EAST PRONG ROARING RIVER STREAM RESTORATION,

Wilkes County, North Carolina

ANNUAL MONITORING REPORT ADDENDUM

Prepared by:
North Carolina State University, Water Quality Group,
NC Stream Restoration Institute

NC STATE UNIVERSITY

nc stream restoration institute

For:
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

MARCH 30, 2004

2003 Addendum to the Stone Mountain River Restoration Monitoring Report

1 Purpose

Morphological field investigation and data analysis was conducted on September 24, 2003 and January 7, 2004 in order to monitor the post construction morphology on the East Prong Roaring River stream restoration site. A three-person team from NCSU performed the field reconnaissance. A geomorphic survey was completed. The monitoring results include assessment of stream bank stability as well as stream morphology. Field reconnaissance involved the re-surveying of permanent cross-sections at riffles and pools, longitudinal profiles, and modified Wolman pebble counts. Vegetation monitoring was performed in July of 2003 by a two-person team. Vegetation plots were sampled for monitoring and evaluation. Photo reference locations were also documented for continued monitoring for the Year 2003. Also included in this report addendum is a summary of the maintenance to date for this project and any potential future concerns.

2 Summary

2.1 Morphology

Cross Sections
Field data was collected in 2003 and 2004 on the permanent cross sections throughout Reaches 2 and 4. Overlaying these sections on previous survey data, as shown in Appendices A and B, shows any changes that have taken place in the channel with regards changes in the width/depth ratio, cross-sectional area, and entrenchment ratio. This is useful information over time to determine the stability of the channel. Most of the cross sections surveyed show little to no change from 2000 to 2003. The changes that did occur include deepening of pools (increased habitat), and a slight narrowing of the channel in some areas. These results indicate overall stability within the channel.

Longitudinal Profile
Longitudinal profiles were surveyed in 2003 and 2004. They were each plotted together with previous surveys to show any changes in the bed form over the previous year. Inverts of cross vanes and permanent cross sections were used as control points so that the annual surveys would be accurately compared. The results of the profiles revealed some deepening of the pools, little to no change in riffles, and proper functioning of the grade control structures. The average slope of the channel has also remained stable.

Pebble Counts
The pebble count data collected in 2003 was revealing as to the degree of the coarsening of the channel substrate. There have been at least three bankfull events since construction in 2000 and the bed material has coarsened up significantly. The changes in bed material indicate improved habitat and removal of fine material that was present immediately after construction.

2.2 Photo Points

The photo points taken along the channel and constructed wetlands and ponds in Reaches 2 and 4 show the vegetation that has come up and survived (including transplants). Also, the channel appears stable with no development of unstable depositional features or erosion of the banks in these areas.

2.3 Vegetation

No additional plants were installed in 2003. There was a marked reduction in surviving bare root plants in Reach 2 and the upper portion of Reach 4 (Appendix C). Deer browse continues to be a problem at this site. Many bare root plants and few live stakes have survived deer browse, but have been limited in vertical growth as a result. As in last years survey results, black walnut and sycamore seem to be the least browsed species.

Natural regeneration was surveyed with the regular plots again this growing season. The numbers were not as abundant as in 2003, but still relatively high. Seedlings range from 1 to 3 years old are abundant throughout the project area. The majority species is sycamore, tulip poplar, river birch, Virginia pine, sweet gum, black cherry, tag alder, and spice bush. Deer browse does not seem to be a problem with these plants.

Bare root survival was above 80% in all plots, however, stem count was low in plots 3 and 4. This number should also not be misinterpreted; it is relative only to this season. Live bare roots were more numerous in 2003. Extrapolated averages across 4 bare root plots gave an overall project average of **330 trees per acre** that are surviving. Live plants included sycamore, sugarberry, black cherry, river birch, black gum, green ash, black walnut, willow oak, tag alder, spice bush, witch hazel, and silky dogwood. Only taller black walnut and sycamore bare roots planted this season were less affected by deer browse. Other survivors were browsed lower to the ground.

Live stake survival was again extremely low. This may be attributed to droughty conditions during growing season and in some cases, washout from flooding. Deer browse was also a contributing factor. It was noted that foot traffic up and down the staked banks was often heavy in select places and that many stakes were dislodged or removed completely.

Herbaceous cover was determined in bare root plots and was greater than 90% in all plots. Switchgrass, rushes, and sedges were exceptionally robust. No more seeding is required.

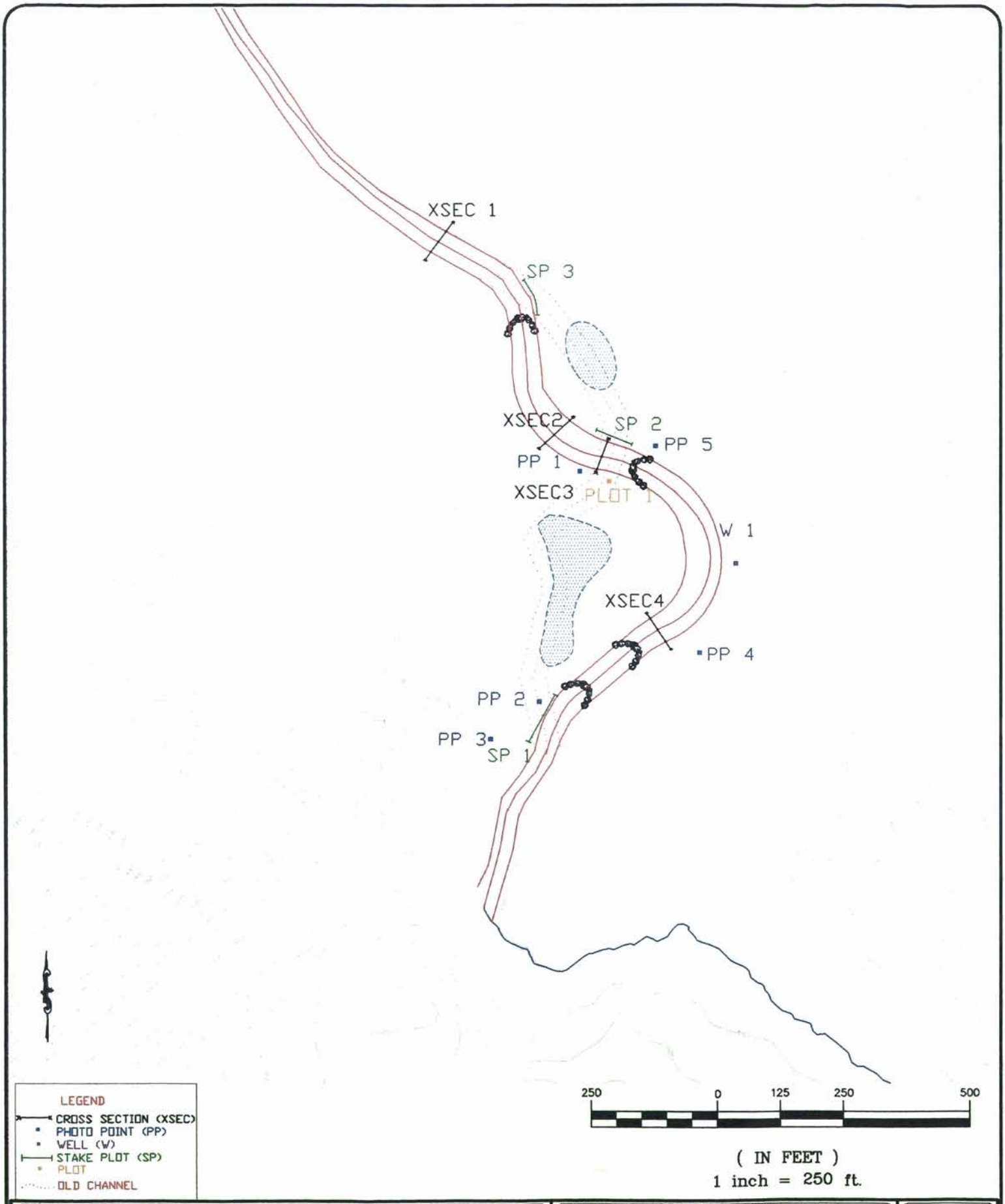
2.3 Project Maintenance

Since November 2000, when the project was completed, there have been two scheduled maintenance events. The first one was in May of 2001, when a failed log cross vane was removed. Also at this time, some grading/stabilization was performed on an eroding stream bank and bioengineering techniques, such as brush mattresses and fascines, were installed. The second was in November 2002, when a two more log cross vanes

was repaired (logs removed and replaced with boulders). One of these structures was in Reach 2 and the other in Reach 4. The two maintenance sites have fairly good access allowing for minimal disturbance of the existing vegetation. NCSU personnel make frequent site visits to the project when in the area, and are constantly monitoring the visual status of the structures and stream banks. The repaired cross vane in Reach 4 continues to be of concern as it is the sole grade control for a very steep riffle. Over the past year there have been several large flow events, with more than one overtopping the banks of the river. This has led to erosion in several meander bends where woody vegetation was not established. NCSU recommends some repair work be considered for the severely eroding areas in 2004. Also, a replanting is scheduled for the Fall/Winter of 2004-2005 of woody vegetation at least two years old. Ideally the bank repair work will be completed immediately before the replanting.

ATTACHMENT A

Plan View Maps for Reaches 2 & 4



nc stream restoration institute

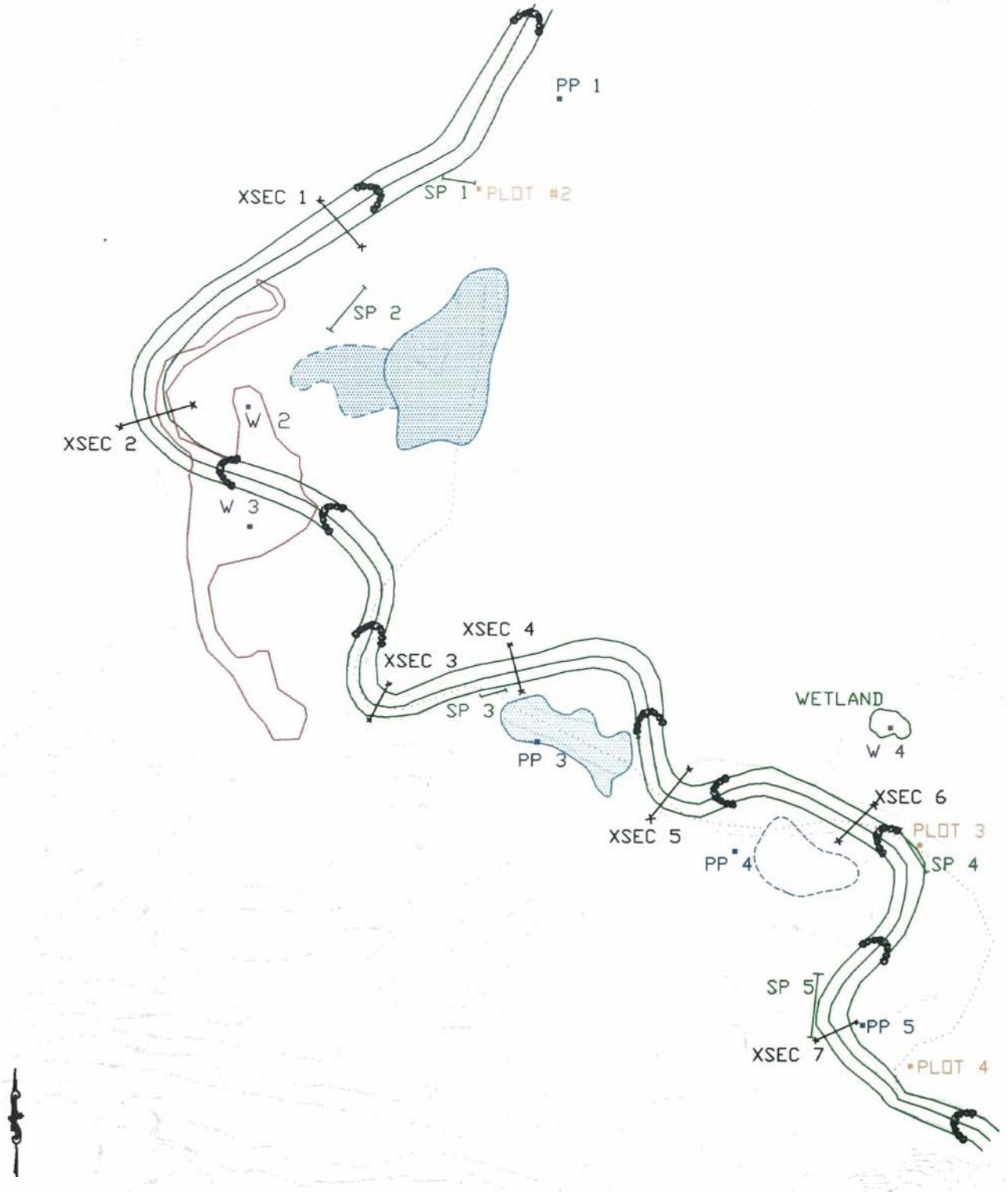
NORTH CAROLINA STREAM RESTORATION INSTITUTE

NCSU WATER QUALITY GROUP

NCSU BOX 7637 • RALEIGH, NORTH CAROLINA 27695-7637

PROJECT: EAST PRONG ROARING RIVER
LOCATION: STONE MOUNTAIN STATE PARK
DATE: JANUARY 22, 2003
SCALE: 1"= 250'
SECTION: REACH 2

FIGURE 1 OF 2



LEGEND
- CROSS SECTION (XSEC)
- PHOTO POINT (PP)
- WELL (W)
- STAKE PLOT (SP)
- PLOT
- OLD CHANNEL

300 0 150 300 600

(IN FEET)

1 inch = 300 ft

NORTH CAROLINA STREAM RESTORATION INSTITUTE
NCSU WATER QUALITY GROUP
NCSU BOX 7637 • RALEIGH, NORTH CAROLINA 27695-7637

PROJECT: EAST PRONG ROARING RIVER
LOCATION: STONE MOUNTAIN STATE PARK
DATE: JANUARY 22, 2003
SCALE: 1"= 300'
SECTION: REACH 4

FIGURE 2 OF 2

APPENDIX A

REACH 2:
STREAM GEOMETRY AND SUBSTRATE DATA
YR 2003 SURVEY

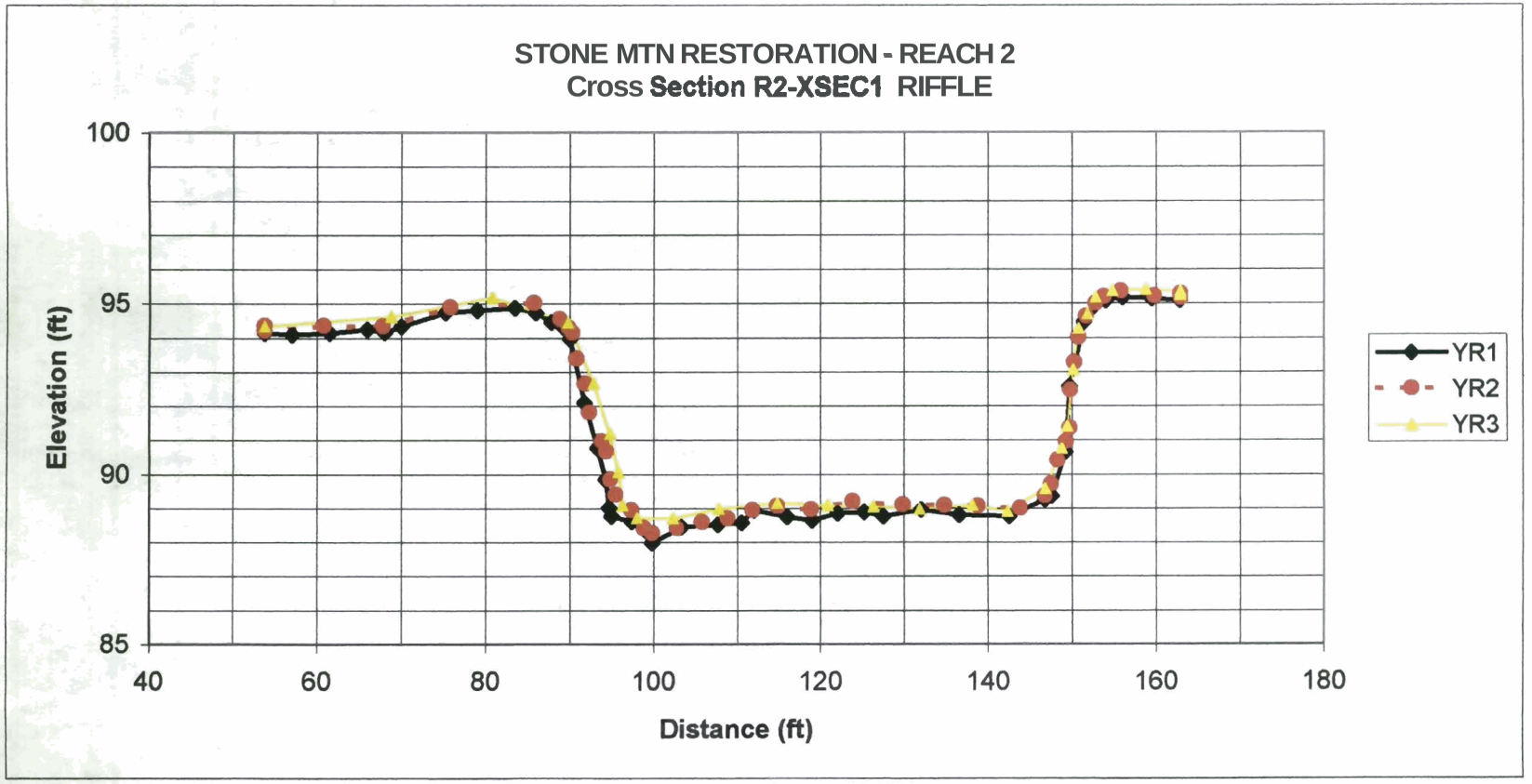
Cross Section R2-XSEC1 RIFFLE

STONE MTN RESTORATION - REACH 2
Yadkin River Basin, Wilkes County, North Caroli
Dani Wise

Sep-03

	Survey Data				
NOTES	STA	HI	FS	ELEV	REV STA
	0	100	5.65	94.35	53.8
	15	100	5.38	94.62	68.8
	27	100	4.82	95.18	80.8
	36	100	5.55	94.45	89.8
	39	100	7.33	92.67	92.8
	41	100	8.82	91.18	94.8
	42	100	9.94	90.06	95.8
	42.5	100	10.92	89.08	96.3
	44.2	100	11.28	88.72	98
	48.5	100	11.3	88.7	102.3
	54	100	11.02	88.98	107.8
	61	100	10.85	89.15	114.8
	67	100	10.92	89.08	120.8
	72.5	100	10.95	89.05	126.3
	78	100	11.02	88.98	131.8
	84.3	100	10.92	89.08	138.1
	88.5	100	11.08	88.92	142.3
	93	100	10.43	89.57	146.8
	95	100	9.24	90.76	148.8
	95.6	100	8.6	91.4	149.4
	96.3	100	6.93	93.07	150.1
	97	100	5.73	94.27	150.8
	98	100	5.3	94.7	151.8
	99	100	4.82	95.18	152.8
	101	100	4.62	95.38	154.8
	105	100	4.6	95.4	158.8
	109.1	100	4.64	95.36	162.9
	109.1	100	4.75	95.25	162.9

R2-XSEC1	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	RIFFLE	C4	450	90.0	151.4	93.98	61.4	4.2	14.6	257.9	6.0	7.3
YR 2	RIFFLE	C4	450	90.3	150.8	94.01	60.5	4.0	15.2	241.4	5.7	7.4
YR 3	RIFFLE	C4	450	89.8	150.8	94.27	61.0	3.9	15.6	239.1	5.6	7.4



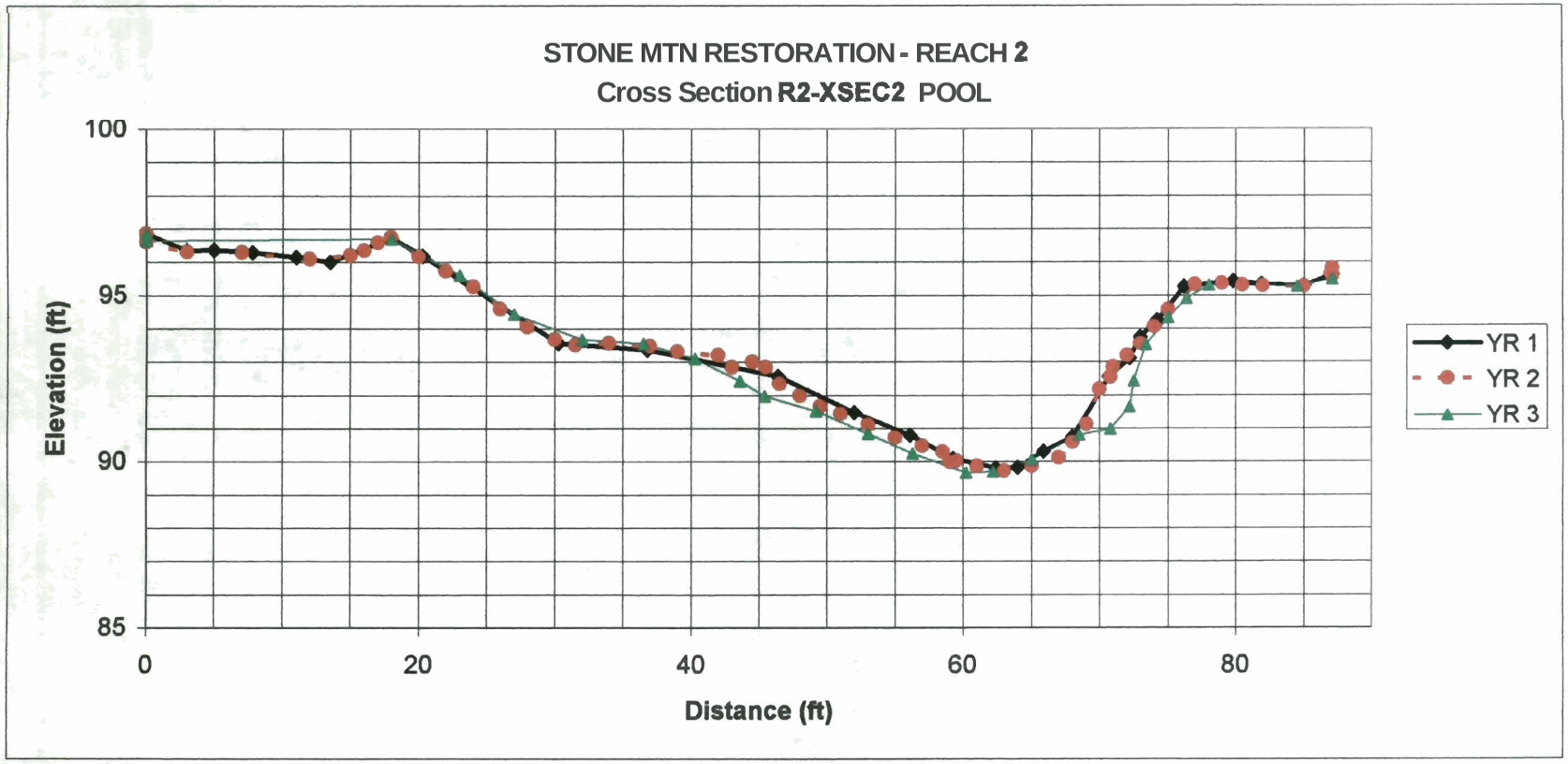
Cross Section R2-XSEC2 POOL

STONE MTN RESTORATION - REACH 2
Yadkin River Basin, Wilkes County, North Caroli
Dani Wise

Sep-03

	Survey Data				
NOTES	STA	HI	FS	ELEV	
LPIN	0	100	2.32	97.68	96.85
GRND	0	100	2.54	97.46	96.63
	18	100	2.48	97.52	96.69
	23	100	3.57	96.43	95.60
	27	100	4.74	95.26	94.43
	32	100	5.5	94.5	93.67
	36.5	100	5.62	94.38	93.55
	40.3	100	6.08	93.92	93.09
LEW	43.6	100	6.74	93.26	92.43
	45.4	100	7.2	92.8	91.97
	49.2	100	7.64	92.36	91.53
	53	100	8.34	91.66	90.83
	56.3	100	8.92	91.08	90.25
	60.2	100	9.5	90.5	89.67
	62.2	100	9.48	90.52	89.69
	65	100	9.11	90.89	90.06
	68.5	100	8.36	91.64	90.81
	70.8	100	8.18	91.82	90.99
REW	72.2	100	7.52	92.48	91.65
	72.5	100	6.74	93.26	92.43
	73.4	100	5.66	94.34	93.51
	75	100	4.84	95.16	94.33
	76.4	100	4.26	95.74	94.91
	78	100	3.87	96.13	95.30
	84.5	100	3.9	96.1	95.27
RPIN	87.1	100	3.69	96.31	95.48

R2-XSEC2	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	POOL	C4	200	18.0	74.2	94.06	56.2	3.2	17.4	181.2	4.3	3.6
YR 2	POOL	C4	200	18.0	75.0	94.56	57	3.6	15.8	205.2	4.8	3.5
YR 3	POOL	C4	200	18.0	75.0	94.33	57	3.5	16.2	200.9	4.7	3.5



Cross Section R2-XSEC3 POOL

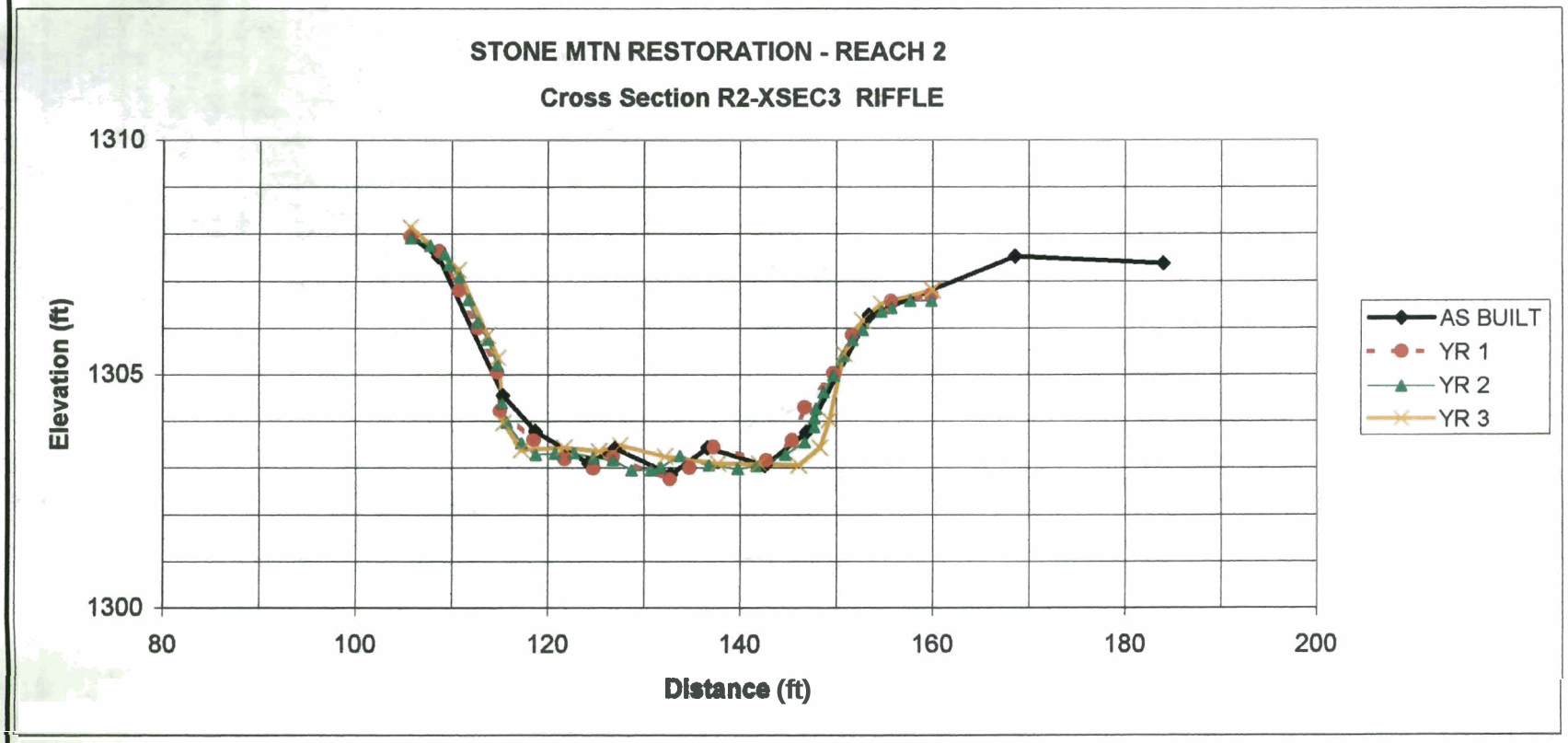
STONE MTN RESTORATION - REACH
Yadkin River Basin, Wilkes County, N
Dani Wise

Sep-03

Survey Data

STA	FS	ELEV	REVISE STA
0	3.86	1308.14	105.7
5	4.77	1307.23	110.7
8	6.16	1305.84	113.7
9.1	6.63	1305.37	114.8
9.7	8.04	1303.96	115.4
11.5	8.62	1303.38	117.2
16.0	8.57	1303.43	121.7
19.6	8.64	1303.36	125.3
21.8	8.52	1303.48	127.5
26.5	8.75	1303.25	132.2
32.0	8.91	1303.09	137.7
36.3	8.91	1303.09	142
40.4	8.95	1303.05	146.1
42.6	8.56	1303.44	148.3
43.6	7.97	1304.03	149.3
45.1	6.54	1305.46	150.8
47	5.84	1306.16	152.7
49	5.48	1306.52	154.7
54.3	5.18	1306.82	160
54.3	5.21	1306.79	160

R2-XSEC3	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	RIFFLE	C4	300	108.6	168.6	1307.52	60.0	2.8	21.6	166.7	4.7	5.0
YR 1	RIFFLE	C4	300	81.0	132.2	1307.63	51.2	3.3	15.5	169.2	4.9	5.9
YR 2	RIFFLE	C4	300	112.7	154.7	1306.35	42.0	4.0	10.4	169.2	4.9	7.1
YR 3	RIFFLE	C4	300	112.7	154.7	1306.35	42.0	4.0	10.4	170.0	4.9	7.1



Cross Section R2-XSEC4 RIFFLE

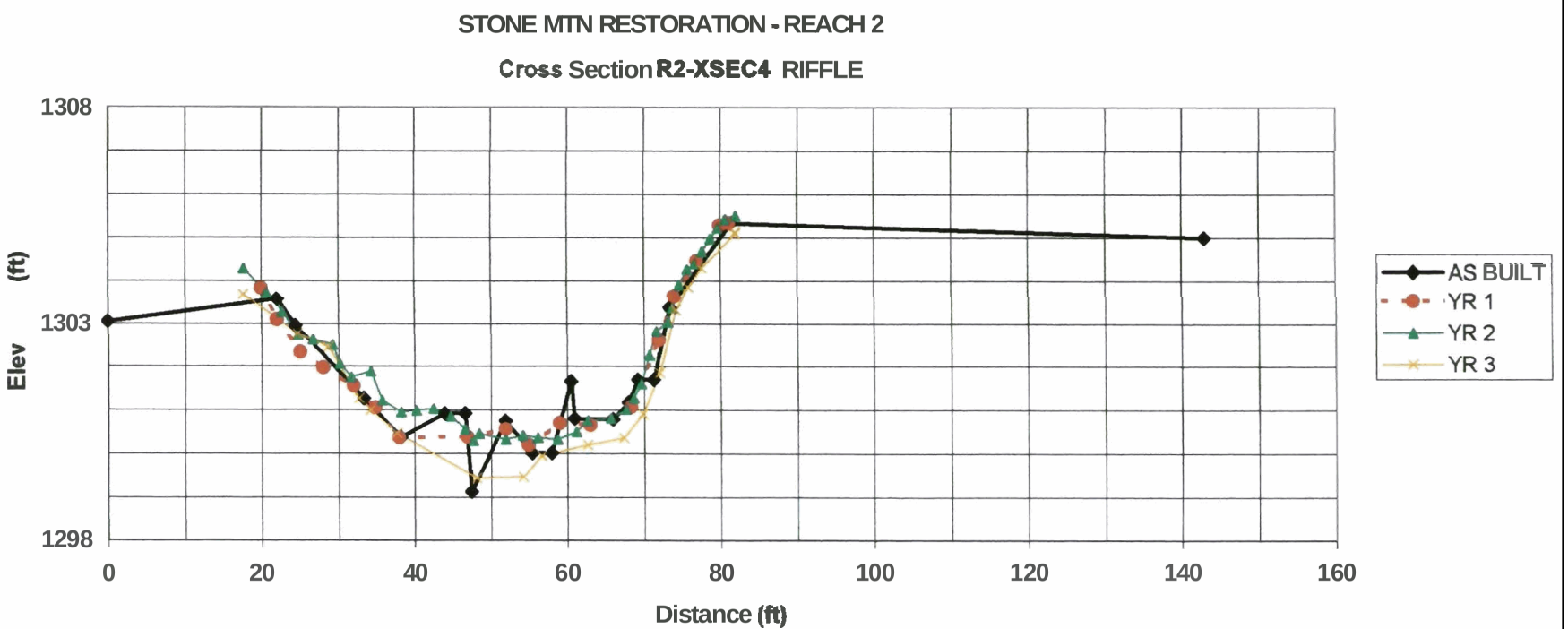
STONE MTN RESTORATION - REACH 2
Yadkin River Basin, Wilkes County, North Caroli
Dani Wise

Sep-03

Survey Data

STA	FS	REV.STA	ELEV
0	6.72	17.7	1303.68
7	7.63	24.7	1302.77
11	7.95	28.7	1302.45
15	9.13	32.7	1301.27
16.5	9.39	34.2	1301.01
20	9.93	37.7	1300.47
30.5	10.96	48.2	1299.44
36.6	10.93	54.3	1299.47
39	10.45	56.7	1299.95
45	10.2	62.7	1300.2
49.7	10.04	67.4	1300.36
52.2	9.49	69.9	1300.91
54.4	8.54	72.1	1301.86
56.5	7.09	74.2	1303.31
58.2	6.55	75.9	1303.85
60	6.11	77.7	1304.29
64.3	5.31	82	1305.09
64.3	5.28	82	1305.12

R2-XSEC4	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	RIFFLE	C4	200	22.0	73.4	1303.57	51.4	2.5	20.9	126.2	4.4	3.9
YR 1	RIFFLE	C4	200	20.0	74.0	1303.82	54.0	2.3	23.1	126.2	3.6	3.7
YR 2	RIFFLE	C4	200	22.0	74.7	1303.57	52.7	2.5	21.3	130.4	3.3	3.8
YR 3	RIFFLE	C4	200	17.7	75.9	1303.68	58.2	2.9	19.8	171.1	4.2	3.4



Longitudinal Profile - 2003 Survey

STONE MTN RESTORATION - REACH 2
Yadkin River Basin, Wilkes County, North Carolina
Dani Johnson

	STA (ft)	ELEV (ft)
Head First Riffle	0	1308.8
Head Last Riffle	1263	1299.6
Valley Length (ft)	950	
Channel Length (ft)	1263	
Elev Change (ft)	9.25	

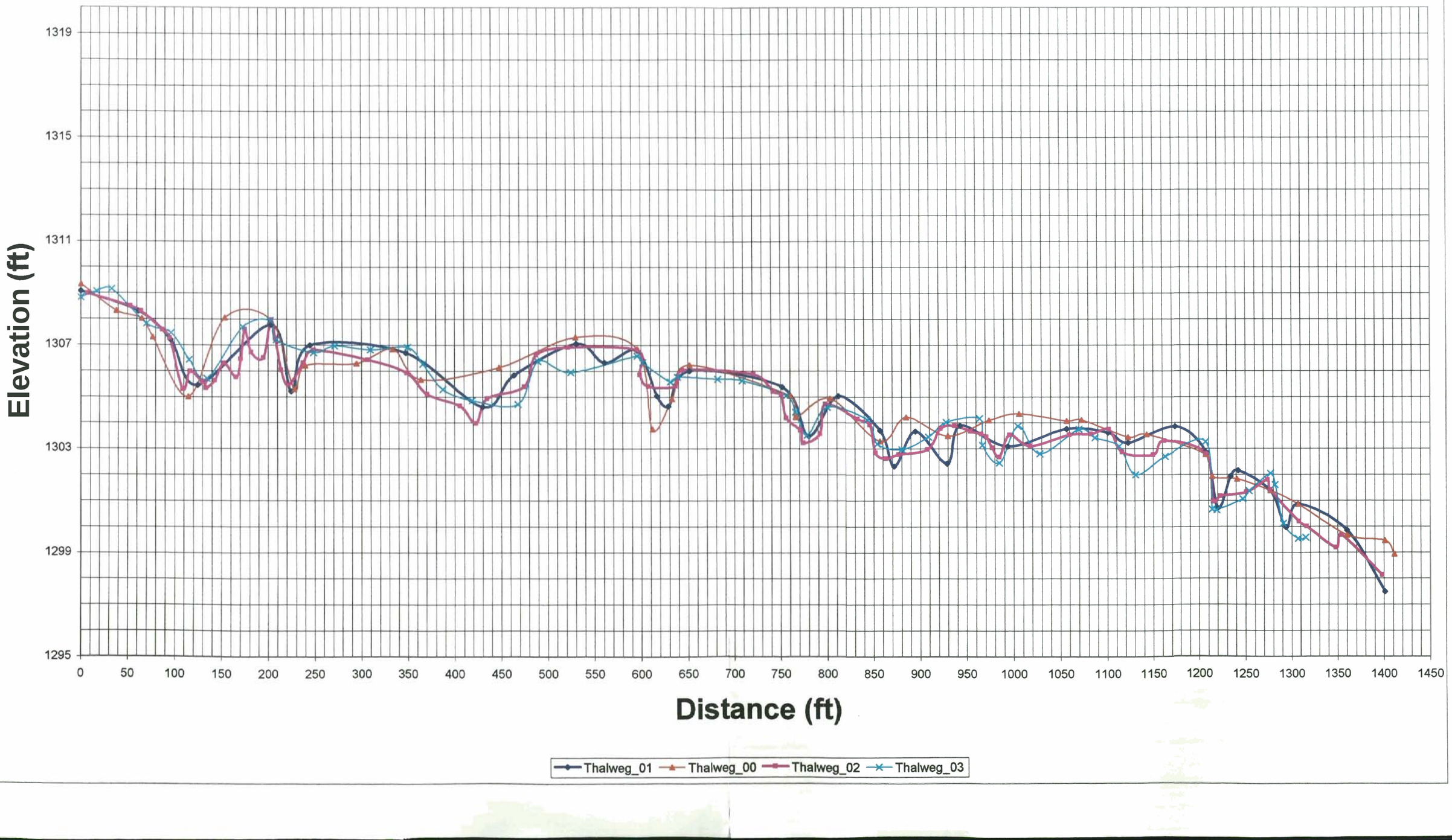
Chan Slope (ft/ft)	0.0073
Valley Slope (ft/ft)	0.0097
Sinuosity, K	1.33

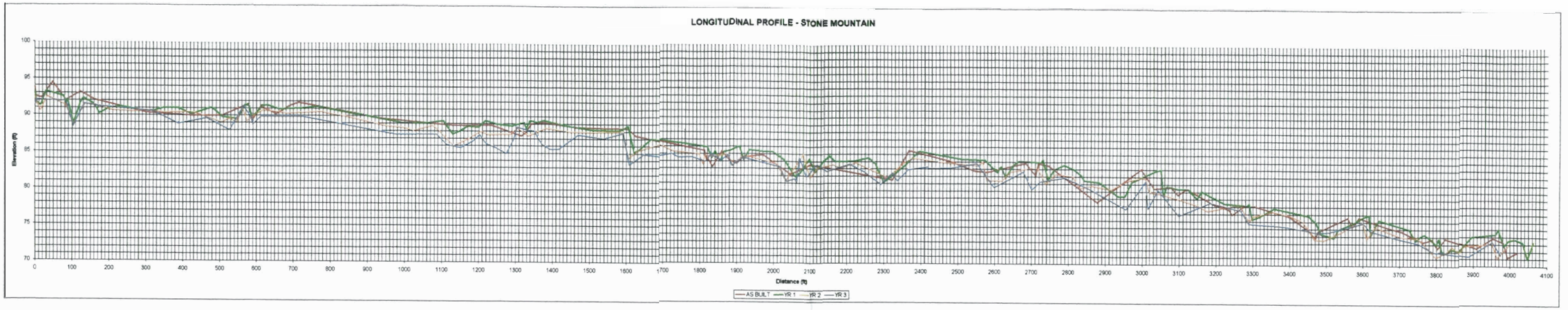
HI for graph 1320

2003 Survey Data

TP	NOTE	revise STA	STA	HI	FS TW	FS WS	WATER DEPTH	ELEV TW	ELEV WS	revise TW ELEV	revise HI
		0	0	100	11.18	10.29	0.89	88.82	89.71	1308.82	1320
		17	17	100	10.95	10.34	0.61	89.05	89.66	1309.05	1320
		33	33	100	10.86	10.44	0.42	89.14	89.56	1309.14	1320
	run	70.5	70.5	100	12.19	11.14	1.05	87.81	88.86	1307.81	1320
	Head of pool	96.5	96.5	100	12.54	11.2	1.34	87.46	88.8	1307.46	1320
		116	116	100	13.58	11.24	2.34	86.42	88.76	1306.42	1320
		135	135	100	14.3	11.28	3.02	85.7	88.72	1305.7	1320
		173	163	100	12.3	11.28	1.02	87.7	88.72	1307.7	1320
1	bs=5.44,xvane 1	202.5	192.5	94.26	6.32	5.69	0.63	87.94	88.57	1307.94	1314.3
		208.7	198.7	94.26	7.06	6.25	0.81	87.2	88.01	1307.2	1314.3
		249	239	94.26	7.55	6.25	1.3	86.71	88.01	1306.71	1314.3
		271.8	261.8	94.26	7.3	6.35	0.95	86.96	87.91	1306.96	1314.3
		310	300	94.26	7.45	6.62	0.83	86.81	87.64	1306.81	1314.3
		350	340	94.26	7.35	6.66	0.69	86.91	87.6	1306.91	1314.3
		366.4	356.4	94.26	8	6.66	1.34	86.26	87.6	1306.26	1314.3
		387.5	377.5	94.26	8.98	6.71	2.27	85.28	87.55	1305.28	1314.3
		419	409	94.26	9.41	6.71	2.7	84.85	87.55	1304.85	1314.3
		468	458	94.26	9.55	6.73	2.82	84.71	87.53	1304.71	1314.3
		490	480	94.26	7.9	6.75	1.15	86.36	87.51	1306.36	1314.3
		525	515	94.26	8.32	6.87	1.45	85.94	87.39	1305.94	1314.3
		596	561	94.26	7.68	6.95	0.73	86.58	87.31	1306.58	1314.3
		602	567	94.26	7.95	7.31	0.64	86.31	86.95	1306.31	1314.3
		631.5	596.5	94.26	8.69	7.41	1.28	85.57	86.85	1305.57	1314.3
2	bs=7.40	639	604	95.36	9.6	8.58	1.02	85.76	86.78	1305.76	1315.4
		682	647	95.36	9.68	8.68	1	85.68	86.68	1305.68	1315.4
		709	674	95.36	9.74	8.75	0.99	85.62	86.61	1305.62	1315.4
3	bs=4.94, jhook	756	721	92.05	7.01	5.93	1.08	85.04	86.12	1305.04	1312.1
		766	731	92.05	7.64	6.34	1.3	84.41	85.71	1304.41	1312.1
		778	743	92.05	8.54	6.41	2.13	83.51	85.64	1303.51	1312.1
		800	765	92.05	7.45	6.45	1	84.6	85.6	1304.6	1312.1
	jhook	843	808	92.05	7.94	6.58	1.36	84.11	85.47	1304.11	1312.1
		854	819	92.05	8.87	6.84	2.03	83.18	85.21	1303.18	1312.1
		880	845	92.05	9.08	6.78	2.3	82.97	85.27	1302.97	1312.1
		909	874	92.05	8.6	6.76	1.84	83.45	85.29	1303.45	1312.1
		928	893	92.05	8.03	6.75	1.28	84.02	85.3	1304.02	1312.1
	rock vane	964	929	92.05	7.89	6.8	1.09	84.16	85.25	1304.16	1312.1
	scour	967	932	92.05	8.92	7.22	1.7	83.13	84.83	1303.13	1312.1
		985	950	92.05	9.6	7.2	2.4	82.45	84.85	1302.45	1312.1
		1005	970	92.05	8.19	9.25	-1.06	83.86	82.8	1303.86	1312.1
		1028	993	92.05	9.25	7.22	2.03	82.8	84.83	1302.8	1312.1
4	bs=6.44	1070	1035	93.95	10.21	9.12	1.09	83.74	84.83	1303.74	1314
		1087	1052	93.95	10.53	9.41	1.12	83.42	84.54	1303.42	1314
	log vane	1113	1078	93.95	10.87	9.73	1.14	83.08	84.22	1303.08	1314
	pool	1131	1096	93.95	11.96	9.81	2.15	81.99	84.14	1301.99	1314
		1163	1128	93.95	11.25	9.75	1.5	82.7	84.2	1302.7	1314
	xvane3	1207	1160	93.95	10.69	9.8	0.89	83.26	84.15	1303.26	1314
		1214	1167	93.95	13.29	10.9	2.39	80.66	83.05	1300.66	1314
		1219	1172	93.95	13.32	10.9	2.42	80.63	83.05	1300.63	1314
		1247	1200	93.95	12.89	10.95	1.94	81.06	83	1301.06	1314
		1254	1207	93.95	12.59	10.95	1.64	81.36	83	1301.36	1314
	xvane4	1277.2	1225.2	93.95	11.91	10.98	0.93	82.04	82.97	1302.04	1314
		1282	1230	93.95	12.35	11.46	0.89	81.6	82.49	1301.6	1314
		1291	1239	93.95	13.85	12.23	1.62	80.1	81.72	1300.1	1314
		1307	1255	93.95	14.42	12.44	1.98	79.53	81.51	1299.53	1314
		1315	1263	93.95	14.38	12.72	1.66	79.57	81.23	1299.57	1314

Longitudinal Profile




LONGITUDINAL PROFILE - STONE MOUNTAIN
Elevation (ft)
100
95
90
85
80
75
70
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
4000
4100
Distance (ft)
AS BUILT
YR 1
YR 2
YR 3

Longitudinal Profile

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

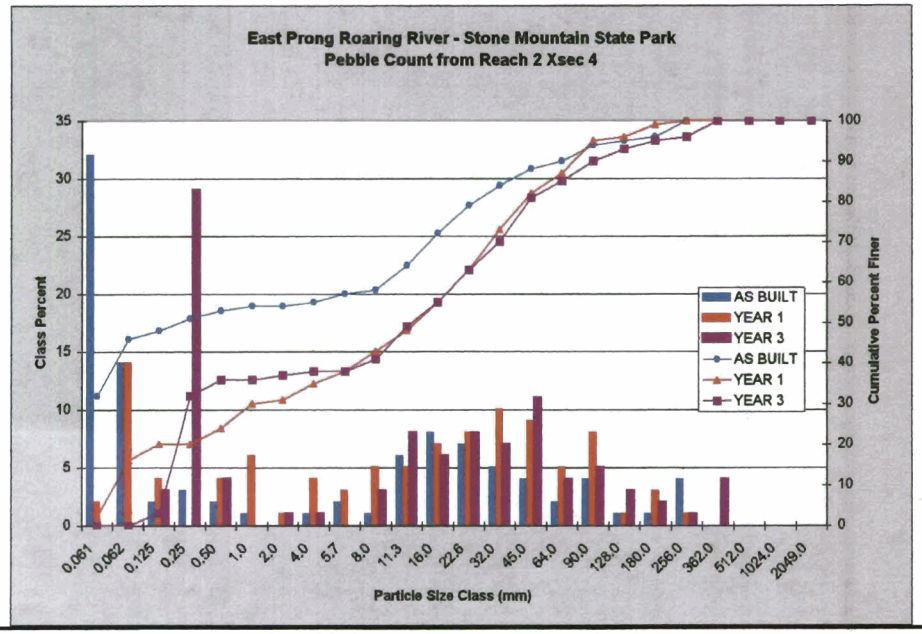
		STA (ft)	ELEV (ft)
	Head First Riffle	0	94.88
	Head Last Riffle	4089	74.91
Chan Slope (ft/ft) 0.005	Valley Length (ft)		
Valley Slope (ft/ft)	Channel Length (ft)	4089	
Sinuosity, K	Elev Change (ft)	0	

YEAR 3 (2003) DATA — **HI=** **100**

TP	NOTE	STA	HI	FS TW	FS WS	FS RTOB	ELEV TW	ELEV WS	REVISED STA	REVISED TW ELEV
		0	103.13	9.29	8.25		93.84	94.88	0	91.34
		5	103.13	8.53			94.6		5	92.1
	XVANE 1	83	103.13	8.63			94.5		83	92
		103	103.13	12.19	9.43		90.94	93.7	103	88.44
		133	103.13	10.04	9.56		93.09	95.63	133	91.59
		171	103.13	10.38	9.96		92.75	93.17	171	91.25
		320	103.13	11.03	10.16		92.1	92.97	320	90.6
		387	103.13	12.7			90.43		387	88.93
		465	103.13	11.94	10.12		91.19	93.01	465	89.69
1	bs=4.16	527	102.9	12.75	9.38		89.54	92.91	527	88.04
	XVANE 2	580	102.9	9.41			92.88		565	91.38
		600	102.9	11.07	9.7		91.22	92.59	585	89.72
		605	102.9	11.97	9.7		90.32	92.59	590	88.82
		626	102.9	10.85	9.76		91.44	92.53	611	89.94
		740	102.9	10.89	9.8		91.4	92.49	725	89.9
		990	102.9	13.25	11.64		89.04	90.65	975	87.54
2		1100	100.73	11.62	10.13		89.11	90.6	1085	87.61
		1129	100.73	13.07	10.2		87.66	90.53	1114	86.16
		1166	100.73	13.47			87.26		1151	85.76
		1200	100.73	12.54	10.18		88.19	90.55	1185	86.69
		1217	100.73	11.63			89.1		1202	87.6
		1234	100.73	12.86	10.22		87.87	90.51	1219	86.37
		1258	100.73	13.38	10.2		87.35	90.53	1243	85.85
		1290	100.73	14.25			86.48		1275	84.98
		1310	100.73	12.27	10.25		88.46	90.48	1295	86.96
3	XVANE 3	1322	98.01	7.89			90.12		1304	88.62
		1353	98.01	8.34	7.6		89.67	90.41	1335	88.17
		1367	98.01	8.39	7.65		89.62	90.36	1349	88.12
		1377	98.01	9.26	8.09		88.75	89.92	1359	87.25
		1390	98.01	10.24	8.1		87.77	89.91	1372	86.27
		1412	98.01	10.89	8.11		87.12	89.9	1394	85.62
		1434	98.01	10.89	8.15	6.56	87.12	89.86	1416	85.62
		1487	98.01	8.91	8.1		89.1	89.91	1469	87.6
		1555	98.01	9.41	8.23		88.6	89.78	1537	87.1
	XVANE 4	1622	98.01	8.68	8.31		89.33	89.7	1591	87.83
		1638	98.01	12.96	10.9		85.05	87.11	1607	83.55
4		1678	95.94	9.49	8.84		86.45	87.1	1647	84.95
		1719	95.94	9.73	7.9		86.21	88.04	1688	84.71
		1754	95.94	9.4	8.13		86.54	87.81	1723	85.04
		1771	95.94	9.86	8.24		86.08	87.7	1740	84.58
		1808	95.94	9.83	8.32		86.11	87.62	1777	84.61
		1846	95.94	10.44	8.31		85.5	87.63	1815	84
		1860	95.94	9.5	8.34		86.44	87.6	1829	84.94
		1888	95.94	10.28	8.44		85.66	87.5	1857	84.16
	XVANE 5	1919	95.94	9.53	8.45		86.41	87.49	1875	84.91
		1930	95.94	11.03	9.18		84.91	86.76	1886	83.41
		1961	95.94	9.94	9.16		86	86.78	1917	84.5
		2060	95.94	11.11	9.48		84.83	86.46	2016	83.33
		2078	95.94	13.15	9.54		82.79	86.4	2034	81.29
		2101	95.94	12.77	9.51		83.17	86.43	2057	81.67
5		2106	94.57	11.96	8.19		82.61	86.38	2062	81.11
		2113	94.57	8.44			86.13	94.57	2069	84.63
		2134	94.57	11.18	8.24		83.39	86.33	2090	81.89
		2164	94.57	9.42	8.32		85.15	86.25	2120	83.65
		2190	94.57	10.4	8.36		84.17	86.21	2146	82.67
		2252	94.57	9.36	8.38		85.21	86.19	2208	83.71
		2292	94.57	10.45	8.52		84.12	86.05	2248	82.62
		2336	94.57	12.16	8.59	3.49	82.41	85.98	2292	80.91
		2367	94.57	10.59	8.57		83.98	86	2323	82.48
		2380	94.57	11.63	8.55		82.94	86.02	2336	81.44
		2409	94.57	10.08	8.55		84.49	86.02	2365	82.99
		2461	94.57	9.72	8.72		84.85	85.85	2417	83.35
6		2466	94.63	9.95			84.68	94.63	2422	83.18
		2526	94.63	9.92	9.15		84.71	85.48	2482	83.21
		2595	94.63	9.28	5.27		85.35	89.36	2551	83.85
		2642	94.63	12.55	9.27		82.08	85.36	2598	80.58
		2683	94.63	11.45	9.3		83.18	85.33	2639	81.68
		2721	94.63	10.42	9.39		84.21	85.24	2677	82.71
		2745	94.63	12.86	10.7		81.77	83.93	2701	80.27
		2767	94.63	11.74	10.69		82.89	83.94	2723	81.39
		2833	94.63	11.2			83.43	94.63	2789	81.93
		2900	94.63	12.74	11.7		81.89	82.93	2856	80.39
7		3000	95.23	16.13	12.63		79.1	82.6	2956	77.6
	XVANE 7	3024	95.23	12.23			83	95.23	3008	81.5
		3031	95.23	16			79.23	95.23	3015	77.73
		3058	95.23	13.39	14.6		81.84	80.63	3042	80.34
		3114	95.23	16.93	14.92		78.3	80.31	3098	76.8
	XSEC 6	3200	95.23	15.16	15.17		80.07	80.06	3184	78.57
8	XVANE 8	3273	89.62	10.61	10.1		79.01	79.52	3267	77.51
		3295	89.62	12.41	10.51		77.21	79.11	3289	75.71
		3386	89.62	12.71	11.16		76.91	78.46	3380	75.41
9		3459	87.36	11.07	9.1		76.29	78.26	3453	74.79
		3481	87.36	11.35	9.08		76.01	78.28	3475	74.51
		3512	87.36	11.21	9.15		76.15	78.21	3506	74.65
		3569	87.36	10.55	9.18		76.81	78.18	3563	75.31
	XVANE 9	3611	87.36	9.95	9.38		77.41	77.98	3600	75.91
		3630	87.36	11.05	9.81		76.31	77.55	3619	74.81
		3703	87.36	12.07	10.95		75.29	76.41	3692	73.79
10		3866	82.66	8.01	6.75		74.65	75.91	3751	73.15
		3905	82.66	9.16	6.89		73.5	75.77	3790	72
		3957	82.66	9.48	6.96		73.18	75.7	3842	71.68
		4002	82.66	9.82	7.04		72.84	75.62	3887	71.34
	XVANE 10	4067	82.66	7.76	7.03		74.9	75.63	3952	73.4
		4089	82.66	9.63	7.75		73.03	74.91	3974	71.53

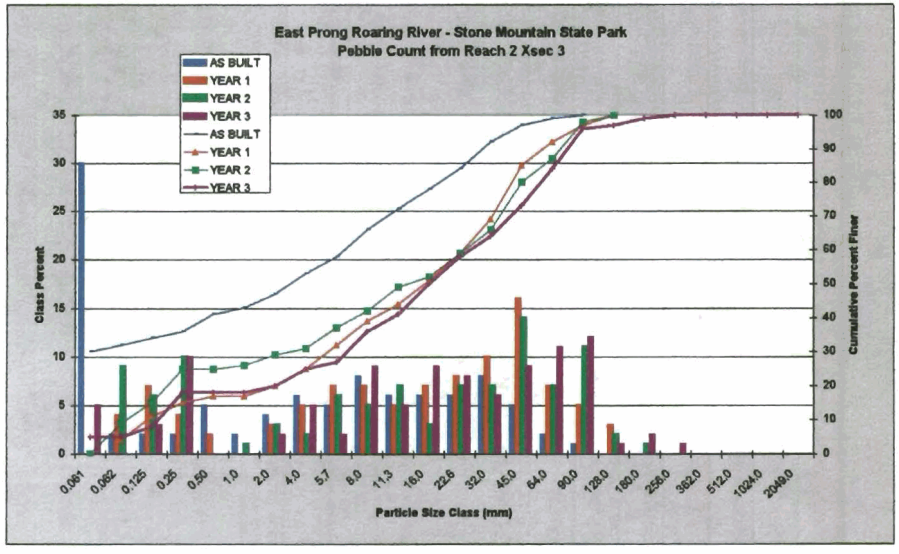
Reach 2	Approx. STA #	Survey Date		Survey Date		Survey Date	
Perm X Sec 4	11+01	2000		2001		2003	
Particle Size (mm)	Particle Size	Total	%Cumulative	Total	%Cumulative	Total	%Cumulative
0.061	Silt/Clay	32	32	2	2	0	0
0.062		14	46	14	16	0	0
0.125	Sand	2	48	4	20	3	3
0.25		3	51	0	20	29	32
0.50		2	53	4	24	4	36
1.0		1	54	6	30	0	36
2.0	G	0	54	1	31	1	37
4.0	r	1	55	4	35	1	38
5.7	a	2	57	3	38	0	38
8.0	v	1	58	5	43	3	41
11.3	e	6	64	5	48	8	49
16.0	l	8	72	7	55	6	55
22.6		7	79	8	63	8	63
32.0		5	84	10	73	7	70
45.0		4	88	9	82	11	81
64.0		2	90	5	87	4	85
90.0		4	94	8	95	5	90
128.0	Cobble	1	95	1	96	3	93
180.0		1	96	3	99	2	95
256.0		4	100	1	100	1	96
362.0	Boulder	0	100	0	100	4	100
512.0		0	100	0	100	0	100
1024.0		0	100	0	100	0	100
2049.0	Bedrock	0	100	0	100	0	100

Particle Sizes (mm):		Particle Sizes (mm):		Particle Sizes (mm):	
D16	0.061	D16	0.1	D16	0.15
D35	0.1	D35	5.7	D35	0.5
D50	0.4	D50	14	D50	14
D84	40	D84	60	D84	60
D95	120	D95	120	D95	180



Reach 2 Perm X Sec 3	Approx. STA # 4+61	Survey Date 2000		Survey Date 2001		Survey Date 2002		Survey Date 2003	
Particle Size (mm)	Particle Size	Total	%Cumulative	Total	%Cumulative	Total	%Cumulative	Total	%Cumulative
0.061	Silt/Clay	30	30	0	0	0	0	5	5
0.062	Sand	2	32	4	4	9	9	0	5
0.125		2	34	7	11	6	16	3	8
0.25		2	36	4	15	10	25	10	18
0.50		5	41	2	17	0	25	0	18
1.0	Gravel	2	43	0	17	1	26	0	18
2.0		4	47	3	20	3	29	2	20
4.0		6	53	5	25	2	31	5	25
5.7		5	58	7	32	6	37	2	27
8.0		8	66	7	39	5	42	9	36
11.3		6	72	5	44	7	49	5	41
16.0		6	78	7	51	3	52	9	50
22.6		6	84	8	59	7	59	8	58
32.0		8	92	10	69	7	66	6	64
45.0		5	97	16	85	14	80	9	73
64.0	Cobble	2	99	7	92	7	87	11	84
90.0		1	100	5	97	11	98	12	96
128.0		0		3	100	2	100	1	97
180.0		0		0		1		2	99
256.0	Boulder	0		0		0		1	100
362.0		0		0		0		0	100
512.0		0		0		0		0	100
1024.0		0		0		0		0	100
2049.0	Bedrock	0		0		0		0	100

Particle Sizes (mm):		Particle Sizes (mm):		Particle Sizes (mm):		Particle Sizes (mm):	
D16	0.061	D16	0.5	D16	0.25	D16	0.2
D35	0.2	D35	8	D35	5	D35	7
D50	4	D50	20	D50	12	D50	16
D84	28	D84	50	D84	60	D84	64
D95	40	D95	85	D95	85	D95	85



APPENDIX B

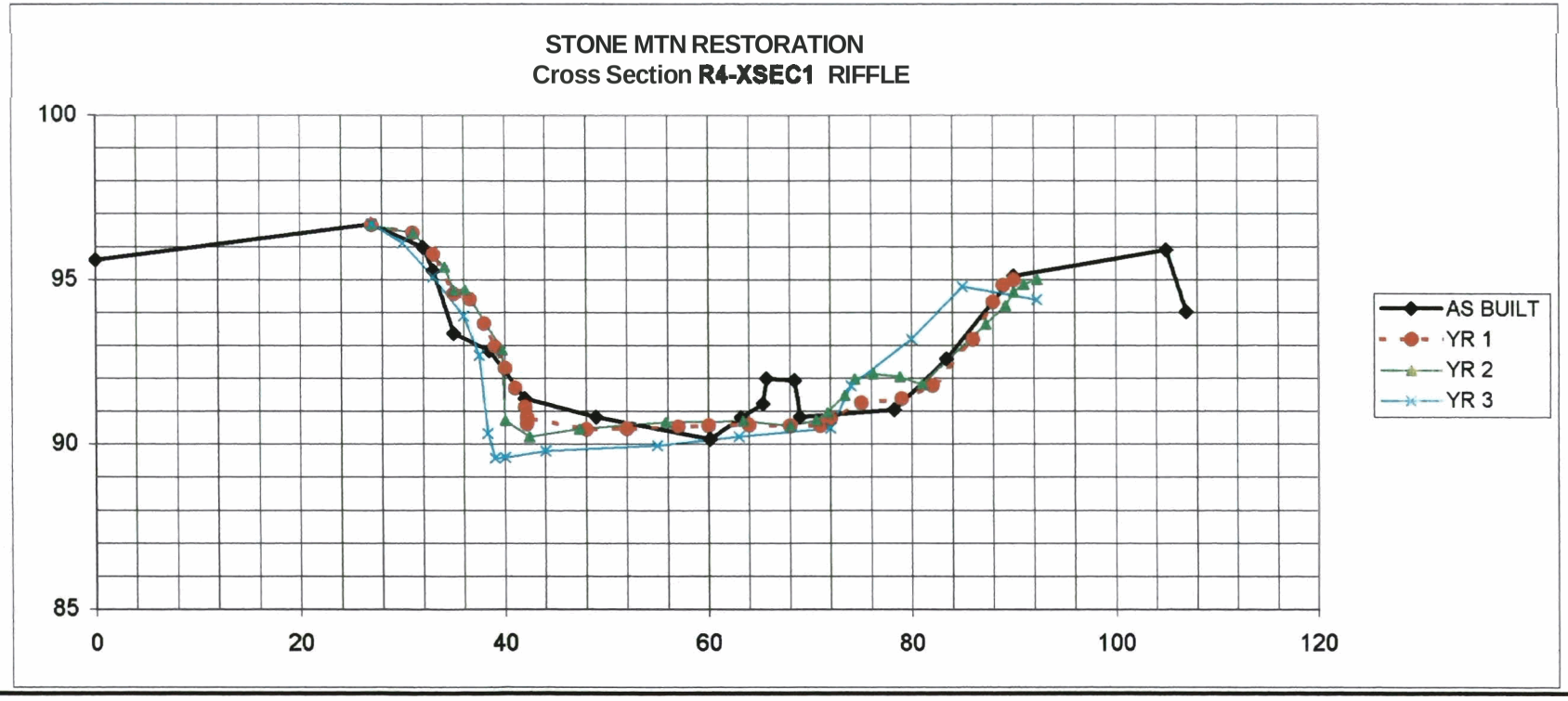
REACH 4:
STREAM GEOMETRY AND SUBSTRATE DATA
YR 2003 SURVEY

Cross Section R4-XSEC1 RIFFLE

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

YEAR 3 (2003)			HI = 100		
	Survey Data			Adjusted Stations/Elev	
NOTES	STA	FS	ELEV	STA	ELEV
	0	5.09	97.78	27	96.7
	3	5.21	97.2	30	96.12
	6	6.12	96.17	33	95.09
	9	7.31	94.98	36	93.9
	10.5	8.5	93.79	37.5	92.71
	11.3	10.87	91.42	38.3	90.34
	12	11.62	90.67	39	89.59
	13	11.6	90.69	40	89.61
	17	11.41	90.88	44	89.8
	28	11.24	91.05	55	89.97
	36	10.97	91.32	63	90.24
	45	10.71	91.58	72	90.5
	47	9.42	92.87	74	91.79
	53	8.02	94.27	80	93.19
	58	6.42	95.87	85	94.79
grad	65.3	6.81	95.48	92.3	94.4

R4-XSEC 1	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	RIFFLE	C	200	32.0	90.0	95.27	58.0	3.8	15.2	221.9	5.1	3.4
YR 1	RIFFLE	C	200	33.0	90.0	95.77	57.0	3.8	14.9	218.0	5.1	3.5
YR 2	RIFFLE	C	200	34.0	91.0	95.00	57.0	3.5	16.2	200.1	4.7	3.5
YR 3	RIFFLE	C	200	33.0	92.0	94.40	59.0	3.6	16.4	212.4	4.8	3.4



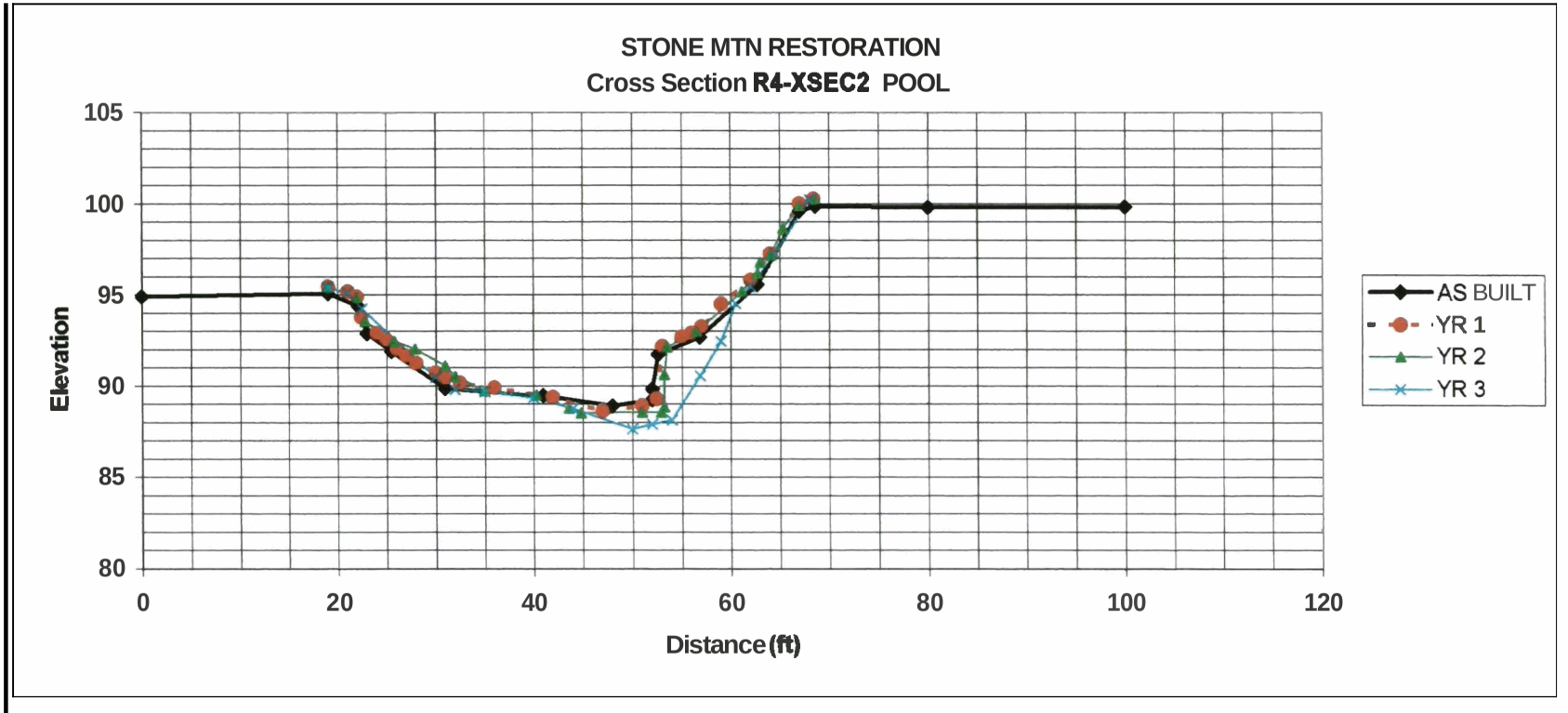
Cross Section R4-XSEC2 POOL

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

YEAR 3 (2003) **HI =** **100**

	Survey Data			Adjusted Stations/Elev	
NOTES	STA	FS	ELEV	STA	ELEV
LTopPin	0	5.25	95.48	19	95.48
grad	0	5.29	95.44	19	95.44
LTOB	2	5.6	95.13	21	95.13
	3.5	6.47	94.26	22.5	94.26
LEW	11	10.23	90.5	30	90.5
	13	10.89	89.84	32	89.84
	16	11.04	89.69	35	89.69
	21	11.35	89.38	40	89.38
	25	11.95	88.78	44	88.78
	31	13.05	87.68	50	87.68
	33	12.81	87.92	52	87.92
	35	12.56	88.17	54	88.17
REW	37.9	10.14	90.59	56.9	90.59
	40	8.25	92.48	59	92.48
	41.5	6.18	94.55	60.5	94.55
RBKFL	43	5.25	95.48	62	95.48
	45.5	3.44	97.29	64.5	97.29
RTOB	49	0.48	100.25	68	100.25

R4-XSEC2	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	POOL	C	200	19.0	62.7	95.06	43.7	4.3	10.1	189.7	6.2	4.6
YR 1	POOL	C	200	19.0	62.0	95.48	43	4.8	9.0	204.7	6.8	4.7
YR 2	POOL	C	200	19.0	61.1	95.20	42.1	4.6	9.1	194.5	6.6	4.8
YR 3	POOL	C	200	19.0	62.0	95.48	43	5.5	7.9	234.8	7.8	4.7



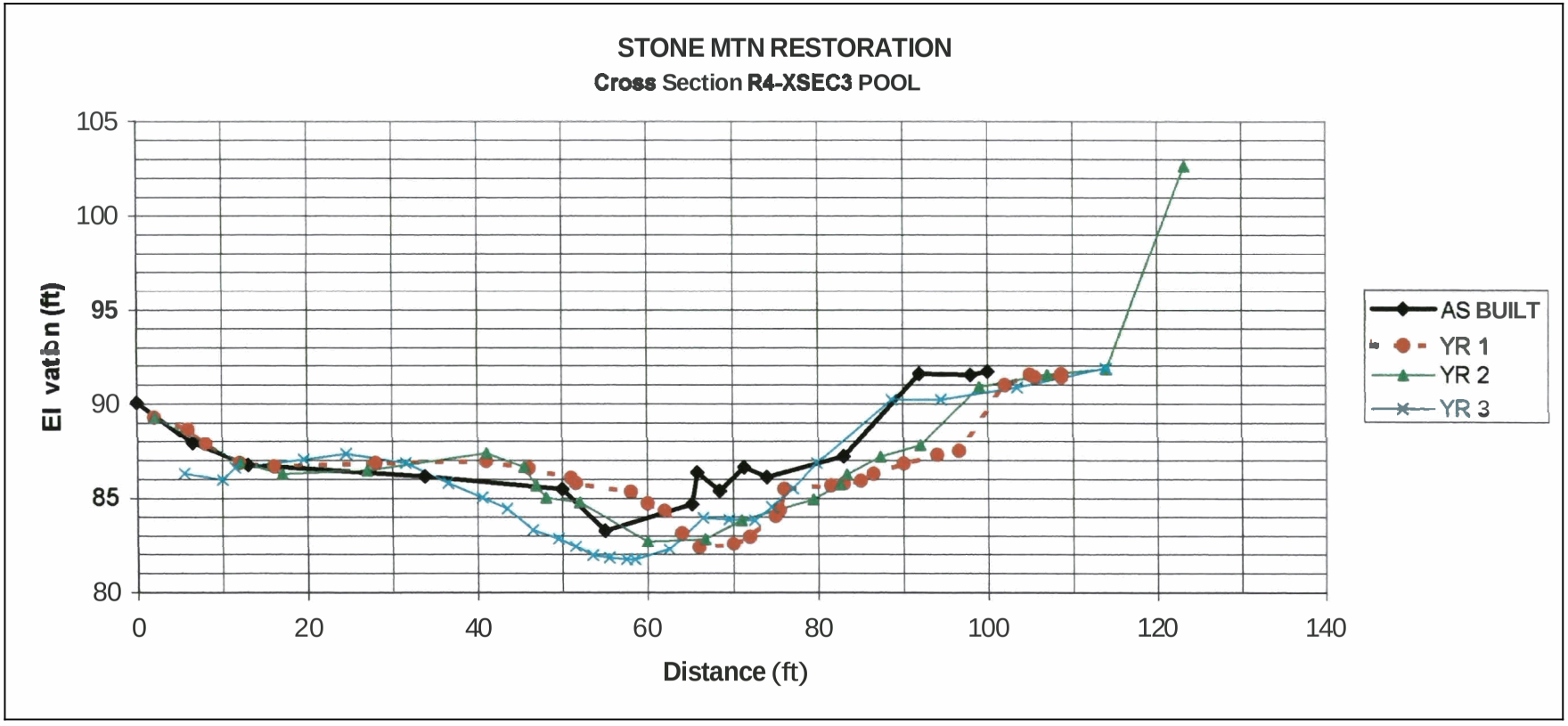
Cross Section R4-XSEC3 POOL

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

YEAR 3 (2003) **HI = 94.57**

	Survey Data			Adjusted Stations/Elev	
NOTES	STA	FS	ELEV	STA	ELEV
	0				
	4	6.39	88.18	5.5	86.32
	8.5	6.73	87.84	10	85.98
	10	6.08	88.49	11.5	86.63
	18	5.65	88.92	19.5	87.06
top bar	23	5.35	89.22	24.5	87.36
	30	5.83	88.74	31.5	86.88
	35	6.9	87.67	36.5	85.81
	39	7.66	86.91	40.5	85.05
lew	42	8.24	86.33	43.5	84.47
	45	9.36	85.21	46.5	83.35
	48	9.82	84.75	49.5	82.89
	50	10.25	84.32	51.5	82.46
	52	10.72	83.85	53.5	81.99
	54	10.86	83.71	55.5	81.85
	56	10.94	83.63	57.5	81.77
	57	10.94	83.63	58.5	81.77
	61	10.41	84.16	62.5	82.3
	65	8.72	85.85	66.5	83.99
	68	8.82	85.75	69.5	83.89
	71	8.86	85.71	72.5	83.85
rew	73	8.16	86.41	74.5	84.55
	75.5	7.17	87.4	77	85.54
	78.3	5.83	88.74	79.8	86.88
	87.2	2.45	92.12	88.7	90.26
	93	2.45	92.12	94.5	90.26
	102	1.82	92.75	103.5	90.89
rtop	112.5	0.8	93.77	114	91.91
rgrnd	112.5	0.86	93.71	114	91.85

R4-XSEC 3	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	POOL	C	200	6.5	92.0	87.92	85.5	2.8	31.0	235.9	4.6	2.3
YR 1	POOL	C	200	8.0	96.5	87.89	88.5	3.3	26.8	292.0	5.5	2.3
YR 2	POOL	C	200	6.0	92.0	87.82	86.0	3.1	28.1	263.2	5.1	2.3
YR 3	POOL	C	200	5.5	85.0	87.50	79.5	3.4	23.2	271.9	5.7	2.5



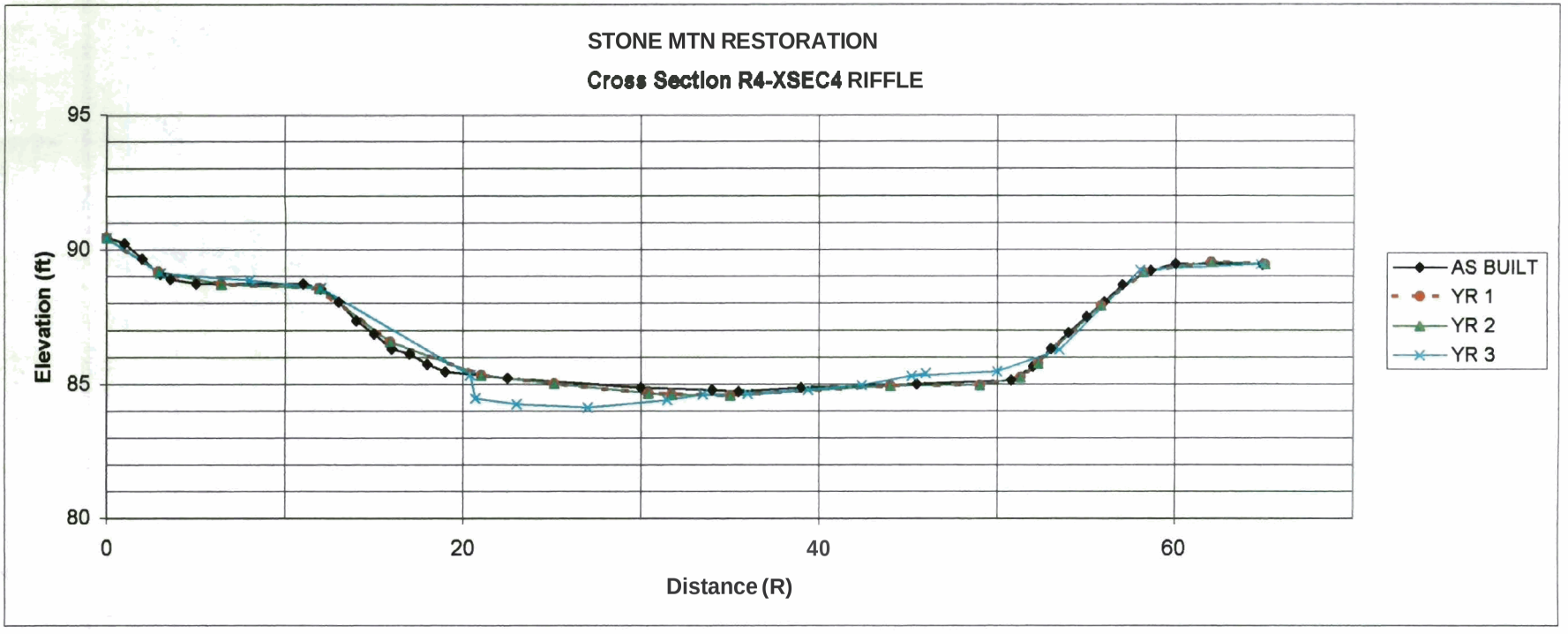
Cross Section R4-XSEC4 RIFFLE

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

YEAR 3 (2003) **HI = 94.63**

	Survey Data			ADJUSTED	ADJUSTED
NOTES	STA	FS	ELEV	STA	ELEV
ltop	0	3.78	90.85	0	90.45
	3	5.09	89.54	3	89.14
	8	5.36	89.27	8	88.87
	12	5.65	88.98	12	88.58
lfw	20.4	8.88	85.75	20.4	85.35
	20.7	9.73	84.9	20.7	84.5
	23	9.95	84.68	23	84.28
	27	10.07	84.56	27	84.16
	31.5	9.8	84.83	31.5	84.43
	33.5	9.59	85.04	33.5	84.64
	36	9.56	85.07	36	84.67
	39.4	9.42	85.21	39.4	84.81
	42.4	9.25	85.38	42.4	84.98
	46	8.8	85.83	46	85.43
	50	8.74	85.89	50	85.49
rew	45.2	8.91	85.72	45.2	85.32
	53.5	7.93	86.7	53.5	86.3
	58	4.97	89.66	58	89.26
rpin	64.8	4.77	89.86	64.8	89.46

R4-XSEC4	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	POOL	C	200	11.0	57.0	88.73	46.0	3.0	15.3	138.0	4.0	4.3
YR 1	POOL	C	200	11.9	58.0	88.73	46.1	3.1	15.0	141.8	4.1	4.3
YR 2	POOL	C	200	11.9	58.0	89.18	46.1	3.5	13.4	159.1	4.6	4.3
YR 3	POOL	C	200	12.0	58.0	89.26	46.0	3.8	12.0	176.0	5.1	4.3



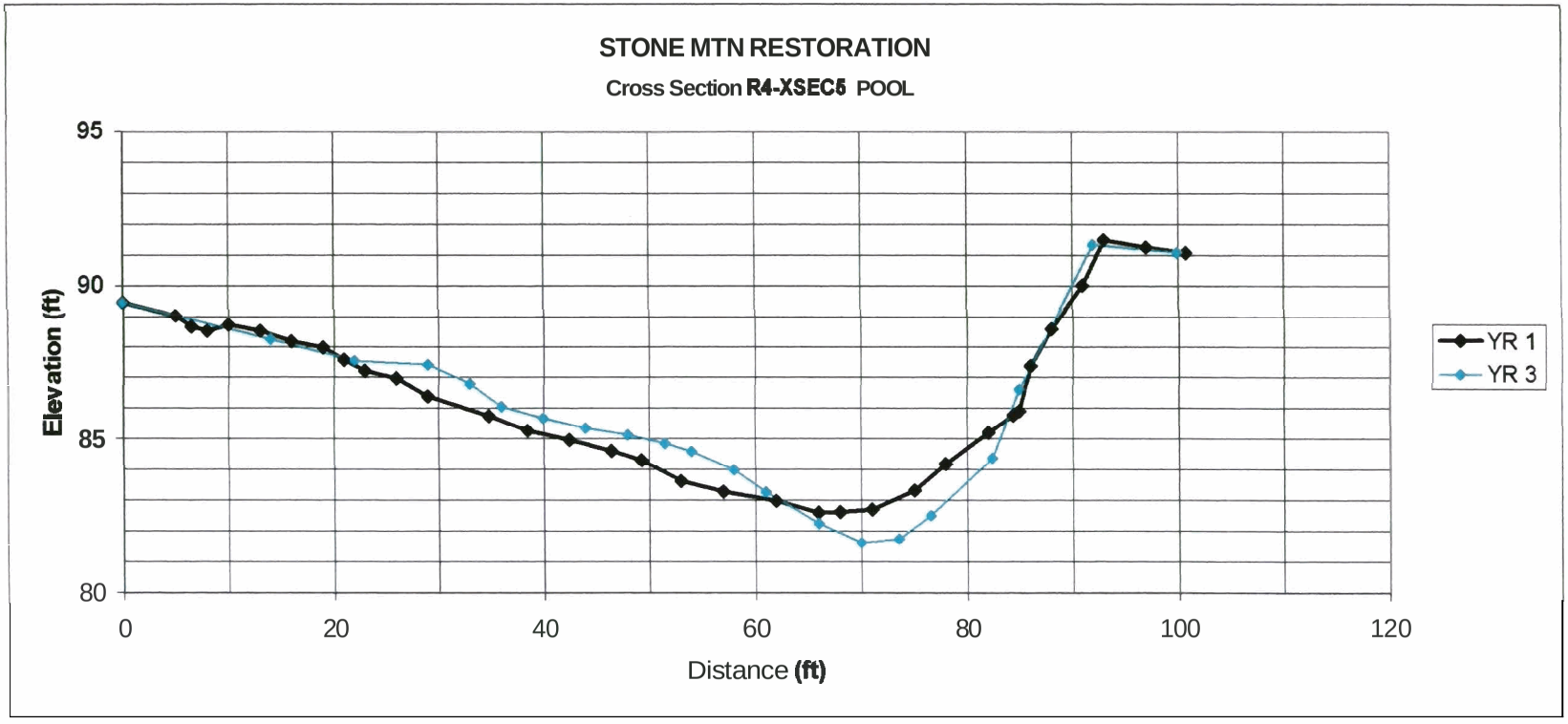
Cross Section R4-XSEC5 POOL

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

YEAR 3 (2003) **HI= 95.23**

	Survey Data			REVISED	REVISED
NOTES	STA	FS	ELEV	STA	ELEV
	0	7.56	87.67	0	89.45
	14	8.76	86.47	14	88.25
	22	9.45	85.78	22	87.56
	29	9.58	85.65	29	87.43
	33	10.21	85.02	33	86.80
	36	10.95	84.28	36	86.06
	40	11.33	83.9	40	85.68
	44	11.64	83.59	44	85.37
	48	11.86	83.37	48	85.15
	51.5	12.15	83.08	51.5	84.86
	54	12.41	82.82	54	84.60
	58	13.01	82.22	58	84.00
	61	13.72	81.51	61	83.29
	66	14.75	80.48	66	82.26
	70	15.37	79.86	70	81.64
	73.5	15.25	79.98	73.5	81.76
	76.5	14.49	80.74	76.5	82.52
rew	82.4	12.62	82.61	82.4	84.39
	85	10.39	84.84	85	86.62
rtob	92	5.65	89.58	92	91.36
tpin	100	5.92	89.31	100	91.09

R4-XSEC5	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	POOL	C	200	21.0	86.0	87.57	65.0	3.0	21.7	194.3	5.0	3.1
YR 3	POOL	C	200	22.0	85.0	87.56	63.0	3.5	18.0	223.0	5.9	3.2



Cross Section R4-XSEC 6 RIFFLE

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

YEAR 3 (2003) **HI = 95.23**

	Survey Data			ADJUSTEI	ADJUSTED
NOTES	STA	FS	ELEV	STA	ELEV
lpin	0	2.45	92.78	0	96.64
	5	2.68	92.55	5	96.41
ltob	8.5	3.4	91.83	8.5	95.69
	11.5	7.35	87.88	11.5	91.74
lew	13	9.44	85.79	13	89.65
	13.5	11.34	83.89	13.5	87.75
	16.5	11.47	83.76	16.5	87.62
	21	10.55	84.68	21	88.54
	24.6	10.19	85.04	24.6	88.9
	30.2	9.93	85.3	30.2	89.16
	36	9.54	85.69	36	89.55
	40	9.74	85.49	40	89.35
rew	41.8	9.62	85.61	41.8	89.47
	43	9	86.23	43	90.09
	48	7.45	87.78	48	91.64
rtob	53.7	4.59	90.64	53.7	94.5
	60	4.16	91.07	60	94.93
	64	4.15	91.08	64	94.94
	66.4	4.32	90.91	66.4	94.77

R4-XSEC6	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	WID	Abkf	Dmax	ER
YR 1	RIFFLE	C	200	8.0	54.3	94.90	46.3	4.4	10.4	205.9	6.0	4.3
YR2	RIFFLE	C	200	9.0	54.0	94.97	46.0	5.2	8.6	236.0	7.5	4.4
YR 3	RIFFLE	C	200	8.5	53.7	94.50	45.2	5.2	8.7	233.8	6.9	4.4

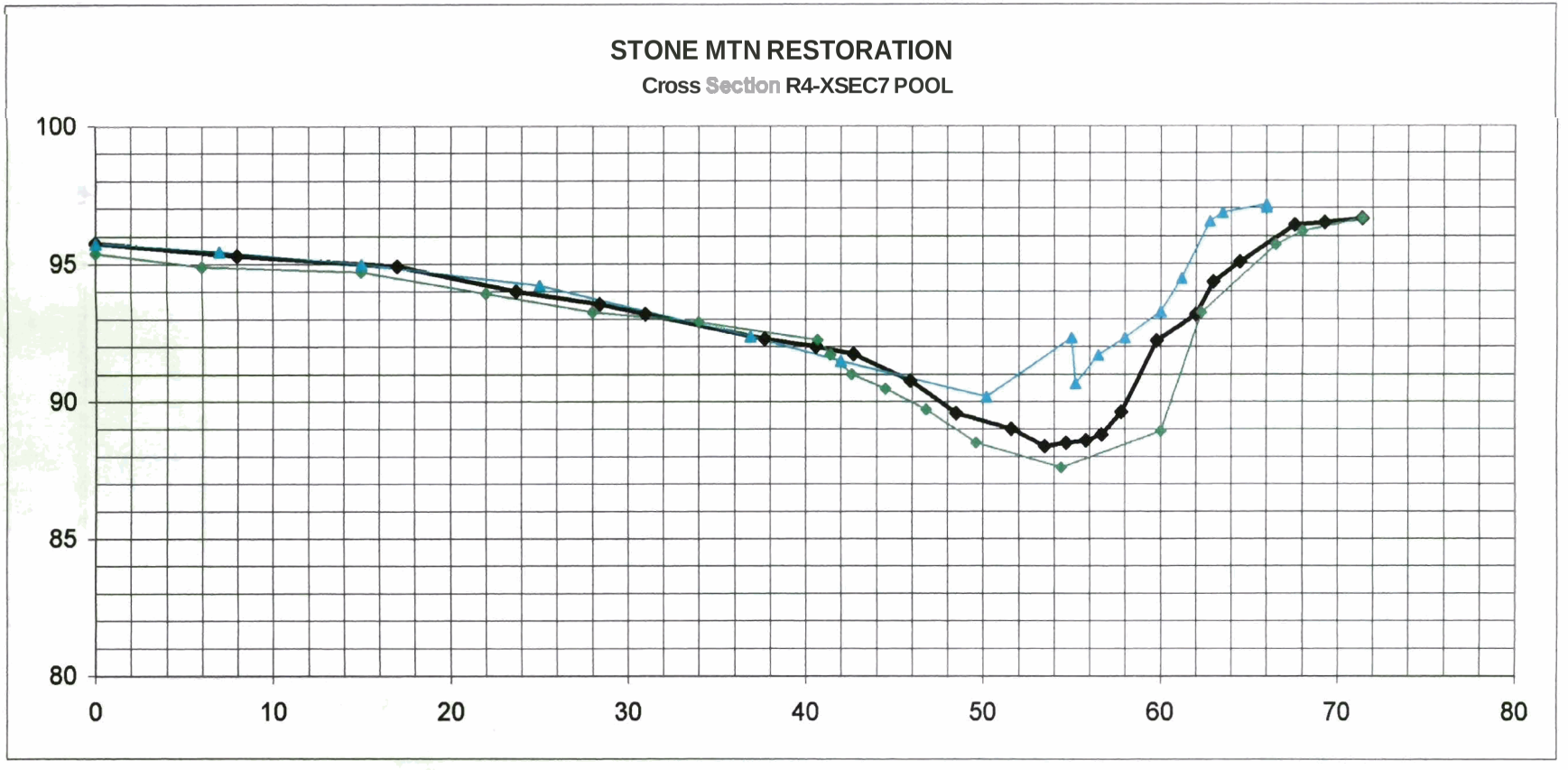
Cross Section R4-XSEC7 POOL

STONE MTN RESTORATION
Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

YEAR 3 (2003) **HI = 100**

	Survey Data			ADJUSTED	ADJUSTED
NOTES	STA	FS	ELEV	STA	ELEV
	0	3.49	96.51	0	95.75
	7	3.77	96.23	7	95.47
	15	4.23	95.77	15	95.01
	25	5	95	25	94.24
lew	36.9	6.86	93.14	36.9	92.38
	42	7.74	92.26	42	91.5
tw	50.2	9.04	90.96	50.2	90.2
ws	55	6.89	93.11	55	92.35
	55.2	8.56	91.44	55.2	90.68
	56.5	7.54	92.46	56.5	91.7
rew	58	6.9	93.1	58	92.34
	60	5.95	94.05	60	93.29
	61.2	4.75	95.25	61.2	94.49
	62.8	2.7	97.3	62.8	96.54
	63.5	2.39	97.61	63.5	96.85
tpiw	66	2.09	97.91	66	97.15
bpiw	66	2.19	97.81	66	97.05

R4-XSEC7	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	POOL	C	200	17.0	64.5	94.91	47.5	3.9	12.2	185.0	6.5	4.2
YR 2	POOL	C	200	15.0	66.5	94.72	51.5	4.3	12.1	219.4	7.1	3.9
YR 3	POOL	C	200	15.0	62.8	95.01	47.8	3.4	14.2	160.6	4.8	4.2



APPENDIX C

VEGETATION MONITORING DATA
YR 2003 SURVEY

Appendix C
Stone Mountain Vegetation Survey: Year 3
Survey Dates: 7-10-03

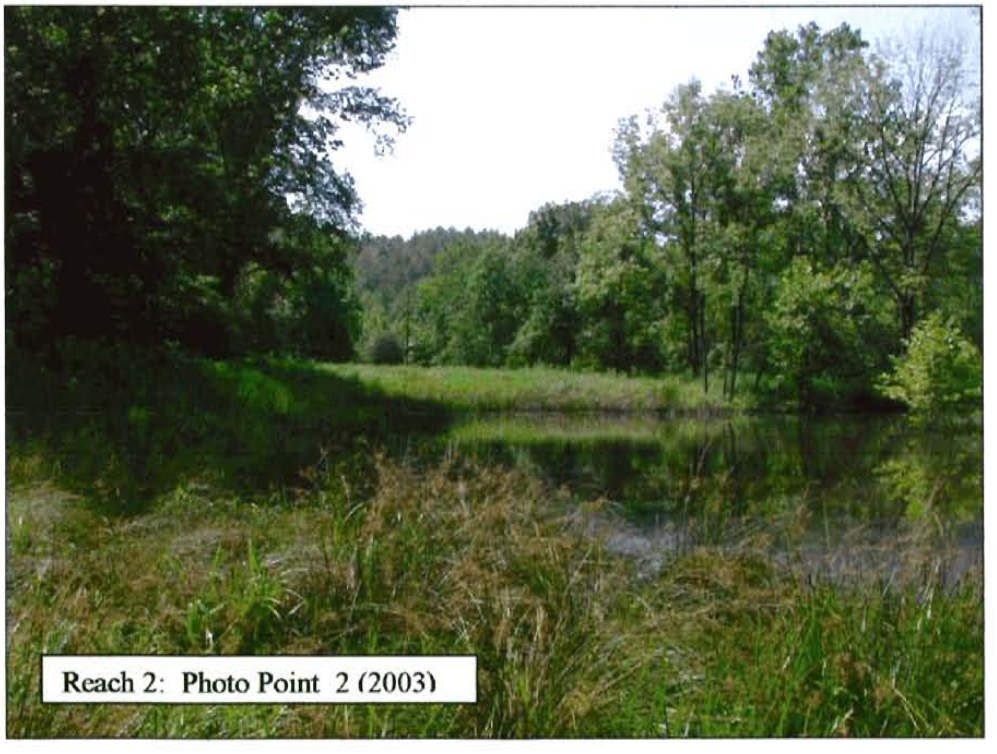
BARE ROOT PLOTS					
Reach	**Plot #**	**Live/Total Stems**	**% survivability**	**% Herbaceous Cover**	**Natural Regeneration** (Stems)
2	1	1/5	20	>90	44
4	2	20/20	100	>90	153
4	3	6/6	100	>90	94
4	4	6/6	100	>90	>300

LIVE STAKE PLOTS				
Reach	**Plot #**	**Live/Total Stems**	**% Survivability**	**Natural Regeneration** (Stems)
2	1	4/6	67	18
2	2	12/22	55	67
2	3	2/15	13	13
4	1	3/15	20	23
4	2	0/0	0	0
4	3	13/22	60	51
4	4	4/7	57	40
4	5	1/1	100	15

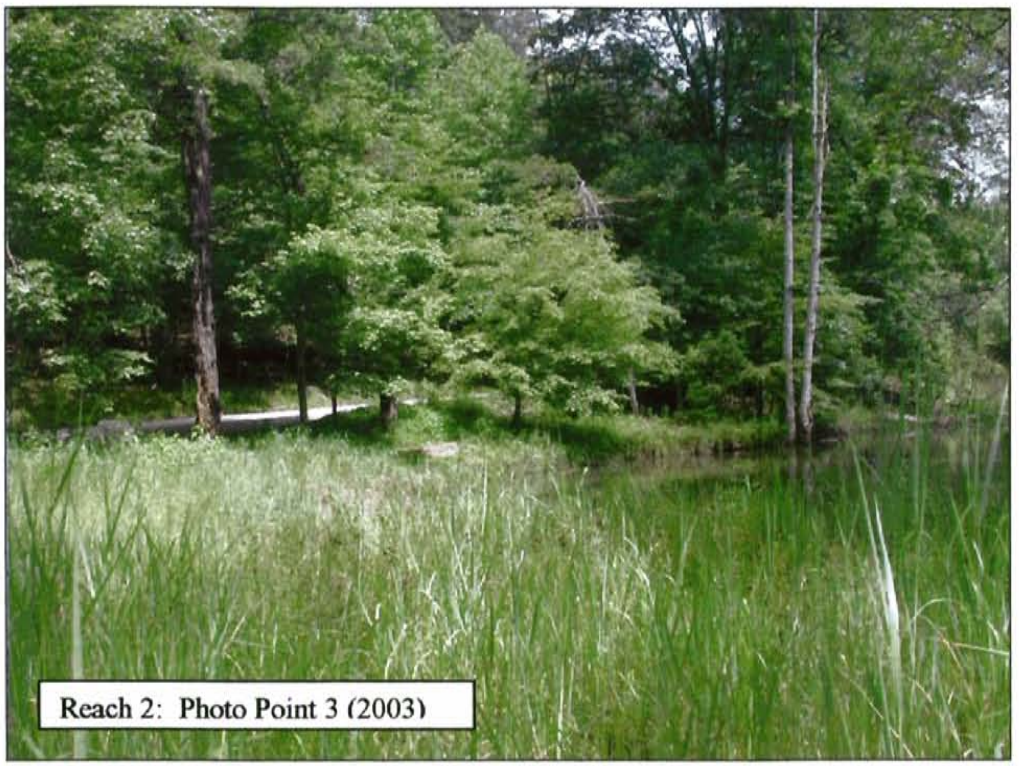
APPENDIX D

PHOTO REFERENCE POINTS
YR 2003 SURVEY

Reach 2: Photo Point 1 (2003)

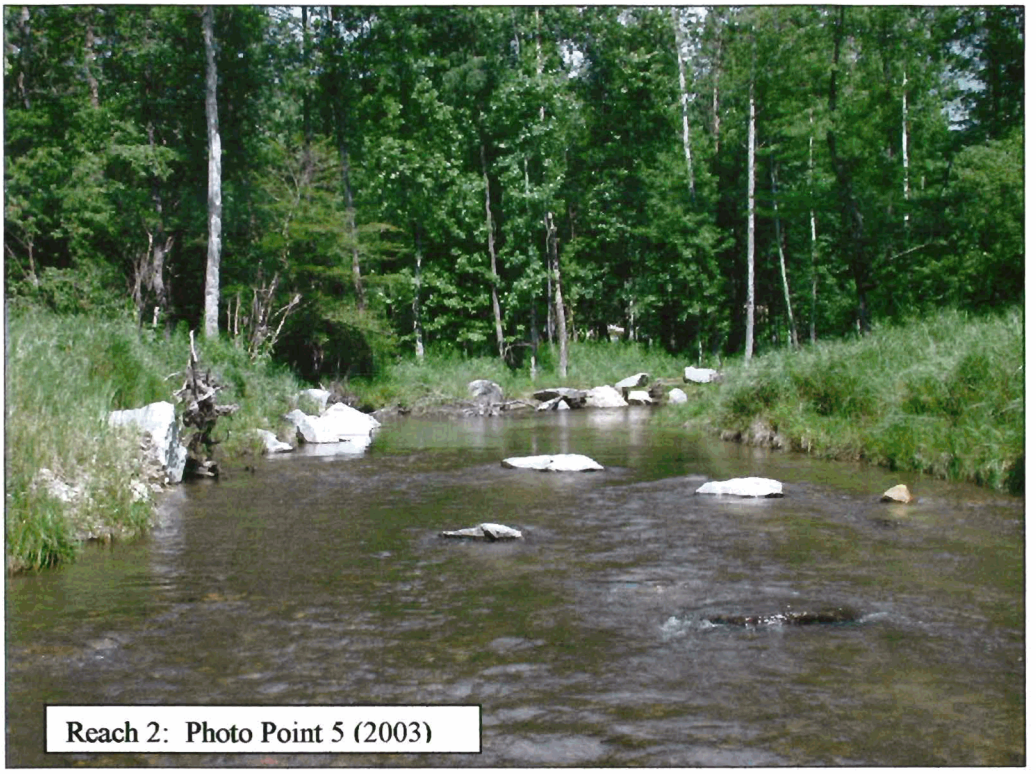


Reach 2: Photo Point 2 (2003)



Reach 2: Photo Point 3 (2003)

Reach 2: Photo Point 4 (2003)



Reach 2: Photo Point 5 (2003)

Reach 4: Photo Point 1 (2003)

Reach 4: Photo Point 2 (2003)

Reach 4: Photo Point 3 (2003)

Reach 4: Photo Point 4 (2003)

Reach 4: Photo Point 5 (2003)

Reach 4: Photo Point 6 (2003)