Cato Farms Stream Restoration
Project No. 72
2007 Monitoring Report (Final): Year 3 of 5

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Ecosystem Enhancement Program

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EXECUTIVE SUMMARY

Executive Summary

The Cato Farms Stream Restoration Project is located in Mecklenburg County. The stream restoration project consisted of restoring 2,500 linear feet of an unnamed tributary (UT) to Clark Creek, restoring 2.9 acres of associated riparian zone, providing one cattle crossing, and fencing the riparian corridor to exclude cattle grazing. The following goals for the Cato Farms Stream Restoration Project were established through the North Carolina Ecosystem Enhancement Program (NCEEP).

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 prevent cattle from entering the riparian area.

The Cato Farms Stream Restoration Project was restored by relocating approximately 2,000 linear feet (Reach 1) of the existing channel to establish an E-type channel (Priority 1). In addition, approximately 500 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. 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. This report serves as the 3rd year of the 5 year monitoring plan for the Cato Farms Stream and Wetland Restoration Site.

Results from the 2007 stream monitoring effort indicate that Cato Farms is maintaining vertical and lateral stability. Current drought conditions during the 2007 monitoring year have severely lowered the normal baseflow levels, creating minimal flow. These conditions created high silt deposition throughout Reach 1 and 2 and stagnant pools with algal blooms in Reach 2. The pattern, profile, and dimension of the restored UT appear stable. A few problem areas were observed, such as moderate bank erosion, moderate to poor streambank cover, loose matting, and aggradation. It is recommended that sections with poor streambank cover should be stabilized with matting and vegetation as soon as possible to prevent future problems.

The 2007 vegetation plot monitoring results indicate that the Cato Farms Site appears to be meeting vegetation success criteria. Planted and naturally recruited vegetation is doing well at the site. Some minor vegetation problems were noted. There are several small barren areas and a high live stake mortality observed along the streambanks. The high live stake mortality observed could be from being planted in compacted soil, planted too high on the banks, or planted too late in the growing season. In the limited areas where vegetation has not established, addition of temporary and permanent seeding is recommended. On the banks with high live stake mortality, replacement of live stakes will help provide long-term stability.

The survival rate for the woody vegetation monitored is 74%. The monitoring data indicates an average of 15 stems per plot. Using the monitoring plot's size of 10m x 10m (0.025 ac), the site density is approximately 600 planted stems per acre. The success goal for planted woody vegetation requires 320 stems per acre for year 3. Overall, the Cato Farms Stream Restoration Project appears to be stable and has met stream and vegetation goals for monitoring year 3.

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SECTION 1
PROJECT BACKGROUND

SECTION 1
PROJECT BACKGROUND

The background information provided in this report is referenced from previous monitoring reports.

1.1 Location and Setting

The Cato Farms Stream Restoration Project is located at the Cato Farms Property in Mecklenburg County, North Carolina immediately south of Huntersville-Concord Road just east of Huntersville (Figure 1.1). The stream restoration project consisted of restoring 2,500 linear feet of an UT to Clark Creek, restoring 2.9 acres of associated riparian zone, providing one cattle crossing, and fencing the riparian corridor to exclude cattle access.

To access the site from Charlotte, take Interstate 77 North to Exit 25 (Gilead Road) and turn right off the exit heading east. Gilead Road will turn into Huntersville-Concord Road. Take Huntersville-Concord Road from this point for approximately 2 miles. Huntersville-Concord Road will cross the UT at a low point in the road. The tributary is located approximately 1,000 feet downstream from where Huntersville-Concord Road crosses the UT to Clark Creek.

1.2 Mitigation Structure and Objectives

The UT to Clark Creek is located within the Southern Outer Piedmont Physiographic Region. The UT site drains approximately 0.41 square miles to Clark Creek, within the Yadkin-Pee Dee River Basin (HUC 3040105). 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 previously have been channelized/straightened, and ditches were created to drain adjacent 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 Cato Farms Stream Restoration Project.

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 Cato Farms Stream Restoration Project was restored by relocating approximately 2,000 linear feet (Reach 1) of the existing channel to establish an E-type channel (Priority 1) and restoring in-place approximately 500 linear feet (Reach 2) to create a B-type channel (Priority 3) to transition the channel to the confluence elevation with Clark Creek. Cato Farm's riparian areas were planted to improve habitat and stabilize streambanks.

A sinuous, stable pattern, with riffle-pool bed features was constructed. Cross-vanes and constructed riffles were installed to provide bank stabilization and maintain grade control. Approximately 2.9 acres of wetlands were preserved by fencing in the entire site to exclude cattle access to the UT and establishing a cattle crossing at the lower end of the project (Table 1.1). Riparian areas along Reach 1 were planted with native grasses and woody stem vegetation. Streambanks were stabilized with geotextile matting, native grasses, and live stakes. Reach 2 was soil bioengineered (live staked) with shrubs.

Table 1.1
Project Mitigation Structure and Objectives
Cato Farms Stream Restoration/Project No. 72

Segment/Reach	Mitigation Type	Approach	Linear Feet or Acreage	Stationing (ft)	Comments
Reach 1	Restoration/Relocation	P1	2,000 linear feet	0+00-20+00	Channel restoration, relocation with use of grade control and bank protection structures.
Reach 2	Restoration in-place	P3	500 linear feet	20+00-25+00	Channel restoration, in-place with use of grade control and bank protection structures.
Cato Farms	Preservation	-	2.9 acres	-	Buffer Restoration/Replanting

1.3 Project History and Background

The stream restoration was designed by CH2MHill, Inc. Monitoring has been conducted annually from 2005 to present. This report serves as the 3rd year of the 5 year monitoring plan for the Cato Farms Stream Restoration Site. Tables 1.2 and 1.3 provide detailed project activity, history and contact information for this project. Table 1.4 provides more in-depth watershed/site background for the UT to Clark Creek

Table 1.2
Project Activity and Reporting History
Cato Farms Stream Restoration/Project No. 72

Activity or Report	Data Collection Completed	Actual Completion or Delivery
Restoration Plan	N/A	July 2002
Final Design-90%	N/A	November 2002
Construction	N/A	N/A
Temporary S&E mix applied to entire project area*	N/A	N/A
Permanent seed mix applied to reach	N/A	N/A
Mitigation Plan/ As-Built (Year 0 Monitoring)	N/A	Summer 2004
Year 1 Monitoring	June 2005	January 2005
Year 2 Monitoring	September 2006	November 2006
Year 3 Monitoring	August 2007	November 2007
Year 4 Monitoring	TBD	TBD
Year 5 Monitoring	TBD	TBD
*Seed and mulch are added as each section of construction is completed.		

Table 1.3
Project Contacts
Cato Farms Stream Restoration/Project No. 72

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

Table 1.4
Project Background
Cato Farms Stream Restoration/Project No. 72

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%

1.4 Monitoring Plan View

The monitoring plan view map (Figure 1.2) illustrates the location of the longitudinal profile stations, cross-section stations, vegetation plots, and photo points. A total of six cross-sections were previously established within Reach 1 and 2. Approximately 2,500 linear feet of longitudinal profile was monitored. Eight previously established vegetation plots were monitored in 2007. Photographs were taken upstream and downstream at each cross-section and at existing photo points.

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SECTION 2
PROJECT CONDITION AND MONITORING RESULTS

SECTION 2

PROJECT CONDITIONS AND MONITORING RESULTS

The following monitoring results are from the 2007 (year 3 of 5) survey completed in August 2007.

2.1 Vegetation Assessment

Eight previously established vegetation monitoring plots were monitored within the riparian buffer of the Cato Farm Stream Restoration Project. Vegetation assessments were conducted following the NCEEP 2004 Stem Counting Protocol which consists of counting woody stems within the established vegetation plots. Planted zones related to the stream restoration consist of the streambank and the buffer area adjacent to the stream. The riparian zone begins at the top of bank and proceeds perpendicular to the stream. The planted streambank initiates at base flow elevation and extends to the top of bank. The overall success of these two particular planted zones is good. Live stakes (*Salix nigra* and *Cornus amomum*) and herbaceous species (*Carex* spp., *Juncus* spp., and *Panicum* spp.) along the streambank are healthy and abundant. The riparian buffer is dominated by a thick herbaceous layer with numerous shrubs and saplings throughout. Natural recruitment vegetation appears to be dominant. This is likely due to the native seed bank.

Overall, planted and naturally recruited vegetation is doing well at the site. Some minor vegetation problems were noted. There are several small barren areas and a high live stake mortality observed along the streambanks. The high live stake mortality observed could from being planted in compacted soil, planted too high on the banks, or planted too late in the growing season. The majority of the live stakes throughout the project area are thriving.

The areas of compacted soil and live stake mortality could lead to an erosion problem over time depending on the extent of natural recruitment in these areas. Coir matting is still holding the majority of the banks together, but it will decompose eventually leaving these areas barren.

In the limited areas where vegetation has not established, addition of temporary and permanent seeding is recommended. On the banks with high live stake mortality, replacement of live stakes is recommended to provide long-term stability.

2.1.1 Soil Data

The Cato Farms Stream Restoration Project is situated between a narrow ridge and valley within the Outer Piedmont Belt of the North Carolina Piedmont Physiographic Province. Researchable data indicates that the soils within the project area are those found in alluvial landforms in this physiographic region; however, grading and filling activities during construction likely have disturbed the parent soil material.

Review of the *Soil Survey of Mecklenburg County, North Carolina* indicates that four soil series are found within or adjacent to the project limits (Figure 2.1). These soil series consist of Enon, Helena, Monacan, and Wilkes. Enon soils are very deep, well-drained soils on ridges and side slopes of the Piedmont uplands. The soils are formed in clayey residuum weathered from mafic or intermediate igneous and metamorphic rocks such as diorite, gabbro, gneiss, and schist of the Piedmont uplands. Slopes range from 0 to 45 percent for the Enon series. Helena soils are very deep, well-drained soils on broad ridges and toe slopes of the Piedmont uplands. The soils are formed in residuum weathered from a mixture of felsic, intermediate, or mafic igneous, or metamorphic rocks such as granite, or granite gneiss that may be cut by dykes of gabbro and diorite, or mixed with hornblende schist or hornblende gneiss. Slopes range from 0 to 15 percent for the Helena series; however, these soils are generally found on slopes that range from 0 to 10 percent. Monacan soils are very deep, well-drained to somewhat poorly-drained soils found along stream corridors. These soils are formed in recent alluvium sediments of the Piedmont and Coastal Plain. Slopes are generally less than 2 percent. Wilkes soils are shallow, well-drained soils adjacent to drainageways. They are formed in residuum weathered from intermediate and mafic crystalline rocks on the Piedmont uplands. Slopes range from 0 to 25 percent for the Wilkes series. Please refer to Table 2.1 for the preliminary soil data of the soil series within the project area.

Table 2.1
Preliminary Soil Data
Cato Farms Stream Restoration Project No. 72

Series	Max Depth (in)	% Clay on Surface	K Factor	T Factor	OM %
Enon	60	5 - 20	0.34	4	0.0 – 3.0
Helena	64	5 - 20	0.37	3	0.0 – 2.0
Monacan	65	7 - 27	0.28	4	0.0 – 3.0
Wilkes	45	5 - 20	0.28	2	0.0 – 2.0

2.1.2 Vegetative Current Conditions

During the initial assessment survey conducted in April 2007, it was noted that some minor areas of streambank have suffered localized loss of vegetative cover. In these areas, it is apparent that flood events likely caused the bank erosion resulting in a loss of vegetation. Furthermore, the compaction of soil and nutrient poor conditions may also be contributing to the mortality of live stakes and herbaceous cover in these limited areas. During the vegetative survey completed in August, it was observed that many of the problem areas noted during the initial vegetation assessment (March 2007) have improved throughout the growing season. It should be noted that much of the sites herbaceous cover in the riparian area is dog-fennel (*Eupatorium capillifolium*). This species seems to be invasive on site; however, it is not listed as an invasive species for North Carolina. Control of this species may need to be done in order to allow for preferred riparian species to establish. Please refer to Appendix 1.1 for the vegetative problem areas table.

2.1.3 Vegetative Current Condition Plan View

Please refer to Appendix 3 for location of vegetative current condition areas onsite and Appendix 1.2 for representative vegetation current condition photos.

2.1.4 Stem Counts

JJG conducted the vegetative assessment and vegetative plot analysis in March and August 2007. The eight previously established vegetative plots represent the riparian buffer zone and streambank vegetation.

Trees planted within the plots monitored includes white oak (*Quercus alba*), swamp chestnut oak (*Quercus michauxii*), river birch (*Betula nigra*), American sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), willow species (*Salix* sp.), silky dogwood (*Cornus amomum*), box-elder (*Acer negundo*), and black gum (*Nyssa sylvatica*). In addition, natural recruitment vegetation was also monitored within these plots. Species encountered were tulip poplar (*Liriodendron tulipifera*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), tag alder (*Alnus serrulata*), Eastern red cedar (*Juniperus virgiana*), oak species (*Quercus* spp.), and species that were originally planted. Refer to Table 2.2 for a summary of stem counts for planted species.

Table 2.2
Stem Counts for Planted Species Arranged by Plot
Cato Farms Stream Restoration Project No. 72

Stem Counts for Planted Species Arranged by Plot – MY-2007											
	Vegetation Plots Monitored (MY-2007)								MY 3-2007	MY 2-2006	MY 1-2005
Species	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Totals**	**Totals**	**Totals**
Shrubs											
Aronia arbutifolia	0	0	0	0	2	0	0	0	**2**	**3**	**13**
Cephalanthus occidentalis	0	2	1	2	1	0	0	0	**6**	**4**	**8**
Cornus amomum	3	0	2	4	10	0	3	10	**32**	**32**	**44**
Cornus sericea	0	0	0	3	0	0	0	0	**3**	**3**	**5**
*Salix nigra**	4	1	1	0	1	4	3	2	**16**	**16**	**16**
Sambucus canadensis	0	2	1	0	0	0	0	0	**3**	**2**	**5**
Trees											
*Acer negundo**	1	2	2	2	2	1	4	4	**18**	**18**	**18**
Carpinus caroliniana	0	0	0	0	0	0	0	0	**0**	**0**	**1**
Carya aquatica	0	0	0	0	0	0	0	0	**0**	**0**	**3**
*Fraxinus pennsylvanica**	0	1	0	0	0	2	2	0	**5**	**5**	**5**
Juglans nigra	0	0	0	0	0	0	0	0	**0**	**0**	**1**
Nyssa sylvatica	1	0	0	0	0	0	0	0	**1**	**1**	**1**
*Populus deltoides**	0	0	0	1	1	1	0	2	**2**	**2**	**2**
*Quercus alba**	0	1	0	0	0	1	1	2	**5**	**5**	**6**
*Quercus michauxii**	1	2	0	3	0	3	2	2	**14**	**14**	**14**
Total Planted Live Stems (2007)	**10**	**12**	**8**	**15**	**17**	**13**	**17**	**24**	**105**	**N/A**	**N/A**
Average # of Stems (2007)	**15**										
Percent Survival (2007)	**77%**	**86%**	**80%**	**100%**	**94%**	**72%**	**61%**	**92%**	**Avg = 74%**		
Stem Density (2007)	**600**										
*Numerous volunteer stems were observed											

The survival rate for the woody vegetation monitored for 2007 is 74%. The monitoring data indicates an average of 15 stems per plot. Using the monitoring plots size of 10m x 10m (0.025 ac), the site density is approximately 600 planted stems per acre. The success goal for planted woody vegetation is 320 stems per acre. Furthermore, many natural recruitment stems were observed within all eight plots. If these volunteers were also included in the stem average and site density calculation, then the number would increase dramatically. The site has satisfied this goal for monitoring year 3.

In conclusion, the vegetation within the Cato Farms Stream Restoration Project meets the success criteria for year 3. Although some loss of streambank vegetation has occurred, the overall growth of the riparian buffer is good.

2.1.5 Vegetation Plot Photos

Please refer to Appendix 1.3 for photographs of the monitoring plots.

2.2 Stream Assessment

Stream dimension, pattern, profile and substrate were evaluated within 2,500 linear feet of the stream restoration site. The stream assessment included walking the entire stream reach and monitoring 2,500 linear feet of longitudinal profile and six pre-established cross-sections. Please refer to Table 2.3 and Appendix 2 for the stability assessment, stream photographs, and raw data, Table 2.4 for the baseline morphology and hydraulic as-built summary, Table 2.5 for monitoring years 2003-2007 morphology and hydraulic summary, and Appendix 3 for the current condition plan view map.

2.2.1 Stream Current Condition Plan View

Please refer to Appendix 3 for location of stream current condition areas onsite.

2.2.2 Stream Current Condition Table

Please refer to Appendix 2.1 for the stream current condition table.

2.2.3 Numbered Issues Photo Section

Please refer to Appendix 2.2 for representative stream current condition photos.

2.2.4 Fixed Photo Station Photos

Please refer to Appendix 2.3 for stream photo station photos and Appendix 2.4 for stream cross-section photos.

2.2.5 Stability Assessment

The pattern, profile, and dimensions of Reach 1 and 2 appear stable with some isolated signs of moderate erosion and heavy sediment deposition. These areas of moderate and severe bank erosion are primarily due to lack of vegetative cover. There are also numerous areas that are not actively eroding but are susceptible to bank erosion due to poor vegetative cover. Current drought conditions during the 2007 monitoring year have severely lowered the normal baseflow levels, creating minimal flow. These conditions most likely attributed to high silt deposition throughout Reach 1 and 2 and stagnant pools with algal blooms in Reach 2. It is assumed that a few high flow events would decrease and flush out some of the fine sediment depositions and algal blooms observed in the 2007 monitoring year.

Due to the nature of the previous monitoring years data provided by and to JJG, the longitudinal profile plot provided for the 2007 monitoring year overlays monitoring years 2005 (year 1 of 5) and 2007 (year 3 of 5). The 2005 monitoring survey was the only data provided that could be used in AutoCAD/LDD to accurately represent the changes in streambed morphology within the Cato Farms Stream Restoration Site. A general overview of Reach 1 and 2 is provided below.

Reach 1

In several 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 and 17+00). Upstream of the bridge crossing from stationing 12+25 through 13+00, vegetation is growing in the middle of the channel, creating a mid channel bar. Within Reach 1, Cross-sections 3, 4, 5, and 6 are located. Cross-sections 3, 4 and 5, which are all pools, have moderate streambank erosion and have shown an increase in width to depth ratio (W/D). Cross-section 6 is a riffle that was previously a pool in monitoring years 2005-2006. Per NCEEP request, Cross-Section 6 was relocated in the 2007 monitoring year from a pool to a riffle stream feature. No significant changes in channel dimension were observed that indicate lateral instability is occurring.

In Reach 1, the average water surface slope and the average bankfull slope were very similar for the surveyed reach, 0.0062 ft/ft and 0.0068 ft/ft respectively. The surveyed water surface slope was slightly lower than the proposed 0.0100 ft/ft, but similar to the 2005 and 2006 surveyed slopes. The profile appears stable and is not showing significant vertical incision; however, fine silt deposition has impacted the streambed morphology. Upstream sources from construction development and abnormal rainfall conditions are most likely attributing to the increase in sediment deposition. As a result, compound pools have developed throughout the reach, increasing pool to pool spacing. For the 2007 monitoring year, the pool furthest downstream within the compound pool was counted for pool to pool spacing measurements.

Overall, pattern measurements did not illustrate any significant shifts in values when comparing the 2007 results to the 2005 and 2006 results. There are no indicators that Reach 1 is illustrating trends towards lateral migration.

Reach 2

Overall, the structures within the transition zone appear to be in good condition; however, the outer arm of some structures are lacking in vegetative cover; therefore, moderate to severe scouring is occurring (Stationing 21+00, 21+50, 22+50, 22+90, 23+90, 23+25, and 24+30). The cross-vane at stationing 24+25 has vegetation growing on the invert and lateral bars are forming on the downstream side of a few cross-vanes below stationing 22+25.

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 were very similar for the surveyed reach, 0.0090 ft/ft and 0.0080 ft/ft respectively. The surveyed water surface slope was slightly lower than the proposed 0.010 ft/ft and steeper than the previous surveyed slopes in 2006 (0.0080 ft/ft and 0.0070 ft/ft, respectively). The profile appears stable and is not showing significant shifting in the bed features; however, results indicate there is a slight change. This change could be due to the minimal to absent baseflow conditions observed during the 2007 longitudinal survey. Pattern measurements also showed a shift in values when comparing the 2007 results to 2006 results. Riffle features that were previously noted in 2006 have transitioned into runs and pool to pool spacing increased. These changes could be due to the lower baseflow levels and sediment deposition due to drought conditions and sediment deposition from upstream sources.

In summary, both Reach 1 and 2 appear to be stable with some minor areas of moderate to severe bank erosion due to lack of vegetative cover. Some minor bank repair work was completed after construction, but no specific information was provided. It is recommended that the sections with poor streambank cover should be stabilized with matting and vegetation as soon as possible to prevent future problems. Please refer to Table 2.3 for a summary of the visual stability assessment, Table 2.4 for the morphology and hydraulic as-built summary, Table 2.5 for monitoring years 2005-2007 morphology and hydraulic summary, Table 2.6 for hydrologic criteria, and Appendix 2 for more detailed stream data tables and plots.

Table 2.3
Categorical Stream Feature Visual Stability Assessment
Cato Farms Stream Restoration Project No. 72

Reach 1				
Feature	**As-Built**	**MY1 (2005)**	**MY2 (2006)**	**MY3 (2007)**
A. Riffles	-	-	100%	75%
B. Pools	-	-	100%	100%
C. Thalweg	-	-	98%	98%
D. Meanders	-	-	98%	99%
E. Bed General	-	-	100%	99%
F. Bank Performance*	-	-	N/A	96%
G. Vanes/J Hooks, etc	-	-	N/A	N/A
F. Wads/Boulders	-	-	96%	100%
Reach 2				
Feature	**As-Built**	**MY1 (2005)**	**MY2 (2006)**	**MY3 (2007)**
A. Riffles	-	-	N/A	N/A
B. Pools	-	-	90%	100%
C. Thalweg	-	-	100%	100%
D. Meanders	-	-	91.67%	100%
E. Bed General	-	-	100%	100%
F. Bank Performance*	-	-	100%	91%
G. Vanes/J Hooks, etc	-	-	N/A	73%
F. Wads/Boulders	-	-	99%	N/A

(Cells noted with a (-), data was not provided, *Although bank erosion is occurring within the reach, it is not actively eroding.)

2.2.6 Quantitative Measures Tables

Tables 2.4 and 2.5 display morphological summary data from all monitoring years. Raw survey data can be found in Appendix 2.

Table 2.4
Baseline Morphology and Hydraulic As-Built Summary
Cato Farms Stream Restoration/Project No. 72

	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream		Design		As-Built		
DIMENSION	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**UR**	**MR**	**LR**	**Coffey Creek**	**Park South Drive**	**Restoration Reach (Reach 1)**	**Transition Reach (Reach 2)**	**Med**	**Min**	**Max**
Bankfull Width (ft)	USGS Gage Data is unavailable for this tributary			-			7.7	5.2	7.6	31.6	5.9	7.00	13.50	As-Built Data was not provided		
Floodprone Width (ft)							16	7	11	46	29	34.20	19.67			
Bankfull Cross-sectional Area							5.7	8.6	9.7	55.4	6.7	8.60	9.70			
Bankfull Mean Depth							0.7	1.65	1.3	1.8	1.1	1.33	0.75			
Bankfull Max Depth							1.9	2	1.9	2.5	1.5	1.76	1.06			
Width/Depth Ratio							10.4	3.2		18	5.2	5.25	17.99			
Entrenchment Ratio							2.1	1.3	6	1.5	4.9	4.89	1.46			
Wetted Perimeter (ft)							-	-	-	-	-	-	-			
Hydraulic Radius (ft)							-	-	-	-	-	-	-			
Bank Height Ratio							1.92	2.19	3.21	1.33	1.83	1.00	1.65-6.41			
PATTERN																
Channel Beltwidth (ft)	-			-			8	5.5	8	226	36	42.6	96.64	As-Built Data was not provided		
Radius of Curvature (ft)							0	0	0	115.7-467.2	11.1-23.5	13.09-27.72	49.47-199.78			
Meander Wave Length (ft)							-	0	0	747-849	44-61	51.89-71.94	319.13-363.04			
Meander Width Ratio							1.04	1.05	1.05	7.16	6.07	6.07	7.16			
PROFILE																
Riffle Length (ft)	-			-			-	-	-	-	-	-	-	As-Built Data was not provided		
Riffle Slope (ft/ft)							-	-	-	-	-	-	-			
Pool Length (ft)							-	-	-	-	-	-	-			
Pool to Pool Spacing (ft)							17.5-32.5	35.2-35.9	3.55-33.3	100-120	14-27	16.51-31.84	42.76-51.31			
SUBSTRATE																
D50 (mm)	-			-			-	0.5	1.2	2.3	0.8	0.82	1.2	As-Built Data was not provided		
D84 (mm)							0	4	9	142	8	8.3	8.64			
ADDITIONAL REACH PARAMETERS	**USGS Gage Data**			**Regional Curve Interval**			**Pre-Existing Condition**			**Project Reference Stream**		**Design**		**As-Built**		
Valley Length (ft)	-			-			-	-	-	-	-	-	-	As-Built Data was not provided		
Channel Length (ft)							-	-	-	-	-	-	-			
Sinuosity							1.01	1.04	1.1	1.22	1.39	1.39	1.22			
Water Surface Slope (ft/ft)							0.0098	0.0092	0.0154	0.01	0.0123	0.01	0.01			
Bankfull Slope (ft/ft)							-	-	-	-	-	-	-			
Rosgen Classification							E6	G5c	G5c	B4c	E5	E	B			

Cells noted with a (-), data was not provided

Table 2.5
Morphology and Hydraulic Monitoring Summary
Cato Farms Stream Restoration/Project No. 72

	Cross-Section #1-Riffle			Cross-Section #2-Riffle			Cross-Section #3-Pool			Cross-Section #4-Pool			Cross-Section #5-Pool			Cross-Section #6-Riffle		
DIMENSION	**2005**	**2006**	**2007**	**2005**	**2006**	**2007**	**2005**	**2006**	**2007**	**2005**	**2006**	**2007**	**2005**	**2006**	**2007**	**2007****		
Bankfull Width (ft)	6.20	5.96	9.02	10.70	12.00	11.06	6.70	7.7	7.38	16.20	14.40	15.58	7.00	11.50	11.91	9.04		
Floodprone Width (ft)	28.10	>100	>100	24.80	>100	>100	-	N/A	N/A	-	N/A	N/A	-	N/A	N/A	>100		
Bankfull Cross-sectional Area	5.40	4.09	6.09	4.40	3.14	2.74	6.40	7.65	6.76	8.40	9.07	8.07	6.00	9.10	9.15	8.20		
Bankfull Mean Depth	0.90	0.69	0.67	0.40	0.26	0.25	-	0.99	0.92	-	0.63	0.52	-	0.79	0.77	0.91		
Bankfull Max Depth	1.70	1.26	1.64	0.70	0.76	0.81	1.90	2.04	1.88	1.60	1.63	1.62	2.10	2.36	2.30	2.21		
Width/Depth Ratio	7.20	8.64	13.46	26.20	46.15	44.24	-	7.78	8.02	-	22.86	29.96	-	14.56	15.47	9.93		
Entrenchment Ratio	4.50	>2.2	>2.2	2.30	>2.2	>2.2	-	N/A	N/A	-	N/A	N/A	-	N/A	N/A	>2.2		
Wetted Perimeter (ft)	-	6.53	9.92	-	15.71	11.69	-	9.13	8.44	-	15.26	16.95	-	13.2	14.06	10.71		
Hydraulic Radius (ft)	-	0.63	0.61	-	0.21	0.23	-	0.84	0.8	-	0.59	0.48	-	0.69	0.65	0.77		
Bank Height Ratio	-	1.00	1.00	-	1.00	1.00	-	1.00	1.00	-	1.00	1.00	-	1.00	1.00	1.00		
SUBSTRATE																		
D50 (mm)	0.27	0.71	0.05	0.06	0.66	0.05	Silt	0.35	0.06	0.10	0.44	0.06	0.38	0.36	0.11	0.13		
D84 (mm)	0.50	1.51	0.8	0.31	2.02	1.00	0.19	1.04	0.38	0.23	0.87	0.43	0.86	0.84	0.58	0.75		
	Reach 1									**Reach 2**								
PROFILE	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**	**Min**	**Max**	**Med**
Riffle Length (ft)	8	80	13	1.77	42.20	9.20	4	14	9	-	-	-	7.80	18.20	11.90	N/A	N/A	N/A
Riffle Slope (ft/ft)	0.0023	0.0080	0.0189	0.0000	0.0621	0.0066	0.0054	0.0622	0.0244	-	-	-	0.0051	0.0218	0.0121	N/A	N/A	N/A
Pool Length (ft)	8.00	118.00	20.00	2.40	74.20	15.30	1	83	29	-	-	-	18.40	37.60	21.40	15	35	3
Pool to Pool Spacing (ft)	15.50	215.00	33.50	8.00	99.70	33.85	21	202	60	-	-	-	5.3	51.9	21.8	36	105	4

ADDITIONAL REACH PARAMETERS	**2005***	**2006**		**2007**	
		Reach 1	Reach 2	Reach 1	Reach 2
Valley Length (ft)	3614.06	1240.00	420	1240.00	420
Channel Length (ft)	2512	2000	512	2000	512
Sinuosity	1.44	1.61	1.22	1.61	1.22
Water Surface Slope (ft/ft)	0.0071	0.0063	0.0080	0.0062	0.0090
Bankfull Slope (ft/ft)	0.0069	0.0060	0.0070	0.0068	0.0080
Rosgen Classification	E5/B5	E	B	E	B

*2005 Survey did not break up stream into separate types of restoration reaches for profile and additional reach parameter calculations and Reach 2 survey lengths were different between monitoring years 2005 and 2006
Cells noted with a (-), data was not provided
Cells noted with a (N/A), data was not applicable

7. Hydrologic Criteria

The Cato Farms Stream Restoration Project has a crest gauge located on site, but was installed following our 2007 survey. Therefore visual assessments are noted for bankfull verification. Indicators such as wrack lines and vegetation layover were observed at the bankfull and greater elevations within the restoration site during the 2007 stream survey. 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. Table 2.6 summarized the visual assessment results below.

Table 2.6
Verification of Bankfull Events
Cato Farms Stream Restoration Project/Project No. 72

Date of Collection	Date of Occurrence	Method	Photo # (if available)
Summer/Fall 2006	Unknown	Visual Assessment	N/A
Spring/Summer 2007	Unknown	Visual Assessment	N/A

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SECTION 3
METHODOLOGY

SECTION 3
METHODOLOGY

3.1 Methodology

Methods employed for the Cato Farms Stream Restoration Project were a combination of those established by standard regulatory guidance and procedures documents and the North Carolina State University and Soil and Environmental Consultants monitoring reports. 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 *Manual of the Vascular Flora of the Carolinas* by Albert R. Radford, Harry E. Ahles, and C. Ritchie Bell as the taxonomic standard for vegetation nomenclature for this report.

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SECTION 4
REFERENCES

SECTION 4
REFERENCES

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.

Radford, A.E., H.A. Ahles, and C.R. Bell. 1964. *Manual of the vascular flora of the Carolinas*. University of North Carolina Chapel Hill.

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

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SECTION 5
FIGURES

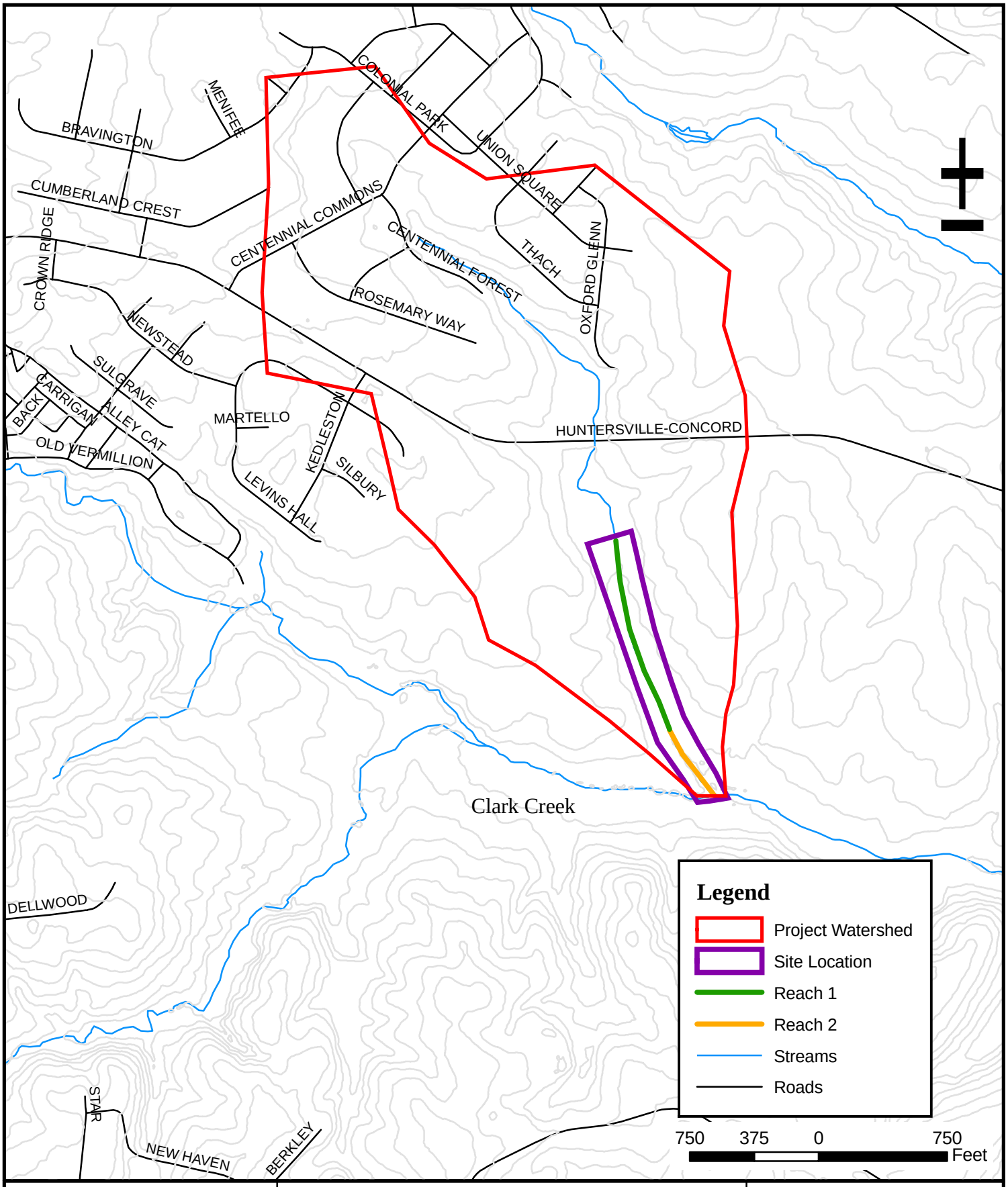
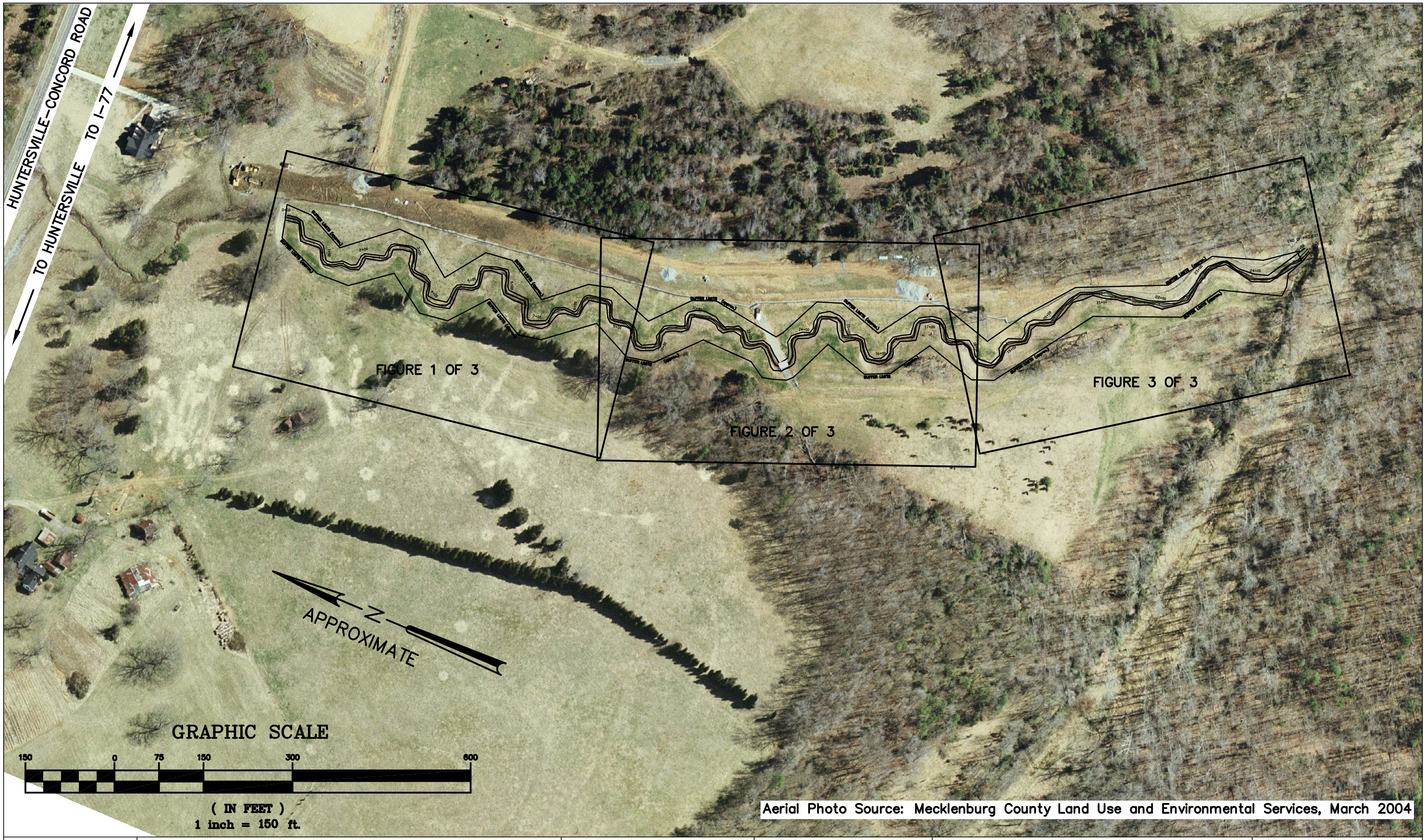


Figure 1.1 Project Location and Watershed Map
Cato Farms Stream Restoration
Mecklenburg County, NC
Year 3 of 5

Project No. 72
November 2007



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Ecosystem Enhancement PROGRAM

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

PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

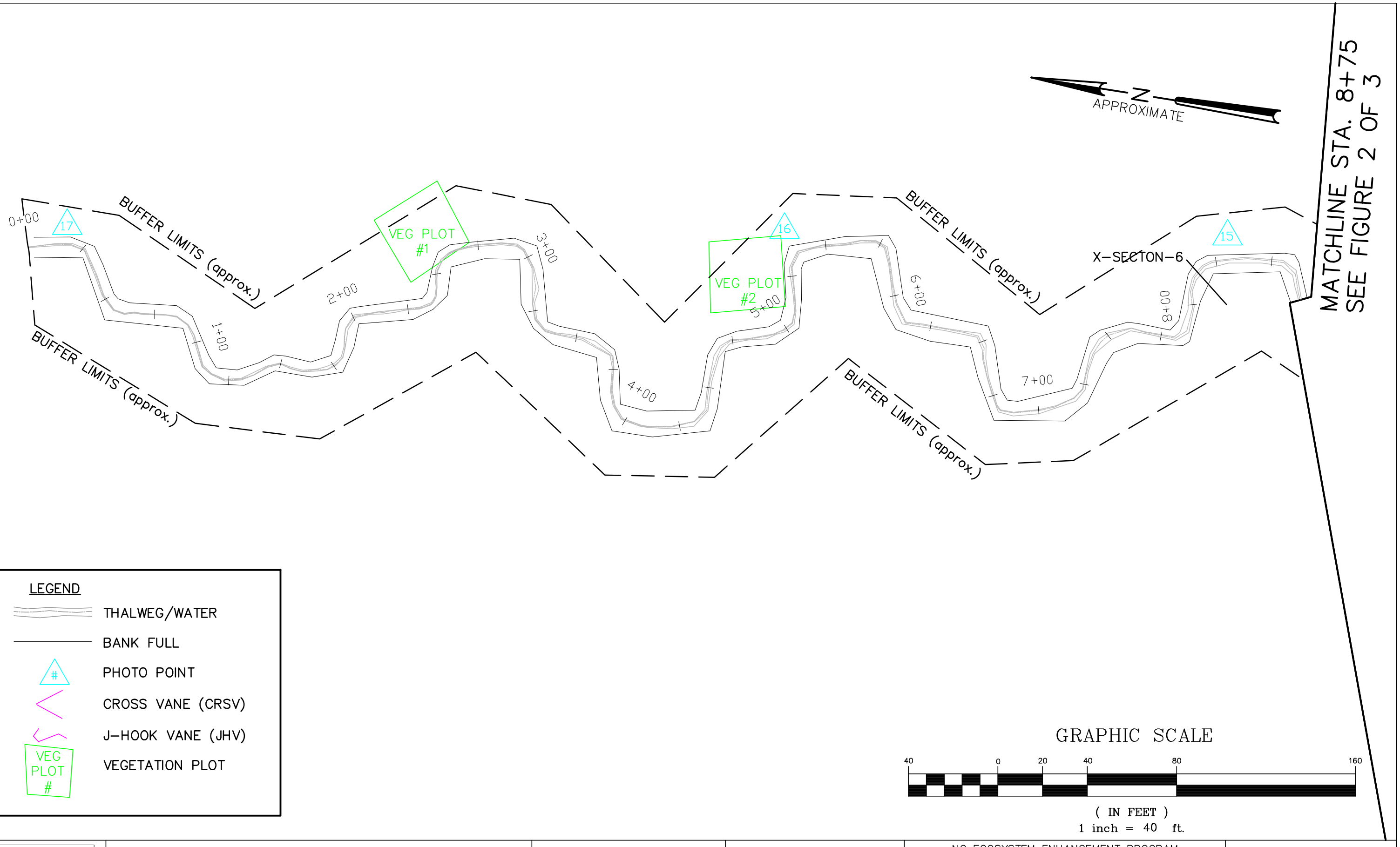
JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW MAP

DATE : NOVEMBER 2007
SCALE : 1"=150'
JOB NO.: 03060-001

FIGURE KEY



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

PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW MAP

DATE : NOVEMBER 2007
SCALE : 1"=40'
JOB NO.: 03060-001

FIGURE 1 OF 3

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MATCHLINE STA. 8+75
SEE FIGURE 1 OF 3

MATCHLINE STA. 17+75
SEE FIGURE 3 OF 3

APPROXIMATE N

BUFFER LIMITS (approx.)

VEG PLOT #3

VEG PLOT #4

VEG PLOT #5

9+00

10+00

11+00

12+00

13+00

14+00

15+00

16+00

17+00

X-SECTON-5

X-SECTON-4

X-SECTON-3

BRIDGE

6 7 8 9 10 11 12 13 14

LEGEND

- THALWEG/WATER
- BANK FULL
- # PHOTO POINT
- CROSS VANE (CRSV)
- J-HOOK VANE (JHV)
- VEG PLOT # VEGETATION PLOT

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)

1 inch = 40 ft.

Ecosystem Enhancement PROGRAM

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

PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW MAP

DATE : NOVEMBER 2007
SCALE : 1" = 40'
JOB NO.: 03060-001

FIGURE 2 OF 3

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MATCHLINE STA. 17+75
SEE FIGURE 2 OF 3

N
APPROXIMATE

CRSV-8
CRSV-7
CRSV-6
CRSV-3
JHV-1
END OF PROJECT

X-SECTON-2
X-SECTON-1

BUFFER LIMITS (approx.)
BUFFER LIMITS (approx.)
BUFFER LIMITS (approx.)

18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
25+11.97

VEG PLOT #6
VEG PLOT #7
VEG PLOT #8

CRSV-5
CRSV-4
CRSV-2
CRSV-1

LEGEND

- THALWEG/WATER
- BANK FULL
- PHOTO POINT (#)
- CROSS VANE (CRSV)
- J-HOOK VANE (JHV)
- VEGETATION PLOT (VEG PLOT #)

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

Ecosystem Enhancement PROGRAM

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

PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

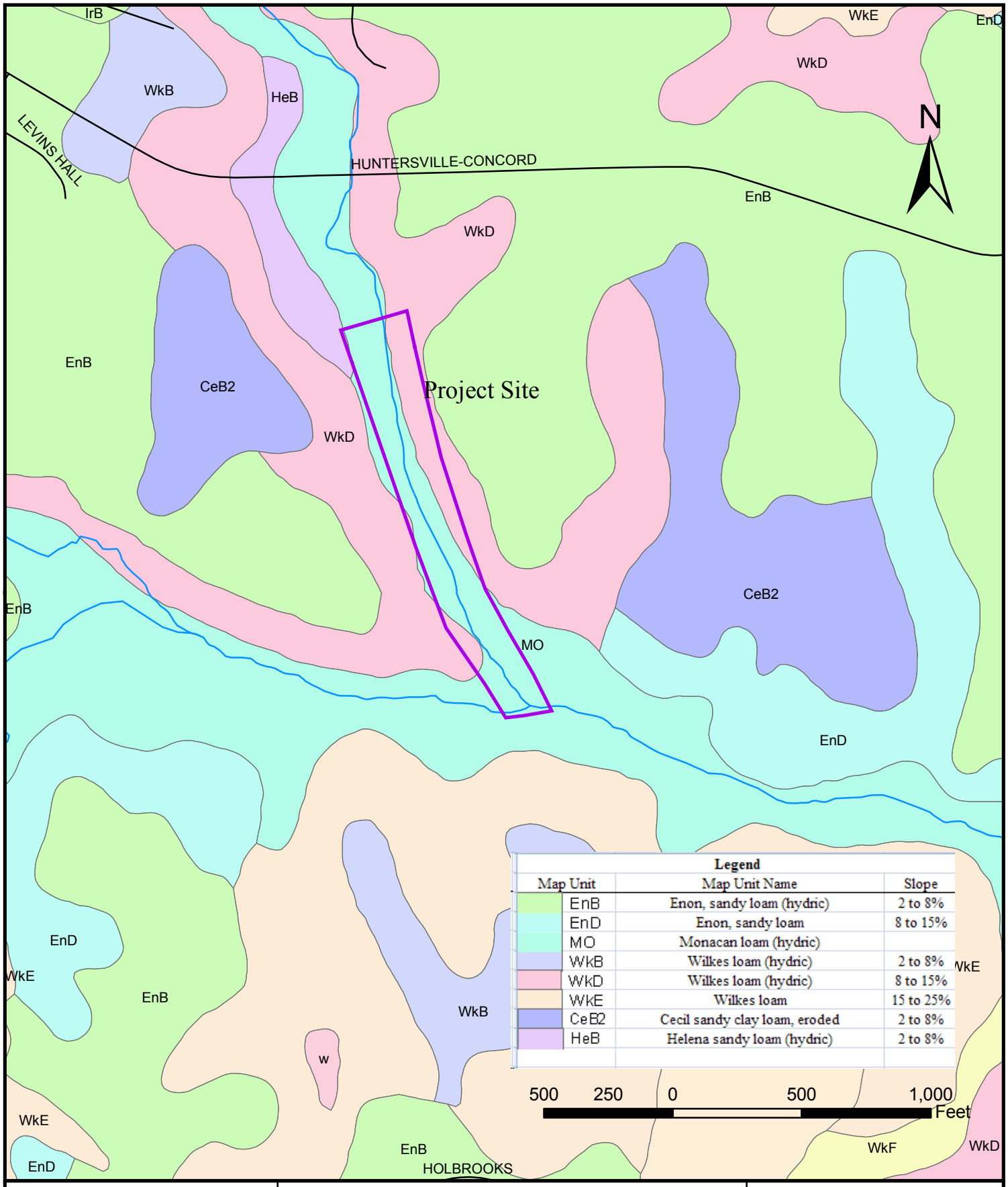
JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW MAP

DATE : NOVEMBER 2007
SCALE : 1" = 40'
JOB NO.: 03060-001

FIGURE 3 OF 3



Ecosystem Enhancement Program

JORDAN JONES & GOULDING

Figure 2.1 Soil Map
Cato Farms Stream Restoration
Mecklenburg County, NC
Year 3 of 5

Project No. 72
February 2008

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SECTION 6
APPENDICES

Appendix 1 - Vegetation Raw Data

Appendix 2 - Geomorphic and Stream Stability Data

Appendix 3 – Integrated Current Condition Plan View

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APPENDIX 1
VEGETATION RAW DATA

1. Vegetation Survey Data Tables*

2. Representative Vegetation Current Condition Photos

3. Vegetation Monitoring Plot Photos

*Raw data tables have been provided electronically.

Stem Counts for Planted Species Arranged by Plot – MY-2007											
	Vegetation Plots Monitored (MY-2007)								MY 3-2007	MY 2-2006	MY 1-2005
Species	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**	**Plot 8**	**Totals**	**Totals**	**Totals**
Shrubs											
Aronia arbutifolia	0	0	0	0	2	0	0	0	**2**	**3**	**13**
Cephalanthus occidentalis	0	2	1	2	1	0	0	0	**6**	**4**	**8**
Cornus amomum	3	0	2	4	10	0	3	10	**32**	**32**	**44**
Cornus sericea	0	0	0	3	0	0	0	0	**3**	**3**	**5**
*Salix nigra**	4	1	1	0	1	4	3	2	**16**	**16**	**16**
Sambucus canadensis	0	2	1	0	0	0	0	0	**3**	**2**	**5**
Trees											
*Acer negundo**	1	2	2	2	2	1	4	4	**18**	**18**	**18**
Carpinus caroliniana	0	0	0	0	0	0	0	0	**0**	**0**	**1**
Carya aquatica	0	0	0	0	0	0	0	0	**0**	**0**	**3**
*Fraxinus pennsylvanica**	0	1	0	0	0	2	2	0	**5**	**5**	**5**
Juglans nigra	0	0	0	0	0	0	0	0	**0**	**0**	**1**
Nyssa sylvatica	1	0	0	0	0	0	0	0	**1**	**1**	**1**
*Populus deltoides**	0	0	0	1	1	1	0	2	**2**	**2**	**2**
*Quercus alba**	0	1	0	0	0	1	1	2	**5**	**5**	**6**
*Quercus michauxii**	1	2	0	3	0	3	2	2	**14**	**14**	**14**
Total Planted Live Stems (2007)	**10**	**12**	**8**	**15**	**17**	**13**	**17**	**24**	**105**	**N/A**	**N/A**
Average # of Stems (2007)	**15**										
Percent Survival (2007)	**77%**	**86%**	**80%**	**100%**	**94%**	**72%**	**61%**	**92%**	**Avg = 74%**		
Stem Density (2007)	**600**										
*Numerous volunteer stems were observed											

Feature Issue		Station Numbers	Suspected Cause	Photo ID #
Bank Erosion - Moderate	Reach 1	0+50 - 0+51	Scour under matting, loose matting - RB	1
		2+20 -2+30	Scour under matting, loose matting - LB	
		2+45 - 2+55	Bare bank - LB	
		3+23	Bank erosion - stream widened - BB	
		4+10 - 4+30	Bank erosion under matting - BB	
		4+95 - 5+10	Bank erosion - RB	
		5+75 - 5+80	Bank erosion under matting - LB	
		6+05 - 6+15	Bank erosion under matting - RB	
		6+50 - 6+51	Bank erosion under matting - LB	
		7+25 7+27	Bank erosion under matting - RB	
		7+50 - 7+52	Bank erosion under matting - LB	
		7+75 - 7+77	Bank erosion under matting - LB	
		8+90 - 8+92	Bank erosion under matting - LB	
		10+65 - 10+75	Bare bank - RB	
		11+30 - 11+50	Bank scour - LB	
		13+00	Storm flow overflow along east side of bridge/some erosion - LB	
		14+75 - 14+76	Bank erosion under matting - LB	
		17+25 - 17+35	Bank erosion under matting - LB	
		18+50 - 18+75	No vegetation cover - RB	
	Reach 2	20+10 - 20+13	Bank scour - RB	
		22+00 - 22+50	Bank erosion under matting - RB	
		23+35 - 23+50	Bank erosion under matting - RB	
		23+50 - 23+70	Moderate bank erosion - RB	
Bank Erosion - Severe	Reach 1	9+15 - 9+25	Severe bank erosion under matting - LB	2
		17+50 - 17+70	Bank erosion eroded bank severe - RB	
Vegetative Cover - Poor		10+25 - 10+55	Poor vegetative cover - LB	3
		14+25 - 15+10	Bare benchriparian area - RB	
		15+75 - 15+85	Bare slope/exposed - RB	
		16+25 - 16+50	Baren benches & points/dead stakes - RB	
		18+25 - 18+75	Bare bank, dead live stakes - BB	
In-Stream Vegetation	Reach 1	12+25 - 12+75	Soft rush in main channel	4
	Reach 2	24+25	Soft rush in main channel	

LB - Left Bank Looking Downstream, RB - Right Bank Looking Downstream, BB - Both Banks, TOB - Top of Bank
Please refer to Appendix 1.2 for Problem Area Photos

1. Bank Erosion: Moderate
3/22/2007

2. Bank Erosion: Severe
3/22/2007

3. Streambank Cover Poor
3/22/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 1.2 Representative Vegetation Current Condition Photos	JORDAN JONES & GOULDING

1. Monitoring Plot 1
8/16/2007

2. Monitoring Plot 2
8/16/2007

3. Monitoring Plot 3
8/16/07

4. Monitoring Plot 4
8/16/07

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 1.3 Vegetation Monitoring Plot Photos	JORDAN JONES & GOULDING

5. Monitoring Plot 5
8/16/2007

6. Monitoring Plot 6
8/17/2007

7. Monitoring Plot 7
8/172007

8. Monitoring Plot 8
8/17/2007

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APPENDIX 2
GEOMORPHIC AND STREAM STABILITY DATA

1. **Stream Current Condition Table**
2. **Representative Stream Current Condition Photos**
3. **Stream Photo Station Photos**
4. **Stream Cross-Section Photos**
5. **Qualitative Visual Stability Assessment**
6. **Cross-Section Plots and Raw Data Tables***
7. **Longitudinal Plots and Raw Data Tables***
8. **Pebble Count Plots and Raw Data Tables***

*Raw data tables have been provided electronically.

Feature Issue	Station Numbers	Suspected Cause	Photo ID #
Bank Erosion - Moderate	0+50 - 0+51	Scour under matting, loose matting - RB	1
	2+20 -2+30	Scour under matting, loose matting - LB	
	2+45 - 2+55	Bare bank - LB	
	3+23	Bank erosion - stream widened - BB	
	4+10 - 4+30	Bank erosion under matting - BB	
	4+95 - 5+10	Bank erosion - RB	
	5+75 - 5+80	Bank erosion under matting - LB	
	6+05 - 6+15	Bank erosion under matting - RB	
	6+50 - 6+51	Bank erosion under matting - LB	
	7+25 7+27	Bank erosion under matting - RB	
	7+50 - 7+52	Bank erosion under matting - LB	
	7+75 - 7+77	Bank erosion under matting - LB	
	8+90 - 8+92	Bank erosion under matting - LB	
	10+65 - 10+75	Bare bank - RB	
	11+30 - 11+50	Bank scour - LB	
	13+00	Storm flow overflow along east side of bridge/some erosion - LB	
	14+75 - 14+76	Bank erosion under matting - LB	
	17+25 - 17+35	Bank erosion under matting - LB	
	18+50 - 18+75	No vegetation cover - RB	
	20+10 - 20+13	Bank scour - RB	
	22+00 - 22+50	Bank erosion under matting - RB	
	23+35 - 23+50	Bank erosion under matting - RB	
	23+50 - 23+70	Moderate bank erosion - RB	
Bank Erosion - Severe	9+15 - 9+25	Severe bank erosion under matting - LB	2
	17+50 - 17+70	Bank erosion eroded bank severe - RB	
Bank Slump	5+40	Bank slump - LB	3
	16+70 - 16+90	Bank failure/bank erosion - BB	
Mid-Channel Bar	7+60	Mid-channel bar channel, over widened	4
Aggradation	22+50	Depositional lateral bar behind cross vane arm	*
	22+90	Deposition in scour pool behind cross vane	
In-Stream Vegetation	12+25 - 12+75	Soft rush in main channel	4
	24+25	Soft rush in main channel	
Vegetative Cover - Poor	10+25 - 10+55	Poor vegetative cover - LB	5
	14+25 - 15+10	Bare benchriparian area - RB	
	15+75 - 15+85	Bare slope/exposed - RB	
	16+25 - 16+50	Baren benches & points/dead stakes - RB	
	18+25 - 18+75	Bare bank, dead live stakes - BB	
Structure - Stressed	21+00	Moderate scour behind cross vane arm - RB	6
	21+50	Moderate bank erosion in front of cross vane arm - LB	
	22+50	Moderate bank erosion behind cross vane arm - RB	
	22+90	Severe scour pool behind cross vane arm - LB	
	23+35	Severe scour pool behind J-Hook - LB	
	24+30	Scour behind cross vane arm - RB	

LB - Left Bank Looking Downstream, RB - Right Bank Looking Downstream, BB - Both Banks, TOB - Top of Bank
Please refer to Appendix 2.2 for Problem Area Photos
Cells noted with a (*) potograph unavailable

1. Bank Erosion: Moderate
3/21/2007

2. Bank Erosion: Severe
3/21/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.2 Representative Stream Current Condition Photos	JORDAN JONES & GOULDING

File name

3. Bank Slump
3/21/2007

4. In-stream Vegetation/Mid-Channel Bar
3/21/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.2 Representative Stream Current Condition Photos	JORDAN JONES & GOULDING

File name

5. Vegetation Cover-Poor
3/21/2007

6. Structure-Stressed
3/21/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.2 Representative Stream Current Condition Photos	JORDAN JONES & GOULDING

File name

Photo Point 1: Upstream-8/17/2007

Photo Point 1: Downstream-8/17/2007

Photo Point 2: Upstream-8/17/2007

Photo Point 2: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 3: Upstream-8/17/2007

Photo Point 3: Downstream-8/17/2007

Photo Point 4: Upstream-8/17/2007

Photo Point 4: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 5: Upstream-8/17/2007

Photo Point 5: Downstream-8/17/2007

Photo Point 6: Upstream-8/17/2007

Photo Point 6: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 7: Upstream-8/17/2007

Photo Point 7: Downstream-8/17/2007

Photo Point 8: Upstream-8/17/2007

Photo Point 8: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 9: Upstream-8/17/2007

Photo Point 9: Downstream-8/17/2007

Photo Point 10: Upstream-8/17/2007

Photo Point 10: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 11: Upstream-8/17/2007

Photo Point 11: Downstream-8/17/2007

Photo Point 12: Upstream-8/17/2007

Photo Point 12: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 13: Upstream-8/17/2007

Photo Point 13: Downstream-8/17/2007

Photo Point 14: Upstream-8/17/2007

Photo Point 14: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 15: Upstream-8/17/2007

Photo Point 15: Downstream-8/17/2007

Photo Point 16: Upstream-8/17/2007

Photo Point 16: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Photo Point 17: Upstream-8/17/2007

Photo Point 17: Downstream-8/17/2007

Photo Point 18: 8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.3 Stream Photo Station Photos	JORDAN JONES & GOULDING

File name

Cross-Section 1: Upstream-8/17/2007

Cross-Section 1: Downstream-8/17/2007

Cross-Section 2: Upstream-8/17/2007

Cross-Section 2: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.4 Stream Cross-Section Photos	JORDAN JONES & GOULDING

File name

Cross-Section 3: Upstream-8/17/2007

Cross-Section 3: Downstream-8/17/2007

Cross-Section 4: Upstream-8/17/2007

Cross-Section 4: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.4 Stream Cross-Section Photos	JORDAN JONES & GOULDING

File name

Cross-Section 5: Upstream-8/17/2007

Cross-Section 5: Downstream-8/17/2007

Cross-Section 6: Upstream-8/17/2007

Cross-Section 6: Downstream-8/17/2007

Prepared For: Ecosystem Enhancement Program	Cato Farms Stream Restoration Year 3 of 5	Date: November 2007 Project No.: 72
	Appendix 2.4 Stream Cross-Section Photos	JORDAN JONES & GOULDING

File name

Reach 1 (2000 linear feet)

Feature Category		(# Stable) Number Performing as Intended	Total Number assessed per 2007 survey	Total Number/ feet in unstable state	% Perform in Stable Condition	Feature Perform Mean or Total
A. Riffles	1. Present?	8	8	N/A	100%	**75%**
	2. Armor Stable?	8			100%	
	3. Facet grade appears stable?	8			100%	
	4. Minimal evidence of embedding/fining?	0			0%	
	5. Length appropriate?	-			-	
B. Pools	1. Present?	39	39	N/A	100%	**100%**
	2. Sufficiently deep?	39			100%	
	3. Length Appropriate?	-			-	
C. Thalweg	1. Upstream of meander bend centering?	40	47	N/A	95%	**98%**
	2. Downstream of meander centering?	47			100%	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	46	47	N/A	98%	**99%**
	2. Of those eroding, # w/concomitant point bar formation?	47			100%	
	3. Apparent Rc within spec?	47			100%	
	4. Sufficient floodplain access and relief?	47			100%	
E. Bed General	1. General channel bed aggradation areas (bar formation)?	N/A		1/50	98%	**99%**
	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		19/176	96%	**96%**
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?					

*Although bank erosion is occuring along the reach, only 35 feet are actively eroding.

Reach 2 (500 linear feet)

Feature Category		(# Stable) Number Performing as Intended	Total Number assessed per 2006 survey	Total Number/ feet in unstable state	% Perform in Stable Condition	Feature Perform Mean or Total
A. Riffles	1. Present?	N/A				
	2. Armor Stable?					
	3. Facet grade appears stable?					
	4. Minimal evidence of embedding/fining?					
	5. Length appropriate?					
B. Pools	1. Present?	8	8	N/A	100%	**100%**
	2. Sufficiently deep?	8			100%	
	3. Length Appropriate?	-			-	
C. Thalweg	1. Upstream of meander bend centering?	4	4	N/A	100	**100%**
	2. Downstream of meander centering?	4			100	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	4	4	N/A	100%	**100%**
	2. Of those eroding, # w/concomitant point bar formation?	N/A			100%	
	3. Apparent Rc within spec?	4			100%	
	4. Sufficient floodplain access and relief?	4			100%	
E. Bed General	1. General channel bed aggradation areas (bar formation)?	N/A		0/5	99%	**100%**
	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		4/88	91%	**91%**
G. Vanes/J-Hooks, etc	1. Free of back or arm scour?	5	11	N/A	45%	**73%**
	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 is occurring along the reach, the banks are not actively eroding

Stream Name: Cato Farms
Cross-Section: 1
Feature: Riffle

As-Built-2004			2005			2006			2007		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
No As-Built Provided			0.00	90.36	(XSPIN)	0.00	90.53		-24.02	91.24	
			4.81	89.90	(XS)	2.00	90.30		-12.16	91.35	
			6.73	89.74	(XS)	4.00	90.13		-7.83	91.25	
			9.79	88.80	(XS)	6.00	89.97		-1.40	91.13	
			12.11	88.66	(XS)	8.00	89.66		0.80	90.73	
			14.15	88.54	(XS)	10.00	88.94		2.75	90.17	
			15.54	88.42	B	12.00	88.59	LBKF	5.15	90.03	
			16.74	87.79	(XS)	16.00	88.38		7.25	89.74	
			17.28	87.24	(XS)	17.00	87.88		8.98	89.23	
			18.31	86.79	(XS)	18.00	87.29	LEW	9.86	88.87	
			18.78	86.72	(XS)	18.80	87.11	TW	13.24	88.80	BKF
			19.05	86.82	(XS)	19.70	87.29	REW	14.83	88.49	
			19.43	87.04	(XS)	20.90	87.99		17.23	87.88	
			19.88	87.57	(XS)	22.60	88.59	RBKF	17.52	87.30	LEW
			21.78	88.51	(XS)	24.00	88.91		17.82	87.14	TW
			24.90	88.85	(XS)	26.00	89.02		18.51	87.30	REW
			27.04	89.17	(XS)	28.00	89.38		18.75	87.66	
			29.97	90.48	(XS)	30.00	90.38		21.38	88.35	
			32.29	90.84	(XSPIN)	30.50	90.58		22.32	88.80	
						31.50	90.78	R HUB	25.72	88.92	
									27.26	89.26	
									28.51	89.82	
									29.21	90.03	
									33.6	91.22	
									36.47	91.73	
									38.88	92.19	
									42.27	92.62	
									43.82	92.94	
									47.24	93.23	
									51.02	93.49	
									53.97	93.57	
									57.75	93.69	

Stream Name: Cato Farms
Cross-Section: 2
Feature: Riffle

As-Built-2004			2005			2006			2007		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
			0.00	91.44	(XSPIN)	-0.87	91.70		-39.80	93.31	
			2.45	91.04	(XS)	0.00	91.44	LHUB	-29.83	93.00	
			5.05	90.42	(XS)	2.28	91.15		-21.56	92.93	
			7.48	89.68	(XS)	4.28	90.62		-16.98	92.88	
			9.58	89.68	(XS)	6.28	89.98		-12.56	92.50	
			11.85	89.55	(XS)	7.48	89.68		-8.17	92.20	
			12.24	89.17	(XS)	9.28	89.69		-5.28	92.09	
			14.32	88.97	(XS)	11.28	89.69	LBKF	-3.81	91.84	
			15.12	88.97	(XS)	12.78	89.29		-2.46	91.61	
			15.98	89.22	(XS)	13.28	89.03	LEW	1.53	91.22	
			17.12	89.34	(XS)	13.98	88.92	TW	3.58	90.77	
			19.99	88.87	(XS)	14.78	89.03	REW	5.28	90.30	
			21.13	89.18	(XS)	16.28	89.65		6.28	89.81	
			22.56	89.67	(XS)	17.28	89.44		7.61	89.82	
			24.23	89.49	(XS)	21.28	89.60		10.44	89.84	LBKF
			26.06	89.48	(XS)	23.28	89.69	RBKF	12.35	89.62	
No As-Built Provided			27.25	89.85	(XS)	26.28	89.71		13.46	89.17	
			29.85	90.87	(XS)	27.28	89.97		13.74	89.03	LEW
			33.10	91.15	(XS)	28.78	90.60		13.83	89.04	TW
			35.63	91.35	(XSPIN)	30.78	91.01		14.47	89.03	REW
						32.28	91.11		14.82	89.77	
						35.63	91.32	R HUB	16.77	89.68	
									19.16	89.56	
									21.89	89.84	RBKF
									23.99	89.67	
									25.78	89.65	
									27.58	90.11	
									28.72	90.63	
									31.25	91.12	
									36.93	91.72	
									39.26	91.87	
									43.63	92.15	
									48.39	92.23	

Stream Name: Cato Farms
Cross-Section: 3
Feature: Pool

As-Built-2004			2005			2006			2007		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
			0.35	93.84	(XSPIN)	0.00	94.18		1.21	93.85	
			2.57	93.64	XS	0.30	93.88	LHUB	4.54	93.48	
			5.38	93.29	(XS)	2.30	93.58		9.46	93.35	
			8.97	93.13	(XS)	5.30	93.42		14.47	93.36	
			9.05	93.13	(XS)	7.30	93.26	Start Left Bench	22.50	93.24	
			13.45	93.22	(XS)	11.30	93.16		25.46	93.31	BKF
			17.98	93.08	(XS)	16.30	93.21		26.56	93.04	
			20.90	93.19	(XS)	20.30	93.19		27.38	92.41	
			25.33	93.16	(XS)	25.80	93.22	LBKF/End Left Bench	27.62	92.23	LEW
			26.54	92.64	(XS)	26.30	92.91		29.76	91.45	
			28.16	91.97	(XS)	27.30	91.83	LEW	29.98	91.43	TW
			28.79	91.91	(XS)	29.70	91.18	TW	30.77	92.23	REW
			29.04	91.30	(XS)	30.60	91.83	REW	31.71	92.66	
No As-Built Provided			29.45	91.26	(XS)	31.80	92.81		32.81	93.32	
			30.36	91.52	(XS)	33.50	93.22	RBKF	34.67	94.00	
			30.98	92.36	(XS)	35.10	94.22	RHUB	35.69	94.67	
			31.98	92.96	(XS)				37.72	95.03	
			33.61	93.73	(XS)				39.54	96.02	
			35.02	94.25	(XSPIN)				42.22	97.15	
			44.78	98.08	(TOB)				44.24	97.7	
									45.4	98.06	
									47.46	98.26	
									49.3	98.74	
									53.72	99.36	
									57.69	100.02	
									61.32	100.45	
									65.19	100.79	

Stream Name: Cato Farms
Cross-Section: 4
Feature: Pool

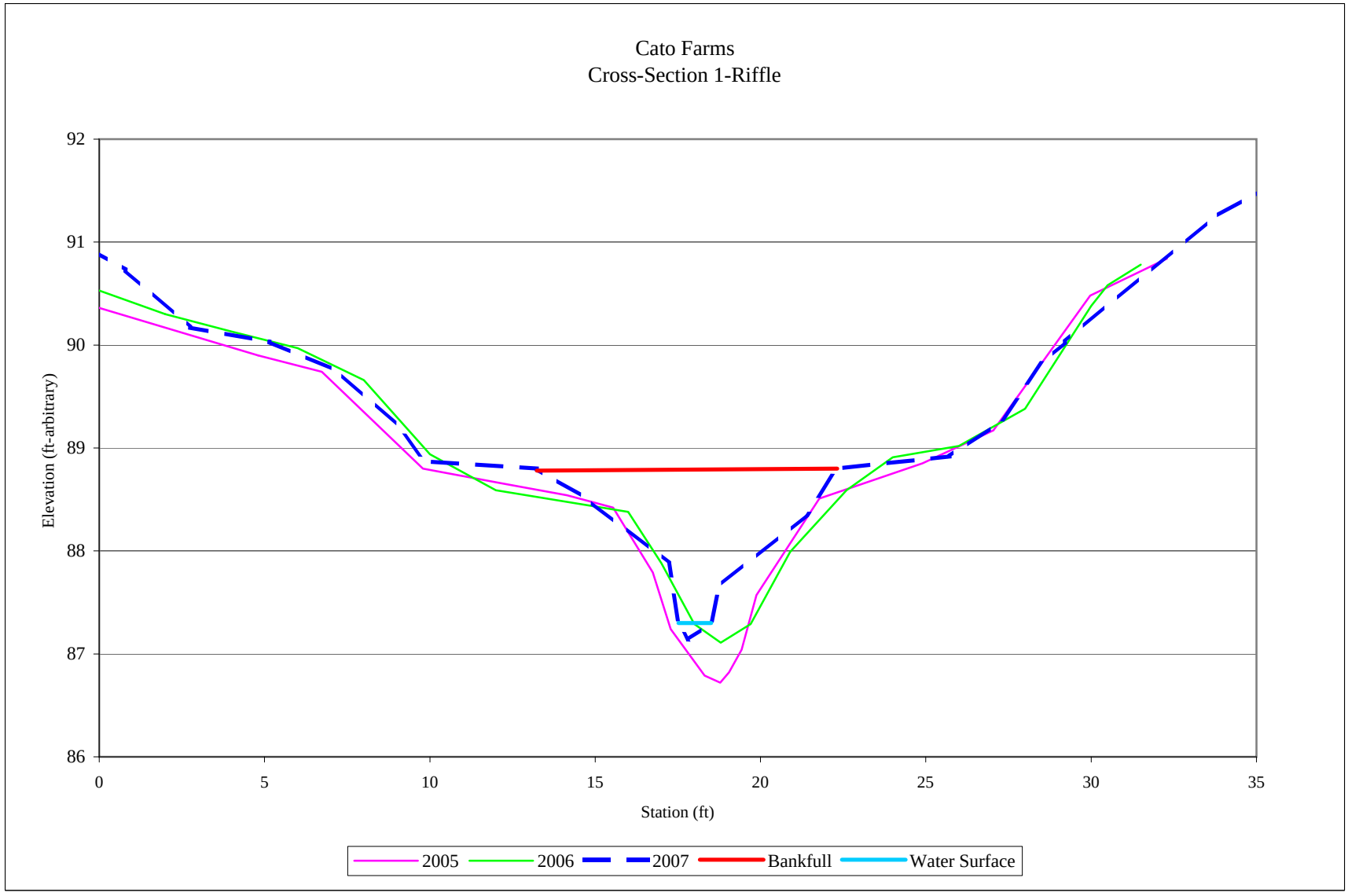
As-Built-2004			2005			2006			2007		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
			0.65	96.67	(X4)	30.19	96.9		-10.28	96.73	
			11.49	97.05	(X4)	33.49	96.78		-6.37	96.82	
			27.45	96.75	(X4)	35.19	96.7		-1.47	96.8	
			32.96	96.77	(X4)	36.19	96.29		2.93	96.97	
			33.49	96.78	(X4LP)	37.19	95.34		7.79	96.96	
			34.53	96.61	(X4)	38.19	94.71		14.6	97.02	
			35.33	96.21	(X4)	38.79	94.23	LBKF	19.36	97.02	
			38.23	94.1	B	39.59	93.1	LEW	24.9	96.94	
			39.37	93.25	(X4)	40.99	92.6	TW	29.54	96.92	
			39.77	92.98	(X4)	42.19	93.1	REW	33.13	96.91	
			39.88	92.95	(X4)	44.19	93.6		33.95	97.05	
			40.2	92.76	(X4)	45.19	93.69		34.7	96.82	
			40.9	92.46	(X4)	47.19	93.8		35.47	96.4	
			41.27	92.45	(X4)	49.19	93.89		36.06	95.65	
			41.85	92.79	(X4)	51.19	93.9		37.9	94.83	
			42.01	93.1	(X4)	53.19	94.23	RBKF	38	94.28	LBKF
	No As-Built Provided		42.23	92.97	(X4)	55.99	94.32		38.5	94.12	
			42.68	93.38	(X4)	57.19	94.45		38.94	93.52	
			44.27	93.54	(X4)	59.19	94.69		39.62	93.12	
			47.12	93.72	(X4)	62.19	94.91		40.64	92.64	
			52.45	94.03	(X4)	64.19	95.12		41.28	93	LEW
			59.11	94.58	(X4)	65.19	95.3		41.52	92.61	TW
			66.72	95.32	(X4RPIN)	66.99	95.48		41.73	93	REW
			67.18	95.42	(X4)	69.19	95.66		42.35	93.65	
			80.53	96.36	(X4)	72.19	95.79		45.83	93.77	
			94.52	96.99	(X4)	75.19	96.01		51.1	94.04	
			116.45	97.8	(X4)	77.19	96.23		55.79	94.4	
			30.81	99.22	(X4LPOSTTOP)	80.19	96.47		60.56	94.94	
			66.88	97.67	(X4RPOSTTOP)	82.19	96.72		64.18	95.19	
									74.66	95.97	
									77.54	96.26	
									93.11	97.11	
									105.55	97.56	

Stream Name: Cato Farms
Cross-Section: 5
Feature: Pool

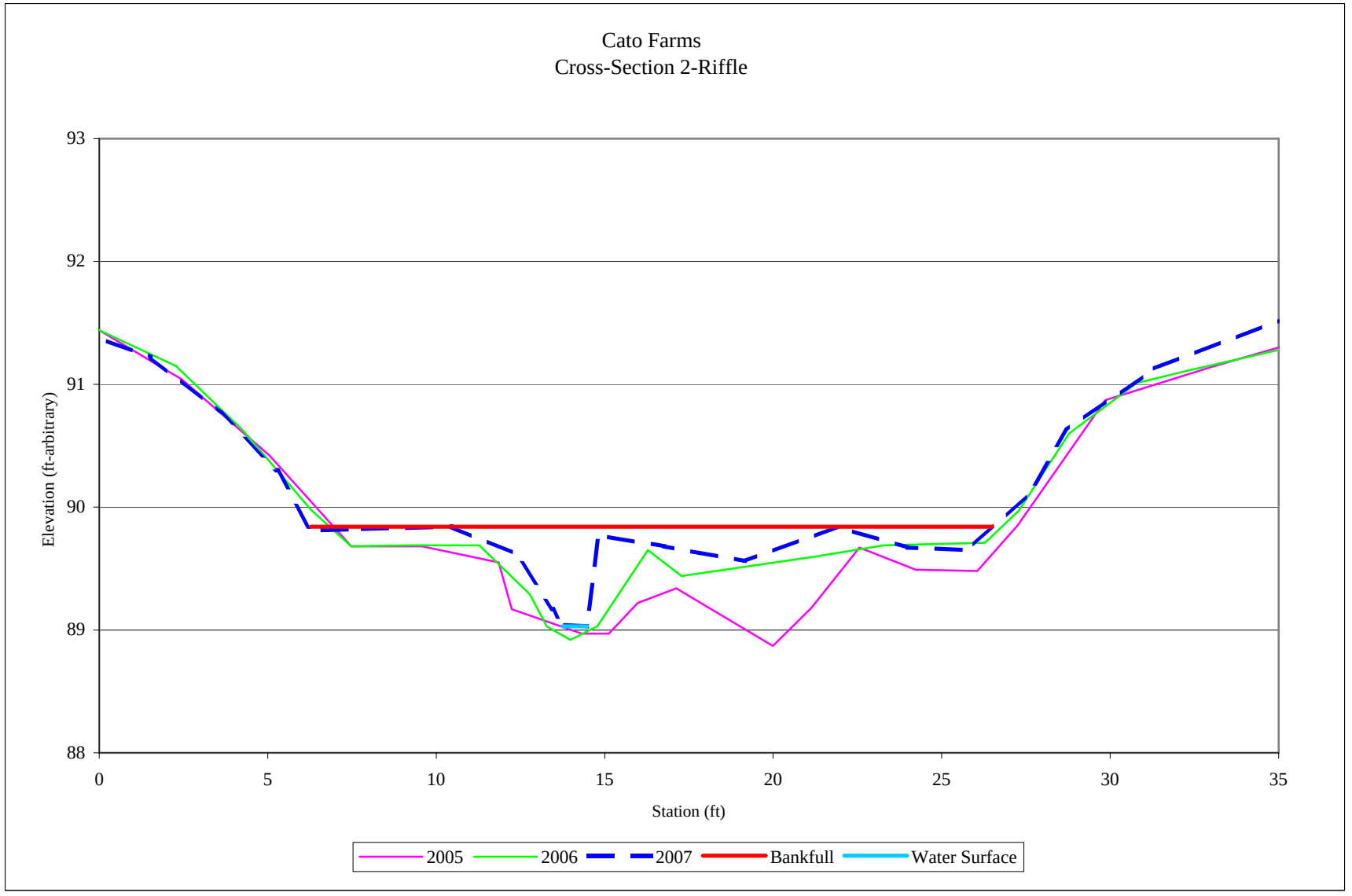
As-Built-2004			2005			2006			2007		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
No As-Built Provided			0.00	97.00	(X5PIN)	10.01	97.16		5.18	97.15	
			9.30	97.08	(X5)	14.01	97.11		11.43	97.11	
			19.62	97.07	(X5)	18.01	97.11		17.82	97.09	
			20.21	97.11	(X5LP)	20.21	97.10		21.47	97.20	
			21.08	97.13	(X5)	22.01	97.26		22.80	96.93	
			22.48	97.20	(X5)	22.51	97.18		24.59	96.09	
			22.65	97.05	(B)	23.01	97.00		24.68	95.51	
			23.72	96.63	(X5)	24.01	96.34		25.76	94.88	
			25.30	95.42	(X5)	25.01	95.71		26.02	94.10	LEW
			26.00	94.85	(X5)	25.51	95.24	LBKF/TOB	27.83	93.98	
			27.13	93.92	(X5)	26.01	94.78		28.13	93.05	
			27.26	93.28	(X5)	26.51	94.34		28.83	92.96	TW
			27.93	93.00	(X5)	26.81	93.88	LEW	29.77	94.30	
			28.51	92.73	(X5)	27.01	93.48		30.71	94.32	
			29.57	93.32	(X5)	27.51	93.03		31.47	94.56	
			29.99	94.08	(X5)	28.01	92.88	TW	32.46	94.88	REW
			30.58	94.36	(X5)	28.41	92.92		33.07	94.90	
			32.67	94.83	(X5)	29.01	93.07		37.02	95.26	RBKF
			32.95	94.80	(B)	29.31	93.88	REW	40.06	95.51	
			34.62	94.95	(X5)	29.61	94.17		43.71	95.71	
			39.57	95.42	(X5)	30.51	94.31		45.11	95.91	
			43.37	95.65	(X5)	31.61	94.64		50.29	96.27	
			44.01	95.70	(X5RP)	33.01	94.92		55.87	96.38	
			51.27	96.07	(X5)	34.01	94.96		60.12	96.50	
			68.43	96.79	(X5)	35.21	95.04		65.64	96.68	
			84.47	97.77	(X5)	36.01	95.18		67.99	96.81	
						37.01	95.24	REW			
						39.01	95.44				
						41.01	95.53				
						43.01	95.66				
						48.01	96.07				
						58.01	96.42				
						62.01	96.56				
						64.01	96.65				

Stream Name: Cato Farms
Cross-Section: 6
Feature: Pool

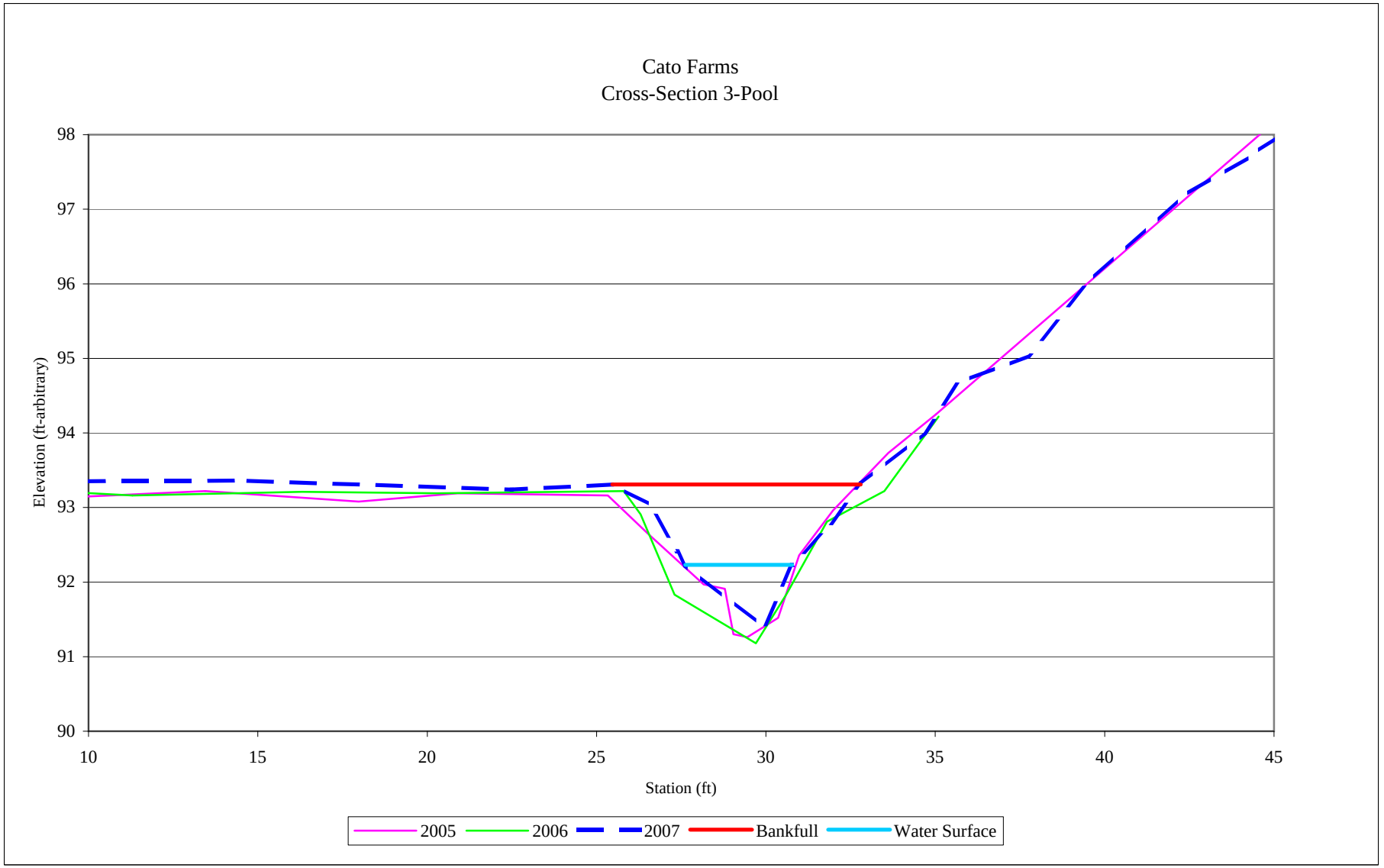
2007		
Station	**Elevation**	**Notes**
8.50	97.74	
10.64	97.74	
14.81	97.62	
16.39	97.22	
17.03	96.75	
18.38	96.23	
19.19	95.41	
19.55	95.52	
19.83	95.00	LEW
20.75	93.84	TW
21.54	94.31	
21.91	94.40	
21.97	94.51	
22.89	94.71	
23.13	95.00	REW
24.34	95.23	
25.29	95.65	
27.60	96.05	BKF
30.21	96.28	
32.53	96.55	
36.81	96.91	
41.05	97.08	
41.06	97.05	
45.14	97.14	



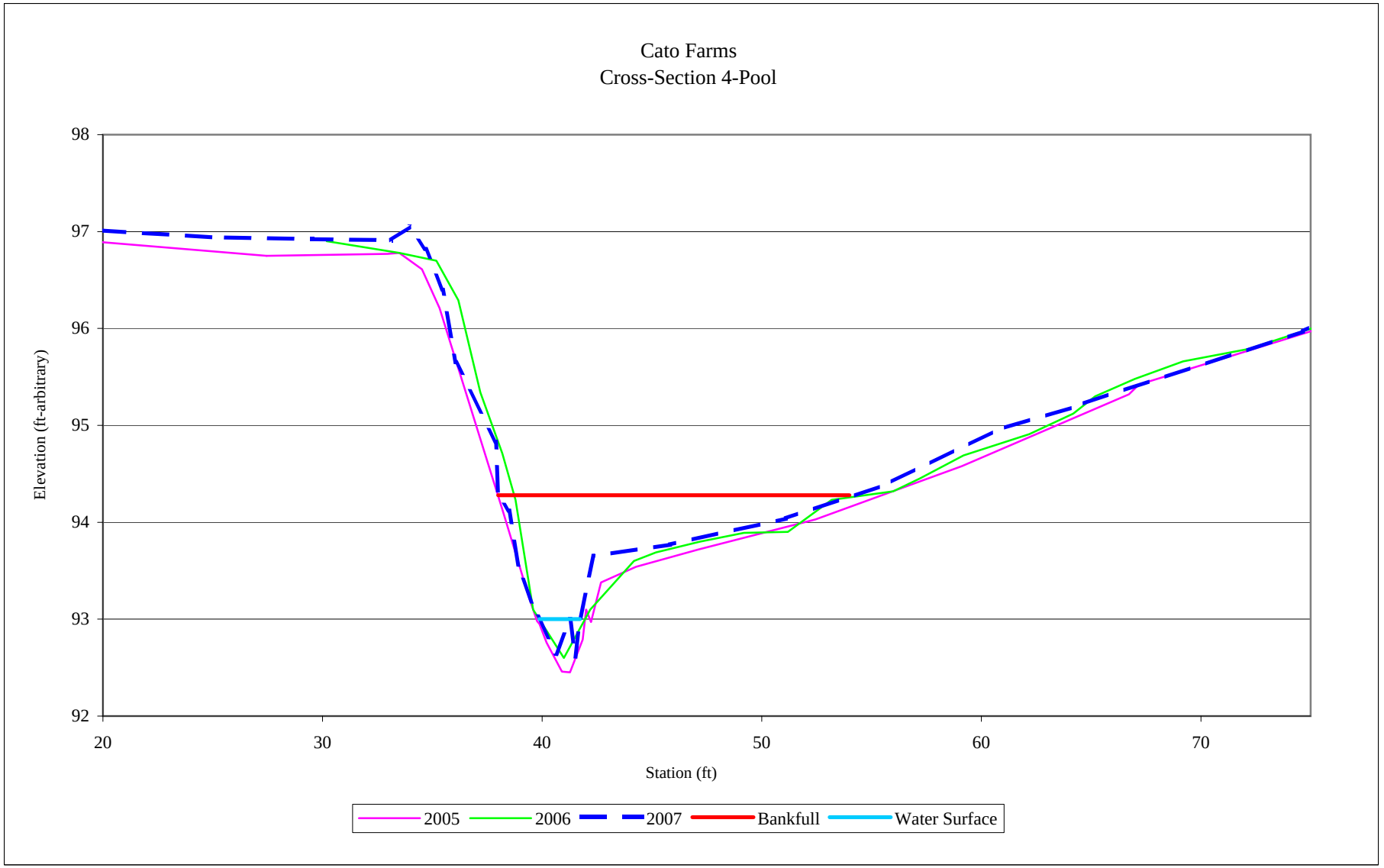
Appendix 2.6 Cross-Section Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5



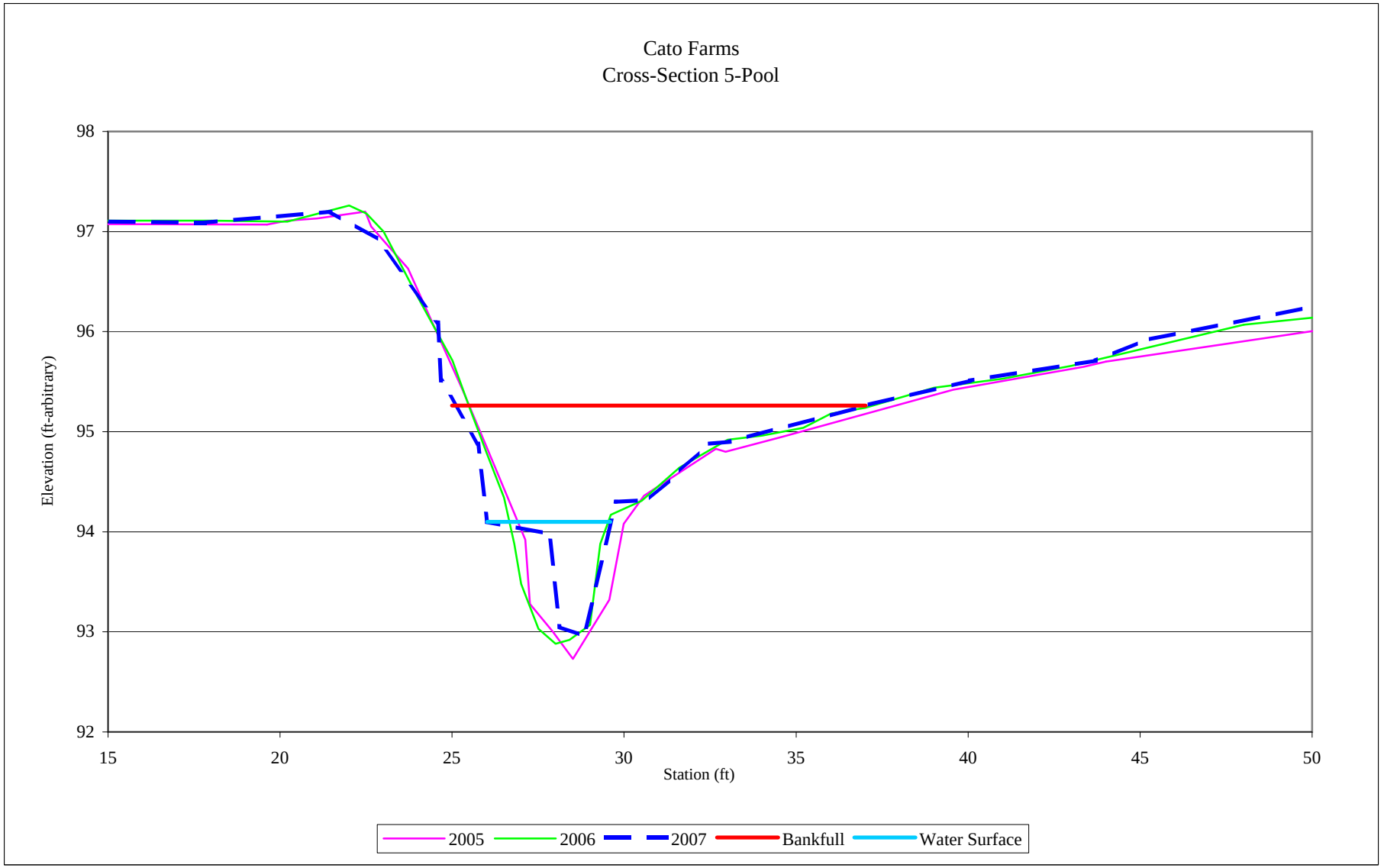
Appendix 2.6 Cross-Section Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5



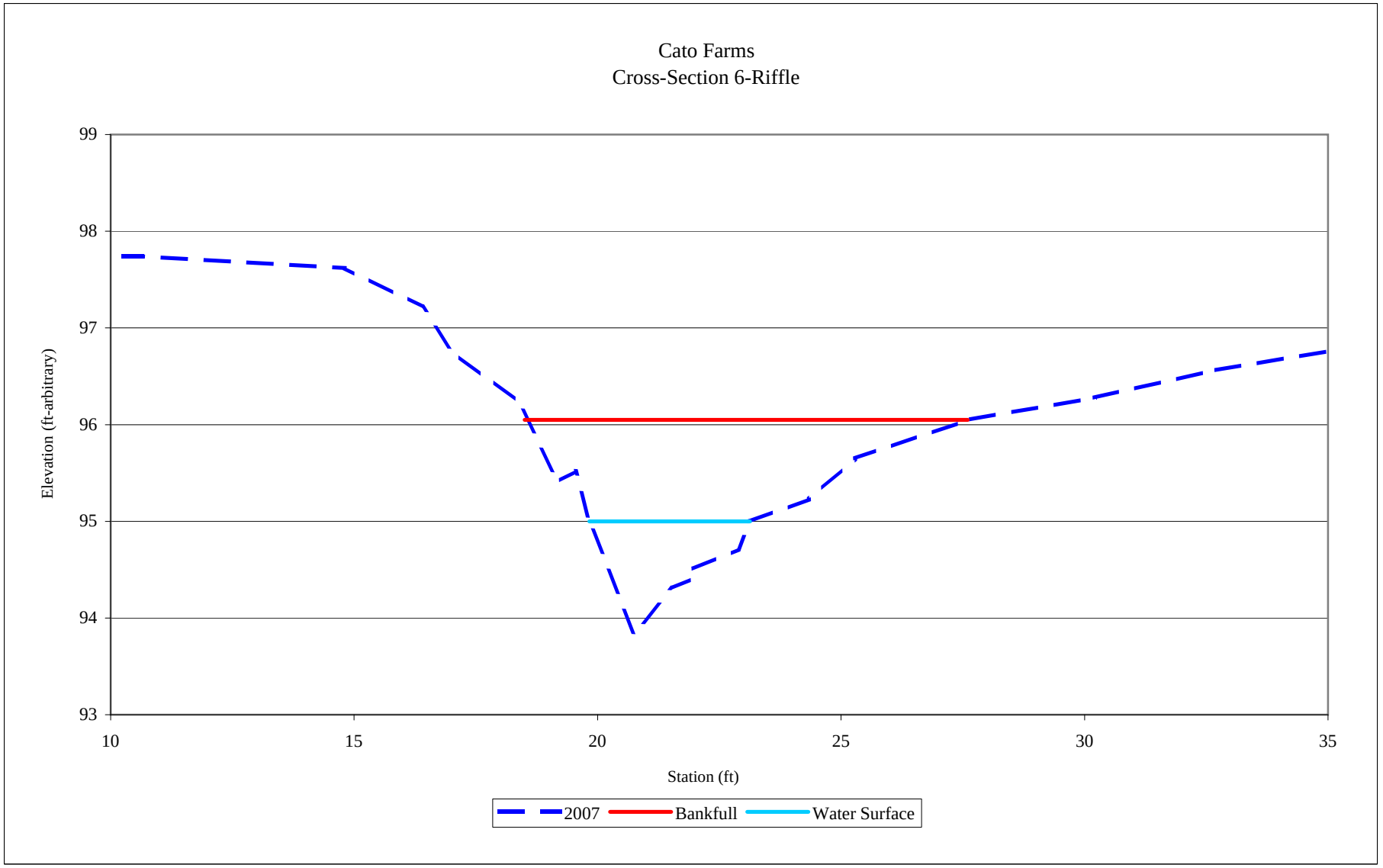
Appendix 2.6 Cross-Section Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5



Appendix 2.6 Cross-Section Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5



Appendix 2.6 Cross-Section Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5



Appendix 2.6 Cross-Section Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5

Cato Farms
MY-2005 Longitudinal Profile

2005		
Station	**TW-2005**	**Notes**
10.2	97.17	TR
17.79	96.92	Thalweg
23.33	96.62	TP
35.88	97.09	Max Pool
44.78	97.07	TR
53.15	96.8	Thalweg
58.4	96.54	TP
63.36	96.41	Thalweg
67.07	96.77	Max Pool
77.88	96.76	Trun
83.13	96.7	Thalweg
89.22	96.67	Thalweg
94.26	96.62	Thalweg
108.85	96.53	Thalweg
114.03	96.51	Thalweg
114.68	96.57	Thalweg
122.34	96.49	Thalweg
131.42	96.44	Thalweg
137.54	96.44	Thalweg
144.31	96.42	Thalweg
149.16	96.43	Thalweg
153.99	96.05	TP
159.59	96.47	Thalweg
165.3	96.36	TR
171.79	96.3	Thalweg
176.87	95.96	TP
180.54	96.21	Thalweg
185.42	96.21	Trun
189.39	95.63	TP
193.5	95.74	Thalweg
199.94	95.58	Thalweg
206.73	95.55	Max Pool
212.75	95.7	Thalweg
214.04	96.28	Thalweg
217.77	96	TR
217.96	95.33	TP
223.45	95.07	Thalweg
228.34	95.63	Thalweg
233.05	95.52	TR
236.42	95.46	Thalweg
239.59	94.98	Thalweg
243.59	94.69	TP
247.56	94.29	Thalweg
252.29	95.35	Max Pool
252.49	95.32	Thalweg
257.62	95.04	TR
261.35	95.07	TP
269.66	95.28	Thalweg
275.14	95.36	Thalweg
281.56	95.23	TR
287.81	94.83	Thalweg
291.16	94.93	Thalweg
299.48	94.88	TP
308.39	94.74	Thalweg
315.91	94.98	Thalweg
323.44	95.06	Thalweg
329.84	94.87	Trun
341.04	95.01	Thalweg
347.11	94.78	Thalweg
361.05	94.81	Thalweg
365.68	94.84	Thalweg
375.69	94.59	TR
382.73	94.66	Thalweg
388.82	94.54	Thalweg
397.01	94.15	Thalweg
397.53	94.14	Thalweg
400.82	94.28	Thalweg
410.69	93.9	Thalweg
420.13	93.47	Thalweg
426.5	93.75	TP
429.84	93.39	Thalweg
433.14	93.72	Thalweg
439.53	93.83	Thalweg
450.11	93.51	Thalweg
454.3	93.32	TR
459.56	92.96	TP
467.38	93.41	Thalweg
476.35	92.99	Thalweg
479.92	93.4	Thalweg
484.21	92.76	Thalweg
488.02	93.18	Thalweg
492.64	93.22	Thalweg
499.96	93.38	Thalweg
513.16	93.04	Thalweg
520.43	92.83	TR
527.93	92.68	Thalweg
532.21	93	TP
543.6	92.77	Thalweg
550.43	92.57	Thalweg
557.2	92.72	Thalweg
561.19	92.6	Thalweg
568.11	92.93	Thalweg
577.2	92.96	Thalweg
586.08	92.73	Thalweg
592.66	92.37	TR

Cato Farms
MY-2007 Longitudinal Profile

2007						
Station	**TW-2007**	**Station**	**WS-2007**	**Station**	**BKF-2007**	**Notes**
0	97.31	0.91	97.66	2.2	100.18	U
5.08	97.3	4.1	97.62	10.72	99.45	U
9.66	97.37	8.39	97.62	35.31	99.22	P
12.19	97.17	22.95	97.58	37.01	99.17	P
19.4	96.61	31.25	97.58	65.35	98.79	P
24.62	96.65	34.85	97.56	81.44	98.61	MP
27.38	96.62	42.6	97.5	135.21	98.51	P
31.76	97.2	53.7	97.32	143.16	98.48	U
41.09	97.19	56.64	97.31	191.45	98.4	R
43.72	97.06	61.35	97.29	206.22	98.08	R
44.95	96.94	72.03	97.29	219.05	98	U
51.21	96.75	87.2	97.25	244.38	97.6	P
55.23	96.62	96.92	97.15	273.09	97.23	P
58.38	96.43	114.11	97.03	283.27	97.61	MP
63.13	96.81	118.94	97.05	295.82	96.92	U
68.71	96.83	128.26	96.86	349.86	96.75	U
73.92	96.71	131.95	96.86	356.09	96.79	U
79.5	96.88	152.03	96.82	367.01	96.72	U
84.3	96.71	156.87	96.71	434.95	96.02	U
90.22	96.61	160.62	96.69	470.52	95.59	U
100.98	96.64	173.77	96.6	472.5	95.6	U
105.05	96.73	174.95	96.6	501.46	95.36	P
105.57	96.31	176.69	96.58	570.22	94.47	MP
112.11	96.7	188.75	96.53	599.64	94.28	U
125.47	96.67	199.31	96.43	628.92	94.21	U
130.19	96.4	202.96	96.43	641.58	94.34	U
134.65	96.49	215.6	96.34	669.65	93.95	U
137.62	96.44	222.8	95.96	698.26	93.81	U
143.91	96.5	227.78	95.95	728.47	93.93	U
148.18	96.49	230.38	95.95	823.08	93.55	P
151.5	96.06	233.75	95.94	887.54	93.15	P
153.11	96.06	236.25	95.91	914.42	93.09	MP
156.78	96.27	236.59	95.9	933.44	92.76	P
161.85	96.38	253.19	95.89	986.5	92.69	U
172.8	96.29	264.51	95.8	1069.11	92.56	U
176.31	96.03	282.82	95.72	1111.29	92.23	U
178.9	96.27	291.06	95.7	1158.31	92.09	R
188.15	95.53	310.05	95.48	1222.63	91.9	U
192.97	95.25	324.43	95.39	1355.91	91	P
199.67	95.47	342.62	95.37	1379.79	90.84	P
200.83	95.42	351.24	95.37	1451.87	90.05	P
210.13	95.69	357.88	95.32	1499.48	89.34	U
212.17	96.18	362.81	95.32	1619.33	88.72	R
217.41	95.37	370.1	95.27	1654.68	88.26	P
219.36	95.1	379.12	95.19	1673.41	88.62	MP
224.8	95.22	384.82	95.19	1701.13	88.13	P
228.33	95.65	395.81	94.82	1702.19	88.27	P
229	95.64	403.61	94.82	1704.79	87.86	U
234.37	95.35	417	94.29	1776.09	87.34	P
238.89	94.83	422.7	94.31	1920.62	86.61	P
244.33	94.14	449.01	94.12	2013	86.28	MP
247.37	94.35	460.21	93.82	2061.75	85.95	P
252.99	95.42	484.73	93.81	2109.99	85.65	P
260.86	95.04	495.35	93.72	2205.37	84.63	P
267.77	95.36	502.45	93.71	2250.12	84	P
270	95.39	513.01	93.7	2304.53	83.17	U
279.65	95.2	521.95	93.38	2394	82.38	P
286.05	94.75	522.85	93.38			P
294.61	95.02	525.51	93.37			P
307.6	94.66	536.32	93.32			MP
320.96	95.1	545.97	93.3			P
328.29	94.91	557.69	93.25			MP
332.76	95.11	564.2	93.24			U
338.78	94.78	572.75	93.07			U
343.29	94.8	579.99	93.06			U
346.76	94.89	592.11	92.95			U
350.71	94.85	594.94	92.92			U
354.15	94.98	607.55	92.9			U
360.5	94.96	616.07	92.79			U
366.4	94.85	621.5	92.77			U
376.33	94.58	635.52	92.77			U
381.02	94.5	662.81	92.75			U
391.15	94.18	667.79	92.75			U
398.66	94.11	673.1	92.68			P
425.43	93.43	682.3	92.64			MP
430.48	93.69	694.3	92.56			P
433.26	93.77	702.88	92.58			P
443.47	94.05	726.04	92.52			U
450.46	93.71	740.5	92.52			U
459.8	93.05	748.98	92.47			U
471.3	93.13	759.31	92.45			U
481.19	93.32	763.15	92.45			U
493.75	93.18	768.87	92.45			U
494.47	93.23	774.31	92.45			U
503	93.31	781.53	92.4			U
514.3	93.05	789.04	92.29			U
522.95	92.81	796.8	92.29			U
524.53	92.8	804.06	92.29			U
535.45	92.72	822.5	92.29			U
544.92	92.68	841.52	92.29			U
554.61	92.59	842.85	92.29			U
556.9	92.67	847.02	92.29			U
571.13	92.67	853.45	92.16			U
579.2	92.74	862.31	92.16			U
588.16	92.61	870.41	92.03			P

CV-2007	
Station	**Elevation**
2024.93	85
2071.1	84.45
2120.58	84.18
2169.31	83.14
2214.25	82.61
2260.63	81.85
2354.95	80.47
2400.58	80.62

Cato Farms
MY-2005 Longitudinal Profile

2005		
Station	**TW-2005**	**Notes**
600.45	92.72	TP
618.1	92.56	Thalweg
620.97	91.92	TR
624.23	92.1	TP
628.35	92.02	Thalweg
636.82	92.26	Thalweg
646.66	92.5	Thalweg
651.43	91.96	Thalweg
653.37	91.9	TR
659.48	92.31	Thalweg
670.21	92.3	Thalweg
671.95	91.84	TR
678.66	92.17	Thalweg
686.81	91.69	Thalweg
692.11	91.63	TP
700.35	91.81	Thalweg
708.1	91.7	Thalweg
714.45	91.53	Thalweg
721.17	90.95	Thalweg
742.45	92.33	Thalweg
749.31	92.06	Thalweg
761.77	91.54	TR
766.71	91.28	Thalweg
776.46	91.52	TP
783.68	91.66	Thalweg
790.24	91.45	TR
802.34	91.68	TP
812.37	91.19	Thalweg
821.9	91.2	Thalweg
830.84	91.61	Thalweg
838.84	91.38	Thalweg
844.93	91.03	Trun
853.09	91.31	TP
860.75	91.22	Thalweg
868.51	91.36	Thalweg
876.91	91	TR
890.32	91.02	Thalweg
899.4	90.69	TP
907.09	90.72	Thalweg
912.91	90.45	Thalweg
917.56	90.68	Thalweg
932.09	90.53	Thalweg
935.85	89.55	Thalweg
943.48	90.86	Thalweg
954.2	90.68	Thalweg
972.63	90.46	Thalweg
985.53	89.4	Thalweg
996.06	90.94	Thalweg
1000.91	90.92	Thalweg
1016.79	90.33	TR
1026.55	90.02	Thalweg
1031	89.58	TP
1036.99	90.68	Thalweg
1046.36	90.52	Thalweg
1053.07	90.36	TR
1056.57	89.51	Thalweg
1059.56	90.4	TP
1070.78	90.12	Thalweg
1078.4	89.91	TR
1096.83	89.88	TP
1109.45	89.98	Thalweg
1119.19	89.41	Thalweg
1128.25	89.55	Thalweg
1132.09	89.67	Thalweg
1137.35	90.36	Thalweg
1141.9	90.24	Thalweg
1154.42	89.99	TR
1161.04	89.5	TP
1166.39	89.76	Thalweg
1174.65	89.16	Thalweg
1185.86	89.27	Thalweg
1185.94	89.22	Thalweg
1191.9	90.28	Thalweg
1197.75	89.13	Thalweg
1204.26	89.85	TR
1212.54	90.12	TP
1217.02	89.63	Thalweg
1220.9	89.07	TR
1225.13	89.73	TP
1229.8	89.13	Thalweg
1235.89	89.78	Thalweg
1242.33	89.55	Thalweg
1245.84	89.76	Trun
1253.21	89.81	Thalweg
1257.8	89.68	Thalweg
1268.3	89.51	Thalweg
1274.07	89.53	Thalweg
1280.16	89.11	TP
1293.57	89.25	Culvert In
1296.92	89.92	Thalweg
1307.61	89.47	Thalweg
1317.67	89.39	TR
1322.76	88.84	Thalweg
1325.69	89.52	TP
1336.17	89.39	Thalweg

Cato Farms
MY-2007 Longitudinal Profile

2007						
Station	**TW-2007**	**Station**	**WS-2007**	**Station**	**BKF-2007**	**Notes**
592.35	92.53	876.32	92.01			P
601.45	92.68	890.98	91.76			R
612.53	92.45	906.39	91.67			R
613.22	92.4091	910.89	91.63			P
618.34	91.9191	915.24	91.54			P
627.42	91.9491	918.67	91.36			MP
635.96	92.2291	943.34	91.4			P
648.78	92.3491	952.18	91.36			P
654.78	91.9191	966.68	91.32			MP
659.43	92.3791	980.4	91.36			U
675.28	91.8691	985.89	91.32			P
683.93	91.7091	992.18	91.18			P
694.66	91.5491	1005.24	91.23			P
717.22	91.1091	1012.2	91.15			P
723.15	90.7391	1022.03	91.15			MP
744.36	91.93	1054.45	91.14			R
750.28	91.7291	1061.44	91.14			P
756.2	91.3791	1070.71	91.13			P
760.01	91.4091	1078.12	91.13			P
766.85	91.2391	1082.38	91.13			P
775.51	91.4591	1085.64	91.13			P
792.32	91.7691	1088.36	91.13			P
800.65	91.04	1089.02	91.13			MP
805.98	91.05	1096.58	91.11			P
818.11	91.3	1109.17	90.95			P
836.89	91.51	1117.15	91			P
840.27	90.88	1117.51	90.95			P
845.09	90.61	1144.88	90.87			MP
850.82	90.81	1145.54	90.73			P
857.92	91.28	1148.91	90.84			U
865.16	91.33	1159.81	90.72			U
872.71	90.89	1164.46	90.73			U
887.25	90.61	1169.11	90.76			U
900.79	90.59	1171.9	90.74			P
908.46	90.4	1175.05	90.72			P
913.63	89.96	1184.05	90.73			MP
917.91	90.55	1190.75	90.64			P
930.96	90.21	1209.86	90.64			P
942.66	89.61	1220.32	90.69			MP
949	90.56	1221.88	90.47			U
963.05	90.5	1225.35	90.64			P
976.06	90.06	1228.91	90.51			P
980.48	90.4	1238.25	90.47			P
988.03	89.42	1251.55	90.22			MP
1000.45	90.25	1270.31	90.22			P
1005.14	90.6	1286.02	90.22			P
1018.76	90.13	1302.49	90.22			P
1025.54	89.45	1310.76	90.07			MP
1035.56	90.29	1319.22	89.87			P
1045.97	90.6	1328.8	89.87			U
1052.71	90.55	1343.53	89.87			P
1058.23	89.48	1349.85	89.87			MP
1068.12	90.56	1350.42	89.84			U
1075.17	90.5	1356.6	89.81			P
1077.05	90	1381.72	89.62			P
1083.49	90.18	1404.16	89.39			P
1090.2	90.2	1406.11	89.26			P
1104.08	89.98	1408.09	89.35			P
1121.66	89.18	1412.99	89.04			U
1141.02	90.07	1426.03	88.65			U
1149.95	89.83	1428.68	88.65			U
1158.16	90.3	1436.81	88.65			P
1164.34	89.85	1445.67	88.65			P
1171.8	89.07	1452.66	88.42			MP
1179.08	89.18	1475.27	88.43			P
1185.08	89.17	1490.74	88.4			P
1189.01	90.16	1494.05	88.4			P
1192.86	90.26	1502.31	88.3			U
1199.86	89.04	1536.75	88.24			U
1212.59	90.05	1549.73	88.24			U
1218.83	89.43	1568.35	88.05			U
1225.05	89.85	1582.71	87.92			U
1232.69	89.02	1598.74	87.16			U
1246.01	89.78	1601.62	87.16			U
1257.83	89.53	1608.51	87.16			U
1267.85	89.97	1636.25	87.16			U
1276.07	89.13	1637.63	87.03			P-BRDG
1291.65	89.02	1640.91	86.85			P-BRDG
1301.31	89.9	1644.96	86.85			U
1309.6	89.37	1649.31	86.85			U
1318.28	89.56	1656.72	86.68			P
1333.8	89.13	1660.26	86.57			P
1351.19	88.74	1666.44	86.57			P
1370.97	87.71	1673.57	86.57			MP
1389.92	89.25	1684.71	86.5			U
1402.04	88.07	1690.73	86.5			U
1408.03	89.09	1693.22	86.5			R
1421.66	88.18	1706.8	86.5			U
1427.6	88.18	1714.4	86.4			P
1439.59	87.73	1719.1	86.24			P
1452.13	87.08	1735.11	86.24			MP
1461.34	88.25	1739.54	86.24			P
1471.27	87.75	1753.43	86.24			P
1490.07	86.96	1756.86	86.24			P
1491.26	86.75	1761.66	86.24			P

Cato Farms
MY-2005 Longitudinal Profile

2005		
Station	**TW-2005**	**Notes**
1342.54	88.86	TR
1348.74	89.17	TP
1359.68	88.85	Thalweg
1362.62	88.91	TR
1367.57	88.35	TP
1375.72	87.6	Thalweg
1380.94	88.42	Thalweg
1388.39	89.19	Thalweg
1392.72	88.94	Head of Glide
1393.47	88.28	TR
1399.88	88.47	Thalweg
1405.85	88.02	TP
1408.65	88.32	Thalweg
1414.19	88.64	Thalweg
1433.97	88.3	Head of Glide
1436.39	87.71	Trun
1444.87	87.7	TP
1446.92	87.6	Thalweg
1451.56	87.54	Thalweg
1456.26	87.02	Thalweg
1459.01	88.38	Thalweg
1467.29	88.09	Thalweg
1493.6	87.36	Thalweg
1498.68	86.96	Thalweg
1508.16	87.5	Thalweg
1512.2	88.44	Thalweg
1531.14	87.86	Thalweg
1557.99	87.55	TR
1560.83	87.11	Thalweg
1568.41	87.65	TP
1571.6	87.75	Thalweg
1587.47	87.16	Thalweg
1598.6	86.96	TR
1602.74	87.35	TP
1609.66	87.1	Thalweg
1621.62	86.72	Thalweg
1623.64	86.79	Thalweg
1625.19	87.1	Thalweg
1627.25	86.66	Thalweg
1628.77	86.35	TR
1639.4	86.85	TP
1644.63	87.21	Thalweg
1645.67	86.91	Thalweg
1646.83	86.78	TR
1651.07	85.37	Thalweg
1659.27	85.88	Thalweg
1666.96	85.98	TP
1673.58	86.2	Thalweg
1682.42	85.85	Thalweg
1688.33	86.06	Thalweg
1696.99	86.27	Thalweg
1713.58	86.25	Thalweg
1733.24	85.56	Thalweg
1735.04	84.77	Thalweg
1740.21	85.34	TR
1747.57	85.89	Thalweg
1756.88	85.84	TP
1760.76	85.25	Head of Glide
1781.64	85.29	TR
1783.58	85.17	TP
1788.83	85.87	Thalweg
1797.85	85.76	Thalweg
1802.05	85.18	TR
1793.62	85.38	Thalweg
1810.49	85.11	TP
1815.06	85.5	Thalweg
1820.03	85.03	Thalweg
1823.47	84.91	TR
1825.87	85.37	TP
1829.63	85.87	Thalweg
1832.02	85.21	Head of Glide
1839.97	84.84	TR
1841.77	84.22	TP
1845.35	84.3	Thalweg
1864.26	84.97	Thalweg
1870.05	84.6	Head of Glide
1868.13	83.83	Thalweg
1872.39	84	Thalweg
1882.53	84.05	Thalweg
1885.16	84.1	Thalweg
1893.4	84.4	Thalweg
1907.19	83.85	Thalweg
1911.34	83.98	Thalweg
1921.24	84.45	Thalweg
1930.19	83.51	Thalweg
1934.85	84.32	Thalweg
1959.02	84.34	Thalweg
1961.23	84.32	Thalweg
1965.27	84.16	Thalweg
1975	84.15	Thalweg
1986.29	84.28	Thalweg
1991.1	84.17	Thalweg
1993.38	82.52	Thalweg
2008.18	84.34	TR
2011.06	84.33	Thalweg

Cato Farms
MY-2007 Longitudinal Profile

2007						
Station	**TW-2007**	**Station**	**WS-2007**	**Station**	**BKF-2007**	**Notes**
1495.75	86.74	1764.15	86.24			MP
1513.81	88.31	1768.64	86.12			U
1531.13	87.64	1769.64	86.12			U
1541.68	88.06	1777.02	86.12			P
1556.03	87.18	1777.46	86.12			P
1565.66	86.66	1779.85	85.72			MP
1570.06	87.95	1817.37	85.51			R
1583.63	87.72	1849.47	85.51			R
1587.69	87.15	1855.78	85.47			P
1594.83	86.62	1866.1	85.41			MP
1601.48	87.04	1878.51	85.26			U
1612.77	86.99	1883.03	85.26			U
1620.33	86.73	1890.45	85.26			U
1626.09	86.7	1926.6	85.25			P
1630.1	85.96	1930.33	85.25			MP
1635.01	86.31	1941.34	85.23			P
1644.45	86.76	1944.1	85.23			P
1651.49	86	1947.58	85.23			P
1660.06	85.63	1950.49	85.23			MP
1666.14	86.12	1967.71	85.23			P
1679.74	85.98	1992.09	85.23			P
1690.8	86.09	1999.24	85.21			U
1696.45	85.98	2012.16	85.21			U
1703.41	86.01	2026.7	85.02			U
1705.23	86.46	2036.33	85.02			U
1711.84	86.53	2036.98	85.02			R
1721.74	85.86	2045.18	84.15			P
1727.33	85.64	2045.67	84.15			P
1730.93	84.37	2048.36	84.13			MP
1747.07	85.86	2050.37	84.13			P
1752.56	85.89	2062.08	84.44			P
1760.16	85.22	2069.87	84.44			P
1765.38	85.4	2070.07	84.44			P
1773.64	85.4	2082.12	84.44			P
1779.5	85.3	2094.24	84.26			MP
1789.63	85.84	2095.75	84.26			U
1793.57	85.41	2121	84.17			U
1807.58	85.64	2122.33	84.16			P
1816.44	85.12	2133.21	83.25			P
1819.36	84.43	2156.17	83.08			MP
1826.31	85.37	2156.72	83.08			P
1828.09	85.53	2176.67	82.83			U
1834.87	84.49	2208.14	82.83			U
1839.68	84.43	2208.36	82.83			U
1848.96	84.55	2211.9	82.81			U
1864.26	84.95	2233.41	82.01			U
1868.85	83.95	2243.35	82.01			U
1881.73	83.81	2248.57	82.01			U
1897.32	84.31	2255.52	82.04			U
1912.84	83.99	2270.39	81.62			U
1923.68	84.4	2279.04	81.64			P
1932.81	83.2	2281.95	81.64			MP
1940.58	84.38	2282.4	81.64			P
1944.15	84.27	2285.58	80.92			U
1960.19	84.14	2291.72	80.92			U
1977.27	84.09	2292.27	80.92			P
1983.08	84.29	2302.81	80.92			P
1991.29	83.17	2310.26	80.9			MP
2008.69	84.37	2318.31	80.8			U
2014.98	84.62	2322.2	80.71			U
2018.43	84.61	2327.31	80.66			U
2024.93	85	2336.9	80.66			CV
2031.89	83.49	2354.33	80.66			P
2036.78	83.24	2374.62	80.66			P
2039.73	82.7	2428.55	80.63			MP
2049.43	84.16	2436.54	80.5			P
2052.41	84.3	2448.25	80.5			U
2058.97	83.46	2457.66	80.5			U
2067.47	83.42					U
2069.56	84.29					U
2071.24	84.63					U
2074.06	84.06					CV
2076.7	82.46					P
2086.01	81.99					MP
2092.84	83.81					O
2095.62	84.42					U
2107.73	82.71					U
2116.24	83.9					U
2120.24	84.46					U
2120.58	84.18					CV
2125.12	81.9					P
2128.33	81.47					MP
2137.73	83.09					P
2140.84	83.46					U
2145.99	81.58					U
2152.88	81.47					U
2156.62	82.43					U
2169.31	83.14					CV
2176.18	81.38					P
2181.08	80.78					MP
2188.51	82.5					P
2194.39	82.76					U
2202.55	81.32					U
2206.99	82.39					U
2209.79	82.59					U

Cato Farms
MY-2005 Longitudinal Profile

2005		
Station	**TW-2005**	**Notes**
2014.75	84.79	Thalweg
2020.57	84.79	Thalweg
2027.26	84.97	Thalweg
2024.93	85	Thalweg
2027.16	84.11	Thalweg
2030.62	83.72	TP
2039.6	84.18	Thalweg
2049.52	84.27	Thalweg
2052.62	84.64	Thalweg
2057.52	84.53	Thalweg
2059.13	83.83	Thalweg
2069	83.86	Thalweg
2070.85	84.77	TR
2074.06	84.06	TP
2074.09	83.31	Thalweg
2076.67	82.96	Thalweg
2084.99	82.14	Head of Glide
2094.39	83.62	TR
2102.37	83.29	Thalweg
2104.03	83	TP
2105.13	82.51	Thalweg
2111.66	83.2	Thalweg
2116.42	83.3	TP
2116.54	81.3	Thalweg
2118.25	82.28	Head of Glide
2120.58	84.18	TR
2123.56	80.58	Thalweg
2126.63	80.73	TP
2127.69	81.12	Thalweg
2138.86	81.17	Thalweg
2141.75	83.21	TR
2149.08	80.64	Thalweg
2153.16	81.2	Thalweg
2157.16	80.82	Thalweg
2163.12	81.4	TP
2169.31	83.14	Thalweg
2169.35	83.14	TP
2174.71	80.84	Thalweg
2182.3	82.55	Thalweg
2192.65	82.63	TR
2199.9	81.64	TP
2202.96	82.34	Thalweg
2207.13	82.72	Thalweg
2209.83	82.59	Thalweg
2214.25	82.61	TR
2215.49	81.43	Thalweg
2222.42	80.32	Thalweg
2227.01	81.24	TP
2230.75	81.56	Thalweg
2231.83	82.23	Thalweg
2235.32	82.25	TP
2237.66	81.28	Thalweg
2253.97	81.4	Thalweg
2259.64	81.1	Thalweg
2260	81.5	TR
2260.63	81.85	Thalweg
2263.47	80.81	Thalweg
2268.77	80	TP
2281.43	81.16	Thalweg
2289.75	80.71	Thalweg
2296.14	80.5	TR
2299.55	80.43	Thalweg
2303.12	79.79	Thalweg
2316.39	80.13	TP
2319.59	79.99	Thalweg
2322.52	80.18	Thalweg
2324.1	80.38	Thalweg
2327.5	80.28	Trun
2329.55	79.69	Thalweg
2333.18	79.81	Thalweg
2334.85	79.08	TP
2340.48	79.62	Thalweg
2345.72	80.14	Thalweg
2349.03	79.6	Head of Glide
2355.59	79.97	Thalweg
2354.95	80.47	Thalweg
2357.48	79.81	TR
2358.01	79.55	Thalweg
2365.22	78.9	TP
2366.87	79.54	Thalweg
2369.32	79.49	Thalweg
2373.39	79.94	TR
2380.94	80.03	TP
2391.7	80.03	Thalweg
2396.87	80.4	TR
2400.58	80.62	Thalweg
2401.33	80.4	Thalweg
2409.94	79.13	Thalweg
2414.54	79.58	Thalweg
2431.4	79.72	Thalweg

Cato Farms
MY-2007 Longitudinal Profile

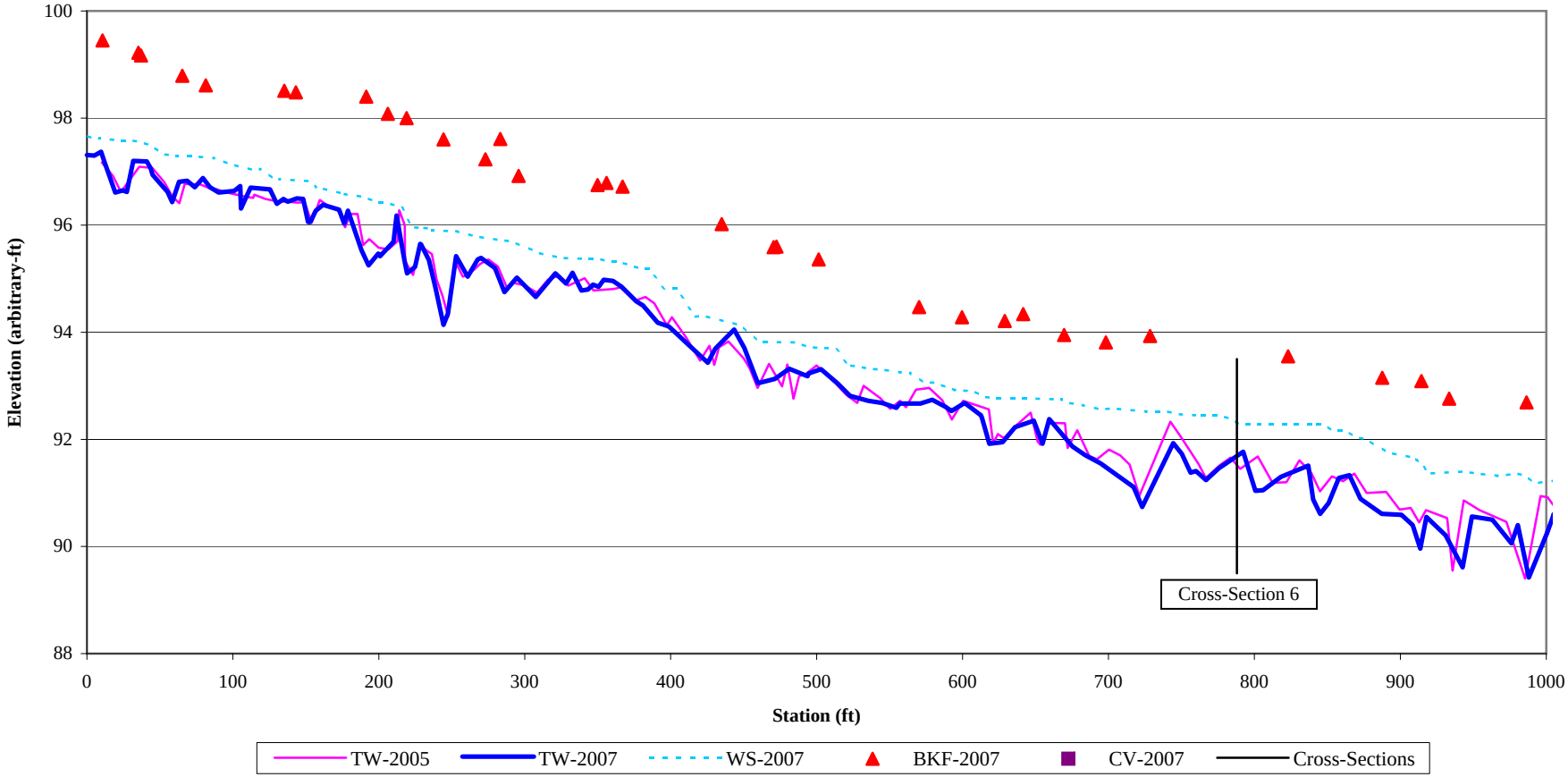
2007						
Station	**TW-2007**	**Station**	**WS-2007**	**Station**	**BKF-2007**	**Notes**
2214.25	82.61					CV
2219.66	80.37					MP
2223.85	80.42					P
2229.64	81.8					U
2236.84	81.79					U
2241.37	80.69					U
2253.4	80.58					U
2255.51	81.69					U
2258.74	81.87					U
2260.63	81.85					CV
2263.28	79.71					MP
2272.79	79.95					P
2292.89	80.75					U
2299.39	79.9					U
2302.12	80.41					U
2305.01	80.98					U
2316.62	79.66					U
2318.36	80.51					U
2327.38	79.63					U
2334.77	79.82					U
2345.92	79.83					U
2350.36	80.22					U
2352.05	80.68					U
2354.95	80.47					CV
2357.55	79.34					P
2368.65	79.08					MP
2378.92	80.65					U
2381.27	80.65					U
2388.02	80.43					U
2396.76	80.42					U
2400.58	80.62					CV
2404.22	79.03					MP
2412.84	79.49					P
2435.27	79.6					U
2435.27	79.6					U

Cato Farms
Longitudinal Profile
2007 Monitoring Year
Reach 1

*Water Surface Elevations below stream bed indicate areas where the channel was dry

Bankfull/Top of Bank = -0.0066*STA + 99.163
Water Surface = -0.0067*STA + 97.762

Slope equations represent entire reach.



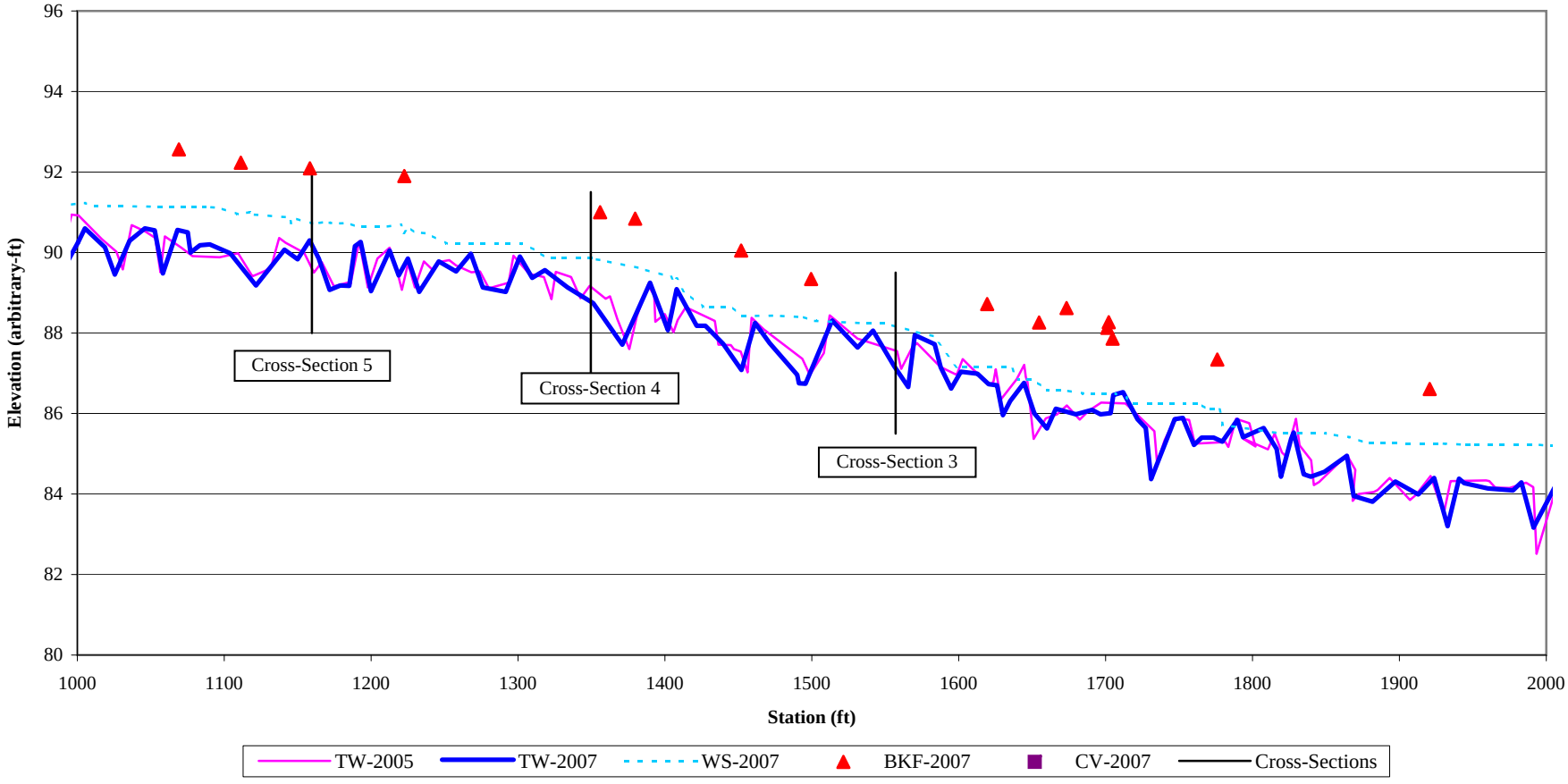
Cato Farms
Longitudinal Profile
2007 Monitoring Year
Reach 1

*Water Surface Elevations below stream bed indicate areas where the channel was dry

Bankfull/Top of Bank = -0.0066*STA + 99.163

Water Surface = -0.0067*STA + 97.762

Slope equations represent entire reach.



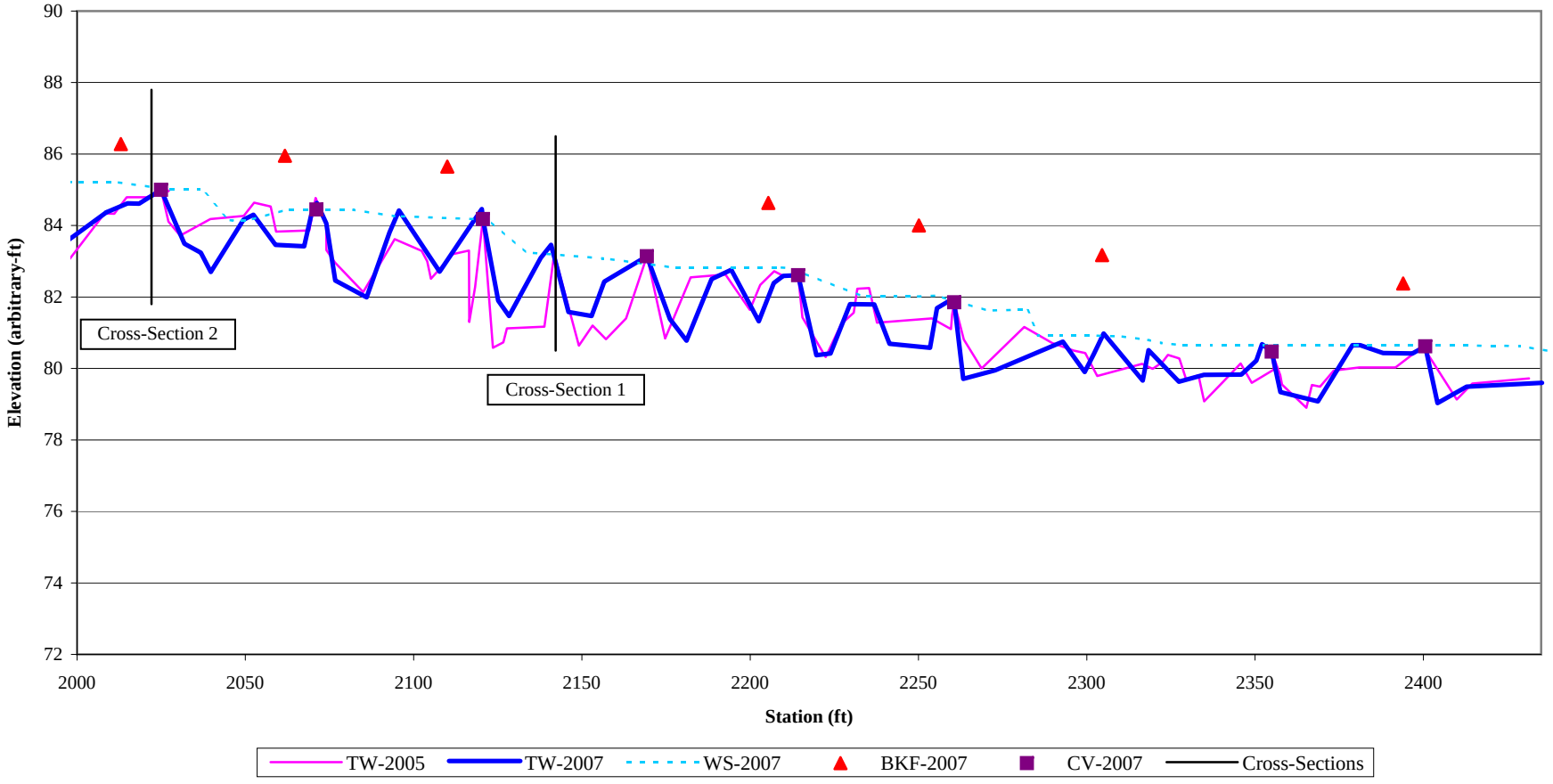
Cato Farms
Longitudinal Profile
2007 Monitoring Year
Reach 2

*Water Surface Elevations below stream bed indicate areas where the channel was dry

Bankfull/Top of Bank = -0.0066*STA + 99.163

Water Surface = -0.0067*STA + 97.762

Slope equations represent entire reach.



Stream Name: Cato Farms
Cross-Section: 1
Feature: Riffle

			2005			2006			2007		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	6	12%	12%	18	18%	18%	57	57%	57%
Sand	very fine sand	0.125	0	0%	12%	9	9%	27%	17	17%	74%
	fine sand	0.250	9	18%	30%	10	10%	37%	4	4%	78%
	medium sand	0.50	23	46%	76%	5	5%	42%	0	0%	78%
	coarse sand	1.00	12	24%	100%	26	26%	68%	10	10%	88%
	very coarse sand	2.0	0	0%	100%	24	24%	92%	11	11%	99%
Gravel	very fine gravel	4.0	0	0%	100%	8	8%	100%	1	1%	100%
	fine gravel	5.7	0	0%	100%	0	0%	100%	0	0%	100%
	fine gravel	8.0	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	11.3	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	16.0	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	22.3	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	32.0	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	45	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	64	0	0%	100%	0	0%	100%	0	0%	100%
Cobble	small cobble	90	0	0%	100%	0	0%	100%	0	0%	100%
	medium cobble	128	0	0%	100%	0	0%	100%	0	0%	100%
	large cobble	180	0	0%	100%	0	0%	100%	0	0%	100%
	very large cobble	256	0	0%	100%	0	0%	100%	0	0%	100%
Boulder	small boulder	362	0	0%	100%	0	0%	100%	0	0%	100%
	small boulder	512	0	0%	100%	0	0%	100%	0	0%	100%
	medium boulder	1024	0	0%	100%	0	0%	100%	0	0%	100%
	large boulder	2048	0	0%	100%	0	0%	100%	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%	0	0%	100%	0	0%	100%
TOTAL/%of whole count			50	100%	100%	100	100%	100%	100	100%	100%

Stream Name: Cato Farms
Cross-Section: 2
Feature: Riffle

			2005			2006			2007		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	27	50%	50%	12	12%	12%	58	58%	58%
Sand	very fine sand	0.125	3	6%	56%	5	5%	17%	1	1%	59%
	fine sand	0.250	9	17%	72%	17	17%	34%	11	11%	70%
	medium sand	0.50	10	19%	91%	10	10%	44%	6	6%	76%
	coarse sand	1.00	3	6%	96%	22	22%	66%	8	8%	84%
	very coarse sand	2.0	1	2%	98%	14	14%	80%	9	9%	93%
Gravel	very fine gravel	4.0	0	0%	98%	14	14%	94%	6	6%	99%
	fine gravel	5.7	1	2%	100%	6	6%	100%	1	1%	100%
	fine gravel	8.0	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	11.3	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	16.0	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	22.3	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	32.0	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	45	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	64	0	0%	100%	0	0%	100%	0	0%	100%
Cobble	small cobble	90	0	0%	100%	0	0%	100%	0	0%	100%
	medium cobble	128	0	0%	100%	0	0%	100%	0	0%	100%
	large cobble	180	0	0%	100%	0	0%	100%	0	0%	100%
	very large cobble	256	0	0%	100%	0	0%	100%	0	0%	100%
Boulder	small boulder	362	0	0%	100%	0	0%	100%	0	0%	100%
	small boulder	512	0	0%	100%	0	0%	100%	0	0%	100%
	medium boulder	1024	0	0%	100%	0	0%	100%	0	0%	100%
	large boulder	2048	0	0%	100%	0	0%	100%	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%	0	0%	100%	0	0%	100%
TOTAL/%of whole count			54	100%	100%	100	100%	100%	100	100%	100%

Stream Name: Cato Farms
Cross-Section: 3
Feature: Pool

			2005			2006			2007		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	31	61%	61%	20	20%	20%	52	52%	52%
Sand	very fine sand	0.125	5	10%	71%	18	18%	38%	13	13%	65%
	fine sand	0.250	7	14%	84%	9	9%	47%	13	13%	78%
	medium sand	0.50	8	16%	100%	22	22%	69%	12	12%	90%
	coarse sand	1.00	0	0%	100%	18	18%	87%	10	10%	100%
	very coarse sand	2.0	0	0%	100%	13	13%	100%	0	0%	100%
G r a v e l	very fine gravel	4.0	0	0%	100%	0	0%	100%	0	0%	100%
	fine gravel	5.7	0	0%	100%	0	0%	100%	0	0%	100%
	fine gravel	8.0	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	11.3	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	16.0	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	22.3	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	32.0	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	45	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	64	0	0%	100%	0	0%	100%	0	0%	100%
Cobble	small cobble	90	0	0%	100%	0	0%	100%	0	0%	100%
	medium cobble	128	0	0%	100%	0	0%	100%	0	0%	100%
	large cobble	180	0	0%	100%	0	0%	100%	0	0%	100%
	very large cobble	256	0	0%	100%	0	0%	100%	0	0%	100%
Boulder	small boulder	362	0	0%	100%	0	0%	100%	0	0%	100%
	small boulder	512	0	0%	100%	0	0%	100%	0	0%	100%
	medium boulder	1024	0	0%	100%	0	0%	100%	0	0%	100%
	large boulder	2048	0	0%	100%	0	0%	100%	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%	0	0%	100%	0	0%	100%
TOTAL/%of whole count			51	100%	100%	100	100%	100%	100	100%	100%

Stream Name: Cato Farms
Cross-Section: 4
Feature: Pool

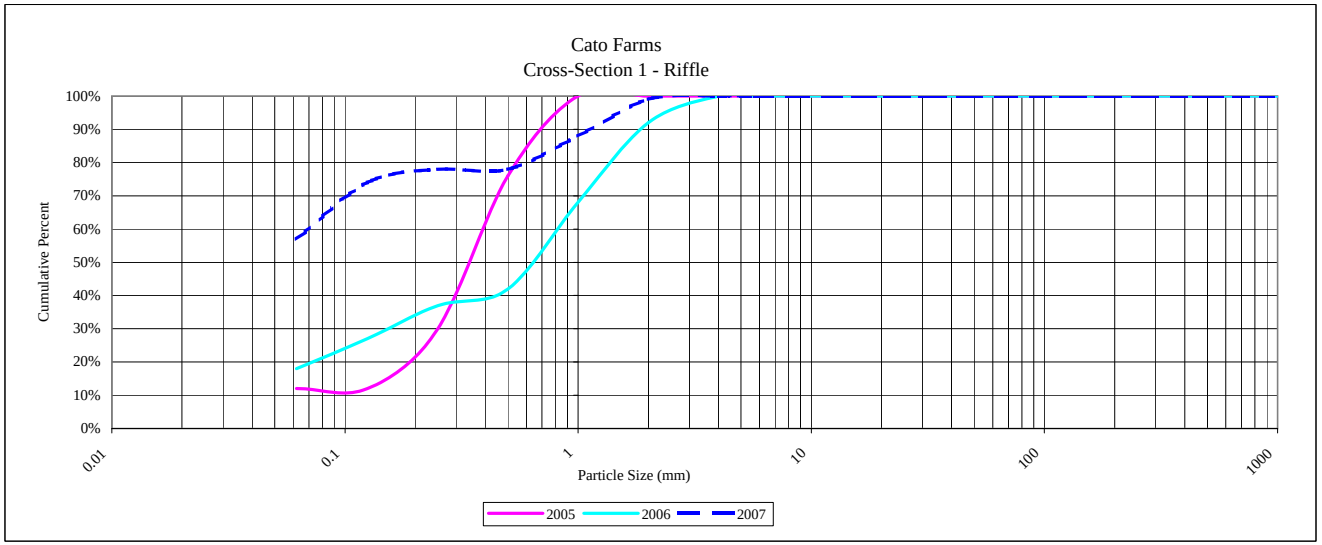
			2005			2006			2006		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	15	30%	30%	12	12%	12%	51	51%	51%
Sand	very fine sand	0.125	8	16%	46%	8	8%	20%	11	11%	62%
	fine sand	0.250	17	34%	80%	19	19%	39%	11	11%	73%
	medium sand	0.50	10	20%	100%	15	15%	54%	15	15%	88%
	coarse sand	1.00	0	0%	100%	32	32%	86%	9	9%	97%
	very coarse sand	2.0	0	0%	100%	8	8%	94%	2	2%	99%
Gravel	very fine gravel	4.0	0	0%	100%	6	6%	100%	1	1%	100%
	fine gravel	5.7	0	0%	100%	0	0%	100%	0	0%	100%
	fine gravel	8.0	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	11.3	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	16.0	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	22.3	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	32.0	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	45	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	64	0	0%	100%	0	0%	100%	0	0%	100%
Cobble	small cobble	90	0	0%	100%	0	0%	100%	0	0%	100%
	medium cobble	128	0	0%	100%	0	0%	100%	0	0%	100%
	large cobble	180	0	0%	100%	0	0%	100%	0	0%	100%
	very large cobble	256	0	0%	100%	0	0%	100%	0	0%	100%
Boulder	small boulder	362	0	0%	100%	0	0%	100%	0	0%	100%
	small boulder	512	0	0%	100%	0	0%	100%	0	0%	100%
	medium boulder	1024	0	0%	100%	0	0%	100%	0	0%	100%
	large boulder	2048	0	0%	100%	0	0%	100%	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%	0	0%	100%	0	0%	100%
TOTAL/%of whole count			50	100%	100%	100	100%	100%	100	100%	100%

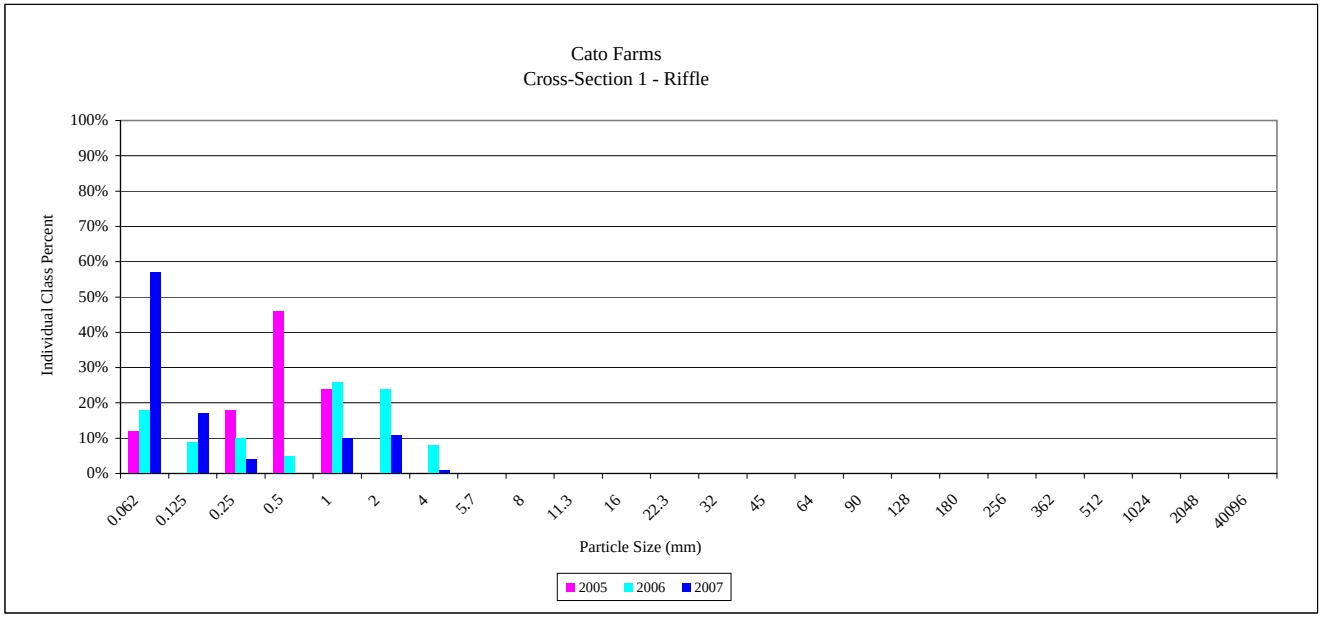
Stream Name: Cato Farms
Cross-Section: 5
Feature: Pool

			2005			2006			2007		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	9	18%	18%	16	16%	16%	39	39%	39%
Sand	very fine sand	0.125	0	0%	18%	15	15%	31%	15	15%	54%
	fine sand	0.250	1	2%	20%	12	12%	43%	12	12%	66%
	medium sand	0.50	15	30%	50%	16	16%	59%	16	16%	82%
	coarse sand	1.00	16	32%	82%	35	35%	94%	12	12%	94%
	very coarse sand	2.0	7	14%	96%	5	5%	99%	5	5%	99%
Gravel	very fine gravel	4.0	2	4%	100%	1	1%	100%	1	1%	100%
	fine gravel	5.7	0	0%	100%	0	0%	100%	0	0%	100%
	fine gravel	8.0	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	11.3	0	0%	100%	0	0%	100%	0	0%	100%
	medium gravel	16.0	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	22.3	0	0%	100%	0	0%	100%	0	0%	100%
	course gravel	32.0	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	45	0	0%	100%	0	0%	100%	0	0%	100%
	very coarse gravel	64	0	0%	100%	0	0%	100%	0	0%	100%
Cobble	small cobble	90	0	0%	100%	0	0%	100%	0	0%	100%
	medium cobble	128	0	0%	100%	0	0%	100%	0	0%	100%
	large cobble	180	0	0%	100%	0	0%	100%	0	0%	100%
	very large cobble	256	0	0%	100%	0	0%	100%	0	0%	100%
Boulder	small boulder	362	0	0%	100%	0	0%	100%	0	0%	100%
	small boulder	512	0	0%	100%	0	0%	100%	0	0%	100%
	medium boulder	1024	0	0%	100%	0	0%	100%	0	0%	100%
	large boulder	2048	0	0%	100%	0	0%	100%	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%	0	0%	100%	0	0%	100%
	TOTAL/%of whole count		50	100%	100%	100	100%	100%	100	100%	100%

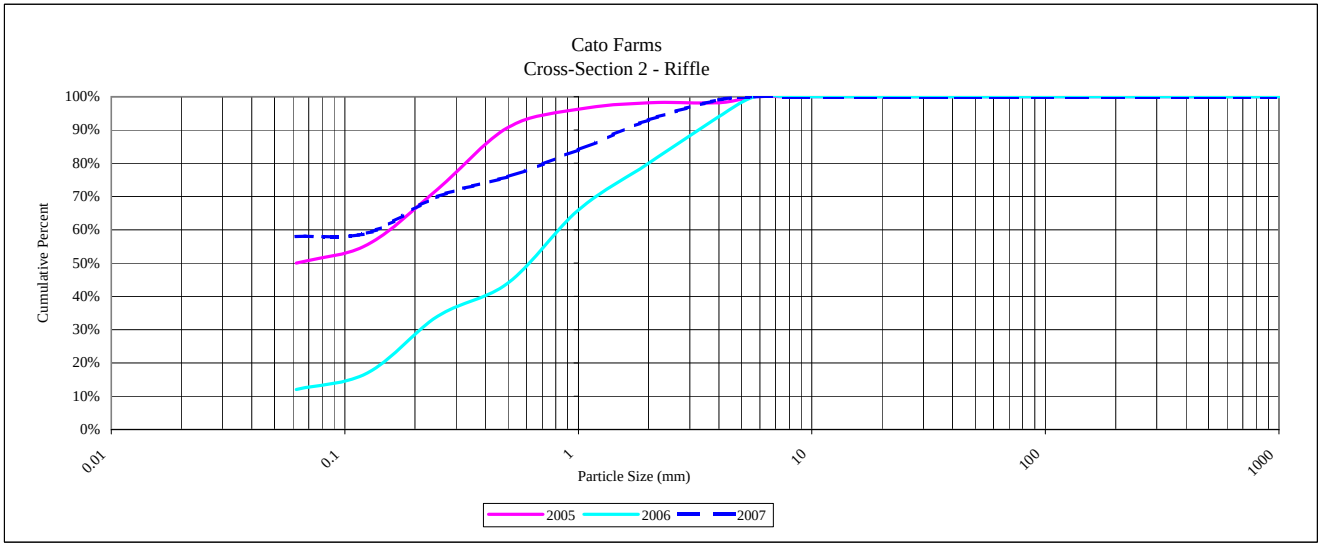
Stream Name: Cato Farms
Cross-Section: 6
Feature: Pool

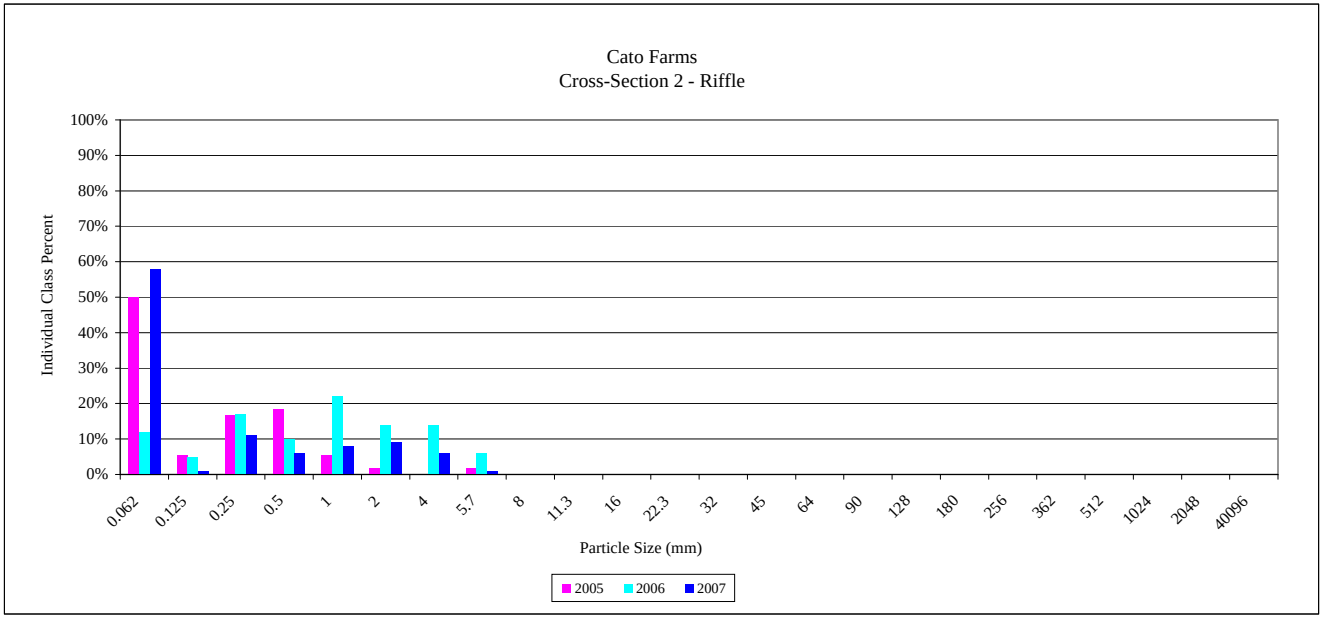
			2007		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	45	45%	45%
Sand	very fine sand	0.125	5	5%	50%
	fine sand	0.250	15	15%	65%
	medium sand	0.50	15	15%	80%
	coarse sand	1.00	8	8%	88%
	very coarse sand	2.0	12	12%	100%
Gravel	very fine gravel	4.0	0	0%	100%
	fine gravel	5.7	0	0%	100%
	fine gravel	8.0	0	0%	100%
	medium gravel	11.3	0	0%	100%
	medium gravel	16.0	0	0%	100%
	course gravel	22.3	0	0%	100%
	course gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
	TOTAL/%of whole count		100	100%	100%



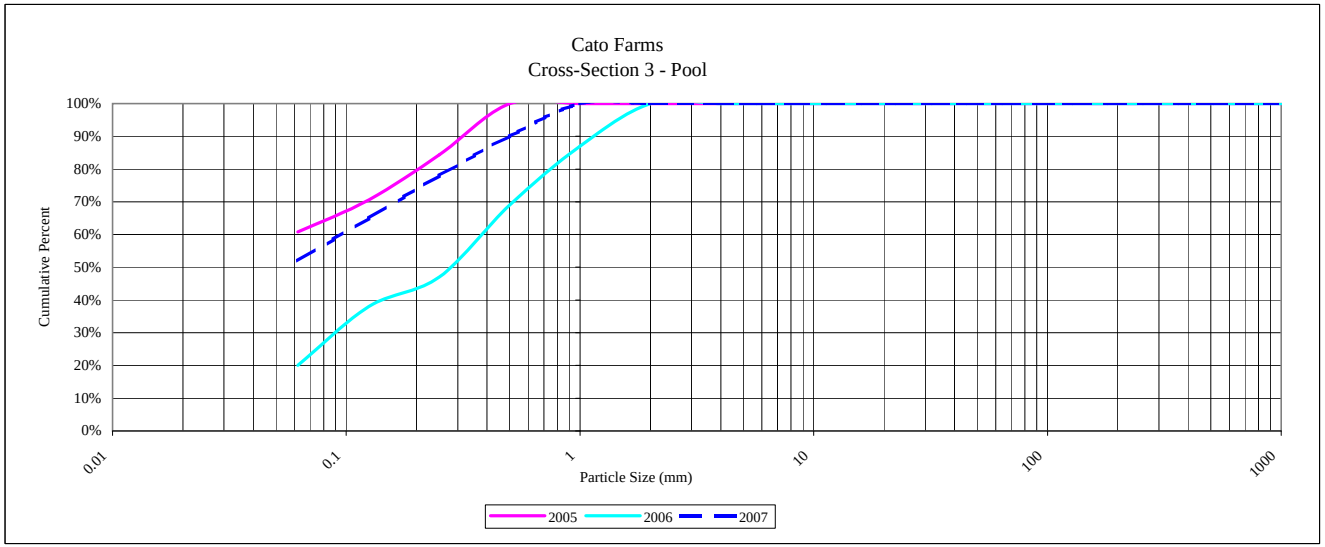


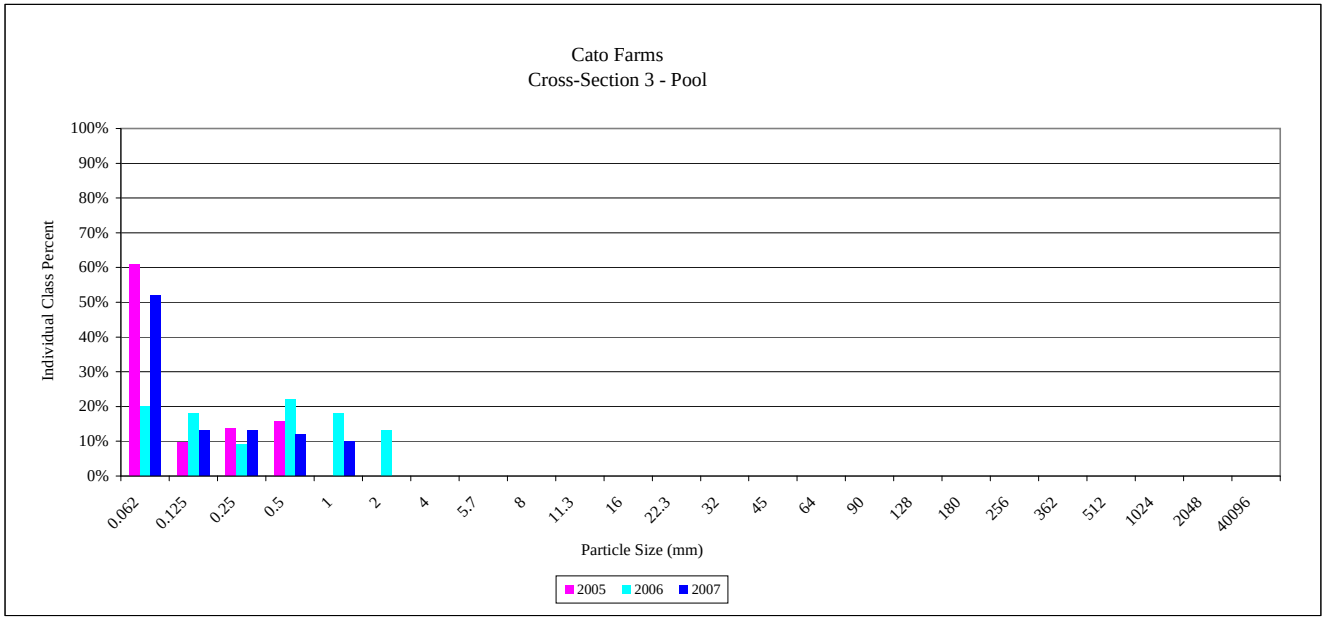
Appendix 2.8 Pebble Count Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5

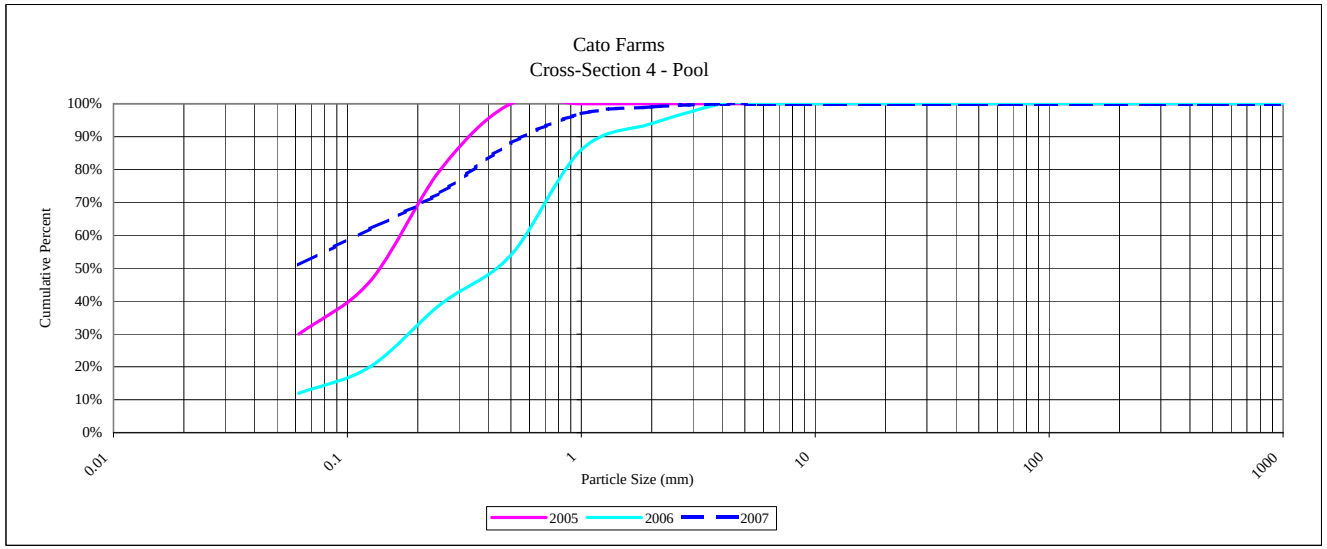


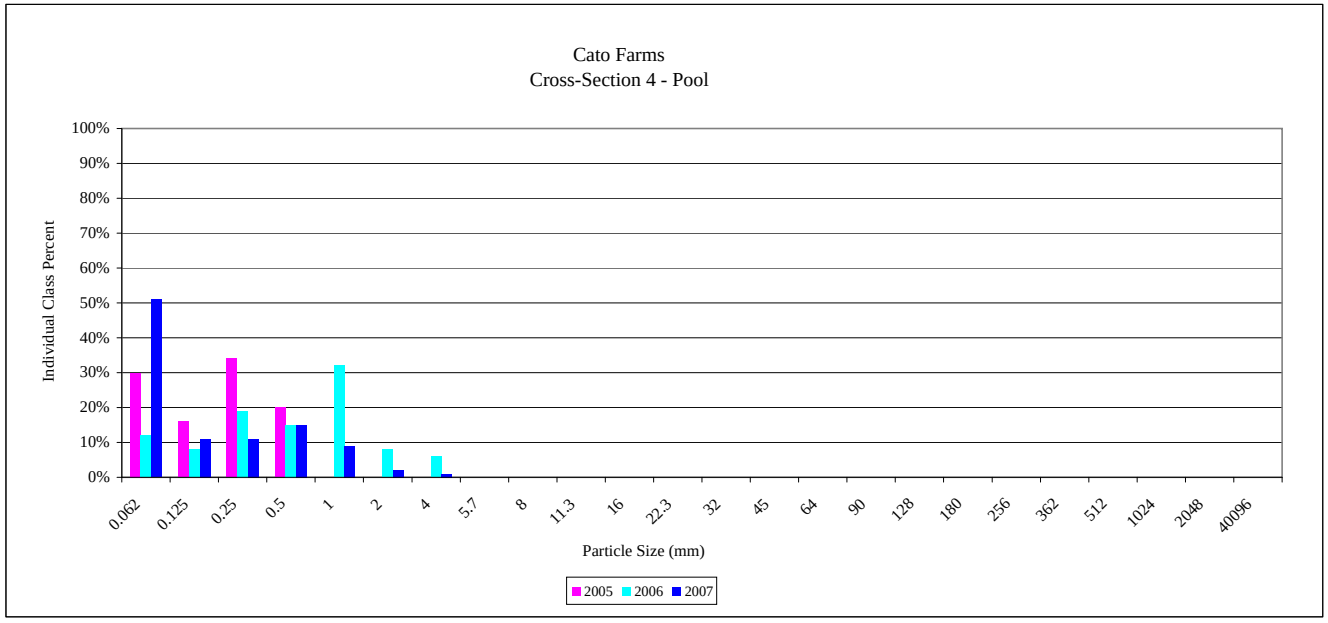


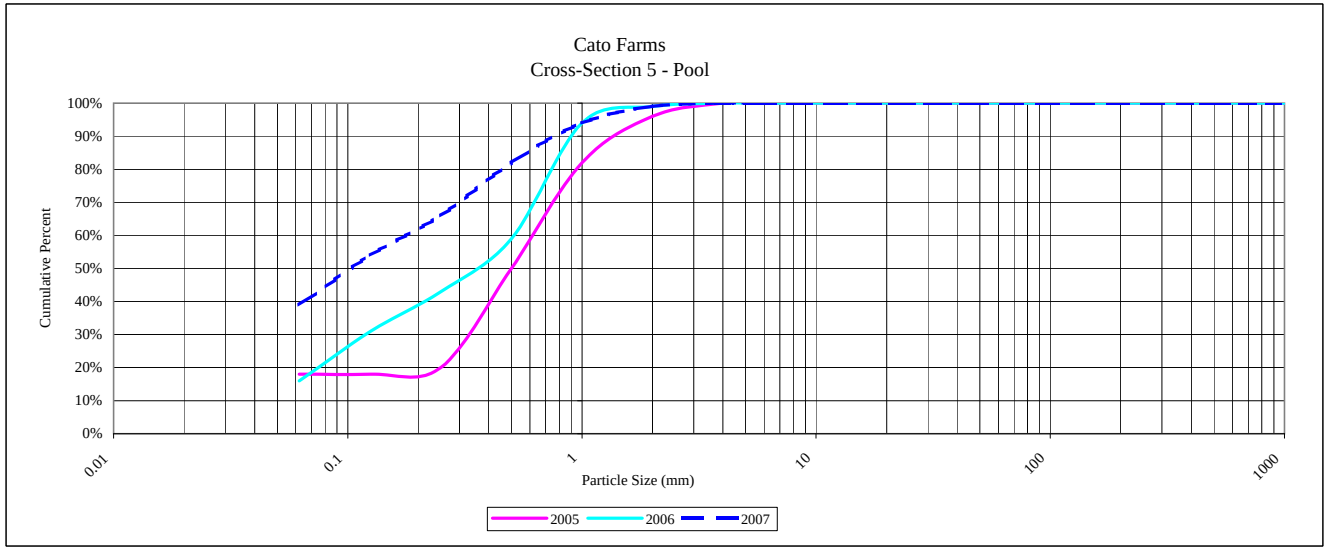
Appendix 2.8 Pebble Count Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5

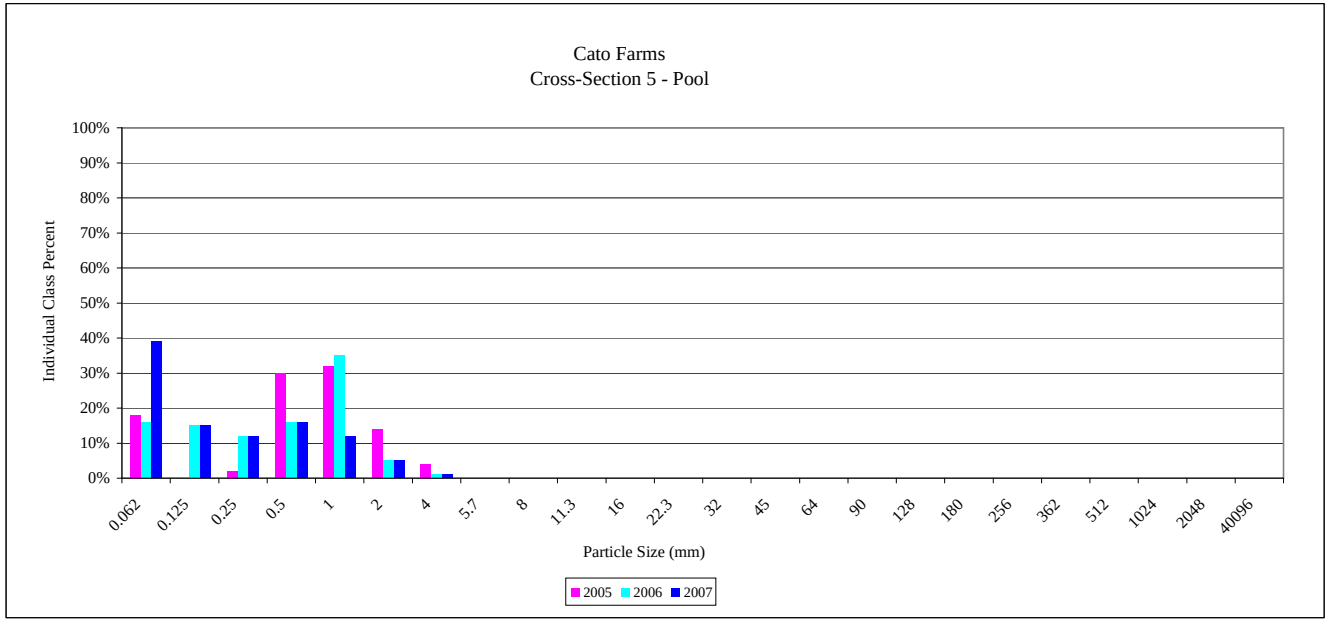

Cato Farms
Cross-Section 3 - Pool
Cumulative Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
Particle Size (mm)
2005
2006
2007


Cato Farms
Cross-Section 3 - Pool
Individual Class Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.3
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)
2005
2006
2007

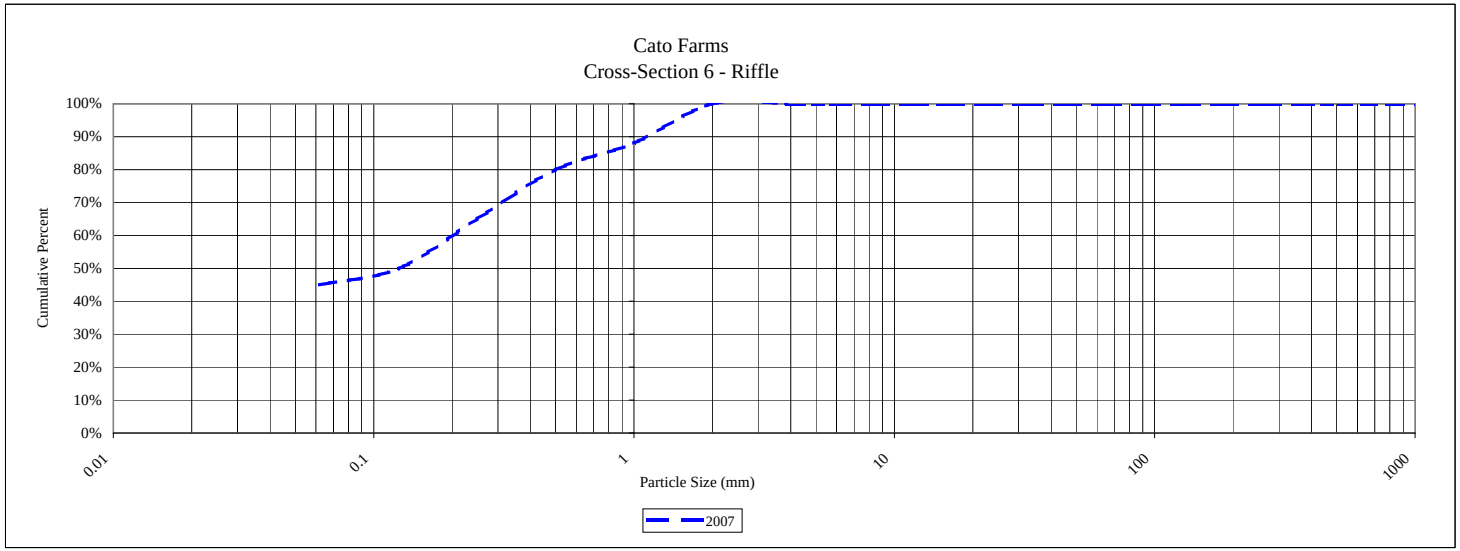

Cato Farms
Cross-Section 4 - Pool
Cumulative Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
Particle Size (mm)
2005
2006
2007

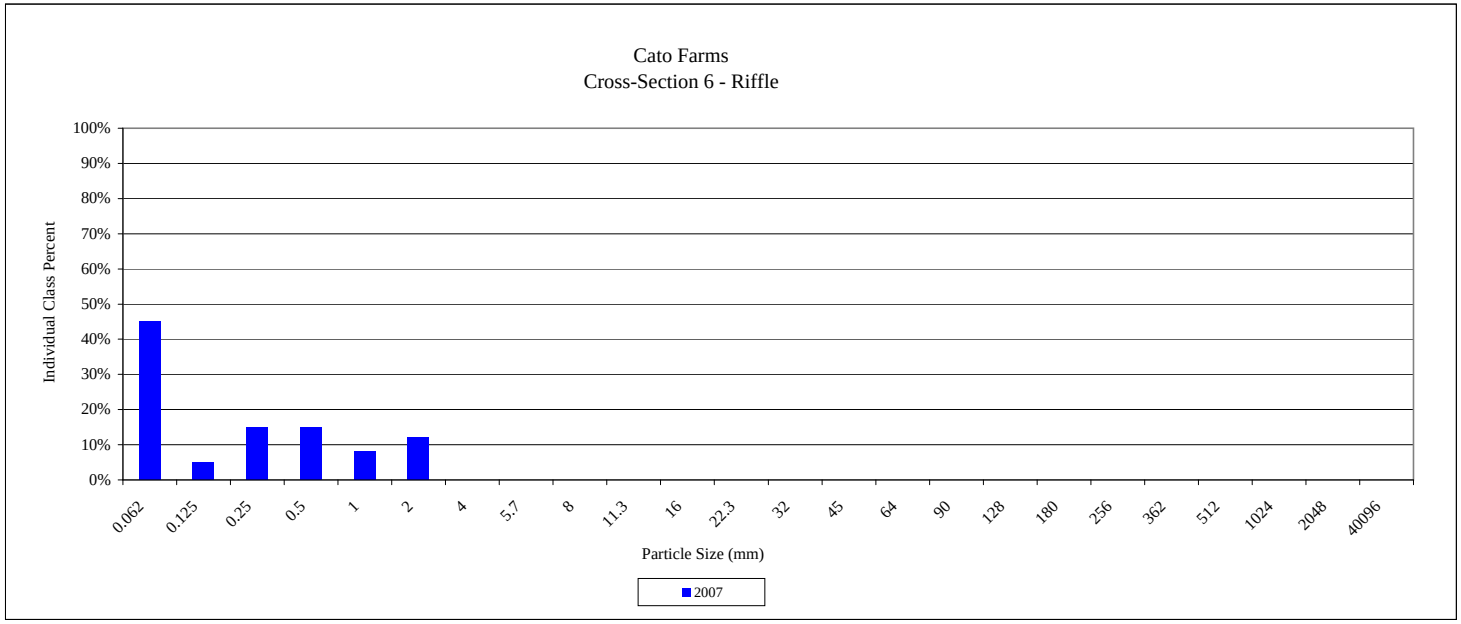

Cato Farms
Cross-Section 4 - Pool
Individual Class Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.3
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)
2005
2006
2007





Appendix 2.8 Pebble Count Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5



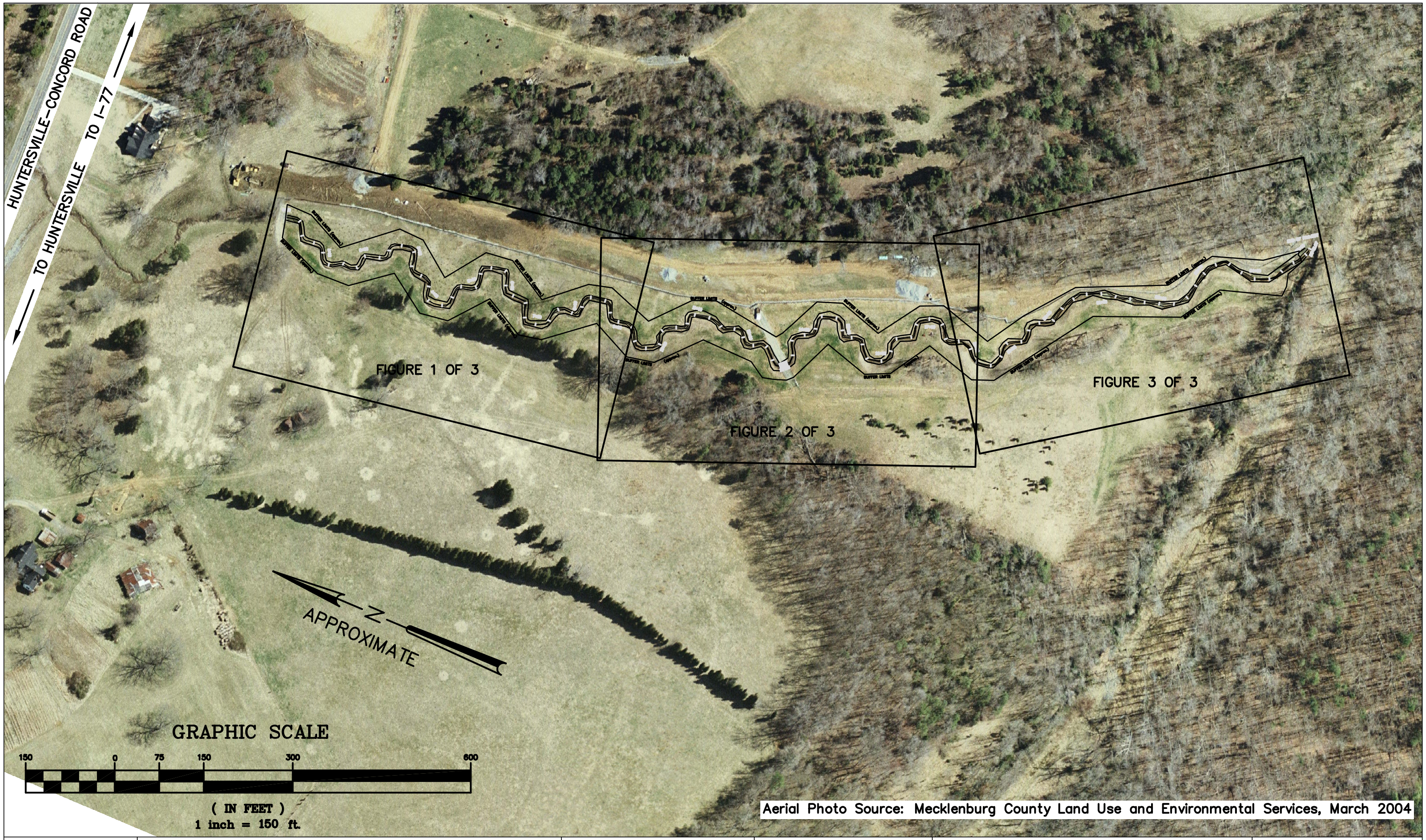


Appendix 2.8 Pebble Count Plots and Raw Data Tables
Cato Farms Stream Restoration
Year 3 of 5

Jordan Jones & Goulding

APPENDIX 3
INTEGRATED PROBLEM AREAS PLAN VIEW

1. Current Condition Plan View Map (Integrated)



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Ecosystem Enhancement PROGRAM

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

PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

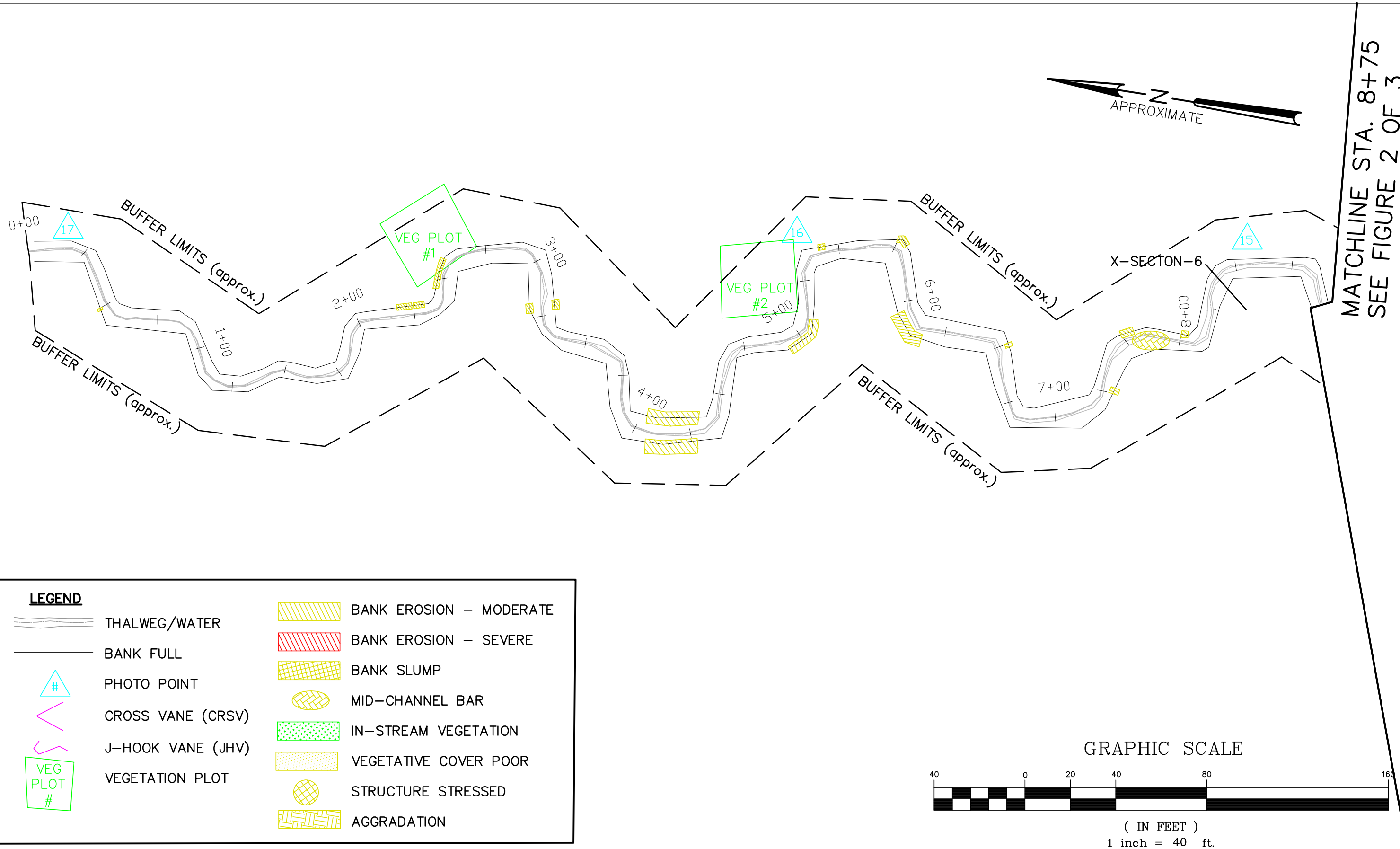
JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

APPENDIX 3
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2007
SCALE : 1"=150'
JOB NO.: 03060-001

FIGURE KEY



LEGEND

- THALWEG/WATER
- BANK FULL
- 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

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)

1 inch = 40 ft.

Ecosystem Enhancement PROGRAM

NOTES:
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PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

APPENDIX 3
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2007
SCALE : 1"=40'
JOB NO.: 03060-001

FIGURE 1 OF 3

MATCHLINE STA. 8+75
SEE FIGURE 1 OF 3

MATCHLINE STA. 17+75
SEE FIGURE 3 OF 3

APPROXIMATE N

BUFFER LIMITS (approx.)

BUFFER LIMITS (approx.)

BUFFER LIMITS (approx.)

BUFFER LIMITS

VEG PLOT #3

VEG PLOT #4

VEG PLOT #5

9+00

10+00

11+00

12+00

13+00

14+00

15+00

16+00

17+00

X-SECTON-5

X-SECTON-4

X-SECTON-3

BRIDGE

6 7 8 9 10 11 12 13 14

LEGEND

- THALWEG/WATER
- BANK FULL
- PHOTO POINT (#)
- CROSS VANE (CRSV)
- J-HOOK VANE (JHV)
- VEGETATION PLOT (VEG PLOT #)
- BANK EROSION – MODERATE
- BANK EROSION – SEVERE
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(IN FEET)

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Ecosystem Enhancement PROGRAM

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PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

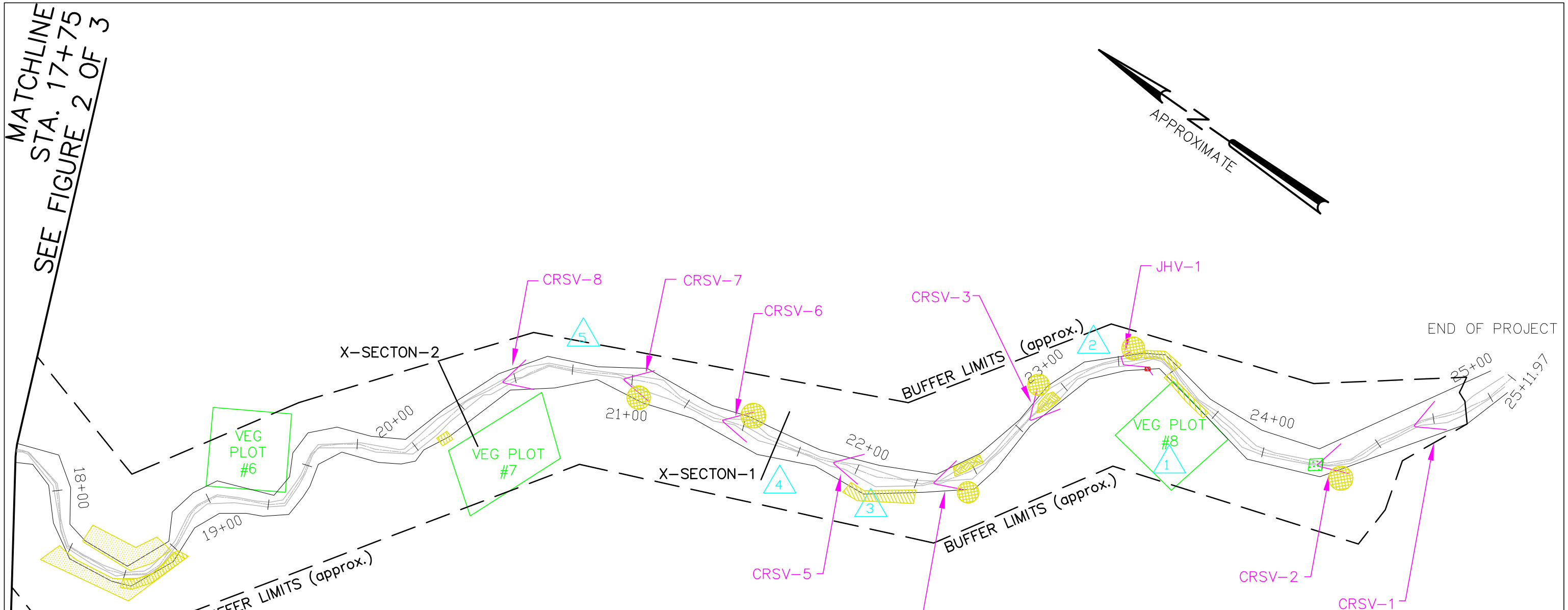
APPENDIX 3
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2007
SCALE : 1" = 40'
JOB NO.: 03060-001

FIGURE 2 OF 3

P:\03\03060\001\DWG\NCES001CS02.dwg, 2/25/2008 4:55:22 PM

MATCHLINE STA. 17+75 SEE FIGURE 2 OF 3



LEGEND

- THALWEG/WATER
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- STRUCTURE – STRESSED
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Ecosystem Enhancement PROGRAM

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PROJECT NO. 72
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 OF 5

JORDAN JONES & GOULDING

NC ECOSYSTEM ENHANCEMENT PROGRAM
CATO FARMS STREAM RESTORATION

APPENDIX 3
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2007
SCALE : 1" = 40'
JOB NO.: 03060-001

FIGURE 3 OF 3