2005 Monitoring Report for the Miller et al. Mitigation Site on Meat Camp Creek, Watauga County

Prepared for the

North Carolina Department of Transportation Stream Mitigation Program

Transportation Improvement Project R-529

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Division of Inland Fisheries

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This 2005 monitoring report is submitted as partial fulfillment of the off-site stream mitigation agreement between the North Carolina Department of Transportation (DOT) and North Carolina Wildlife Resources Commission (WRC) for the R-529 US 421 road improvement project in Watauga County. Under this agreement, a total of 14,814 linear feet of stream mitigation is required by the United States Army Corps of Engineers (USACE) and 7,407 linear feet of mitigation is required by the North Carolina Division of Water Quality (DWQ). The purpose of this report is to summarize the 2005 monitoring data collected from 652 linear feet of Meat Camp Creek located on the Miller et al. property, Watauga County (Figure 1). Mickey and Scott (2002) described pre-construction survey methods, site conditions, and project objectives. The 2005 monitoring data is compared with the 2003 as-built report (Mickey and Hining 2003a) and 2003 monitoring report (Mickey and Hining 2003b).

Repairs

Streambank stabilization work at the Miller et al. mitigation site on Meat Camp Creek was completed on September 23, 2002. Since completion of the project, an as-built survey report (Mickey and Hining 2003a) and one monitoring report (Mickey and Hining 2003b) have been submitted to the DWQ and USACE. At the time of the 2003 monitoring report, all work was reported to be stable and functioning as designed. However, following the submittal of the 2003 monitoring report, a storm event on November 19, 2003 caused major bank failure between stations 3+10 to 3+55 (45 linear feet) and containing reference cross-section 3+37. Local landowners noted that the re-constructed streambank at this location was functioning as planned as floodwaters neared the top of the bank. However, during the storm an upstream culvert became blocked. When this temporary dam broke, a “wall of water” could be heard and then seen coming down Meat Camp Creek, covering both the state maintained road and adjacent floodplain at the site. This “wall of water” caused the failure of the left streambank (Appendix 1). The flood also damaged 34 feet of the right streambank at stations 5+00 to 5+34. Repairs were made to these sites on July 13, 2004. However, they were not completed as planned due to circumstances beyond our control to have large boulders delivered to the site. We planned to return at a later date to complete the repairs. Unfortunately, before the final repairs could be made utilizing large boulders, the site experienced hurricane floods on September 8, 13, and 27, 2004. These floods caused additional damage to the site (Appendices 1 and 2). Final repairs were made to the site on November 19, 2004. These repairs included reshaping the damaged bank and adding three rock vanes and one rock cross-vane from station 3+10 to 3+55. Additional repairs requiring the repositioning or addition of large boulders also required at stations 4+15 to 4+90 (Appendices 1 and 2).

Monitoring

The 2005 monitoring survey was completed on March 30, 2005. The 2005 data is compared with data from the 2003 monitoring report (Mickey and Hining 2003b). A monitoring survey was not conducted in 2004 because hurricane-caused damage had not been repaired.

Longitudinal Profile

The 2005 longitudinal profile revealed some changes in the channel thalweg (Figure 2). The pool at station 0+22 deepened 1.12 ft and the pool at station 1+73 aggraded 1.24 ft and is now a run. There has also been some channel aggradation (0.2 ft – 0.5 ft) from stations 1+85 to 2+89. The pool at station 3+76 increased in depth by 2.78 ft and the pool at station 4+97 increased in depth by 0.32 ft from the 2003 monitoring survey. These thalweg changes are due to the three hurricane storms that occurred on September 8, 13, and 27, 2004. From stations 4+45 to 4+89, the thalweg increased in maximum depth by 0.83 ft. The increase in depth at this location is a direct result of the repair work to rock vanes that occurred in this area on November 19, 2004.

Cross-sections

Five cross-sections are monitored at the site. Cross-sections showed some adjustments following the September, 8, 13, and 27, 2004 hurricanes and November 19, 2004 repairs when compared with the 2003 monitoring survey (Figure 3). As a result of the hurricanes, cross-section 1+73 has aggraded 1.24 ft and the stream feature has changed from a pool to a run. The streambank at cross-section 3+37 received the most damage from the September 2004 hurricanes and required major repairs (Figure 3.2, Appendix 1). The thalweg at pool cross-section 3+66 increased 0.39 ft in depth. (Figure 3.3). The thalweg depth at cross-section 4+74 increased 0.83 ft (Figure 3.4). This is a direct result of repair work that occurred at this site on November 19, 2004. During repairs, the left bank point bar at cross-section 4+74 from stations 0+30 to 0+46 was lowered approximately 1.2 ft. Materials from the point bar were used to rebuild the right bank after the September 2004 hurricanes. This point bar should increase in height over a period of time following future bankfull events. Cross-section 4+97 showed slight increase in depth of, 0.32 ft compared to the depth found during the 2003 monitoring survey (Figure 3.5).

Substrate

The pre-construction and as-built riffle pebble counts reveled $D_{50's}$ of 45.0 mm and 46.6 mm (coarse gravel) (Mickey and Hining 2003a, 2003b). The 2003 monitoring pebble count D_{50} was 37.2 mm (Mickey and Hining 2003b whereas the 2005 weighted and riffle $D_{50's}$ were 33.0 mm and 32.0 mm. While the 2005 monitoring D_{50} pebble size was slightly smaller than the post and as-built D_{50s}, it is still in the coarse gravel range.

Riparian Improvements

A total of 177 live stakes and bare root nursery trees were planted on March 17, 2003 (Table 1). Plantings included tag alder *Alnus serrulata,* silky dogwood *Cornus amomum,* silky willow *Salix sericea,* black walnut *Juglans nigra,* and black locust *Robina pseudoacacia.* As a result of the September 2004 hurricanes and following the November 19, 2004 repairs, disturbed streambanks were replanted with 30 silky willow live stakes and 25 tag alder (Table 1). A vegetation count was not conducted for this monitoring survey report because the plants were still dormant and difficult to identify. A vegetation count will be conducted during spring 2005 the results included in the 2006 monitoring report.

Livestock Exclusion

The livestock management program includes two water tanks and fencing to exclude them from the riparian zone. Following the September 2004 hurricanes, repairs had to be made to a section of fencing from stations 3+10 to 3+45 along Meat Camp Creek and to one watering tank outlet pipe. The fencing and watering tank are now functioning properly.

Bankfull rain events

Bankfull rain events are monitored through review of the United States Geological Survey's South Fork New River gage (03161000) near Jefferson, North Carolina, and by personal observations of bankfull stage stakes placed on site. Since completion of the as-built survey (Mickey and Hining 2003a) there have been ten bankfull or greater than bankfull events at the site (Table 2). It should be noted that the period from fall 2002 through fall 2003 was an unusually wet period. Of the seven bankfull events that occurred during this time, the thunder storm on November 19, and hurricane storms on September 2, 13, and 27, 2004 were the most severe, causing damage to the site (Figure 3.2, Appendix 1). The November 19, 2003 storm dropped 6 inches of rain in less than 8 hours on the site (personal communication, landowner).

Conclusion

Since completion of the project on September 23, 2002, the Miller et al. mitigation site on Meat Camp Creek had remained stable until the November 19, 2003 flood and September 8, 13, 27, 2004 hurricanes. As a result of these floods, some damage occurred to streambanks, most notably at stations 3+10 to 3+55 and 4+45 to 4+89. Repairs were completed on November 19, 2004 and the 2005 monitoring survey documents the impacts of the hurricanes and repairs to this site. Streambanks have been returned to stable condition and in-stream structures are functioning as designed. The 2006 monitoring survey will determine if the repairs made to this site are stable.

References

Mickey, J. H. and S. S. Hining. 2003. As-built report for the Meat Camp Creek mitigation site, Watauga County. North Carolina Wildlife Resources Commission, Raleigh.

Mickey, J. H. and S. S. Hining. 2003. 2003 monitoring report for the Miller et al. mitigation site on Meat Camp Creek, Watauga County. North Carolina Wildlife Resources Commission, Raleigh.

Mickey, J. H. and S. Scott. 2002. Stream restoration plan, Miller site, Meat Camp Creek, Watauga County. North Carolina Wildlife Resources Commission, Raleigh.

FIGURE 1. Location of the Miller et al. mitigation site on Meat Camp Creek, Watauga County, March 30, 2005.

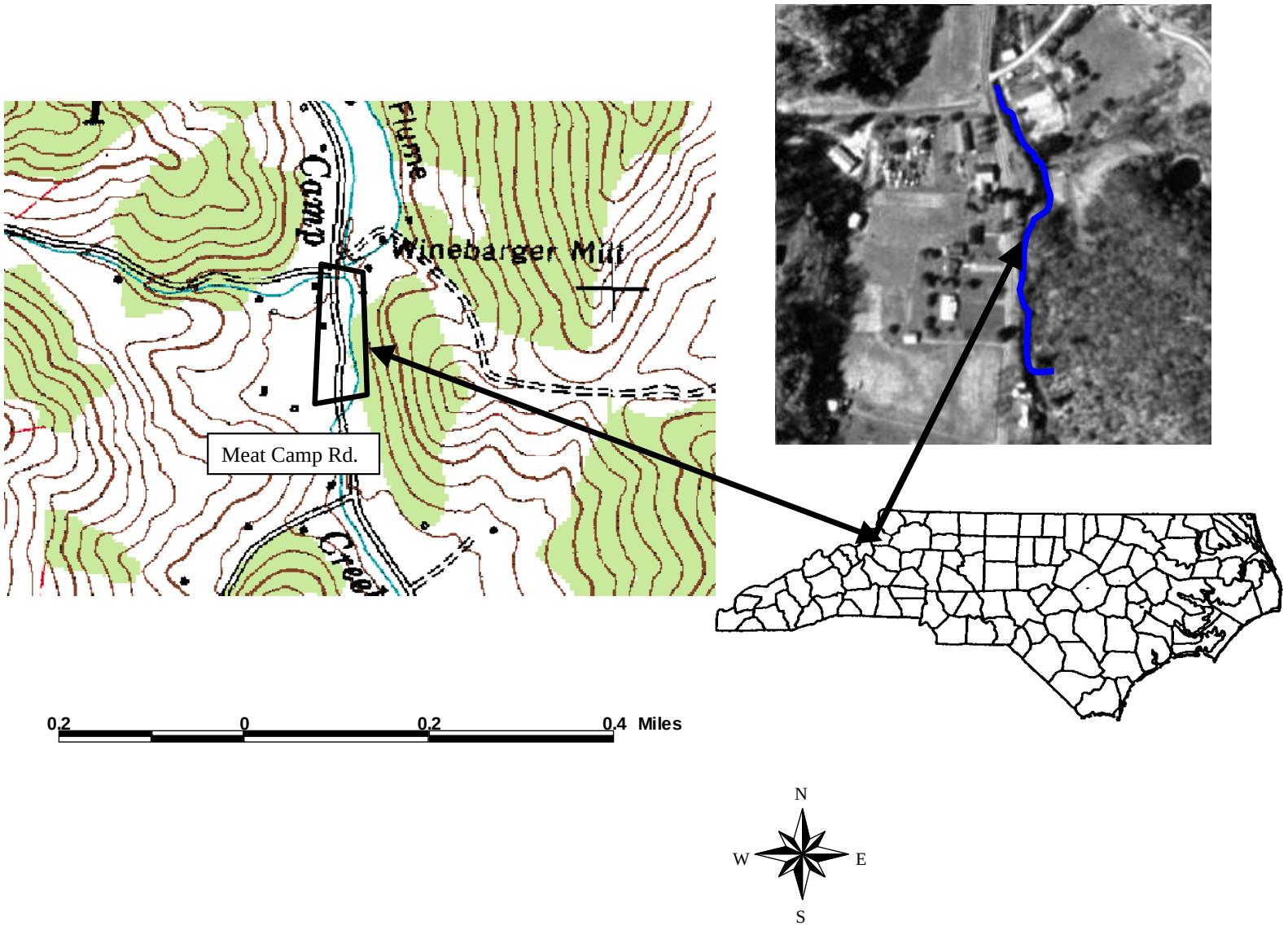


FIGURE 2. Comparison of the 2003 as-built, 2003, and 2005 monitoring survey longitudinal profiles, Miller et al mitigation site, Meat Camp Creek, New River basin, Watauga County.

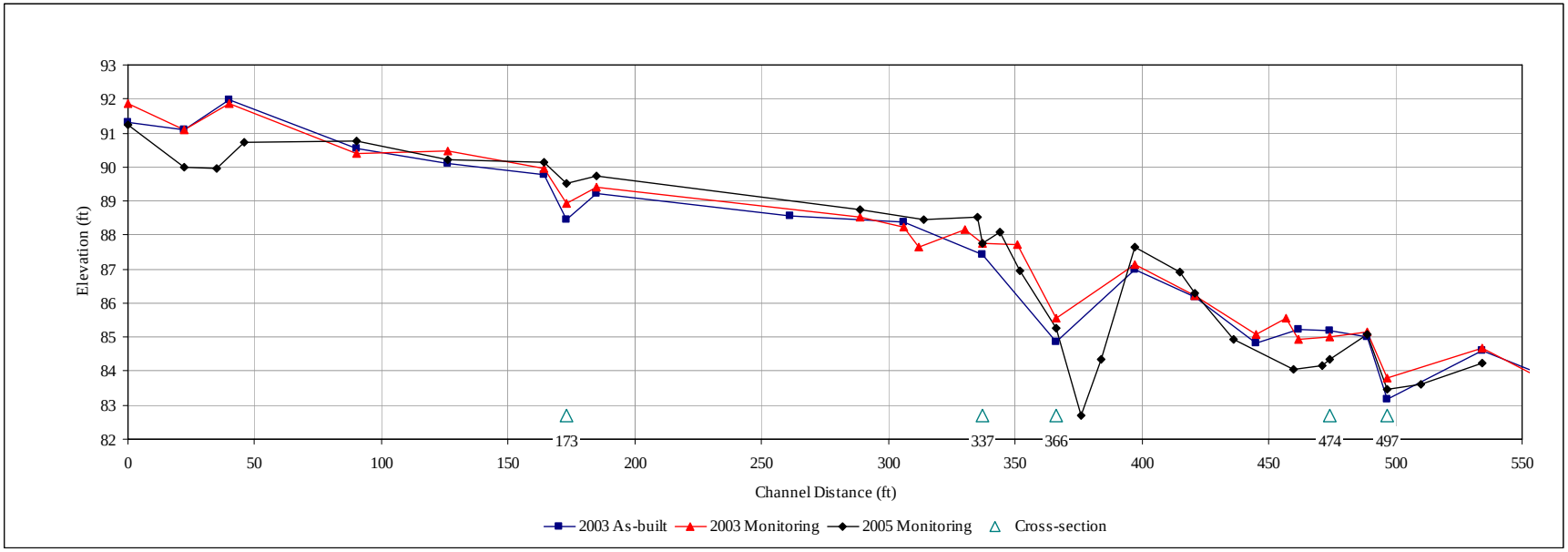


FIGURE 3. Comparison of the 2003 as-built, 2003, and 2005 monitoring cross-sections, Miller et al. mitigation site, Meat Camp Creek, New River basin, Watauga County.
fpa = flood prone area, bkf = bankfull

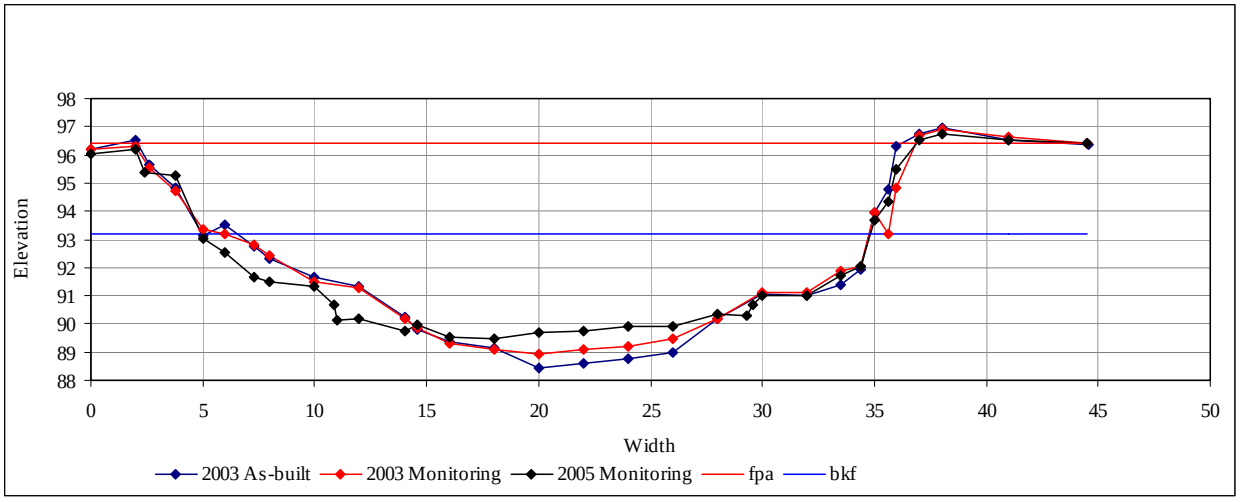


FIGURE 3.1. Cross-section 1+73, run.

FIGURE 3. Continued.

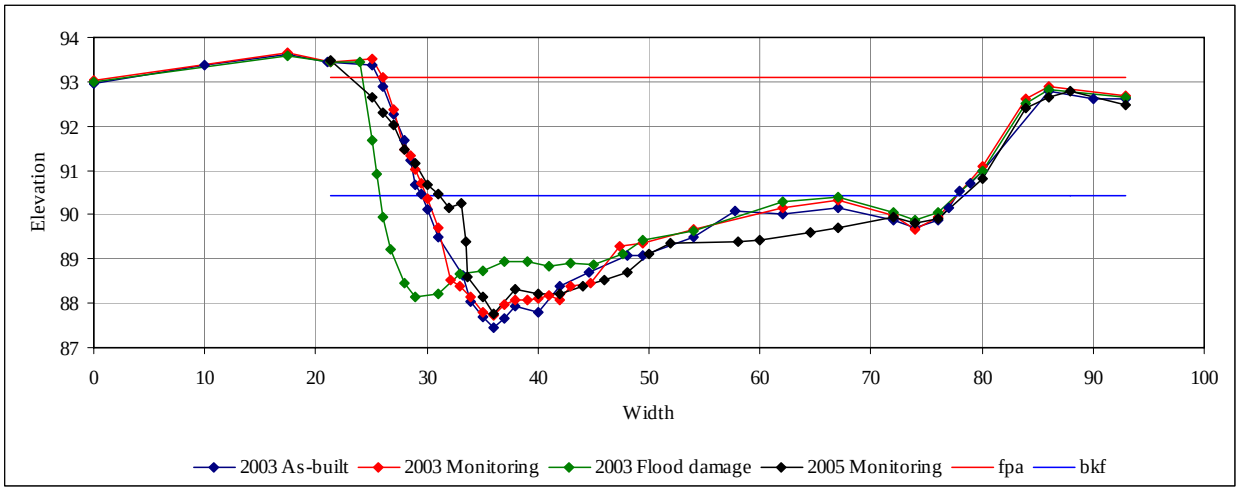


FIGURE 3.2. Cross-section 3+37, riffle. Note: graph green line represents flood damage that occurred on November 19, 2003 after the 2003 monitoring report was completed. Photograph was taken during high flows on March 30, 2005.

FIGURE 3. Continued.

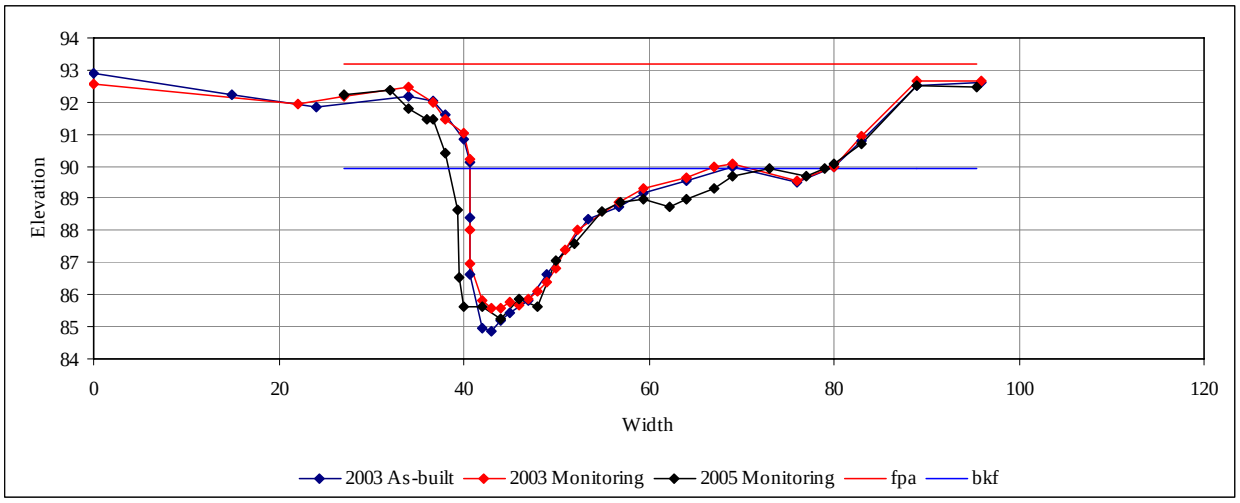


FIGURE 3.3. Cross-section 3+66, pool. Photograph was taken during high flows on March 30, 2005.

FIGURE 3. Continued.

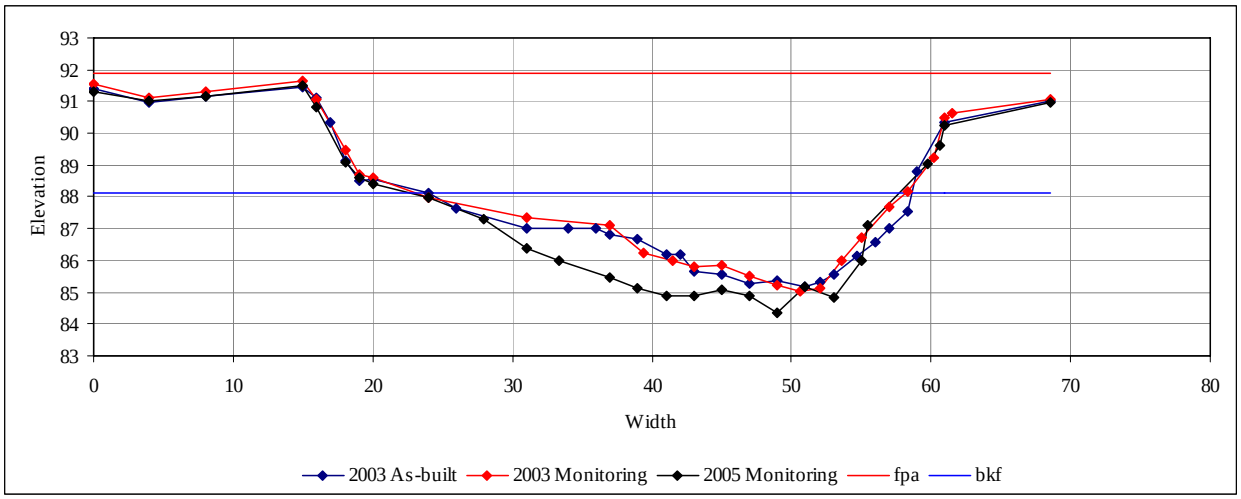


FIGURE 3.4. Cross-section 4+74, riffle. Photograph was taken during high flows on March 30, 2005.

FIGURE 3. Continued.

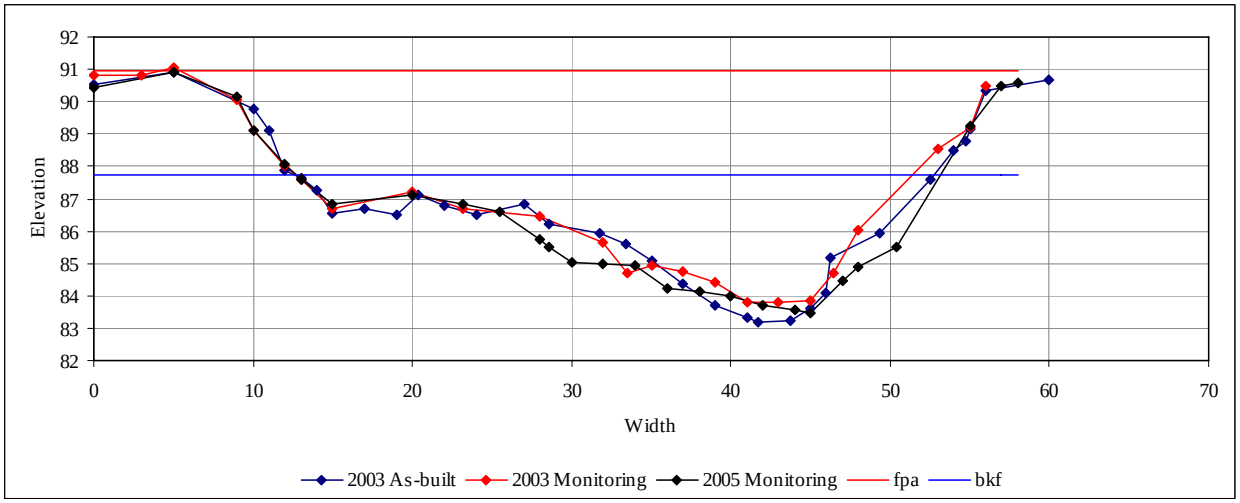
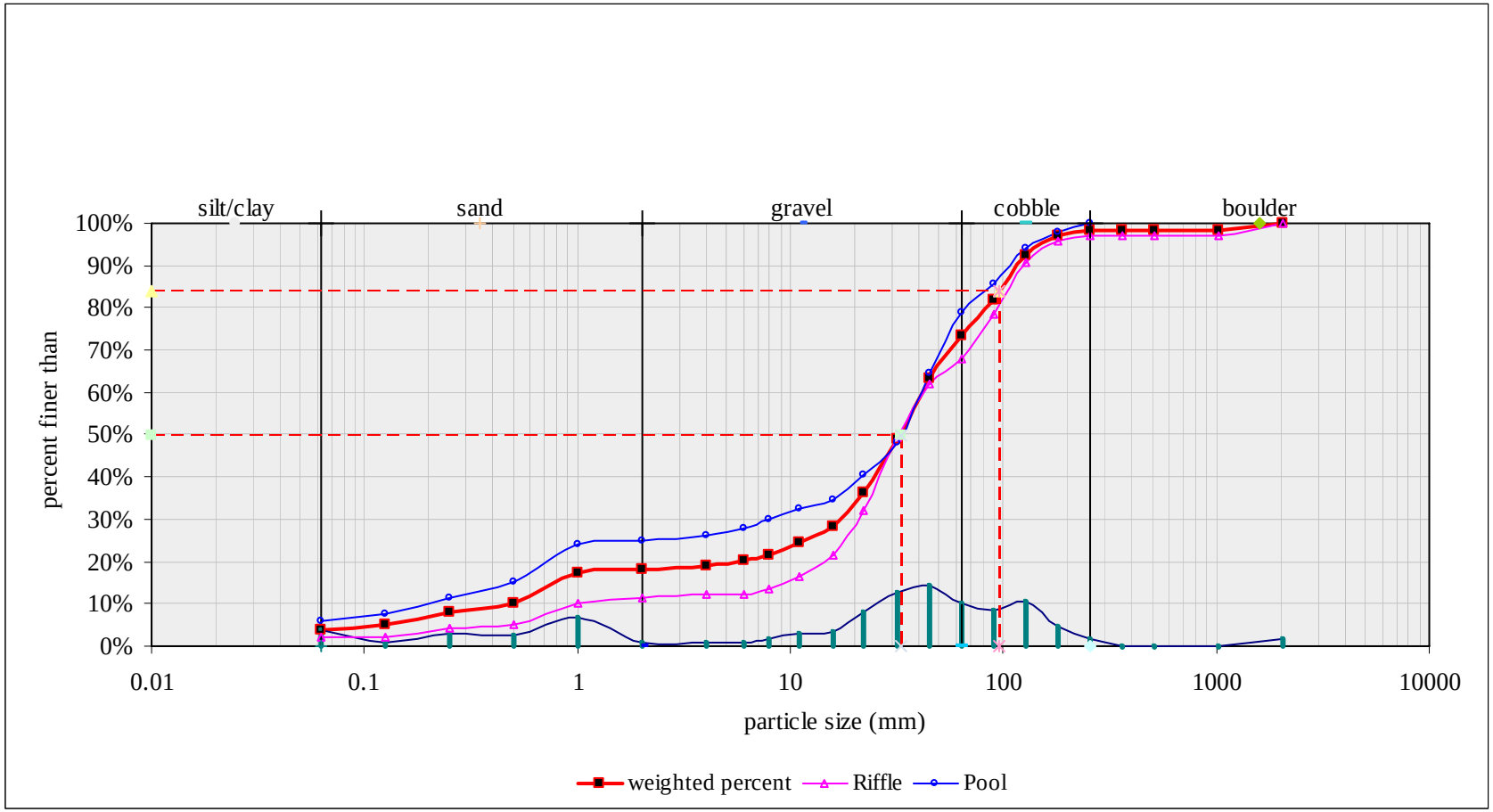


FIGURE 3.5. Cross-section 4+97, pool. Photograph was taken during high flows on March 30, 2005.

FIGURE 4. Pebble count summary for the Miller et al. mitigation site on Meat Camp Creek, New River basin, Watauga County, March 30, 2005.



	Size percent less than (mm)						Percent by substrate type				
	D16	D35	D50	D65	D84	D95	Silt/clay	Sand	Gravel	Cobble	Boulder
Weighted	0.89	21	33	48	96	150	4%	14%	55%	25%	2%
Riffle 3+37	10	23	32	54	110	170	2%	9%	57%	29%	3%
Pool 4+97	0.53	16	33	46	83	140	6%	19%	54%	21%	0%

TABLE 1. Plantings along Meat Camp Creek at the Miller et al. site, Watauga County, March 12, 2003 and November 19, 2005.

		Number planted	
Scientific name	Common name	2003	2005
Salix sericea	Silky willow	136	30
Robina pseudoacacia	Black locust	26	
Juglans nigra	Black walnut	5	
Alnus serrulata	Tag alder	10	25
	Total	177	55 = 232

Table 2. Monitoring of inner berm and bankfull events in the South Fork New River watershed from the United States Geological Survey gage number 03161000 near Jefferson, Ashe County, North Carolina.

Date	Gage height (ft)	Flows (cfs)	Comments
2/22-23/03	5.0	2,250	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)

[a]This event produced major local flooding at the Bare, Carp, Racey and Miller sites. Local rains were in excess 6 inches and this event caused damage to the Bare and Miller sites.

Appendix 1: Photographs of damage and repairs to stations 3+10 to 3+55 at the Miller et al. mitigation site on Meat Camp Creek, New River drainage, Watauga County. November 19, 2003 – November 19, 2004.

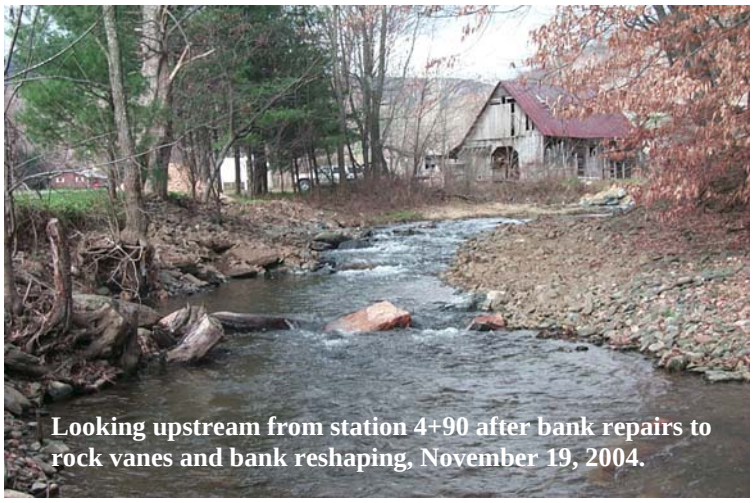
After November 19, 2003 flood. Notice that 6 ft of the watering tank drainage pipe is exposed.

Bank damage after September 8, 13, and 27, 2004 hurricanes.

Bank after repairs using three rock vanes, one rock weir, and bank reshaping, November 19, 2004.

Appendix 2: Photographs of September 8, 13, 27, 2004 hurricane damage from stations 4+15 to 4+90 at the Miller et al. mitigation site on Meat Camp Creek, New River drainage, Watauga County. This site was repaired on November 19, 2004.

Bank damage, looking upstream from station 4+90 after hurricanes, October 2004.



Looking upstream from station 4+90 after bank repairs to rock vanes and bank reshaping, November 19, 2004.