

# Cato Farms Stream Restoration

## Project No. 72

### 2009 Monitoring Report: Year 5 of 5



**November 2009 (Revised April 2010)**

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Cato Farms Site – Pre-Construction Photos





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**SECTION 1**  
**EXECUTIVE SUMMARY**

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# SECTION 1

## EXECUTIVE SUMMARY

The Cato Farms Stream Restoration Project (Site) is located at the Cato Farms Property in Mecklenburg County, North Carolina just east of the Town of Huntersville (Appendix 1.1). The Site drains approximately 0.41 square miles to Clark Creek, within the Southern Outer Piedmont Physiographic Region of the Yadkin-Pee Dee River Basin (HUC 3040105). The Site consisted of restoring 2,444 linear feet of the unnamed tributary (UT) to Clark Creek, restoring the associated riparian zone, providing one cattle crossing, and fencing the riparian corridor to exclude cattle access. This report serves as the fifth year of the five year monitoring plan for the Site.

### 1.1 Goals and Objectives

The UT runs through the agricultural property of William Cato and family. Prior to restoration, the site was predominantly utilized for cattle grazing. Historically, the land was cleared to provide pasture land, with access to the stream for cattle watering. The UT appears to have been previously channelized/straightened and its adjacent floodplain areas ditched to drain wetlands. These activities are thought to have inhibited stream channel stability; therefore, producing an incised, eroded stream. Furthermore, the channel incision may have caused adjacent hydric soils to become less saturated. The following goals were established for the Site.

1. Restore the stream to a stable form.
2. Restore the riparian zone adjacent to the stream.
3. Provide a crossing for cattle at one location along the project reach.
4. Provide fencing to exclude cattle access to the UT and the riparian areas.

The Site was restored by relocating approximately 1,833 linear feet (Reach 1) of the existing channel to establish an E-type channel (Priority 1). In addition, approximately 611 linear feet (Reach 2) of stream was restored in-place to create a B-type channel (Priority 3) to transition the channel to the confluence elevation with Clark Creek. The total stream linear footage of 2,444 represents the centerline footage, not the thalweg footage as provided in the as-built plans and excludes the 20 ft cattle crossing (bridge easement). Cato Farm's riparian areas were planted to improve habitat and stabilize streambanks. The entire Site was fenced in to exclude cattle access to the UT and a cattle crossing was established at the lower end of the project. Appendix 2 provides more detailed project activity, history, contact information, and watershed/site background for this project.

### 1.2 Vegetative Assessment

The following monitoring results are from the 2009 (year 5 of 5) survey completed in September 2009.

Several of the problem areas noted during the previous vegetative assessments (2005-2008) have improved throughout the growing seasons. The woody vegetation monitored for 2009 indicates an average of 11 stems per plot. Using the monitoring plots size of 10m x 10m (0.0247 acres), the average site density is approximately 455 planted stems per acre. This meets the mitigation success criteria for planted woody vegetation (450 stems per acre) after year 5. Several natural recruitment stems were observed within all eight plots. Furthermore, the natural recruitment woody stems recorded substantially increases the number of live stems per plot. A review of the planted and natural recruits monitored indicates a current site density of approximately 1,134 stems per acre.

In conclusion, the vegetation within the Site meets the success criteria for year 5. Although some loss of streambank vegetation has occurred, the overall growth of the riparian buffer is good.

### 1.3 Stream Assessment

Results from the 2009 stream monitoring effort indicate that the channel is maintaining vertical and lateral stability. However, the channel thalweg has appeared to shift back and forth laterally over the last few years seemingly in response to the dense stands of *Juncus* sp. in areas of the channel. This vegetation is likely a byproduct of the intense drought and low flows between late 2006 through early 2009. EEP has relayed observing this in many smaller channels across the state over this time period. Typically areas of instability noted in 2009 had their origins earlier in the projects history and have not advanced since their onset. The following general observations were noted.

- In a few outer bends, there are areas of moderate to severe bank erosion under the matting due to the lack of vegetative cover. (approximate stationing 9+15, 16+85, and 17+50).
- Overall, the structures appear to be in good condition; however, the outer arm of some structures are lacking in vegetative cover; therefore, moderate scouring has occurred over the years (stationing 22+50, 22+90 and 24+30).
- Throughout the entire stream restoration project, in-stream vegetation (soft rush (*Juncus effuses*) and various grasses) are growing in the middle of the channel, creating abnormal flow conditions.
- Approximately at station 4+00, the channel water is now spread across the point bar rather than entirely in the pool area due to in-stream vegetation growth.

#### *Reach 1*

Within Reach 1, cross-sections 3, 4, 5, and 6 are located. All of these cross-sections have had sediment deposition occurring over the past monitoring years. These cross-sections have all illustrated a decrease in the bankfull mean depth and cross-sectional area. The substrate analysis shows a shift towards finer material. Again, the trapping of this finer material is apparently related to the drought induced channel vegetation. In addition, the watershed immediately above and on the Western edge of the project boundary saw a great deal of development over the last several years. Although the channel is illustrating a shift in substrate and cross-sectional

dimensions, the aggradation occurring throughout the reach could most likely be flushed out over the years to come with significant storm flows.

The average water surface slope and the average bankfull slope were the same for the surveyed reach, 0.0066 ft/ft. The surveyed water surface slope was slightly lower than the proposed 0.0100 ft/ft, but similar to the previous monitoring year's surveyed slopes. The profile appears stable and is not showing vertical incision; however, fine silt deposition has impacted the substrate composition. Upstream sources from construction development and abnormal rainfall conditions are most likely contributing to the increase in sediment deposition. Several compound pools have developed throughout the reach, which is most likely due to the increase of in-stream vegetation growth and sediment deposition.

### *Reach 2*

Overall, the structures within the transition zone appear to be in good condition; however, the outer arm of some structures are lacking vegetative cover; therefore, moderate to severe scouring has occurred over the monitoring years (Stationing 21+00, 21+50, 22+50, 22+90, 23+90, 23+25, and 24+30).

Cross-sections 1 and 2 are located within Reach 2. Both cross-section 1 and 2 are riffles and appear to be stable with minimal erosion occurring. The average water surface slope and the average bankfull slope are the same for the surveyed reach, 0.0090 ft/ft. The surveyed water surface slope was slightly lower than the proposed 0.010 ft/ft and similar to the previous surveyed water surface and bankfull slopes in 2006 (0.0093 ft/ft and 0.0083 ft/ft, respectively). The profile appears stable and is not showing significant shifting in the bed features.

The Site has a crest gauge that was installed in 2007. One bankfull or greater event was recorded during the 2009 monitoring year. Bankfull events prior to 2007 were recorded by visual assessments only. A local USGS gauge, Clark Creek, is located within the area, but the drainage area is larger than 10 square miles and was not used per NCEEP recommendation.

In summary, Reach 1 and 2 stream dimension, pattern, and profile appear stable. However, in-stream vegetation growth is advancing, resulting in abnormal flow conditions throughout the channel. Please refer to Appendix 4 for more detailed stream data tables and plots and Appendix 1.2 for the location of the longitudinal profile stations, cross-section stations, vegetation plots, photo points, and gauges.

## **1.4 Annual Monitoring Summary**

Overall, the 2009 monitoring results indicate that the Site appears to be meeting vegetation, stream, and hydrology success criteria. Planted and naturally recruited vegetation is doing well at the site, although some minor vegetation problems were noted. The pattern, profile, and dimension of the restored channel appear to be stable. However, the channel thalweg has appeared to shift back and forth laterally over the last few years seemingly in response to the dense stands of *Juncus* sp. in areas of the channel. This vegetation is likely a byproduct of the intense drought and low flows between late 2006 through early 2009. EEP has relayed observing



this in many smaller channels across the state over this time period. Typically areas of instability noted in 2009 had their origins earlier in the projects history and have not advanced since their onset. The substrate analysis shows a shift towards finer material. Again, the trapping of this finer material is apparently related to the drought induced channel vegetation. In addition, the watershed immediately above and on the Western edge of the project boundary saw a great deal of development over the last several years.

The background information provided in this report is referenced from the previous reports prepared by CH2MHill (2002) and North Carolina State University (2005). Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.



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**SECTION 2**  
**METHODOLOGY**

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## SECTION 2

### METHODOLOGY

#### 2.1 Methodology

Methods employed for the Cato Farms Stream Restoration Project were a combination of those established by standard regulatory guidance as well as procedures documents as well as previous monitoring reports completed by North Carolina State University and CH2MHill. Geomorphic and stream assessments were performed following guidelines outlined in the Stream Channel Reference Sites: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration a Natural Channel Design Handbook (Doll et al, 2003). Vegetation assessments were conducted following the NCEEP 2004 Stem Counting Protocol which consists of counting woody stems within the established vegetation plots. JJG used the *Flora of the Carolinas, Virginia, Georgia, and surrounding areas* by Alan S. Weakley as the taxonomic standard for vegetation nomenclature for this report.



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**SECTION 3**  
**REFERENCES**

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## SECTION 3

### REFERENCES

CH2MHill. 2002. Restoration Report (Cato Farms Stream Restoration). Raleigh, NC.

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E., 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, Cheryl C; Rawlins, C.L.; Potyondy, John P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique*. Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

North Carolina State University. Annual Monitoring Report (Year 1 of 5) (Cato Farms Stream Restoration). Raleigh, NC.

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

Weakley, A.S. 2008. *Flora of the Carolinas, Virginia, Georgia, Northern Florida, and Surrounding Areas* (Draft April 2008). University of North Carolina at Chapel Hill: Chapel Hill, NC.



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## **SECTION 4**

### **APPENDICES**

**Appendix 1 - General Figures and Plan Views**

**Appendix 2 - General Project Tables**

**Appendix 3 - Vegetation Assessment Data**

**Appendix 4 – Stream Assessment Data**

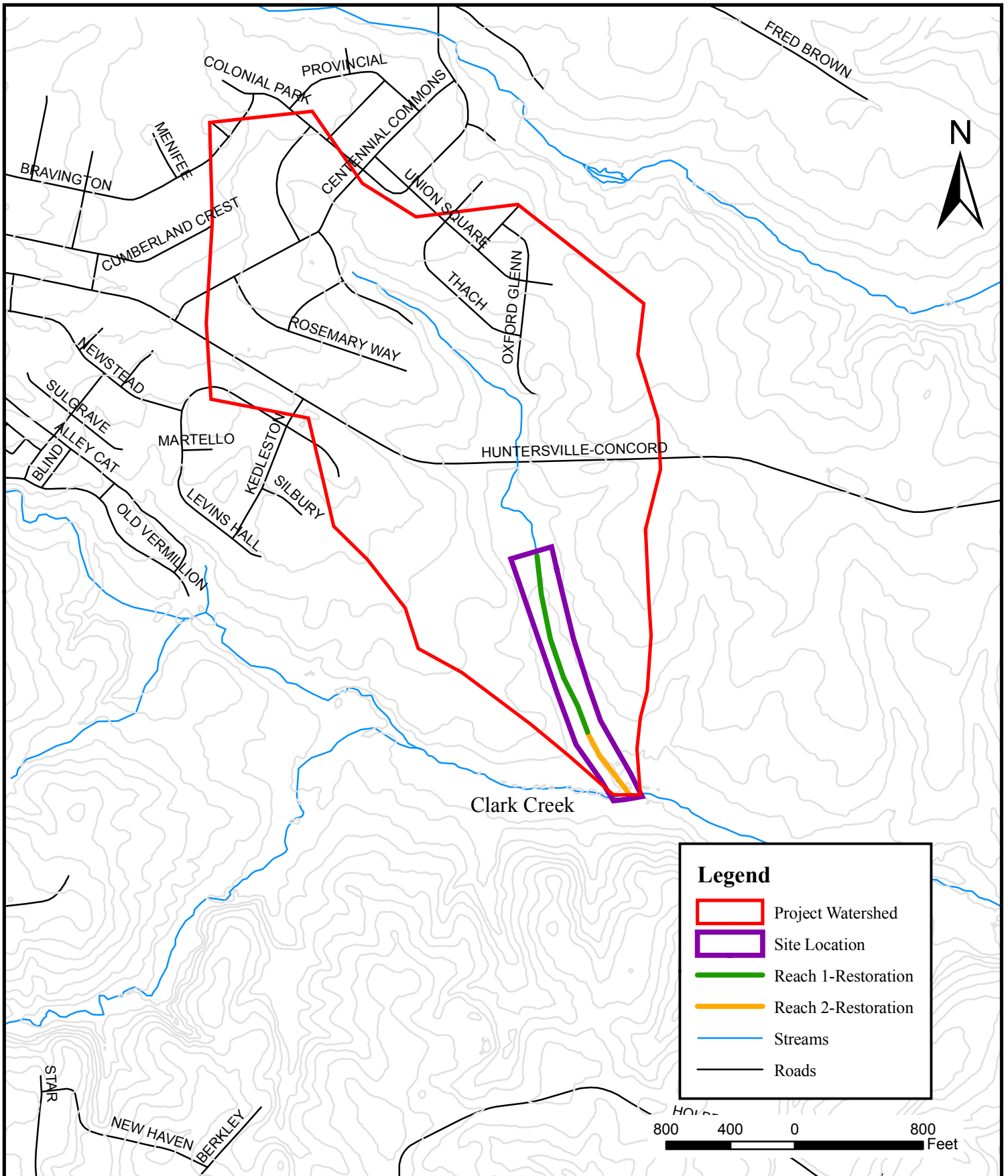


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# APPENDIX 1

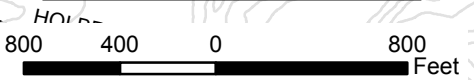
## GENERAL FIGURES AND PLAN VIEWS

- 1. Project Location Map**
- 2. Current Condition Plan View**



**Legend**

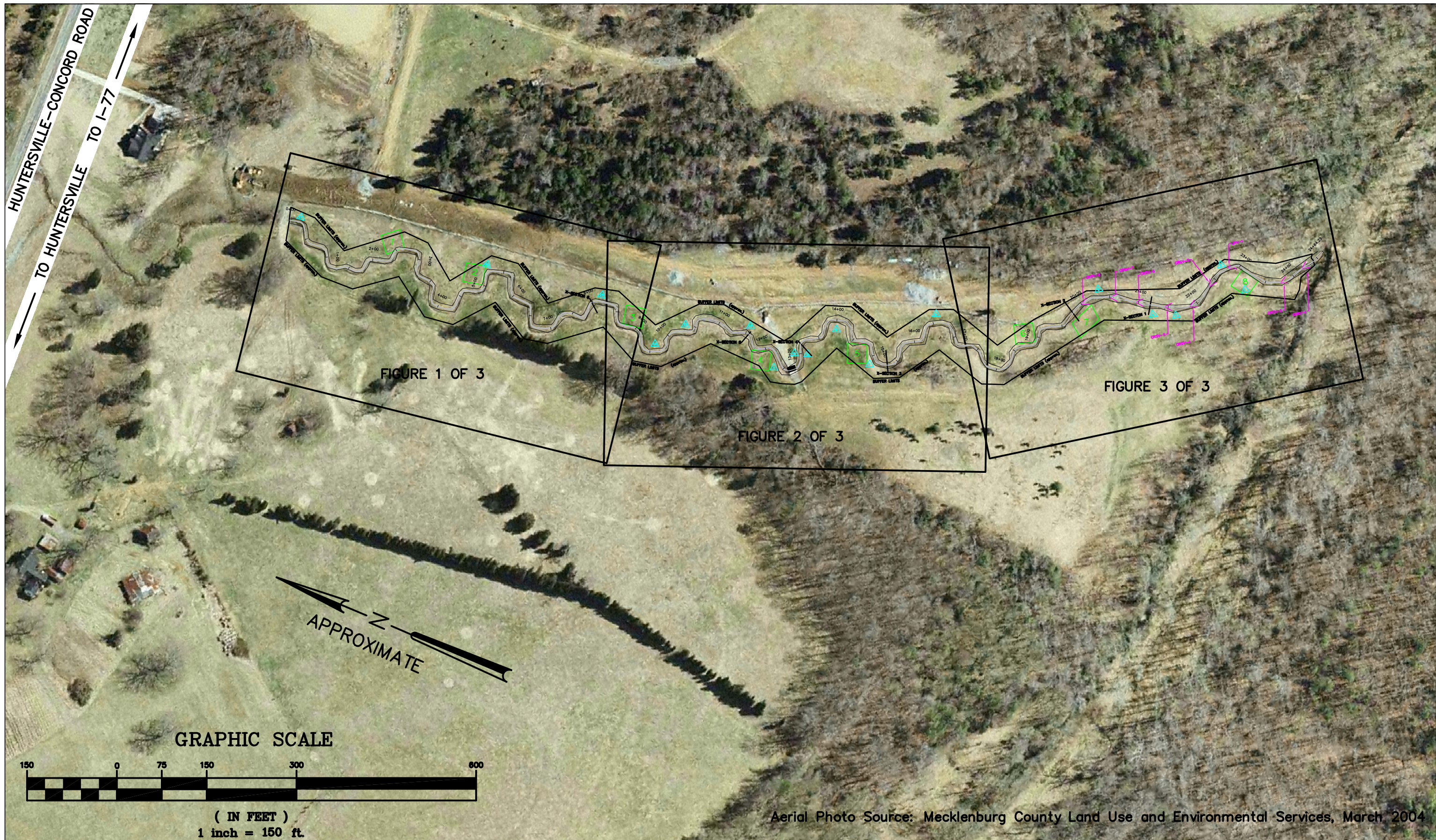
- Project Watershed
- Site Location
- Reach 1-Restoration
- Reach 2-Restoration
- Streams
- Roads



Appendix 1.1 Project Location Map  
 Cato Farms Stream Restoration  
 Mecklenburg County, NC  
 Year 5 of 5

Project No. 72  
 November 2009





Aerial Photo Source: Mecklenburg County Land Use and Environmental Services, March 2004



NOTES:  
 1. GENERAL SITE DATA PROVIDED BY NCEEP.  
 2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 72  
 MECKLENBURG COUNTY  
 NORTH CAROLINA  
 MONITORING  
 YEAR 5 OF 5

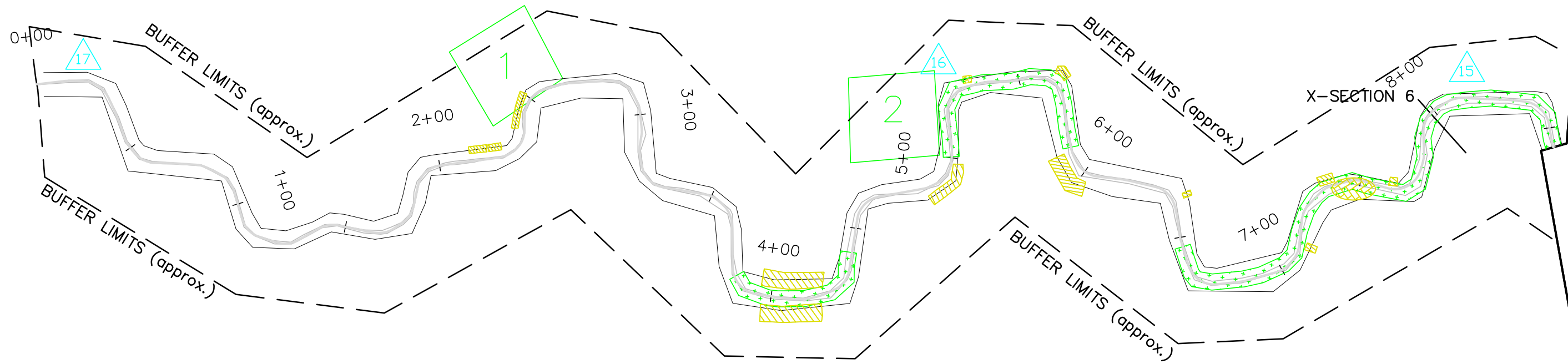


NC ECOSYSTEM ENHANCEMENT PROGRAM  
 CATO FARMS STREAM RESTORATION

APPENDIX 1.2  
 CURRENT CONDITION PLAN VIEW

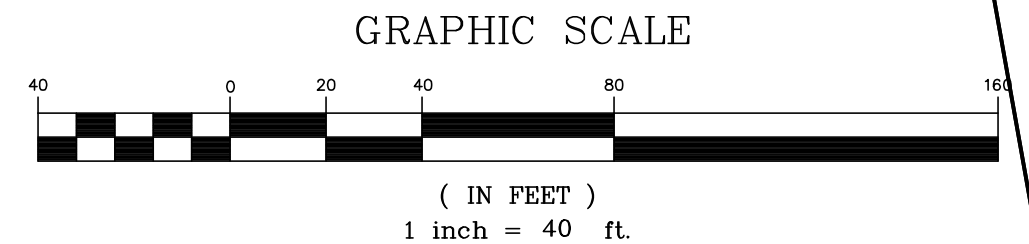
DATE : NOVEMBER 2009  
 SCALE : 1"=150'  
 JOB NO.: 03060004

FIGURE KEY



MATCHLINE STA. 8+75  
SEE FIGURE 2 OF 3

LEGEND	
	THALWEG/WATER
	BANKFULL
	PHOTO POINT
	CROSS VANE (CRSV)
	J-HOOK VANE (JHV)
	VEGETATION PLOT
	BANK EROSION - MODERATE
	BANK EROSION - SEVERE
	BANK SLUMP
	MID-CHANNEL BAR
	IN-STREAM VEGETATION
	VEGETATIVE COVER POOR
	STRUCTURE STRESSED
	AGGRADATION



NOTES:  
1. GENERAL SITE DATA PROVIDED BY NCEEP.  
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 72  
MECKLENBURG COUNTY  
NORTH CAROLINA  
MONITORING  
YEAR 5 OF 5

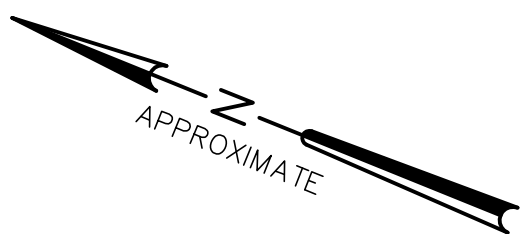
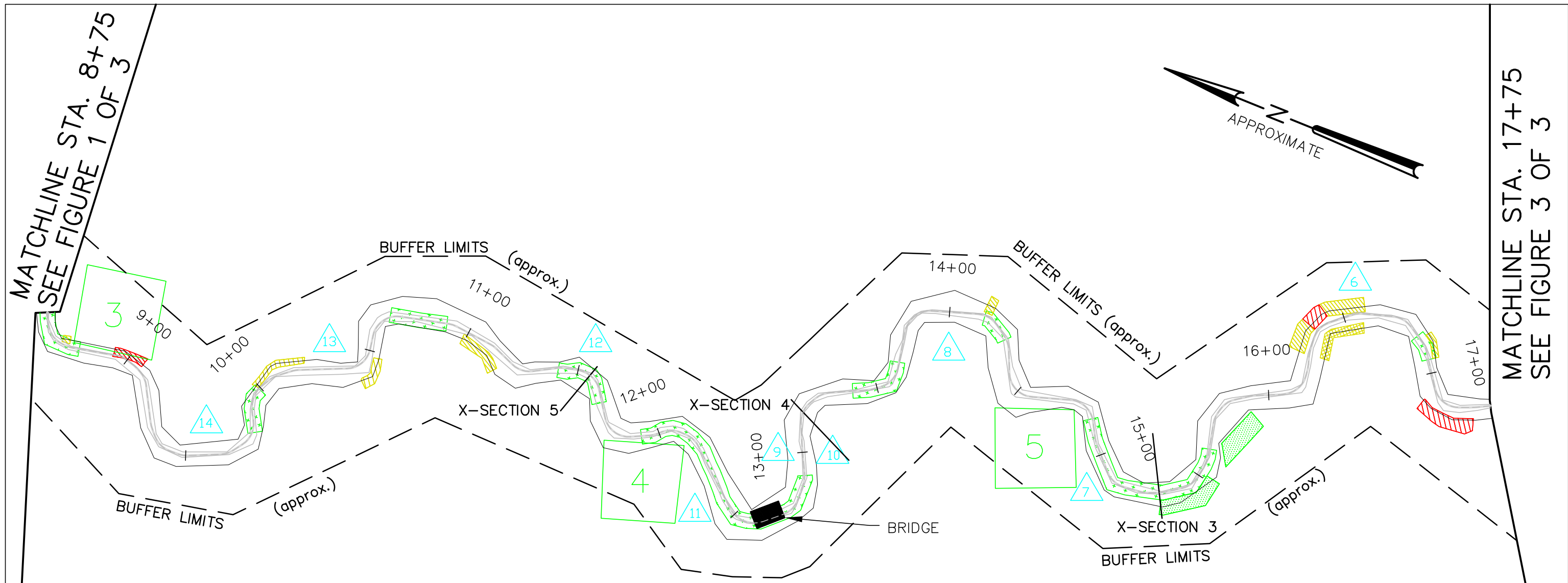


NC ECOSYSTEM ENHANCEMENT PROGRAM  
CATO FARMS STREAM RESTORATION

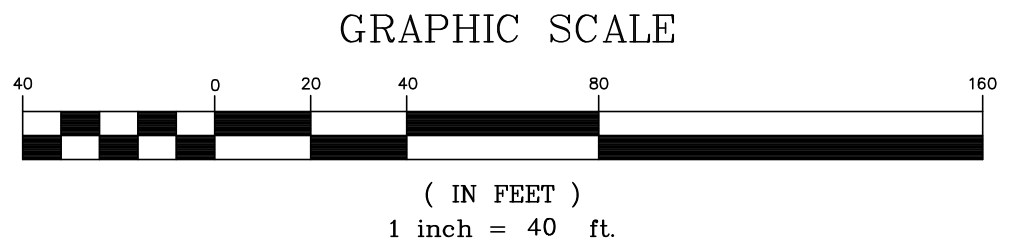
APPENDIX 1.2  
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009  
SCALE : 1"=40'  
JOB NO.: 03060004

FIGURE 1 OF 3



LEGEND	
	THALWEG/WATER
	BANKFULL
	PHOTO POINT
	CROSS VANE (CRSV)
	J-HOOK VANE (JHV)
	VEGETATION PLOT
	BANK EROSION - MODERATE
	BANK EROSION - SEVERE
	BANK SLUMP
	MID-CHANNEL BAR
	IN-STREAM VEGETATION
	VEGETATIVE COVER - POOR
	STRUCTURE - STRESSED
	AGGRADATION



NOTES:  
 1. GENERAL SITE DATA PROVIDED BY NCEEP.  
 2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 72  
 MECKLENBURG COUNTY  
 NORTH CAROLINA  
 MONITORING  
 YEAR 5 OF 5



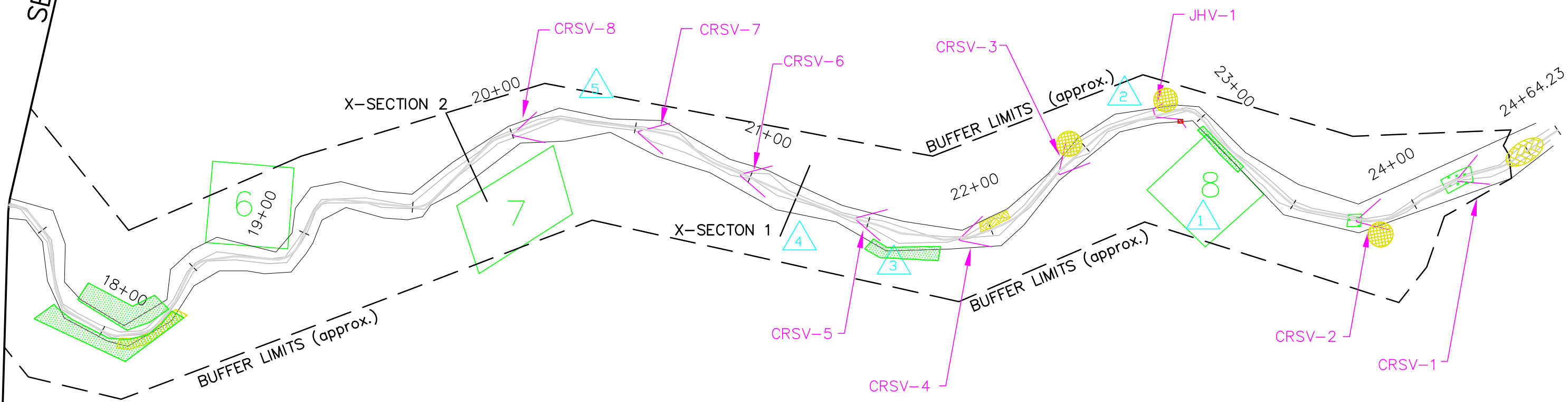
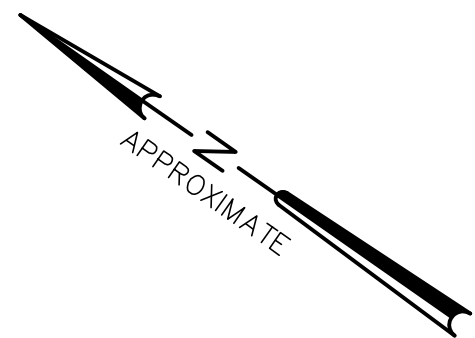
NC ECOSYSTEM ENHANCEMENT PROGRAM  
 CATO FARMS STREAM RESTORATION  
 APPENDIX 1.2  
 CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009  
 SCALE : 1"=40'  
 JOB NO.: 03060004  
 FIGURE 2 OF 3

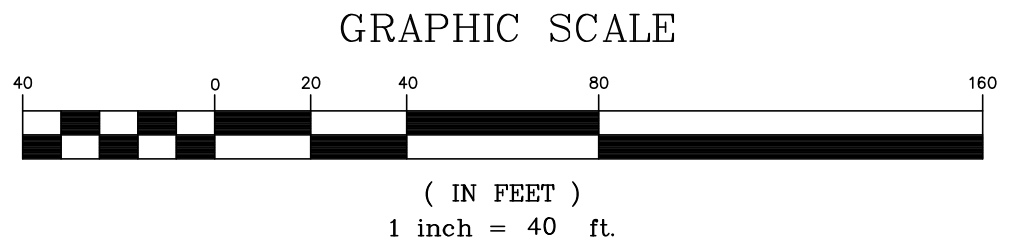
MATCHLINE STA. 8+75  
 SEE FIGURE 1 OF 3

MATCHLINE STA. 17+75  
 SEE FIGURE 3 OF 3

MATCHLINE  
STA. 17+75  
SEE FIGURE 2 OF 3



LEGEND	
	THALWEG/WATER
	BANKFULL
	PHOTO POINT
	CROSS VANE (CRSV)
	J-HOOK VANE (JHV)
	VEGETATION PLOT
	BANK EROSION - MODERATE
	BANK EROSION - SEVERE
	BANK SLUMP
	MID-CHANNEL BAR
	IN-STREAM VEGETATION
	VEGETATIVE COVER - POOR
	STRUCTURE - STRESSED
	AGGRADATION



NOTES:  
1. GENERAL SITE DATA PROVIDED BY NCEEP.  
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 72  
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NC ECOSYSTEM ENHANCEMENT PROGRAM  
CATO FARMS STREAM RESTORATION

APPENDIX 1.2  
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009  
SCALE : 1"=40'  
JOB NO.: 03060004

FIGURE 3 OF 3



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## **APPENDIX 2 GENERAL PROJECT TABLES**

- 1. Project Mitigation Structure and Objectives**
- 2. Project Activity and Reporting History**
- 3. Project Contacts**
- 4. Project Background**

Segment/Reach	Mitigation Type	Approach	Linear Footage or Acres	Stationing	Comments	
				(ft)*		
Reach 1	Restoration	P1	1,833 linear feet	0+00-18+33	Channel restoration, relocation with use of grade control and bank protection structures.	
Reach 2	Restoration	P3	611 linear feet	18+33-24+44	Channel restoration, in-place with use of grade control and bank protection structures.	
Component Summations						
Restoration Level	Stream (lf)	Wetland (ac)		Upland (ac)	Buffer (ac)	BMP
		Riparian	Non-Riparian			
Restoration (R)	2,444	N/A	N/A	N/A	N/A	N/A
Enhancement (E)	N/A	N/A	N/A	N/A	N/A	N/A
Enhancement I (E)	N/A	N/A	N/A	N/A	N/A	N/A
Enhancement II (E)	N/A	N/A	N/A	N/A	N/A	N/A
Creation (C)	N/A	N/A	N/A	N/A	N/A	N/A
Preservation (P)	N/A	N/A	N/A	N/A	N/A	N/A
HQ Preservation (P)	N/A	N/A	N/A	N/A	N/A	N/A
<b>Totals</b>	<b>2,444</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
*Stationing linear footage represents the centerline footage, not the thalweg footage and is correct to exclude the 20 ft cattle crossing (bridge easement).						

Activity or Report	Data Collection Completed	Actual Completion or Delivery
Restoration Plan	N/A	Jul-02
Final Design-90%	N/A	Nov-02
Construction	N/A	Mar-03
Planting	N/A	Mar-04
Mitigation Plan/ As-Built (Year 0 Monitoring)	N/A	Summer 2004
Year 1 Monitoring	Jun-05	Jan-05
Year 2 Monitoring	Sep-06	Nov-06
Year 3 Monitoring	Aug-07	Nov-07
Year 4 Monitoring	Jun-08	Nov-08
Year 5 Monitoring	Mar-09 and Sep-09	Nov-09

<b>Designer</b>	CH2MHill 4824 Parkway Plaza Boulevard, Suite 200 Charlotte, NC 28217
<b>Contractor's Name</b>	Unknown
<b>Planting Contractor</b>	Unknown
<b>Seeding Contractor</b>	Unknown
<b>Monitoring Performers</b>	Jordan, Jones, & Goulding 9101 Southern Pine Blvd., Suite 160 Charlotte, NC 28273
<b>Stream Monitoring, POC</b>	Kirsten Young, 704-527- 4106 ext.246
<b>Vegetation Monitoring, POC</b>	



Project County	Mecklenburg, North Carolina
Drainage Area	0.41 sq. mi
Drainage impervious cover estimate	< 5%
Stream Order	1st
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont
Rosgen Classification of As-built	E (~2,000 ft)
	B (~500 ft)
Cowardin Classification	N/A
Dominant soil types	Monacan, Cecil, Enon, Iredell, Helena, and Wilkes
Reference site ID	Coffey Creek
	UT to Little Sugar Creek
USGS HUC for Project and Reference	3040105
NCDWQ Sub-basin for Project and Reference	03-07-11
NCDWQ classification for Project and Reference	C
Any portion of any project segment 303d list?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reason for 303d listing or stressor?	N/A
% of project easement fenced?	100%



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## **APPENDIX 3 VEGETATION ASSESSMENT DATA**

- 1. Vegetation Plot Mitigation Success**
- 2. Vegetation Monitoring Plot Photos**
- 3. Vegetation Plot Summary Data Table**

<b>Vegetation Plot ID</b>	<b>Vegetation Survival Threshold Met (Y/N)</b>
Plot 1	Y
Plot 2	Y
Plot 3	N
Plot 4	Y
Plot 5	Y
Plot 6	Y
Plot 7	Y
Plot 8	Y



Monitoring Plot 1 (9/2009)



Monitoring Plot 2 (9/2009)



Monitoring Plot 3 (9/2009)



Monitoring Plot 4 (9/2009)

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**Appendix 3.2 Vegetation Monitoring Plot Photos**





Monitoring Plot 5 (9/2009)



Monitoring Plot 6 (9/2009)



Monitoring Plot 7 (9/2009)



Monitoring Plot 8 (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 3.2 Vegetation Monitoring Plot Photos**



Cato Farms  
Stem Counts for Planted Species

Species	Common Name	Type	Current Data (MY5-2009)																Annual Means											
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Current Mean		MY1-2005*		MY2 - 2006**		MY3 - 2007**		MY4- 2008**			
			P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T		
<i>Acer negundo</i>	boxelder	T	1	1	2	2	2	2			2	2	1	1	4	4	4	6	2	3	2	2	2	2	2	2	2	2	2	3
<i>Acer rubrum</i>	red maple	T		1		2		2		1				1		10	10	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4	
<i>Alnus serrulata</i>	tag alder	T		2															N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2		
<i>Aronia arbutifolia</i>	chokeberry	S								2	2							2	2	2	2	2	2	2	2	N/A	2	2		
<i>Carpinus caroliniana</i>	american hornbeam	T																	N/A	N/A	1	1	N/A	N/A	N/A	N/A	N/A	N/A		
<i>Carya aquatica</i>	water hickory	T																	N/A	N/A	2	2	N/A	N/A	N/A	N/A	N/A	N/A		
<i>Cephalanthus occidentalis</i>	button bush	S			2	2	1	1			1	1							1	1	2	2	1	1	2	2	2	1	1	
<i>Cornus amomum</i>	silky dogwood	S	3	3			2	2	4	4	10	10			3	3	10	10	5	5	7	7	8	8	5	5	5	5		
<i>Cornus sericea</i>	redosier dogwood	S							3	3									3	3	3	3	3	3	N/A	3	3			
<i>Fraxinus pennsylvanica</i>	green ash	T			1	2							2	2	2	2			2	2	2	2	2	2	2	2	2	N/A		
<i>Juglans nigra</i>	black walnut	T														1	3	1	3	1	1	N/A	N/A	N/A	N/A	1	3			
<i>Juniperus virginiana</i>	eastern redcedar	T		3		1				2									N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2		
<i>Liquidambar styraciflua</i>	sweet gum	T		3				23	4		3			3		20	20	N/A	11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3			
<i>Nyssa sylvatica</i>	blackgum	T	2	2															2	2	1	1	1	1	1	1	2	2		
<i>Platanus occidentalis</i>	sycamore	T		2										5		4			N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4		
<i>Pinus taeda</i>	loblolly pine	T		4		2		1											N/A	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2		
<i>Populus deltoides</i>	cottonwood	T								1	1	1	1			2	2	1	1	1	1	1	1	1	1	1	1	N/A		
<i>Quercus alba</i>	white oak	T			1	1							1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	N/A		
<i>Quercus michauxii</i>	swamp chestnut oak	T	1	2	2	2			3	3			3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
<i>Salix nigra</i>	black willow	S	4	6	1	1	1	1			1	1	4	4	3	3	2	2	2	3	3	3	3	3	2	2	2	3		
<i>Sambucus canadensis</i>	elderberry	S			2	1	1	1											2	1	1	1	2	2	2	2	2	2		
Plot Area (acres)			0.0247																											
Species Count			4	10	6	9	4	7	3	6	5	6	5	7	5	8	6	9	5	8	7	7	5	5	6	6	6	8		
Stem Count			10	28	9	14	5	31	10	17	15	18	11	15	11	46	19	55	11	28	18	18	13	13	14	14	13	22		
Stems per Acre			405	1134	364	567	202	1255	405	688	607	729	445	607	445	1862	769	2227	455	1134	700	700	525	525	545	545	525	865		

Type=Shrub or Tree

P = Planted

T = Total

\*Data was collected by another monitoring firm-no volunteer stems were included in data

\*\*Numerous volunteer stems were



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## **APPENDIX 4 STREAM ASSESSMENT DATA**

- 1. Stream Station Photos**
- 2. Stream Cross-Section Photos**
- 3. Qualitative Visual Stability Assessment**
- 4. Verification of Bankfull Events**
- 5. Cross-Section Plots and Raw Data Tables\***
- 6. Longitudinal Plots and Raw Data Tables\***
- 7. Pebble Count Plots and Raw Data Tables\***

\*Raw data tables have been provided electronically.



Photo Point 1: View Upstream (9/2009)



Photo Point 1: View Downstream (9/2009)



Photo Point 2: View Upstream (9/2009)



Photo Point 2: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.1 Stream Station Photos**







Photo Point 3: View Upstream (9/2009)



Photo Point 3: View Downstream (9/2009)



Photo Point 4: View Upstream (9/2009)



Photo Point 4: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.1 Stream Station Photos**





Photo Point 5: View Upstream (9/2009)



Photo Point 5: View Downstream (9/2009)



Photo Point 6: View Upstream (9/2009)



Photo Point 6: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.1 Stream Station Photos**





Photo Point 7: View Upstream (9/2009)



Photo Point 7: View Downstream (9/2009)



Photo Point 8: View Upstream (9/2009)



Photo Point 8: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.1 Stream Station Photos**





Photo Point 9: View Upstream (9/2009)



Photo Point 9: View Downstream (9/2009)



Photo Point 10: View Upstream (9/2009)



Photo Point 10: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.1 Stream Station Photos**





Photo Point 11: View Upstream (9/2009)



Photo Point 11: View Downstream (9/2009)



Photo Point 12: View Upstream (9/2009)



Photo Point 12: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

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**Appendix 4.1 Stream Station Photos**





Photo Point 13: View Upstream (9/2009)



Photo Point 13: View Downstream (9/2009)



Photo Point 14: View Upstream (9/2009)



Photo Point 14: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.1 Stream Station Photos**





Photo Point 15: View Upstream (9/2009)



Photo Point 15: View Downstream (9/2009)



Photo Point 16: View Upstream (9/2009)



Photo Point 16: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.1 Stream Station Photos**





Photo Point 17: View Upstream (9/2009)



Photo Point 17: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



Appendix 4.1 Stream Station Photos







Cross-Section 1: View Upstream (9/2009)



Cross-Section 1: View Downstream (9/2009)



Cross-Section 2: View Upstream (9/2009)



Cross-Section 2: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.2 Stream Cross-Section Photos**





Cross-Section 3: View Upstream (9/2009)



Cross-Section 3: View Downstream (9/2009)



Cross-Section 4: View Upstream (9/2009)



Cross-Section 4: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.2 Stream Cross-Section Photos**





Cross-Section 5: View Upstream (9/2009)



Cross-Section 5: View Downstream (9/2009)



Cross-Section 6: View Upstream (9/2009)



Cross-Section 6: View Downstream (9/2009)

Prepared For:

Cato Farms Stream Restoration  
Year 5 of 5

Date: November 2009

Project No.: 72



**Appendix 4.2 Stream Cross-Section Photos**



**Reach 1 (1833 linear feet)**

Feature Category		(# Stable) Number Performing as Intended	Total Number assessed per as-built survey	Total Number/ feet in unstable state	% Perform in Stable Condition	Feature Perform Mean or Total
A. Riffles	1. Present?	0	8	N/A	0%	<b>0%</b>
	2. Armor Stable?	0			0%	
	3. Facet grade appears stable?	0			0%	
	4. Minimal evidence of embedding/fining?	0			0%	
	5. Length appropriate?	-			-	
B. Pools	1. Present?	39	39	N/A	100%	<b>100%</b>
	2. Sufficiently deep?	39			100%	
	3. Length Appropriate?	-			-	
C. Thalweg*	1. Upstream of meander bend centering?	39	47	N/A	83%	<b>83%</b>
	2. Downstream of meander centering?	39			83%	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	37	47	N/A	79%	<b>84%</b>
	2. Of those eroding, # w/concomitant point bar formation?	40			85%	
	3. Apparent Rc within spec?	40			85%	
	4. Sufficient floodplain access and relief?	40			85%	
E. Bed General	1. General channel bed aggradation areas (bar formation)?	N/A		13/621	84%	<b>92%</b>
	2. Channel bed degradation - areas of increasing down-cutting or head cutting?			0/0	100%	
F. Bank Performance**	1. Actively eroding, wasting, or slumping bank	N/A		3/104	97%	<b>97%</b>
G. Vanes/J-Hooks, etc	1. Free of back or arm scour?	N/A				
	2. Height appropriate?					
	3. Angle and geometry appear appropriate?					
	4. Free of piping or other structural failures?					
H. Wads/ Boulders	1. Free of scour?	N/A				
	2. Footing stable?					

\*Channel had abnormal flow conditions, TW was difficult to distinguish in field due to in-stream vegetation growth

\*\*Although bank erosion was recorded along the reach, the banks have not advanced from the previous monitoring year

**Reach 2 (611 linear feet)**

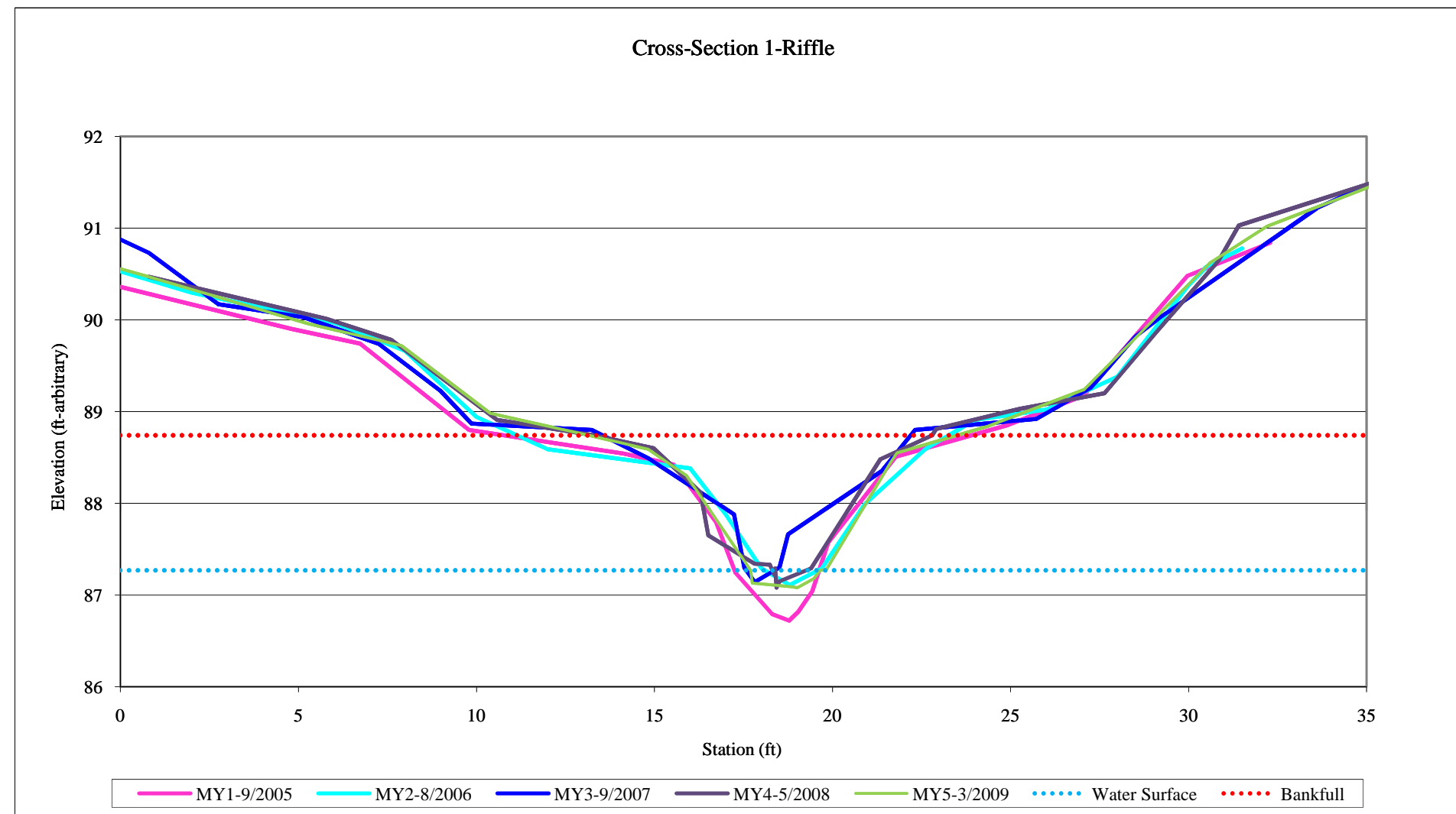
Feature Category		(# Stable) Number Performing as Intended	Total Number assessed per as-built survey	Total Number/ feet in unstable state	% Perform in Stable Condition	Feature Perform Mean or Total
A. Riffles	1. Present?	6	13	N/A	46%	<b>35%</b>
	2. Armor Stable?	6			46%	
	3. Facet grade appears stable?	6			46%	
	4. Minimal evidence of embedding/fining?	0			0%	
	5. Length appropriate?	-			-	
B. Pools	1. Present?	15	15	N/A	100%	<b>100%</b>
	2. Sufficiently deep?	15			100%	
	3. Length Appropriate?	-			-	
C. Thalweg	1. Upstream of meander bend centering?	15	15	N/A	100%	<b>100%</b>
	2. Downstream of meander centering?	15			100%	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	15	15	N/A	100%	<b>100%</b>
	2. Of those eroding, # w/concomitant point bar formation?	N/A			100%	
	3. Apparent Rc within spec?	15			100%	
	4. Sufficient floodplain access and relief?	15			100%	
E. Bed General	1. General channel bed aggradation areas (bar formation)?	N/A		0/0	100%	<b>100%</b>
	2. Channel bed degradation - areas of increasing down-cutting or head cutting?	N/A		0/0	100%	
F. Bank Performance*	1. Actively eroding, wasting, or slumping bank	N/A		2/94	91%	<b>91%</b>
G. Vanes/J-Hooks, etc	1. Free of back or arm scour?	8	11	N/A	73%	<b>86%</b>
	2. Height appropriate?	-			-	
	3. Angle and geometry appear appropriate?	-			-	
	4. Free of piping or other structural failures?	11			100%	
H. Wads/ Boulders	1. Free of scour?	N/A				
	2. Footing stable?					

\*Although bank erosion was recorded along the reach, the banks have not advanced from the previous monitoring year

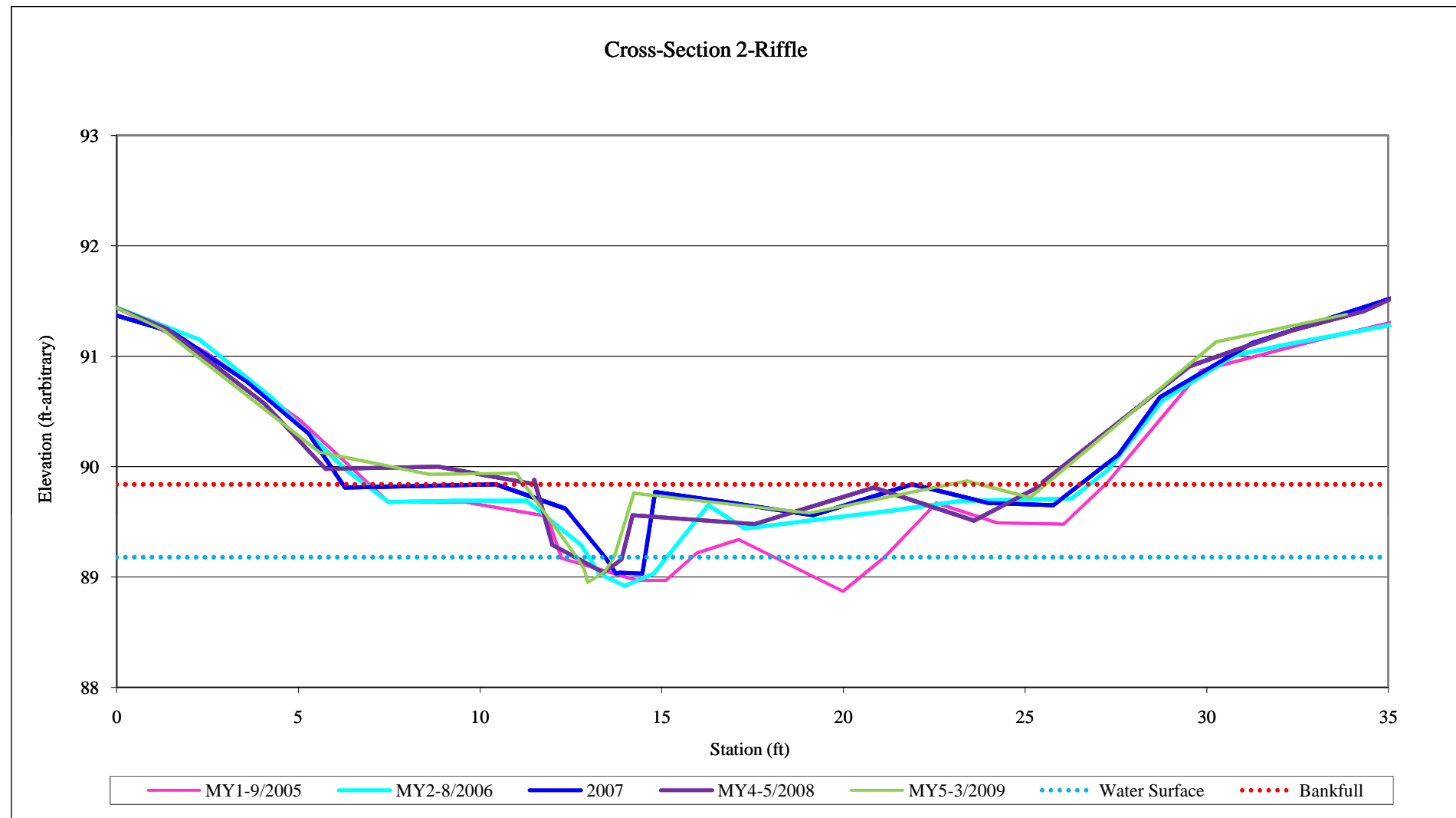
<b>Date of Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo # (if available)</b>
Summer/Fall 2006	Unknown	Visual Assessment	N/A
Spring/Summer 2007	Unknown	Visual Assessment	N/A
Spring 2008	Unknown	Crest Gauge	N/A
Summer 2009	Unknown	Crest Gauge	N/A

Stream Name: Cato Farms		
Cross-Section: 1		
Feature: Riffle		
Station	Elevation	Notes
-3.84	90.97	x1
0.80	90.47	x1-lpt
5.26	89.96	x1
7.89	89.72	x1
10.39	88.98	x1
13.16	88.74	x1-b
14.83	88.59	x1
15.90	88.30	x1
17.70	87.27	x1-lw
17.75	87.13	x1
18.84	87.09	x1
19.01	87.08	x1
19.49	87.18	x1
19.65	87.27	x1-rw
19.83	87.28	x1
21.64	88.45	x1
21.81	88.55	x1
24.36	88.84	x1
27.07	89.24	x1
30.59	90.62	x1
32.19	91.02	x1
38.41	91.95	x1

Summary Data	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	7.36
Bankfull Width (ft)	10.32
Bankfull Mean Depth (ft)	0.71
Bankfull Max Depth (ft)	1.66
Width/Depth Ratio	14.54
Entrenchment Ratio	2.77



Stream Name: Cato Farms		
Cross-Section: 2		
Feature: Riffle		
Station	Elevation	Notes
-8.18	92.21	x2
-3.13	91.82	x2
-1.44	91.61	x2
0	91.44	x2-lpt
1.28	91.24	x2
5.58	90.13	x2
8.61	89.93	x2
10.99	89.94	x2
11.27	89.84	x2-b
12.66	89.18	x2-lw
12.87	89.07	x2
12.96	88.95	x2
13.44	89.05	x2
13.69	89.18	x2-rw
14.23	89.76	x2
19.06	89.58	x2
23.4	89.87	x2
25.13	89.72	x2
30.26	91.13	x2
33.85	91.38	x2-rpt

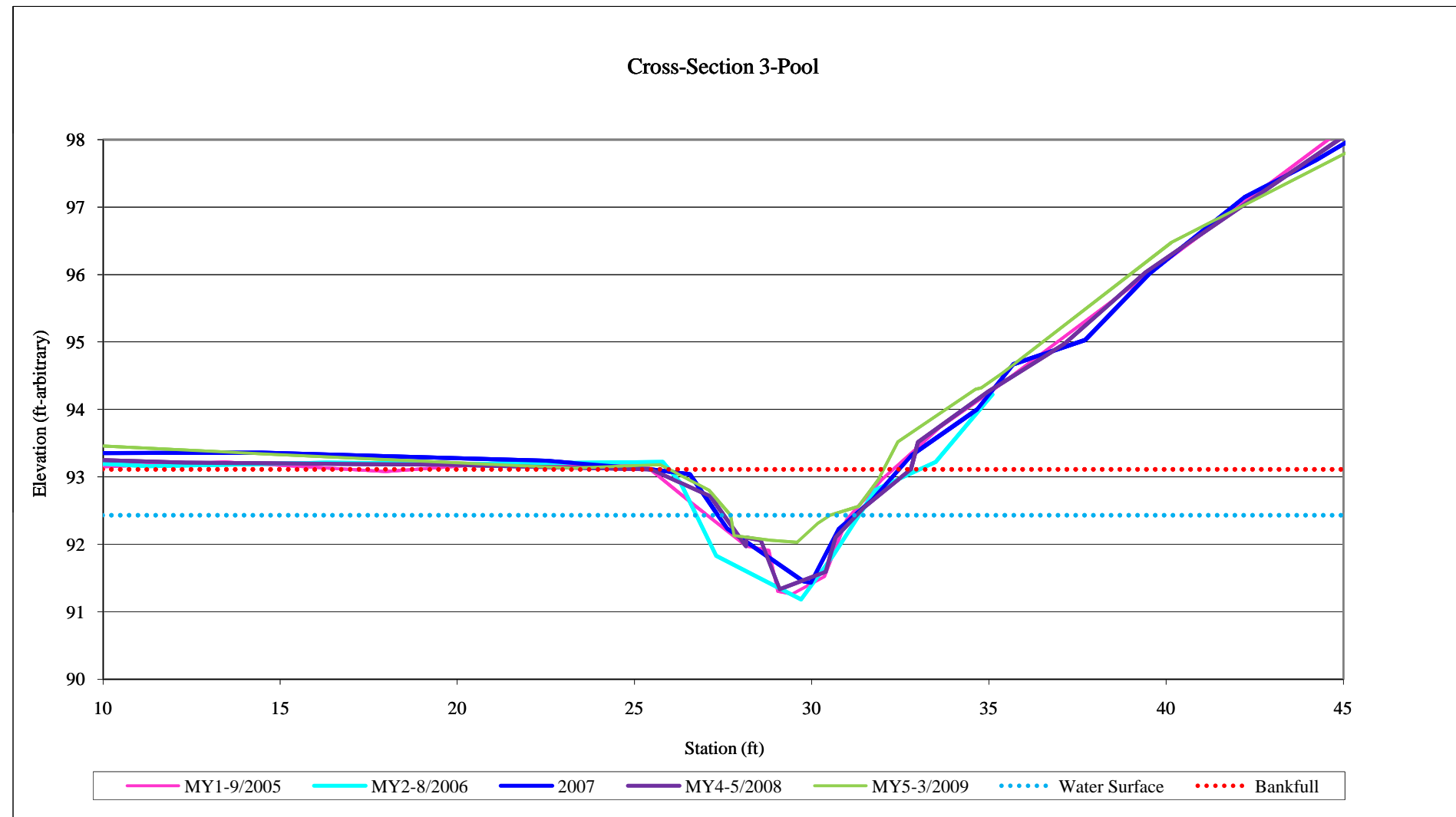


Summary Data	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	2.79
Bankfull Width (ft)	11.68
Bankfull Mean Depth (ft)	0.24
Bankfull Max Depth (ft)	0.89
Width/Depth Ratio	48.67
Entrenchment Ratio	2.19



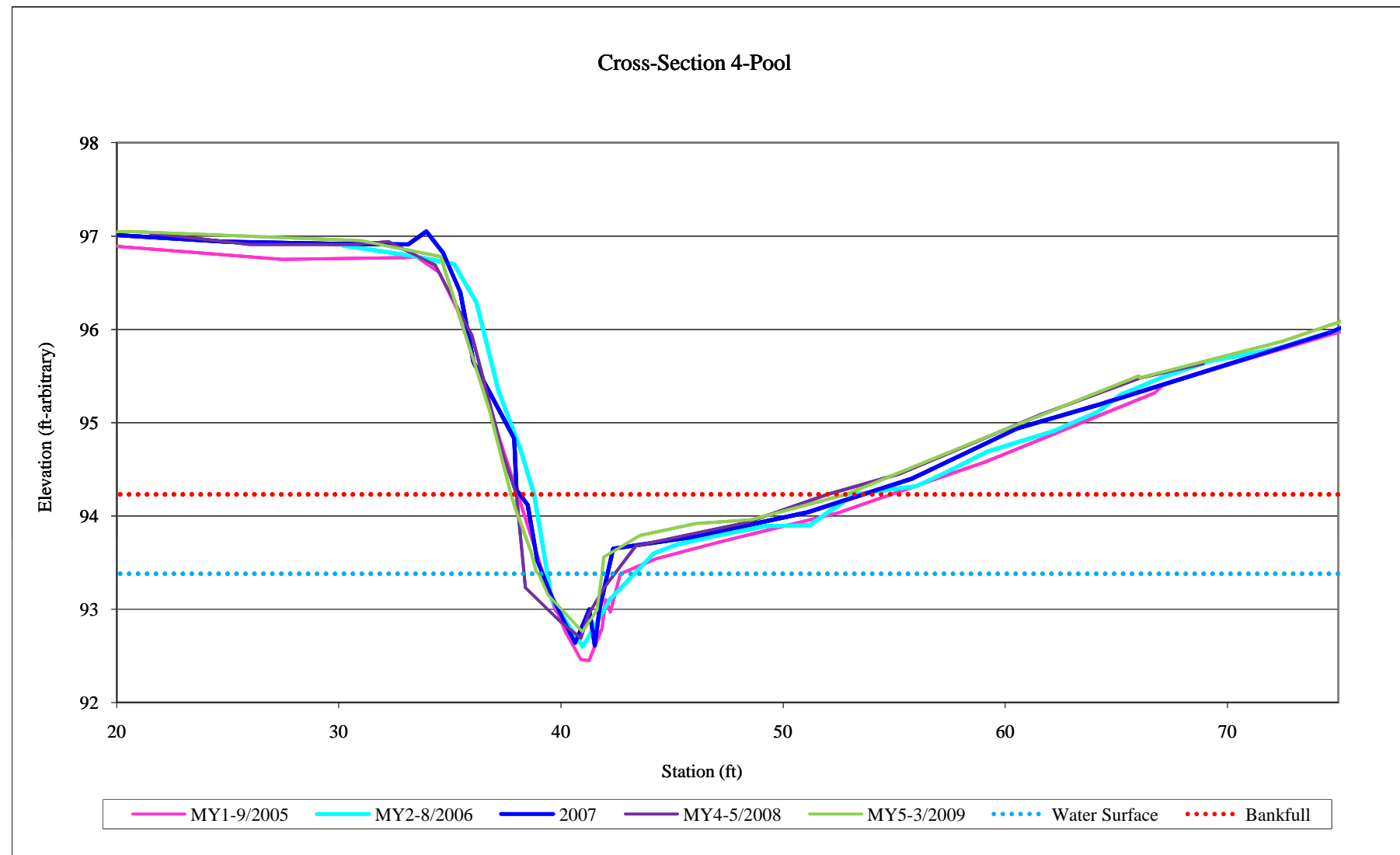
Stream Name: Cato Farms		
Cross-Section: 3		
Feature: Pool		
Station	Elevation	Notes
-10.81	94.59	x3
-2.37	94.27	x3
0.3	93.88	x3
3.37	93.63	x3
14.53	93.34	x3
23.23	93.13	x3
25.73	93.18	x3
27.1	92.8	x3
27.71	92.43	x3-lw
27.81	92.13	x3
28.84	92.06	x3
29.59	92.03	x3
30.17	92.31	x3
30.52	92.43	x3-rw
31.32	92.56	x3
31.88	92.96	x3
32.03	93.11	x3-b
32.43	93.52	x3
34.62	94.3	x3-rpt
34.79	94.32	x3
35.38	94.54	x3
40.16	96.48	x3
47.51	98.46	x3

Summary Data	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	3.90
Bankfull Width (ft)	6.05
Bankfull Mean Depth (ft)	0.64
Bankfull Max Depth (ft)	1.08
Width/Depth Ratio	9.45
Entrenchment Ratio	N/A



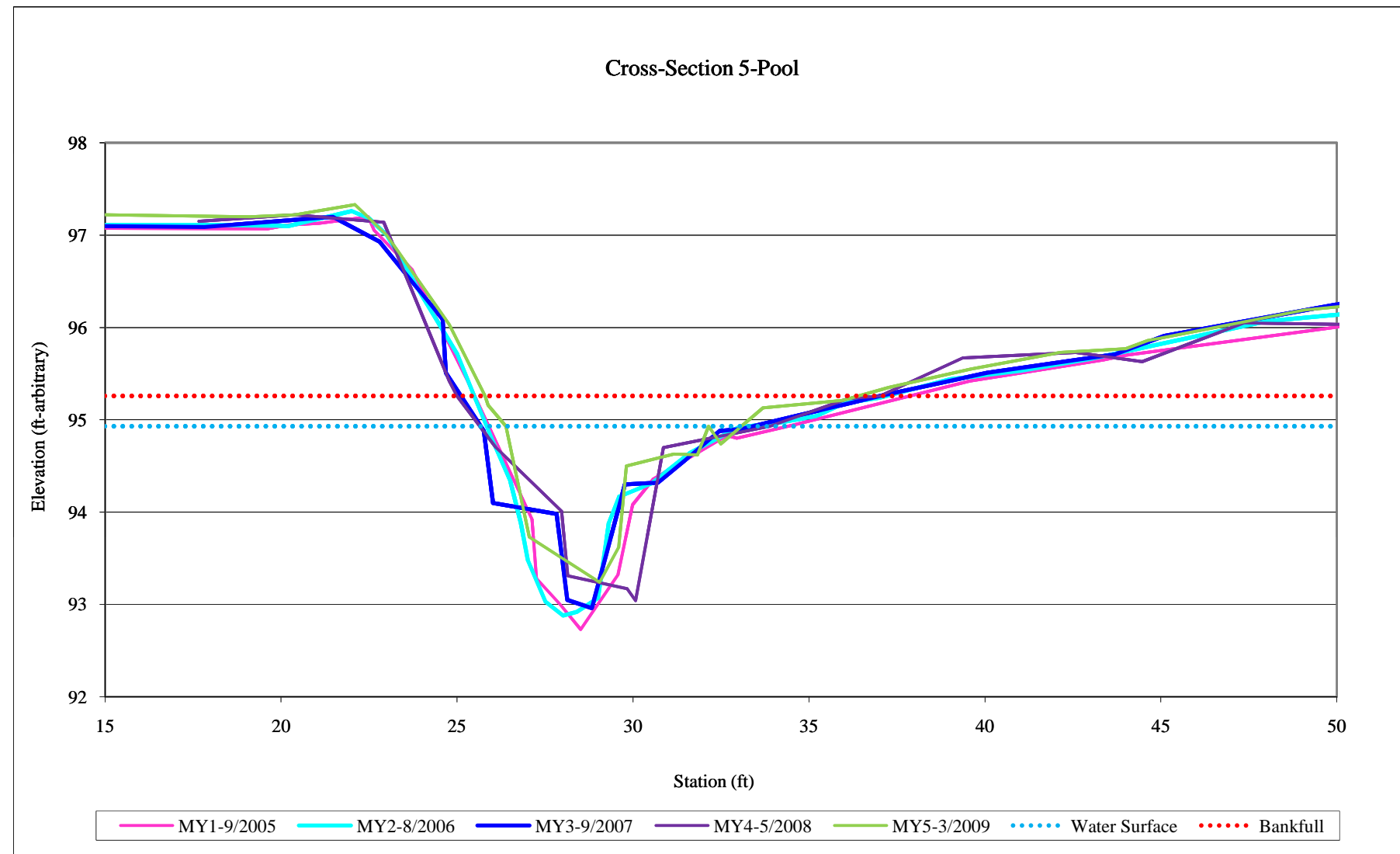
Stream Name: Cato Farms		
Cross-Section: 4		
Feature: Pool		
Station	Elevation	Notes
-16.23	96.78	x4
8.56	97	x4
20.59	97.05	x4
31	96.95	x4
34.58	96.78	x4
36.79	95.13	x4
37.75	94.23	x4-b
37.96	94.07	x4
38.65	93.62	x4
38.88	93.41	x4
38.98	93.38	x4-lw
39.43	93.15	x4
40.96	92.76	x4
41.62	92.99	x4
41.85	91.38	x4-rw
41.92	93.56	x4
43.56	93.79	x4
46.08	93.92	x4
48.55	93.96	x4
52.82	94.23	x4
59.92	94.92	x4
66.01	95.5	x4-rpt
66.05	95.48	x4
72.45	95.87	x4
81.24	96.58	x4
91.06	97.16	x4

Summary Data	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	7.24
Bankfull Width (ft)	15.07
Bankfull Mean Depth (ft)	0.48
Bankfull Max Depth (ft)	1.47
Width/Depth Ratio	31.40
Entrenchment Ratio	N/A



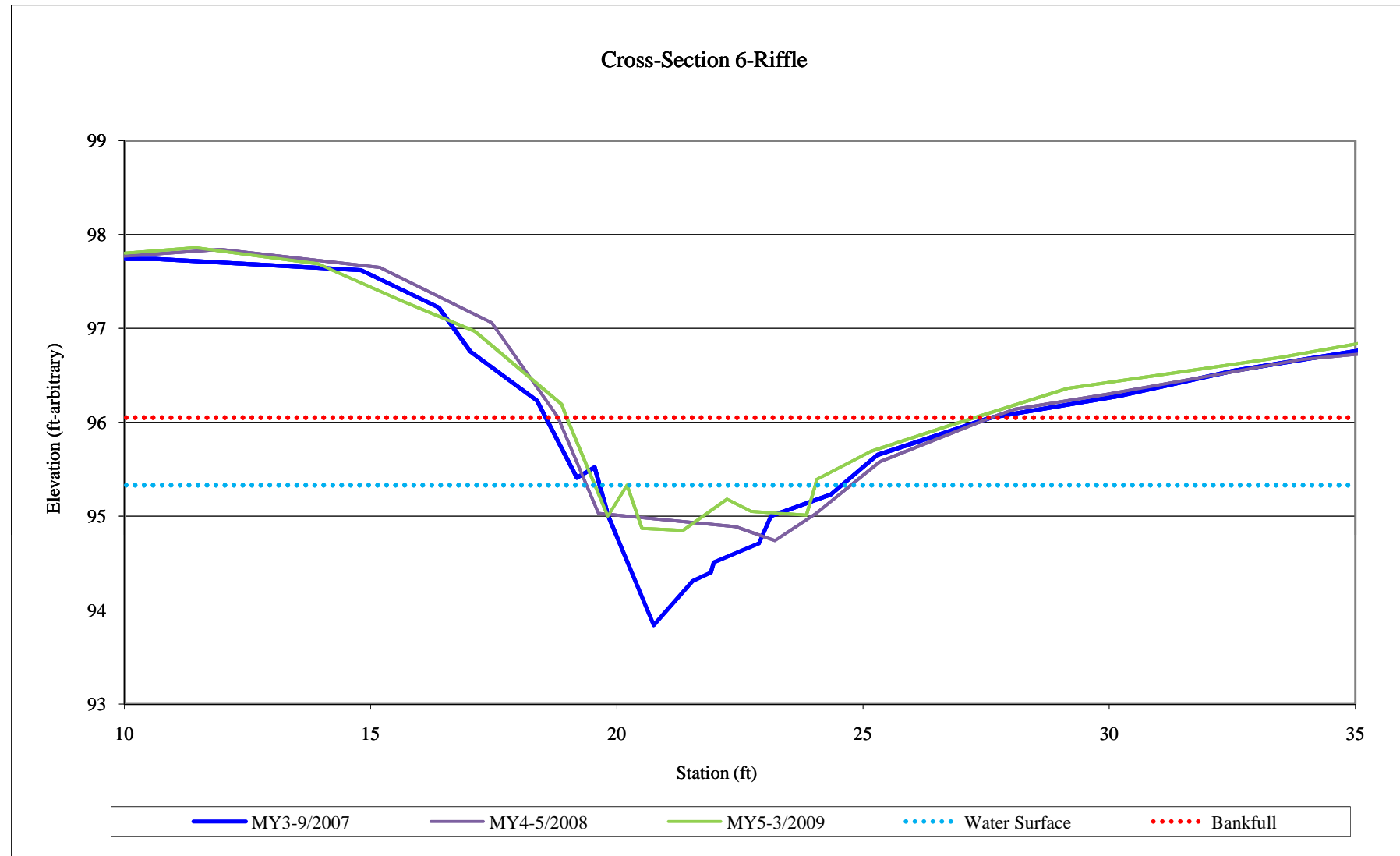
Stream Name: Cato Farms		
Cross-Section: 5		
Feature: Pool		
Station	Elevation	Notes
-7.03	97.24	x5
3.10	97.03	x5
13.58	97.23	x5
19.10	97.20	x5
20.39	97.22	x5-lpt
22.10	97.33	x5
23.00	97.00	x5
24.78	96.03	x5
25.80	95.26	x5
25.88	95.16	x5
26.39	94.93	x5-lw
27.05	93.73	x5
29.05	93.24	x5
29.59	93.62	x5
29.81	94.50	x5
31.16	94.63	x5
31.83	94.62	x5
32.15	94.93	x5-rw
32.49	94.74	x5
33.69	95.13	x5
35.96	95.21	x5
37.26	95.35	x5
39.59	95.55	x5
42.14	95.73	x5-rpt
44.00	95.77	x5
44.63	95.86	x5
49.09	96.19	x5
56.93	96.48	x5
63.59	96.64	x5
68.88	96.92	x5

Summary Data	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	7.80
Bankfull Width (ft)	10.62
Bankfull Mean Depth (ft)	0.73
Bankfull Max Depth (ft)	2.02
Width/Depth Ratio	14.55
Entrenchment Ratio	N/A



Stream Name: Cato Farms		
Cross-Section: 6		
Feature: Riffle		
Station	Elevation	Notes
-2.64	97.98	x6
2.76	97.87	x6
6.19	97.87	x6
8.50	97.74	x6-lpt
11.44	97.86	x6
13.92	97.69	x6
15.64	97.29	x6
17.12	96.97	x6
18.88	96.19	x6
18.98	96.05	x6
19.82	95.00	x6
20.21	95.33	x6-lw
20.51	94.87	x6
21.35	94.85	x6
22.24	95.18	x6
22.73	95.05	x6
23.85	95.01	x6
24.03	95.33	x6-rw
24.06	95.39	x6
25.16	95.69	x6
26.72	95.96	x6
29.15	96.36	x6
33.47	96.69	x6
36.80	97.00	x6
41.01	97.11	x6-rpt
41.34	98.02	x6
49.00	97.25	x6

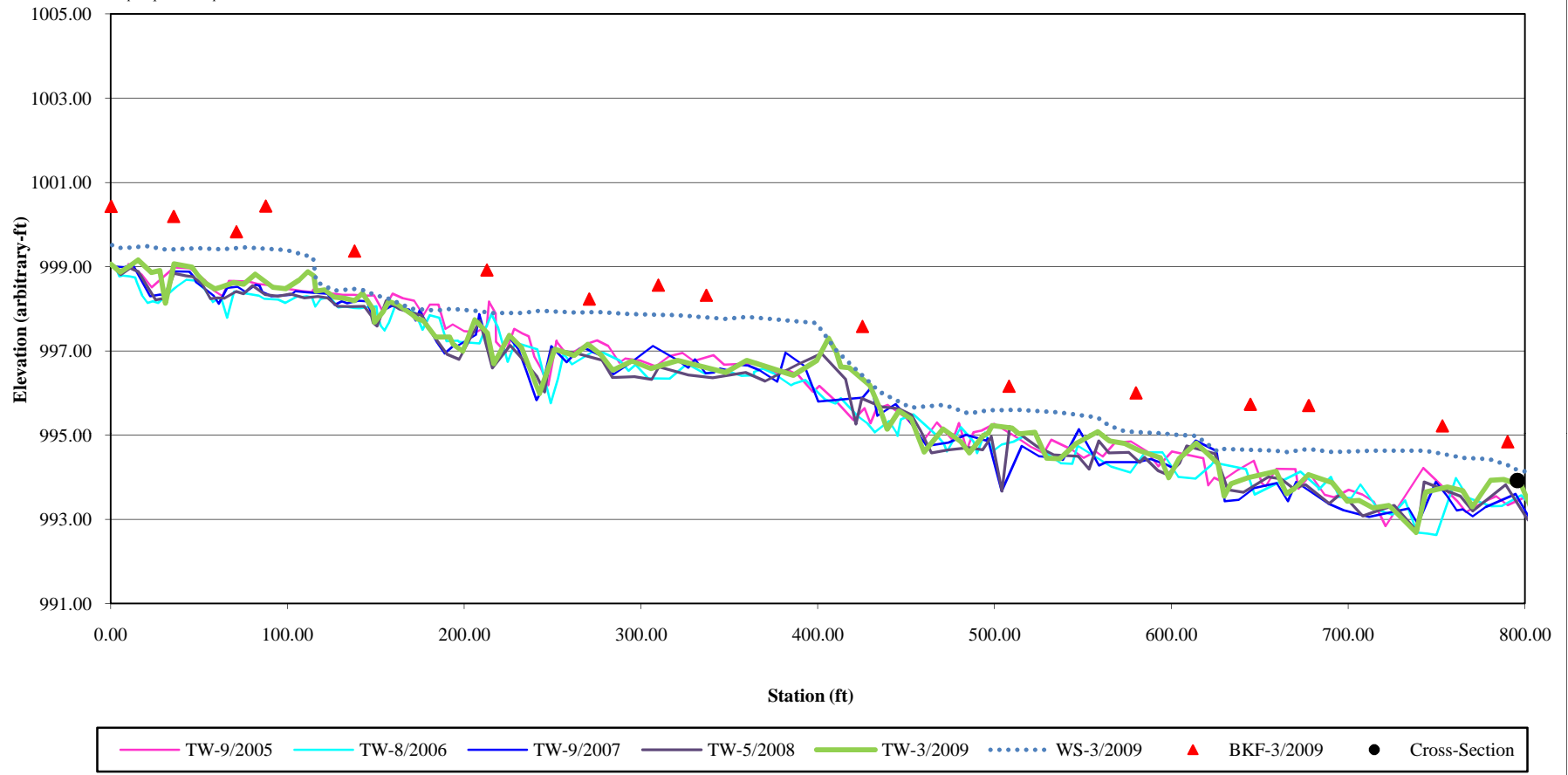
Summary Data	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	5.71
Bankfull Width (ft)	8.29
Bankfull Mean Depth (ft)	0.69
Bankfull Max Depth (ft)	1.20
Width/Depth Ratio	12.01
Entrenchment Ratio	3.05



**Cato Farms  
Longitudinal Profile  
2009 Monitoring Year**

Bankfull/Top of Bank =  $-0.0067 \cdot \text{STA} + 1000.4$   
 Water Surface =  $-0.0067 \cdot \text{STA} + 999.53$

*Slope equations represent entire reach.*

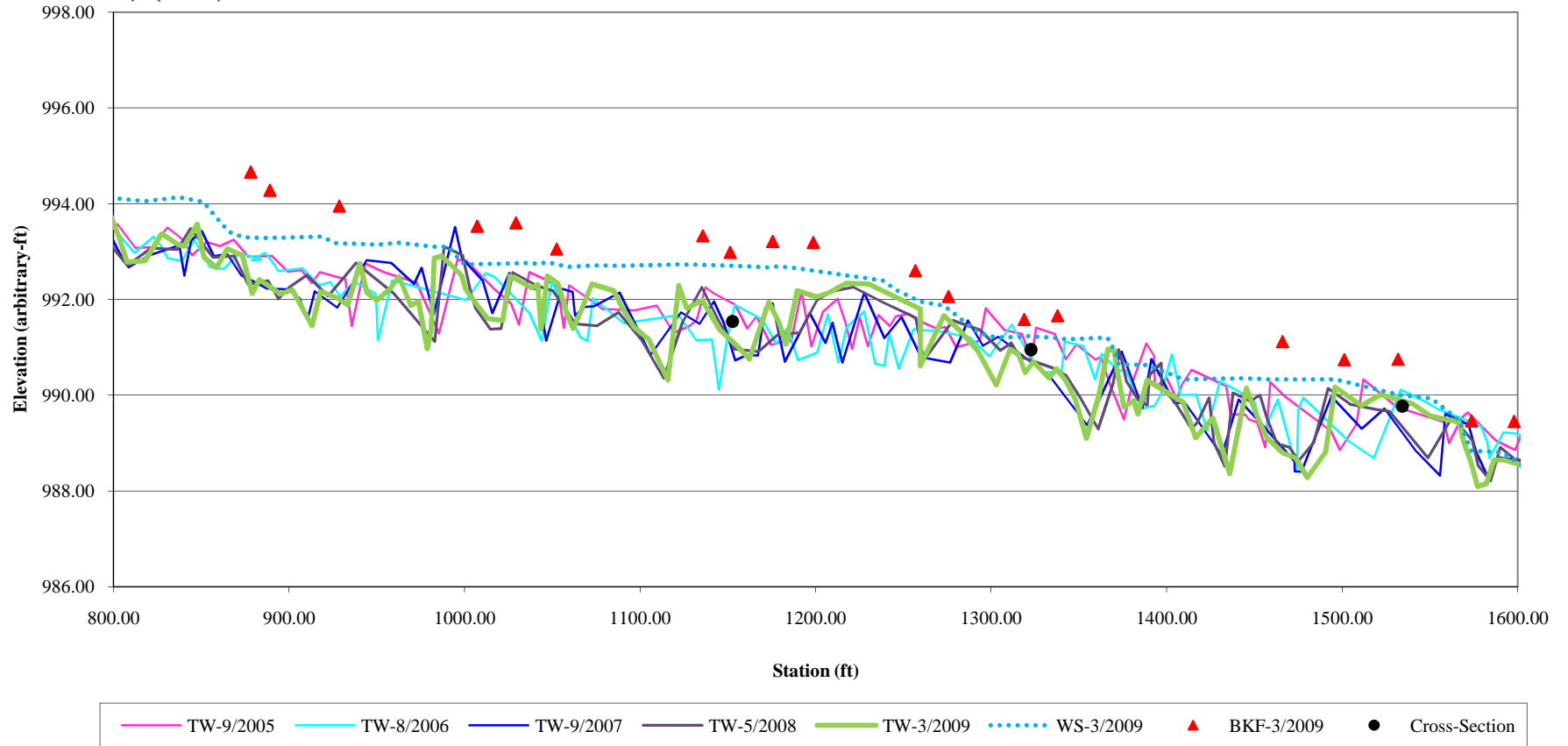


Appendix 4.6 Longitudinal Plots and Raw Data Tables  
 Cato Farms Stream Restoration  
 Year 5 of 5

**Cato Farms  
Longitudinal Profile  
2009 Monitoring Year**

Bankfull/Top of Bank =  $-0.0067 \cdot \text{STA} + 1000.4$   
 Water Surface =  $-0.0067 \cdot \text{STA} + 999.53$

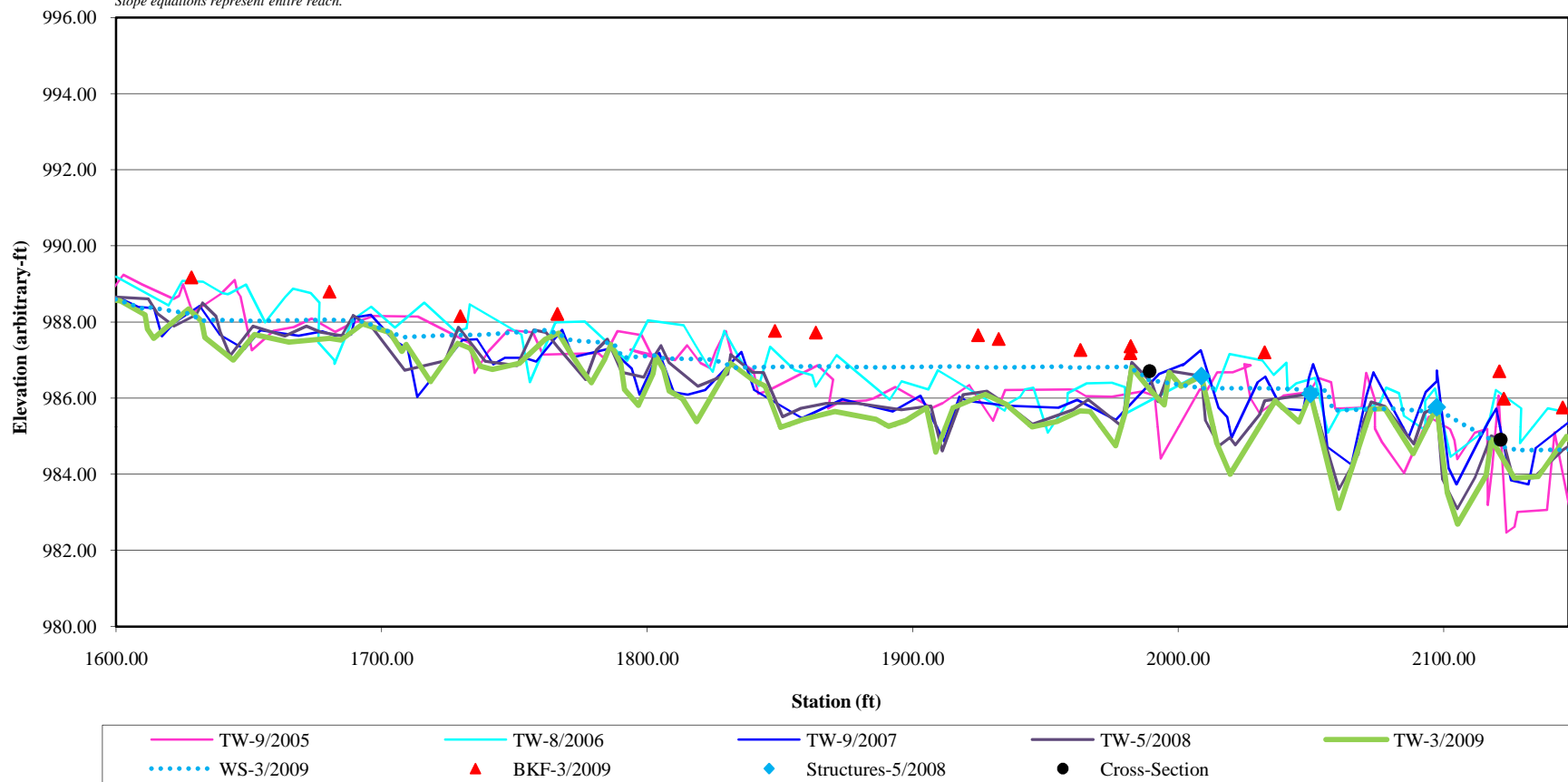
*Slope equations represent entire reach.*



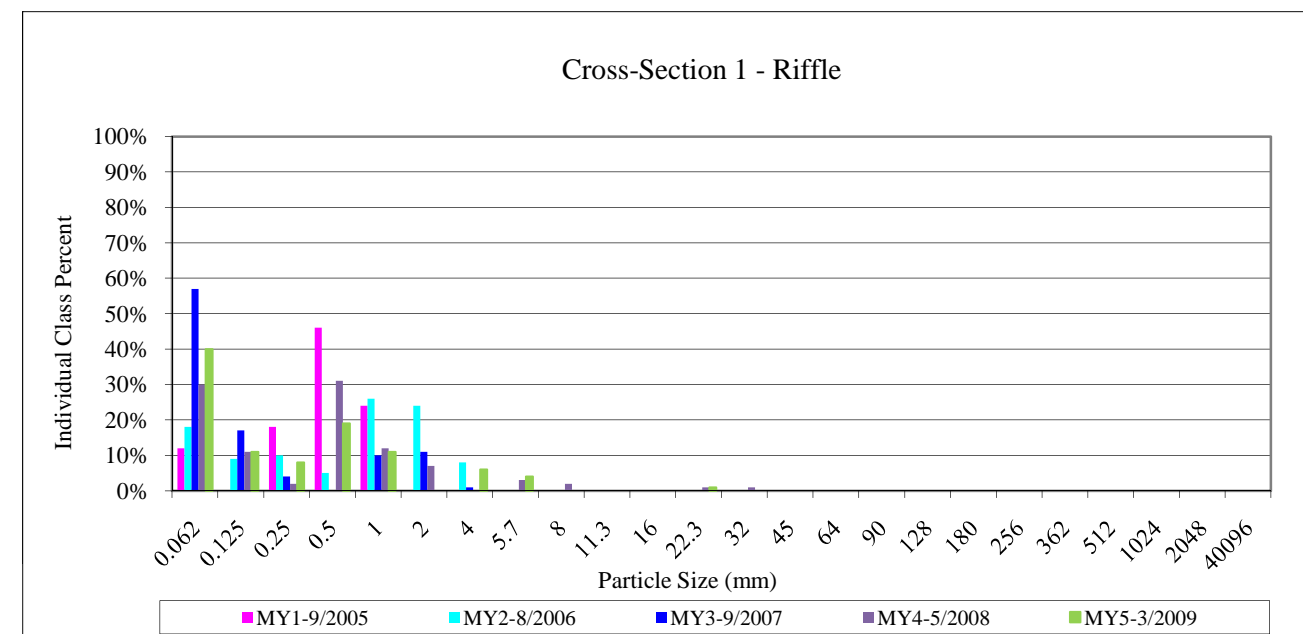
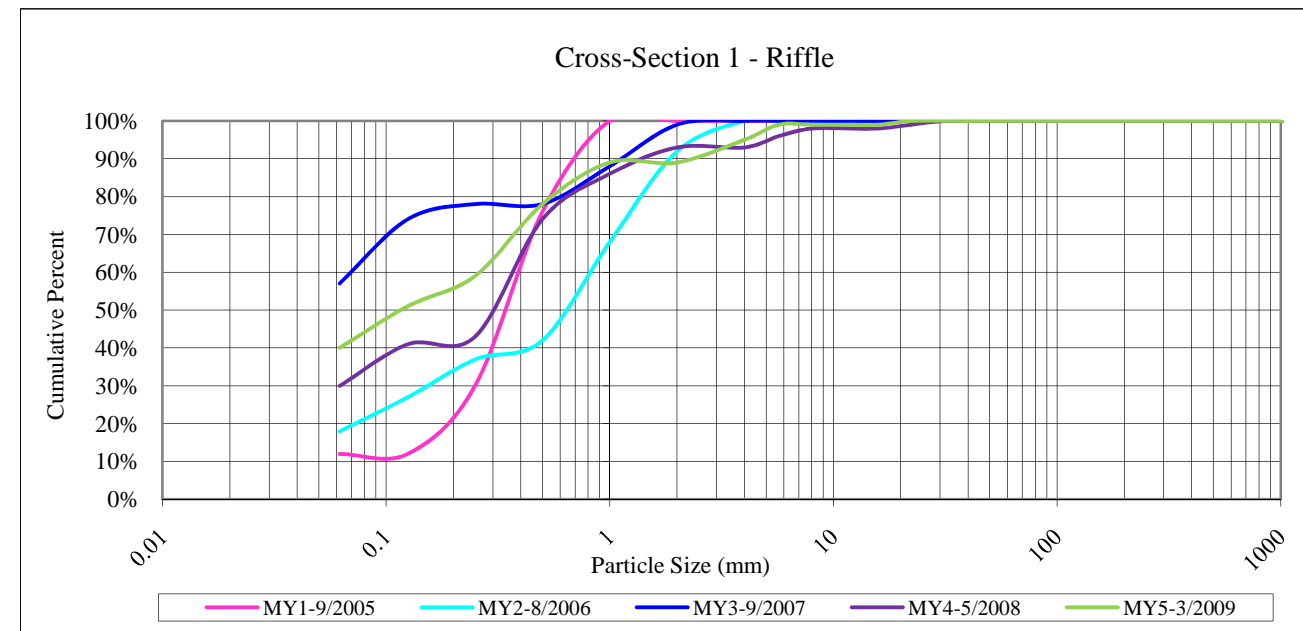
**Cato Farms  
Longitudinal Profile  
2009 Monitoring Year**

Bankfull/Top of Bank =  $-0.0067 \cdot \text{STA} + 1000.4$   
 Water Surface =  $-0.0067 \cdot \text{STA} + 999.53$

*Slope equations represent entire reach.*

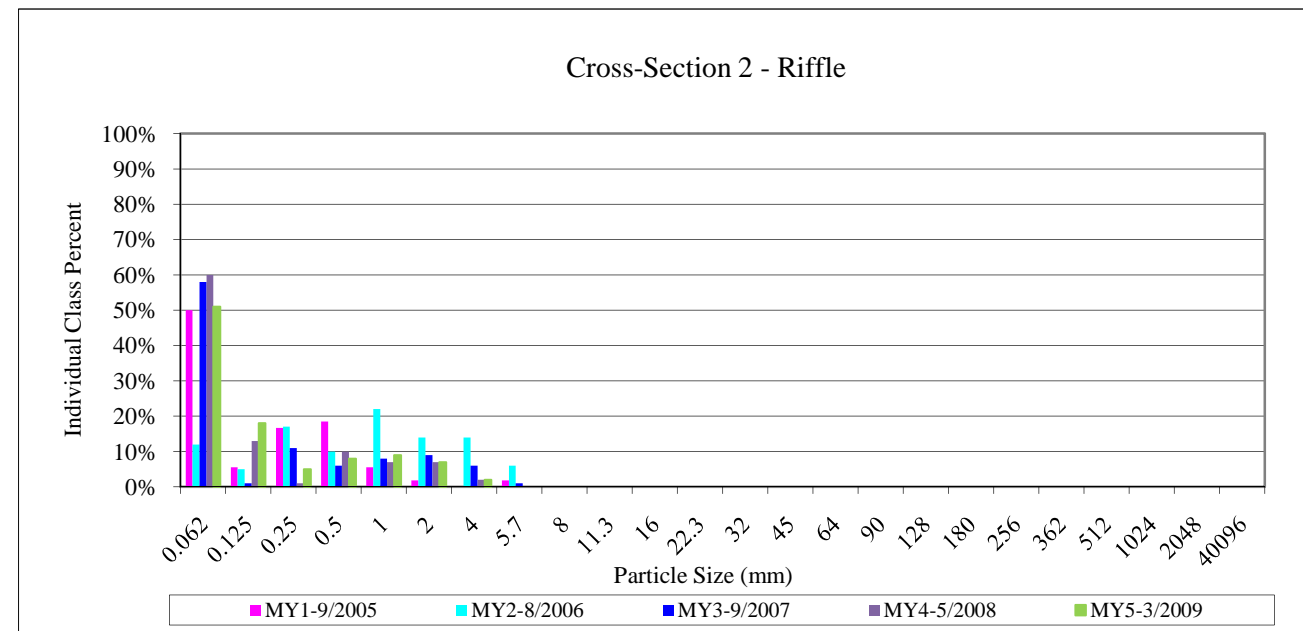
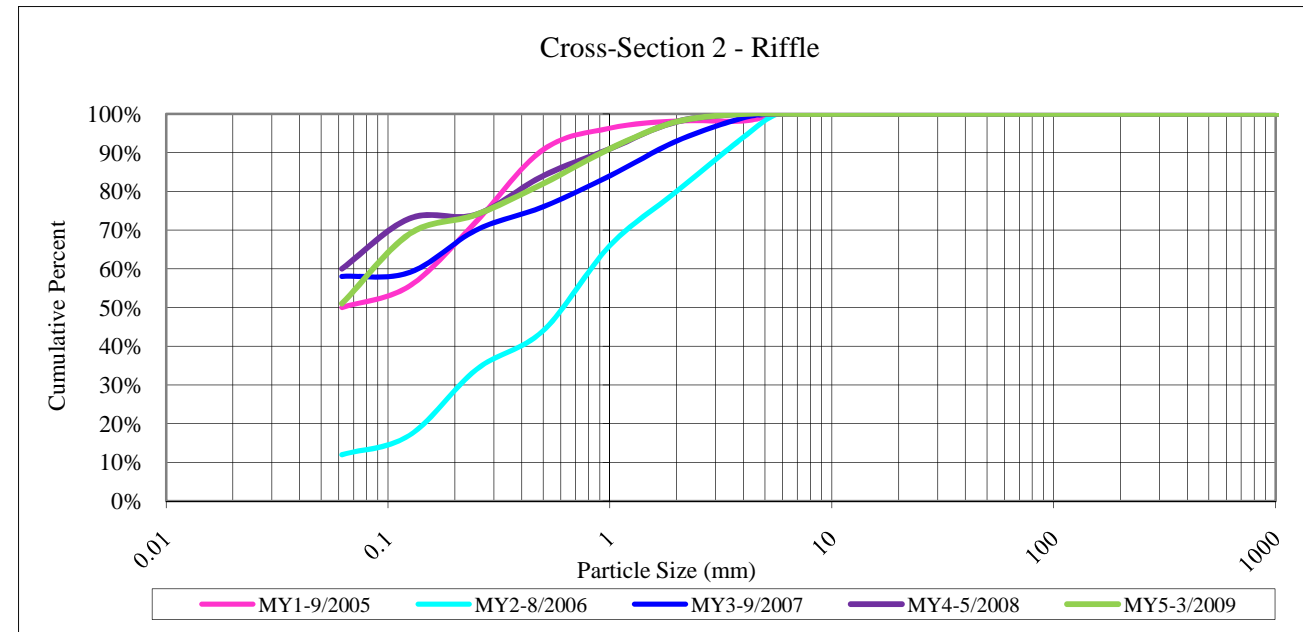


Project Name: Cato Farms					
Cross-Section: 1					
Feature: Riffle					
			2009		
Description	Material	Size (mm)	Total #	Item %	Cum %
<b>Silt/Clay</b>	silt/clay	0.062	40	40%	40%
<b>Sand</b>	very fine sand	0.125	11	11%	11%
	fine sand	0.250	8	8%	8%
	medium sand	0.50	19	19%	19%
	coarse sand	1.00	11	11%	11%
	very coarse sand	2.0	0	0%	0%
<b>Gravel</b>	very fine gravel	4.0	6	6%	6%
	fine gravel	5.7	4	4%	4%
	fine gravel	8.0	0	0%	0%
	medium gravel	11.3	0	0%	0%
	medium gravel	16.0	0	0%	0%
	course gravel	22.3	1	1%	1%
	course gravel	32.0	0	0%	0%
	very coarse gravel	45	0	0%	0%
	very coarse gravel	64	0	0%	0%
<b>Cobble</b>	small cobble	90	0	0%	0%
	medium cobble	128	0	0%	0%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
<b>Boulder</b>	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
<b>Bedrock</b>	bedrock	40096	0	0%	0%
<b>TOTAL % of whole count</b>			100	100%	100%
<b>Summary Data</b>					
D50	0.12				
D84	0.77				
D95	4				





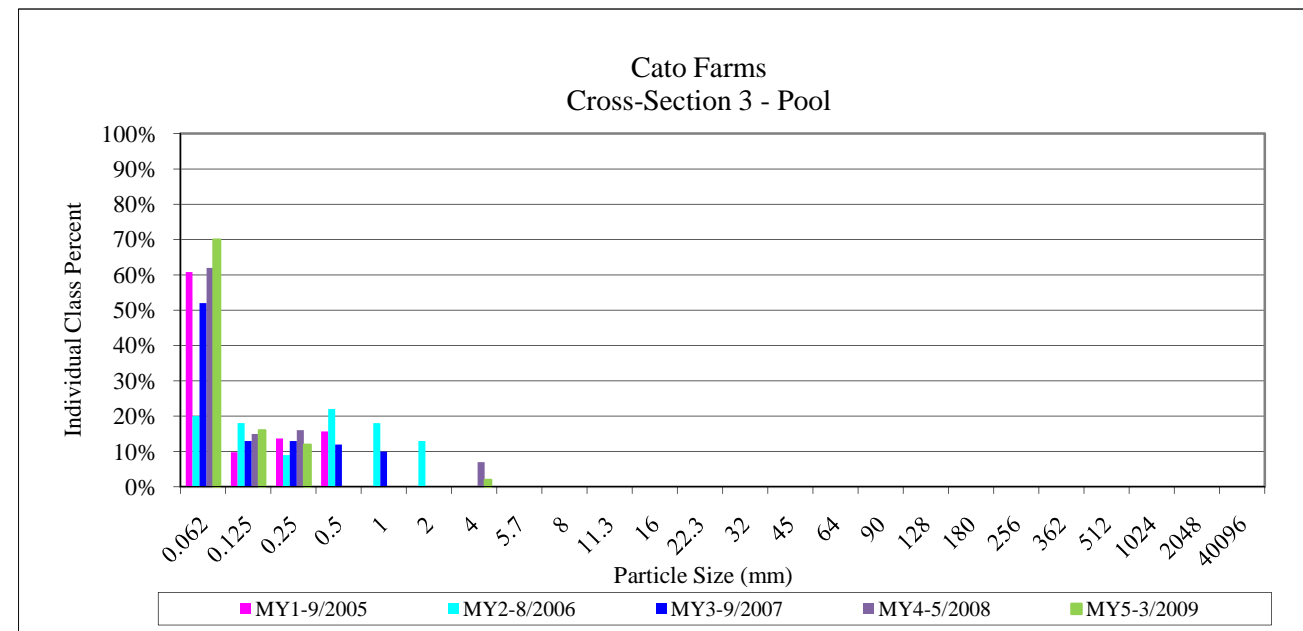
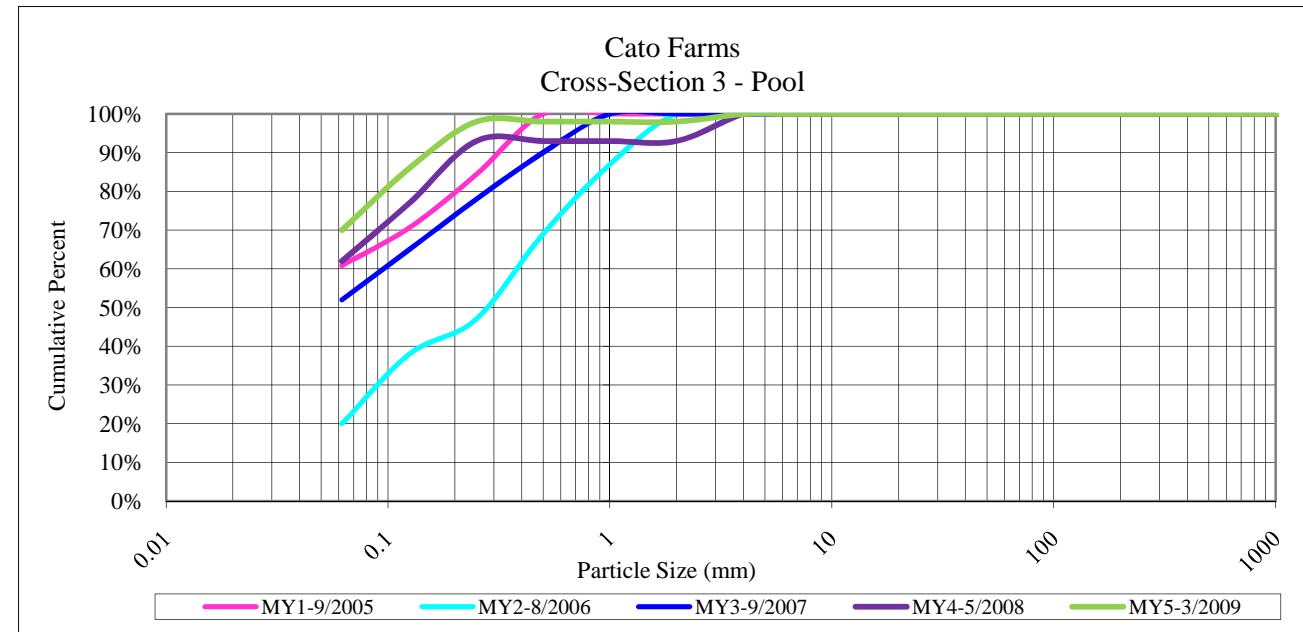
Project Name: Cato Farms					
Cross-Section: 2					
Feature: Riffle					
			2009		
Description	Material	Size (mm)	Total #	Item %	Cum %
<b>Silt/Clay</b>	silt/clay	0.062	51	51%	51%
<b>Sand</b>	very fine sand	0.125	18	18%	18%
	fine sand	0.250	5	5%	5%
	medium sand	0.50	8	8%	8%
	coarse sand	1.00	9	9%	9%
	very coarse sand	2.0	7	7%	7%
<b>Gravel</b>	very fine gravel	4.0	2	2%	2%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	0	0%	0%
	medium gravel	11.3	0	0%	0%
	medium gravel	16.0	0	0%	0%
	course gravel	22.3	0	0%	0%
	course gravel	32.0	0	0%	0%
	very coarse gravel	45	0	0%	0%
	very coarse gravel	64	0	0%	0%
<b>Cobble</b>	small cobble	90	0	0%	0%
	medium cobble	128	0	0%	0%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
<b>Boulder</b>	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
<b>Bedrock</b>	bedrock	40096	0	0%	0%
<b>TOTAL % of whole count</b>			100	100%	100%
Summary Data					
D50	0.06				
D84	0.61				
D95	1.57				



Project Name: Cato Farms					
Cross-Section: 3					
Feature: Pool					
2009					
Description	Material	Size (mm)	Total #	Item %	Cum %
<b>Silt/Clay</b>	silt/clay	0.062	70	70%	70%
<b>Sand</b>	very fine sand	0.125	16	16%	16%
	fine sand	0.250	12	12%	12%
	medium sand	0.50	0	0%	0%
	coarse sand	1.00	0	0%	0%
	very coarse sand	2.0	0	0%	0%
<b>Gravel</b>	very fine gravel	4.0	2	2%	2%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	0	0%	0%
	medium gravel	11.3	0	0%	0%
	medium gravel	16.0	0	0%	0%
	course gravel	22.3	0	0%	0%
	course gravel	32.0	0	0%	0%
	very coarse gravel	45	0	0%	0%
	very coarse gravel	64	0	0%	0%
<b>Cobble</b>	small cobble	90	0	0%	0%
	medium cobble	128	0	0%	0%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
<b>Boulder</b>	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
<b>Bedrock</b>	bedrock	40096	0	0%	0%
<b>TOTAL % of whole count</b>			100	100%	100%

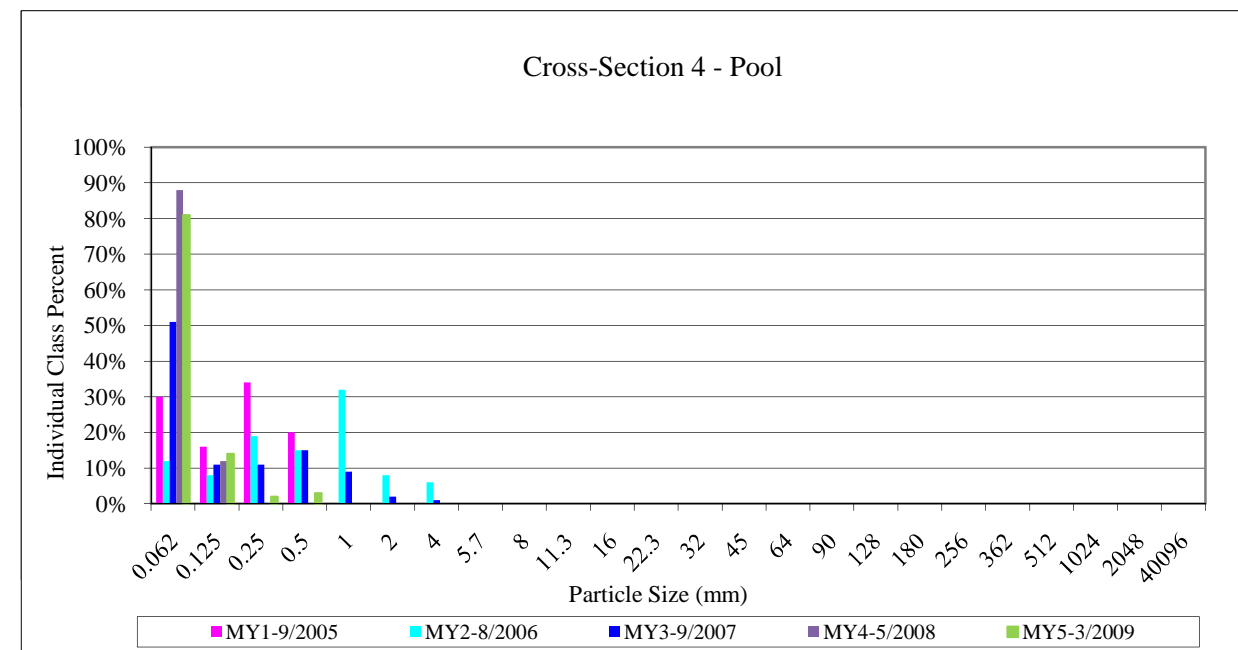
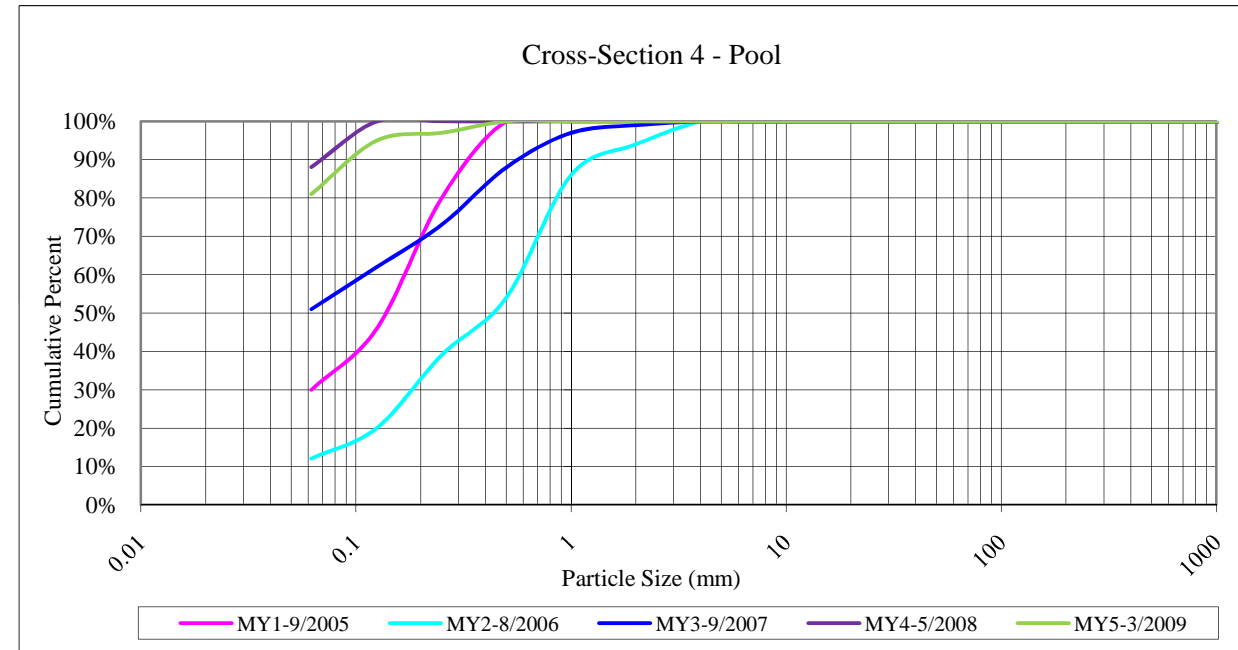
Summary Data	
D50	0.04
D84	0.12
D95	0.22



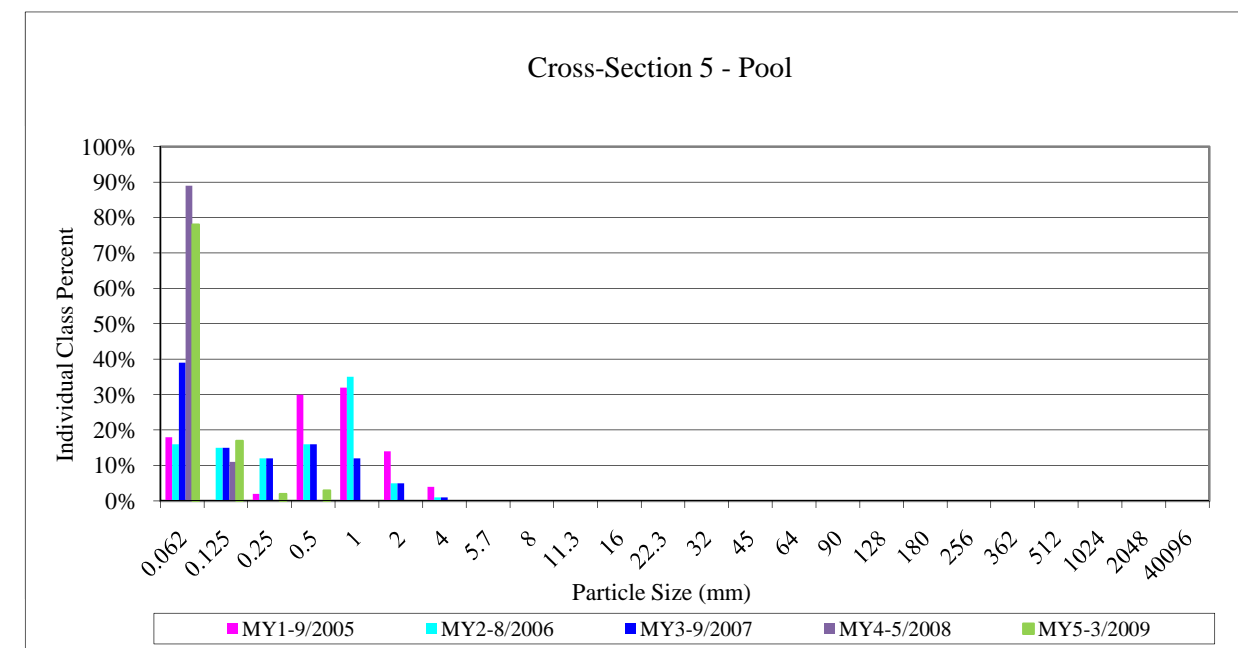
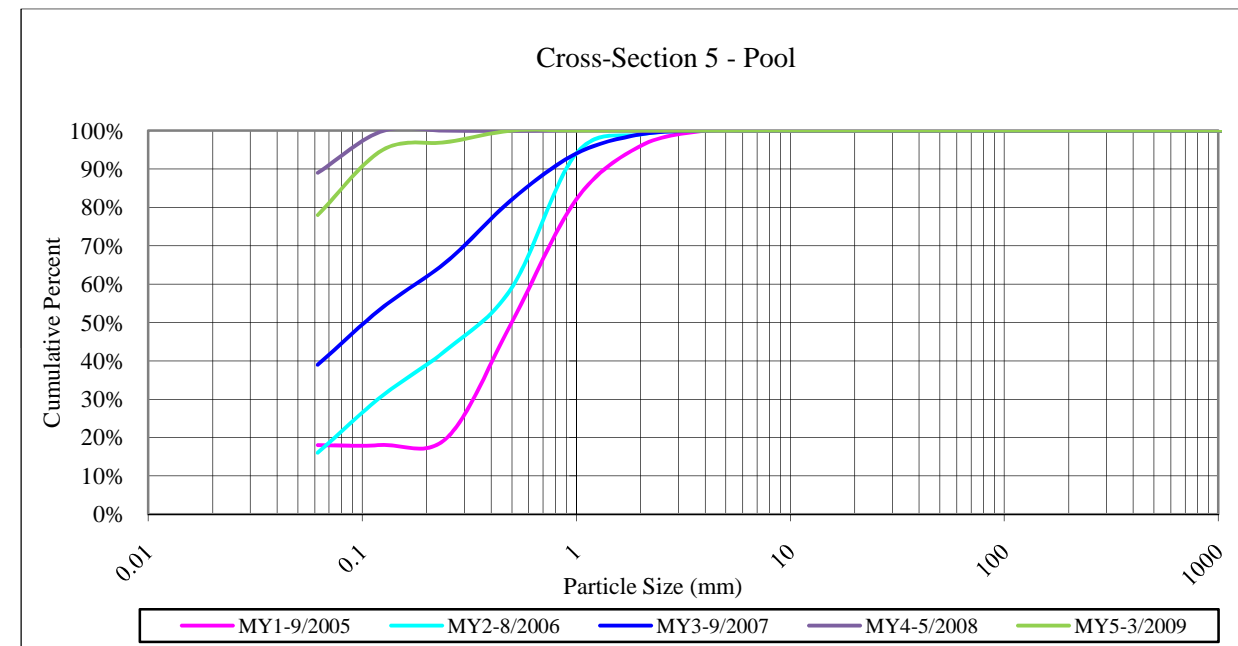
Project Name: Cato Farms					
Cross-Section: 4					
Feature: Pool					
			2009		
Description	Material	Size (mm)	Total #	Item %	Cum %
<b>Silt/Clay</b>	silt/clay	0.062	81	81%	81%
<b>Sand</b>	very fine sand	0.125	14	14%	14%
	fine sand	0.250	2	2%	2%
	medium sand	0.50	3	3%	3%
	coarse sand	1.00	0	0%	0%
	very coarse sand	2.0	0	0%	0%
<b>Gravel</b>	very fine gravel	4.0	0	0%	0%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	0	0%	0%
	medium gravel	11.3	0	0%	0%
	medium gravel	16.0	0	0%	0%
	course gravel	22.3	0	0%	0%
	course gravel	32.0	0	0%	0%
	very coarse gravel	45	0	0%	0%
	very coarse gravel	64	0	0%	0%
	<b>Cobble</b>	small cobble	90	0	0%
medium cobble		128	0	0%	0%
large cobble		180	0	0%	0%
very large cobble		256	0	0%	0%
<b>Boulder</b>	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
<b>Bedrock</b>	bedrock	40096	0	0%	0%
<b>TOTAL % of whole count</b>			100	100%	100%

Summary Data	
D50	0.04
D84	0.08
D95	0.13



Project Name: Cato Farms					
Cross-Section: 5					
Feature: Pool					
			2009		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	78	78%	78%
Sand	very fine sand	0.125	17	17%	17%
	fine sand	0.250	2	2%	2%
	medium sand	0.50	3	3%	3%
	coarse sand	1.00	0	0%	0%
	very coarse sand	2.0	0	0%	0%
Gravel	very fine gravel	4.0	0	0%	0%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	0	0%	0%
	medium gravel	11.3	0	0%	0%
	medium gravel	16.0	0	0%	0%
	course gravel	22.3	0	0%	0%
	course gravel	32.0	0	0%	0%
	very coarse gravel	45	0	0%	0%
	very coarse gravel	64	0	0%	0%
	Cobble	small cobble	90	0	0%
medium cobble		128	0	0%	0%
large cobble		180	0	0%	0%
very large cobble		256	0	0%	0%
Boulder	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
Bedrock	bedrock	40096	0	0%	0%
<b>TOTAL % of whole count</b>			100	100%	100%
Summary Data					
D50	0.04				
D84	0.08				
D95	0.13				



Project Name: Cato Farms					
Cross-Section: 6					
Feature: Riffle					
			2009		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	84	84%	84%
Sand	very fine sand	0.125	16	16%	16%
	fine sand	0.250	0	0%	0%
	medium sand	0.50	0	0%	0%
	coarse sand	1.00	0	0%	0%
	very coarse sand	2.0	0	0%	0%
Gravel	very fine gravel	4.0	0	0%	0%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	0	0%	0%
	medium gravel	11.3	0	0%	0%
	medium gravel	16.0	0	0%	0%
	course gravel	22.3	0	0%	0%
	course gravel	32.0	0	0%	0%
	very coarse gravel	45	0	0%	0%
	very coarse gravel	64	0	0%	0%
Cobble	small cobble	90	0	0%	0%
	medium cobble	128	0	0%	0%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
Boulder	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
Bedrock	bedrock	40096	0	0%	0%
<b>TOTAL % of whole count</b>			100	100%	100%
Summary Data					
D50	0.04				
D84	0.06				
D95	0.11				

