

**Caviness Farm Stream Restoration Site
Randolph County, North Carolina
EEP Project No. 73**

**2008 Annual Monitoring Report
Monitoring Year 5**



Submitted to:

NCDENR EEP
1619 Mail Service Center
Raleigh, NC 27699-1619



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**CAVINNESS STREAM RESTORATION
2008 MONITORING REPORT**

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I. EXECUTIVE SUMMARY/PROJECT ABSTRACT

The following report summarizes the monitoring activities that have occurred in 2008 at the Caviness Farm Mitigation Site. The site is located in Randolph County, North Carolina. The project includes Tibbs Run and a tributary referred to as West Branch. The project is on an active cattle farm and the stream and riparian buffer have been fenced to exclude livestock. The site was designed during July 2003 and constructed in January 2004 by the North Carolina Department of Transportation (NCDOT) to provide 3,250 linear feet of mitigation credit. Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all offsite mitigation projects, including Caviness Farm (EEP project number 73). The EEP is responsible for fulfilling the remaining monitoring requirements and future remediation for this project. This report provides the monitoring results for the fifth year of monitoring. The Caviness Farm Site will be monitored through 2008 or until success criteria are met. No hydrologic monitoring or stream survey is required for this project; however, vegetation monitoring and an annual visual inspection of the channel for stability of structures are required for five years.

For the 2008 monitoring year, the average number of stems per acre on site is 587. The site met the interim success criteria of 320 trees per acre by the end of year three, and meets the final success criteria of 260 trees per acre by the end of year five. Vegetation across the site, including planted stems and natural regeneration vegetation, appears to be well established. Larger, mature trees are present throughout the restoration buffer. Natural regeneration of seedlings from these mature trees is present throughout the buffer area.

Areas exhibiting vegetative problems were observed, including invasive exotic species, and damaged livestock exclusion fencing. Three exotic and invasive species were observed within the mitigation area. These include Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), and Nepalese browntop (*Microstegium vimineum*). Occurrences of privet were observed to have the highest density from the confluence to the crossing on the Western Tributary (Sta. 50+00 to 53+40) and from NC 42 to the ford on the main channel (Sta. 10+00 to 18+50). Portions of the fence between the buffer and pasture have been damaged by livestock and needs to be repaired or replaced. Additional areas of fencing appear to be degraded and will need maintenance or repair. These areas were deemed minor, and currently pose only a small threat to vegetation success or project goals. In 2006 some beaver activity was observed at the very top of the main stem. They were removed in early 2007 by EEP's wildlife control contractor and during this time the site was in the peak of the historic drought. Little flow was exhibited in the channel for the remainder of 2007. Between May of 2008 and Fall of 2008, the beaver returned creating 6 dams on the project site and EEP has informed WKD that the beaver and the dams are currently being removed.

The stream channel was visually inspected during the Spring and Fall of 2008. A few structures were found throughout the site that were not performing as designed, along with minor instances of bank erosion due to lack of stabilization, though neither of these situations pose a threat to the overall success of the project. No remedial action is recommended for these areas at this time. Also, a debris jam located just upstream from a culvert crossing may present future issues. It is recommended that it be removed. Repairs are recommended for localized instances of damaged fencing. Overall, the Caviness Farm Stream Restoration Site remains stable and functional.

II. PROJECT BACKGROUND

A. Location and Setting

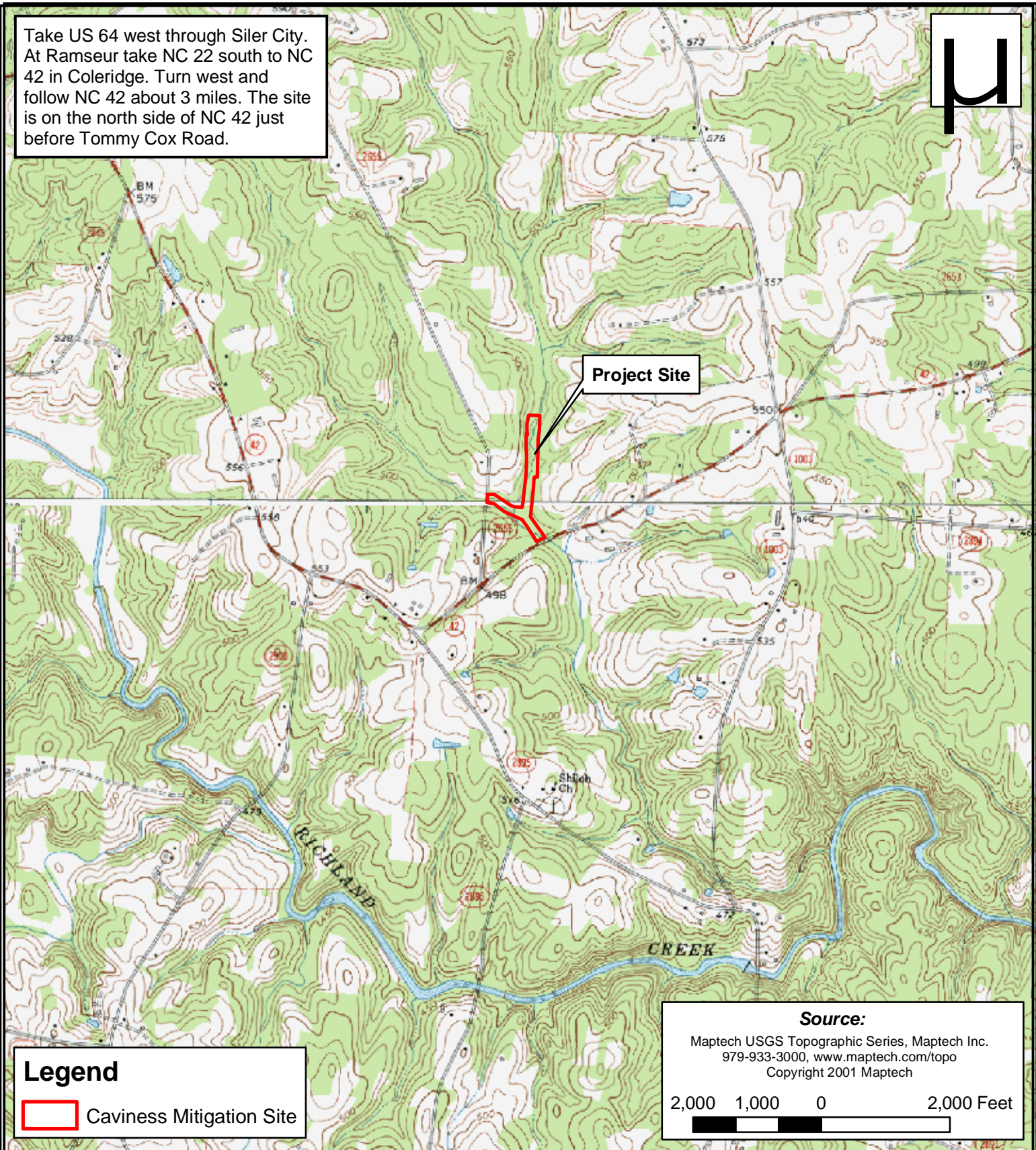
The Caviness Farm Stream Restoration Site provides 3,250 linear feet of mitigation that includes 2,255 linear feet of Tibbs Run and 810 linear feet of a tributary referred to as West Branch. The site is located between Asheboro and Coleridge near the intersection of Tommy Cox Road (SR 2655) and NC 42 in the southeastern portion of Randolph County, North Carolina (**Figure I**). To access the site take US 64 west through Siler City. At Ramseur take NC 22 south to NC 42 in Coleridge. Turn west and follow NC 42 about 3 miles. The site is on the north side of NC 42 just east of Tommy Cox Road. These streams are tributaries to the Haw River (USGS 8-digit hydrologic unit 03030003).

B. Project Restoration Components

Tibbs Run and its tributary, West Branch, are on an active cattle farm. The stream segments and adjacent floodplains were subject to unrestricted grazing. The upper reach of Tibbs Run was only slightly incised and retained much of its natural meander pattern. A mature tree canopy is present over much of the reach. The stream is bounded by active pasturelands, and riparian vegetation consisted only of early successional herbaceous vegetation. The mitigation plan consists of a Priority 1 restoration of both Tibbs Run and West Branch, along with establishment of a 50-foot vegetated buffer with cattle exclusion fencing. The purpose of this report is to detail the vegetation monitoring and visual stream assessment in 2008 at the Caviness Farm Restoration Site. No hydrologic monitoring is required for this site. Table I describes the project restoration components.

Table 1. Project Restoration Components Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73								
Project Segment or Reach ID	Existing Feet/Acres	Type	Approach	Footage or Acreage	Mitigation Ratio	Mitigation Units	Stationing	Comment
Tibbs Run		R	P1	2,255 ft			10+00 - 33+00	
West Branch		R	P1	810 ft			50+00 - 58+00	
Tibbs Run + West Branch Total				11 acres				
Buffer Area								
Mitigation Unit Summations								
Stream (lf)	Riparian Wetland	Nonriparian Wetland (Ac)	Total Wetland (AC)	Buffer (Ac)	Comment			
3,250	0.00	0.00	0.00	11.00				
R = Restoration		EII = Enhancement II		P1 = Priority I		P3 = Priority III		
EI = Enhancement I		S = Stabilization		P2 = Priority II		SS =Stream Bank Stabilization		

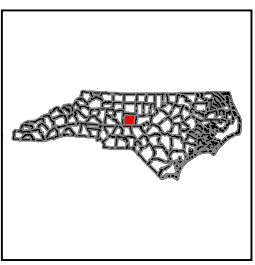
Take US 64 west through Siler City.
At Ramseur take NC 22 south to NC
42 in Coleridge. Turn west and
follow NC 42 about 3 miles. The site
is on the north side of NC 42 just
before Tommy Cox Road.



Legend
Caviness Mitigation Site

Source:
Maptech USGS Topographic Series, Maptech Inc.
979-933-3000, www.maptech.com/topo
Copyright 2001 Maptech

2,000 1,000 0 2,000 Feet



**FIGURE 01
VICINITY MAP**
Caviness Stream Mitigation Site
Randolph County, North Carolina

Map Produced: November 2008

C. Project History and Background

The Caviness Farm Site was constructed to provide 3,065 linear feet of mitigation credit for stream impacts associated with Transportation Improvement Program (TIP) number U-2524. Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all offsite mitigation projects, including Caviness. The EEP project number for Caviness Farm is 73. EEP is responsible for fulfilling the remaining monitoring requirements and future remediation for this project. The construction of Caviness Farm was completed in early 2004. Year 1 monitoring took place in 2004. Additional details regarding project contacts and the timeline and history of the project are provided in **Tables I, II, and III.**

Table II. Project Activity and Reporting History Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	NA*	May 2001
Final Design – 90%	NA*	July 2003
Construction	NA*	January 2004
Temporary S&E mix applied to entire project area		
Permanent seed mix applied to entire project area		
Containerized and B7B plantings for each reach/segments 1&2		
Mitigation Plan / As-built (Year 0 Monitoring – baseline)		2004
Year 1 Monitoring		2004
Year 2 Monitoring	November 2005	December 2005
Structural maintenance (bench expansion, vane adjustment) Reach 1		
Year 3 Monitoring	November 2006	December 2006
Supplemental planting of containerized material reach/segment 1		
Year 4 Monitoring	October 2007	December 2007
Year 5 Monitoring	October 2008	
Year 5 + Monitoring		
Bolded items represent those events or deliverables that are variable. Non-bolded items represent events that are standard components over the course of a typical project.		

*Historical project documents necessary to provide this data were not available at the time of this report submission

Table III. Project Contacts Table Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73	
Designer	HSMM 1305 Navaho Drive, Suite 303 Raleigh, NC 27609
Primary project design POC	Roy Currin (919) 878-5250
Construction Contractor	NCDOT
Monitoring Performers 2004	NCDOT
Monitoring Performers 2005	Earth Tech 701 Corporate Center Drive, Suite 475 Raleigh, NC 27612
Monitoring Performers 2006-2008	WK Dickson and Co., Inc. 720 Corporate Center Drive Raleigh, NC 27607
Stream Monitoring POC	Mr. Daniel Ingram (919) 782-0495
Vegetation Monitoring POC	Mr. Daniel Ingram (919) 782-0495

Table IV. Project Background Table Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73	
Project County	Randolph
Drainage Area	
Tibbs Run	3.3 sq. mi.
West Branch	1.13 sq. mi.
Drainage impervious cover estimate (%)	
Tibbs Run	<1%
West Branch	<1%
Stream Order	
Tibbs Run	3rd order
West Branch	2nd order
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt (45c)
Rosgen Classification of As-built	E5
Cowardin Classification	
Dominant soil types	List on new line for each project reach
	Georgeville silt loam
	Cecil sandy clay loam
	Appling sandy loam
	Vance sandy loam
Reference site ID	North Branch of Deaton
	Tributary to Sandy Creek
	Tributary to Tibbs Run
	Mud Lick Creek
USGS HUC for Project and Reference	3030003
NCDWQ Sub-basin for Project and Reference	3/6/2009
NCDWQ classification for Project and Reference	List on new line for each project reach
Tibbs Run	C
Tributary to Sandy Creek	WS-III
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	

D. Monitoring Plan View

Photographs were taken throughout the monitoring season to document the evolution of the restored stream channel. The locations of all photo points and vegetation plots are shown in **Figure 2** (Monitoring Plan View). There are 20 permanent photo points located at various points along the length of the channel. Three vegetation-monitoring plots 50 feet by 50 feet in size were randomly located within the riparian buffer of the Caviness Farm Stream Restoration project.

III. PROJECT CONDITION AND MONITORING RESULTS

Monitoring results are discussed below. An initial visual survey was conducted in April 2008 with a more detailed monitoring survey (evaluation of vegetation plots) conducted in October 2008.

A. Vegetation Assessment

Planted zones related to the stream restoration consist of the riparian buffer zone and the stream banks. The riparian buffer zone initiates at the top of the bank and continues out perpendicular to the immediate channel following the general pattern of the meandering channel. The planted stream bank initiates at the normal base flow elevation and extends to the top of bank or interface with the floodplain. This site contains approximately 11 acres of planted trees. Vegetative success criteria state that there must be a minimum of 320 trees per acre living after three years and 260 trees per acre after five years. **Appendix A** contains a site map and 2008 vegetation plot photos.

The following species were planted:

<u>Scientific Name</u>	<u>Common Name</u>
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Platanus occidentalis</i>	Sycamore
<i>Quercus falcata</i>	Southern Red Oak
<i>Quercus alba</i>	White Oak
<i>Quercus phellos</i>	Willow Oak

1. Soil Data

Table V. Preliminary Soil Data					
Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73					
Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
Georgeville	63	5-27	0.43	4	0.5-2.0
Cecil	75	5-20	0.28	4	0.5-1.0
Appling	65	5-20	0.24	4	0.5-2.0
Vance	72	8-20	0.24	3	0.5-2.0

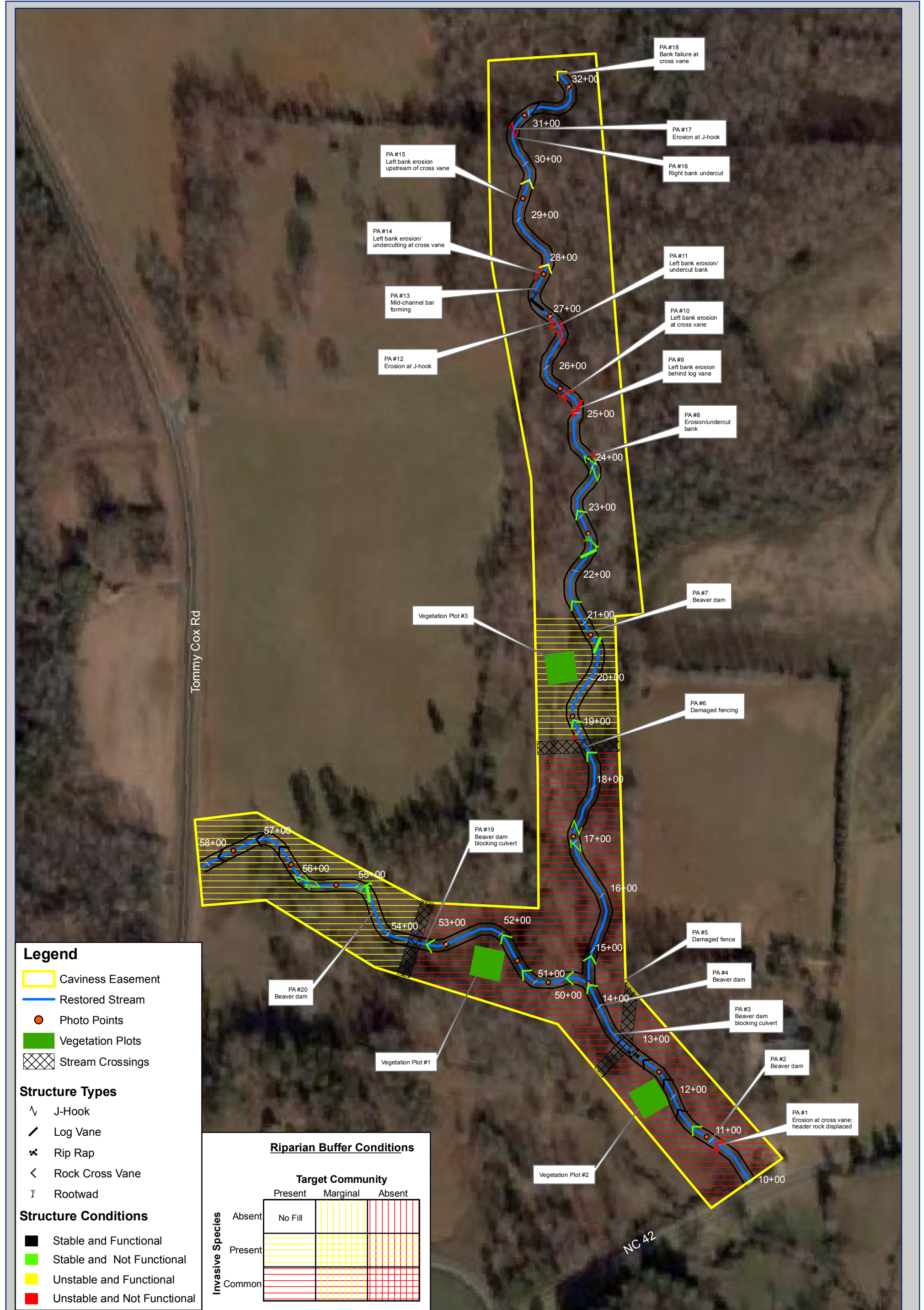


Figure 2
Caviness Current Conditions Plan View
Year 4 Monitoring
October 2008

0 75 150 300 Feet
 1 inch equals 150 feet



2. Vegetative Problem Areas

Areas exhibiting vegetative problems were observed, including exotic invasive species, and stability of livestock exclusion fencing. Three exotic and invasive species were observed within the mitigation area. These include Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), and Nepalese browntop (*Microstegium vimineum*). The Japanese honeysuckle and browntop are locally significant. Nearly all occurrences of the privet were observed below the crossing on the Western Tributary and below the ford on the main channel. The large privet previously identified in VP 2 is still present and producing fruits. EEP does not generally consider these invasive species to be “high threat”, meaning they are not likely to impact the sites functionality in a substantial way. No remedial action is recommended for these invasive species.

The area in Plot 3 that had been mowed appears to have recovered. Fencing at the crossing downstream from this plot has not been repaired and has suffered additional damage from flooding. This fencing needs to be repaired. Fencing in a number of areas throughout the easement boundary appears degraded and needs repair and maintenance. These areas were deemed minor and pose no immediate threat to vegetation success or project goals. Specific areas of bare banks, failures, and damaged fencing are marked on the Current Conditions Plan View in **Appendix B**. All vegetative problem areas and the vegetative plan view are provided in **Appendix A**.

3. Stem Counts

Stem counts were conducted on October 1, 2008 applying the NCDOT Stem Counting Protocol and using Radford’s *Manual of the Vascular Flora of the Carolinas* for taxonomic identification. The 2008 vegetation monitoring of the site shows a calculated average tree density of 587 trees per acre (**Table VI**). Most of the tree stems show vigorous growth and many have created a shaded understory condition. The mortality observed is likely due to an inability of smaller weaker stems to survive under the increasing shade of the more vigorous stems.

For the 2008 monitoring year, the average number of stems per acre on site is 587. The site met the interim success criteria of 320 trees per acre by the end of year three, and meets the final success criteria of 260 trees per acre by the end of year five.

The number of stems in Plots 2 and 3 decreased and stems in Plot 1 remained the same. The change in Plots 2 and 3 is likely due to the weaker stems inability to survive under the shade of the developing canopy. The species showing the largest decrease is green ash. The most vigorous species planted is the sycamore.

**Table VI: Stem counts for each species arranged by plot.
Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73**

Species		Plots (50 t x50 ft)			Year 1 Totals	Year 2 Totals	Year 3 Totals	Year 4 Totals	Year 5 Totals
Scientific Name	Common Name	VP1	VP2	VP3	(2004)	(2005)	(2006)	(2007)	(2008)
Shrubs									
No Shrubs were planted									
Trees									
<i>Fraxinus pennsylvanica</i>	Green ash	3	11	8	27	39	32	31	22
<i>Platanus occidentalis</i>	Sycamore	9	22	7	39	49	48	43	38
<i>Quercus alba</i>	White oak	14	5	8	31	35	24	29	27
<i>Quercus falcata</i>	Southern red oak	2	1	0	19	5	4	3	3
<i>Quercus phellos</i>	Willow oak	6	0	5	0	13	11	11	11
Planted Stem Survival Summary Data		Stems per Plot			Average # Stems				
Initial Stems Planted		41	55	55	50.3				
Year 1		38	52	45	45.0				
Year 2		35	65	40	46.7				
Year 3		33	58	28	39.7				
Year 4		34	51	32	39.0				
Year 5		34	39	28	33.7				
		Percent Survival			Average				
Year 1		93%	95%	82%	90%				
Year 2		85%	118%	73%	92%				
Year 3		80%	105%	51%	79%				
Year 4		83%	93%	58%	78%				
Year 5		83%	71%	51%	67%				
		Stems per Acre			Average				
Initial Planting Density		714	958	958	877				
Year 1		662	906	784	784				
Year 2		610	1133	697	813				
Year 3		575	1011	488	691				
Year 4		592	889	558	680				
Year 5		592	680	488	587				

*Plot size is 2500 square feet (0.574 ac) *Survival based on initial planted stem count*

4. Vegetation Plot Photos

Photos of the vegetation plots are located in **Section A-2 of Appendix A.**

5. General Site Vegetation Notes

Vegetation across the site, including planted stems and natural regeneration vegetation, appears to be well established. Larger, mature trees are present throughout the restoration buffer. Natural regeneration of seedlings from these mature trees is occurring throughout the buffer area. Many seedlings found in the plots that are due to this natural recruitment include American sycamore, green ash, black willow (*Salix nigra*), box elder (*Acer negundo*), sweet gum (*Liquidambar styraciflua*), and tulip poplar (*Liriodendron tulipifera*). Plot 2 has a high density of sweetgum saplings that are competing with all stems not in the canopy. Silky willow (*Salix sericea*) and silky dogwood (*Cornus amomum*) are growing along the stream banks. Three exotic and invasive species were observed within the mitigation area. These include Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), and Nepalese browntop (*Microstegium*

vimineum). Occurrences of the privet were observed to have the highest density below the crossing on the Western Tributary and below the ford on the main channel.

The herbaceous cover at the site is becoming diverse, and it is good where it is not affected by larger trees or dense seedlings and. Herbaceous species observed include arrowleaf tearthumb (*Polygonum sagittatum*), Canada goldenrod (*Solidago canadensis*), common rush (*Juncus effusus*), dog fennel (*Eupatorium capillifolium*), jewelweed (*Impatiens capensis*), Nepalese browntop (*Microstegium vimineum*), sawtooth blackberry (*Rubus argutus*), tall pasture fescue (*Lolium arundinaceum*), and wingstem (*Verbesina alternifolia*). The fescue is limited in occurrence, and it is only significant along the fence line.

Portions of the fence between the buffer and pasture have been damaged by livestock, and need to be repaired or replaced. Additional areas of fencing appear to be degraded and need maintenance or repair. These areas were deemed minor, but they may pose a threat to vegetation success or project goals should livestock be allowed access to the restoration area. Beaver activity appears to be significant throughout the project. Six beaver dams were observed, two of which span the channel and two are partially blocking culverts. The continued cutting of live stems by beavers for construction of the beaver dams may threaten the overall vegetative success of the site if the beaver persist.

B. Stream Assessment

1. Success Criteria

Per the draft planning document dated September 2001, photographs taken throughout the monitoring period will be used to subjectively evaluate channel aggradation or degradation, bank erosion, growth of riparian vegetation, and the effectiveness of erosion control measures. Longitudinal photos taken will indicate the absences of developing bars within the channel or an excessive increase in channel depth. As a Priority 1 project this stream should provide long-term stability to the channel and result in regular bankfull discharge within the project. No documentation of cross-sections or profiles is required, and none were performed for this annual monitoring report or for the 2005, 2006, and 2007 annual monitoring reports.

2. Stream Description

Tibbs Run and its tributary, West Branch, are on an active cattle farm. The stream and riparian buffer have been fenced to exclude livestock. The stream was bounded by active pasturelands, and riparian vegetation consisted only of early successional herbaceous vegetation. The project consists of a Priority 1 restoration on both Tibbs Run and West Branch, along with establishment of a 50-foot vegetated buffer with cattle exclusion fencing. The proposed design for these channels was an E5 stream type. Only photographic documentation and subjective evaluation of channel aggradation or degradation and bank erosion is required.

3. Stream Problem Areas

In the course of 2008 monitoring activities, 20 problem areas were identified. These areas are discussed below in **Table VII** and can be located on the Caviness Farm Current Conditions Plan View figure in **Appendix B** along with photos of each problem.

**Table VII. Stream Problem Areas
Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73**

Feature Issue	Station Numbers	Suspected Cause	Photo Number	Structure Status
Erosion at Cross Vane	10+75	Incorrect installation, header rock displaced	PA #1	UN
Beaver Dam	11+00	Beaver activity	PA #2	--
Beaver Dam blocking Culvert	13+50	Beaver activity	PA #3	--
Beaver Dam	14+00	Beaver activity	PA #4	--
Damaged Fence	~14+00 on L Bank	Cattle; Improper fence installation	PA #5	--
Damaged Fence	18+50	Fence delimiting crossing has been removed	PA #6	--
Beaver Dam	20+80	Beaver activity	PA #7	--
Erosion undercut bank	24+25	Tree falling across channel	PA #8	--
L Bank Erosion Behind Log Vane	25+00	Lack of bank stabilization, incorrect structure installation	PA #9	UN
L Bank Erosion at Cross Vane	25+40	Lack of bank stabilization, incorrect structure installation	PA #10	UN
L Bank Erosion/Undercut Bank	26+50 to 27+00	Undercut Bank	PA #11	--
Erosion at J-hook	27+00	Incorrect installation, header rock displaced	PA #12	UN
Mid-Channel Bar Forming	27+60	Channel is too wide	PA #13	--
L Bank Erosion/Undercutting at Cross Vane	27+80	Lack of bank stabilization, incorrect structure installation	PA #14	UF
L Bank Erosion Upstream of Cross Vane	29+40	Incorrect structure installation and tree undercut and in channel	PA #15	UF
R Bank Undercut	30+50	Undercut Bank	PA #16	--
Erosion at J-hook	30+80	Incorrect installation, header rock displaced	PA #17	UN
Bank Failure at Cross Vane	32+25	Lack of bank stabilization, incorrect structure installation	PA #18	UF
Beaver dam blocking culvert	53+25	Beaver activity	PA #19	--
Beaver dam	54+50	Beaver activity	PA #20	--

UN Unstable – Nonfunctional
UF Unstable – Functional

SN Stable – Nonfunctional
SF Stable – Functional

A number of rock structures are unstable and nonfunctional, but do not appear to pose a threat to channel stability or project goals. Erosion of the banks appears to be increasing throughout the upper portion of Reach 1 between station 24+00 and 32+00. Currently the larger trees are helping maintain stabilization of the channel through this portion. Seven structures were deemed unstable; two of these still functional. There are six instances of minor bank erosion at structures. These problem areas could be caused by incorrect installation and lack of adequate vegetative bank stabilization. Additionally, four instances of bank erosion and slumping are present from bank undercutting and lack of bank stabilization. The proportionality of unstable banks has increased

from 3.2 percent in 2007 to 4.8 percent in 2008, a relatively minor increase and well within normal tolerances. A mid-channel bar is forming where the channel is overly wide at Station 27+60.

The beaver activity has partially blocked two culvert crossings. Without prompt maintenance, these areas could become blocked and potentially wash out the culvert crossings. The beaver dam at station 14+00 has obstructed the channel completely. Structures were not assessed where the channel is flooded because of lack of visibility. The displaced boulders from the rock cross vanes could create debris jams or other forms of bed erosion such as scouring and head cuts, but appear to pose not threat to the overall success of the project. Other minor areas of erosion and aggradation were noted during field investigations.

The vegetative cover is extensive on this site and includes mature trees in the riparian area where many of these issues were noted between stations 21+00 and 32+00. The areas behind the beaver dams were not visible, and based on the previous monitoring report in 2007, some of these structures may be unstable and non-functional.

4. Stream Conclusions

Overall, the Caviness Farm Stream Restoration Site has remained geomorphically stable with localized minor areas of erosion. A few structures are not performing as designed, and bank erosion and slumping are an issue in other areas due to lack of vegetative bank stabilization. Additionally, a mid-channel bar is forming where the channel is overly wide. A number of structures are inundated because of beaver dams and are not visible. The beaver dams are causing flooding on the site, which could lead to further areas of bank erosion. Wrack lines have been observed during the 2008 site visits, indicating the presence of out-of-bank flow at least twice during this monitoring season.

Seven structures exhibited loss of bank protection due to erosive forces, but remain stable. The debris jams and beaver dams present concern and it is recommended that they be removed. Some areas of damaged fences appear to have been repaired by the landowner. However, several areas show evidence of continued cattle damage. If the damage becomes worse, cattle could get into the easement and threaten the success of the site. It is recommended that the damaged fencing be repaired or replaced.

5. Fixed Photo Station Photos

Photos from established photo points were collected on October 1, 2008 during the stream monitoring activities. These photos are included in **Appendix B**.

6. Stream Problem Area Photos

Representative photos of each stream problem area were taken and are shown in **Appendix B**.

IV. RECOMMENDATIONS

The Caviness Farm Stream Restoration Site remains stable and functional through Year 5 monitoring. Several rock structures were installed incorrectly which caused scouring and bank erosion, though they remain stable. The beaver dams on the site are causing flooding, which may cause increased erosion and could lead to further areas of erosion. It is recommended that the beaver and their dams be removed. The project's success could also be threatened if cattle get

into the easement because of damaged fencing. It is recommended that the damaged fencing be repaired or replaced, and that the fencing be maintained over time.

References:

USACOE (2003) *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ

USACOE (1987) *Corps of Engineers Wetlands Delineation Manual*. Tech report Y-87-1.
AD/A176.

Rosgen, D.L. (1996) *Applied River Morphology*. Wildland Hydrology Books, Pagosa Springs,
Co.

Radford, A.E., H.E. Ahles and F.R. Bell. 1968. *Manual of the Vascular Flora of the Carolinas*.
The University of North Carolina Press, Chapel Hill, North Carolina.

APPENDIX A-VEGETATION RAW DATA

A-1 VEGETATION MONITORING PLOT PHOTOS

A-2 VEGETATION PROBLEM AREAS SUMMARY TABLE (A.1)

Appendix A, Section A-1. Vegetation Monitoring Plot Photos



Photo 1. Vegetation Plot 1



Photo 2. Vegetation Plot 1



Photo 3. Vegetation Plot 2



Photo 4. Vegetation Plot 2



Photo 5. Vegetation Plot 3



Photo 6. Vegetation Plot 3

Appendix A, Section A-2. Vegetative Problem Areas Summary Table

Table A.1. Vegetative Problem Areas Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73			
Feature/Issue	Station # / Range	Probable Cause	Photo #
Invasive/Exotic	10+00 to 21+00	Invasive species common	PA #1
Populations	50+00 to 58+00	Invasive species common	PA #2

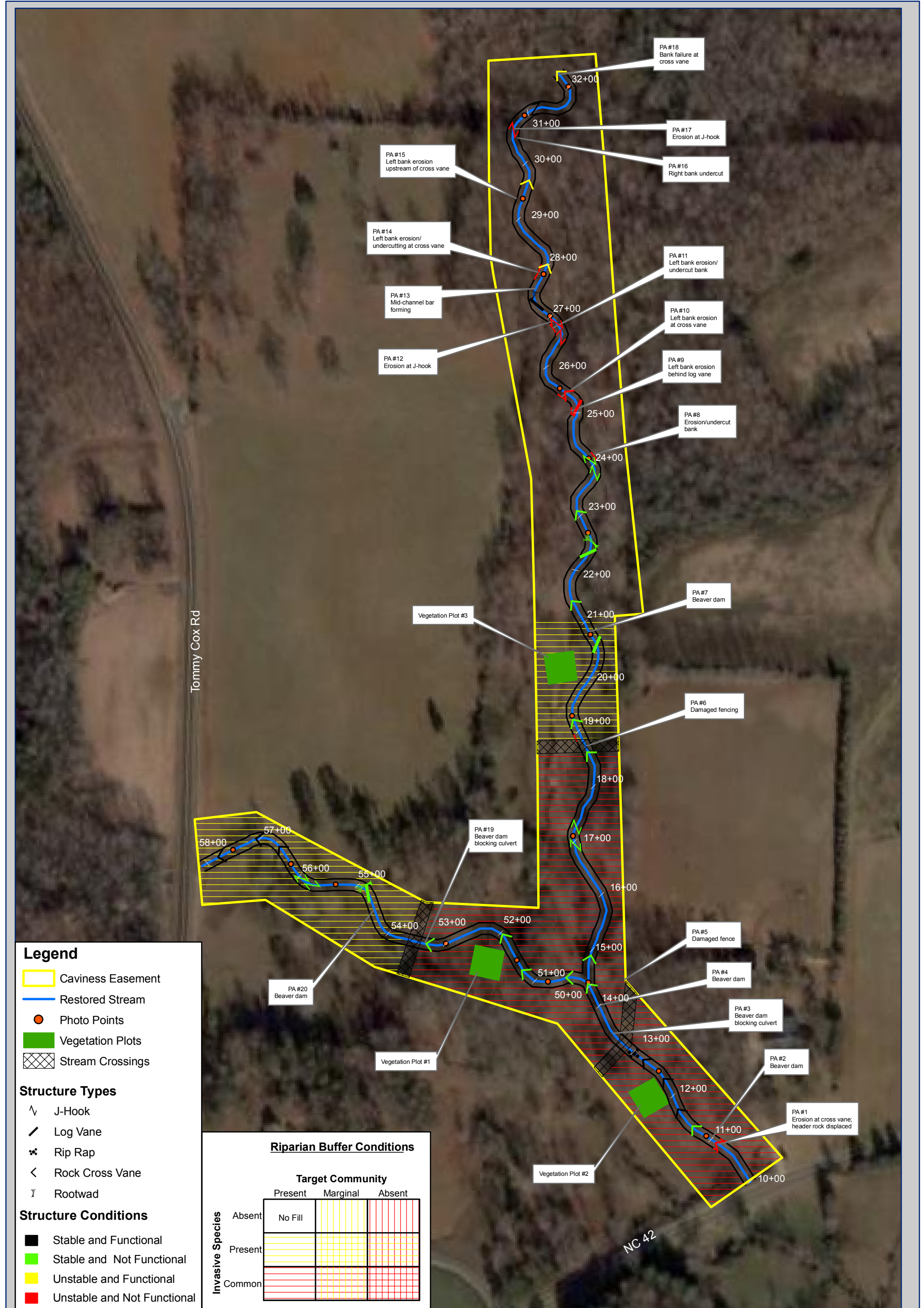
APPENDIX B-GEOMORPHOLOGIC RAW DATA

B-1 CURRENT CONDITIONS PLAN VIEW

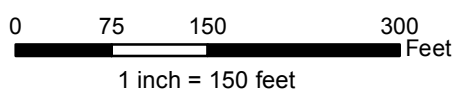
B-2 STREAM PROBLEM AREAS SUMMARY TABLE (B.1)

B-3 REPRESENTATIVE STREAM PROBLEM AREA PHOTOS

B-4 STREAM PHOTO STATION PHOTOS



Appendix B, Section B-1
Caviness Current Conditions Plan View
Year 5 Monitoring
October 2008



Appendix B, Section B-2. Stream Problem Areas Summary Table

Table B.1. Stream Problem Areas Caviness Farm (Tibbs Run) Stream Restoration Site/Project No. 73				
Feature Issue	Station Numbers	Suspected Cause	Photo Number	Structure Status
Erosion at Cross Vane	10+75	Incorrect installation, header rock displaced	PA #1	UN
Beaver Dam	11+00	Beaver activity	PA #2	--
Beaver Dam blocking Culvert	13+50	Beaver activity	PA #3	--
Beaver Dam	14+00	Beaver activity	PA #4	--
Damaged Fence	~14+00 on L Bank	Cattle; Improper fence installation	PA #5	--
Damaged Fence	18+50	Fence delimiting crossing has been removed	PA #6	--
Beaver Dam	20+80	Beaver activity	PA #7	--
Erosion undercut bank	24+25	Tree falling across channel	PA #8	--
L Bank Erosion Behind Log Vane	25+00	Lack of bank stabilization, incorrect structure installation	PA #9	UN
L Bank Erosion at Cross Vane	25+40	Lack of bank stabilization, incorrect structure installation	PA #10	UN
L Bank Erosion/Undercut Bank	26+50 to 27+00	Undercut Bank	PA #11	--
Erosion at J-hook	27+00	Incorrect installation, header rock displaced	PA #12	UN
Mid-Channel Bar Forming	27+60	Channel is too wide	PA #13	--
L Bank Erosion/Undercutting at Cross Vane	27+80	Lack of bank stabilization, incorrect structure installation	PA #14	UF
L Bank Erosion Upstream of Cross Vane	29+40	Incorrect structure installation and tree undercut and in channel	PA #15	UF
R Bank Undercut	30+50	Undercut Bank	PA #16	--
Erosion at J-hook	30+80	Incorrect installation, header rock displaced	PA #17	UN
Bank Failure at Cross Vane	32+25	Lack of bank stabilization, incorrect structure installation	PA #18	UF
Beaver dam blocking culvert	53+25	Beaver activity	PA #19	--
Beaver dam	54+50	Beaver activity	PA #20	--

Appendix B, Section B-3. Representative Stream Problem Area Photos



PA #1 – Erosion at cross vane; header rock displaced. Sta. 10+75



PA #2 – Beaver dam. Sta. 11+00



PA #3 – Beaver dam at culvert. Sta. 13+50



PA #4 – Beaver dam. Sta. 14+00



PA #5 – Damaged fence. Sta. 14+00



PA#6 – Damaged fence. Sta. 18+50



PA #7 – Beaver dam. Sta. 20+80



PA #8 – Bank erosion/tree falling across channel. Sta. 24+25



PA #9 – Left bank erosion behind log vane. Sta. 25+00



PA #10 – Left bank erosion at cross vane. Sta. 25+60



PA #11 – Left bank erosion/undercut bank. Sta. 26+50 to 27+00



PA #12 – Erosion at J-hook; header rock displaced. Sta. 27+00



PA #13 – Mid-Channel bar forming. Sta. 27+60



PA #14 – Left bank erosion/undercutting at cross vane. Sta. 27+80



PA #15 – Left bank erosion upstream of cross vane. Sta. 29+40



PA #16 – Right bank undercut. Sta. 30+50



PA #17 – Erosion at cross vane. Sta. 30+80



PA #18 – Bank failure at cross vane. Sta. 32+00



PA #19 – Beaver dam at culvert. Sta. 53+25



PA #20 – Beaver dam. Sta. 54+50

Appendix B, Section B-4. Stream Photo Station Photos



Photo Point 1 – facing upstream. Sta. 11+10



Photo Point 2 – facing upstream. Sta. 12+50



Photo Point 3 – facing upstream. Sta. 14+34



Photo Point 4 – facing upstream. Sta. 17+10



Photo Point 4 – facing downstream. Sta. 17+10



Photo Point 5 – facing upstream. Sta. 19+25



Photo Point 6 – facing upstream. Sta. 12+80



Photo Point 7 – facing upstream. Sta. 22+70



Photo Point 7 – facing downstream. Sta. 22+70



Photo Point 8 – facing upstream. Sta. 24+15



Photo Point 9 – facing left bank. Sta. 25+60



Photo Point 10 – facing left bank. Sta. 27+00



Photo Point 11 – facing left bank. Sta. 27+80



Photo Point 12 – facing left bank and downstream. Sta. 29+40



Photo Point 13 – facing upstream. Sta. 29+90



Photo Point 14 – facing upstream. Sta. 32+00



Photo Point 15 – facing upstream. Sta. 50+80



Photo Point 15 – facing downstream. Sta. 50+80



Photo Point 16 – facing upstream. Sta. 51+00



Photo Point 17 – facing upstream. Sta. 53+00



Photo Point 18 – facing upstream. Sta. 55+40



Photo Point 18 – facing downstream. Sta. 55+40



Photo Point 19 – facing upstream. Sta. 56+30



Photo Point 19 – facing downstream. Sta. 56+30



Photo Point 20 – facing upstream. Sta. 57+50



Photo Point 20 – facing downstream. Sta. 57+50