Monitoring Report
Year 4
Rich Fork Mitigation Site
Davidson County, North Carolina

Yadkin 03040103
Contract #R-9999WM

Submitted to:

North Carolina
Department of Environment and
Natural Resources
Ecosystem Enhancement Program

Submitted by:

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EXECUTIVE SUMMARY

The Rich Fork Mitigation Project restored 21.49 acres of riverine wetland and 3,398 linear feet of stream and preserved an additional 1,972 linear feet of stream in Davidson County in the Yadkin River Basin (HUC 03040103030030). The site will yield 18.59 Wetland Mitigation Units and 3,792 Stream Mitigation Units. The project was initiated in the spring of 2000 and construction was completed in the spring of 2004. The goal of the project is to re-establish an integrated wetland-stream complex that will restore ecosystem processes, structure, and composition to mitigate for wetland functions and values that have been lost as a result of anthropogenic disturbances in this region of the Yadkin River Basin.

Monitoring activities in 2007 looked at the fourth growing season following construction. This report includes analyses of both hydrologic and vegetation monitoring results as well as local climatic conditions throughout the growing season. Monitoring included sampling vegetation survivability at six locations, recording groundwater elevations at six locations, and documenting the general site conditions at six permanent photograph points within the wetland restoration area.

The wetland restoration components of the project were evaluated to determine their compliance with the success criteria established for vegetation and hydrology (the soils did not require success criteria). Climatic on-site data for the 2007 growing season were compared to historical data from Lexington, North Carolina to determine whether 2007 was a normal climatic year. This step is a precursor to validating the results of the wetland monitoring. The historical data were collected from the NRCS, "Water and Climate Center, Climate Analysis for Wetlands by County" website. This evaluation concluded that 2007 was a below average year for rainfall during the growing season. Rainfall was within the 30th to 70th percentiles for the months of March, April, June, and October. Rainfall was less than the 30th percentile threshold in May, July, August, September, and November. There were no months where rainfall was greater than the 70th percentile threshold. The piedmont of North Carolina experiences an exceptional drought during the 2007 growing season. This is reflected in the gauge hydrographs, which show the water table steadily lowering as the drought worsens throughout the summer.

The site was planted at a density of 680 trees per acre. The target community for the majority of the wetland restoration is bottomland hardwood forest. There were six vegetative monitoring plots established throughout the planting areas. The 2007 vegetation monitoring of the planted areas revealed an average density of 633 trees per acre, which is above the minimum requirement of 260 trees per acre needed to meet the success criteria at the end of the five-year monitoring period.

Wetland hydrology was monitored with groundwater gauges throughout the entire 2007 growing season. The results from the gauges indicated that the water table was within 12 inches of the soil surface for a continuous period of greater than 12.5% of the growing season at all six monitoring gauges. This surpassed the success criteria of saturation for a continuous period of at least 8% of the growing season. The project groundwater gauges also closely mimiced the hydroperiod recorded at the reference wetland gauges.

Soils in the restoration portion of the site were determined to be Wehadkee and Chewacla. Since these soils are already considered hydric, no success criteria or monitoring is required.

Fourth year monitoring data were collected in October and November 2007 for cross-sectional area, planform, and profiles in the four monitored reaches and compared to the as-built condition. Three bankfull events occurred during the 2007 monitoring season. The permanent cross-sections, planform and profile showed minimal deviation from the as-built conditions, indicating that the streams are maintaining a stable form with respect to dimensions and features. Aquatic macroinvertebrates were sampled in October 2006, but the identification results were unavailable before Monitoring Year 3 was submitted. The results of the 2006 sampling show that the restored reaches of the project stream have higher number of taxa than the reference reach upstream of the project site. Macroinvertebrate sampling did not occur this year due to extreme drought conditions. Sampling will resume next year.

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Appendices

1.0 WETLANDS

Wetland hydrology and vegetation were evaluated to determine their compliance with the success criteria established for the site (soils did not require success criteria). Climatic data for the 2007 growing season were compared to historical data to determine whether 2007 was a normal year in terms of climate conditions as a precursor to validating the results of the wetland monitoring. The historical data were collected from the NRCS, Water and Climate Center, "Climate Analysis for Wetlands by County" website. This evaluation concluded that 2007 was a below average year for rainfall during the growing season. Rainfall was within the 30th to 70th percentiles for the months of March, April, June, and October. Rainfall was less than the 30th percentile threshold in May, July, August, September, and November. There were no months where rainfall was greater than the 70th percentile threshold (Appendix B). The piedmont of North Carolina experiences an exceptional drought during the 2007 growing season. This is reflected in the gauge hydrographs, which show the water table steadily lowering as the drought worsens throughout the summer.

1.1 Vegetation - The 21.49-acre wetland restoration site was planted at a density of 680 trees per acre. There were six vegetation monitoring plots established throughout the planted areas. The 2007 vegetation monitoring revealed an average density of 633 trees per acre, which is above the minimum requirement of 260 trees per acre (Appendix A). The results from 2007 also showed no vegetation mortality and determined most trees to be healthy. It is anticipated that the vegetation success will be met at the end of five years. The average density for the Piedmont Bottomland Forest species was 633 trees per acre after four years (Table 1). A total of 6.5 trees per monitoring plot are needed to meet the 260 trees per acre minimum requirement.

Table 1: Vegetation Monitoring Results

Plot #	Willow Oak	Swamp Chestnut Oak	Laurel Oak	Yellow Poplar	Swamp Blackgum	Black Willow	Silky Dogwood	Overcup Oak	Green Ash	Cherrybark Oak	Total - Year 4	Total (at planting)	Density - Year 4 (Trees/Acre)
1		12		4					2		18	18	720
2		2	6					6		3	17	17	680
3	9	2	1						6		18	18	720
4		3	4			2	1	1	4		15	18	600
5		1							13		14	14	560
6	2	7	1	1					2		13	13	520
											Total Year 4 Average		**633**

Table 2: Vegetation History (Trees/Acre)

Plot #	Year 1	Year 2	Year 3	Year 4	Year 5
1	720	720	720	720	
2	560	600*	680*	680	
3	640	640	720*	720	
4	680	680	600	600	
5	520	520	560*	560	
6	480	480	520*	520	

* More trees/acre recorded in Year 3 because of either a resprout from a tree that was previously counted as dead or a missed tree from previous monitoring.

1.2 Hydrology - Wetland hydrology was monitored throughout the entire 2007 growing season with groundwater gauges (Appendix B). The results of this monitoring indicated that the water table was within 12 inches of the soil surface for a continuous period of greater than 12.5% of the growing season at all six monitoring gauges (Table 3). In addition, the site gauges closely mimic the hydroperiod measured at the reference wetland. Table 4 presents the hydroperiod history of each well over the course of the monitoring.

Table 3: Hydrologic Monitoring Results

Gauge #	5%	5% - 8%	8% -12.5%	>12.5%	No. of Days	Dates Meeting Success
1				X	58	3/14-5/10
2				X	66	3/14-5/17
3				X	67	3/14-5/20
4				X	66	3/14-5/18
5				X	54	3/14-5/6
6				X	54	3/14-5/6
Ref. Wetland				X	61	3/14-5/13

Table 4. Hydroperiod History

Gauge #	Pre-Restoration	Year 1	Year 2	Year 3	Year 4	Year 5
1	<5%	>12.5%	>12.5%	>12.5%	>12.5%	
2	<5%	>12.5%	>12.5%	>12.5%	>12.5%	
3	<5%	>12.5%	>12.5%	>12.5%	>12.5%	
4	<5%	>12.5%	>12.5%	>12.5%	>12.5%	
5	<5%	>12.5%	>12.5%	>12.5%	>12.5%	
6	<5%	>12.5%	>12.5%	>12.5%	>12.5%	
Ref. Wetland	>12.5%	>12.5%	>12.5%	>12.5%	>12.5%	

1.3 Soils - Soils in the restoration portion of the site were determined to be Wehadkee and Chewacla. Wehadkee is a hydric soil on the state and federal hydric soils list and the Chewacla soils have hydric inclusions of poorly drained soils. The overburden and fill associated with the Chewacla soils was removed during construction to restore the hydric characteristics of the soil lost from filling and overbank flooding. As both soils are already considered hydric, no success criteria or monitoring was required.

2.0 STREAMS

The restored streams were monitored to evaluate their compliance with the success criteria established for physical (cross-section, planform and profile) and biological stability.

2.1 Physical - The as-built survey was completed immediately prior to relocation of active flow into the channel in June 2004. Fourth year monitoring data was collected in October 2007 for cross-sectional area, planform and profiles in the four monitored reaches and compared to the as-built condition (Appendix C). Three bankfull events occurred during this time. The permanent cross-sections (Table 5), planform (Table 6) and profile (Table 7) showed minimal deviation from the as-built conditions, indicating that the streams are maintaining a stable form with respect to dimensions and features.

Table 5. Bankfull Cross-Sectional Area

X-Section	As-Built	Year 1	Year 2	Year 3	Year 4	Year 5
XS-1 Main Stem Up	7.3	7.3	6.3	6.2	5.4	
XS-2 Main Stem Up	2.1	2.5	1.9	1.6	2.1	
XS-3 Main Stem Down	5.9	5.7	5.2	2.9	2.8	
XS-4 Main Stem Down	4.6	4.9	4.0	5.2	5.5	
XS-1 Tributary Up	1.8	1.6	2.7	1.2	1.1	
XS-2 Tributary Up	1.2	1.1	0.9	1.5	1.2	
XS-3 Tributary Down	2.6	2.7	1.6	1.3	1.2	
XS-4 Tributary Down	1.1	1.2	0.9	0.7	0.5	

Table 6. Planform (Sinuosity/Radius of Curvature)

Reach	As-Built	Year 1	Year 2	Year 3	Year 4	Year 5
Main Stem Up	1.2/13.9	1.2/13.9	1.2/13.5	1.2/13.8	1.2/13.8	
Main Stem Down	1.2/13.0	1.2/13.1	1.2/14.9	1.2/11.8	1.2/11.8	
Tributary Up	1.2/7.4	1.2/7.4	1.2/8.7	1.2/7.0	1.2/7.0	
Tributary Down	1.4/7.3	1.4/7.3	1.4/7.6	1.3/7.0	1.2/7.0	

Table 7. Profile (Average depth in feet from control elevation)

Reach	As-Built	Year 1	Year 2	Year 3	Year 4	Year 5
Main Stem Up	1.42	1.37	1.28	1.26	1.23	
Main Stem Down*	1.37	1.41	1.33	1.46	1.43	
Tributary Up	0.87	0.82	0.79	0.75	0.76	
Tributary Down	1.15	1.09	0.86	1.20	0.92	

*Values from previous years have been revised following an update of Monitoring Year 3 calculations.

2.2 Biological Monitoring - Due to drought conditions during the summer of 2007, benthic macroinvertebrate sampling was not conducted. Results of the October 2006 sampling are included in this report due to the identification results being unavailable for the 2006 monitoring report. During the October 2006 monitoring, the tributary was not sampled, because the surrounding area, including the channel, was ponded. The biotic values on the upstream and confluence increased while the main stem biotic value decreased. This deviation can be explained by season to season variation and skewing of data due to a limited number of species sampled. There was one EPT taxa sampled in the main stem during this monitoring event.

Table 8. Summary Benthic Macroinvertebrate Data

Sampling Location	Total No. of Organisms						Total Number of Taxa						Biotic Index Assigned Values					
Year	Pre	1	2**	3	4	5	Pre	1	2**	3	4	5	Pre	1	2**	3	4	5
Upstream*	24	33	18	26			9	10	4	3			6.61	7.47	7.84	8.98		
Main Channel	54	52	16	23			6	17	7	5			6.98	7.63	8.12	7.96		
Tributary	N/A	56	N/A	N/A			N/A	18	N/A	N/A			N/A	7.45	N/A	N/A		
Confluence	124	27	50	57			16	13	20	14			6.44	6.77	7.59	8.10		

*Upstream control site monitored pre-restoration; ** Second-year monitoring was not conducted (due to site conditions) and a supplemental sample was completed in 2006.

3.0 MAINTENANCE/MANAGEMENT ACTIONS

The flooding of Rich Fork Creek during the 2007 monitoring year caused a debris blockage of the tributary near the confluence with the main stem in this area, which created backwater conditions. This blockage (deposited sand and silt) was removed and the tributary was reconnected with the main stem as part of the continuing maintenance schedule at the Rich Fork Site.

4.0 CONCLUSIONS

Findings from this monitoring year indicate that the project site is performing as designed. Vegetation data have shown continued growth of planted stems since the third year of monitoring. The survival of the planted species exceeds the density requirement of the success criteria and non-target species were not identified in any of the vegetation monitoring plots. All six groundwater monitoring gauges exceeded the hydrologic success criteria of 8% of the growing season.

Physical monitoring of the stream at four permanent monitoring reaches documented minor changes in the cross sections and profiles. Small changes in the planform may be attributed to the drought conditions and overgrowth of vegetation in the channel, making it difficult to locate the thalweg. The observable changes in the profiles and cross-sections were due to minor bed aggradation in both the tributary and the mainstem. This process resulted from the sediment brought onto the site from the flooding of Rich Fork Creek and the dead organic debris from the densely vegetated banks. The cross-sections on the mainstem indicated some change with deposition and erosion occuring. On the tributary, Cross-section 4 shows the deposition from backwater events on the floodplain. This deposition encompasses the area near the confluence of the main stem and tributary. This condition will continue to be monitored.

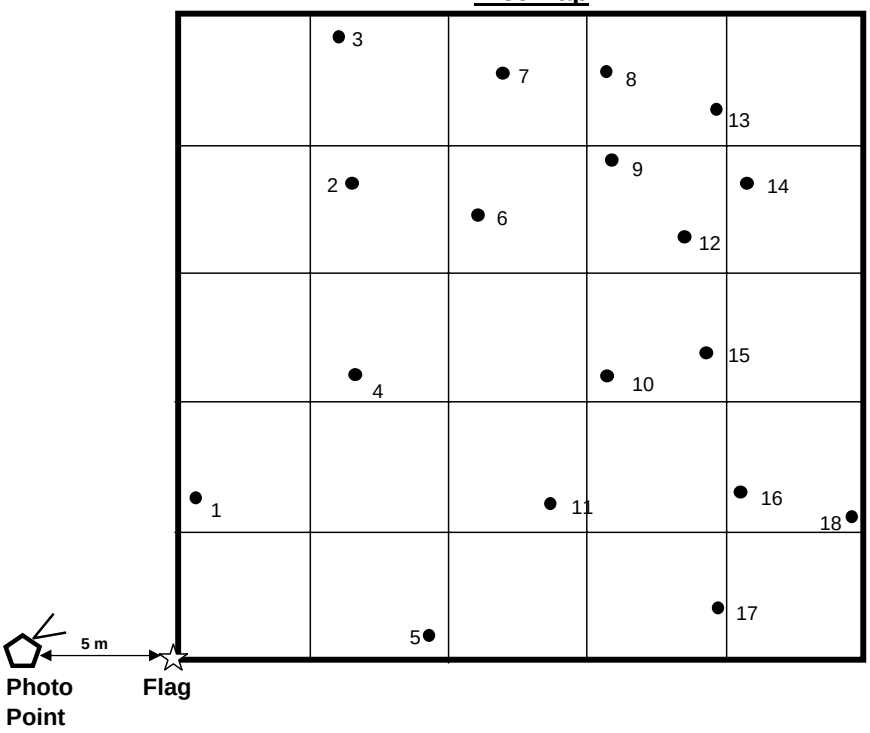
The majority of the stream is maintaining a stable form and the entire stream is accessing its floodplain. In-stream structures are stable and functioning as designed. Observations of stream bank vegetation indicate that live stake survivability is high and the herbaceous vegetation is well developed on the stream banks. Macroinvertebrates were not sampled in 2007, but October 2006 data revealed negligible change from the previous sampling.

Appendix A
Vegetation Monitoring Plot Data Sheets

Vegetation Monitoring Worksheet

Site: Rich Fork **Plot:** 1 **Date:** 7/5/2007

Plot Map



ID	Species	Height (m)	Collar Diameter (cm)	Comments (insect damage, disease, browsing)
1	Yellow Poplar (*Liriodendron tulipifera*)	1.13	1.4	healthy
2	Yellow Poplar (*Liriodendron tulipifera*)	0.63	0.9	healthy
3	Swamp Chestnut Oak (*Quercus michauxii*)	0.86	0.8	healthy
4	Swamp Chestnut Oak (*Quercus michauxii*)	0.90	1.2	healthy
5	Swamp Chestnut Oak (*Quercus michauxii*)	1.14	1.3	healthy
6	Yellow Poplar (*Liriodendron tulipifera*)	0.64	1.3	healthy
7	Yellow Poplar (*Liriodendron tulipifera*)	0.60	0.9	healthy
8	Swamp Chestnut Oak (*Quercus michauxii*)	0.24	0.4	top has died back
9	Swamp Chestnut Oak (*Quercus michauxii*)	0.50	0.7	healthy
10	Swamp Chestnut Oak (*Quercus michauxii*)	0.60	0.8	healthy
11	Green Ash (*Fraxinus pennsylvanica*)	1.80	2.1	healthy
12	Swamp Chestnut Oak (*Quercus michauxii*)	1.29	1.6	healthy
13	Swamp Chestnut Oak (*Quercus michauxii*)	0.46	0.6	top has died back
14	Swamp Chestnut Oak (*Quercus michauxii*)	0.90	0.9	healthy
15	Swamp Chestnut Oak (*Quercus michauxii*)	0.70	1.4	healthy
16	Swamp Chestnut Oak (*Quercus michauxii*)	0.90	0.7	healthy
17	Green Ash (*Fraxinus pennsylvanica*)	1.38	1.3	fungus on all leaves
18	Swamp Chestnut Oak (*Quercus michauxii*)	0.96	1.5	top has died back

Notes - Tree heights smaller than previous years reflect die back in tops of trees.
- Plot map updated annually to more accurately reflect tree locations.

Species	Percent of Total
Swamp Chestnut Oak (*Quercus michauxii*)	67%
Yellow Poplar (*Liriodendron tulipifera*)	22%
Green Ash (*Fraxinus pennsylvanica*)	11%

Density:

Total Number of Trees **18** / **0.025 acres** = **720** **trees / acre**

Survivability:

Total Number of Trees **18** / **18 trees** **x** **100** = **100** **% survivability**

Number of New Recruits : _____

Note : Flag located N 38° E, 27' from monitoring well

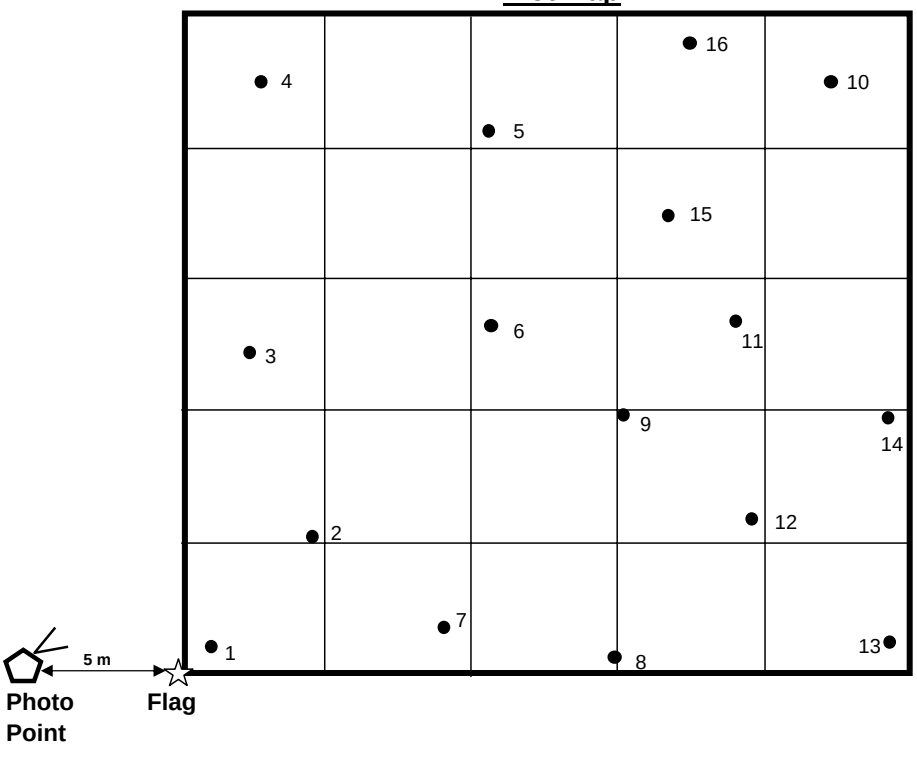
Previous

Current

Vegetation Monitoring Worksheet

Site: Rich Fork **Plot:** 2 **Date:** 7/5/2007

Plot Map



ID	Species	Height (m)	Collar Diameter (cm)	Comments (insect damage, disease, browsing)
1	Laurel Oak (*Quercus laurifolia*)	1.98	1.8	healthy
2	Laurel Oak (*Quercus laurifolia*)	1.18	2.8	healthy
3	Overcup Oak (*Quercus lyrata*)	1.00	1.4	healthy
4	Swamp Chestnut Oak (*Quercus michauxii*)	0.84	1.3	healthy
5	Overcup Oak (*Quercus lyrata*)	0.88	1.1	healthy
6	Laurel Oak (*Quercus laurifolia*)	1.13	1.1	top has died back
7	Overcup Oak (*Quercus lyrata*)	1.10	1.6	healthy
8	Cherrybark Oak (*Quercus falcata*)	0.87	0.9	healthy
9	Overcup Oak (*Quercus lyrata*)	1.42	1.8	healthy
10	Cherrybark Oak (*Quercus falcata*)	1.71	2.7	healthy
11	Overcup Oak (*Quercus lyrata*)	0.94	1.2	healthy
12	Laurel Oak (*Quercus laurifolia*)	1.65	1.7	healthy
13	Swamp Chestnut Oak (*Quercus michauxii*)	2.43	3.6	healthy
14	Laurel Oak (*Quercus laurifolia*)	1.74	1.7	healthy
15	Laurel Oak (*Quercus laurifolia*)	1.94	2.8	healthy
16	Overcup Oak (*Quercus lyrata*)	1.03	1.4	healthy
17	Cherrybark Oak (*Quercus falcata*)	1.10	1.8	healthy

Notes - Tree heights smaller than previous years reflect die back in tops of trees.
- Plot map updated annually to more accurately reflect tree locations.

Species	Percent of Total
Swamp Chestnut Oak (*Quercus michauxii*)	12%
Cherrybark Oak (*Quercus falcata*)	18%
Laurel Oak (*Quercus laurifolia*)	35%
Overcup Oak (*Quercus lyrata*)	35%

Density:

Total Number of Trees **17** / **0.025 acres** = **680** **trees / acre**

Survivability:

Total Number of Trees **17** / **17 trees** x **100** = **100** **% survivability**

Number of New Recruits : _____

Note : Flag located W 270° N, 126' from monitoring well

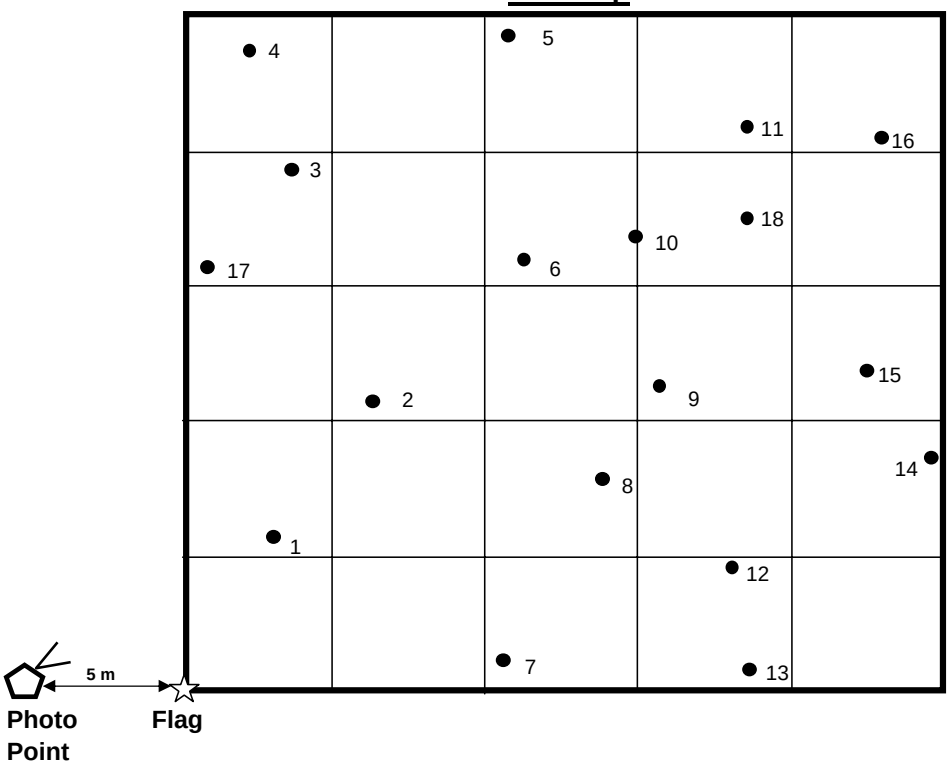
Previous

Current

Vegetation Monitoring Worksheet

Site: Rich Fork **Plot:** 3 **Date:** 7/5/2007

Plot Map



ID	Species	Height (m)	Collar Diameter (cm)	Comments (insect damage, disease, browsing)
1	Willow Oak (*Quercus phellos*)	1.55	2.7	healthy
2	Laurel Oak (*Quercus laurifolia*)	0.90	0.9	healthy
3	Willow Oak (*Quercus phellos*)	1.04	1.3	healthy
4	Willow Oak (*Quercus phellos*)	1.01	1.3	healthy
5	Swamp Chestnut Oak (*Quercus michauxii*)	0.82	0.9	healthy
6	Willow Oak (*Quercus phellos*)	1.16	1.3	healthy
7	Green Ash (*Fraxinus pennsylvanica*)	2.19	2.5	healthy
8	Green Ash (*Fraxinus pennsylvanica*)	2.43	3.1	healthy
9	Green Ash (*Fraxinus pennsylvanica*)	2.32	2.9	healthy
10	Willow Oak (*Quercus phellos*)	1.85	2.1	healthy
11	Willow Oak (*Quercus phellos*)	0.71	0.8	healthy
12	Green Ash (*Fraxinus pennsylvanica*)	2.74	4.1	healthy
13	Green Ash (*Fraxinus pennsylvanica*)	1.81	3.3	healthy
14	Swamp Chestnut Oak (*Quercus michauxii*)	2.01	3.0	healthy
15	Green Ash (*Fraxinus pennsylvanica*)	2.31	3.4	healthy
16	Willow Oak (*Quercus phellos*)	1.18	1.4	healthy
17	Willow Oak (*Quercus phellos*)	1.08	1.4	healthy
18	Willow Oak (*Quercus phellos*)	1.21	1.4	healthy

Notes - Tree heights smaller than previous years reflect die back in tops of trees.
- Plot map updated annually to more accurately reflect tree locations.

Species	Percent of Total
Swamp Chestnut Oak (*Quercus michauxii*)	11%
Willow Oak (*Quercus phellos*)	50%
Green Ash (*Fraxinus pennsylvanica*)	33%
Laurel Oak (*Quercus laurifolia*)	6%

Density:

Total Number of Trees **18** / **0.025 acres** = **720** **trees / acre**

Survivability:

Total Number of Trees **18** / **18 trees** x **100** = **100** **% survivability**

Number of New Recruits : _____

Note : Flag located N 38° E, 27' from monitoring well

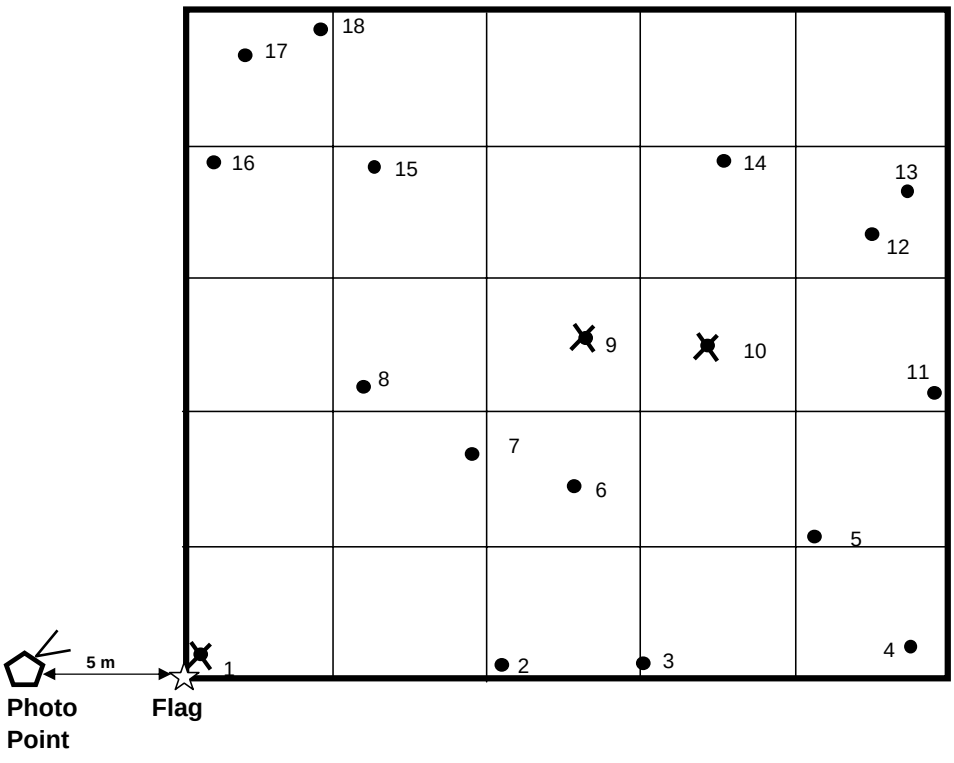
Previous

Current

Vegetation Monitoring Worksheet

Site: Rich Fork **Plot:** 4 **Date:** 7/5/2007

Plot Map



ID	Species	Height (m)	Collar Diameter (cm)	Comments (insect damage, disease, browsing)
1	Swamp Black Gum (*Nyssa sylvatica*)			dead
2	Laurel Oak (*Quercus laurifolia*)	1.11	1.0	sparse leaves
3	Laurel Oak (*Quercus laurifolia*)	1.30	1.4	all leaves dead
4	Black Willow (*Salix nigra*)	2.75	4.6	insect damage
5	Swamp Chestnut Oak (*Quercus michauxii*)	1.12	1.3	healthy
6	Laurel Oak (*Quercus laurifolia*)	1.10	1.3	healthy
7	Swamp Chestnut Oak (*Quercus michauxii*)	1.61	2.2	healthy
8	Swamp Chestnut Oak (*Quercus michauxii*)	1.55	2.5	healthy
9	Yellow Poplar (*Liriodendron tulipifera*)			dead
10	Yellow Poplar (*Liriodendron tulipifera*)			dead
11	Overcup Oak (*Quercus lyrata*)	0.85	0.7	healthy
12	Silky Dogwood (*Cornus amomum*)	1.31	1.5	healthy multistem
13	Green Ash (*Fraxinus pennsylvanica*)	3.41	4.5	healthy
14	Green Ash (*Fraxinus pennsylvanica*)	2.69	3.5	healthy
15	Laurel Oak (*Quercus laurifolia*)	1.20	1.1	no leaves remaining on tree
16	Green Ash (*Fraxinus pennsylvanica*)	2.22	2.5	healthy
17	Black Willow (*Salix nigra*)	3.13	3.6	healthy
18	Green Ash (*Fraxinus pennsylvanica*)	2.22	2.9	healthy

Notes - Tree heights smaller than previous years reflect die back in tops of trees.
- Plot map updated annually to more accurately reflect tree locations.

Species	Percent of Total
Swamp Chestnut Oak (*Quercus michauxii*)	20%
Green Ash (*Fraxinus pennsylvanica*)	27%
Overcup Oak (*Quercus lyrata*)	7%
Silky Dogwood (*Cornus amomum*)	7%
Black Willow (*Salix nigra*)	13%
Yellow Poplar (*Liriodendron tulipifera*)	0%
Laurel Oak (*Quercus laurifolia*)	27%

Density:

Total Number of Trees **15** / **0.025 acres** = **600** **trees / acre**

Survivability:

Total Number of Trees **15** / **18 trees** x **100** = **83.3** **% survivability**

Number of New Recruits : _____

Note : Flag located E 158° S, 76' from monitoring well

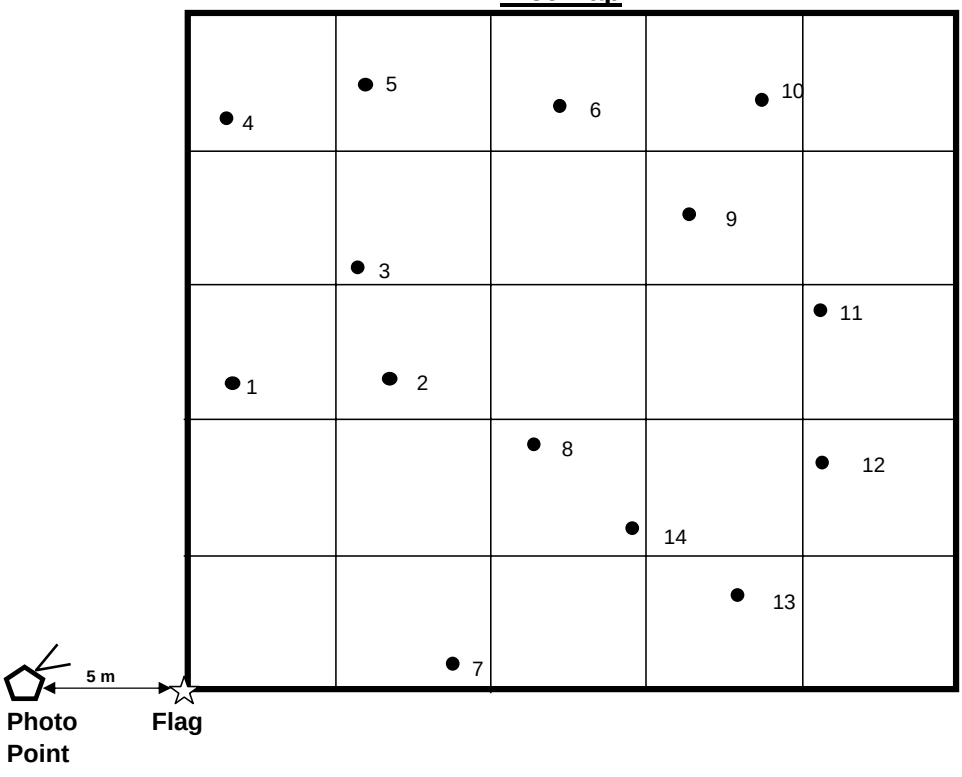
Previous

Current

Vegetation Monitoring Worksheet

Site: Rich Fork **Plot:** 5 **Date:** 7/5/2007

Plot Map



ID	Species	Height (m)	Collar Diameter (cm)	Comments (insect damage, disease, browsing)
1	Green Ash (*Fraxinus pennsylvanica*)	1.65	2.2	healthy
2	Green Ash (*Fraxinus pennsylvanica*)	1.52	1.5	healthy
3	Green Ash (*Fraxinus pennsylvanica*)	1.70	2.1	healthy
4	Green Ash (*Fraxinus pennsylvanica*)	1.79	2.5	healthy
5	Green Ash (*Fraxinus pennsylvanica*)	1.92	2.4	healthy
6	Green Ash (*Fraxinus pennsylvanica*)	1.73	2.3	healthy
7	Green Ash (*Fraxinus pennsylvanica*)	1.72	1.8	healthy
8	Green Ash (*Fraxinus pennsylvanica*)	1.37	1.5	healthy
9	Green Ash (*Fraxinus pennsylvanica*)	2.34	3.6	healthy
10	Swamp Chestnut Oak (*Quercus michauxii*)	1.21	1.3	healthy
11	Green Ash (*Fraxinus pennsylvanica*)	2.04	2.8	healthy
12	Green Ash (*Fraxinus pennsylvanica*)	2.28	3.2	healthy
13	Green Ash (*Fraxinus pennsylvanica*)	1.39	1.3	healthy
14	Green Ash (*Fraxinus pennsylvanica*)	0.98	1.1	healthy

Notes - Tree heights smaller than previous years reflect die back in tops of trees.
- Plot map updated annually to more accurately reflect tree locations.

Species	Percent of Total
Swamp Chestnut Oak (*Quercus michauxii*)	7%
Green Ash (*Fraxinus pennsylvanica*)	93%

Density:

Total Number of Trees **14** / **0.025 acres** = **560** **trees / acre**

Survivability:

Total Number of Trees **14** / **14 trees** x **100** = **100** **% survivability**

Number of New Recruits : _____

Note : Flag located N 38° E, 27' from monitoring well

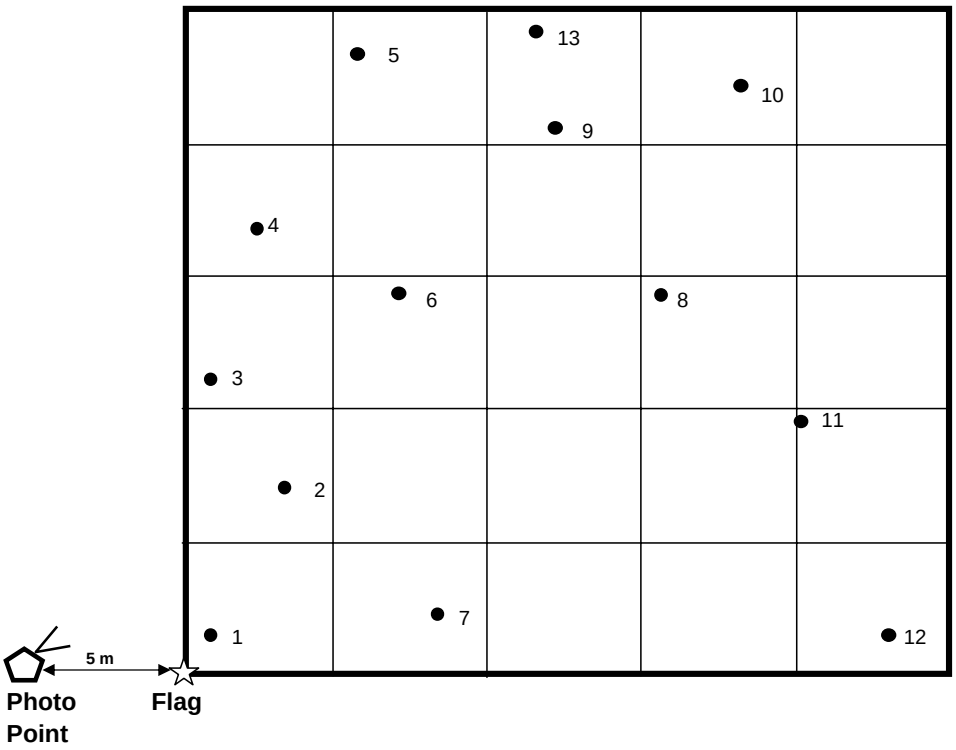
Previous

Current

Vegetation Monitoring Worksheet

Site: Rich Fork **Plot:** 6 **Date:** 7/5/2007

Plot Map



ID	Species	Height (m)	Collar Diameter (cm)	Comments (insect damage, disease, browsing)
1	Swamp Chestnut Oak (*Quercus michauxii*)	1.22	2.5	healthy
2	Swamp Chestnut Oak (*Quercus michauxii*)	1.18	1.5	healthy
3	Swamp Chestnut Oak (*Quercus michauxii*)	1.19	1.8	healthy
4	Swamp Chestnut Oak (*Quercus michauxii*)	0.37	1.0	top has died back
5	Swamp Chestnut Oak (*Quercus michauxii*)	1.40	2.2	healthy
6	Willow Oak (*Quercus phellos*)	0.98	1.4	healthy
7	Swamp Chestnut Oak (*Quercus michauxii*)	1.54	1.6	healthy
8	Green Ash (*Fraxinus pennsylvanica*)	1.60	1.9	healthy
9	Yellow Poplar (*Liriodendron tulipifera*)	0.35	0.9	top has died back
10	Swamp Chestnut Oak (*Quercus michauxii*)	0.55	0.9	top has died back
11	Green Ash (*Fraxinus pennsylvanica*)	1.82	3.7	healthy
12	Willow Oak (*Quercus phellos*)	1.65	1.5	healthy
13	Laurel Oak (*Quercus laurifolia*)	0.50	0.6	healthy

Notes - Tree heights smaller than previous years reflect die back in tops of trees.
- Plot map updated annually to more accurately reflect tree locations.

Species	Percent of Total
Swamp Chestnut Oak (*Quercus michauxii*)	54%
Green Ash (*Fraxinus pennsylvanica*)	15%
Yellow Poplar (*Liriodendron tulipifera*)	8%
Willow Oak (*Quercus phellos*)	15%
Laurel Oak (*Quercus laurifolia*)	8%

Density:

Total Number of Trees **13** / **0.025 acres** = **520** **trees / acre**

Survivability:

Total Number of Trees **13** / **13 trees** x **100** = **100** **% survivability**

Number of New Recruits : _____

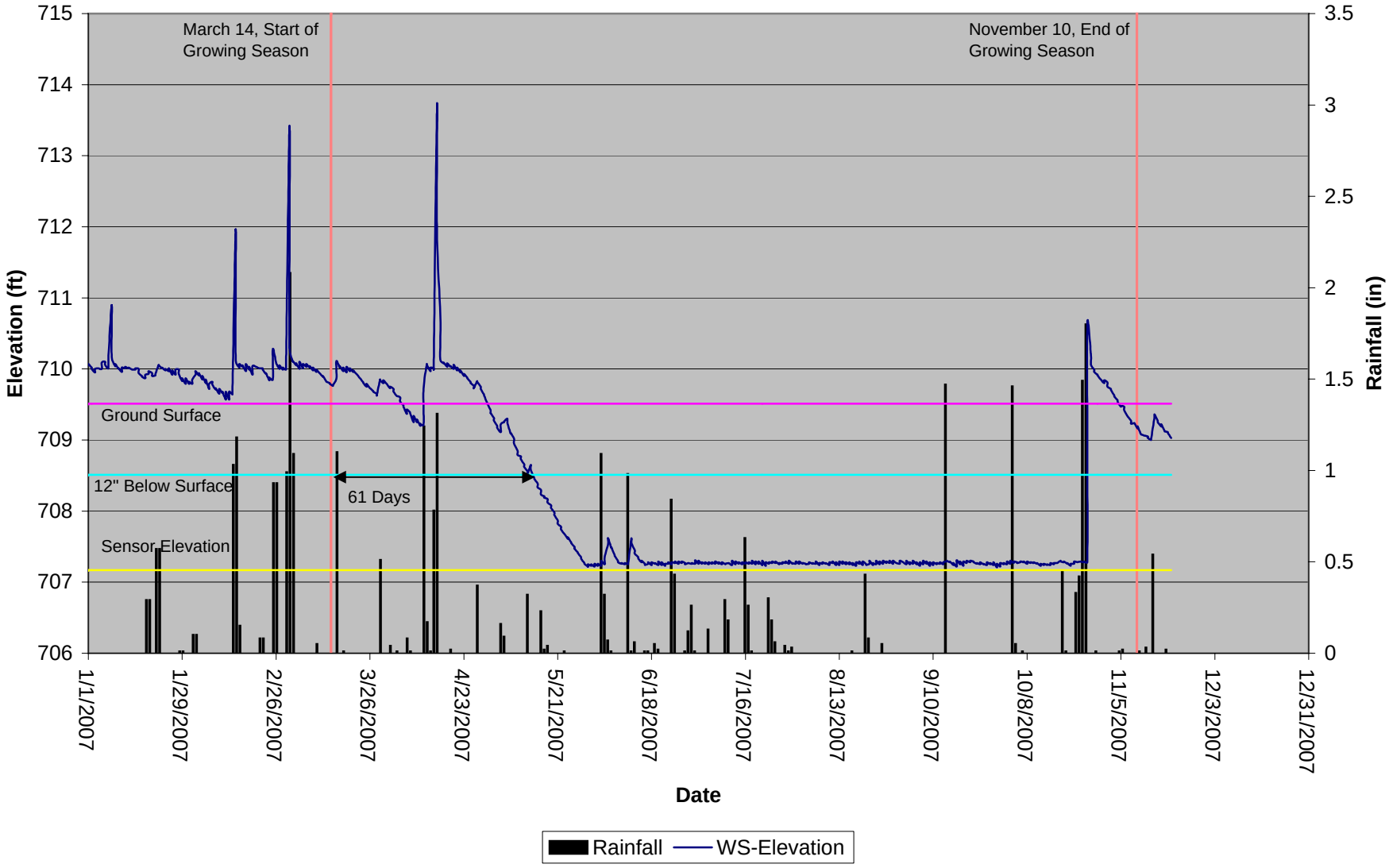
Note : Flag located N 38° E, 27' from monitoring well

Previous

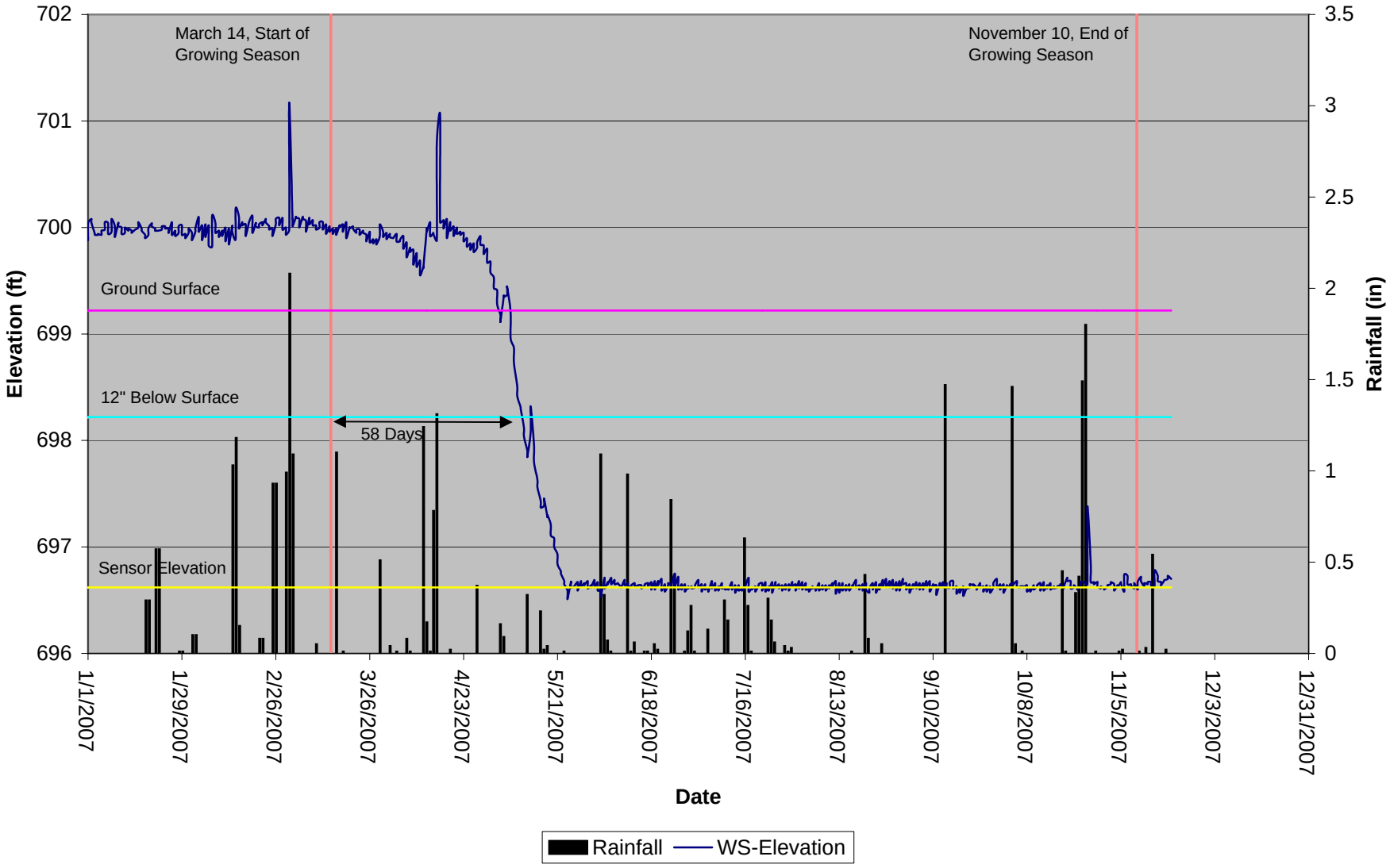
Current

Appendix B
Hydrologic Monitoring and Hydroperiod

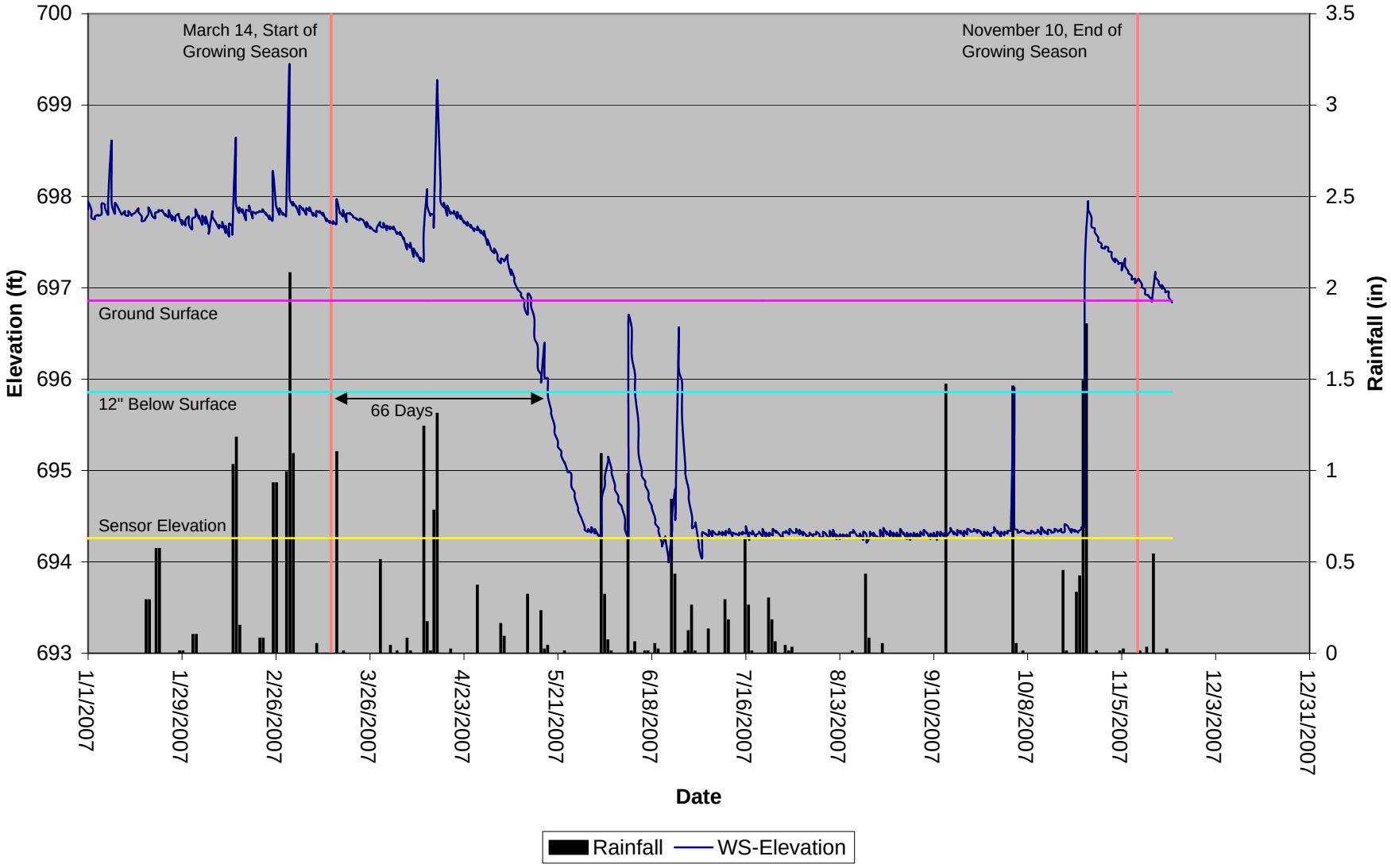
Rich Fork Reference Chart Hydrograph



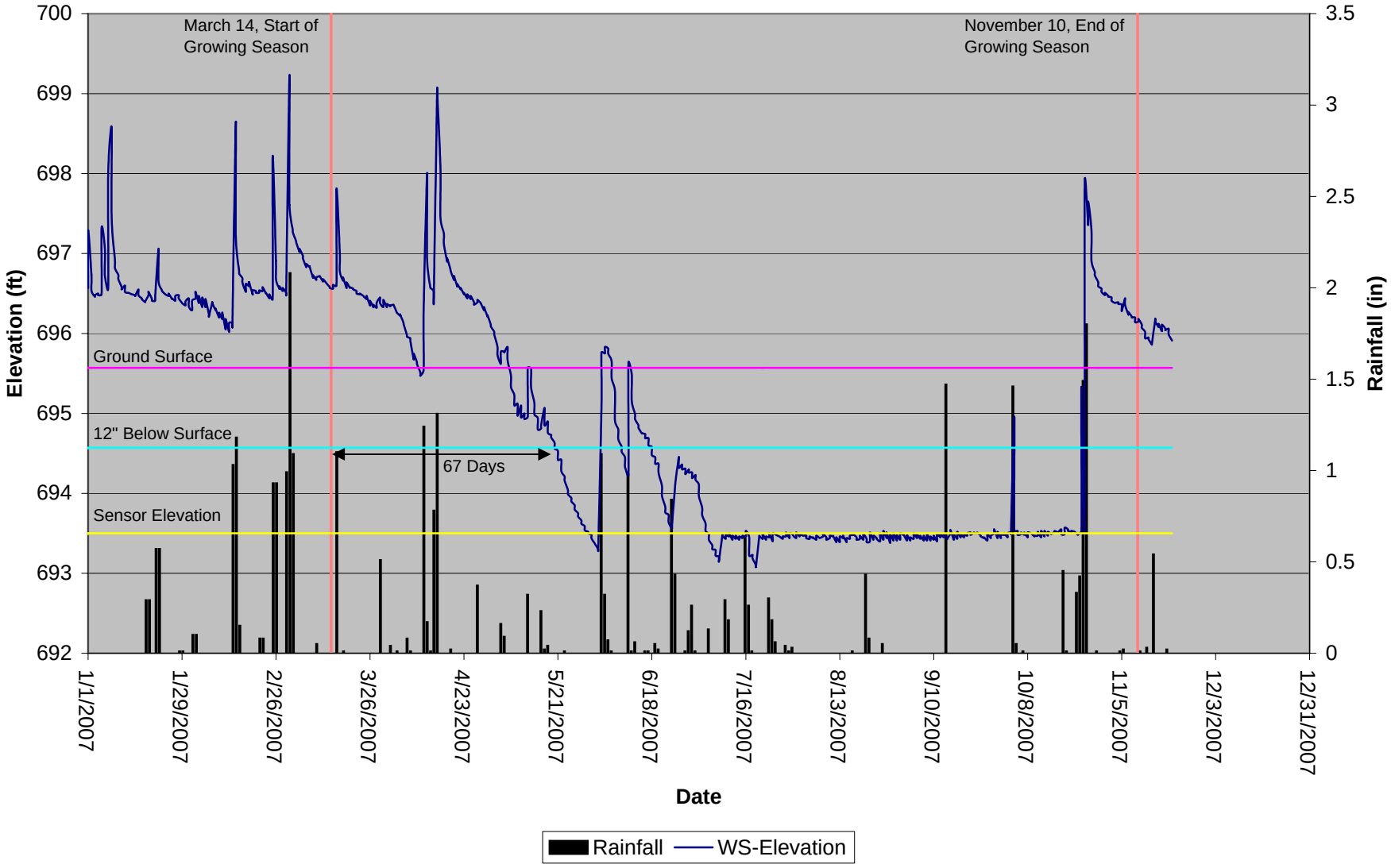
Rich Fork Gauge 1 Hydrograph



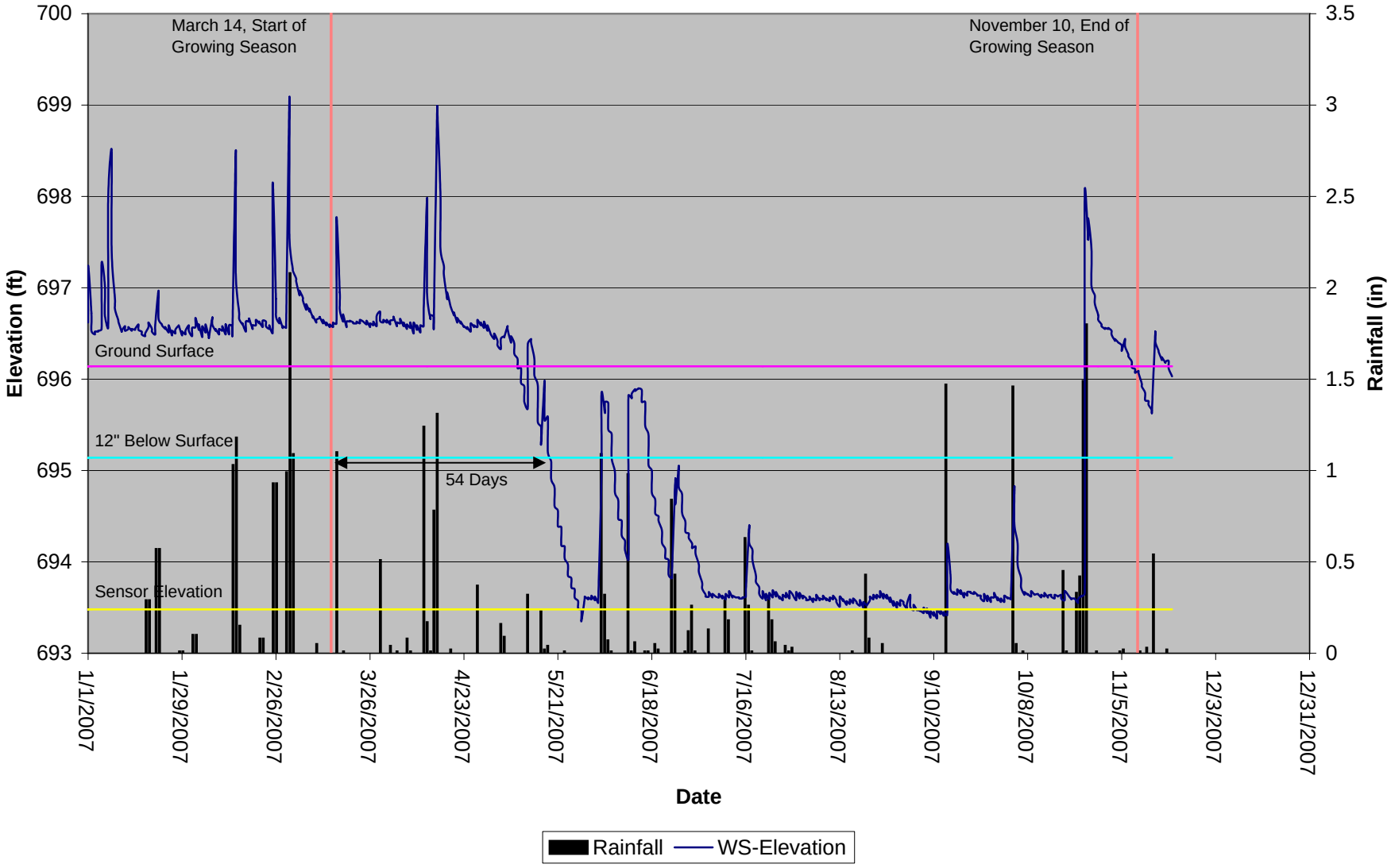
Rich Fork Gauge 2 Hydrograph



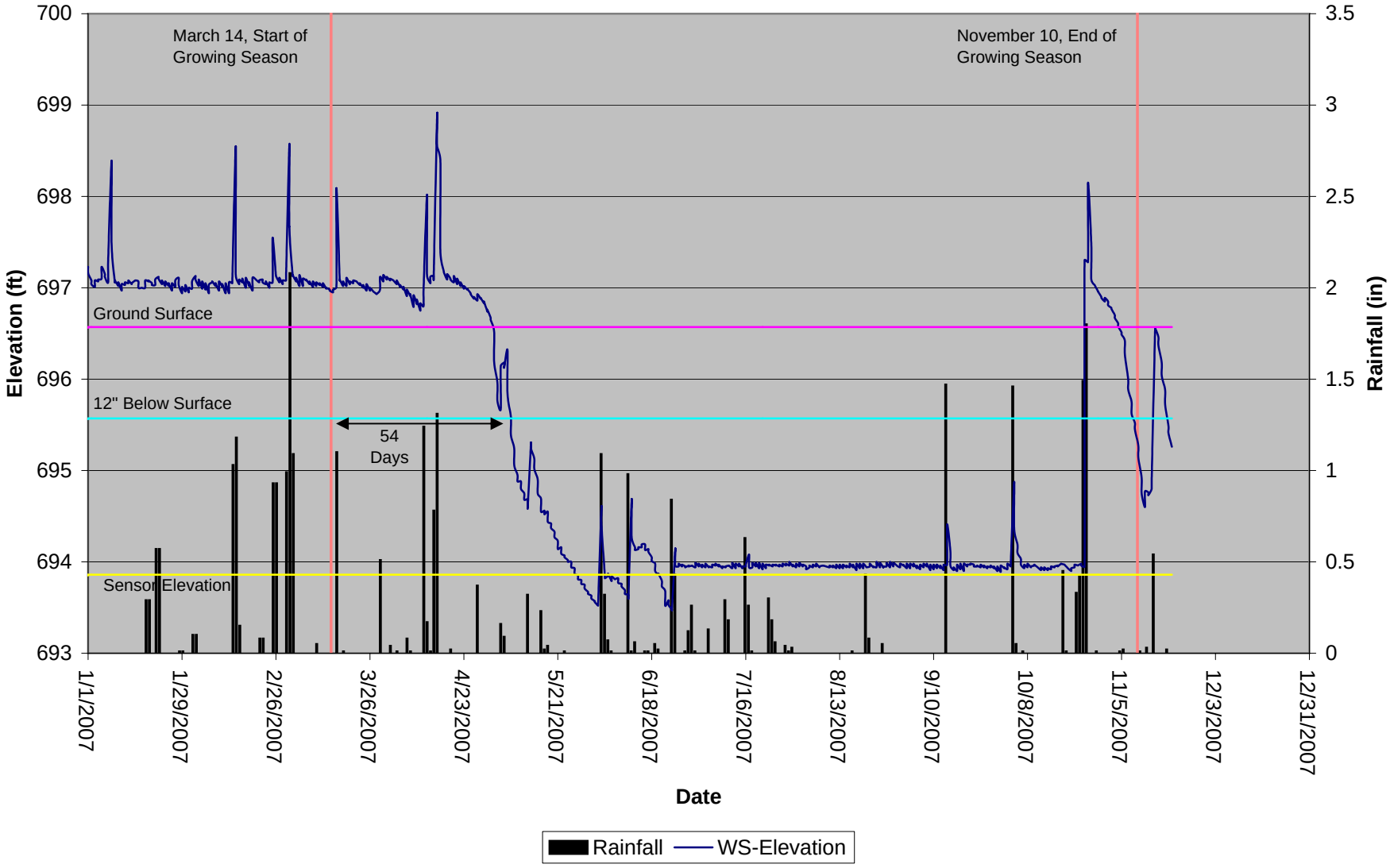
Rich Fork Gauge 3 Hydrograph



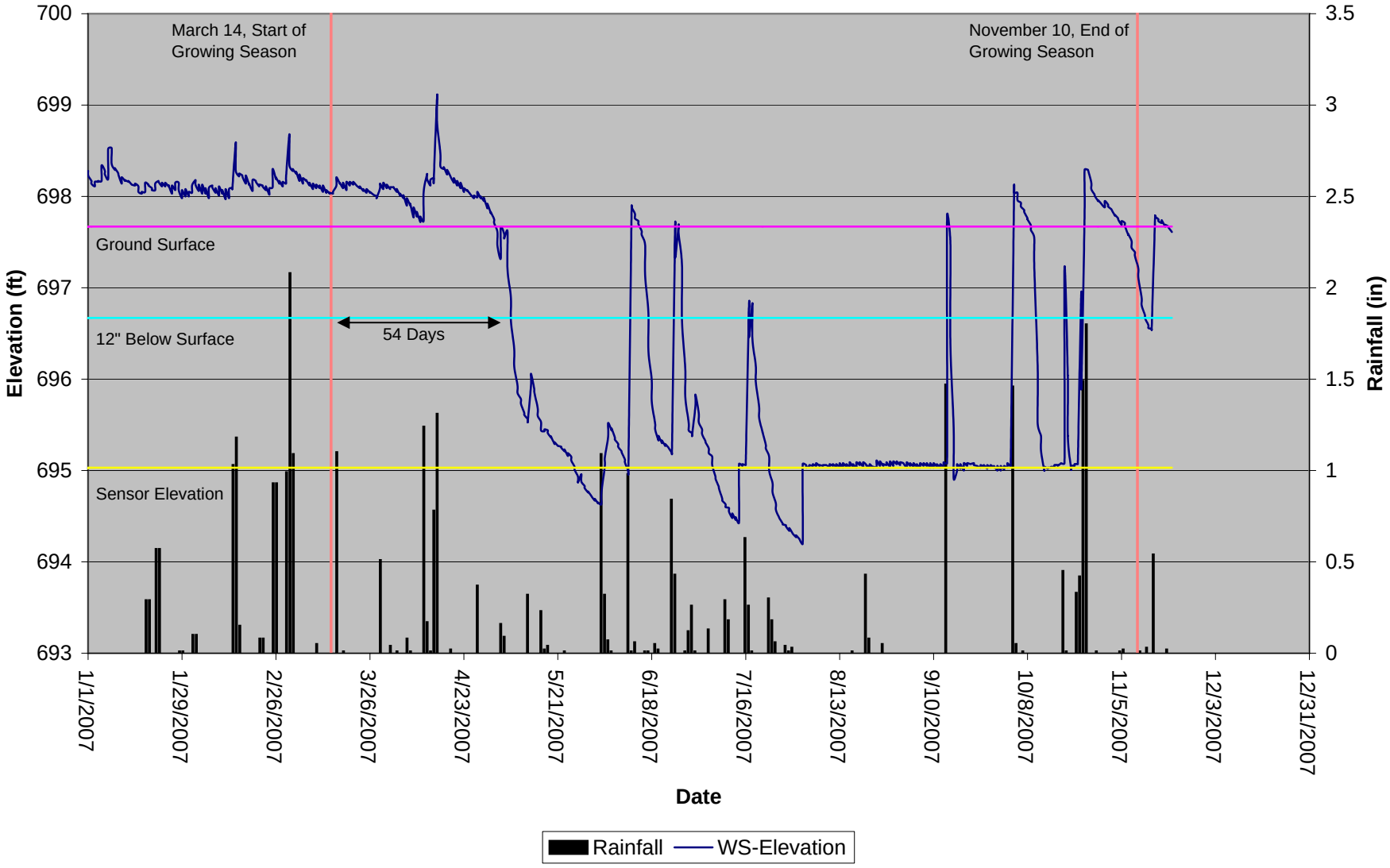
Rich Fork Gauge 4 Hydrograph



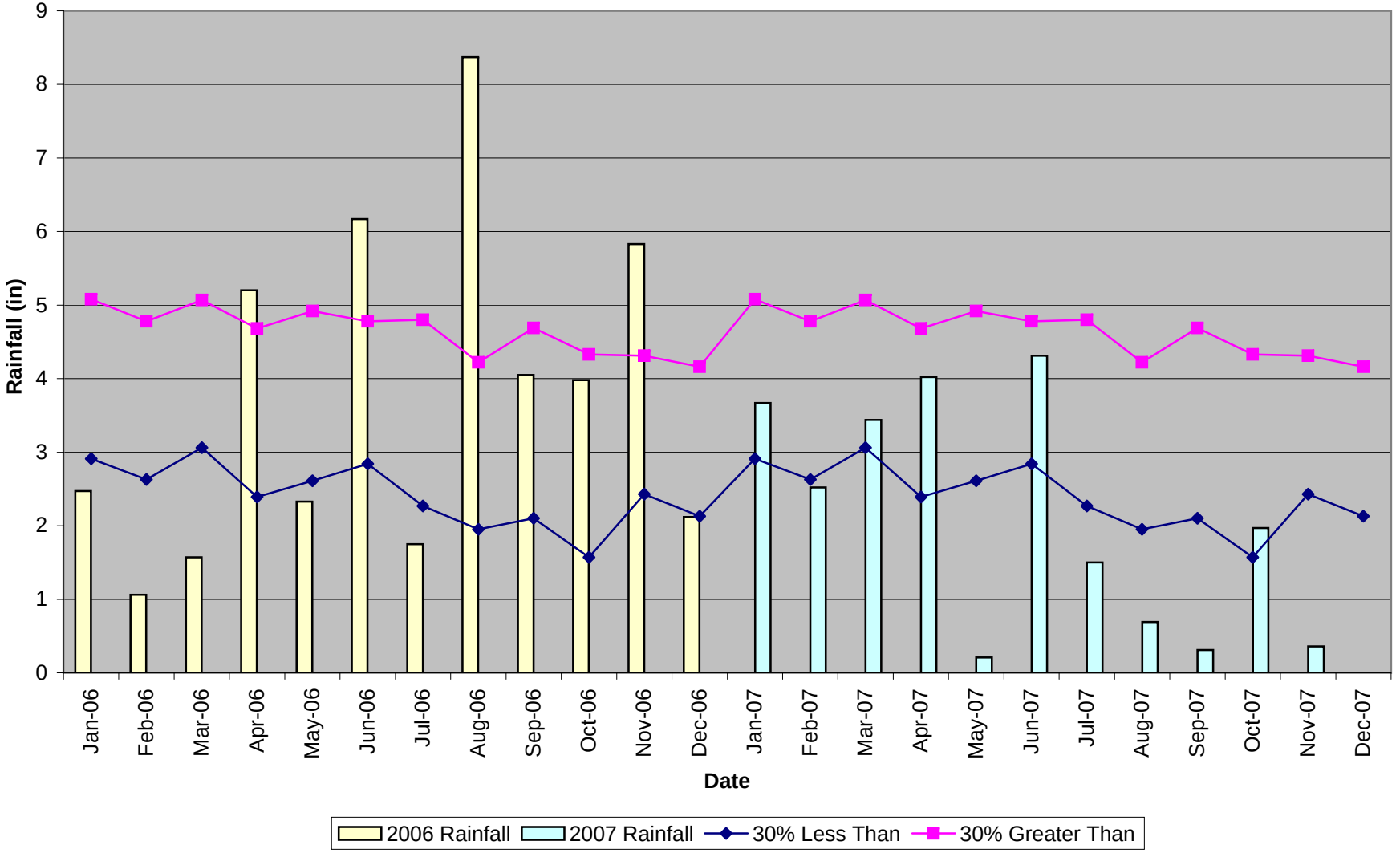
Rich Fork Gauge 5 Hydrograph



Rich Fork Gauge 6 Hydrograph



Rich Fork Site 30-70 Percentile Graph 2006-2007
Lexington, NC Monthly Rainfall

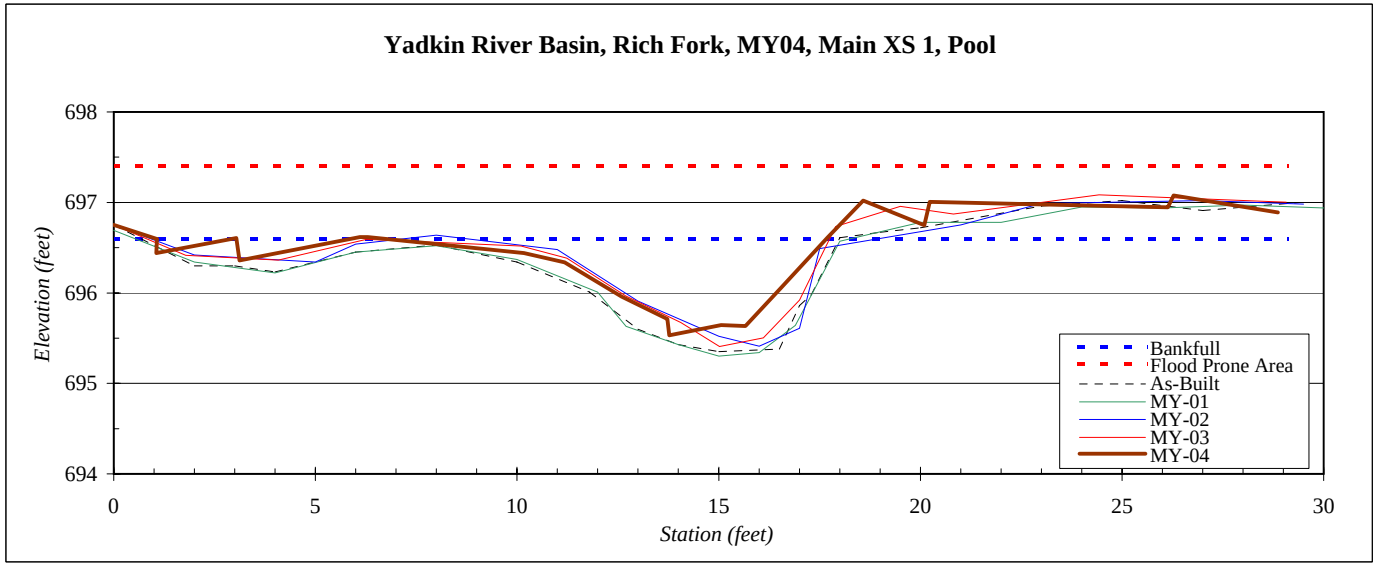


Appendix C
Stream Morphology

River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Main XS 1, Pool
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

Station	Elevation
0.0	696.75
1.8	696.41
4.1	696.36
6.3	696.59
10.1	696.52
11.2	696.38
12.7	695.97
14.1	695.67
15.0	695.41
16.1	695.50
17.0	695.92
17.9	696.73
19.5	696.96
20.8	696.87
24.4	697.09
29.1	697.00

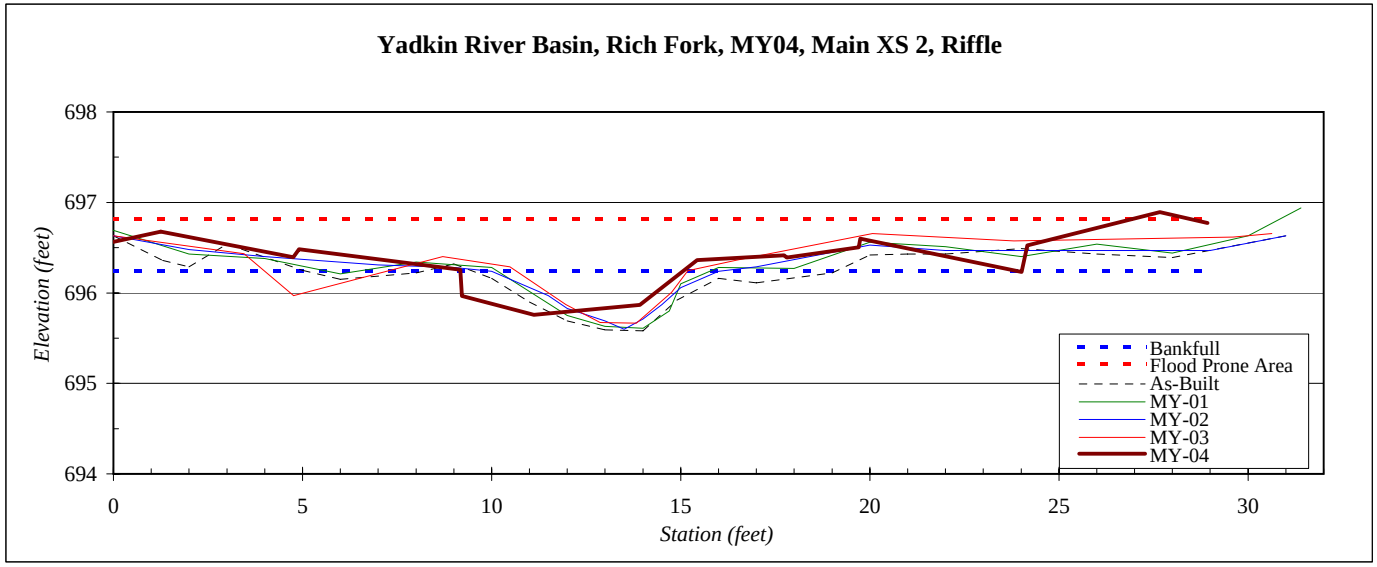
SUMMARY DATA	
Bankfull Elevation:	696.6
Bankfull Cross-Sectional Area:	5.4
Bankfull Width:	15.7
Flood Prone Area Elevation:	697.4
Flood Prone Width:	>50
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.3
W / D Ratio:	46.0
Entrenchment Ratio:	>3
Bank Height Ratio:	1.1



River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Main XS 2, Riffle
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

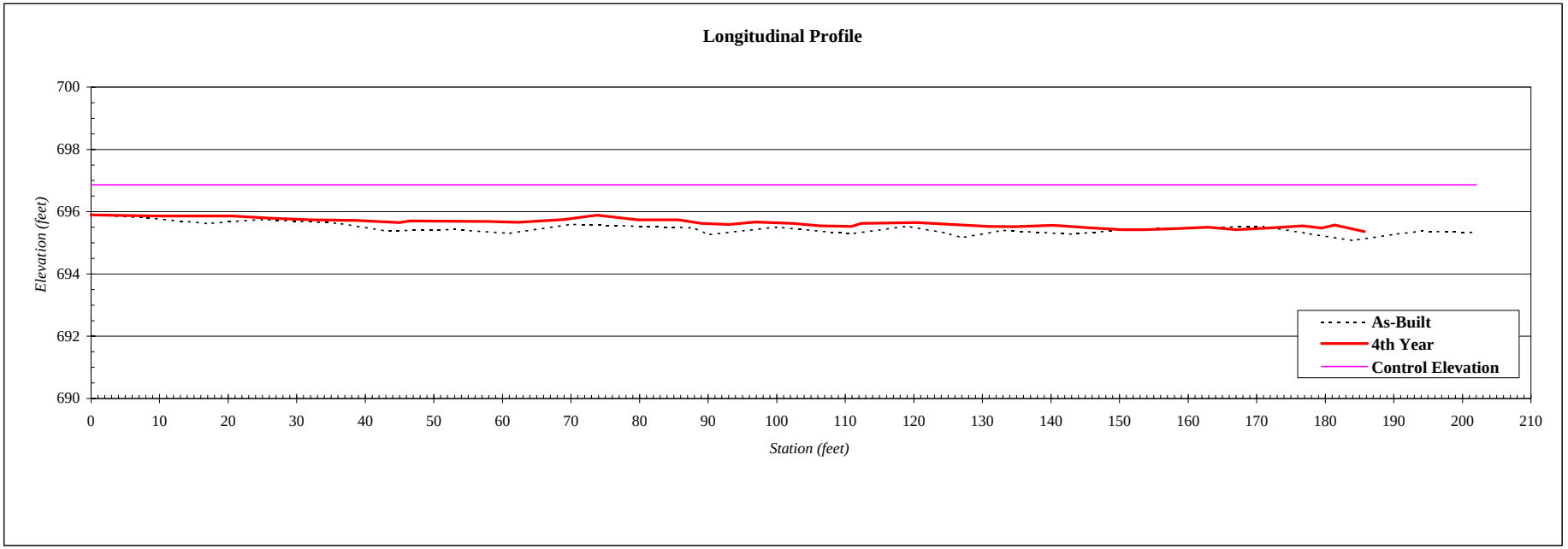
Station	Elevation
0.0	696.56
1.3	696.68
4.8	696.39
4.9	696.48
9.2	696.26
9.2	695.96
11.1	695.76
13.9	695.87
15.4	696.36
17.7	696.42
17.8	696.39
19.7	696.50
19.7	696.60
24.0	696.23
24.2	696.53
27.7	696.89
28.9	696.77

SUMMARY DATA	
Bankfull Elevation:	696.24
Bankfull Cross-Sectional Area:	2.1
Bankfull Width:	6.0
Flood Prone Area Elevation:	696.81
Flood Prone Width:	>35
Max Depth at Bankfull:	0.5
Mean Depth at Bankfull:	0.4
W / D Ratio:	16.0
Entrenchment Ratio:	16.8
Bank Height Ratio:	1.0



River Basin:	Yadkin
Watershed:	Rich Fork Creek
Reach:	Mainstem
Profile ID:	Upstream
Date:	10/22/2007
Field Crew:	B. Roberts, T. King
Control Elevation:	696.86

Average Slope:	0.003
As-Built Avg. Depth:	1.42
4th Year Avg. Depth:	1.23

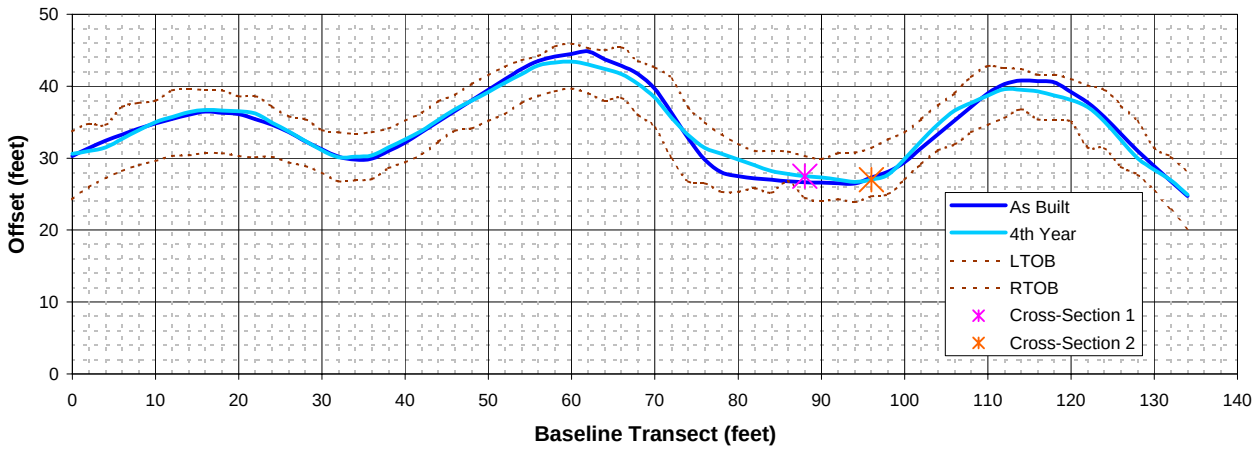


River Basin:	Yadkin
Watershed:	Rich Fork
Planform ID	Main Up
Date:	10/22/2007
Field Crew:	BR, TK

SUMMARY DATA	
Stream Segment Length:	160
Distance Between Survey Points:	134
Distance Between Stations:	2
Sinuosity:	1.2
Mean Radius of Curvature:	13.8
Belt Width:	18.5

View of mainstem upstream planform looking downstream

Stream Type:	E5

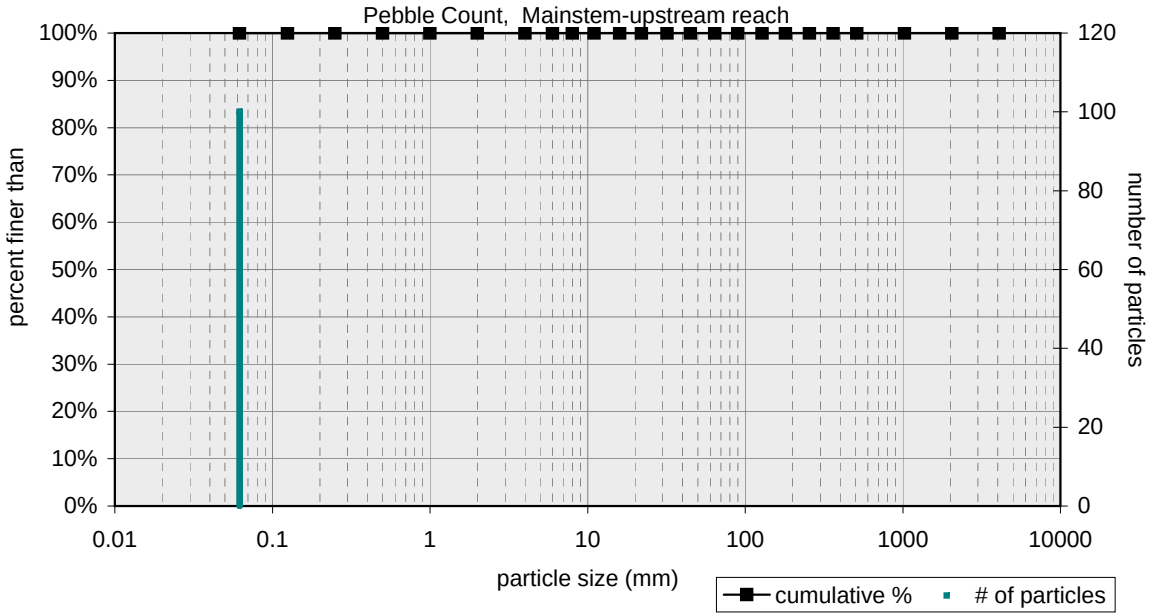


Comments:

Pebble Count of Channel Reach

Pebble Count,
Mainstem-upstream reach
Rich Fork Creek
High Point, NC
Note:

Material	Size Range (mm)		Count
silt/clay	0	0.062	**100**
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	
coarse gravel	22	32	
very coarse gravel	32	45	
very coarse gravel	45	64	
small cobble	64	90	
medium cobble	90	128	
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
	total particle count:		100



bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	100

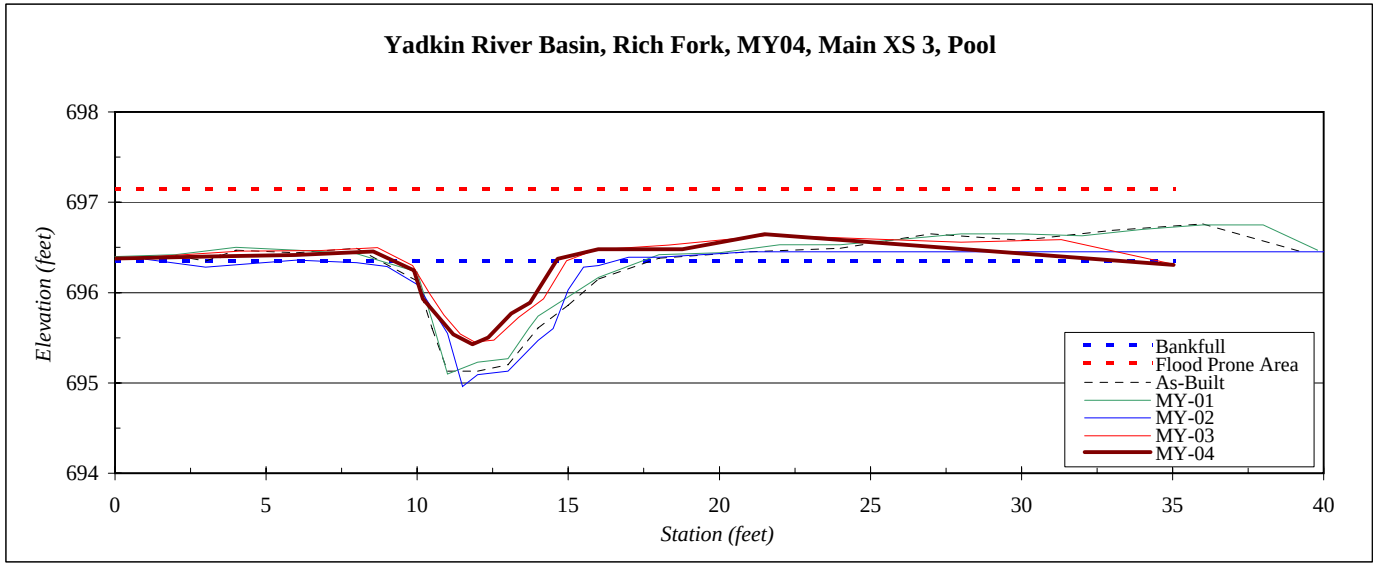
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.06	0.1	0	0	0	1.0	0.1	1.0

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	100%	0%	0%	0%	0%	0%	0%	0%	0%

River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Main XS 3, Pool
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

Station	Elevation
0.0	696.38
3.5	696.40
6.0	696.42
8.5	696.46
9.9	696.25
10.2	695.93
11.2	695.54
11.8	695.43
12.4	695.50
13.1	695.77
13.7	695.89
14.6	696.38
16.0	696.48
18.8	696.48
21.5	696.65
26.1	696.53
35.0	696.31

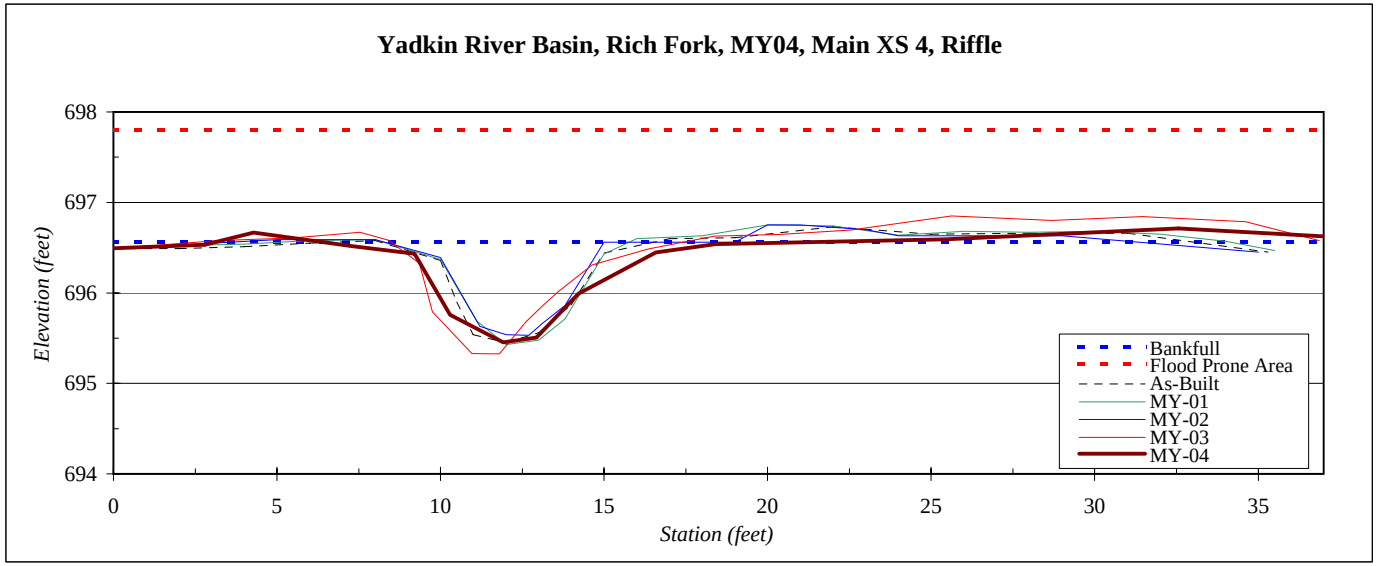
SUMMARY DATA	
Bankfull Elevation:	696.35
Bankfull Cross-Sectional Area:	2.8
Bankfull Width:	5.4
Flood Prone Area Elevation:	697.15
Flood Prone Width:	>40
Max Depth at Bankfull:	0.9
Mean Depth at Bankfull:	0.5
W / D Ratio:	10.2
Entrenchment Ratio:	>7
Bank Height Ratio:	1.0



River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Main XS 4, Riffle
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

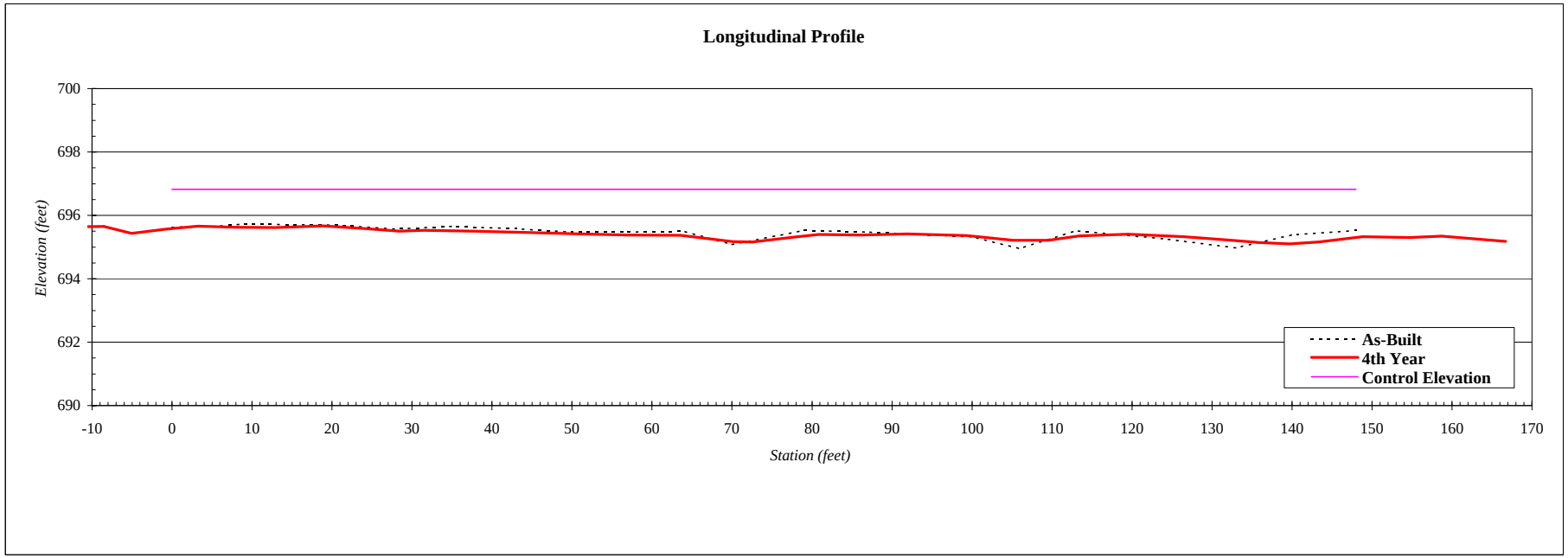
Station	Elevation
0.0	696.49
2.8	696.53
4.3	696.67
7.3	696.52
9.2	696.43
10.3	695.76
11.9	695.45
12.9	695.51
14.2	695.99
16.6	696.45
18.4	696.54
25.4	696.59
32.6	696.71
38.8	696.59

SUMMARY DATA	
Bankfull Elevation:	696.56
Bankfull Cross-Sectional Area:	5.5
Bankfull Width:	17.7
Flood Prone Area Elevation:	697.8
Flood Prone Width:	>50
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.3
W / D Ratio:	57.4
Entrenchment Ratio:	>3
Bank Height Ratio:	1.0



River Basin:	Yadkin
Watershed:	Rich Fork Creek
Reach:	Mainstem
Profile ID:	Downstream
Date:	10/22/2007
Field Crew:	B. Roberts, T. King
Control Elevation:	696.82

Average Slope:	0.003
As-Built Avg. Depth:	1.37
4th Year Avg. Depth:	1.43

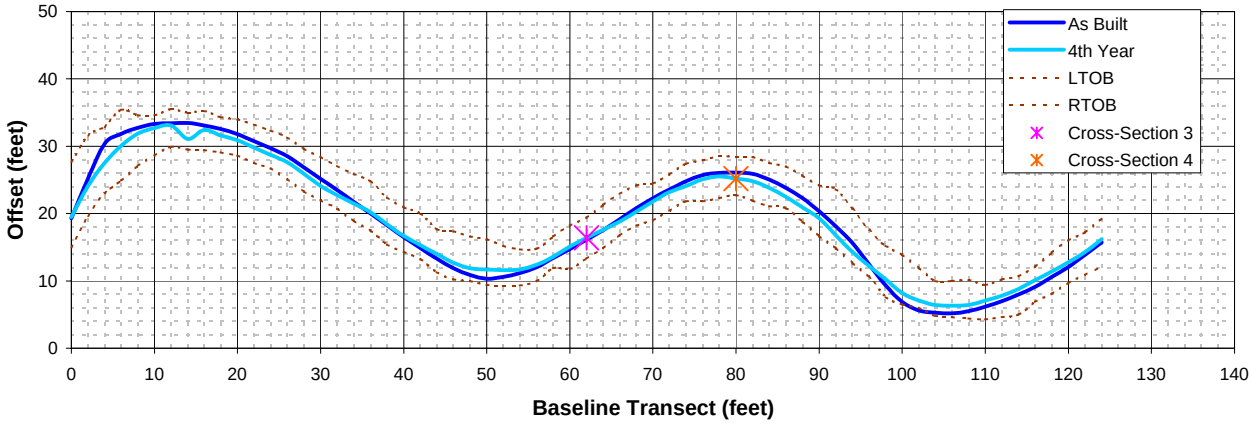


River Basin:	Yadkin
Watershed:	Rich Fork
Planform ID	Main Dwn
Date:	10/22/2007
Field Crew:	BR, TK

SUMMARY DATA	
Stream Segment Length:	151
Distance Between Survey Points:	124
Distance Between Stations:	2
Sinuosity:	1.2
Mean Radius of Curvature:	11.8
Belt Width:	26.8

View of mainstem upstream planform looking downstream

Stream Type:	E5



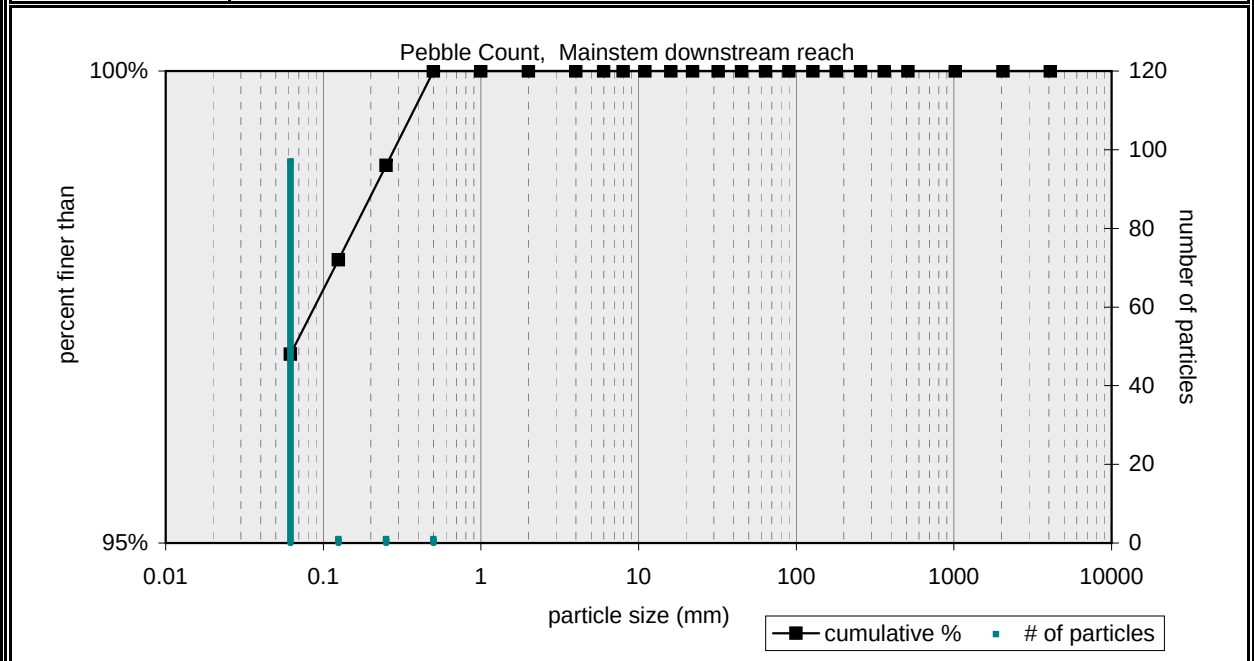
Comments:

Due to an extreme drought, there was no water in this section of main tributary

Pebble Count of Channel Reach

Pebble Count,
Mainstem downstream reach
Rich Fork Creek
High Point, NC
Note:

Material	Size Range (mm)		Count
silt/clay	0	0.062	**97**
very fine sand	0.062	0.13	**1**
fine sand	0.13	0.25	**1**
medium sand	0.25	0.5	**1**
coarse sand	0.5	1	
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	
coarse gravel	22	32	
very coarse gravel	32	45	
very coarse gravel	45	64	
small cobble	64	90	
medium cobble	90	128	
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
	total particle count:		100



bedrock			
clay hardpan			
detritus/wood			
artificial			
	total count:		100

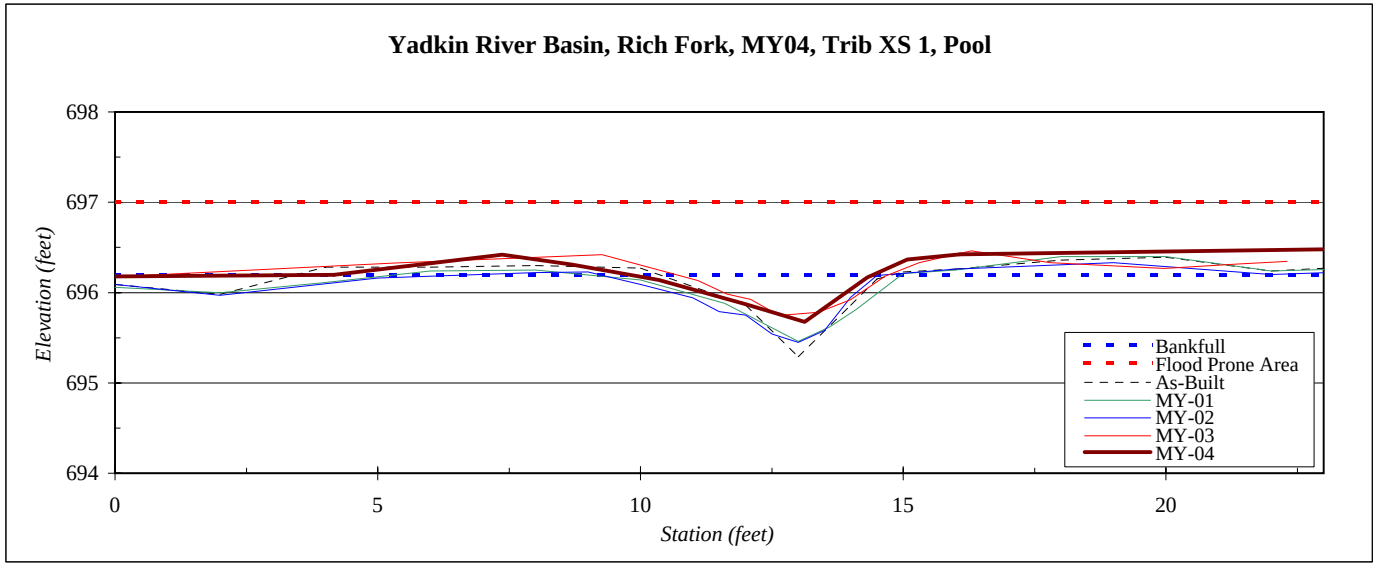
based on	size percent less than (mm)						particle size distribution		
sediment	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
particles only	0.062	0.06	0.1	0	0	0	1.0	0.1	1.0

based on	percent by substrate type								
total count	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	97%	3%	0%	0%	0%	0%	0%	0%	0%

River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Trib XS 1, Pool
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

Station	Elevation
0.0	696.18
4.2	696.20
7.4	696.42
8.7	696.31
10.3	696.14
12.0	695.88
13.1	695.68
14.3	696.17
15.1	696.37
16.1	696.42
28.9	696.53

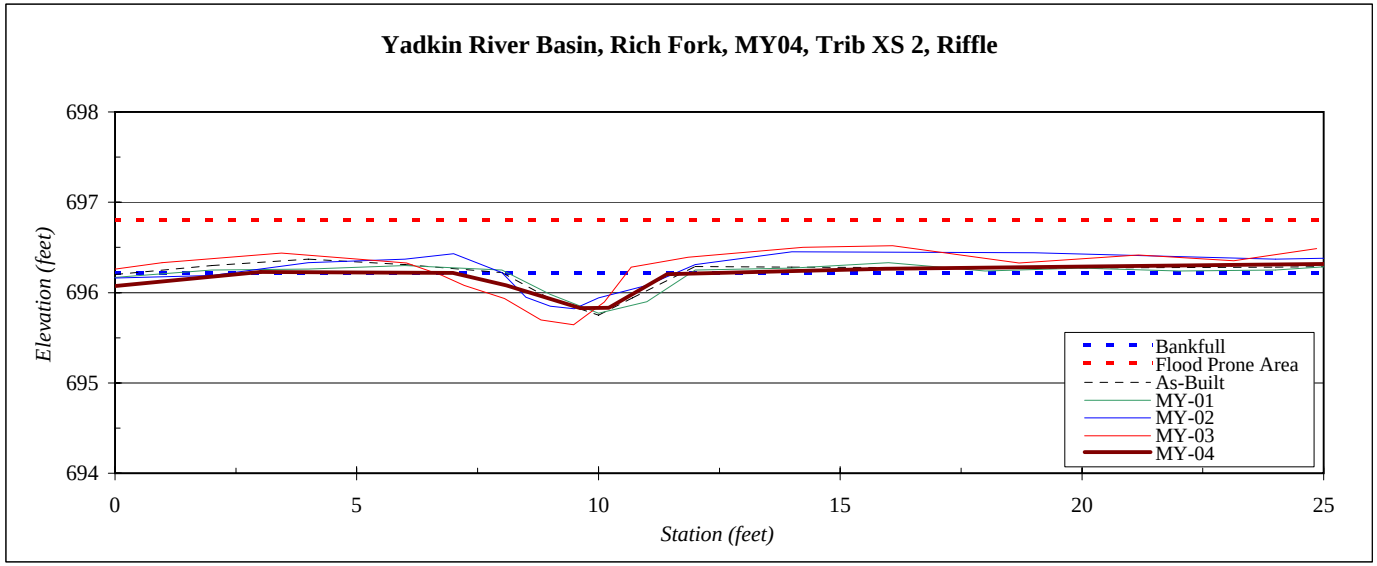
SUMMARY DATA	
Bankfull Elevation:	696.19
Bankfull Cross-Sectional Area:	1.1
Bankfull Width:	4.5
Flood Prone Area Elevation:	697.0
Flood Prone Width:	>30
Max Depth at Bankfull:	0.5
Mean Depth at Bankfull:	0.2
W / D Ratio:	18.7
Entrenchment Ratio:	>6
Bank Height Ratio:	1.0



River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Trib XS 2, Riffle
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

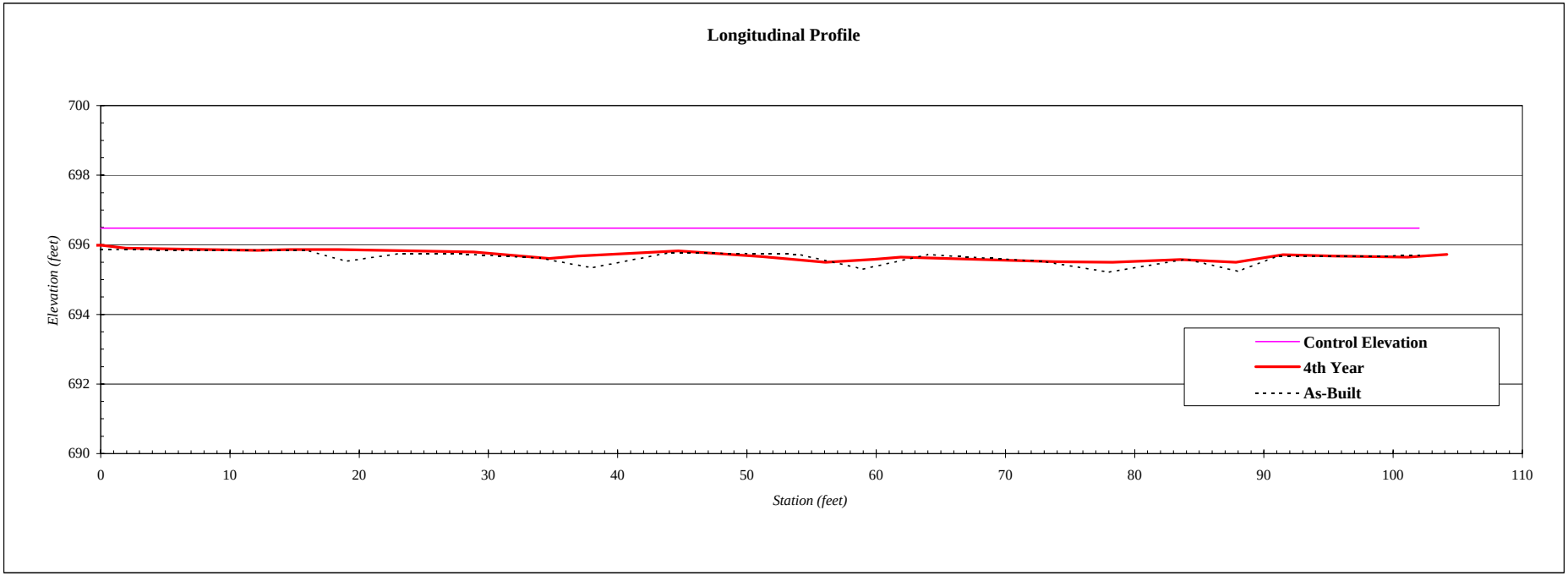
Station	Elevation
0.0	696.07
3.0	696.23
5.5	696.22
7.0	696.22
8.1	696.08
9.6	695.83
10.2	695.83
11.4	696.21
15.9	696.26
23.1	696.31
32.9	696.36

SUMMARY DATA	
Bankfull Elevation:	696.22
Bankfull Cross-Sectional Area:	1.2
Bankfull Width:	9.0
Flood Prone Area Elevation:	696.8
Flood Prone Width:	>25
Max Depth at Bankfull:	0.4
Mean Depth at Bankfull:	0.1
W / D Ratio:	69.6
Entrenchment Ratio:	>2
Bank Height Ratio:	1.0



River Basin:	Yadkin
Watershed:	Rich Fork Creek
Reach:	Tributary
Profile ID:	Upstream
Date:	10/22/2007
Field Crew:	B. Roberts, T. King
Control Elevation:	696.48

Average Slope:	0.002
As-Built Avg. Depth:	0.87
4th Year Avg. Depth:	0.76

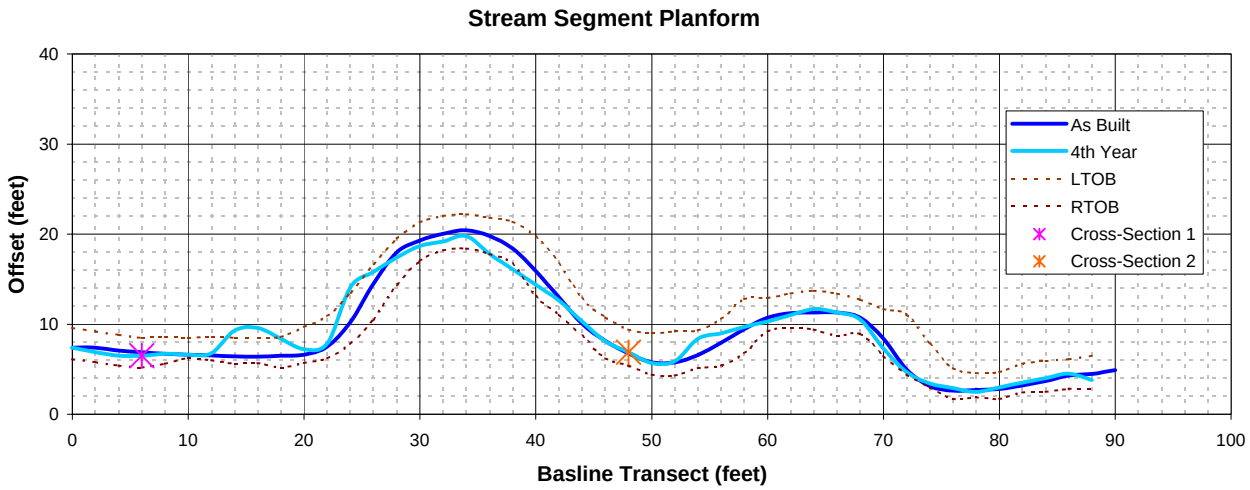


River Basin:	Yadkin
Watershed:	Rich Fork
Planform ID	Trib Up
Date:	10/22/2007
Field Crew:	BR, TK

SUMMARY DATA	
Stream Segment Length:	107
Distance Between Survey Points:	88
Distance Between Stations:	2
Sinuosity:	1.2
Mean Radius of Curvature:	7.0
Belt Width:	17.3

View of mainstem upstream planform looking downstream

Stream Type:	E5



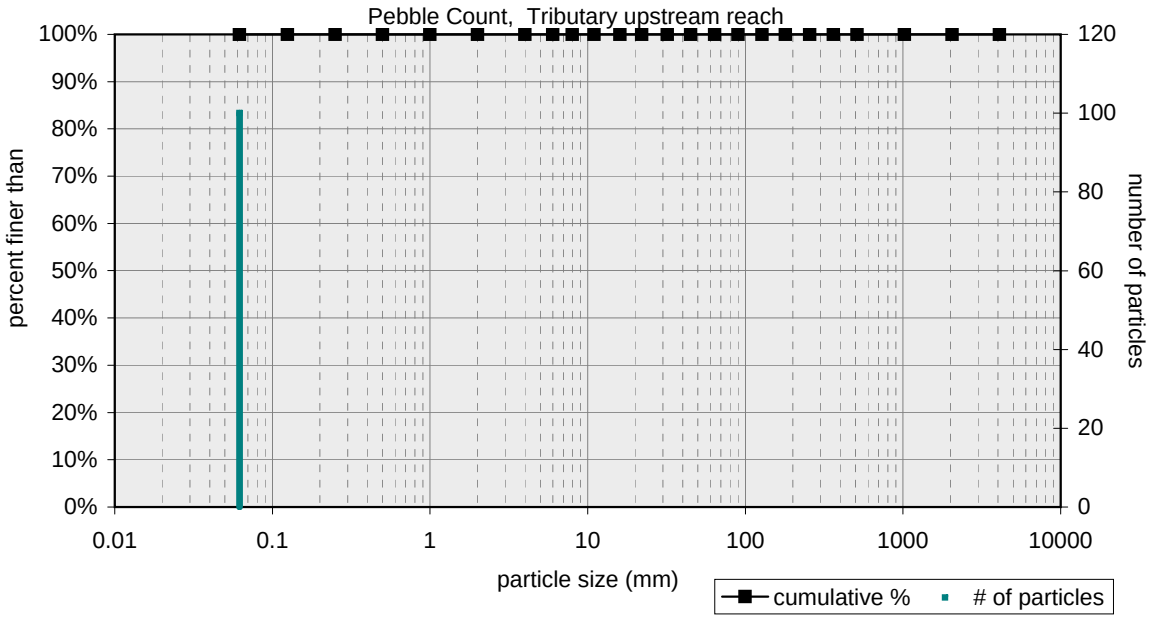
Comments:

Due to an extreme drought, there was no water in the tributary

Pebble Count of Channel Reach

Pebble Count,
Tributary upstream reach
Rich Fork Creek
High Point, NC
Note:

Material	Size Range (mm)		Count
silt/clay	0	0.062	**100**
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	
coarse gravel	22	32	
very coarse gravel	32	45	
very coarse gravel	45	64	
small cobble	64	90	
medium cobble	90	128	
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
	total particle count:		100



bedrock			
clay hardpan			
detritus/wood			
artificial			
	total count:		100

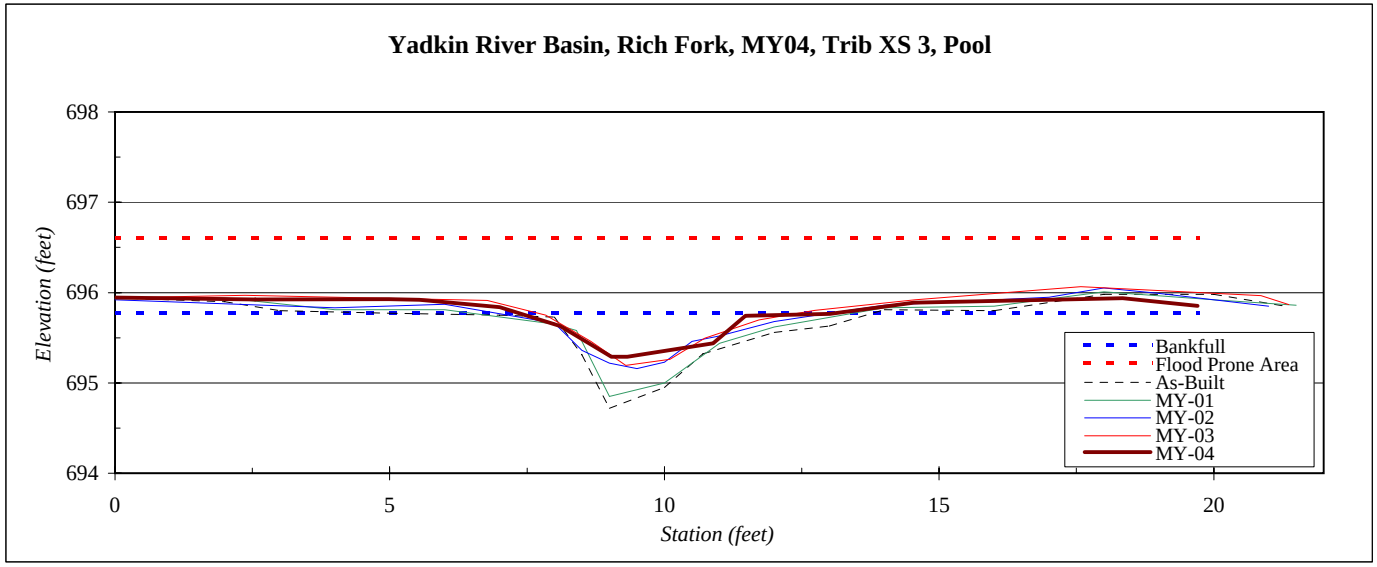
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.06	0.1	0	0	0	1.0	0.1	1.0

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	100%	0%	0%	0%	0%	0%	0%	0%	0%

River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Trib XS 3, Pool
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

Station	Elevation
0.0	695.95
2.5	695.92
5.0	695.93
5.5	695.92
7.0	695.84
8.1	695.63
9.0	695.29
9.3	695.29
10.9	695.44
11.5	695.74
13.0	695.77
14.5	695.89
18.3	695.94
19.7	695.85

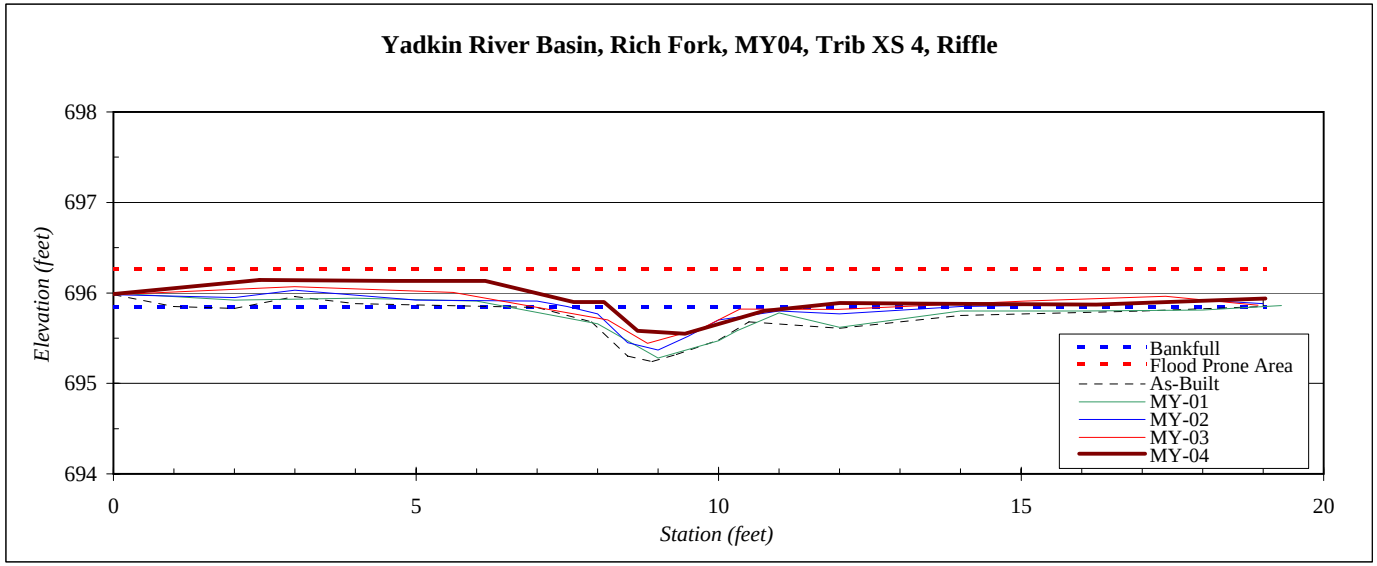
SUMMARY DATA	
Bankfull Elevation:	695.77
Bankfull Cross-Sectional Area:	1.2
Bankfull Width:	5.7
Flood Prone Area Elevation:	696.6
Flood Prone Width:	>30
Max Depth at Bankfull:	0.5
Mean Depth at Bankfull:	0.2
W / D Ratio:	27.1
Entrenchment Ratio:	>6
Bank Height Ratio:	1.0



River Basin:	Yadkin
Watershed:	Rich Fork, MY04
XS ID	Trib XS 4, Riffle
Date:	10/22/2007
Field Crew:	B. Roberts, T. King

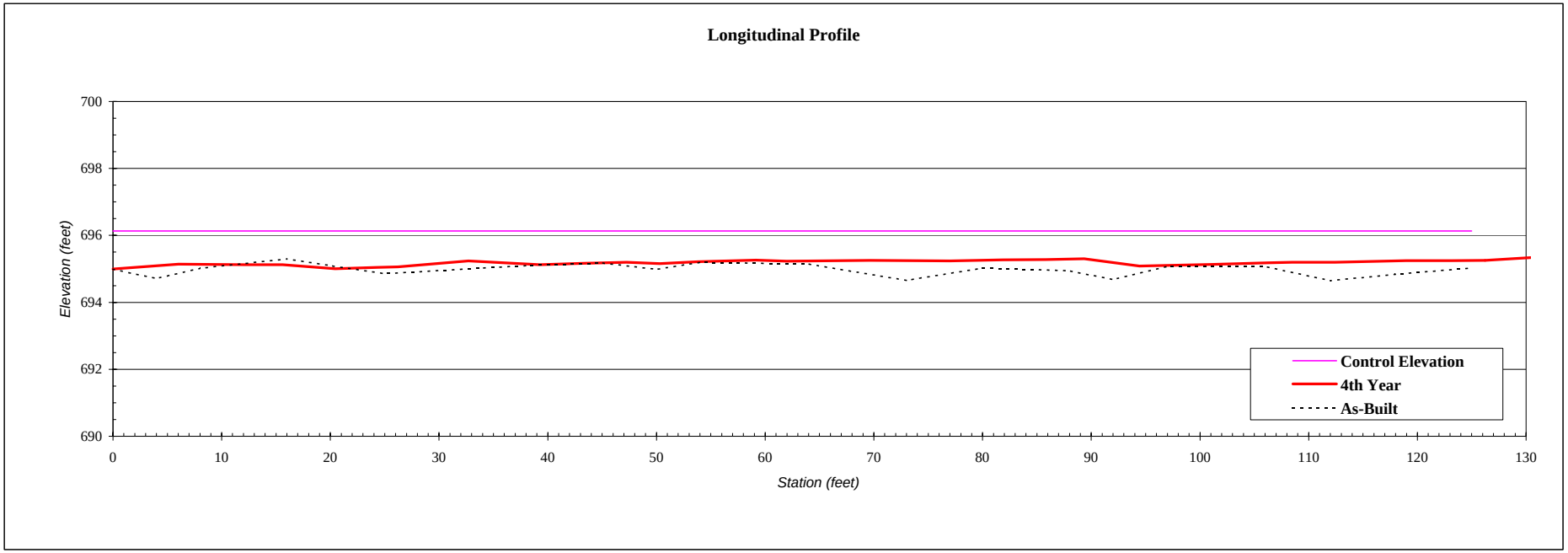
Station	Elevation
0.0	695.99
2.4	696.14
4.6	696.13
6.1	696.13
7.6	695.90
8.1	695.90
8.7	695.58
9.4	695.55
10.7	695.80
12.0	695.89
13.3	695.88
16.2	695.87
19.0	695.94

SUMMARY DATA	
Bankfull Elevation:	695.85
Bankfull Cross-Sectional Area:	0.5
Bankfull Width:	3.3
Flood Prone Area Elevation:	696.26
Flood Prone Width:	>20
Max Depth at Bankfull:	0.3
Mean Depth at Bankfull:	0.2
W / D Ratio:	19.9
Entrenchment Ratio:	>6
Bank Height Ratio:	1.0



River Basin:	Yadkin
Watershed:	Rich Fork Creek
Reach:	Tributary
Profile ID:	Downstream
Date:	10/22/2007
Field Crew:	B. Roberts, T. King
Control Elevation:	696.13

Average Slope:	-0.003
As-Built Avg. Depth:	1.15
4th Year Avg. Depth:	0.92

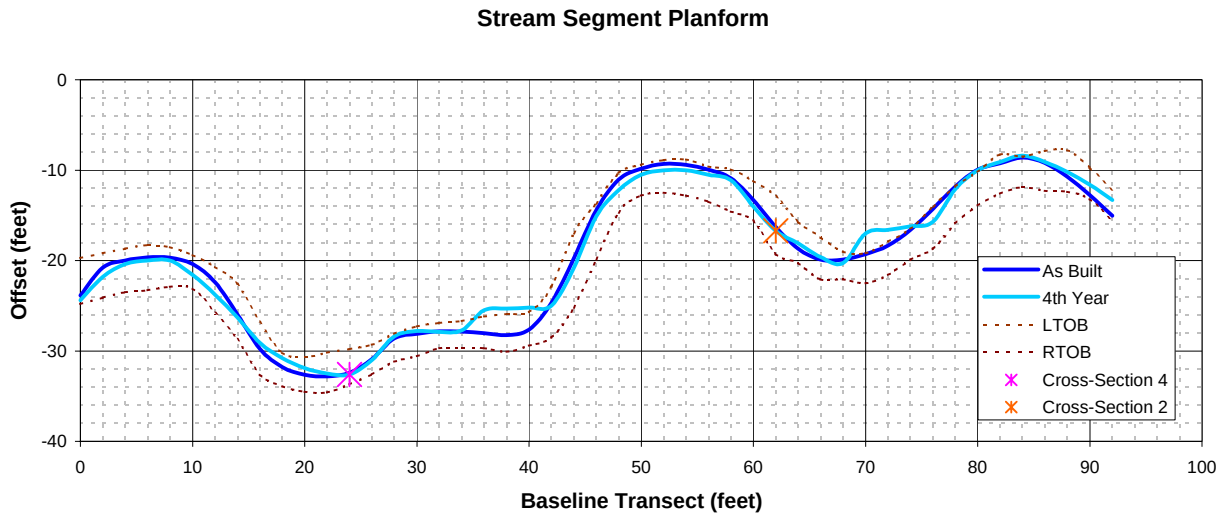


River Basin:	Yadkin
Watershed:	Rich Fork
Planform ID	Trib Dwn
Date:	10/22/2007
Field Crew:	BR, TK

SUMMARY DATA	
Stream Segment Length:	123
Distance Between Survey Points:	92
Distance Between Stations:	2
Sinuosity:	1.3
Mean Radius of Curvature:	7.0
Belt Width:	24.2

View of mainstem upstream planform looking downstream

Stream Type:	E5



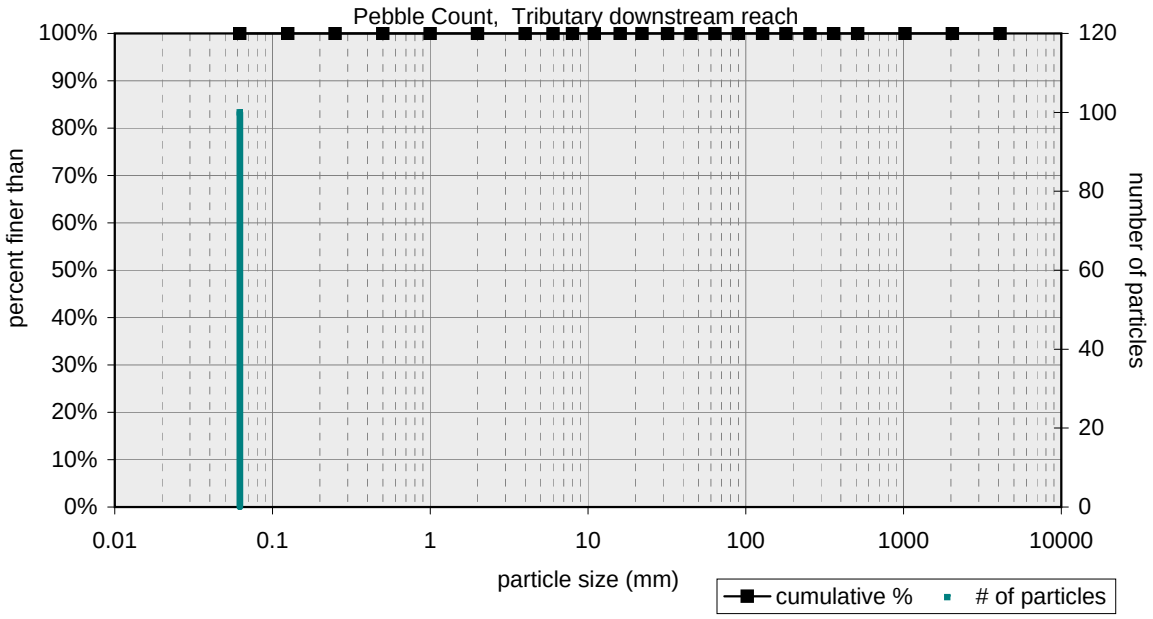
Comments:

Due to an extreme drought, there was no water in the tributary

Pebble Count of Channel Reach

Pebble Count,
Tributary downstream reach
Rich Fork Creek
High Point, NC
Note:

Material	Size Range (mm)		Count
silt/clay	0	0.062	**100**
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	
medium gravel	11	16	
coarse gravel	16	22	
coarse gravel	22	32	
very coarse gravel	32	45	
very coarse gravel	45	64	
small cobble	64	90	
medium cobble	90	128	
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
	total particle count:		100



bedrock			
clay hardpan			
detritus/wood			
artificial			
	total count:		100

based on	size percent less than (mm)						particle size distribution		
sediment	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
particles only	0.062	0.06	0.1	0	0	0	1.0	0.1	1.0

based on	percent by substrate type								
total count	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	100%	0%	0%	0%	0%	0%	0%	0%	0%

Appendix D
Benthic Macroinvertebrate Report

UT to Rich Fork Stream and Wetland Restoration Project
Benthic Macroinvertebrate Sampling
October 10, 2006

Aquatic macroinvertebrates were sampled from the unnamed tributary to Rich Fork (UTRF) at the Rich Fork Stream and Wetland Restoration Site on October 10, 2006. This sample was for the third monitoring year and the second taken in 2006 due to no sample being taken in 2005.

The UTRF is a first order, low gradient stream that was restored in 2003. Based on the stream size, the North Carolina Qual-4 method was used to sample for macroinvertebrates. The North Carolina Division of Water Quality (NCDWQ) recommends this method for streams smaller than 4 meters wide and with a drainage area smaller than 3 square miles. This method is defined as four separate samples: one kick net, one sweep, one leaf pack, and one visual inspection (Standard Operating Procedures for Benthic Macroinvertebrates, Biological Assessment Unit, NCDWQ 2003). For this stream, a sand bag sample was used instead of a kick net due to low stream velocity. The visual inspection lasted 5 minutes for each location.

The site conditions on that day were sunny and warm with temperatures reaching 75 degrees F. Water flowed in the UTRF from beginning to end. The tributary to the UTRF was blocked before it joins the UTRF due to flood debris and had standing water over the sample site and was not sampled.

The sampling locations were based on those used during the first monitoring year. The confluence site sampled moved up a half of a meander because of better sampling habitat.

A reference sample was completed directly upstream of the project stream (Upper Reach Sample). This portion of the stream has grown over with cattails and has no defined substrate. There were signs of iron-fixing bacteria in the water. One sweep and one combined leaf pack/visual were all that could be completed here. The leaf pack and visual inspection were combined due to the lack of substrate material to sample.

The first project sample was completed approximately one-third of the way downstream (Main Channel Sample). The site was chosen because of the mature willows providing shade along the bank. The full Qual-4 was completed at this site. There were no noticeable riffles in the stream.

The project stream was sampled again just before the restored reach joins Rich Fork (Confluence Sample). This site was also located near several willows that provided shade and potential habitat for stream organisms. The full Qual-4 was completed.

A sample within the tributary could not be completed due to obstructed flow in the channel and standing water (Tributary Sample).

The results from the sampling are in Table 1 and show a decrease in biotic value from earlier in the year at two of the three locations sampled. The North Carolina biotic values on the restored reach were 8.10 and 7.86 and the reference reach had a value of 8.98. Any biotic value over 7.48 in the Piedmont is rated as poor under North Carolina guidelines. There was only one EPT taxa sampled at the confluence in 2007. There are several factors that contributed to decreased macroinvertebrate populations in the project stream. A drought led to a dry streambed throughout much of the growing season in 2005, which would greatly impact existing macroinvertebrate communities. On July 22-23, 2006, there was a large flooding event where water reached as high as 3 feet in certain points on the project site. On October 22, 2007 there was only standing water in the upstream portion of the project stream. These extreme changes in water level and flow decrease the ability of less tolerant macroinvertebrates species to establish a stable population within the project stream, and can lead to higher biotic index values considered poor.

Table 1: Aquatic Community Summary					
Sampling Location		**EPT**	**Biotic Index**	**Taxa Richness**	**# of Organisms**
Upper Reach (Reference)	**Pre-Restoration**	1	6.61	9	24
	Year 1 (2004)	1	7.47	10	33
	Year 2 (2006*)	0	7.84	4	18
	Year 3 (2006)	0	8.98	3	26
	Year 4 (2007)	N/A	N/A	N/A	N/A
	Year 5 (2008)				
Main Channel	**Pre-Restoration**	3	6.98	6	54
	Year 1 (2004)	3	7.63	17	52
	Year 2 (2006*)	0	8.12	7	16
	Year 3 (2006)	0	7.96	5	23
	Year 4 (2007)	N/A	N/A	N/A	N/A
	Year 5 (2008)				
Confluence	**Pre-Restoration**	3	6.44	16	124
	Year 1 (2004)	4	6.77	13	27
	Year 2 (2006*)	2	7.59	20	50
	Year 3 (2006)	1	8.10	14	27
	Year 4 (2007)	N/A	N/A	N/A	N/A
	Year 5 (2008)				
Tributary	**Pre-Restoration**	N/A	N/A	N/A	N/A
	Year 1 (2004)	4	7.45	18	56
	Year 2 (2006*)	N/A	N/A	N/A	N/A
	Year 3 (2006)	N/A	N/A	N/A	N/A
	Year 4 (2007)	N/A	N/A	N/A	N/A
	Year 5 (2008)				

*****Replacement sampling

BENTHIC MACROINVERTEBRATES COLLECTED FROM UNNAMED TRIBUTARY TO RICH FORK, DAVIDSON COUNTY, NC, 10/10/06.

SPECIES	T.V.	F.F.G.	UPPER	MAIN	CONFLUENCE
NEMATODA	**6**				
MOLLUSCA					
Bivalvia					
Veneroida					
Corbiculidae					
Corbicula fluminea	**6.1**	**FC**		1	
Sphaeriidae	***8**	**FC**			
Pisidium sp.	**6.5**	**FC**		1	
Gastropoda					
Basommatophora					
Physidae					
Physella sp.	**8.8**	**CG**		14	13
ANNELIDA					
Oligochaeta	***10**	**CG**			
Tubificida					
Lumbricidae		**CG**	3		10
Naididae	***8**	**CG**			
Tubificidae w.o.h.c.	**7.1**	**CG**			1
Branchiura sowerbyi	**8.3**	**CG**		6	2
ARTHROPODA					
Crustacea					
Amphipoda		**CG**			
Crangonyctidae					
Crangonyx sp.	**7.9**	**CG**			16
Isopoda					
Asellidae					
Caecidotea sp.	**9.1**	**CG**	22		6
Insecta					
Odonata					
Calopterygidae		**P**			
Calopteryx sp.	**7.8**	**P**	1		
Gomphidae		**P**			
Gomphus sp.	**5.8**	**P**			2
Hemiptera					
Gelastocoridae		**-**			
Gelastocoris sp.		**P**			1
Trichoptera					
Phryganeidae		**SH**			
Ptilostomis sp.	**6.4**	**SH**			1
Coleoptera					
Dytiscidae		**P**			
Laccophilus sp.	**10**	**P**			1
Haliplidae					
Peltodytes sp.	**8.7**	**SH**		1	
Hydrophilidae		**P**			
Sperchopsis tesselatus	**6.1**	**CG**			1
Diptera					
Chironomidae					
Chaetocladius sp.	***6**	**CG**			
Chironomus sp.	**9.6**	**CG**			1
Cryptochironomus sp.	**6.4**	**P**			1
Paratendipes sp.	**5.1**	**CG**			1
TOTAL NO. OF ORGANISMS			26	23	57
TOTAL NO. OF TAXA			3	5	9
EPT TAXA			0	0	1

Appendix E
Permanent Photo Documentation Points

Photo Location 1: View looking toward large cedar and restored channel at confluence with Rich Fork Creek. 7/5/07 MY04

Photo Location 2, Photo 1: View looking toward large cedar and vegetation monitoring plot #6. 7/5/07 MY04

Photo Location 2, Photo 2: View looking toward vegetation monitoring plot #1. 7/5/07 MY04

Photo Location 3: View looking east along the wetland preservation area. 7/5/07 MY04

Photo Location 4: View looking east. 7/5/07 MY04

Photo Location 5: View looking north toward tree line of wetland preservation area. 7/5/07 MY04

Photo Location 6, Photo 1: View looking west toward large cedar. 7/5/07 MY04

Photo Location 6, Photo 2: View looking from Rich Fork toward Photo Point #2 at the spoil pile. 7/5/07 MY04