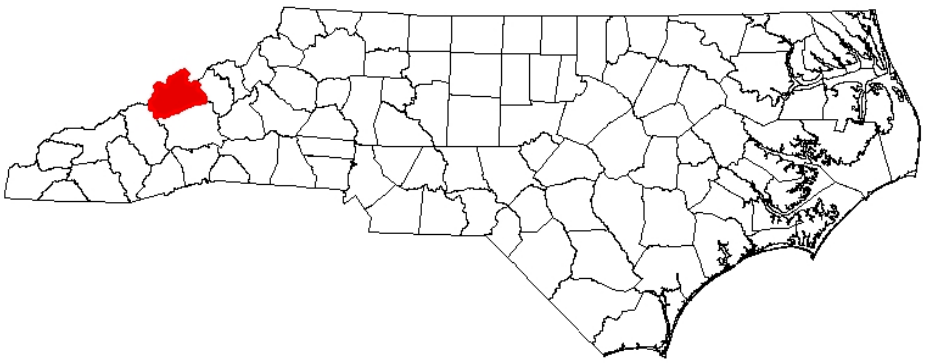
ANNUAL REPORT FOR 2004



Paint Fork Creek Stream Mitigation Site (Fosson Site)
Madison County
WBS Element 32573.4.1
TIP No. A-10WM

Prepared By:
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North Carolina Department of Transportation
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Summary

The following report summarizes the stream monitoring activities that have occurred during the Year 2004 at the Fosson Site in Madison County. This site was designed and constructed during 1999 by the North Carolina Wildlife Resources Commission (NCWRC). This report provides the monitoring results for the second formal year of monitoring (Year 2004); however, it is actually the fifth year since construction. Based on existing conditions, NCDOT does not anticipate any additional monitoring efforts at this time. The actual timeline for formal monitoring will be decided by the Mitigation Review Team.

Based on the overall conclusions of monitoring along Paint Fork Creek and its associated tributaries, the Fosson Site has met the required monitoring protocols for the second formal year of monitoring. Localized areas of active bank scour and erosion exist; however, immediate stabilization is not warranted at this time and is not anticipated in the near future.

Based on information obtained from the USGS, the Fosson Site has met the required hydrologic monitoring protocols and vegetative success criteria. No biological sampling was conducted as part of this monitoring project. It is unknown whether or not this sampling will be conducted as part of overall monitoring activities.

NCDOT anticipates that the year 2004 formal monitoring efforts will close out all monitoring requirements on this site. All of the required protocols have been achieved and no supplemental corrective-action work is needed at this time.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2004 at the Fosson Site. The site is situated immediately south and adjacent to Paint Fork Road (SR 1530) in the southeastern portion of Madison County (Figure 1). It is approximately 3.0 miles (4.5 kilometers) east-southeast of Mars Hill and nearly 14 miles (22.4 kilometers) north of Asheville. The Fosson Site was constructed as one of four projects to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number A-10 in Madison County.

The mitigation project covers approximately 1,700 linear feet along the left bank (facing downstream) of Paint Fork Creek and one of its unnamed tributaries. Design and construction was implemented during 1999 by the North Carolina Wildlife Resources Commission (NCWRC). Stream restoration involved the installation of rootwads and rock vanes and sloping the adjacent streambanks to reduce overall erosion. It also included the installation of native vegetation.

1.2 Purpose

According to the as-built report (NCWRC, 2000), the objectives for this mitigation site were to improve water quality, riparian quality and stability, and fisheries habitat associated with Paint Fork Creek and one of its unnamed tributaries. The following specific objectives were proposed:

- Increase of the overall floodplain areas associated with Paint Fork Creek and its unnamed tributary;
- Reducing slopes along the southern streambanks of Paint Fork Creek and introducing vegetation to resist the effects of flooding;
- Installation of rootwads and/or vanes to alleviate active erosion and increase fisheries habitat;
- Planting of native trees, shrubs, and ground cover that will help to stabilize the stream banks, establish shade, and provide wildlife cover and food.

Successful stream mitigation is demonstrated by a stable channel that does not aggrade or degrade over time. It is also demonstrated by reduced erosion rates, the permanent establishment of native vegetation, and bed features consistent with the design stream type. Vegetation survival is based on federal guidelines denoting success criteria for wetland mitigation. Results of stream monitoring conducted during the 2004 growing season at the Fosson Site are included in this report.

Activities in 2004 reflect the second formal year of monitoring following the restoration efforts; however, it is the fifth year since construction. Included in this report are analyses on stability (primarily the longitudinal profile and cross sections), vegetative monitoring results, and site photographs.

1.3 Project History

The effort to provide stream mitigation for TIP No. A-10 began in 1996 with a Memorandum of Agreement (MOA) between the North Carolina Department of Transportation (NCDOT) with the NCWRC. The MOA was to provide 25,000 feet of mitigation for 9,990 feet of jurisdictional stream impacts. Subsequent amendments to the MOA were made to provide mitigation for additional stream impacts from TIP No. A-10. These amendments resulted in a total mitigation of over 26,000 feet.

The NCDOT worked with representatives from the NCWRC, U.S. Army Corps of Engineers, North Carolina Division of Water Quality, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Natural Resources Conservation Service and Madison County Soil and Water Conservation District on a Mitigation Review Team. The purpose of the team was to develop criteria and policies for selecting stream reaches for mitigation.

The Fosson Site was one of the sites selected by the Mitigation Review Team to provide compensatory mitigation for TIP No. A-10. The mitigation plan for this mitigation site was developed during 1998 and approved by the team. The NCWRC implemented the project in 1999.

September 1999	Construction Completed.
September 1999	Site Planted with Native Perennial Seed Mix
December 2000	NCWRC Planted Live Stakes and Bare Rooted Trees
March – July 2003	Stream Channel Monitoring (1 yr.)
March – July 2003	Vegetation Monitoring (1 yr.)
May 2004	Stream Channel Monitoring (2 yr.)
May 2004	Vegetation Monitoring (2 yr.)

1.4 Debit Ledger

The entire Fosson Site was used for TIP No. A-10 to compensate for unavoidable stream impacts related with roadway construction. This project generated 1,700 linear feet of stream credits.

2.0 STREAM ASSESSMENT

2.1 Success Criteria

The success criterion, as defined by the Mitigation Site Monitoring Protocol for the NCWRC/NCDOT Mitigation Program (2003), evaluates channel stability and improvements to fish habitat. Specifically, this evaluation includes all or a combination of the following parameters: channel stability, erosion control, seeding, woody vegetation, and overall response of fish and invertebrate populations for stream mitigation projects. This is to be accomplished using photo reference sites, stream dimension and profile, survival of planted vegetation, and direct sampling of important populations. The chart provided below further details the criteria used to evaluate success or failure at these mitigation sites.

NCWRC/ NCDOT Mitigation Monitoring Criteria

Measurement	Success (requires no action)	Failure	Action
Photo Reference Sites			
Longitudinal Photos Lateral Photos	No significant* aggradation, degradation, or erosion	Significant* aggradation, degradation, or erosion	When significant* aggradation, degradation or erosion occurs, remedial actions will be undertaken.
Channel Stability			
Cross-Sections Longitudinal Profiles Pebble Counts	Minimal evidence of instability (down-cutting, deposition, erosion, decrease in particle size)	Significant* evidence of instability	When significant* evidence of instability occurs, remedial actions will be undertaken.
Plant Survival			
Survival Plots	≥75% coverage in Photo Plots	<75% coverage in Photo Plots	Areas of less than 75% coverage will be re-seeded and/or fertilized, live stakes and bare-rooted trees will be replanted to achieve >80% survival.
Stake Counts	≥80% survival of stakes, 4/m2	<80% survival of stakes, 4/m2
Tree Counts	≥80% survival of bare-rooted trees	<80% survival of bare-rooted trees
Biological Indicators (only used for projects with potential to make watershed level changes)			
Invertebrate Pop. Fish Populations	Population measures remain to same or improve	Population measures indicate a negative trend	Reasons for failure will be evaluted and remedial action plans developed and implemented.
Overall success or failure will be based on success of 3 of the 4 criteria.			

*Significance or subjective determinations of success will be determined by a majority decision of the Mitigation Review Team

Federal guidelines for stream mitigation are relatively consistent with those protocols established by the NCWRC and NCDOT. These guidelines include the following main parameters: no less than two bankfull events for the five-year monitoring period, reference photos, plant survivability analyses, channel stability analyses, and biological data if specifically required by permit conditions (USACE, 2003). This report addresses all of the above mentioned parameters for both the NCWRC/NCDOT protocols and federal guidelines aside from shading and biological data, which was not required at this site.

Natural streams are dynamic systems that are in a constant state of change. Longitudinal profile and cross section surveys will differ from year to year based on changes in the watershed. Natural channel stability is achieved by allowing the stream to develop a proper dimension, pattern, and profile such that, over time, channel features are maintained and the stream system neither aggrades nor degrades. A stable stream consistently transports its sediment load, both in size and type, associated with local deposition and scour. Channel instability occurs when the scouring process leads to degradation, or excessive sediment deposition results in aggradation (Rosgen, 1996). The following surveys were conducted in support of the monitoring assessment:

- Longitudinal Profile Survey. This survey addressed the overall slope of the reach, as well as slopes between bed features. The bed features are secondary delineative

criteria describing channel configuration in terms of riffle/pools, rapids, step/pools, cascades and convergence/divergence features which are inferred from channel plan form and gradient. The surveys are compared on a yearly basis to note and/or compare aggradation, degradation, head cuts, and areas of mass wasting. The longitudinal profile is expected to change from year to year. Significant changes may require additional monitoring.

- Cross Section Surveys. These surveys addressed the following characteristics at various locations along the reach: entrenchment ratio, width/depth ratio, and dominant channel materials. The entrenchment ratio is a computed index value used to describe the degree of vertical containment. The width/depth ratio is an index value which indicates the shape of the channel cross section. The dominant channel materials refer to a selected size index value, the D_{50}, representing the most prevalent of one of six channel material types or size categories, as determined from a channel material size distribution index.

2.2 Stream Description

2.2.1 Pre-Construction Conditions

The Paint Fork Creek at the Fosson Site classified as a C4b stream type according to the Rosgen Classification of Natural Rivers. This was subsequently based on the low sinuosity, entrenchment, width/depth ratio, and substrate type. Sinuosity was low as compared with other C stream types (NCWRC, 2000). The unnamed tributary (UT) was characteristic of a B stream-type that had degraded into a G stream-type. The conditions of both channels have been strongly influenced by previous channelization and agriculture processes at both the site and throughout the watershed.

The main channel was eroding along most of this reach due to the presence of a berm along the north bank and row cropping on the south bank. The row cropping had limited the width of riparian vegetation between the field and the stream. Deep-water habitat was rare with few pools present. Bedrock was one of the contributing factors. Two locations were noted along the reach whereby the bedrock was causing additional erosion (NCWRC,2000).

2.2.2 Post-Construction Conditions

The mitigation of Paint Fork Creek and its unnamed tributary involved the construction of j-hook vanes, rock vanes, rootwad revetments, and additional bank sloping. Coir logs were used to further define and stabilize the streambanks. Throughout the entire reach the inner berm was maintained, enhanced, or created as channel modifications were made. Unfortunately, the adjoining landowner along the right streambank withdrew from the program after designs and recommendations were made. The landowner did eventually carry out the recommended work. A conservation easement was ultimately established along the left streambank.

2.2.3 Monitoring Conditions

Paint Fork Creek was initially classified as a C4b stream type according to the Rosgen Classification of Natural Rivers. A total of six cross sections (five along Paint Fork Creek and one along its tributary) were surveyed. A comparison of channel morphology is presented in Table 1. Channel stationing is provided on Figure 2.

Table 1. Abbreviated Morphological Summary (Fosson Site)

Variable		Paint Fork Creek - Main Channel (Combined Cross Sections #1 Thru #5)						
		Pre-Const.*	As-Built*	2000**	2001**	2002**	2003	2004
Drainage Area (mi^2)		12.9	12.9	12.9	12.9	12.9	12.9	12.9
Bankfull Width (ft)	Mean	-	-				20.3	22.2
Bankfull Mean Depth (ft)	Mean	-	-				1.38	1.74
Width/Depth Ratio	Mean	-	-				15	13.2
Bankfull Cross Sectional Area (ft^2)	Mean	-	-				27.8	37.5
Maximum Bankfull Depth (ft)	Mean	-	-				2.2	2.6
Width of Floodprone Area (ft)	Mean	-	-				158.4	158.4
Entrenchment Ratio	Mean	-	-				5.16	5.16
Slope		0.007	-				0.007	0.007
Particle Sizes (Riffle Sections)								
D_{16} (mm)		-	-				0.115	<0.0062
D_{35} (mm)		-	-				1.41	0.18
D_{50} (mm)		16.0	-				25.6	1.3
D_{84} (mm)		-	-				114	90
D_{95} (mm)		-	-				304	664

* According to the NCWRC, comparisons of pre-construction, as-built, and monitoring data are not valid due to intangible factors. Monitoring data for subsequent years should be used as the basis of comparison.
** No data available.

2.3 Results of the Stream Assessment

2.3.1 Site Data

The assessment included the re-survey of six cross sections of the two streams and the longitudinal profile of Paint Fork Creek established by the NCWRC after construction. The length of the profile along Paint Fork Creek was approximately 1,000 linear feet. The profile associated with the UT was not surveyed. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The locations of the cross sections and longitudinal profiles are shown in Appendix A.

- Cross Section #1. Paint Fork Creek, Station 9+31, midpoint of run
- Cross Section #2. Paint Fork Creek, Station 7+75, midpoint of run
- Cross Section #3. Paint Fork Creek, Station 5+64, midpoint of run
- Cross Section #4. Paint Fork Creek, Station 4+49, end of riffle
- Cross Section #5. Paint Fork Creek, Station 2+67, midpoint of run

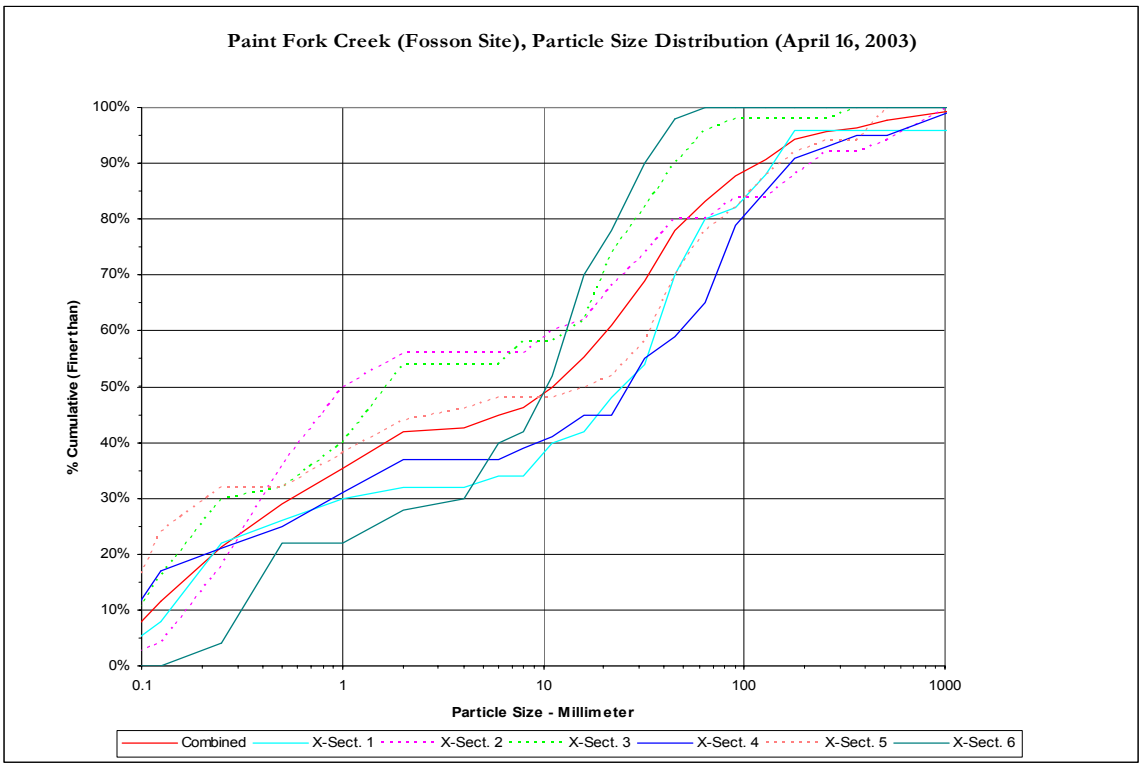
- Cross Section #6. Unnamed Tributary, approximately 100 feet upstream on confluence, midpoint of riffle

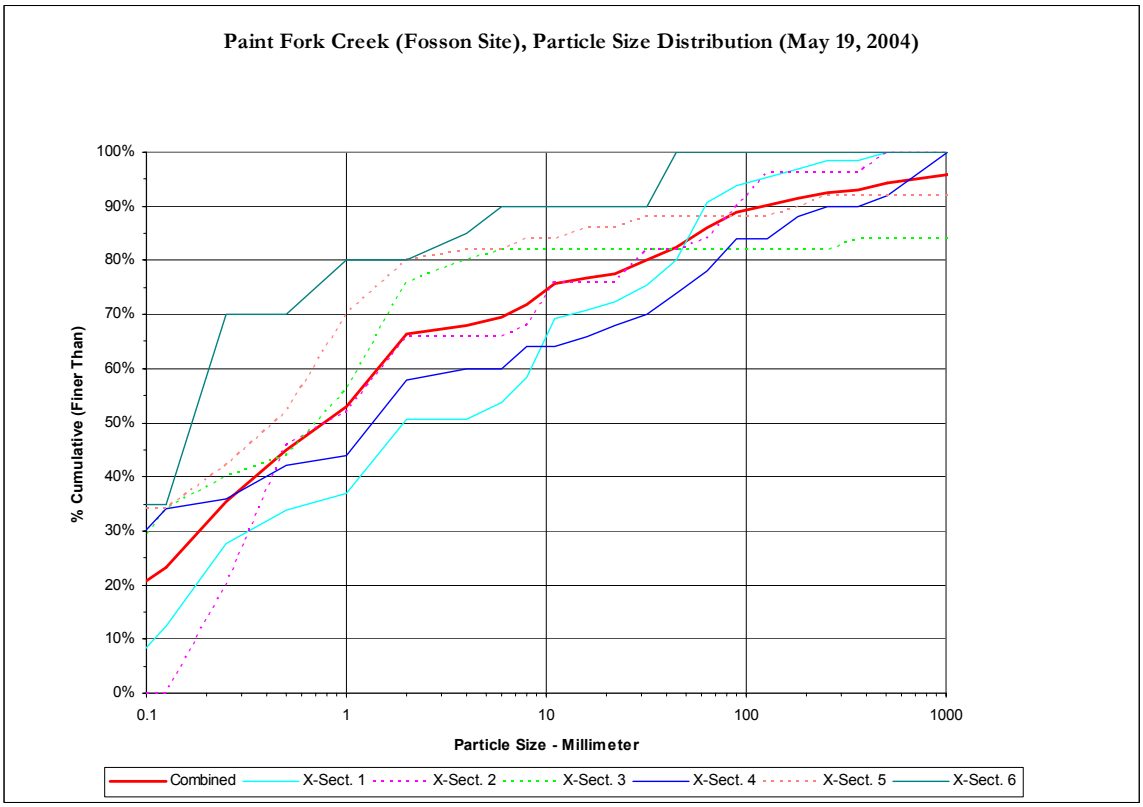
All six cross sections have remained intact based on comparisons with as-built data, Year 2003 data, and visual observations. Several benchmarks and existing stakes associated with the as-built surveys were not found; therefore exact data comparisons were not feasible. Based on the comparison of cross section survey results with the as-built sections, Year 2003 data, and Year 2004 data, all six cross sections appear stable. Survey data will vary depending on actual location of rod placement and alignment; however, this information should remain similar in overall appearance. The cross section comparison is presented in Appendix B.

Pebble counts were taken at each cross section as a means to determine the extent of change in bed material during the monitoring period. However, only pebble counts taken at riffle sections will be utilized to classify the stream. No existing data was available Paint Fork Creek or its tributary. The pebble counts taken during the Year 2003 monitoring period noted that the D_{50} (50 percent of the sampled population is equal to or finer than the representative particle diameter) for the riffle sections of Paint Fork Creek and its tributary was approximately 25.6 mm and 10.3 mm, respectively, which is indicative of a gravel-bed stream.

The Year 2004 pebble counts for the riffle sections of Paint Fork Creek and its tributary indicated a D_{50} of approximately 1.3 mm and 0.2, respectively, which is characteristic of a sand-bed stream. Since no active erosion was observed on site, the increase in accumulation of finer material from 2003 to 2004 may be attributed to watershed problems outside and upstream of the Fosson Site. It could also be a result of increased streamflow associated with 2003. Approximately 10 bankfull events were documented in 2003, however in 2004 only two bankfull events have been documented (USGS, 2004). The increased streamflow in 2003 could have distributed the finer material either on the floodplain or farther downstream, thus resulting in a higher D_{50} in 2003 than in 2004.

Two charts depicting the particle size distributions for Paint Fork Creek and its tributary for the Years 2003 and 2004, respectively, are presented below.


Paint Fork Creek (Fosson Site), Particle Size Distribution (April 16, 2003)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Cumulative (Finer than)
0.1
1
10
100
1000
Particle Size - Millimeter
Combined
X-Sect. 1
X-Sect. 2
X-Sect. 3
X-Sect. 4
X-Sect. 5
X-Sect. 6


Paint Fork Creek (Fosson Site), Particle Size Distribution (May 19, 2004)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Cumulative (Finer Than)
0.1
1
10
100
1000
Particle Size - Millimeter
Combined
X-Sect. 1
X-Sect. 2
X-Sect. 3
X-Sect. 4
X-Sect. 5
X-Sect. 6

A longitudinal profile survey was conducted on the predetermined segment of Paint Fork Creek. Bank stability was assessed during the cross section and longitudinal profile surveys. Several areas of active scouring were observed in 2003. These areas were re-assessed in 2004. Descriptions and evaluations of these areas are as follows:

Paint Fork Creek (Main Stem)

- Station 2+72. Active scouring was noted around the rootwad on the left bank (facing downstream) in 2003. The scour did not appear to be compromising the structure. The establishment of vegetation has stabilized this area in 2004.
- Station 4+19. A small center bar was observed during low flow conditions in 2003; however, no active erosion was noted along the adjacent stream banks. The small center bar was observed again in 2004 and the adjacent stream banks have remained stable.
- Station 5+03. Active erosion was noted along both stream banks at the bedrock seam crossing the channel in 2003. The establishment of vegetation has stabilized this area in 2004.

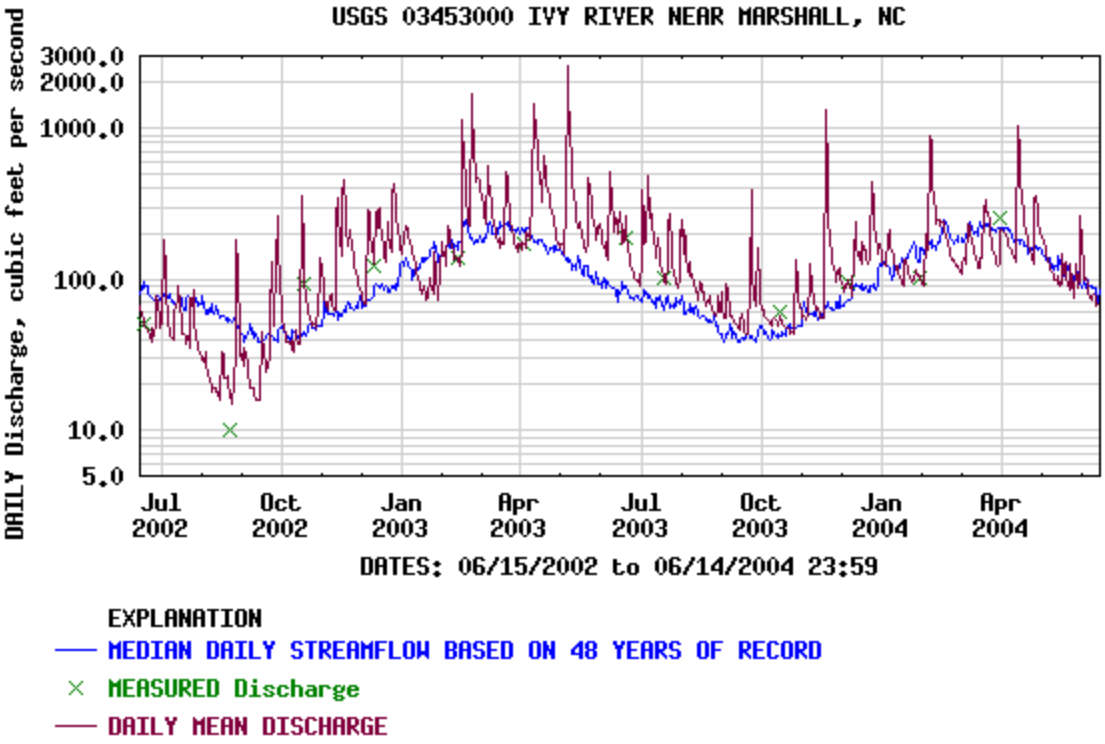
UT to Paint Fork Creek

- Cross Section #6. Deposition was noted along channel in 2003. The banks have remained stable in 2004.

2.3.2 Climatic Data

Monitoring requirements state that at least two bankfull events must be documented through the five-year monitoring period. No surface water gages exist on Paint Fork Creek or its tributaries. A review of known U.S. Geological Survey (USGS) surface water gages identified two gages within 10 miles (16 kilometers) of the mitigation site: one along the French Broad River approximately one mile downstream of Marshall and one along the Ivy River at the US 25/70 crossing between Marshall and Weaverville, immediately northwest of the Madison and Buncombe County boundary.

The Ivy River gage was utilized for this report since it is downstream and part of the overall watershed of Paint Fork Creek. It was also the smaller of the two gages (158 square-mile drainage area as compared to the 1,332 square-mile drainage area associated with the French Broad). The Ivy River gage more accurately reflects hydrology and precipitation in the project area. It is situated in USGS Hydrologic Unit 06010105. Datum of the gage is 1,700.41 feet above sea level NGVD29. Based on the drainage area associated with the gage, the correlated bankfull discharge according to the NC Rural Mountain Regional Curves (USACE, 2003) is between 450 and 500 cubic feet per second (cfs). A review of peak flows was conducted for the period between June 2002 and June 2004. According to the graph, there were 13 bankfull events occurring during this period, with 10 of the events happening in 2003. Approximately six of these events over the two year period exceeded 1,000 cfs, well above the bankfull discharge. The USGS graph depicting these peak flows is presented below.



2.4 Conclusions

Paint Fork Creek and its tributary remain stable. Small, isolated areas of degradation existed along the two reaches in 2003; however, these areas have stabilized with the increased establishment of vegetation in 2004.

All six of the cross sections along Paint Fork Creek and its tributary remain stable. However, the two streams have exhibited a change in the composition of bed material from gravel-bed in 2003 to sand-bed in 2004. This could be explained by disturbance upstream of the Fosson site or the numerous bankfull events in 2003.

Based on information obtained from the USGS, the Fosson Site has met the required monitoring protocols for hydrology. No supplemental work is proposed at this time.

3.0 VEGETATION

3.1 Success Criteria

The NCDOT has monitored the Paint Fork Creek Site for the first five years since construction. A 320 stems per acre survival criterion for planted seedlings was used to determine success for the first three years. The required survival criterion decreases by 10 percent per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20 percent of the total number of plants of all species planted.

3.2 Description of Species

According to the As-Built Report for the Fosson Mitigation Site, Paint Fork Creek, Madison County (2000), the following species were planted along the streambanks:

Live Stakes

Black willow (*Salix nigra*)
Silky willow (*Salix sericea*)
Silky dogwood (*Cornus amomum*)

Bare Rooted Trees

Black willow (*Salix nigra*)
Red-osier dogwood (*Cornus stonoifera*)
Willow oak (*Quercus phellos*)
River birch (*Betula nigra*)
Black walnut (*Juglans nigra*)
Elderberry (*Sambucus canadensis*)
Green ash (*Fraxinus pennsylvanica*)

Permanent Seeding Mix

Sensitive fern (*Onoclea sensibilis*)
Joe pye weed (*Eupatorium fistulosa*)
Swamp milkweed (*Asclepias incarnata*)
Eastern gamagrass (*Tripascum dactyloides*)
Creeping spikerush (*Eleocharis palustris*)
Green bulrush (*Scirpus atrovirens*)
Hop sedge (*Carex lupilina*)
Rice cut grass (*Leersia oryzoides*)
Soft rush (*Juncus effusus*)
Softstem bulrush (*Scirpus validus*)
Three square spikerush (*Scirpus americanus*)
Virginia wild rye (*Elymus virginicus*)
Woolgrass (*Scirpus cyperinus*)
Deertongue (*Panicum clandestinum*)
Button bush (*Cephalanthus occidentalis*)
Elderberry (*Sambucus canadensis*)
Red chokeberry (*Aronia arbutifolia*)
Silky dogwood (*Cornus amomum*)
Winterberry (*Ilex verticillata*)
Blackgum (*Nyssa sylvatica*)
Green ash (*Fraxinus pennsylvanica*)
Red maple (*Acer rubrum*)
Pin oak (*Quercus palustris*)
Black cherry (*Prunus serotina*)
Silver maple (*Acer saccharium*)

3.3 Plot Descriptions

Several vegetation plots were installed by the NCWRC during and immediately after construction. Since these plots were not staked and information regarding species was not available, eight new plots were randomly established along the left streambanks and floodplain within the project area. No plots were established on the right streambank due to the narrow riparian buffer. These eight plots included two large 1,000 square-foot areas along the left bank of Paint Fork Creek; Tree Plot A downstream of Point F7 on As-Built schematic presented in Appendix A and Tree Plot B near Point F4. The remaining six plots were one-meter square plots (12.1 square feet). Stakes were placed at all four edges of the 1,000 square-foot plots and at the two opposing edges of the 12.1 square-foot plots. These stakes were flagged and labeled for future identification. Vegetation (trees) within the two 1,000 square-foot plots were flagged, tagged, and numbered. The vegetation associated with the 12.1 square-foot plots were only flagged. Due to the narrow riparian area and ease of access, the locations of these plots were not surveyed.

Tree Plot A is oriented in an east-west direction between Cross Sections #4 and #5 along the left streambank. Silky dogwood, river birch, and elderberry are the dominant woody

species within the plot. Section 3.4 provides numerical counts for species found within Tree Plots A and B, as well as the six small plots.

Tree Plot B is also situated along the left streambank, between Cross Sections #2 and #3. It is oriented in an east-west direction. Dominant woody species observed were silky dogwood, willow oak, river birch, elderberry, and green ash.

3.4 Results of Vegetation Monitoring

Vegetation Monitoring Statistics, by Plot

Plot No. (Type)	Black Willow	Silky Willow	Silky Dogwood	Red-osier Dogwood	Willow Oak	River Birch	Black Walnut	Elderberry	Green Ash	Red Maple	Total 2003 (Year 1)	Total 2004 (Year 2)	Total 2005 (Year 3)	Total 2006 (Year 4)	Total 2007 (Year 5)	Total (at planting)	Density (Trees/Acre)
Plot A (50'x20')			15			2		16			34	33				34	1,437
Plot B (50'x20')			6		3	2		6	1		22	18				22	784
											AVERAGE DENSITY (2004)						**1,110**

Vegetation Monitoring Statistics, by Plot

Plot No. (Type)	Black Willow	Silky Willow	Silky Dogwood	Red-osier Dogwood	Willow Oak	River Birch	Black Walnut	Elderberry	Green Ash	Red Maple	Total 2003 (Year 1)	Total 2004 (Year 2)	Total 2005 (Year 3)	Total 2006 (Year 4)	Total 2007 (Year 5)	Total (at planting)	Density (Trees/Acre)
Plot 1 (1 meter grid)	1		1								2	2				2	7,200
Plot 2 (1 meter grid)											0	0				0	0
Plot 3 (1 meter grid)			1								1	1				1	3,600
Plot 4 (1 meter grid)											0	0				0	0
Plot 5 (1 meter grid)											0	0				0	0
Plot 6 (1 meter grid)											0	0				0	0
											AVERAGE DENSITY (2004)						**1,800**

Site Notes:

Vegetation plots were established during the first year of monitoring. Several plots were installed during construction; however, these plots could not be located. Canary grass (*Phalaris* sp.) dominates the herbaceous stratum at the site, especially along Paint Fork Creek. This species is considered to be invasive; however, it provides excellent ground cover and rooting stability during the growing season. Specific notes regarding each plot are presented below.

Tree Plot A. Eight volunteer black locusts (*Robinia* sp.) were observed in the plot. Herbaceous species included canary grass, Japanese knotweed (*Fallopia japonica*), blackberry (*Rubus* sp.), vetch (*Vicia* sp.), goldenrod (*Solidago* sp.), plantain (*Plantago* sp.), onion (*Allium* sp.), and henbit (*Lamium* sp.) in 2004.

Tree Plot B. No woody volunteers were observed. Herbaceous species included canary grass, Japanese knotweed, blackberry, plantain, henbit, and chickweed (*Stellaria* sp.) in 2004.

Plot 1. Four silky dogwoods, three river birch, two black willows, and one willow oak were observed within five feet of the plot. Fescue (*Festuca* sp.), jewelweed (*Impatiens capensis*), goldenrod, and dock (*Rumex* sp.) were observed in and immediately adjacent to the vegetation plot.

Plot 2. One green ash and two elderberry were observed within five feet of the plot. Canary grass and blackberry were observed in and immediately adjacent to the vegetation plot.

Plot 3. Three silky dogwoods, two green ash, and one black willow were observed within five feet of the plot. Fescue, onion, and goldenrod were observed in and immediately adjacent to the vegetation plot.

Plot 4. Canary grass was observed in and immediately adjacent to the plot. One silky dogwood and one green ash were noted within five feet of the vegetation plot.

Plot 5. Canary grass, soft rush (*Juncus* sp.), goldenrod, and blackberry were observed in and immediately adjacent to the plot. One elderberry was noted within five feet of the vegetation plot.

Plot 6. Canary grass, multiflora rose (*Rosa multiflora*), and Japanese honeysuckle (*Loncera japonica*) were observed in and immediately adjacent to the plot. No woody stems were noted within five feet of the vegetation plot.

3.5 Conclusions

The 2004 vegetation monitoring of the site represents an average density above the minimum required by the success criteria of 260 trees per acre.

4.0 BIOLOGICAL INDICATORS

Personnel with the Tennessee Valley Authority (TVA) were to conduct biological sampling along Paint Fork Creek and its tributary. It is unknown at this time whether or not the sampling has been conducted at the mitigation site. If this information becomes available, it will be inserted into the report at a later time.

5.0 OVERALL CONCLUSIONS

The Fosson Site has met the required monitoring protocols for the second formal year of monitoring. Localized areas of active bank scour and erosion existed in 2003; however, these areas have stabilized in 2004 due to the increased establishment of vegetation. No remedial actions are warranted at this time.

Based on information obtained from the USGS, the Fosson Site has met the required hydrologic monitoring protocols. The vegetative success criteria have also been met for the

second formal year of monitoring. No biological sampling has been conducted to-date. It is unknown whether or not this sampling will be conducted as part of overall monitoring activities.

6.0 REFERENCES

North Carolina Wildlife Resources Commission (NCWRC), 2000. As-built Report for the Fosson Mitigation Site, Paint Fork Creek, Madison County.

Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

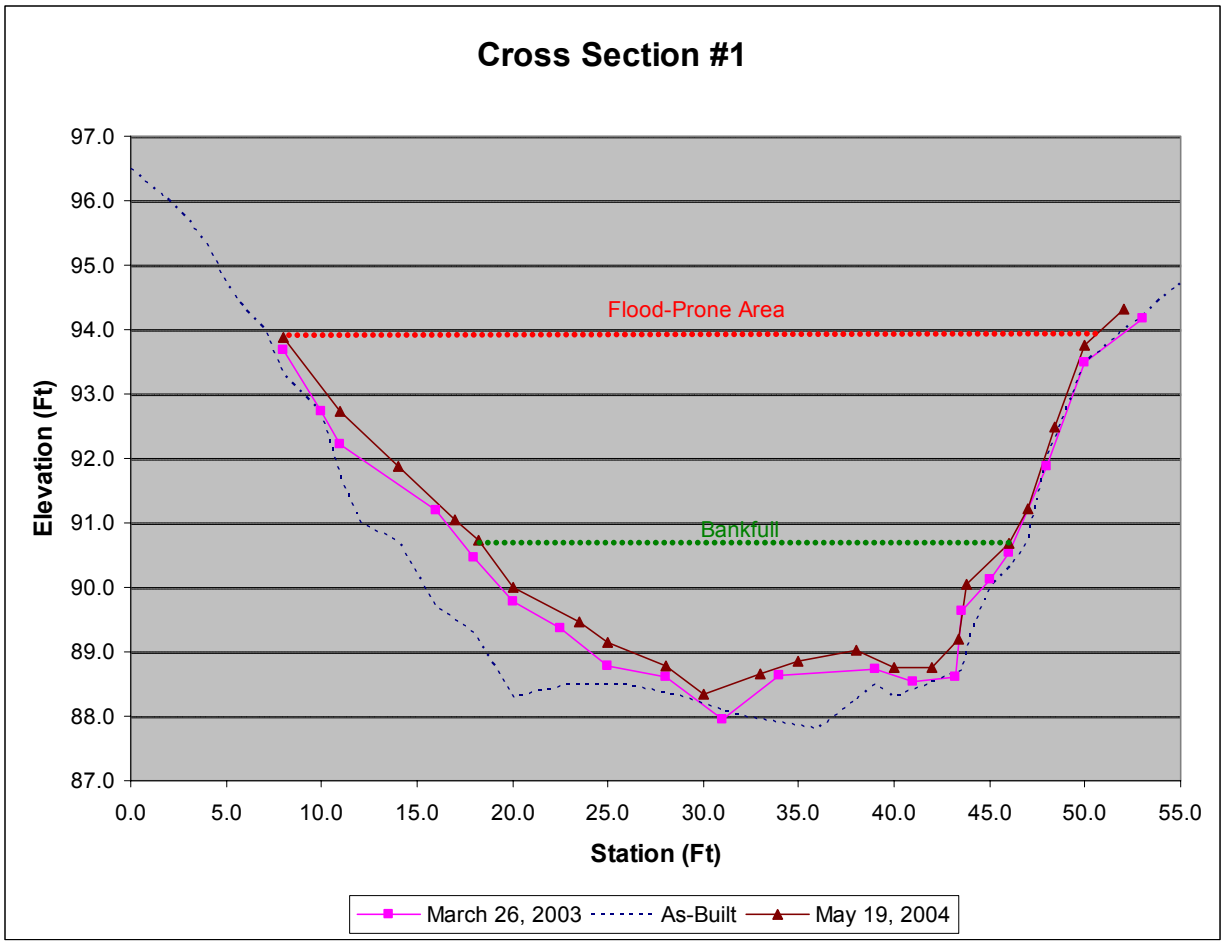
US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. Prepared with cooperation from the US Environmental Protection Agency, NC Wildlife Resources Commission, and the NC Division of Water Quality.

US Geological Survey (USGS), 2004. Real-time Data for USGS 03453000 Ivy River near Marshall, NC. http://waterdata.usgs.gov/nc/nwis.

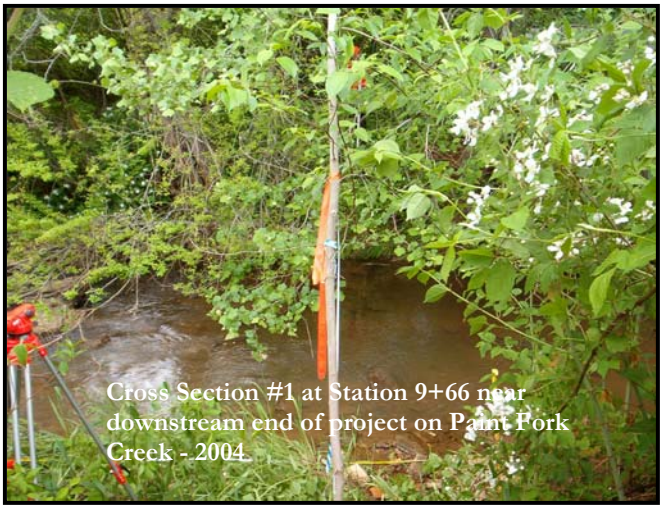
APPENDIX A
AS-BUILT DATA

APPENDIX B

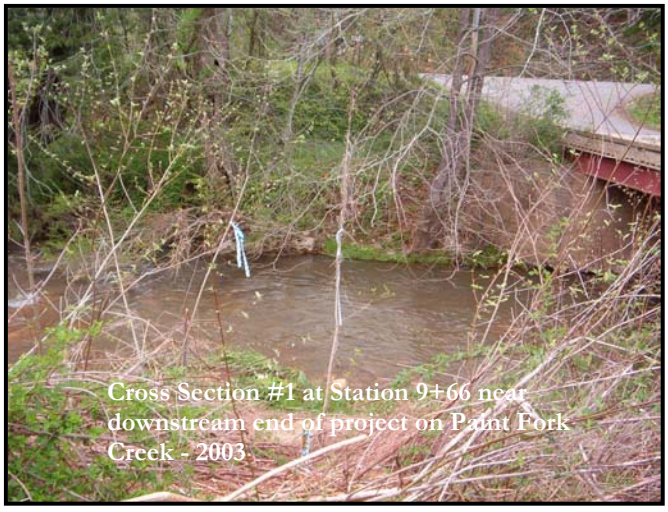
CROSS SECTIONS AND THE LONGITUDINAL PROFILE COMPARISON



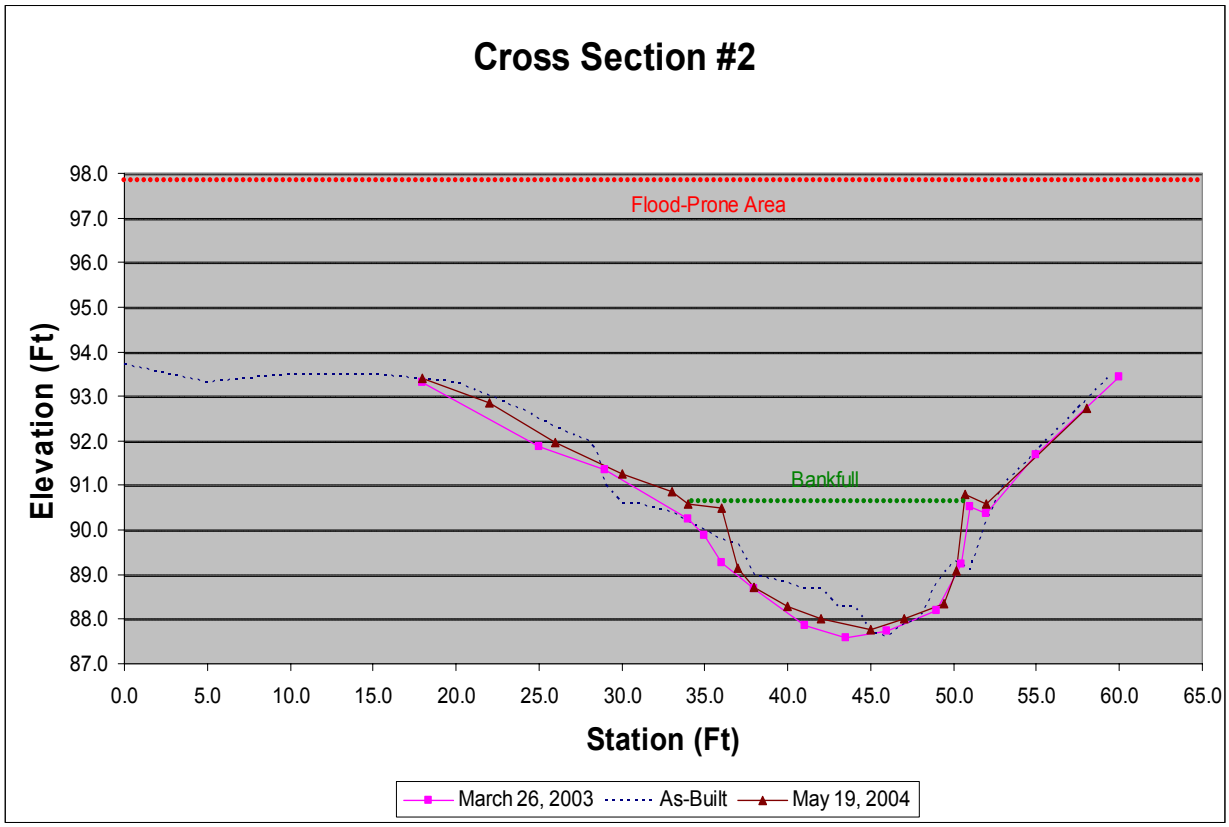
Cross-Section #1 Abbreviated Morphological Summary		
	2003	2004
Bankfull Cross Sectional Area (ft2)	33.5	43
Maximum Bankfull Depth (ft)	2.2	2.4
Bankfull Mean Depth (ft)	1.3	1.5
Width/Depth Ratio	20.1	18.1
Entrenchment Ratio	1.5	1.4
Bankfull Width (ft)	26	27.9



Cross Section #1 at Station 9+66 near downstream end of project on Paint Fork Creek - 2004



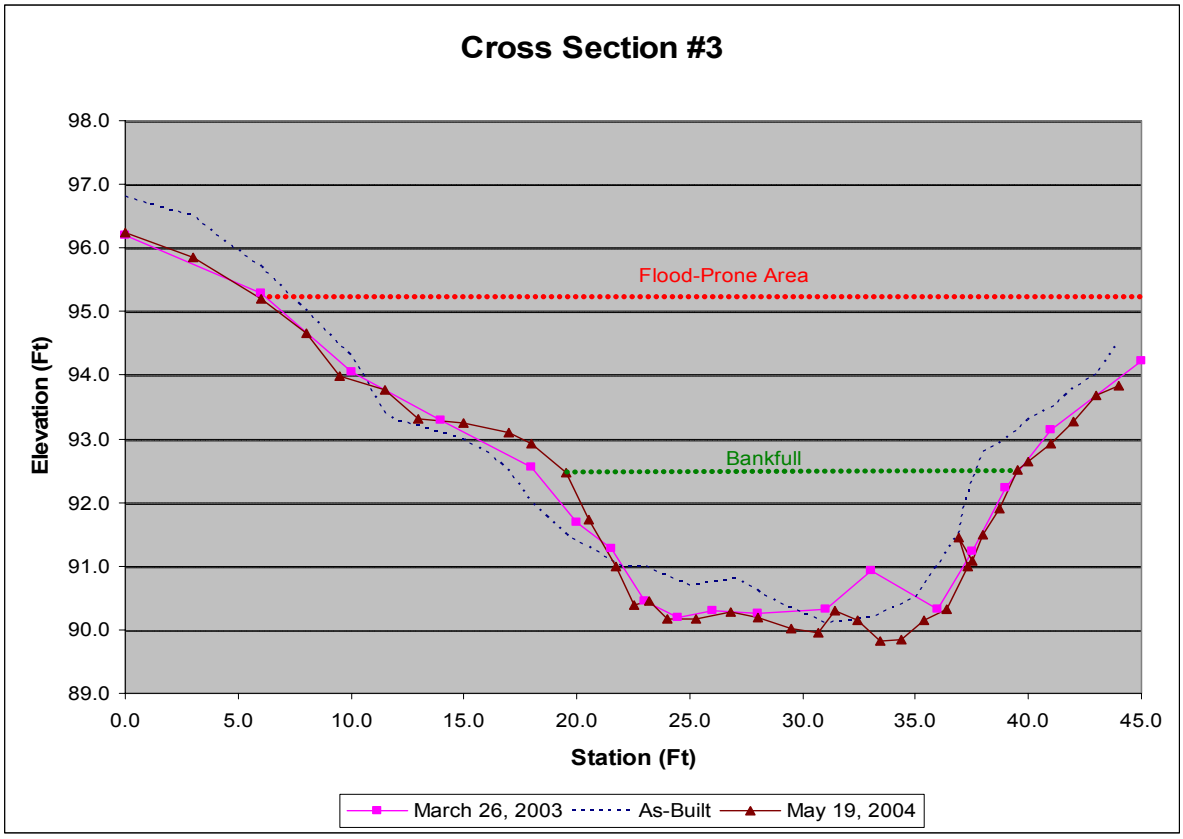
Cross Section #1 at Station 9+66 near downstream end of project on Paint Fork Creek - 2003



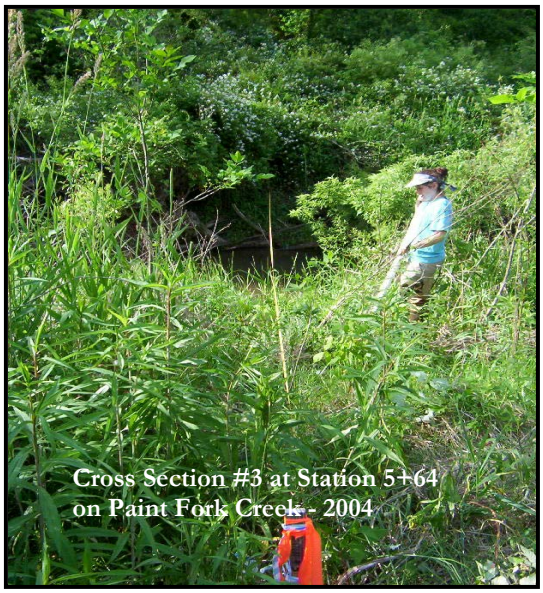
Cross-Section #2 Abbreviated Morphological Summary		
	2003	2004
Bankfull Cross Sectional Area (ft2)	25.5	32.6
Maximum Bankfull Depth (ft)	2.3	2.8
Bankfull Mean Depth (ft)	1.6	2
Width/Depth Ratio	9.7	8.6
Entrenchment Ratio	2.2	2.4
Bankfull Width (ft)	15.8	16.7


Cross Section #2 at Station 7+75 on Paint Fork Creek - 2004

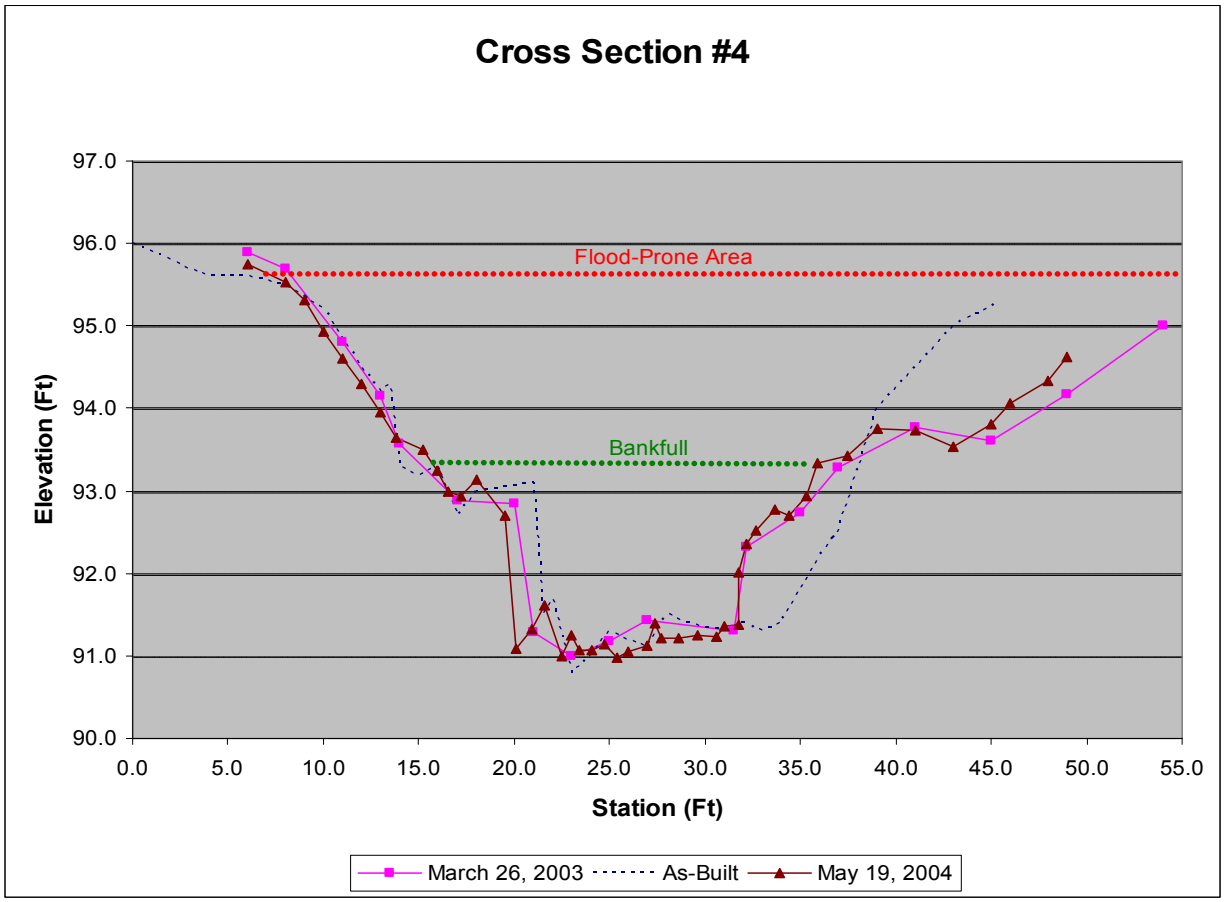

Cross Section #2 at Station 8+06 on Paint Fork Creek - 2003



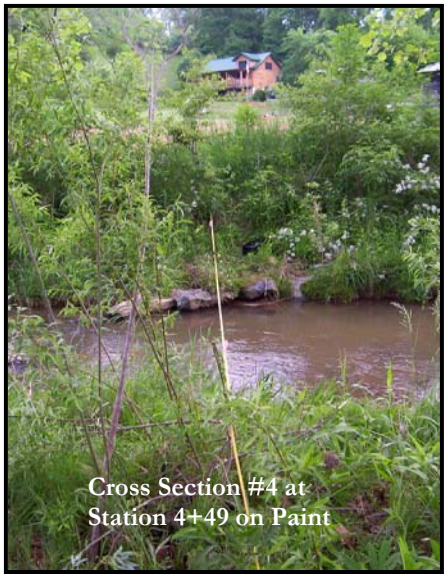
Cross-Section #3 Abbreviated Morphological Summary		
	2003	2004
Bankfull Cross Sectional Area (ft2)	30	39.7
Maximum Bankfull Depth (ft)	2	2.3
Bankfull Mean Depth (ft)	1.5	1.5
Width/Depth Ratio	13.7	13.8
Entrenchment Ratio	1.8	2.3
Bankfull Width (ft)	20.3	20.2


Cross Section #3 at Station 5+64 on Paint Fork Creek - 2004


Cross Section #3 at Station 5+86 on Paint Fork Creek - 2003

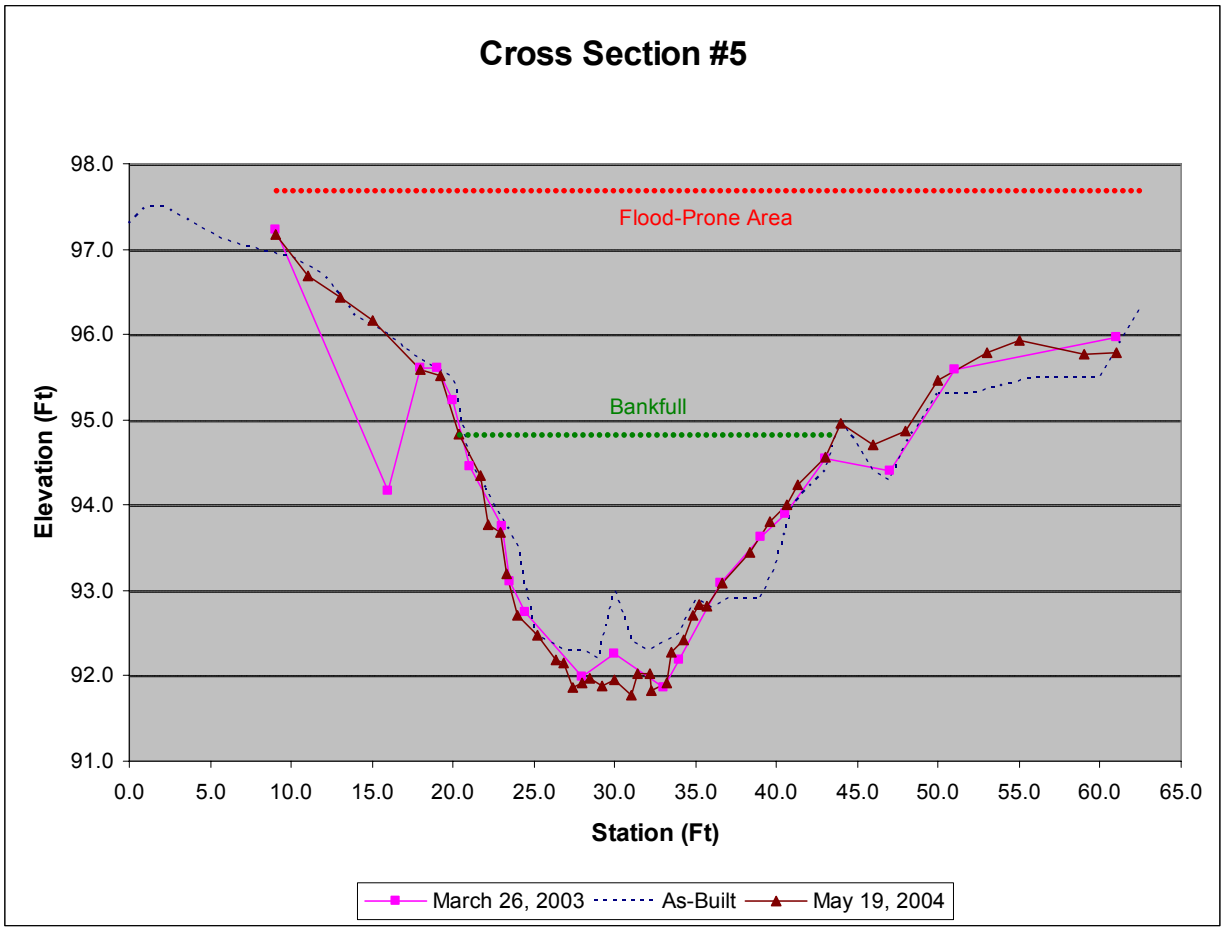


Cross-Section #4 Abbreviated Morphological Summary		
	2003	2004
Bankfull Cross Sectional Area (ft2)	27.7	29.5
Maximum Bankfull Depth (ft)	2.3	2.3
Bankfull Mean Depth (ft)	1.3	1.5
Width/Depth Ratio	17	13.8
Entrenchment Ratio	2.7	2.3
Bankfull Width (ft)	21.7	20.2

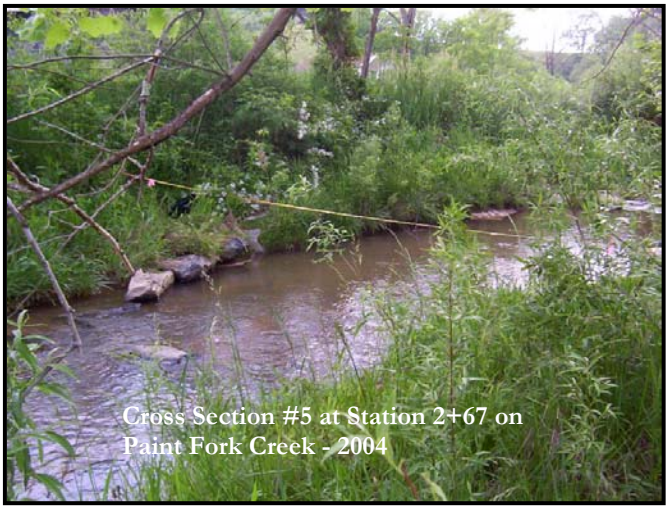


Cross Section #4 at Station 4+49 on Paint

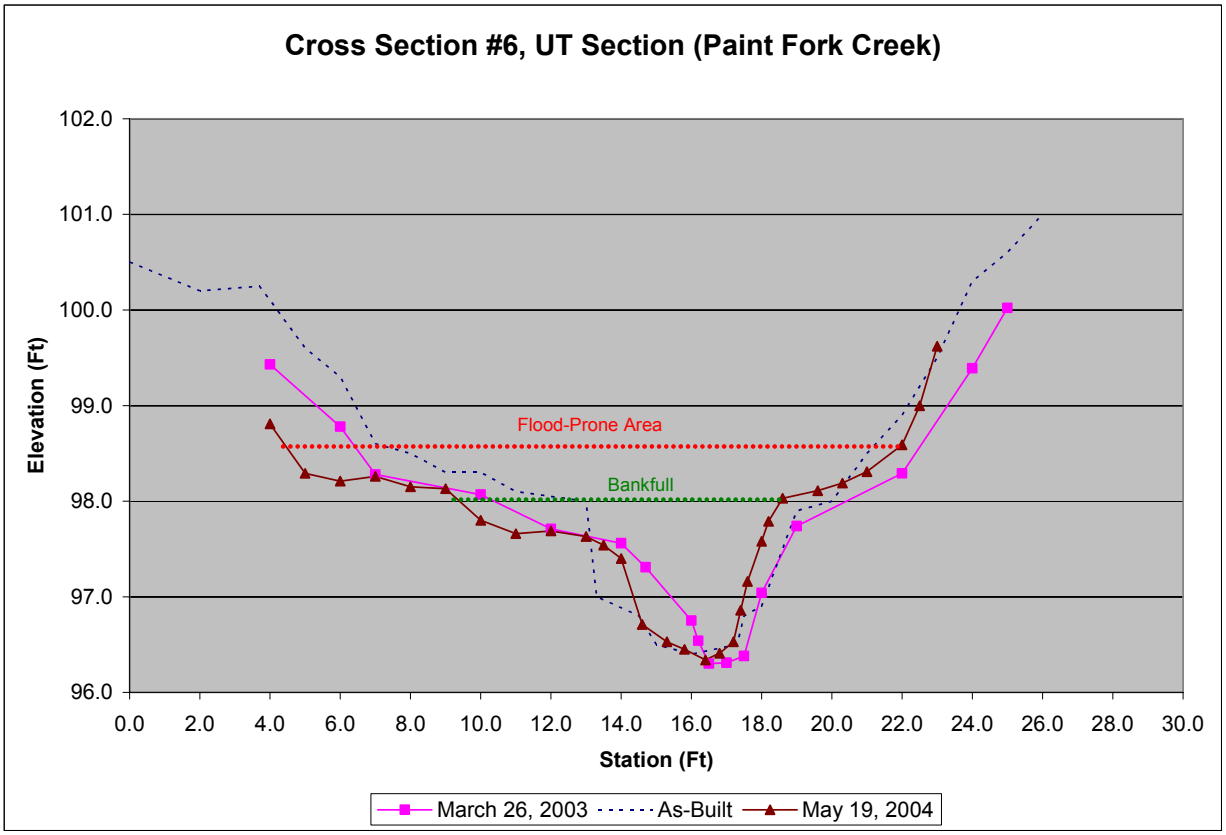
Cross Section #4 at Station 4+68 on Paint Fork Creek - 2003



Cross-Section #5 Abbreviated Morphological Summary		
	2003	2004
Bankfull Cross Sectional Area (ft2)	22.2	42.8
Maximum Bankfull Depth (ft)	2	3.1
Bankfull Mean Depth (ft)	1.2	1.7
Width/Depth Ratio	14.5	15.5
Entrenchment Ratio	2.8	2.4
Bankfull Width (ft)	17.9	25.8


Cross Section #5 at Station 2+67 on Paint Fork Creek - 2004

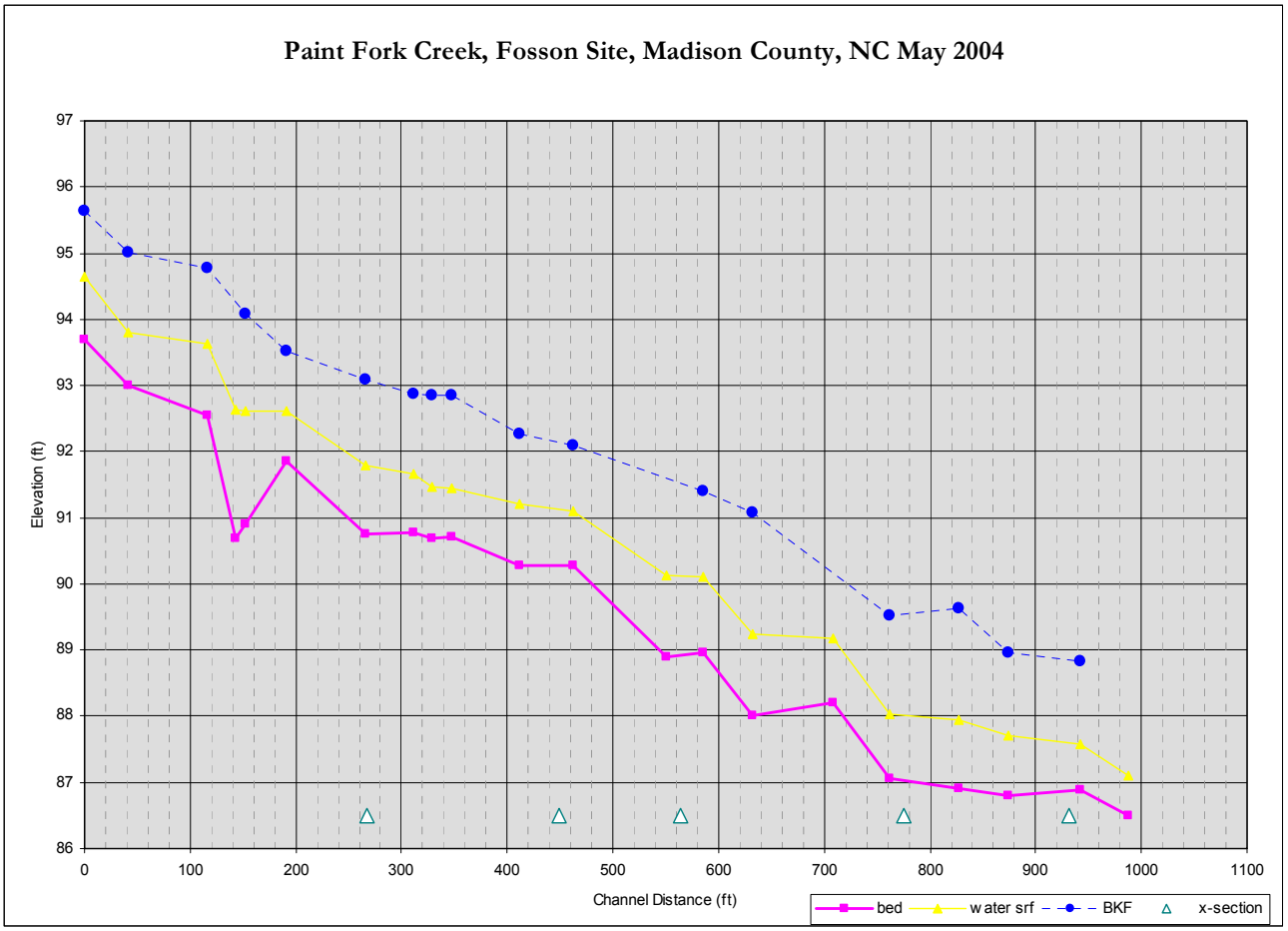

Cross Section #5 at Station 2+79 on Paint Fork Creek - 2003



Cross-Section #6 Abbreviated Morphological Summary		
	2003	2004
Bankfull Cross Sectional Area (ft2)	2.1	2.8
Maximum Bankfull Depth (ft)	1	1.2
Bankfull Mean Depth (ft)	0.6	0.7
Width/Depth Ratio	6.5	6.4
Entrenchment Ratio	4.1	4.2
Bankfull Width (ft)	3.7	4.3


Cross Section #6 along Unnamed Tributary to Paint Fork Creek - 2004


Cross Section #6 along Unnamed Tributary to Paint Fork Creek - 2003


Paint Fork Creek, Fosson Site, Madison County, NC May 2004
Elevation (ft)
97
96
95
94
93
92
91
90
89
88
87
86
0
100
200
300
400
500
600
700
800
900
1000
1100
Channel Distance (ft)
bed
water srf
BKF
x-section

APPENDIX C

SITE PHOTOGRAPHS

Paint Fork Creek

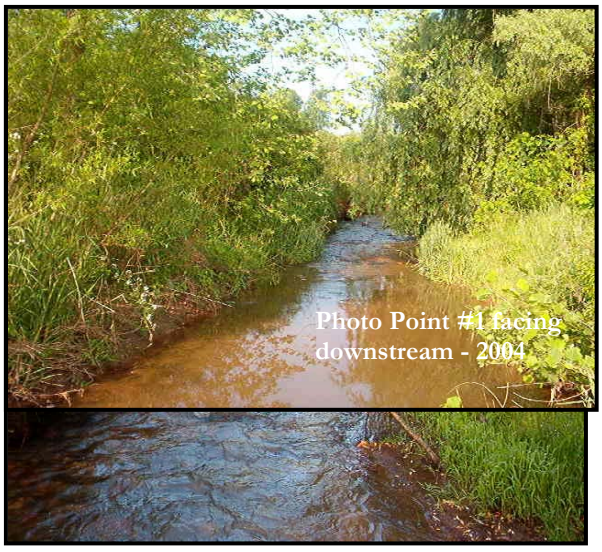


Photo Point #1 facing downstream - 2004

Photo #1 facing downstream - 2003

Photo Point #3 facing upstream - 2004

Photo Point #3 facing upstream - 2003

Paint Fork Creek (Continued…)


Photo Point #4 facing downstream - 2004


Photo Point #4 facing downstream - 2003

Vegetation Plots


Tree Plot A facing downstream - 2004


Tree Plot A facing upstream - 2003


Tree Plot B facing downstream - 2004


Tree Plot B facing downstream - 2003

Vegetation Plots continued


Vegetation Plot #1 – 2004


Vegetation Plot #1 - 2003


Vegetation Plot #2 – 2004


Vegetation Plot #2 - 2003


Vegetation Plot #3 - 2004


Vegetation Plot #3 - 2003

Vegetation Plots (Continued…)


Vegetation Plot #4 - 2004


Vegetation Plot #4 - 2003


Vegetation Plot #5 - 2004


Vegetation Plot #5 - 2003