

**RACEY MITIGATION SITE ON LAXON CREEK,
WATAUGA COUNTY**

Year 5 Monitoring Report

Period Covered: July 31, 2005 - June 27, 2006

Prepared for the

North Carolina Ecosystem Enhancement Program



North Carolina Wildlife Resources Commission
Division of Inland Fisheries
Watershed Enhancement Group
Raleigh

This report summarizes the 2006 monitoring data collected from 1,160 linear feet of stream channel on Laxon Creek at the Racey stream mitigation site in Watauga County (Figure 1), and compares it with four previous years of monitoring data. Mickey and Scott (2001) described pre-construction survey methods, site conditions, and project objectives. The purpose of the project was to improve aquatic habitat, reestablish riparian area vegetation, and establish stream channel stability. This monitoring report is submitted as partial fulfillment of the off-site stream mitigation requirements of the North Carolina Department of Transportation (NCDOT) for the R-0529 US 421 road improvement project in Watauga County. For that project, a total of 14,814 linear feet of stream mitigation were required by the United States Army Corps of Engineers (USACE) Section 404 permit and 7,407 linear feet of mitigation were required by the North Carolina Division of Water Quality (NCDWQ) Section 401 water quality certification.

From 2000 to 2005 all reports associated with this mitigation site were prepared for the NCDOT stream mitigation program. In 2005, responsibility for this site was transferred from NCDOT to the North Carolina Ecosystem Enhancement Program (EEP). This document was prepared using guidelines developed by the North Carolina Wildlife Resources Commission. This was done to maintain consistency with earlier reports and to facilitate the comparison of the 2006 data with previous years' data.

Monitoring

The 2006 monitoring survey data were collected on May 17 and 18. These data are compared with as-built data and the previous years monitoring data (Mickey and Scott 2001; Mickey and Hining 2003; Mickey and Wasseen 2006). The 2006 monitoring survey included a longitudinal profile, channel cross-section dimension measurements, pebble counts, and woody plant stem counts (planted trees/live stakes). A photographic chronology of the site was maintained at three locations: stations 1+88, 7+33, and 8+40 (Appendices 1-3). Photographs are taken looking upstream.

Bankfull Events

Bankfull flow events were documented through review of the United States Geological Survey's South Fork New River flow gage (gage number 03161000) near Jefferson, North Carolina, by photographs and by personal observations of bankfull stage pins placed on site. Bankfull at the Racey site corresponded to approximately 1,800 cubic feet per second at the gage station. However, due to the localization of many rain events, some bankfull events could only be confirmed by direct observation (visiting the site after a rain event or through contact with the landowner). Since completion of the project there have been 14 bankfull or greater events at the site (Table 1).

Longitudinal Profile

Prior longitudinal profile survey data indicated little change in the channel thalweg (Figure 2). Visual observations prior to the 2006 longitudinal profile survey revealed the channel had changed little from previous surveys; therefore a decision was made to collect longitudinal

profile data only from station 0+0 to 4+00; approximately one-third the project length (Figure 2). The remaining portion of the channel was to be surveyed if the data showed a significant change in the channel thalweg. There was no appreciable change in the profile of this section between 2001 (as-built) and 2002; however, in 2003 beavers constructed dams at stations 1+58, 3+58, 6+53, and 8+58. These dams were subsequently washed out during the flood events associated with a series of hurricanes in 2004. The 2006 data reveals minor changes in stream bed elevation at stations 0+48 to 1+58 and 2+64 to 3+40 that can be attributed to sediment being deposited behind the beaver dams. It should be noted that the 2001 and 2002 longitudinal profile surveys ended at station 9+23 because little construction activity occurred between this point and the confluence of the South Fork New River. Comparison of the 2006 data with previous years indicates that the minor changes in the longitudinal profile are the result of normal storm events and not the result of stream enhancement activities.

Cross-sections

Four cross-sections were surveyed in 2006 and compared with previous cross-section measurements (Figure 3; Mickey and Scott 2001; Mickey and Hining 2003; Mickey and Wasseen 2006). Cross-sectional dimensions showed some adjustment following the 2004 hurricanes when compared with the previous years monitoring survey data (Figure 3). This included minor adjustments in thalweg depths and minor lateral movement of the channel. Most of the cross-sections exhibited minor build up of the streambanks due to deposition of soil materials (silt, sand, small gravel) during high flow storm events.

CROSS-SECTION 1+88 – run (Figure 3.1): This cross-section is located just above a root wad. There has been little change in the cross-section from 2001 through 2006. The thalweg deepened and the channel widened slightly following the three September 2004 hurricanes; in spite of this the banks are stable and well vegetated.

CROSS-SECTION 2+08 – pool (Figure 3.2): This cross-section is located over the middle of a pool just below a rock weir and has changed little over time. The thalweg has remained stable compared with the 2005 data, but has deepened when compared to the as-built through 2004 measurements. Although the channel widened slightly following the three September 2004 hurricanes, the banks are stable and well vegetated.

CROSS-SECTION 7+13 – step pool (Figure 3.3): This cross-section is located between two rock weirs. The thalweg has deepened since the 2001 as-built survey was completed. The streambanks are stable and well vegetated. While the banks are stable, the steep right bank should be monitored for potential bank erosion problems. Overall this cross-section is stable.

CROSS-SECTION 8+40 – run (Figure 3.4): The thalweg has deepened since the as-built survey was completed. Both streambanks are aggrading as the vegetation continues to grow and trap sediment (silt, sand, and small gravel). The stream channel at this cross-section has remained stable throughout the five years of monitoring.

Immediately below cross-section 8+40 the left bank has migrated slightly and a central bar has developed creating a separate channel along the right bank. These channel adjustments are

the direct result of beaver activity during 2003-2004. While both banks are well vegetated and stable, there is the potential risk of bank erosion developing along the right bank should the central bar continue to grow. This location should be monitored for bank erosion problems.

Substrate

Pebble count data were collected from a riffle at cross-section 1+88 (Figure 4). Pavement analysis trends remained consistent from 2003 to 2005. In 2006 there was a slight downward trend for all particle sizes except for the D_{84} . Since 2001 the D_{50} cumulative distribution has ranged in size from medium gravel (9.5 mm) to very coarse gravel (39.0 mm) to course gravel (23.0 mm) (Figure 4). Fluctuations in particle size are normal and can be attributed to sampling bias, flood events, and sediment being transported from disturbed land higher in the watershed. These changes are not significant enough to show any trends or negative impacts.

Riparian Improvements

Since construction was completed on November 3, 2000, all disturbed banks have become well vegetated (Appendices 1-3). A total of 412 stems comprised of live stakes and bare-rooted plants were planted within 0.67 acres of disturbed streambanks in 2001 and 2002 (Table 2). A total of 179 stems were counted in 2006 (43% survival) (Table 2). The density of stems in the disturbed areas planted is 267/acre (179 stems/0.67 acres), which is above the 260 stems/acre required for woody species planted at mitigation sites through year five of monitoring (USACE 2003). It should be noted that the stem counts and survival calculations did not include seven black cherry *Prunus serotina*, 14 white pine *Pinus strobes*, and 18 black walnut *Juglans nigra* planted by the landowner in 2001.

Site Repairs

A major flood event occurring on November 19, 2003 resulted in some minor damage to the rock crossvane at station 3+57 (Appendix 4). Damage to the structure occurred after a ford crossing was replaced with a bridge by the landowner in 2002 (construction of a bridge at this location was permitted in the conservation easement). Flood waters crested the bridge and lateral movement of flood waters was constricted by the bridge abutments. This constriction resulted in the flood waters creating an upward current under the crossvane boulders, causing the structure to fail. Under normal flood conditions water would have flowed over the structure, holding it in place. This structure, along with some minor bank damage immediately downstream from the site, was repaired on February 25, 2004. These repairs have been the only ones required at this site since construction was completed on November 3, 2000 (Mickey and Scott 2001).

Summary

It has been almost six years since construction at the Racey site was completed. During this period there have been 14 bankfull or greater events resulting in only minor damage at the site. The streambank improvements and repairs have remained stable with no failures noted. In-

stream structures are functioning as designed. The riparian vegetation is thriving and continues to build and stabilize the streambanks.

Recommendations

The steep right bank at cross-section 7+13 and the central bar below cross-section 8+40 should be monitored annually for bank erosion problems. The interpretation of the five years of monitoring data, the fact that there have been no major failures to the structures or streambanks, and the continuing growth of the dense riparian vegetation suggests that the stream reach at the Racey site is stable, and needs no further detailed monitoring. It is our recommendation that this site be considered stabilized and released from further monitoring. Furthermore, we recommend NCDOT be awarded 1,160 mitigation credits (1:1 ratio) for this site as approved by NCDWQ (NCDWQ letter to the NCWRC dated November 6, 2000).

Acknowledgements

J. Mickey, Jr., J. Wasseen, II and S. Hining of the Elkin watershed enhancement team collected and analyzed the field data; J. Wasseen, II and J. Mickey, Jr. prepared this report. J. Borawa improved the report with his thorough review and thoughtful suggestions.

References

- Mickey, J. H. and S. Scott. 2001. As-built report for the Racey mitigation site, Laxon Creek, Watauga County. North Carolina Wildlife Resources Commission, Raleigh.
- Mickey, J. H. and S. Hining. 2003. Carp mitigation site, unnamed tributary to Laxon Creek, Watauga County. Period covered: April 2, 2002 – April 15, 2003. North Carolina Wildlife Resources Commission, Raleigh.
- Mickey, J. H. and J. Wasseen, II. 2006. Carp mitigation site, unnamed tributary to Laxon Creek, Watauga County. Period covered: June 3, 2004 – September 27, 2005. North Carolina Wildlife Resources Commission, Raleigh.
- USACE (U.S. Army Corps of Engineers), Wilmington District, U. S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, and the North Carolina Division of Water Quality. 2003. Stream Mitigation guidelines. Wilmington, North Carolina.

FIGURE 1.—Location of Racey mitigation site, Laxon Creek, Watauga County.

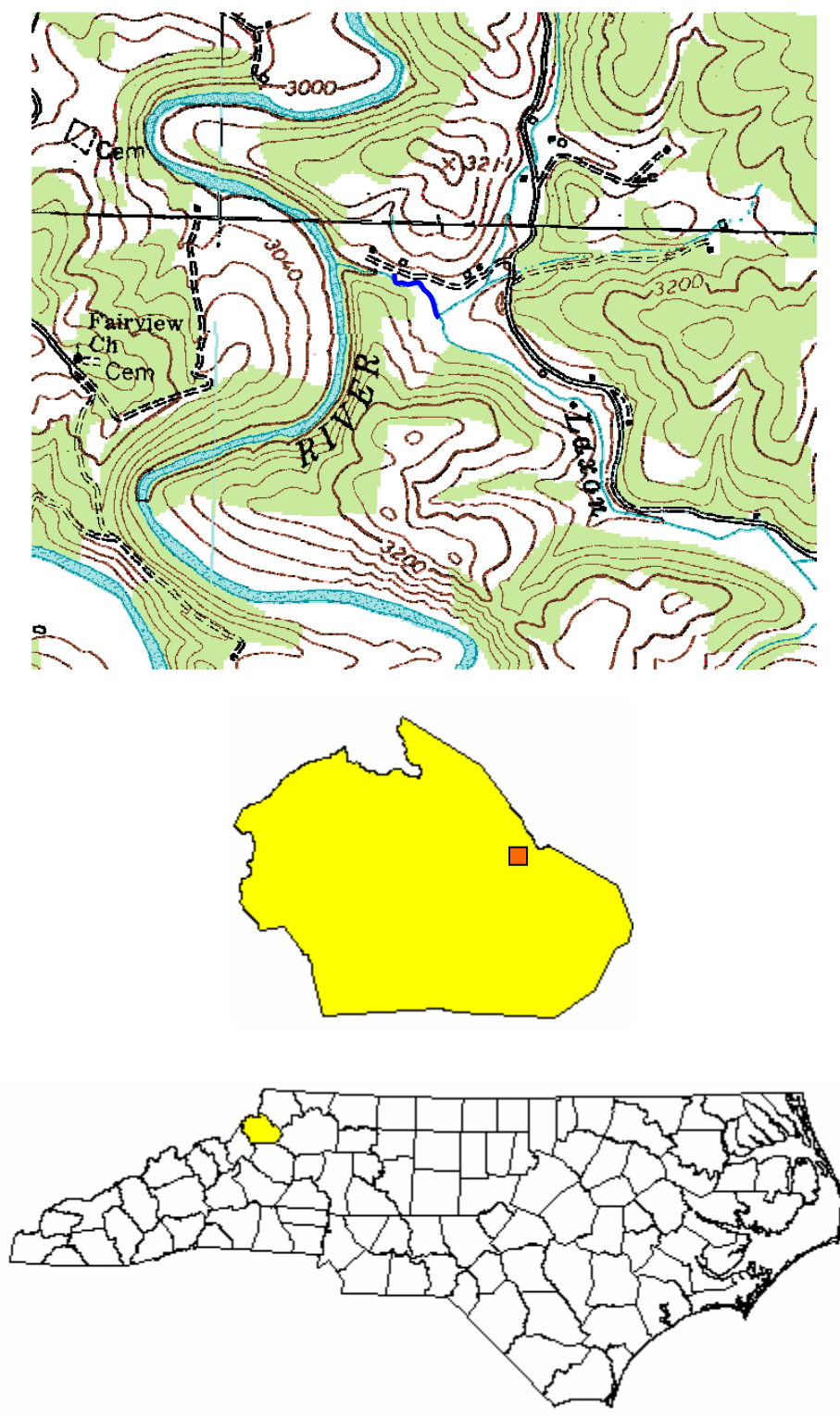


FIGURE 2.—Longitudinal profile comparisons for 2001-2004 and 2006, Racey mitigation site, Laxon Creek, Watauga County. It should be noted that the 2001 and 2002 longitudinal profile surveys ended at station 9+23 because little construction activity occurred between that point and the confluence with the South Fork New River.

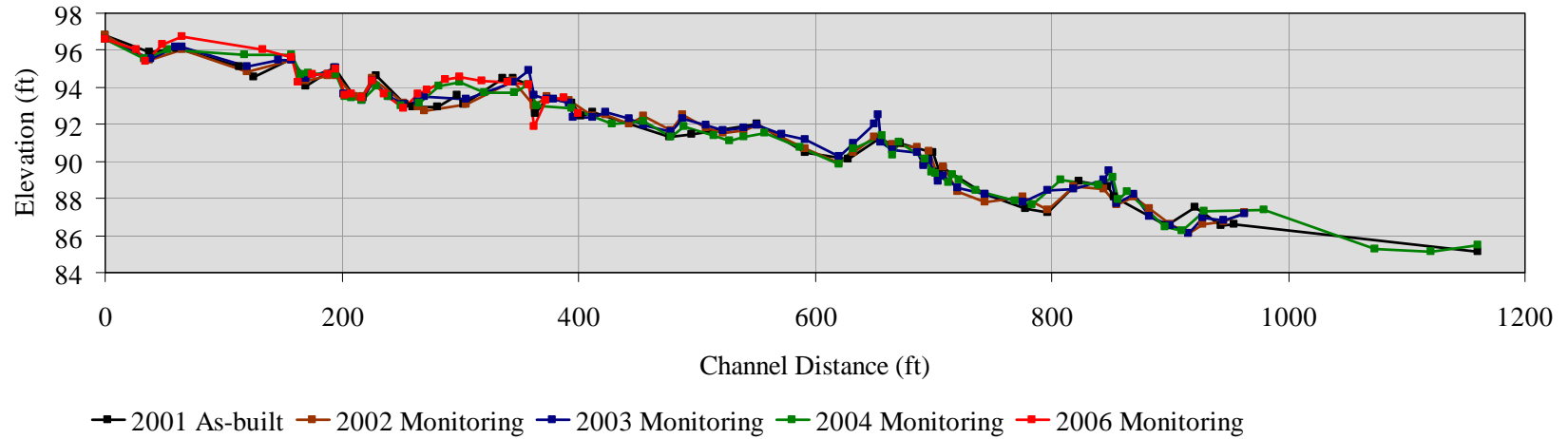


FIGURE 3.—Four cross-sectional dimension comparisons, Racey mitigation site, Laxon Creek, Watauga County 2001-2006.

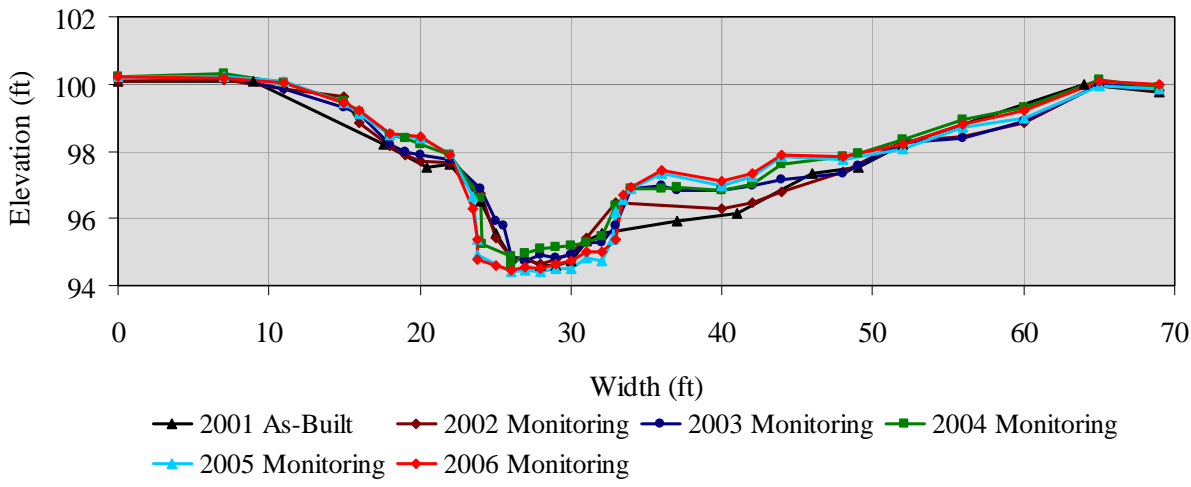


FIGURE 3.1.—Cross-section 1+88, run.

FIGURE 3.—Continued.

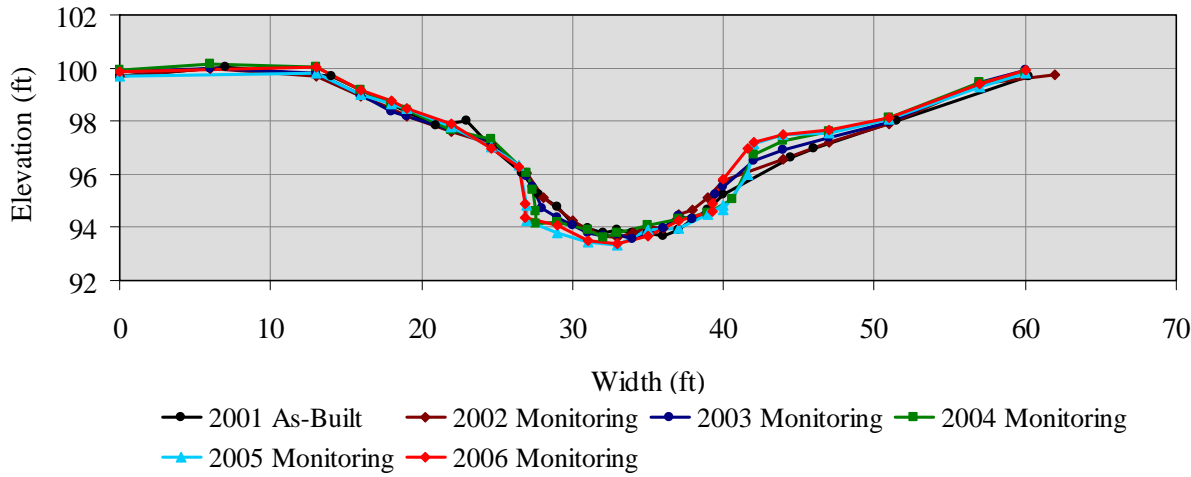


FIGURE 3.2.—Cross-section 2+08, pool.

FIGURE 3.—Continued.

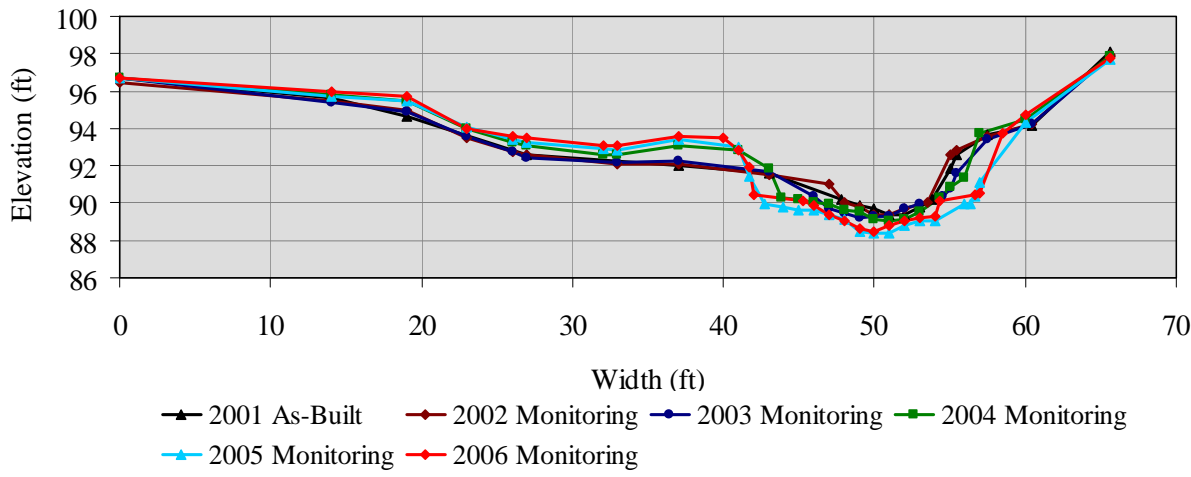


FIGURE 3.3.—Cross-section 7+13, step pool.

FIGURE 3.—Continued.

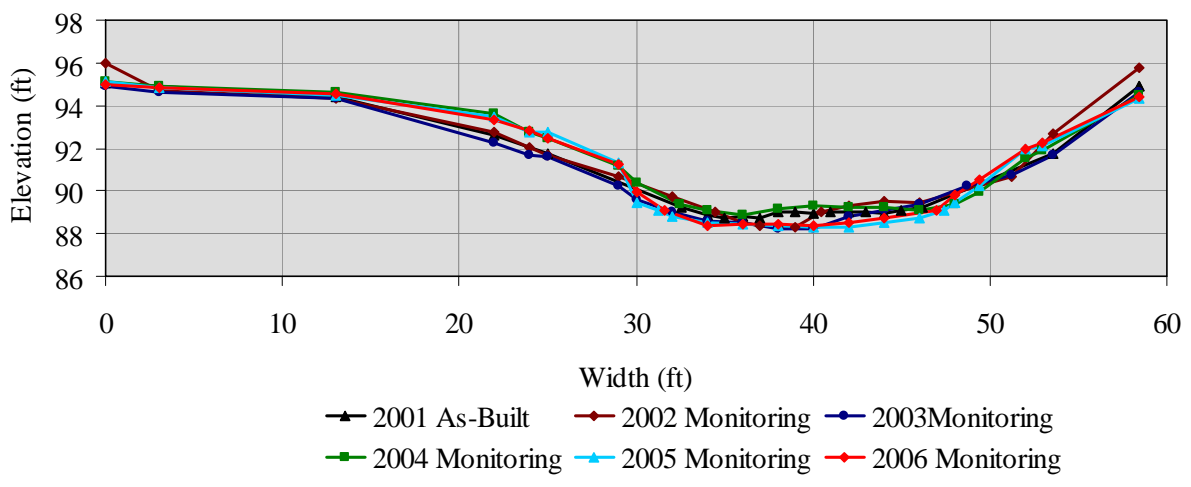
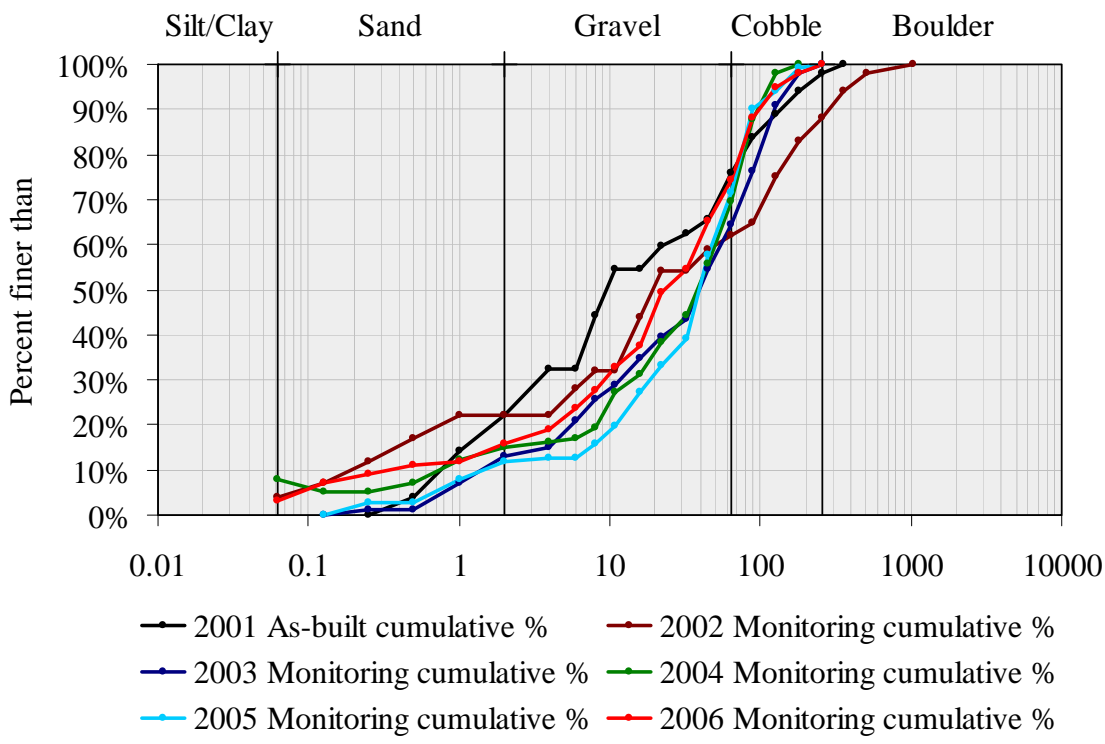


FIGURE 3.4.—Cross-section 8+40, run.

FIGURE 4.—Pebble count data comparisons, Racey mitigation site, Laxon Creek, Watauga County, 2001-2006.



Size class index	Particle size (mm) in year sampled					
	2001	2002	2003	2004	2005	2006
D ₁₆	1.2	0.4	4.3	3.6	8.2	2.1
D ₃₅	6.4	12.0	16.0	19.0	24.0	13.0
D ₅₀	9.5	19.0	39.0	38.0	39.0	23.0
D ₈₄	91.0	190.0	110.0	84.0	80.0	81.0
D ₉₅	200.0	390.0	160.0	120.0	140.0	130.0

TABLE 1.—Monitoring of inner berm and bankfull events at Racey mitigation site based on data from the United States Geological Survey South Fork New River gage (gage number 03161000) near Jefferson, Ashe County, North Carolina and from on-site observations.

Date	Gage height (ft)	Flows (cfs)	Comments
2/22-23/03	5.0	2,250	Bankfull event (gage quit working)
3/16/03	4.4	1,725	Inner berm event
4/10/03	5.4	2,819	Bankfull event
4/18/03	5.6	3,200	Bankfull event
6/7/03	4.1	1,820	Inner berm event
6/17/03	4.7	2,000	Bankfull event
8/9/03	4.2	1,450	Inner berm event
8/10/03	4.1	1,400	Inner berm event
11/19/03 ^a	5.4	1,880	Bankfull event
2/7/04	4.8	2,080	Bankfull event
9/2/04	11.7	14,700	Bankfull event (hurricane)
9/13/04	8.6	7,550	Bankfull event (hurricane)
9/28/04	6.3	3,820	Bankfull event (hurricane)
7/8/05	4.6	2,000	Bankfull event (tropical storm)
10/7/05	4.0	1,410	Inner berm event (tropical storm)
11/29/05	6.5	4,130	Bankfull event
1/18/06	5.2	2,460	Bankfull event
2/5/06	4.4	1,690	Inner berm event
4/22/06	4.3	1,610	Inner berm event
6/25/06	6.8	4,470	Bankfull event (tropical storm)
6/27/06	5.7	3,130	Bankfull event (tropical storm)

^aThis event produced rainfall in excess of six inches at the Racey site that resulted in major, localized flooding (see Appendix 4).

TABLE 2.—Vegetation monitoring results for the Racey mitigation site, Laxon Creek, Watauga County, 2001-2006.

Type of plants		Number planted		2002	2003	2004	2005	2006
Scientific name	Common name	2001	2002	stem count ^a	stem count ^a	stem count	stem count	stem count
<u>Livestakes</u>								
<i>Cornus amomum</i>	Silky dogwood	157				29	59	69
<i>Salix nigra</i>	Black Willow	13				2	3	1
<i>Salix sericea</i>	Silky Willow	30				31	45 ^b	31
<u>Bare root nursery stock</u>								
<i>Alnus serrulata</i>	Tag alder		45			30	37	35
<i>Diospyros virginiana</i>	Persimmon	25	7			1	1	0
<i>Fraxinus americana</i>	White ashe	25				2	1	0
<i>Juglans nigra</i>	Black walnut	0	5			2	3	3
<i>Pinus strobes</i>	White pine	20				5	6	1
<i>Prunus serotina</i>	Black Cherry	50				15	18	23
<i>Quercus rubra</i>	Northern red oak	25				6	4	0
<i>Robinia pseudoacacia</i>	Black locust		10			10	18 ^b	16 ^b
Total (trees and livestakes)		345	67			133	195	179
Percent Survival						32%	47%	43%

^a No count conducted, planted vegetation too small to locate in the dense grasses and forbs.

^b Counts were actually higher than the number of stems planted due to natural regeneration.

Appendix 1: Photographic log of the Racey mitigation site looking upstream at cross-section 1+88, Laxon Creek, Watauga County, October 2000-July 2005.



October 30, 2000 before construction.



November 3, 2000 after construction.



May 29, 2001.



July 9, 2002.



August 14, 2003.



June 30, 2004.

APPENDIX 1: Continued.



July 21, 2005.



April 24, 2006

APPENDIX 2: Photographic log of the Racey mitigation site looking upstream at cross-section 7+13, Watauga County, October 2000-July 2005.



October 30, 2000 before construction.



November 3, 2000 after construction.



June 1, 2001.



July 9, 2002.

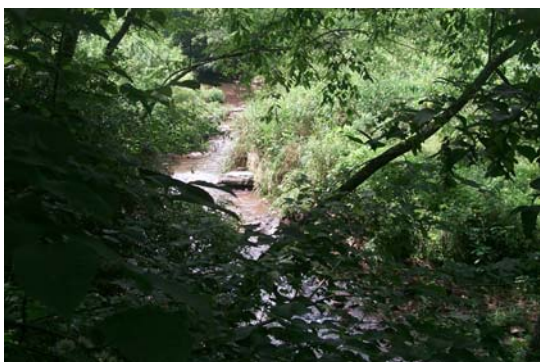


May 14, 2003.



June 7, 2004.

APPENDIX 2: Continued.



July 21, 2005.



April 24, 2006.

APPENDIX 3: Photographic log of the Racey mitigation site looking upstream at cross-section 8+40, Watauga County, October 2000-July 2005.



October 30, 2000 before construction.



November 2, 2000 after construction.



May 29, 2001.



July 30, 2002.



July 14, 2003.



June 7, 2004.

APPENDIX 3: Continued.



July 21, 2005.



May 18, 2006.

APPENDIX 4. Overview photograph showing the location of the bridge at longitudinal profile station 3+57 during the November 19, 2003 flood event on Laxon Creek, Watauga County. The rock crossvane at this location was damaged during the flood and had to be repaired. Photograph courtesy of Dr. Jana Carp.

