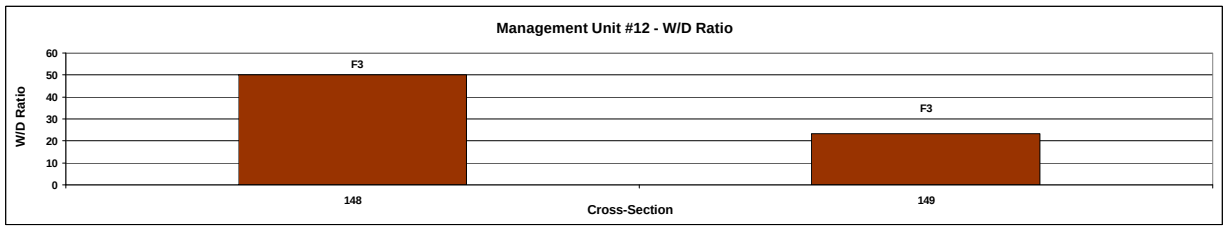


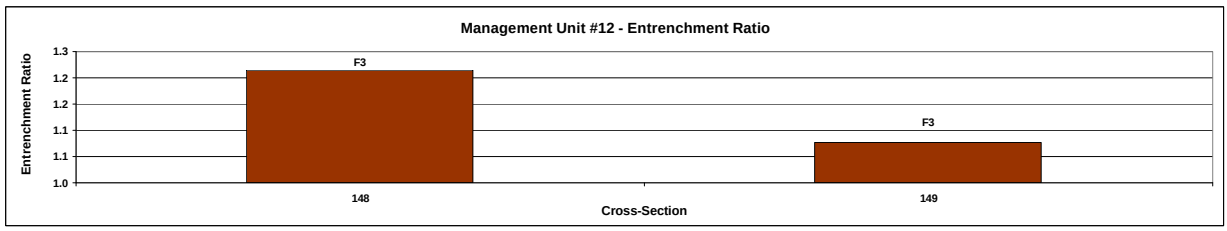
Stony Clove Creek Management Unit #12 - 2001 Stream Morphology Data

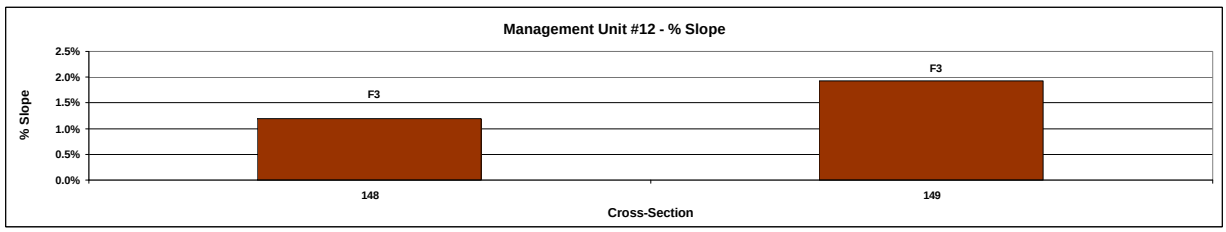


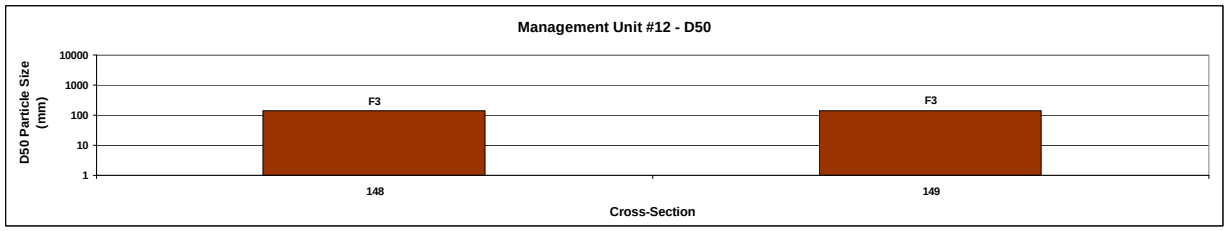


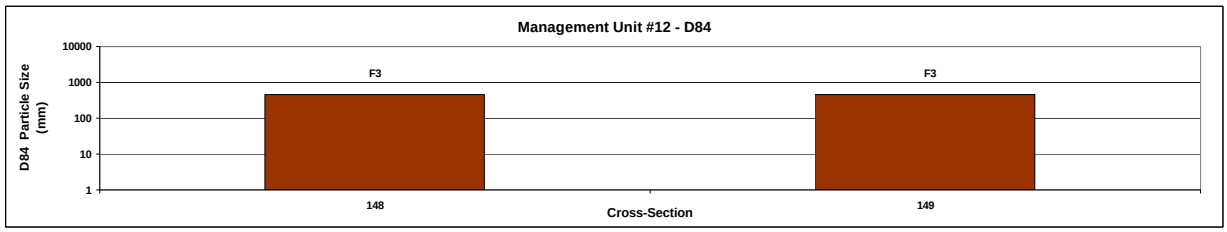




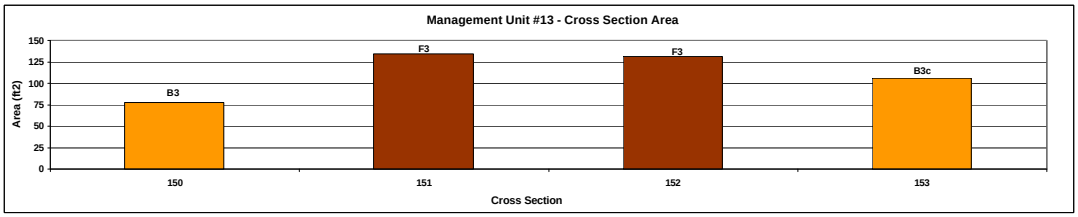


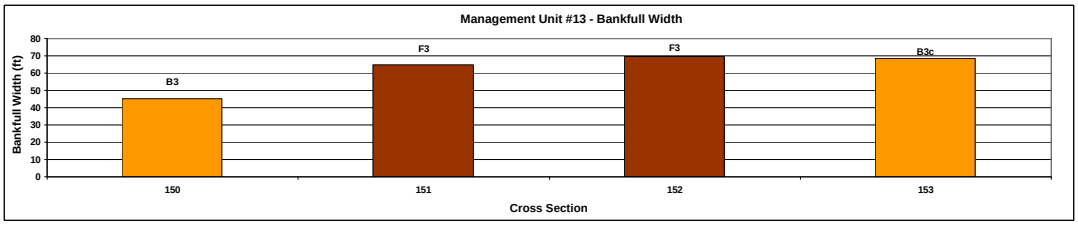


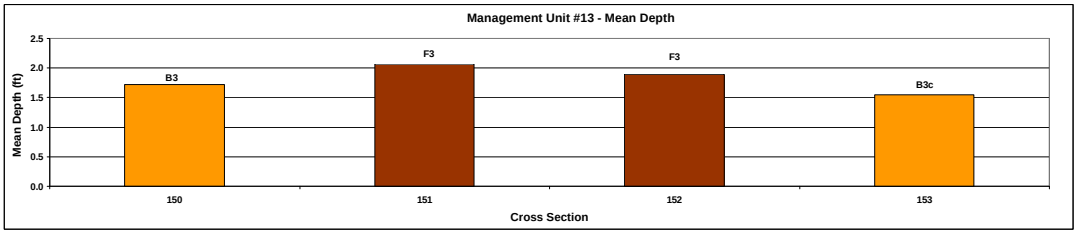


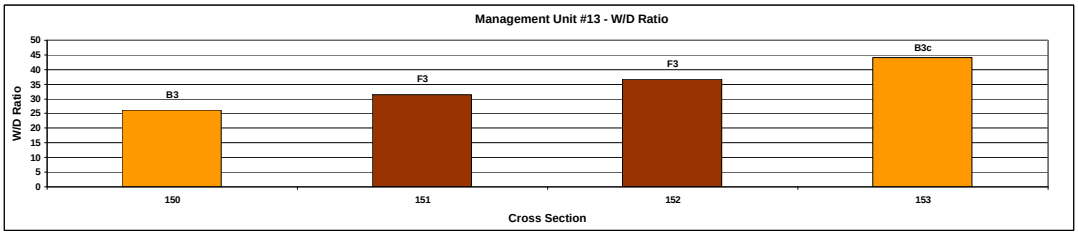


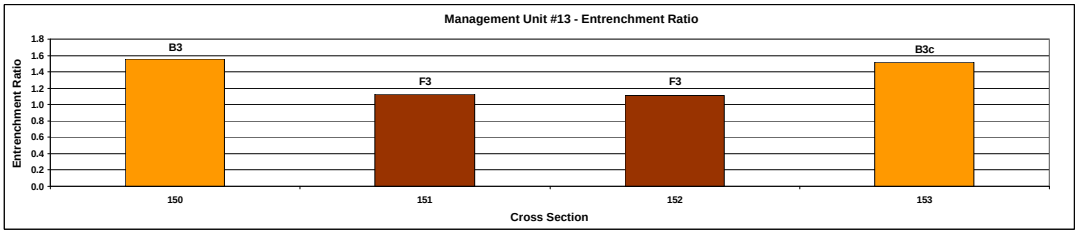
Stony Clove Creek Management Unit #13 - 2001 Stream Morphology Data

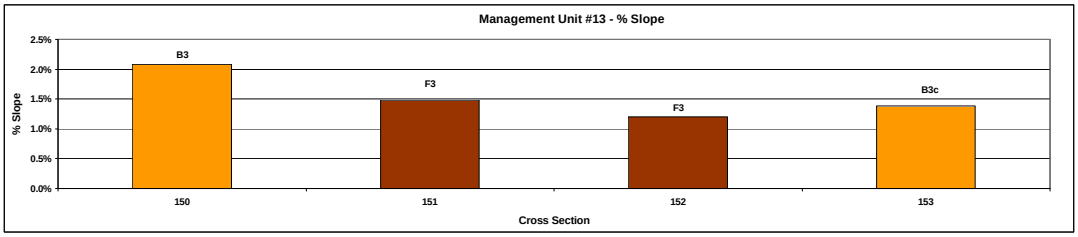


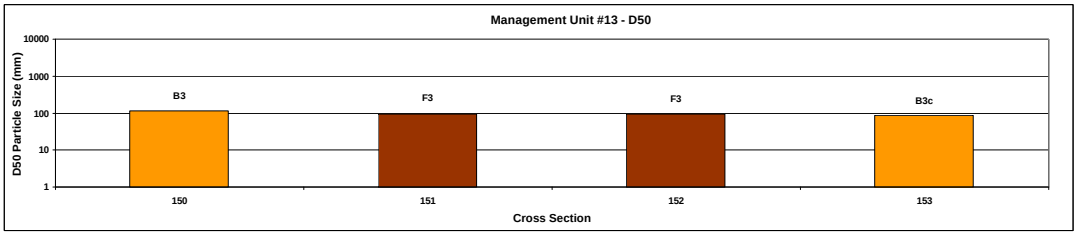


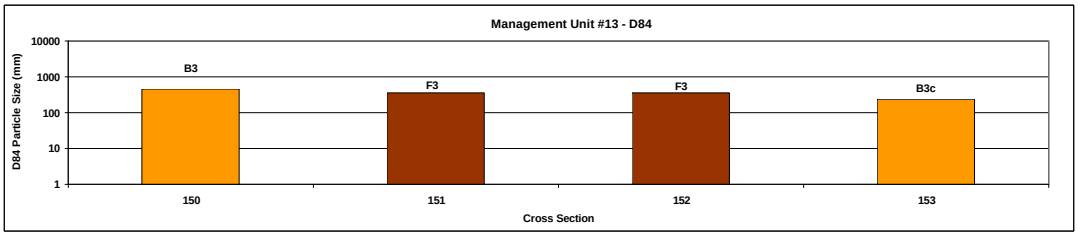




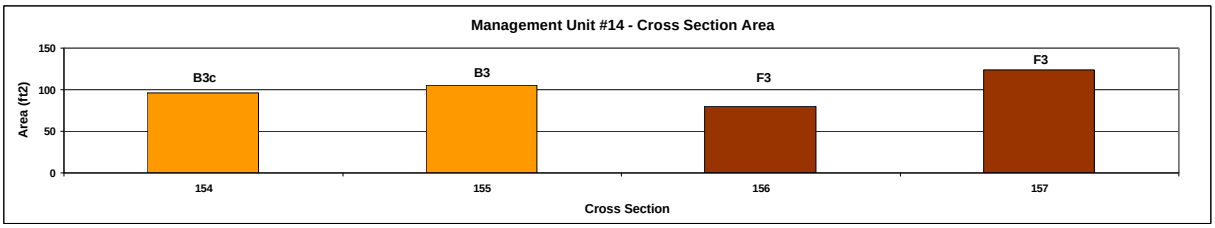


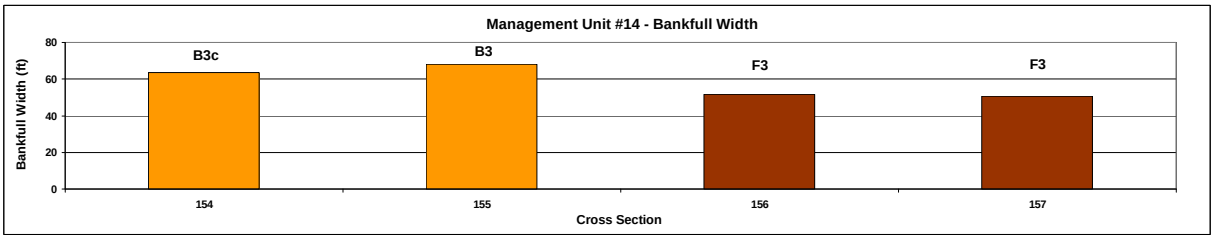


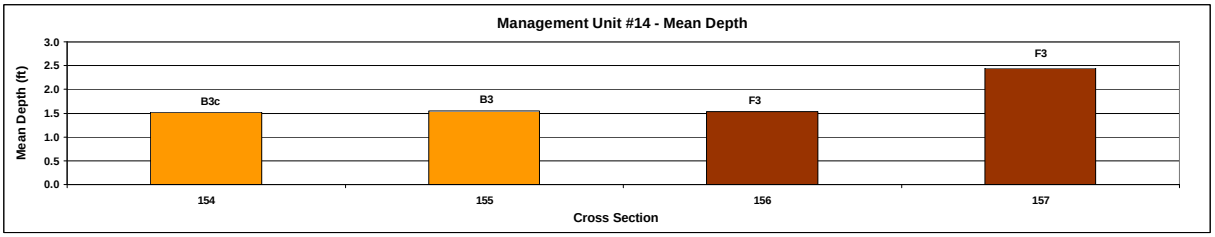


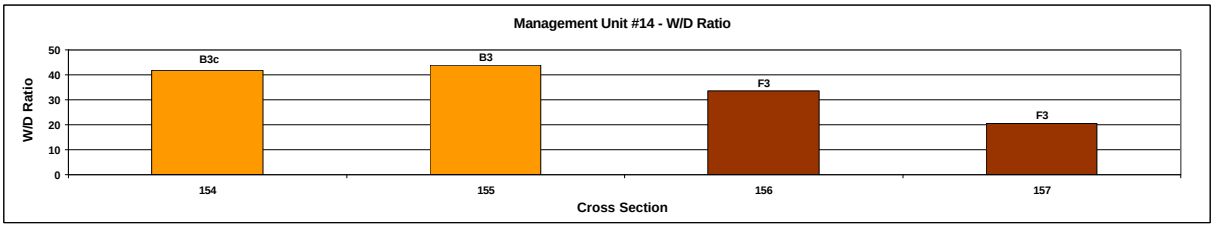


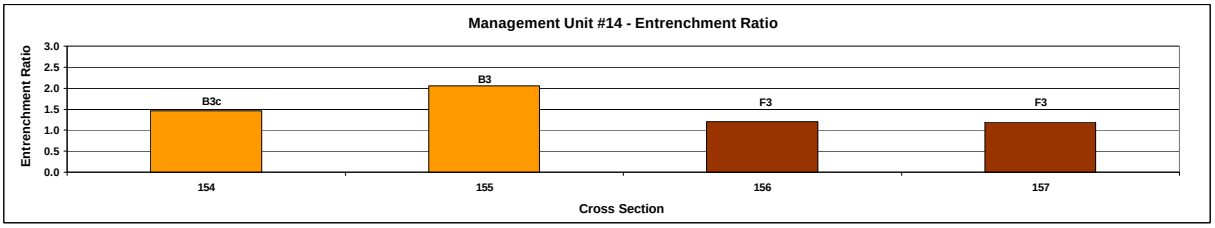
Stony Clove Creek Management Unit #14 - 2001 Stream Morphology Data

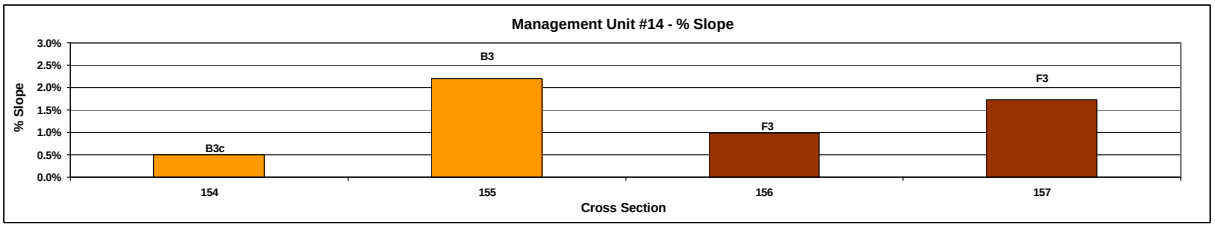


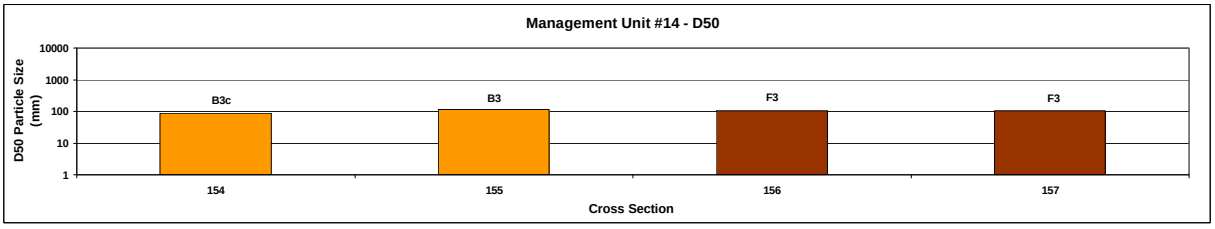


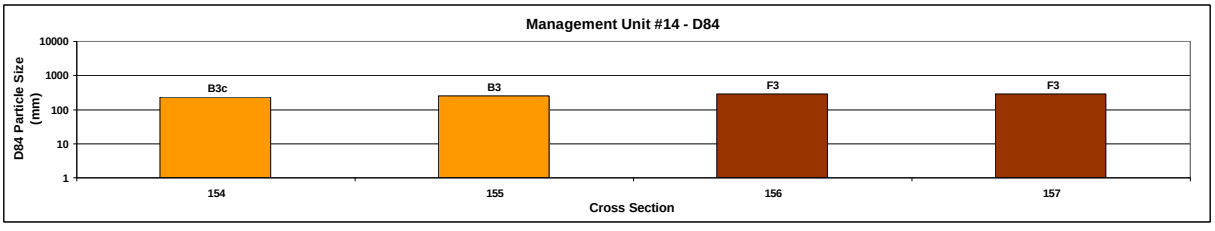




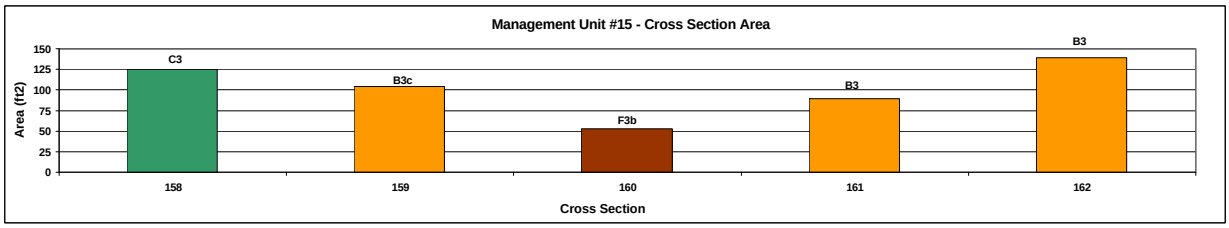


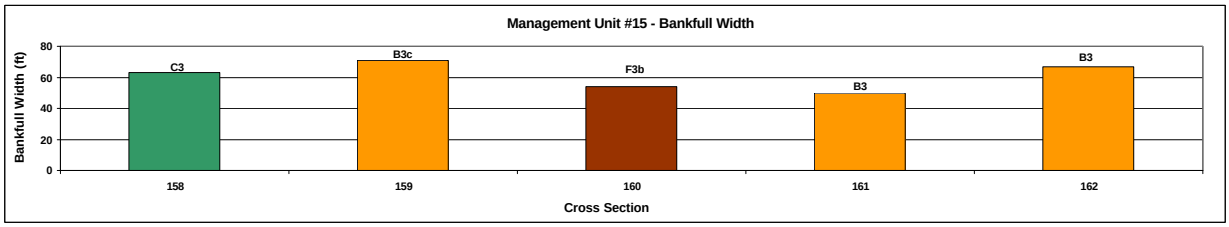


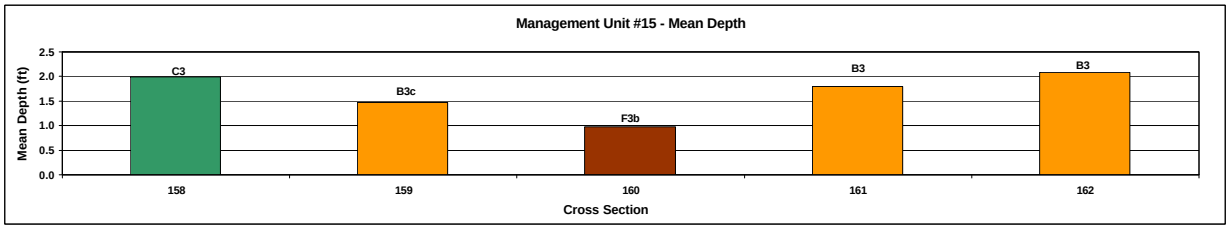


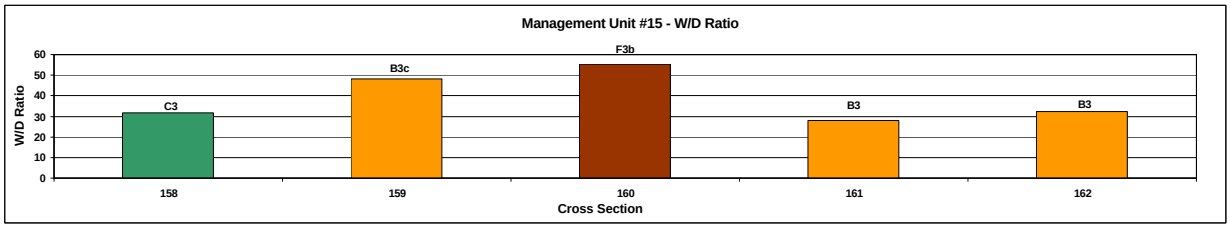


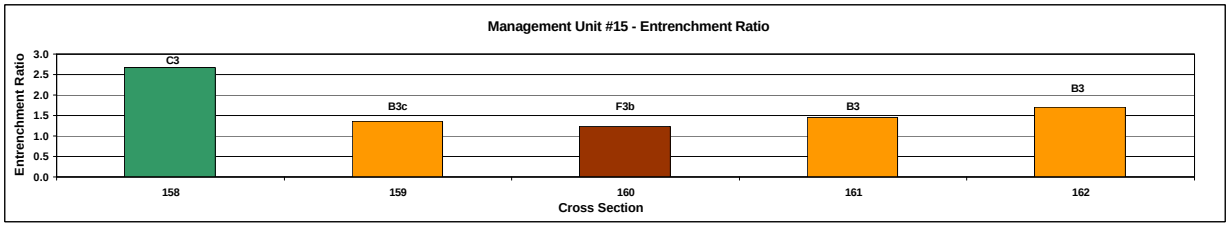
Stony Clove Creek Management Unit #15 - 2001 Stream Morphology Data

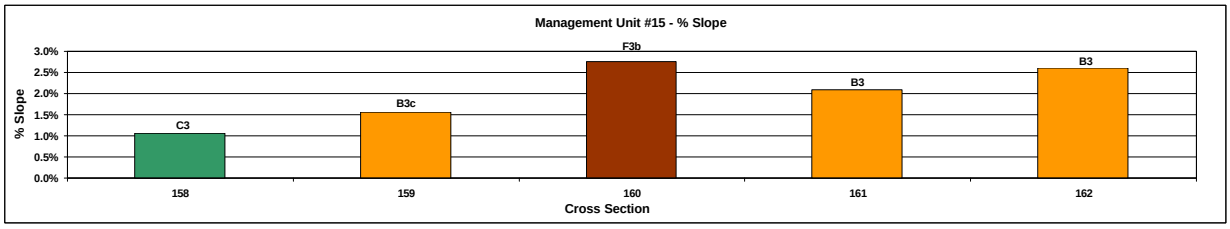


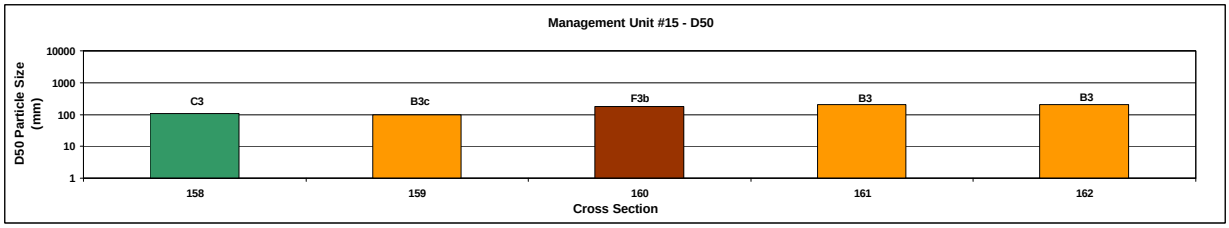


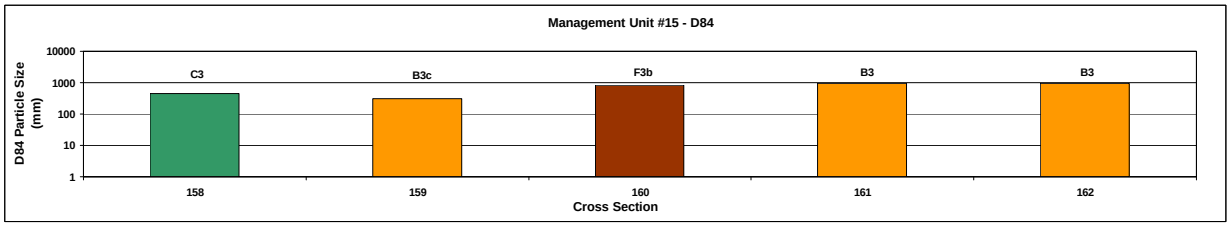




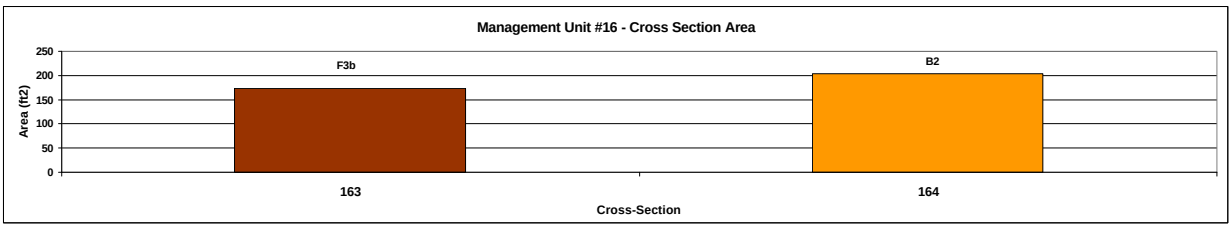


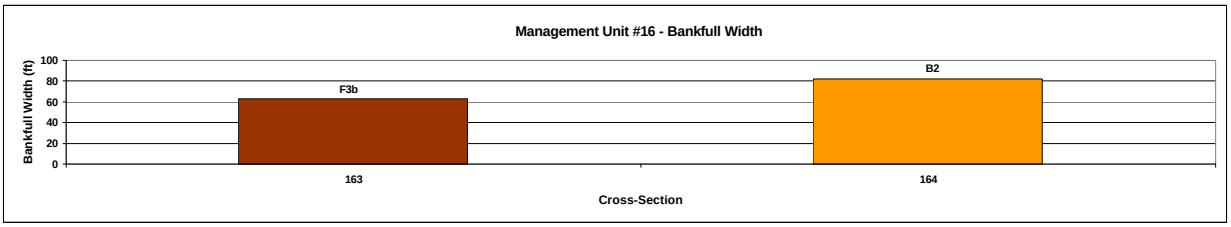


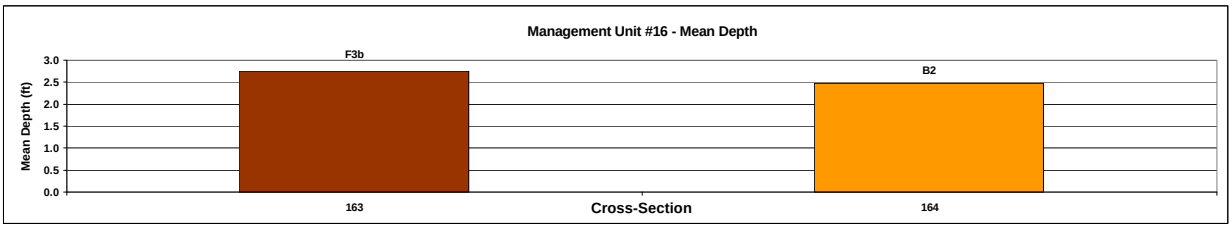


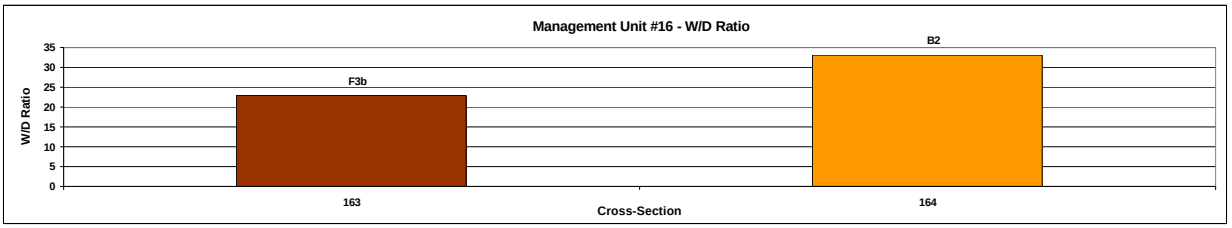


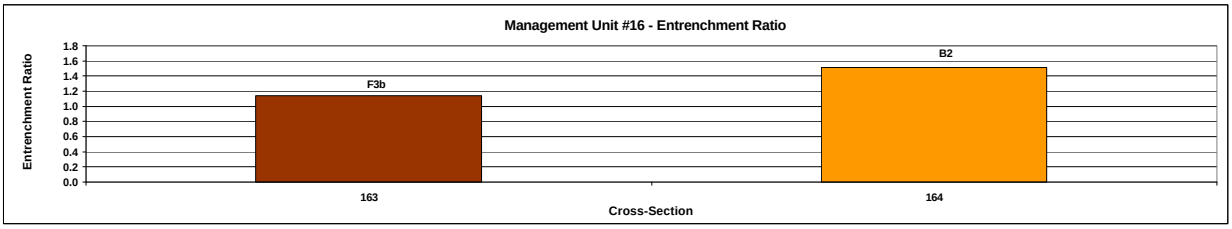
Stony Clove Creek Management Unit #16 - 2001 Stream Morphology Data

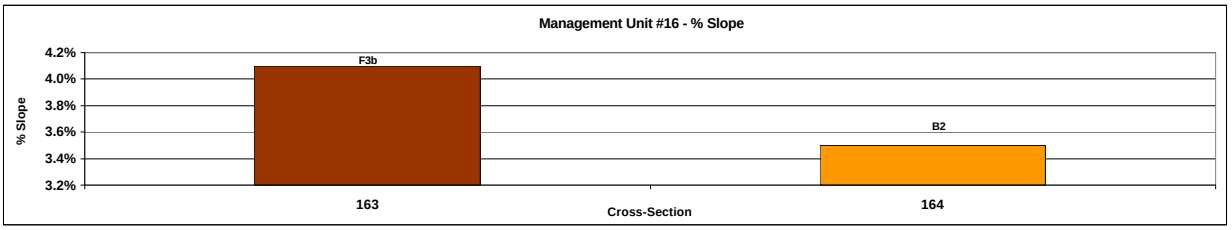


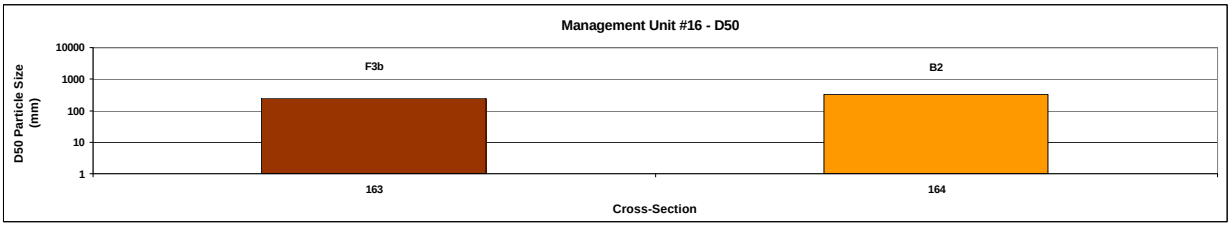


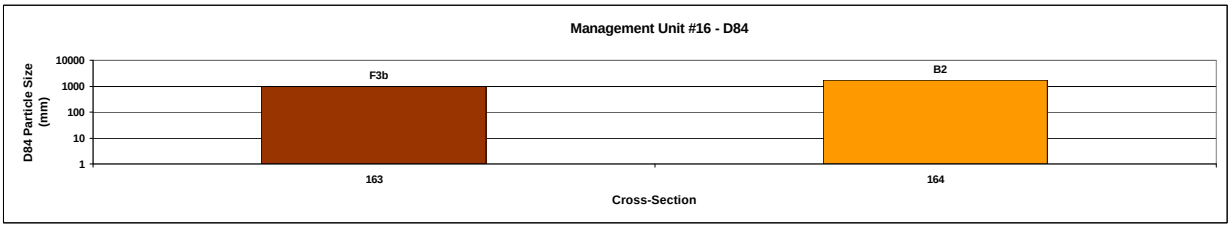




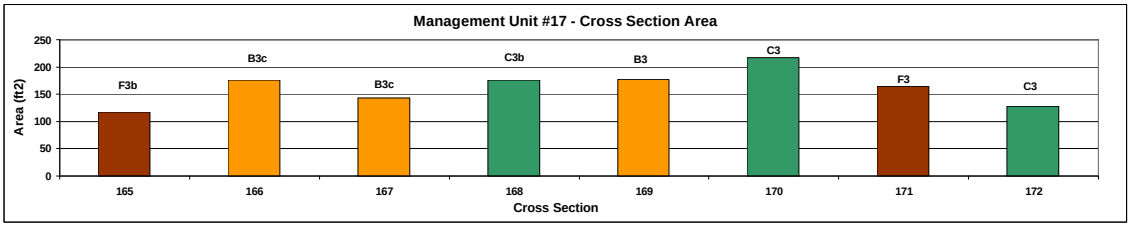


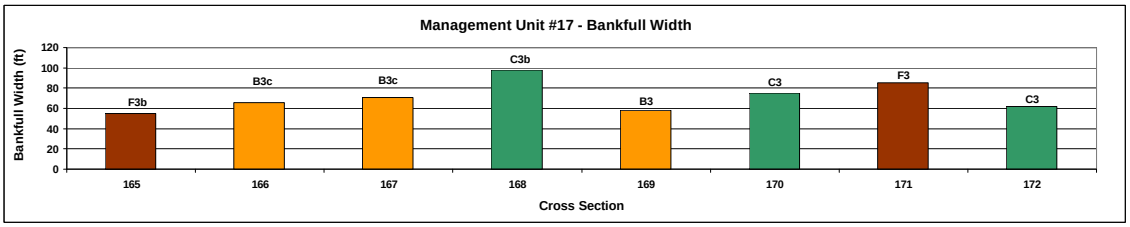


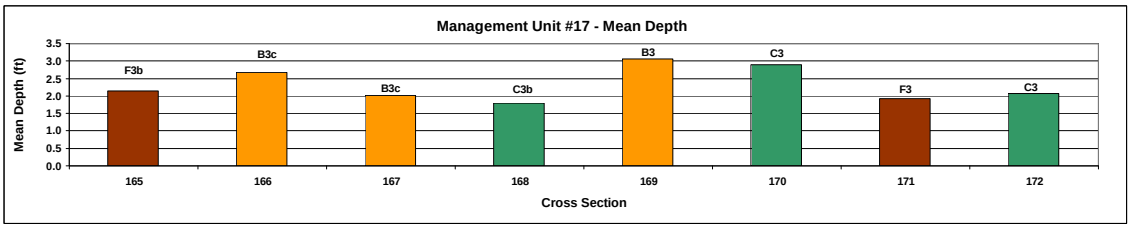


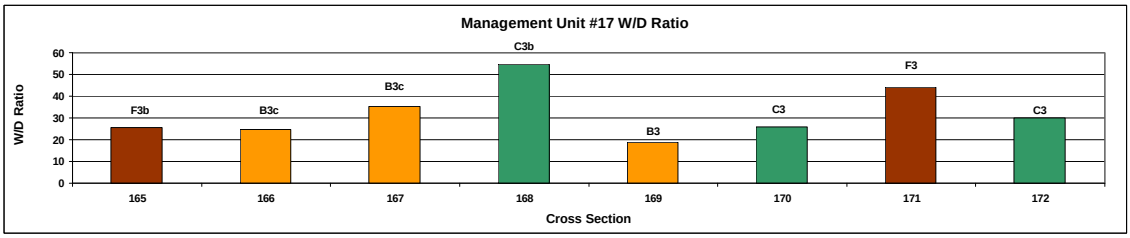


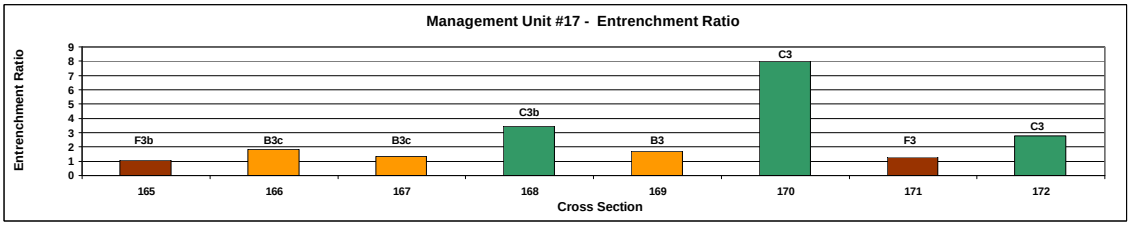
Stony Clove Creek Management Unit #17 - 2001 Stream Morphology Data

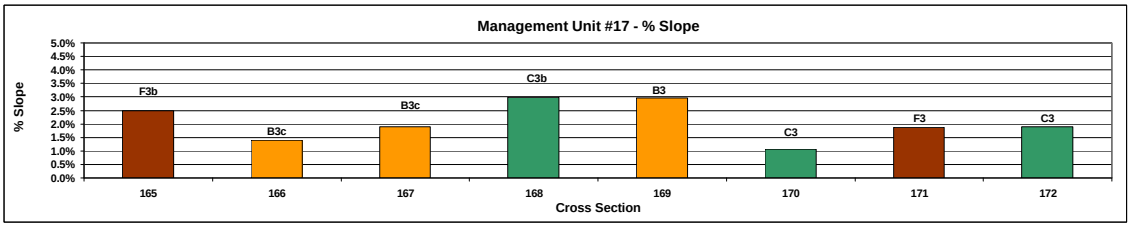


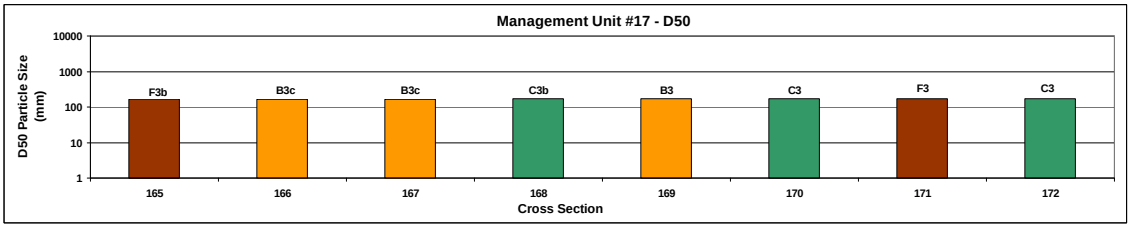


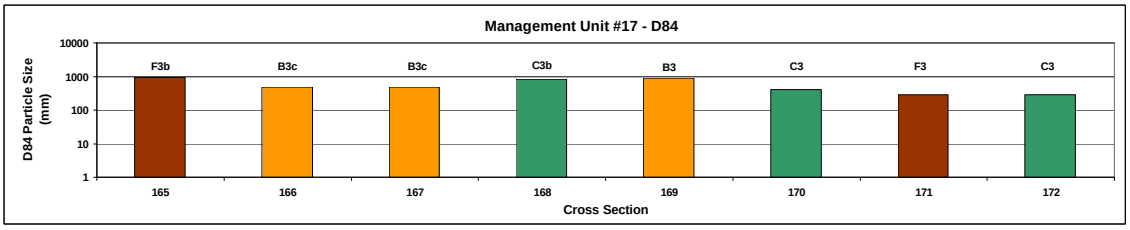




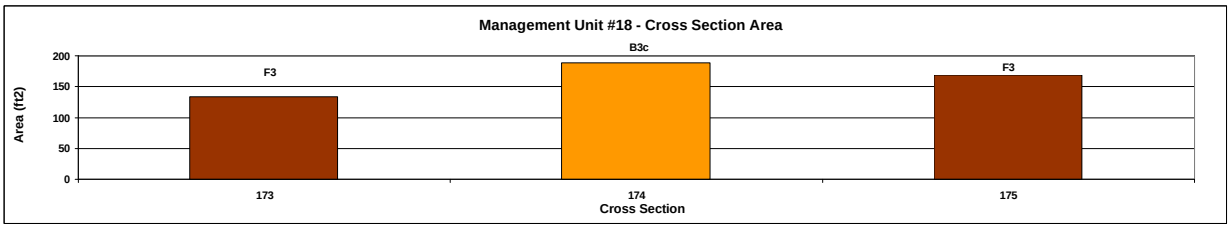


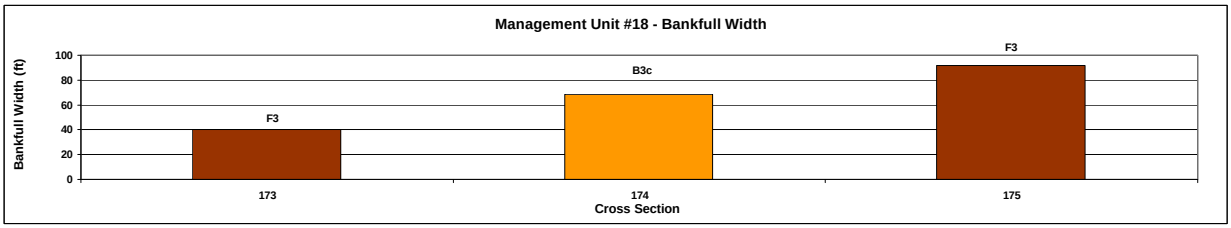


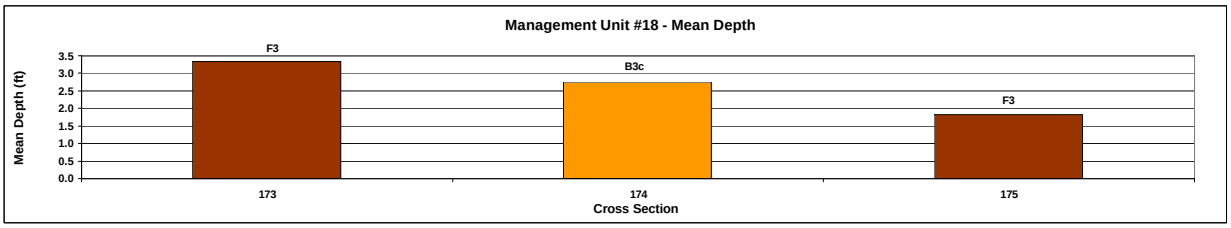


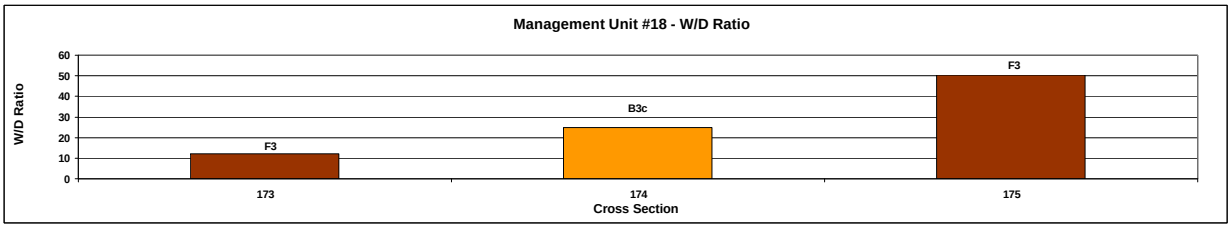


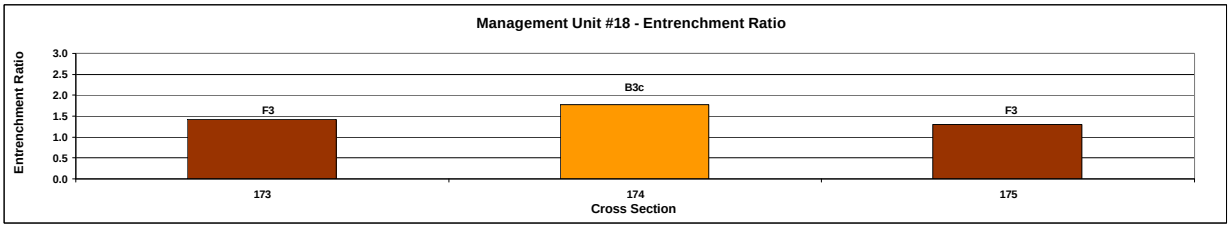
Stony Clove Creek Management Unit #18 - 2001 Stream Morphology Data

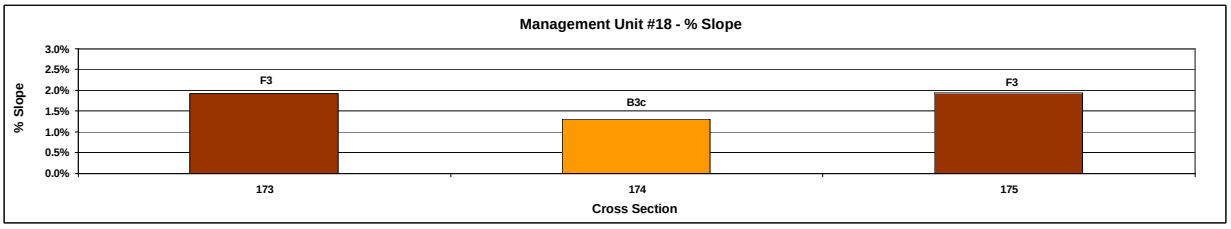


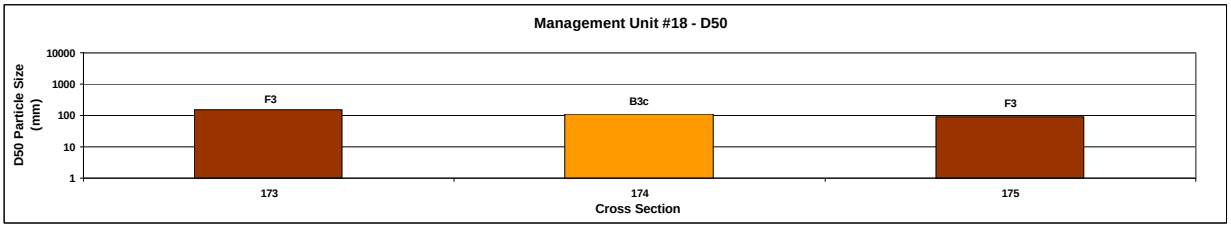


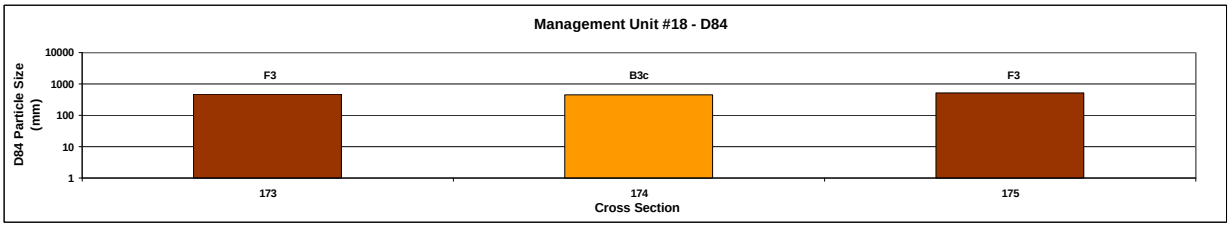




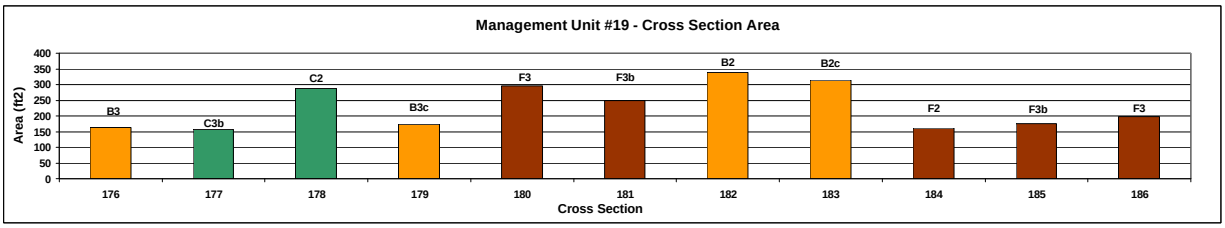


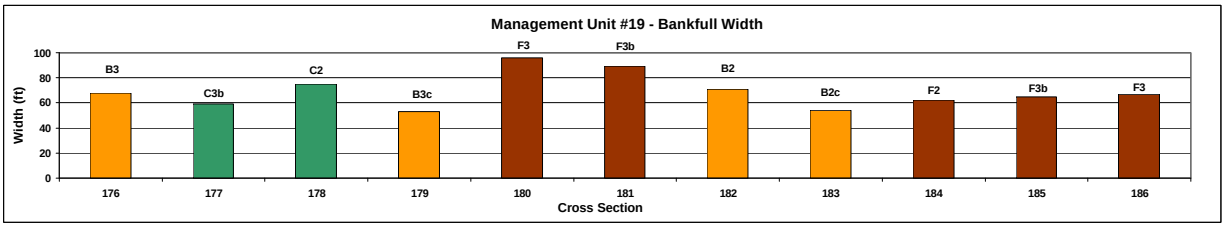


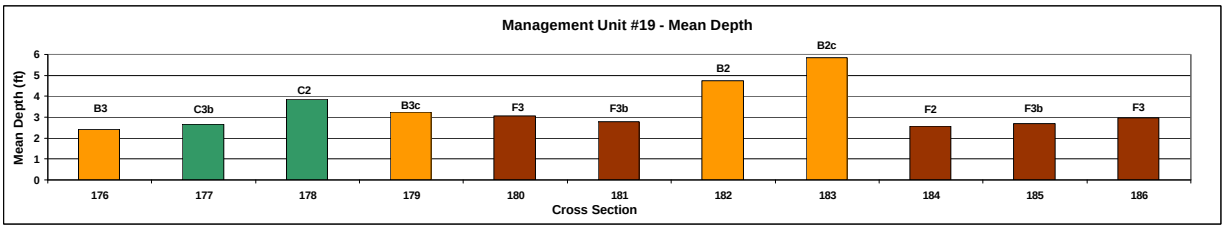


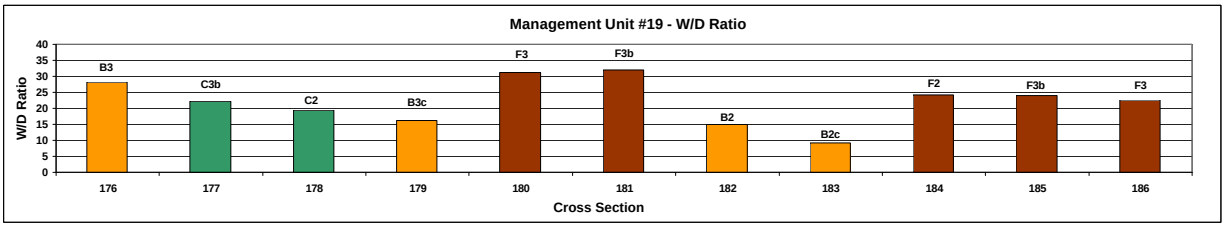


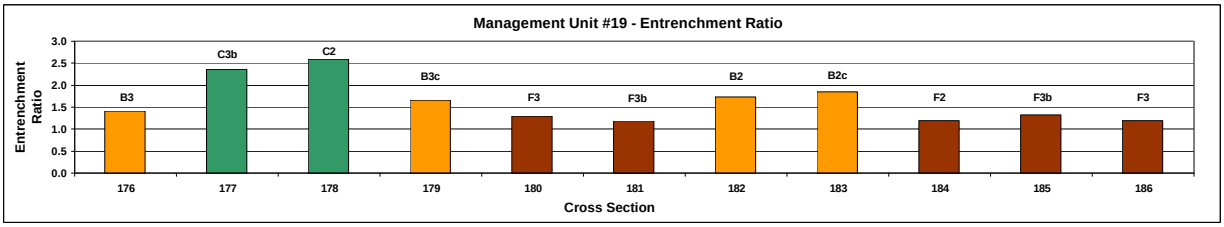
Stony Clove Creek Management Unit #19 - 2001 Stream Morphology Data

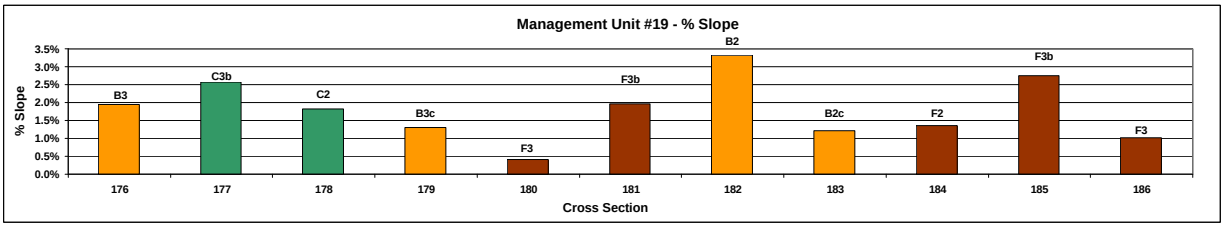


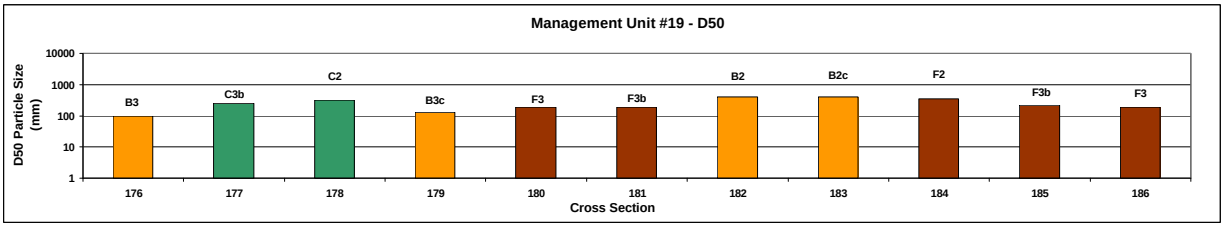


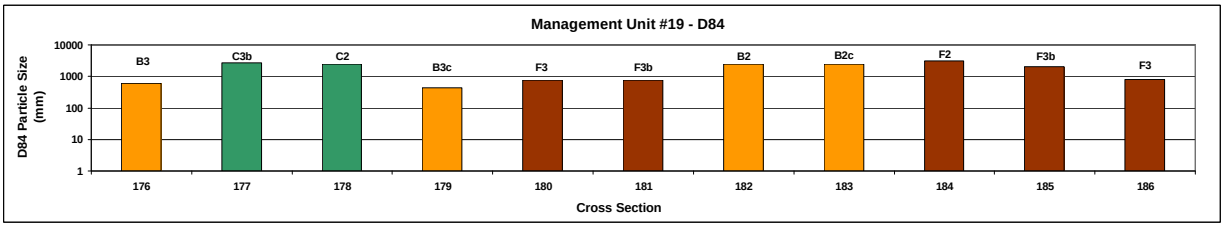




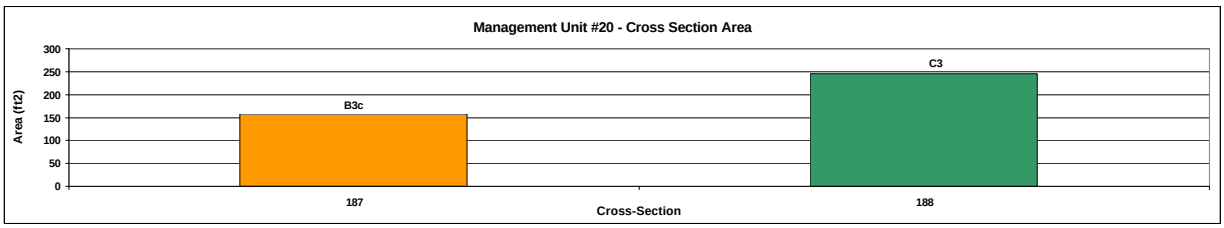


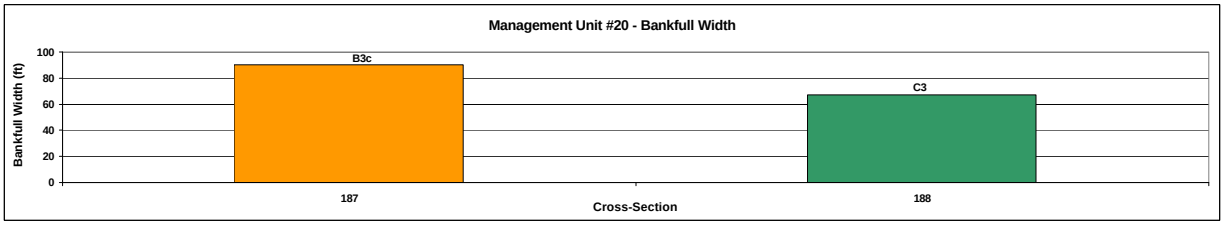


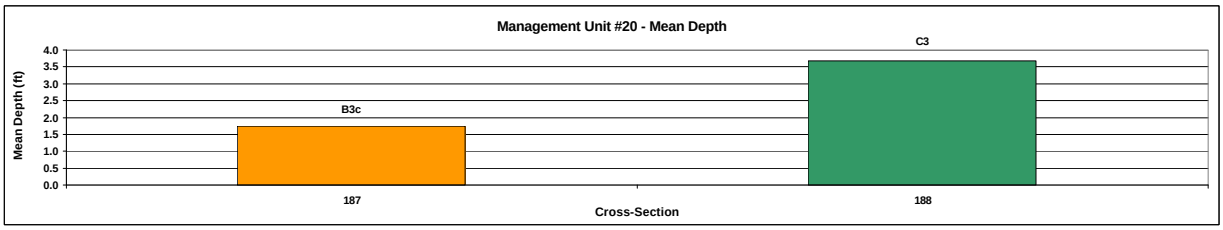


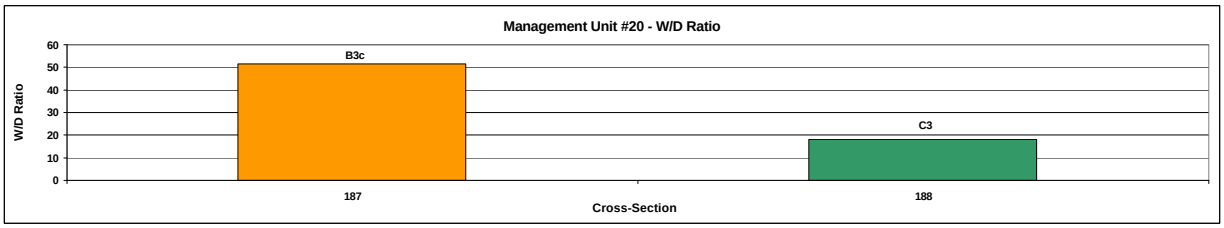


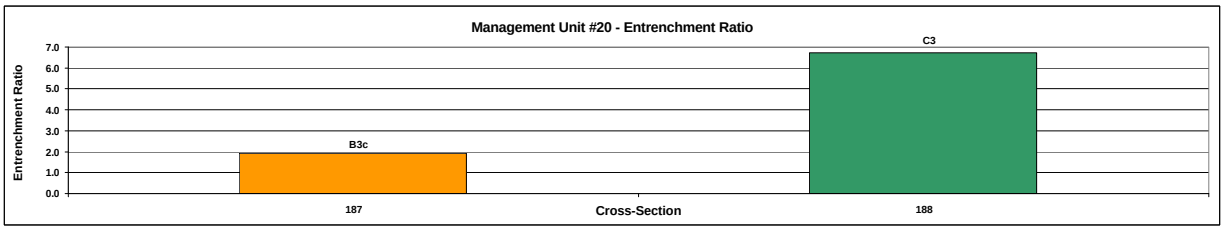
Stony Clove Creek Management Unit #20 - 2001 Stream Morphology Data

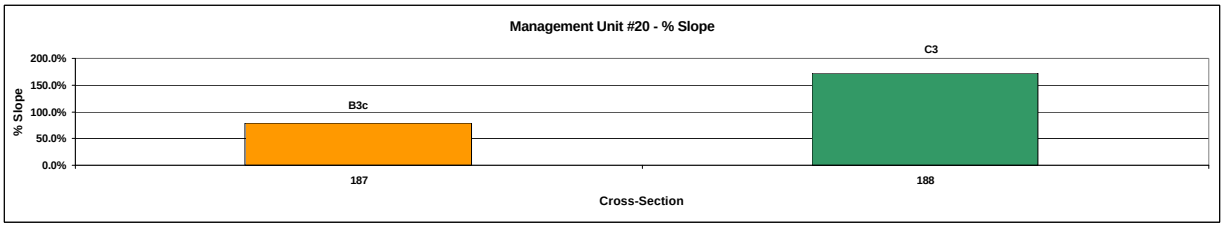


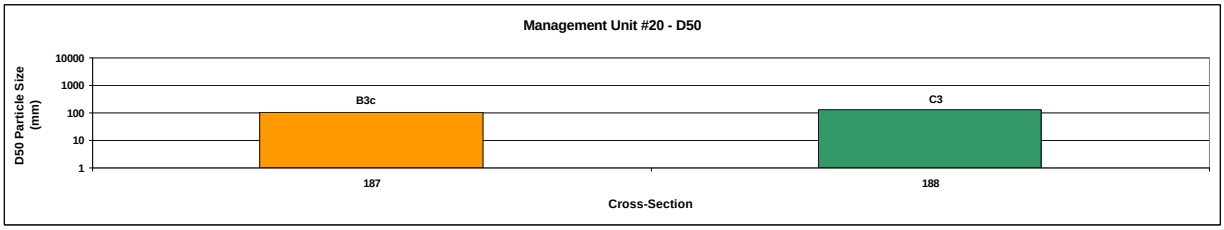


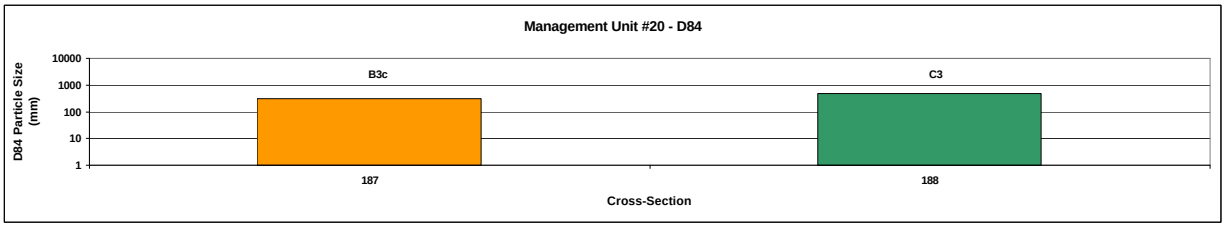




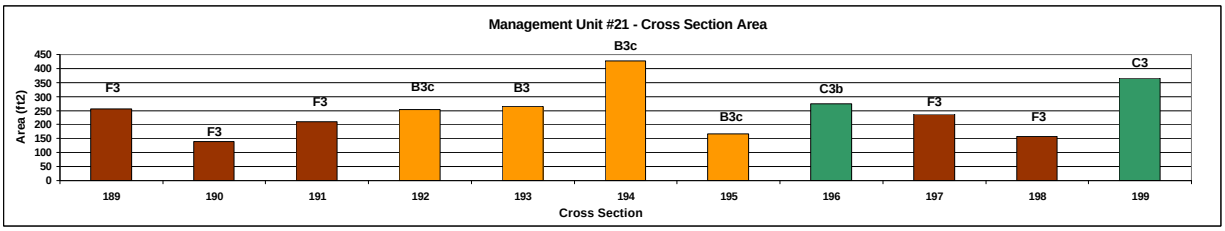


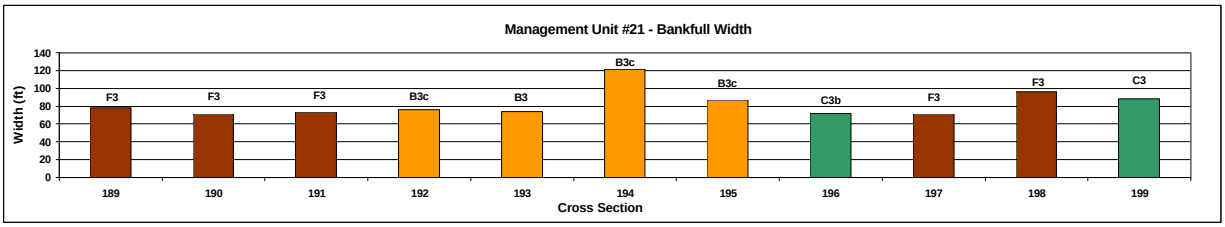


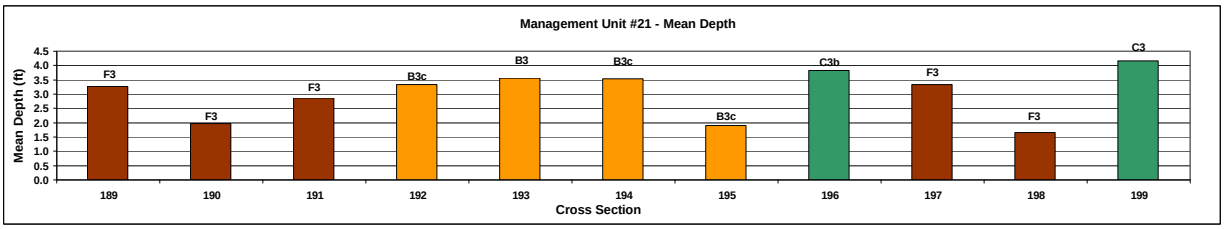


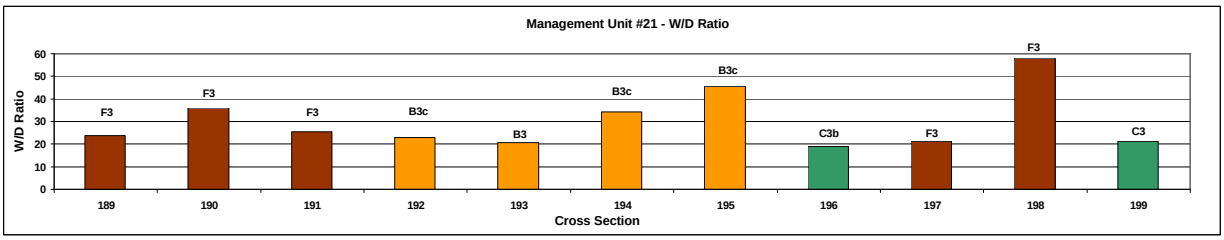


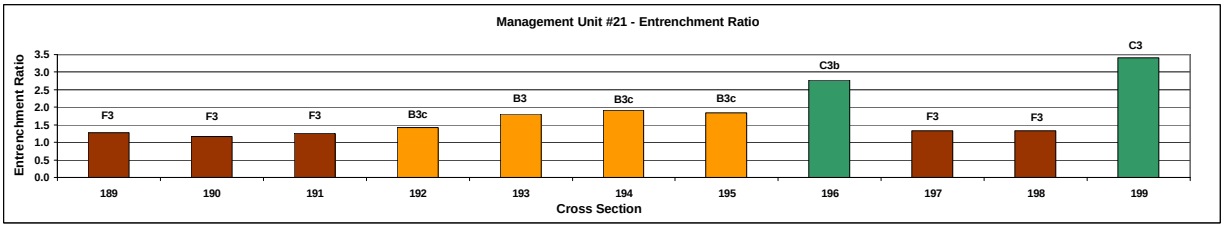
Stony Clove Creek Management Unit #21 - 2001 Stream Morphology Data

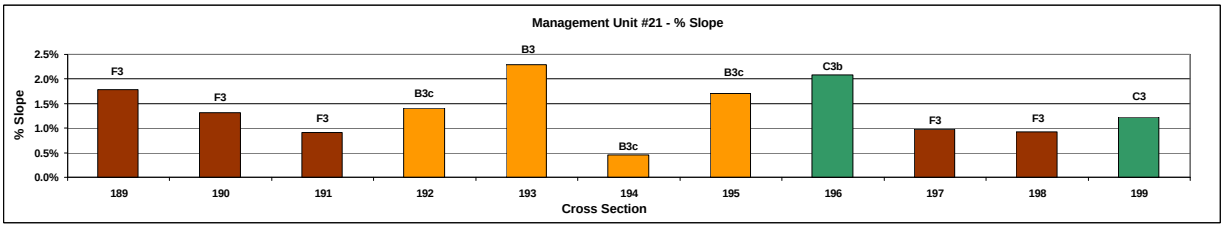


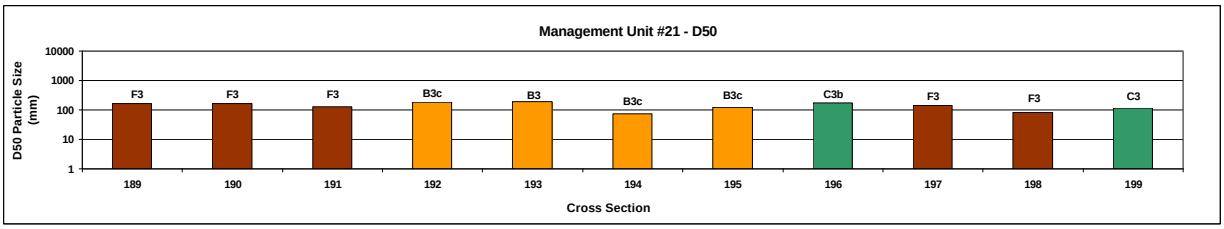


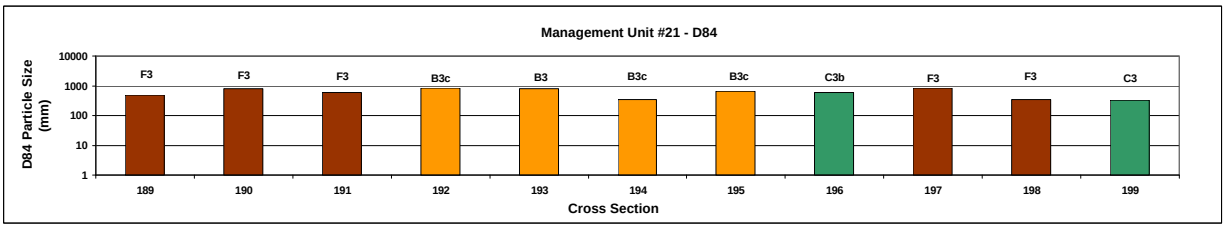












Stony Clove Creek - Bank Erosion Monitoring Site Prioritization

During the 2001 stream feature inventory, twenty-seven eroding banks along the Stony Clove Creek mainstem were identified for monitoring (see map Appendix D 37). Stream banks chosen showed visual evidence of recent significant erosion. A prioritization process was developed by Stony Clove Creek project staff to prioritize these erosion sites for restoration. This prioritization process uses six criteria; bank erosion hazard index, near bank shear stress rating, entrainment, erosion area, infrastructure threat, and water quality threat.

Bank Erodibility Hazard Index

Bank Erodibility Hazard Index (BEHI), developed by Dave Rosgen, is a means of measuring the potential for significant bank erosion at specific locations (Rosgen, 1996). This tool was used to evaluate and predict the potential for bank erosion at the twenty-seven bank erosion monitoring sites.

The BEHI method evaluates bank erosion potential by measuring five criteria; bank height versus the *bankfull stage*, ratio of riparian vegetation rooting depth to stream bank height, bank angle, percentage of root density, composition of stream bank materials, soil stratification and bank surface protection afforded by debris and vegetation. As the ratio of bank height to bankfull depth increases, the potential for bank erosion increases. Steep bank angle, low root density, high soil stratification and homogeneous particle distribution contribute to a higher potential for bank erosion. Values of these five criteria are calculated and each assigned an according index number, which are totaled to determine bank erosion potential. A 'very high' BEHI rating increased the erosion site prioritization rating by two points and a 'high' rating received one point. (See Section 3.3 Watershed Assessment and Inventory for completed BEHI sheet for BEMS #24)

BANK EROSION HAZARD INDEX

SITE: Stony Clove BEHI# DATE:

DATA COLLECTED BY: LOCATION:

Notes:

CRITERIA		VERY LOW		LOW		MODERATE		HIGH		VERY HIGH		EXTREME	
		VALUE	INDEX	VALUE	INDEX	VALUE	INDEX	VALUE	INDEX	VALUE	INDEX	VALUE	INDEX
BANK HT/ BKF HT		1.0 - 1.1	1.0 - 1.9	1.1 - 1.19	2.0 - 3.9	1.2 - 1.5	4.0 - 5.9	1.6 - 2.0	6.0 - 7.9	2.1 - 2.8	8.0 - 9.0	> 2.8	10
ROOT DEPTH / BANK HEIGHT		1.0 - 0.9	1.0 - 1.9	0.89 - 0.50	2.0 - 3.9	0.49 - 0.30	4.0 - 5.9	0.29 - 0.15	6.0 - 7.9	0.14 - 0.05	8.0 - 9.0	< 0.05	10
ROOT DENSITY (%)		100 - 80	1.0 - 1.9	79 - 55	2.0 - 3.9	54 - 30	4.0 - 5.9	29 - 15	6.0 - 7.9	14 - 5	8.0 - 9.0	< 5	10
BANK ANGLE (DEGREES)		0 - 20	1.0 - 1.9	21 - 60	2.0 - 3.9	61 - 80	4.0 - 5.9	81 - 90	6.0 - 7.9	91 - 119	8.0 - 9.0	> 119	10
SURFACE PROTECTION (%)		100 - 80	1.0 - 1.9	79 - 55	2.0 - 3.9	54 - 30	4.0 - 5.9	29 - 15	6.0 - 7.9	15 - 10	8.0 - 9.0	< 10	10
TOTALS													
NUMERICAL ADJUSTMENTS	None												
TOTAL ADJUSTED SCORE													**0.0**

BANK MATERIALS:
BEDROCK: BANK EROSION POTENTIAL ALWAYS VERY LOW
BOULDERS: BANK EROSION POTENTIAL ALWAYS LOW
COBBLE: DECREASE BY ONE CATEGORY UNLESS MIXTURE OF GRAVEL/SAND IS OVER 50%
GRAVEL: ADJUST VALUES UP BY 5 - 10 POINTS DEPENDING ON COMPOSITION OF SAND
SAND: ADJUST VALUES UP BY 10 POINTS
SILT/CLAY: NO ADJUSTMENT

STRATIFICATION: 5 - 10 POINTS (UPWARD) DEPENDING ON POSITION OF UNSTABLE LAYERS IN RELATION TO BANKFULL STAGE

BANK EROSION POTENTIAL	
Very Low	5-9.25
Low	10-19.5
Moderate	20-29.5
High	30-39.5
Very High	40-45
Extreme	46-50

Sample BEHI data collection sheet from Rosgen, Dave "Applied River Morphology." Wildland Hydrology Books, Pagosa Springs, Colorado, Table 6-8, pg. 6-41, 1996 revised 2001

Near Bank Stress Rating

This rating is based on near bank shear stress ratio, which determines the force exerted by a bankfull flow on stream bed or banks. Stream bank erosion is related to the distribution of streamflows in the near-bank region, which is defined as the one-third portion of the channel cross section nearest to the stream bank being evaluated.

Near bank Shear Stress Ratio = Near bank shear stress/Mean shear stress
Where shear stress = (mean depth) (slope) (specific weight of water)

Near Bank Shear Stress Rating	Near Bank Shear Stress Ratio
Very Low	Less than 0.8
Low	0.8 - 1.05
Moderate	1.06 - 1.14
High	1.15 - 1.19
Very High	1.20 - 1.60
Extreme	greater than 1.60

Table from Rosgen, Dave "Applied River Morphology." Wildland Hydrology Books, Pagosa Springs, Colorado, Table 6-9, pg. 6-41, 1996 revised 2001.

An 'extreme' near bank stress rating increased the erosion site prioritization rating by two points and a 'very high' near bank stress rating received one point.

Entrainment Stability Rating (Average Boundary Shear Stress)

This rating is based on entrainment ratio, used to determine the force exerted by a bankfull flow on the bed or banks of a stream relative to the force required to move the sediment supplied to the reach. A resulting ratio less than 1 indicates that the shear stress is inadequate to move the supplied material and therefore the reach is likely to be aggradational at bankfull flow. A resulting ratio greater than 1 indicates that the shear stress is adequate to move the supplied material and therefore the reach is likely to be degradational at bankfull flow. A 'poor' entrainment rating increased the erosion site prioritization rating by two points and a 'fair' entrainment rating received one point.

T_o = Shear Stress = (mean depth) (slope) (specific weight of water)
T_c = Critical Shear Stress, calculated using D84 from revised shields relation

Entrainment Ratio	Rating
$T_o/T_c < 1.0$	Excellent
$1.0 <= T_o/T_c < 1.5$	Good
$1.5 <= T_o/T_c < 2.5$	Fair
$T_o/T_c <= 2.5$	Poor

Table from Johnson, Peggy A., Gleason, Gary L., and Hey, Richard D. (1999) "Rapid Assessment of Channel Stability in Vicinity of Road Crossing." Journal of Hydraulic Engineering, Vol. 125, No. 6, June, 1999.

Erosion Area

The lengths of the bank erosion sites were measured from field collected data using a Global Positioning System (GPS) unit. The bank height was measured from cross-section survey data. Erosion sites with areas greater than one standard deviation from the mean area increased its prioritization rating by two points and areas greater than one-half standard deviation received one point.

Infrastructure Threat

Threats to infrastructure, including roads, houses, or driveways, from erosion were identified at each bank erosion monitoring site during the BEHI evaluation. An infrastructure threat increased the erosion site prioritization rating by two points.

Water Quality Threat

Clay exposures at bank erosion monitoring sites were documented during the 2001 stream feature inventory. A water quality threat increased the erosion site prioritization rating by two points.

Bank Erosion Monitoring Sites (BEMS) Prioritization

The prioritization table below depicts how the six criteria discussed above are combined to create a low to high BEMS prioritization rating (Appendix D 36). Orange cells indicate ratings that increased the BEMS prioritization rating by two points, yellow cells indicate an increase of one point.

In the future, it may be necessary to further prioritize each BEMS prioritization category. In this case professional judgement will be used to determine restoration sites based on but not limited to; size and scope of restoration project, funding availability, and landowner cooperation.

Stony Clove Creek Bank Erosion Monitoring Site Prioritization

BEMS #	BEHI Score	BEHI Category	NBS/Shear Stress	Near Bank Stress Rating	Entrainment	Entrainment Stability Rating	Erosion Area (ft2)	Infrastructure Threat	Water Quality Threat	BEMS Prioritization Points	BEMS Prioritization Rating
1	27.3	Moderate	0.60	Very Low	0.61	Excellent	701.91	None	None	0	Low Priority
5	34.0	High	0.99	Low	1.12	Good	552.33	None	None	1	Low Priority
10	39.1	Moderate	1.45	Very High	1.07	Good	888.08	None	None	1	Low Priority
4	34.2	Moderate	0.64	Very Low	3.25	Poor	201.25	None	None	2	Low Priority
6	38.5	High	1.36	Very High	1.25	Good	686.88	None	None	2	Low Priority
7	37.2	High	1.07	Moderate	1.67	Fair	2128.50	None	None	2	Low Priority
9	37.9	High	0.75	Very Low	1.70	Fair	807.36	None	None	2	Low Priority
19	25.4	Moderate	1.13	Moderate	3.72	Poor	385.63	None	None	2	Low Priority
3	29.2	Low	1.27	Very High	4.32	Poor	210.49	None	None	3	Low Priority
2	32.6	High	1.37	Very High	6.89	Poor	133.28	None	None	4	Medium Priority
14	35.0	High	1.50	Very High	11.00	Poor	551.15	None	None	4	Medium Priority
16	40.3	Very High	1.46	Very High	2.08	Fair	690.56	None	None	4	Medium Priority
18	30.3	High	1.69	Extreme	2.17	Fair	224.68	None	None	4	Medium Priority
12	30.2	High	0.92	Low	5.97	Poor	768.24	House	None	5	Medium Priority
15	40.8	Very High	1.02	Low	2.04	Fair	931.26	None	Present	5	Medium Priority
20	37.9	High	1.84	Extreme	1.16	Good	2381.88	House/Driveway	None	5	Medium Priority
26	37.6	High	1.04	Low	0.23	Excellent	3095.70	Road (Route 214)	Present	5	Medium Priority
13LB	32.0	High	0.94	Low	3.35	Poor	2102.40	House	None	5	Medium Priority
13RB	35.3	High	0.61	Very Low	3.35	Poor	NA	House	None	5	Medium Priority
11	35.8	High	1.30	Very High	5.85	Poor	1006.47	House	None	6	Medium Priority
22	41.3	Very High	0.58	Very Low	1.05	Good	695.20	Road (Silver Hollow)	Present	6	Medium Priority
8	39.7	Very High	0.76	Very Low	8.01	Poor	8941.28	Houses	Present	8	High Priority
15.5	41.9	Very High	1.06	Moderate	3.61	Poor	1645.06	House	None	7	High Priority
21	41.5	Very High	1.48	Very High	0.51	Excellent	6053.60	Road (Silver Hollow)	Present	7	High Priority
23	42.3	Very High	1.14	Moderate	9.82	Poor	18857.64	None	Present	8	High Priority
25	42.9	Very High	1.30	Very High	4.93	Poor	27571.55	None	Present	9	High Priority
17	41.8	Very High	1.28	Very High	5.71	Poor	11398.40	None	Present	9	High Priority
24	41.8	Very High	1.50	Very High	2.88	Poor	19745.25	None	Present	9	High Priority

Stony Clove Creek
Bank Erosion Monitoring Sites

Lanesville

Chichester

Phoenicia

Stony Clove
Rod & Gun Club

Chichester
Bridge

Silver
Hollow
Bridge

BEMS 1
BEMS 2
BEMS 3
BEMS 4
BEMS 5
BEMS 6
BEMS 7
BEMS 8
BEMS 9
BEMS 10
BEMS 11
BEMS 12
BEMS 13
BEMS 14
BEMS 15
BEMS 15.5
BEMS 16
BEMS 17
Lanesville Demostration Project
BEMS 18
BEMS 19
BEMS 20
BEMS 21
BEMS 22
BEMS 23
BEMS 24
BEMS 25
BEMS 26

MU 1
MU 2
MU 3
MU 4
MU 5
MU 6
MU 7
MU 8
MU 9
MU 10
MU 11
MU 12
MU 13
MU 14
MU 15
MU 16
MU 17
MU 18
MU 19
MU 20
MU 21

Hollow Tree Brook
Myrtle Brook
Warner Creek

Diamond Notch Rd.
Neal Rd.
Mountain Rd.
Meadow Brook Rd.
Jansen Rd.
Beecher Rd.
Stony Rd.
Myrtle Rd.
Osterhoudt Rd.
Benjamin Rd.
North Inn Rd.
Willowy Lane
Alder Rd.
Stony Clove Lane
Park Rd.
Silver Hollow Rd.
School Ln.
Romer St.
Trempel St.
Main St.
214

N

Scale 1:27000

0 3,000 6,000 Feet

Legend
- Management Unit Break
- Stream
- Bridge
- Watershed Boundary
- Roads
- BEMS Monitoring Pin
- Erosion