BARE MITIGATION SITE ON AN UNNAMED TRIBUTARY TO PEAK CREEK, ASHE COUNTY

Year 5 Monitoring Report
Period Covered: June 16, 2005 – March 3, 2007

Prepared for the

North Carolina Ecosystem Enhancement Program

North Carolina Wildlife Resources Commission
Watershed Enhancement Group
Raleigh

June 2007

This report summarizes the 2006-2007 monitoring data collected from 2,183 linear feet of an unnamed tributary (UT) to Peak Creek at the Bare stream mitigation site in Ashe County (Figure 1), and compares it with the previous years' monitoring data. Mickey and Scott (2001) described pre-construction survey methods, site conditions, and project objectives. The purpose of the project was to improve in-stream habitat and reduce bank erosion of the previously channelized and heavily grazed stream reach. 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 2002 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 previously developed by the North Carolina Wildlife Resources Commission. This was done to maintain consistency with earlier reports and to facilitate the comparison of the 2007 data with previous years' data without having to change report formats.

Monitoring

The 2006-2007 monitoring survey was completed on March 2, 2007. These data are compared with as-built data collected in November 2001 and monitoring data collected in 2002, 2004, and 2005 (Mickey and Scott 2002; Mickey and Wasseen 2005a, 2005b). The vegetation survey was completed on April 22, 2006 and the longitudinal profile survey, channel cross-section surveys, pebble counts, and photographic log of the site (Appendices 1-11), were collected on March 1 and 2, 2007. The interval between the beginning and completion of the 2006-2007 survey was due to scheduling conflicts.

Bankfull Rain 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 Bare site corresponded to approximately 1,800 cubic feet per second at the gage station. Since completion of the project there have been 20 bankfull or greater events at the site (Table 1). Eleven of those bankfull events occurred since the last survey was completed in 2005, and there are no obvious signs of channel instability. Additionally, the mitigation site has exceeded the required number of bankfull events necessary to release the mitigation site from further monitoring, which are 2 bankfull events in 5 years (USACE 2003).

Longitudinal Profile

The 2007 longitudinal profile data revealed minor changes had occurred in the channel thalweg since the 2004 survey (Figure 2). From station 0+00 to 0+24 the thalweg has degraded

0.4 foot from all of the previous years' monitoring. From station 0+24 to 1+87 the channel continues to aggrade, filling in all of the pools created during construction. This is likely due to the erosion of soils from the riparian area upstream. That area has been disturbed by cattle grazing and mowing of the stream banks. It is interesting to note the formation of two pools from stations 2+13 to 2+46 and 2+46 to 2+87; and the pool between stations 2+87 and 3+07 is now deeper than it was at the time of the as-built survey. These changes could be attributed to the flood events associated with the series of hurricanes in September 2004; however, it is uncertain if this was the cause due to the lack of longitudinal profile survey data from 2005 and 2006. The thalweg has changed little from station 3+07 to 6+26 since the 2004 survey. From station 6+29 to 6+45 the channel has aggraded, shortening the pool, and creating a steeper riffle. The channel is similar to the previous years' surveys from station 6+45 to station 8+37. The pool at station 8+37 has deepened and lengthened and a riffle has formed at station 8+86. From station 8+86 to station 18+42 the channel elevations closely follow previous years. The 2004 survey documents the formation of a new pool at station 18+75; this year's survey reveals that the pool at that location has been filled in by channel bed material. This aggradation continues downstream to station 20+37. At that point, the channel reverses the trend and begins to degrade. At station 20+84 the channel deepens close to the 2001 as-built elevation, and at station 21+44 a new pool has formed, perhaps due to natural occurrences, or the rain events associated with the series of hurricanes in September 2004. These minor changes in the longitudinal profile appear to be natural occurrences and not because of instabilities caused by the stream enhancement activities. The 2007 survey ended at station 21+76 because the survey team believed that the end of the conservation easement fencing was the survey ending point.

Cross-sections

Eleven cross-sections were surveyed in 2007 and compared with previous cross-section measurements (Figure 3; Mickey and Scott 2002; Mickey and Wasseen 2005a, 2005b). Cross-sectional dimensions showed some adjustments in thalweg depths and minor lateral movement of the channel when compared with previous years' monitoring survey data (Figure 3). Most of the cross-sections exhibit some build up of the streambanks due to deposition of soil materials during bankfull or greater than bankfull storm events.

CROSS-SECTION 1+78 – run (Figure 3.1): This cross-section transects a run that has evolved from a shallow pool. This change is attributable to the disturbance of the streambed where a livestock watering system supply line was repaired in 2004; and the three hurricanes of September 2004. The thalweg shifted from the center of the stream to the right bank. There appears to be some minor scour occurring on the right bank; however the bank was well vegetated, and did not show any significant signs of lateral movement. The streambanks continue to increase in height as a direct result of streambed materials being captured by the riparian vegetation during flood events.

CROSS-SECTION 2+90 – pool (Figure 3.2): This cross-section transects a pool maintained by a rock vane and root wads. The pool has deepened below the 2001 as-built survey elevation, which could be credited to two storm events occurring between the 2005 and 2007 surveys producing flows >4, 000 ft^3/s per second. The streambanks increased in height since the 2004 repairs (Mickey and Wasseen 2005a). This is attributable to streambed materials being captured

by riparian vegetation during flood events. The banks are stable and there has been no lateral shift in the stream channel.

CROSS-SECTION 6+29 – pool (Figure 3.3): This cross-section transects a pool, and was added in 2004 to monitor repairs made to the vertical, eroding right bank. Both banks are exhibiting some erosion, but they are well vegetated and did not show any major signs of lateral movement. Pool depth has increased by 0.5 feet since the last survey.

CROSS-SECTION 7+19 – pool (Figure 3.4): This cross-section transects a pool maintained by a cross-vane and root wads. The 2007 monitoring survey indicates no major changes from the 2005 survey. Point bar height has increased as streambed materials were captured by riparian vegetation during flood events. This cross-section has remained stable with no lateral movement observed along the stream banks.

CROSS-SECTION 10+35 – riffle (Figure 3.5): This cross-section transects a stable riffle immediately upstream of the lower livestock crossing located at longitudinal profile station 10+64. No in-stream channel modifications were made at this site in order to monitor the natural recovery of the channel once livestock were excluded from the riparian zone. The wetted stream width as measured from water's edge to water's edge at base flow (elevation approximately 85.2 feet) narrowed from 18.3 feet in 2001, to 8.0 feet in 2005, and then to 7.0 feet in 2007. Vegetation along the left bank continues to trap streambed materials during bankfull and flood events, effectively narrowing the wetted perimeter of the channel. The right bank has remained stable.

An existing drainage ditch is present from location 0+78 to 0+80 on the cross-section. The landowner requested and was granted permission in 2005 to clean out the ditch to alleviate hydrologic trespass impacts to her pastures. The 2007 survey revealed the ditch is filling back in; however, the left bank of the ditch is increasing in height.

CROSS-SECTION 11+68 – riffle (Figure 3.6): This cross-section transects a riffle that has a high left bank and a long, sloping point bar on the right bank. The left bank has remained stable. From 2001 to 2007 the point bar on the right bank has increased up to 1.5 feet in height from location 0+26 to 0+64 on this cross-section. This is a direct result of streambed materials being captured by riparian vegetation during flood events. While there has been some adjustment in the thalweg and right point bar, the stream banks are stable with no lateral movement. During the 2005 survey there appears to be an incorrect rod reading at location 0+70.

CROSS-SECTION 16+81 – riffle (Figure 3.7): This cross-section transects a riffle that has a high right bank and long, sloping point bar on the left bank. The left point bar continues to increase in height as a direct result of streambed materials being captured by riparian vegetation during flood events. This cross-section has remained stable with no lateral movement along the stream banks. During the 2004 survey there appears to be an incorrect rod reading at location 0+56.

CROSS-SECTION 17+08 – pool (Figure 3.8): This cross-section transects a pool maintained by root wads. It was first surveyed in 2004 to monitor the pool formed by the root wads used to stabilize the bank. The 2007 monitoring survey indicates the left bank has exhibited some erosion from location 0+34 to 0+35 on the cross-section. There has been a slight deepening of the pool. The left point bar is increasing in height due to the deposition of streambed materials being captured by riparian vegetation during flood events.

CROSS-SECTION 17+57 – run (Figure 3.9): This cross-section transects a riffle/run complex below a rock weir. Both banks exhibited minor increases in height due to the deposition of streambed materials being captured by riparian vegetation during flood events. The thalweg at this site has remained stable since 2002. The banks are stable and there has been no lateral shift in the stream channel.

CROSS-SECTION 18+42 – riffle (Figure 3.10): This cross-section transects a stable riffle. Enhancement activities in 2001 consisted of minor grading along the top of the right bank. The thalweg and stream bottom profile have remained stable. Both banks increased in height due to the deposition of streambed materials being captured by riparian vegetation during flood events.

CROSS-SECTION 20+80 – pool (Figure 3.11): This cross-section transects a constructed pool stabilized with root wads. By 2005, this pool had aggraded 1.2 feet since its construction in 2001; however, in 2007 the pool had deepened 1.8 feet, which is slightly below the level found during the as-built survey. Both banks have increased in height due to the deposition of streambed materials being captured by riparian vegetation during flood events.

Substrate

Pebble count data were collected from a riffle at cross-section 18+42 (Figure 4). Substrate analysis indicates an increasing trend in all particle sizes, from 2001 to 2007. Since 2001 the D_{50} has coarsened from medium (16 mm), to coarse (27 mm), to very coarse (52 mm) gravel. The increase in particle size, especially the D_{50}, is probably a result of the channel narrowing, which increases sediment transport competence. The D_{84} and D_{95} fluctuated very little from year to year; however, from 2001 to 2007 the particle sizes were generally increasing. The fluctuations in the D_{84} and D_{95} size class indexes are normal and can be attributed to flood events where sediment was transported from disturbed land higher in the watershed.

Riparian Improvements

A total of 2,229 bare root trees and live stakes were planted in the 3.02 acre conservation easement area during 2001-2003. The site was divided into three vegetation areas with total stem counts (trees and live stakes) being made in each area (Table 2). No effort was made to distinguish between planted stems and naturally regenerated stems. The 2006 vegetation survey revealed a total of 1,126 stems (373 stems per acre) present on the site. Although this is 50.5% less than the original number planted, the density of counted stems present in 2006 exceeded the 260 stems per acre required for woody species planted at mitigation sites through monitoring year five (USACE 2003).

Many of the planted trees are now above the heavy forbs growth at the site. Of the 14 tree/shrub species planted, those with the best survivorship or natural regeneration (or both) are silky willow *Salix sericea,* black willow *Salix nigra,* tag alder *Alnus serrulata,* sycamore *Platanus occidentalis,* white ashe *Fraxinus americana,* black cherry *Prunus serotina,* and black locust *Robinia pseudoacacia* (Table 2). Tag alder and silky willow stems counted in 2006 exceeded the number of planted stems by 440% and 288% due to the high rate of natural regeneration. Closely grouped stem masses of silky dogwood, silky willow, and tag alder were counted as one individual plant instead of several plants. Stem counts for these species would have been much higher if individual stems were counted.

Three species of native plants, yellow poplar *Liriodendron tulipifera* (2 stems), ninebark *Physocarpus opulifolius* (20 stems), and white pine *Pinus strobes* (21 stems) were found to be naturally recolonizing the site. The invasive exotic multiflora rose *Rosa multiflora* also was present throughout the site and large colonies were growing on the adjacent upland pastures. Left unchecked, the multiflora rose could spread throughout the project and threaten the viability of the native species. To prevent this from occurring, it will be necessary to control it by mechanical grubbing or with the application of herbicides.

Livestock Exclusion

The livestock management program included installation of two stream-crossings, a well with pressurized water lines, five watering tanks, and fencing to exclude livestock from the riparian zone. All livestock management devices are functioning properly.

Summary

Since completion of the project on September 6, 2001, the Bare mitigation site, located on an unnamed tributary to Peak Creek, one as-built survey and four monitoring surveys have been conducted. The site has remained stable with no major failures to structures. However some damage occurred to streambanks as a result of the November 19, 2003 flood. Repairs were completed on July 20, 2004. The site has remained stable since the 2004 repairs and through the subsequent September 2004 hurricanes. The longitudinal profile and the cross-sections have revealed some aggradation and degradation of the stream thalweg during the five-year monitoring period. This is most likely due to substrate transported from upstream sources (unstable streambanks, pastures, construction activities, and unpaved roads). Substrate composition has increased in size class because of increased sediment transport competence. The riparian vegetation is flourishing, preserving bank integrity and channel sinuosity. There have been 11 bankfull events since monitoring in 2005, and 20 bankfull events overall. The stream channel and banks are stable and in-stream structures are functioning as designed.

Recommendations

1. This site be considered stabilized and released from further monitoring.

2. Award 2,183 mitigation credits (1:1 ratio) to EEP for this site as approved by NCDWQ (NCDWQ Certification Number 3185 dated April 20, 1998).

3. Implement a multiflora rose control plan to prevent the species from displacing native plants within the easement area before they have matured.

Acknowledgements

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

References

Mickey, J. H. and S. Scott. 2001. Stream restoration plan, Bare site, unnamed tributary to Peak Creek, Ashe County. North Carolina Wildlife Resources Commission, Raleigh.

Mickey, J. H. and S. Scott. 2002. As-built report for the Bare mitigation site, unnamed tributary to Peak Creek, Ashe County. North Carolina Wildlife Resources Commission, Raleigh.

Mickey, J. H. and J. Wasseen. 2005a. Bare mitigation site, unnamed tributary to Peak Creek, Ashe County. Monitoring Report. North Carolina Wildlife Resources Commission, Raleigh.

Mickey, J. H. and J. Wasseen. 2005b. 2005 Monitoring report for the Bare mitigation site on an unnamed tributary to Peak Creek, Ashe County. 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.—Bare stream mitigation site on an unnamed tributary (UT) to Peak Creek, New River drainage, Ashe County, North Carolina.

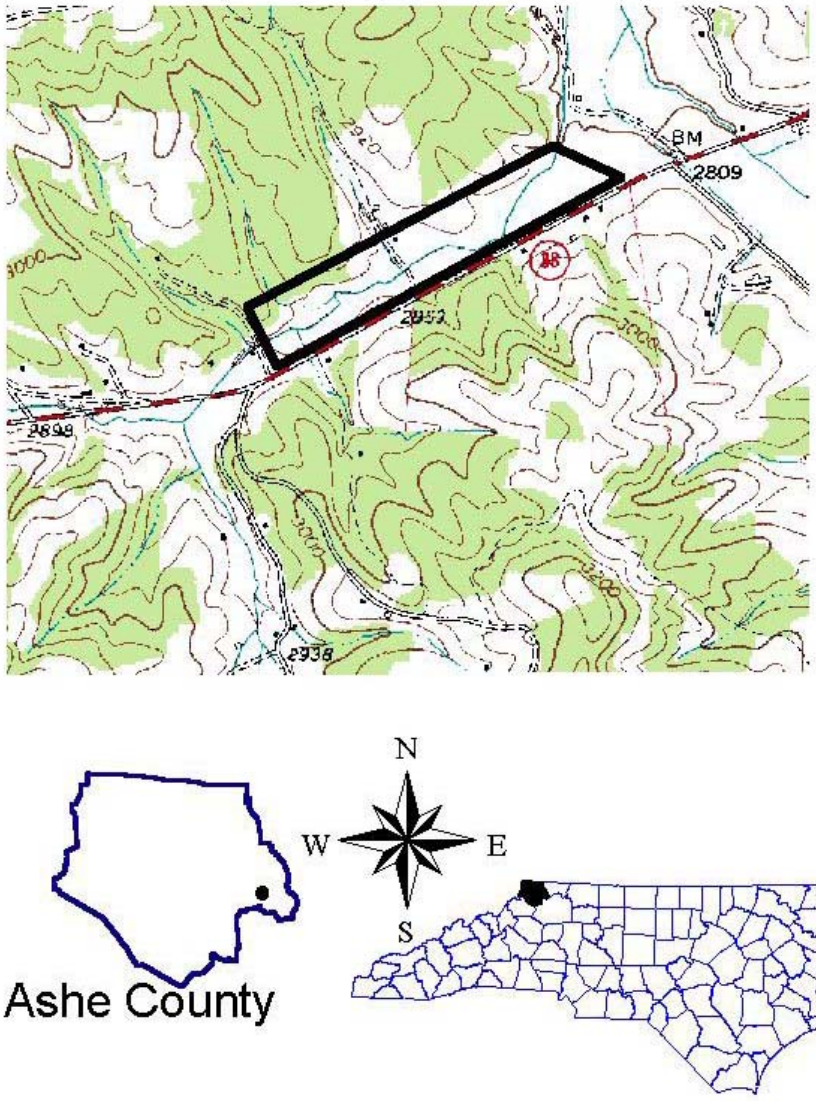

FIGURE 2.—Longitudinal profile comparisons, Bare mitigation site, UT to Peak Creek, New River drainage, Ashe County, 2001-2007.

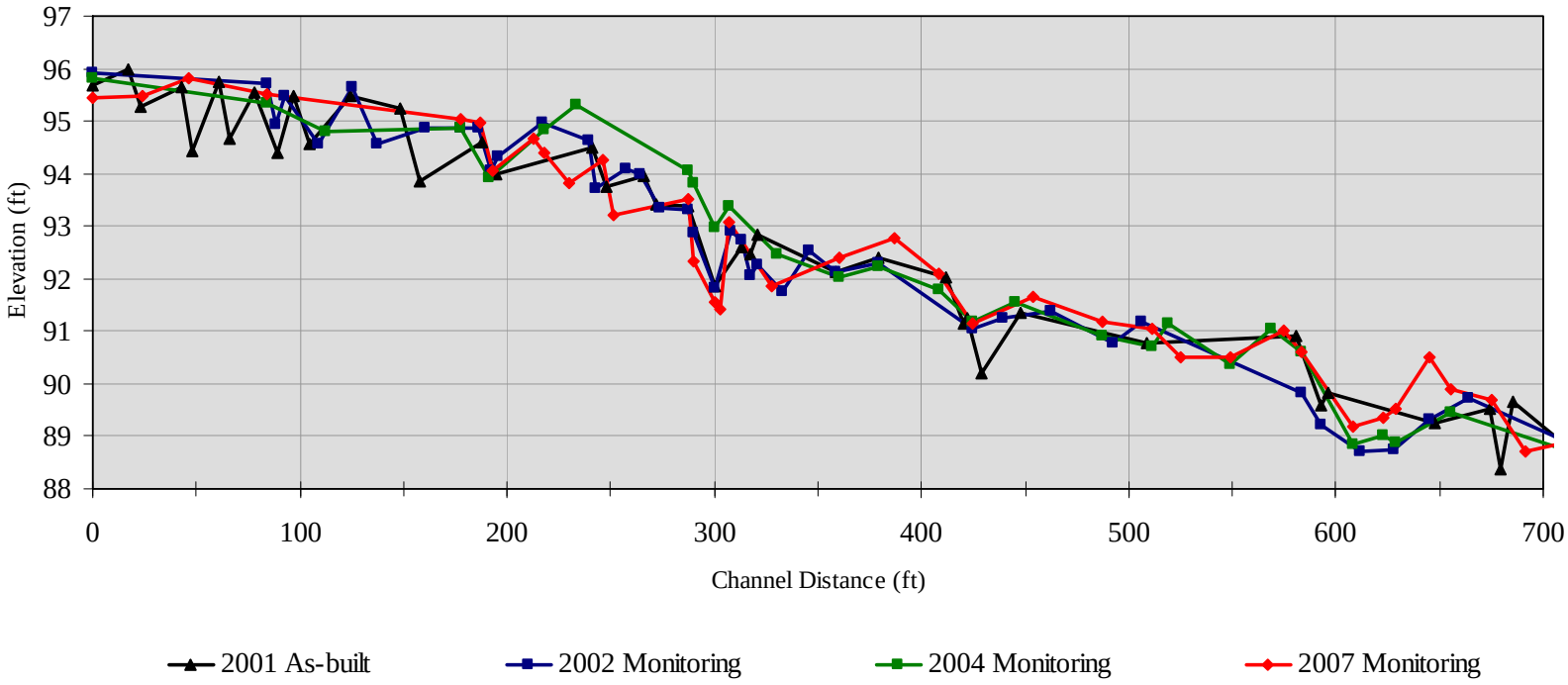

FIGURE 2.1.—Longitudinal profile from stations 0+00 to 7+00.

FIGURE 2.—Continued.

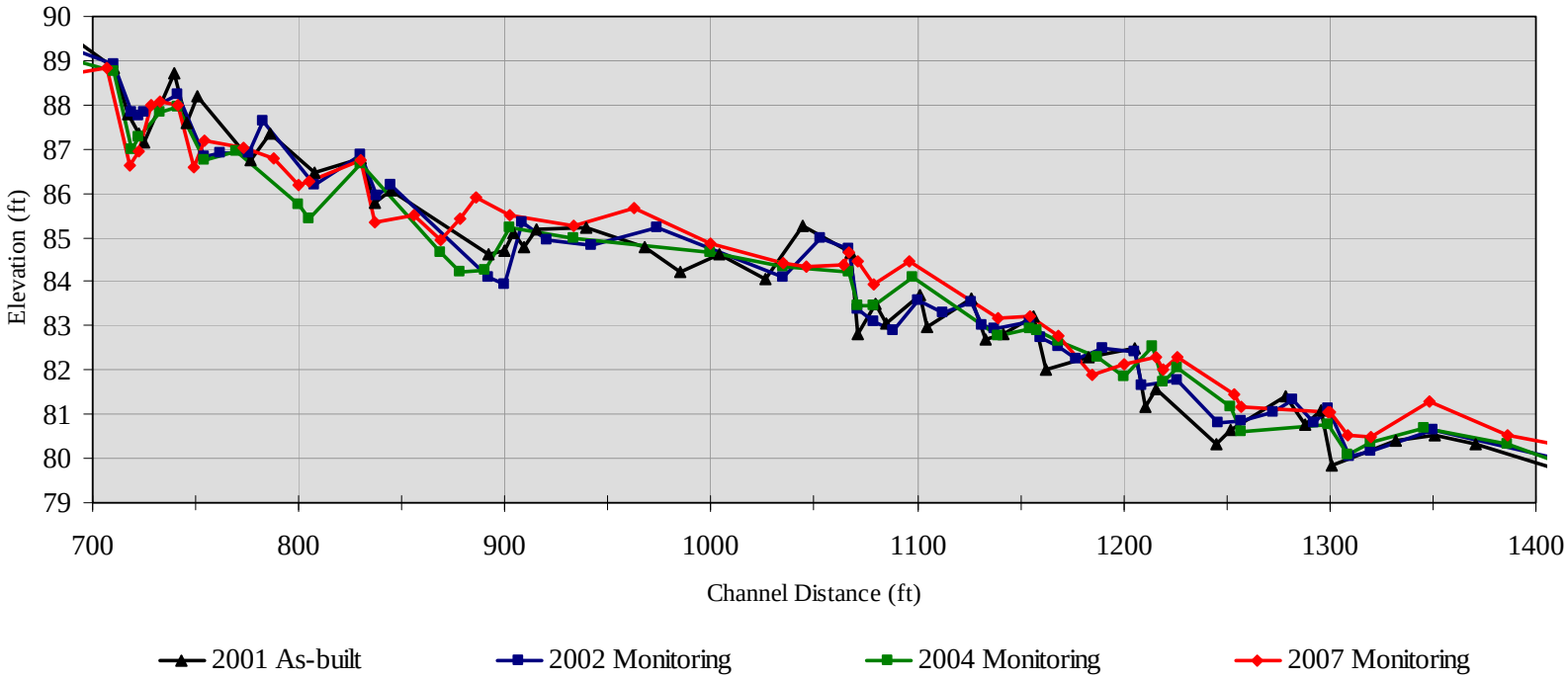

FIGURE 2.2.—Longitudinal profile from stations 7+00 to 14+00.

FIGURE 2.—Continued.

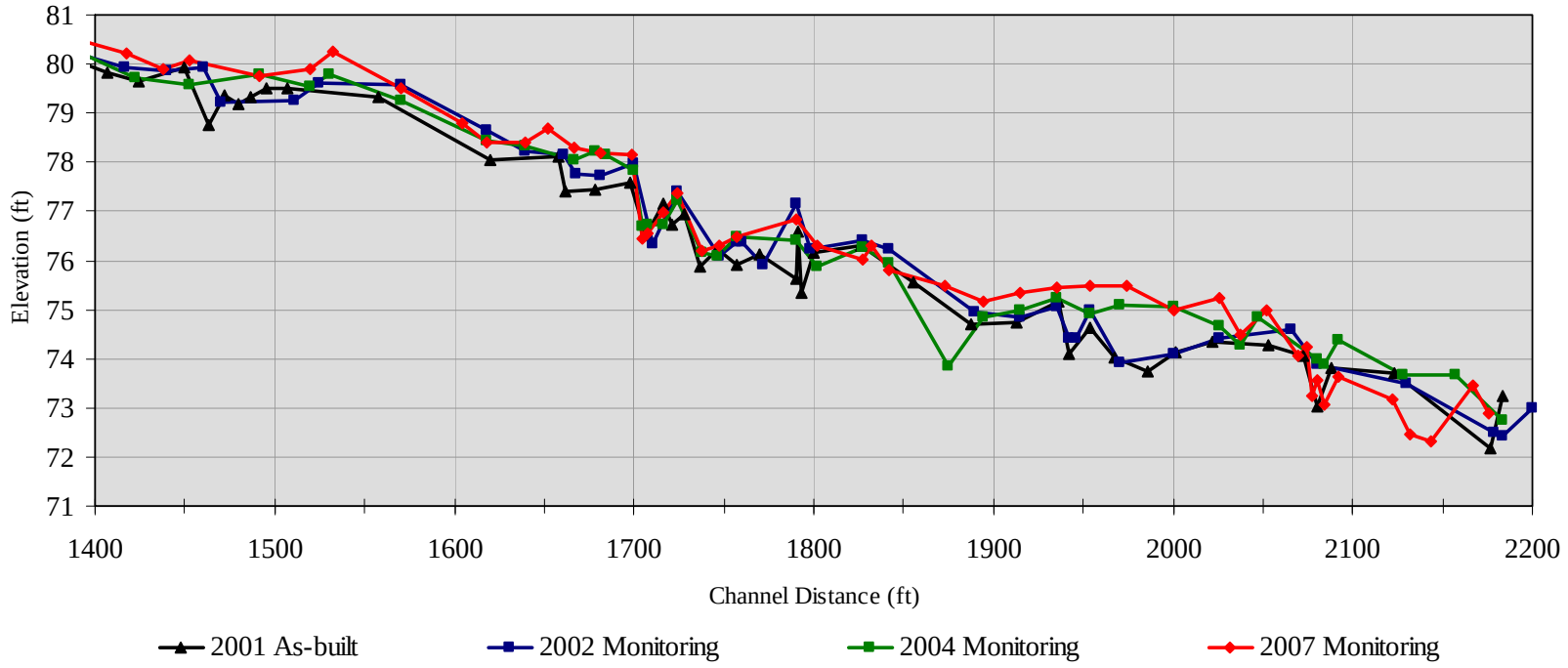

FIGURE 2.3.—Longitudinal profile from stations 14+00 to 22+00.

FIGURE 3.—Cross-section comparisons, Bare mitigation site, UT to Peak Creek, New River drainage, Ashe County, 2001-2007. Pictures were taken at each cross-section surveyed in 2007. The flood prone area (fpa) and bankfull (bkf) elevations are depicted with red and blue horizontal lines.

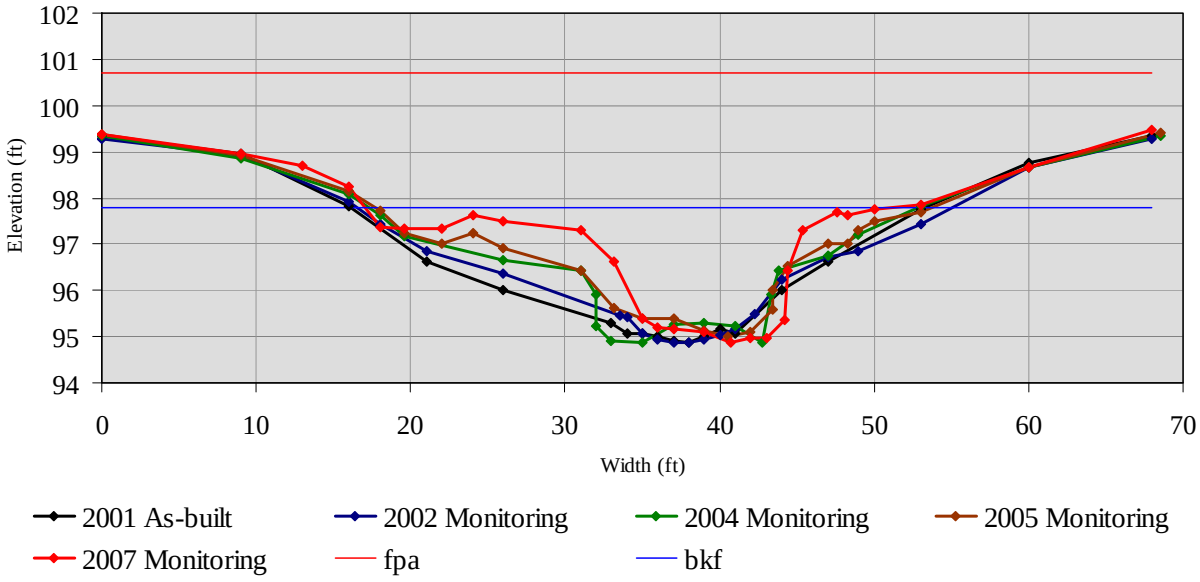

FIGURE 3.1.—Cross-section station 1+78, run.

FIGURE 3.—Continued.

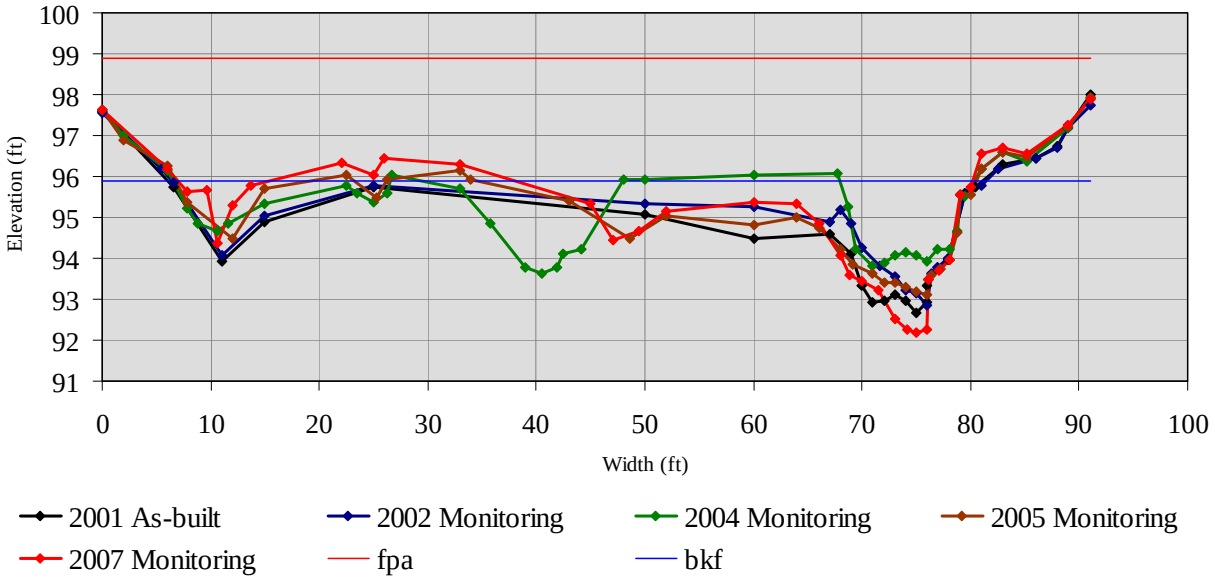

FIGURE 3.2.—Cross-section station 2+90, pool.

FIGURE 3.—Continued.

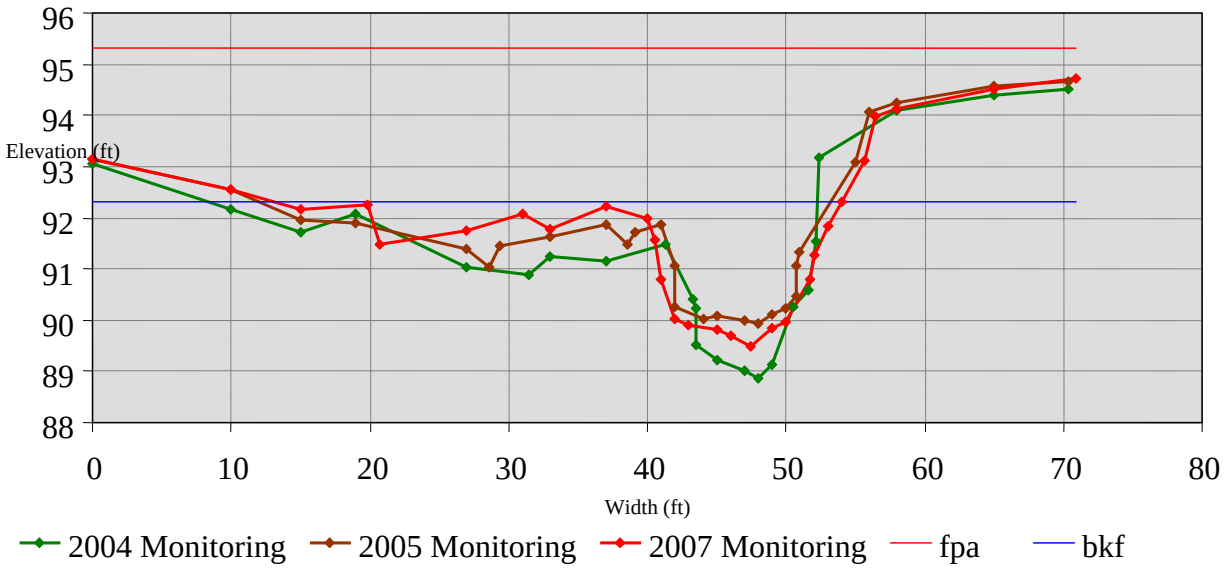

FIGURE 3.3.—Cross-section station 6+29, pool, new cross-section in 2004.

FIGURE 3.—Continued.

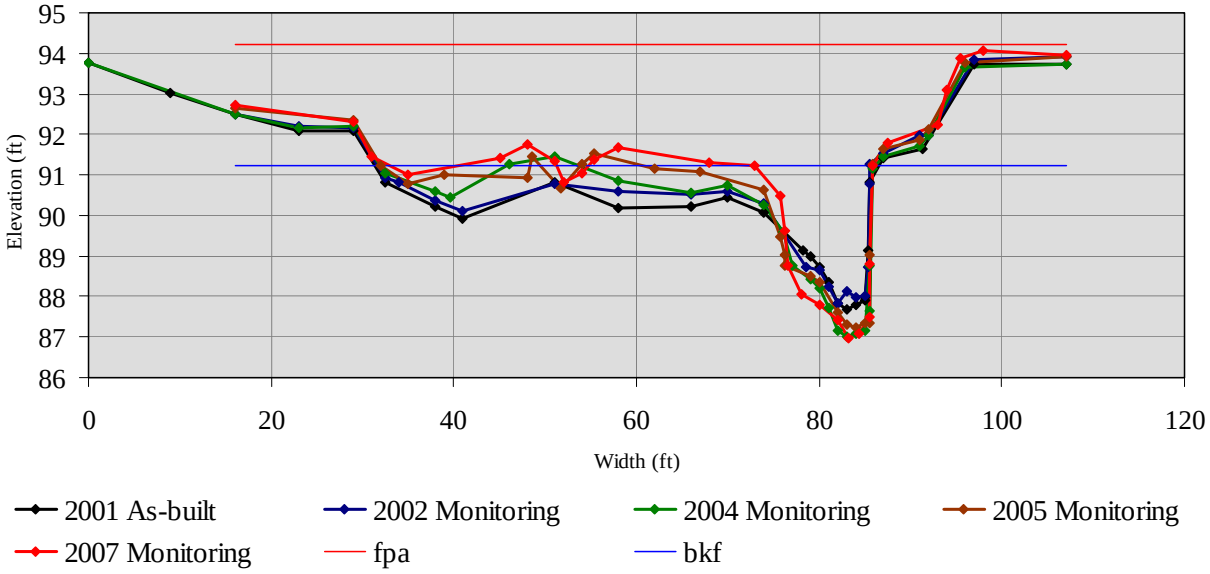

FIGURE 3.4.—Cross-section station 7+19, pool.

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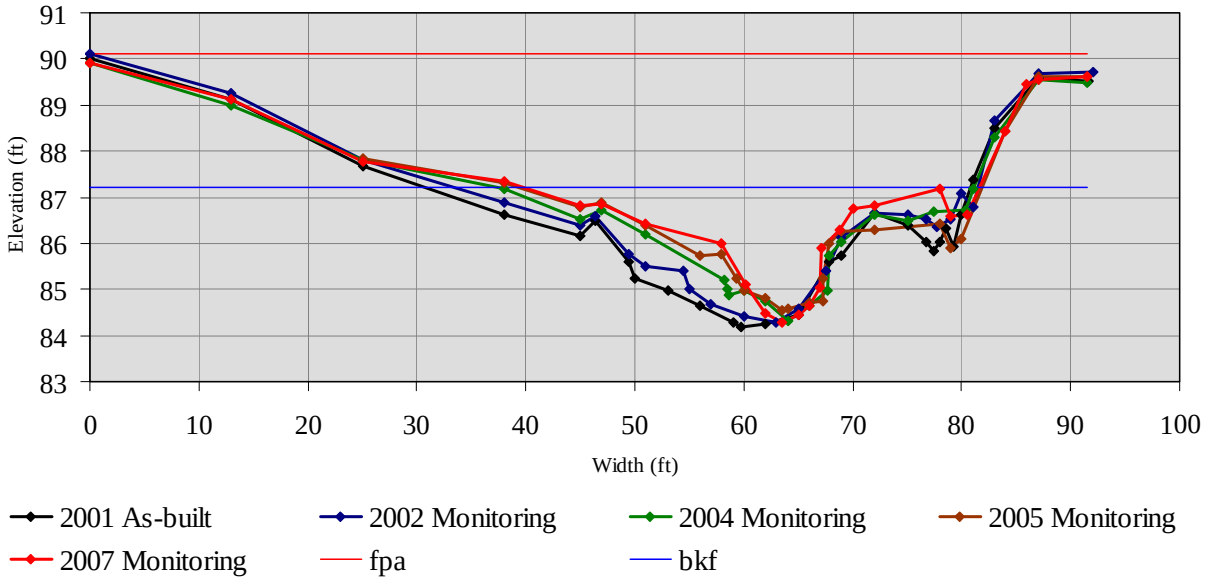

FIGURE 3.5.—Cross-section station 10+35, riffle

FIGURE 3.—Continued.

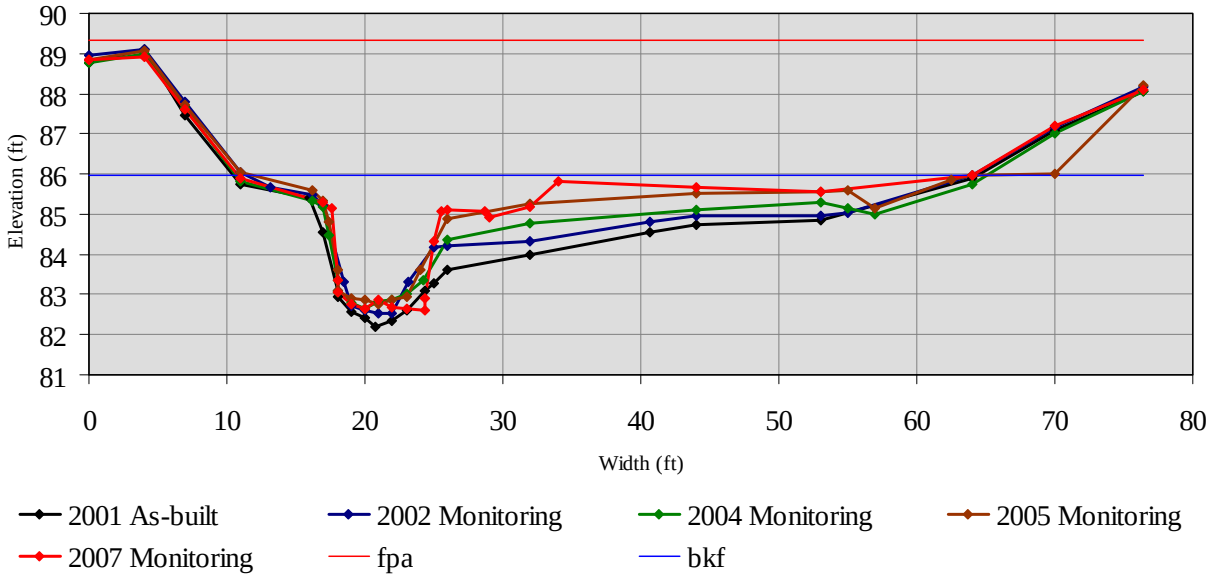

FIGURE 3.6.—Cross-section station 11+68, riffle.

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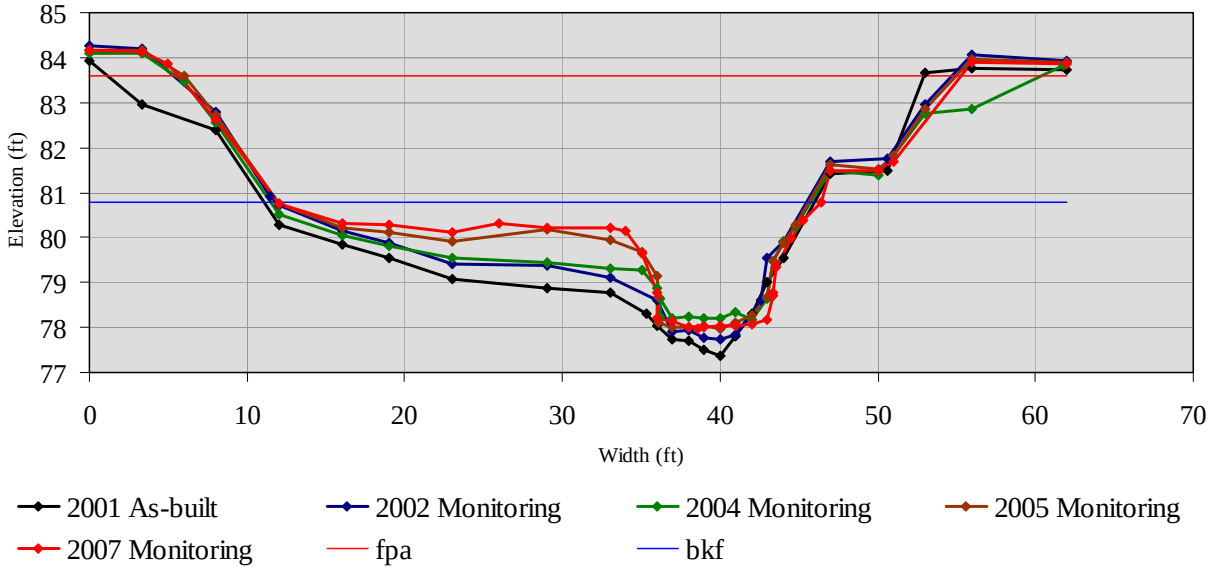

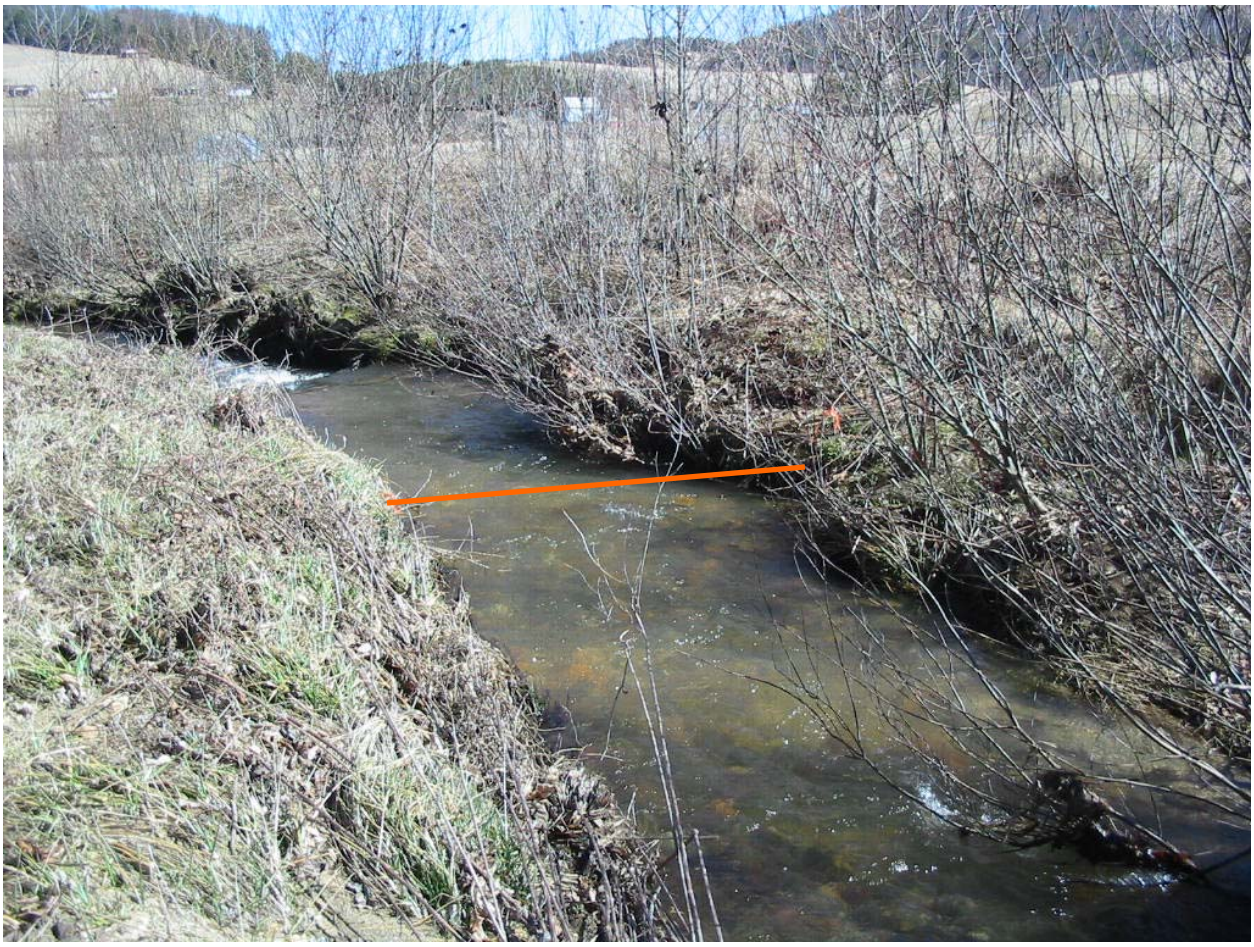

FIGURE 3.7.—Cross-section station 16+81, riffle.

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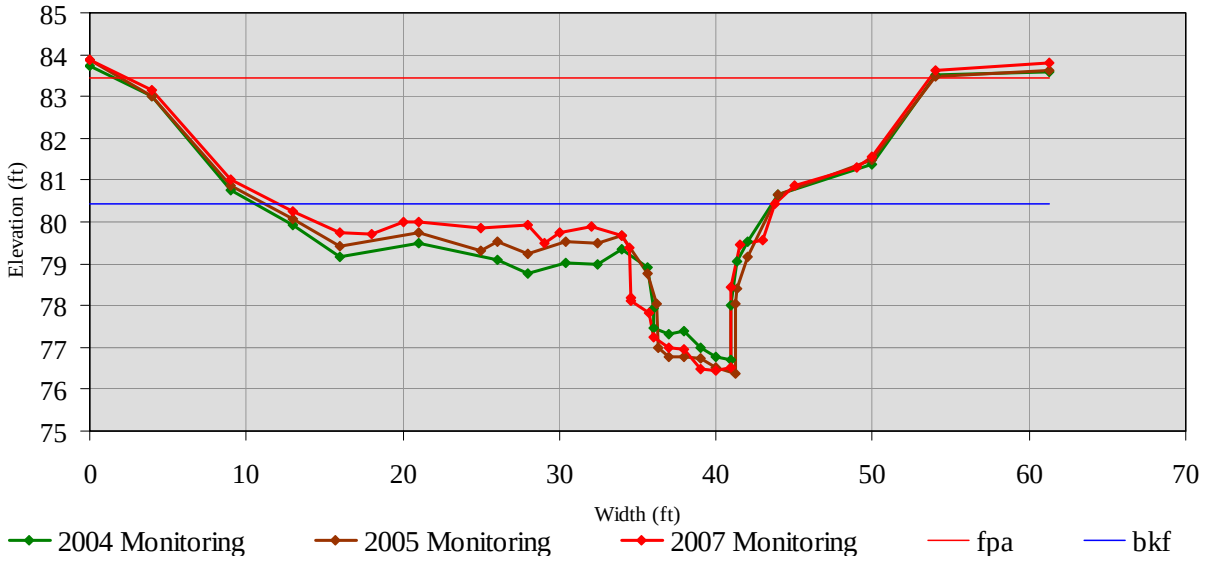

FIGURE 3.8.—Cross-section station 17+08, pool, new cross-section in 2004.

FIGURE 3.—Continued.

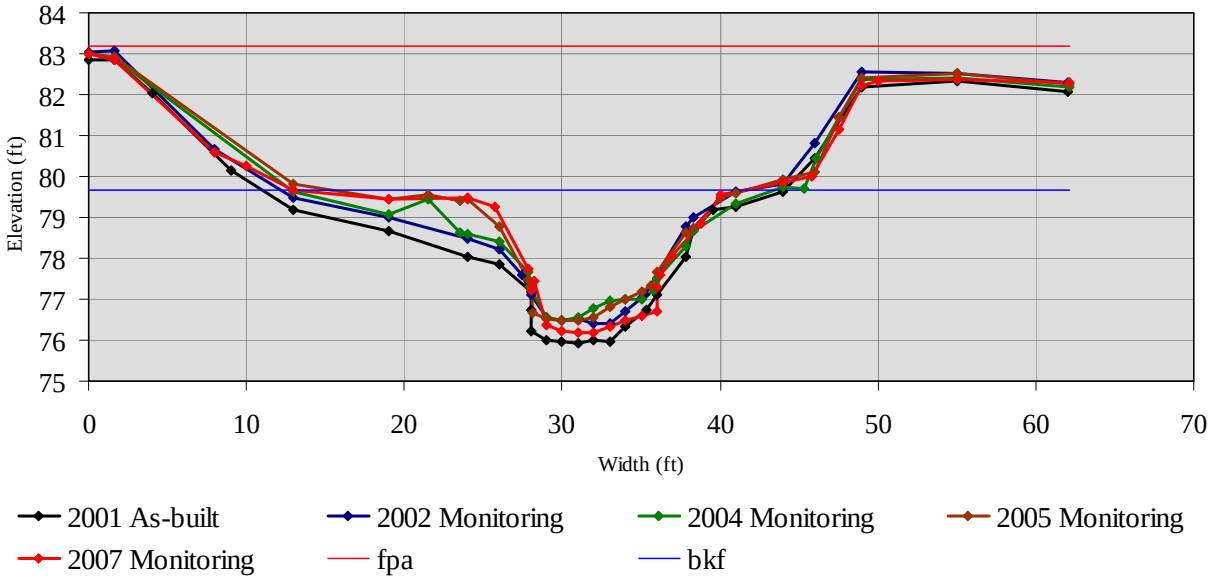

FIGURE 3.9.—Cross-section station 17+57, run.

FIGURE 3.—Continued.

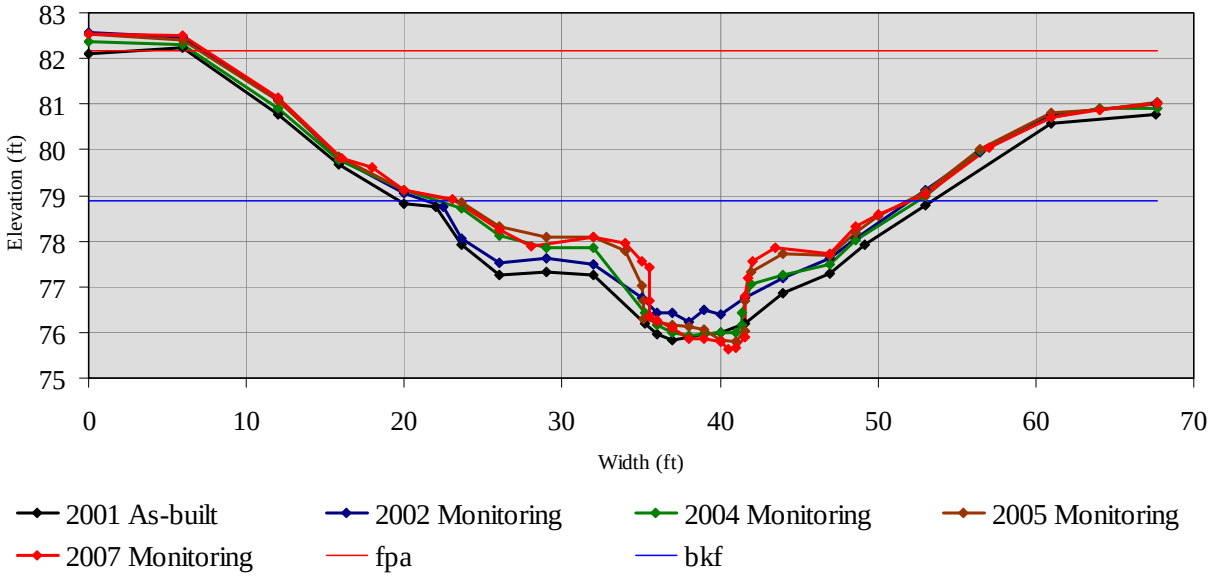

FIGURE 3.10.—Cross-section station 18+42, riffle.

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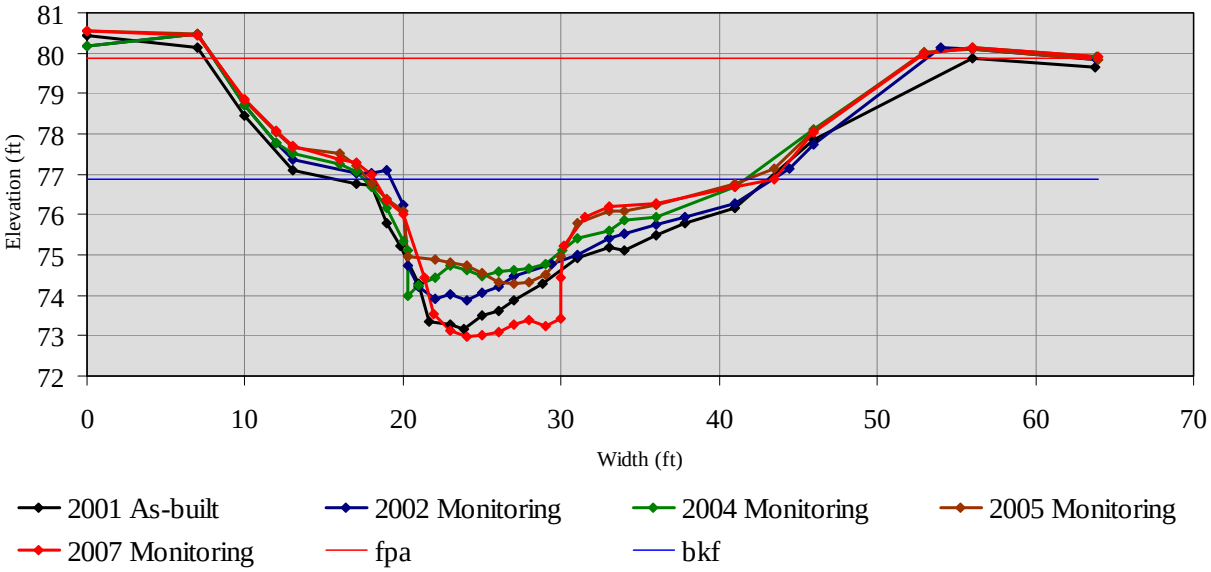
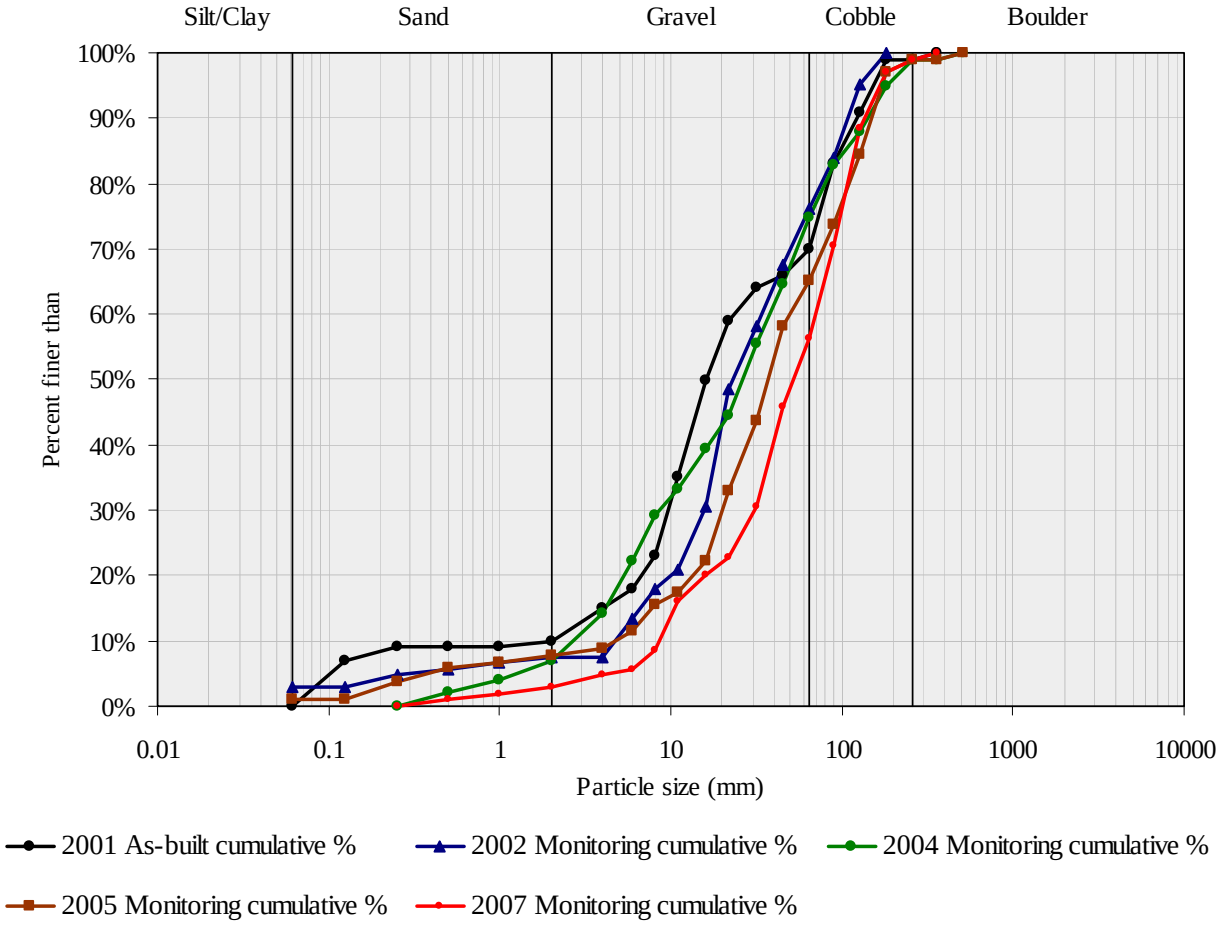


FIGURE 3.11.—Cross-section station 20+80, pool.

FIGURE 4.—Pebble count comparisons, Bare site, UT to Peak Creek, New River drainage, Ashe County, 2001-2007.



Size Class Index	Particle size (mm) in year sampled				
	2001 As-built	2002	2004	2005	2007
D_{16}	5	7	4	8.6	11
D_{35}	11	17	12	24	35
D_{50}	16	26	27	37	52
D_{84}	94	93	98	130	120
D_{95}	152	128	181	170	170

TABLE 1.—Inner berm and bankfull events at the Bare 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 (ft^3/s)	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)
9/1/06	4.8	2,090	Bankfull event
11/8/06	4.9	2,160	Bankfull event
11/16/06	5.4	2,670	Bankfull event
11/17/06	5.0	2,310	Bankfull event
12/23/06	4.6	1,860	Bankfull event
1/1/07	5.6	2,980	Bankfull event
1/2/07	4.5	1,760	Inner berm event

[a]This event produced rainfall in excess of six inches at the Bare site that resulted in major, localized flooding (see Appendices 1-11).

TABLE 2.—Vegetation monitored at the Bare mitigation site, UT to Peak Creek, New River drainage, Ashe County, April 21, 2006.

Scientific name	Common name	Number planted 2001 - 2003	Stem count April 21, 2006 Area 1[a]	Area 2[b]	Area 3[c]	Total	Percent change in numbers[e]
Live Stakes							
Cornus amomum	Silky dogwood	700	46	84	35	165	-76.4
Salix nigra	Black willow	76	16	17	25	58	-23.7
Salix sericea	Silky willow	56	13	22	182	217[d]	288.0
Bare root nursery stock							
Alnus serrulata	Tag alder	45	51	79	113	243[d]	440.0
Betula nigra	River birch	100	14	2	5	21	-79.0
Celtis laevigata	Sugarberry	69	0	0	0	0	0.0
Cornus florida	Dogwood	600	39	52	115	206	-65.7
Diospysros virginiana	Persimmon	30	0	0	0	0	0.0
Fraxinus Americana	White ashe	90	15	2	28	45	-50.0
Juglans nigra	Black walnut	144	16	3	14	33	-77.1
Platanus occidentalis	Sycamore	100	25	15	26	66	-34.0
Prunus serotina	Black cherry	90	11	19	28	58	-35.6
Quercus rubra	Red oak	112	0	0	0	0	0.0
Robinia pseudoacacia	Black locust	17	3	1	10	14	-17.6
Total		2,229	249	296	581	1,126	-49.5
Volunteers							
Liriodendron tulipifera	Tulip poplar		2	0	0	2	
Physocarpus opulifolius	Nine bark		2	11	7	20	
Pinus strobus	White pine		2	9	10	21	
Total			255	316	598	1,169	

[a]Area 1 from station 0+02 to station 5+59 at upper livestock crossing.

[b]Area 2 from station 5+69 at upper livestock crossing to station 10+46 at lower livestock crossing

[c]Area 3 from station 10+64 at lower livestock crossing to end of project at station 21+83. This site combines areas previously known as Area 3 and Area 4 (Mickey and Wasseen 2005).

[d]Counts were higher than number of stems planted due to natural regeneration.

[e]Calculated using 2006 total stem count and number planted.

Appendix 1: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking downstream from station 1+78 to 3+21,

Before construction, March 3, 2000.

After construction and during flood, September 27, 2002.

May 4, 2004.

May 26, 2005

April 5, 2006.

March 2, 2007

Appendix 2: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking downstream at cross-section 2+90.

Before construction, December 1, 2000.

After construction, October 4, 2001.

During flood, September 27, 2002.

After flood, October 4, 2002.

May 9, 2003.

May 26, 2005.

Appendix 2: Continued.

April 5, 2006.

March 2, 2007

Appendix 3: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking upstream from station 5+50.

Eroding bank before construction, March 3, 2000.

After construction and during flood, September 27, 2002.

June 16, 2005.

April 5, 2006.

March 2, 2007

Appendix 4: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking downstream from station 7+19.

Before construction, December 1, 2000.

After construction, March 2002

During flood, September 27, 2002.

May 4, 2004.

June 16, 2005.

March 2, 2007.

Appendix 5: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking upstream from station 8+90.

Before construction, March 3, 2000.

After construction and during flood, September 27, 2002.

After flood, October 4, 2002.

May 9, 2003.

May 4, 2004.

June 16, 2005.

Appendix 5: Continued.

April 4, 2006.

March 2, 2007.

Appendix 6: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking upstream from station 10+35 Note: No work occurred at this cross-section. The wetted stream width at base flow has narrowed approximately 11 feet since 2001.

After fencing, March 2002.

October 4, 2002.

May 9, 2003.

May 4, 2004.

June 16, 2005.

April 5, 2006.

Appendix 7: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking downstream from station 10+79.

Before construction, March 3, 2000.

After construction and during flood, September 27, 2002.

After flood, October 4, 2002.

May 9, 2003.

May 4, 2004.

June 17, 2005.

Appendix 7: Continued.

April 5, 2006.

March 2, 2007.

Appendix 8: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking downstream from station 16+58.

Before construction, March 3, 2000.

May 9, 2003.

May 4, 2004.

June 17, 2005.

April 5, 2006.

March 2, 2007.

Appendix 9: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Looking upstream from station 18+26.

Before construction, September 7, 2001.

After construction, October 2001.

During flood, September 27, 2002.

After flood, October 4, 2002.

May 9, 2003.

May 4, 2004.

Appendix 9: Continued.

June 17, 2005.

April 5, 2006.

March 2, 2007.

Appendix 10: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Overview of station 1+78 to 3+21.

Before construction, March 3, 2000.

May 9, 2003.

June 17, 2005.

April 5, 2006.

March 2, 2007.

Appendix 11: Photographs of the Bare mitigation site, unnamed tributary to Peak Creek, New River drainage, Ashe County. Overview below first crossing at station 10+54.

Before construction, March 3, 2000.

May 9, 2003.

June 17, 2005.

April 5, 2006.

March 2, 200