2004 - 2005 Monitoring Report for the Wild Mitigation Site on Obids Creek, Ashe County

Prepared for the

North Carolina Department of Transportation Stream Mitigation Program

Transportation Improvement Project R-529

Period Covered, April 28, 2004 – June 30, 2005

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2005

This report summarizes 2004 and 2005 monitoring data collected along 1,819 linear feet of Obids Creek at the Wild stream mitigation site in Ashe County (Figure 1). Mickey and Scott (2002) described pre-construction survey methods, site conditions, and project objectives. Channel modifications were completed on September 23, 2002. The purpose of the project is to improve in-stream habitat and reduce bank erosion of a previously channelized and heavily grazed (cattle) stream reach. This 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, Transportation 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).

Monitoring

Monitoring surveys were conducted on April 28, 2004 and June 17 and 30, 2005. The 2004 and 2005 monitoring data is compared with as-built data collected on January 9, 2003 (Mickey and Scott 2003). The 2004 and 2005 monitoring surveys included longitudinal profile survey (2004 only), channel cross-section surveys, pebble counts, and woody vegetation stem counts (planted trees/live stakes). A photographic log of the site is maintained at four locations: stations 7+75 to 8+50; 8+65 to 9+60; 10+64 to 11+27; and 12+29 to 13+41 (Appendices 1 - 4). Photographs are taken looking down stream. Photographs of additional sites are maintained in the site files.

Bankfull rain events are monitored through review of the United States Geological Survey's South Fork New River gage (03161000) near Jefferson, North Carolina, by photographs and by personal observations of bankfull stage pins placed on site. Since completion of the project there have been 10 bankfull or greater than bankfull events at the site (Table 1).

Longitudinal Profile

Longitudinal profile data was collected during 2004 from four reaches; stations 2+86 – 3+73, 7+21 – 9+90, 10+56 – 12+60, and 12+82 – 14+67 (Figure 2). These sections were compared with the as-built longitudinal profile. No appreciable change in the longitudinal profile was present between 2003 and 2004. The longitudinal profile has remained stable with no identified aggradation or degradation areas. Minor changes in the longitudinal profile are the result of normal storm events and not the result of stream enhancement activities. Therefore, a longitudinal profile survey was not collected in 2005.

Cross-sections

Nine cross-sections were surveyed during April 2004 and June 2005. Cross-sections showed some adjustments following the September 8, 13, and 27, 2004 hurricanes when compared with the 2004 monitoring survey (Figure 3). While there have been some adjustments in thalweg depths, there was no noticeable lateral movement of the channel following the 2004 hurricanes.

Most of the cross-sections exhibit some build up of the streambanks due to deposition of soil materials (silt, sand, small gravel) during bankfull or greater than bankfull storm events.

CROSS-SECTION 3+55 – riffle (Figure 3.1): This cross-section is located over a deep riffle just below a cross vane. There has been little change in the cross-section from 2003 thru 2005. The thalweg deepened to as-built elevations following the three September 2004 hurricanes. This cross-section has remained stable with no lateral movement (bank erosion) observed along the left and right banks.

CROSS-SECTION 7+36 – pool (Figure 3.2): This cross-section is located over the tail end of a long pool just above a cross vane. There has been some channel migration along the right bank at cross-section station 0+59.4 since completion of the project. However, the bank is stable and well vegetated.

CROSS-SECTION 8+19 – riffle (Figure 3.3): This cross section is located over a riffle. The thalweg profile has remained stable exhibiting only minor adjustments due to storm events. The unusual high point for the as-built survey at station 0+18.9 was shot on top of a root wad, instead of behind or to the side of the structure. The build up of the bank from stations 0+30 – 0+50 is due to cattle no longer having access to this crossing area and the result of streambed materials (silt, sand, gravel) being captured by riparian vegetation during flood events. This cross-section has remained stable with no lateral movement (bank erosion) observed along the left and right banks. However, a few holes have developed behind the root wads. These sites will need to be monitored for possible bank erosion problems in the future.

CROSS-SECTION 9+16 – run (Figure 3.4): This cross-section is located over a run below a cross vane with root wads along the right bank. However, it could also be considered a fast pool. The 2004 and 2005 monitoring surveys indicate no major changes in the thalweg of the cross-section when compared with the as-built survey. However, as bank vegetation continues to increase in density, bank height has increased as streambed materials (silt, sand, gravel) are captured by riparian vegetation during flood events. This cross-section has remained stable with no lateral movement (bank erosion) observed along the left and right banks.

CROSS-SECTION 10+88 – pool (Figure 3.5): This cross-section is located over a stable pool immediately downstream of the upper ford and below a cross vane with root wads along the left bank. There has been very little change in this cross-section.

CROSS-SECTION 12+32 – riffle (Figure 3.6): This cross-section is located over a riffle. The only change at this site is 1 foot deepening of the thalweg along the left bank. Both banks are stable and well vegetated.

CROSS-SECTION 12+74– pool (Figure 3.7): This cross-section is located over a pool below a cross vane with root wads along the left bank. The thalweg has deepened next to the root wads. Station 0+17.9 identifies a hole behind the root wads whereas the high point at station 0+19 is on top of the root wads. The three September 2004 hurricanes moved a large boulder at stations 0+29 – 0+33. As a result channel depth increased between the boulder and the right bank with the bank remaining stable. The right bank continues to increase in height as a

direct result of streambed materials (silt, sand, small gravel) being captured by riparian vegetation during flood events. This cross-section is considered stable with no lateral movement (bank erosion) observed along the left and right banks.

CROSS-SECTION 13+80 – 14+29 pool/riffle complex (Figure 3.8): This cross-section goes through an S curve meander pattern, making it part cross-section, part longitudinal profile. This allowed for the monitoring of two distinct pools that were created with root wads and bank re-shaping. The only noticeable change from 2003 to 2005 is the creation of a run feature from stations 0+30 – 0+40. This site is very stable and well vegetated. During the 2002 construction, transplants of tag alder *Alnus serrulata* and ninebark *Physocaupus opulifolius* were used on top of and behind the root wads on the right bank. These transplants have experienced rapid growth, providing bank stability and stream shading.

CROSS-SECTION 16+52 – pool (Figure 3.9): This cross-section is located just below the lower ford and immediately below a cross vane. The cross-section has remained stable and the thalweg has deepened approximately 0.8 ft along the right bank. There have been some minor adjustments to the bankfull and floodplain areas that have captured streambed materials (silt, sand, small gravel) during flood events.

Substrate

Bed material analysis was conducted in a riffle at cross-section 18+42 (Figure 4). Substrate analysis indicates a slight increase in all particle sizes, except for the D_{95} category, from 2003 to 2005. Since 2003 the D_{50} has coarsened from medium, to coarse, to very coarse gravel. The increase in particle size, especially the D_{50} and D_{84}, is probably a result of the elimination of cattle having access to streambanks and a shifting of the substrate following the three September 2004 hurricanes. Based on visual observations following these hurricane events, the stream substrate appeared cleaner with less silt and sand.

Riparian Improvements

A total of 716 bare root trees and live stakes were planted in the 2.6 acre conservation easement area during the winter of 2003. The site is divided into five vegetation plot areas with total stem counts (trees and live stakes) being made in each area. The 2004 vegetation survey counted 297 stems at the five sites for a 41.5% survival or 114 stems per acre (Table 2). Of the 11 tree/shrub species planted, those having a greater than 50% survival rate in 2004 were locust *Robinia pseudoacacia* (70%), black walnut *Juglans nigra* (67%), and red oak *Quercus ruba* (60%); (Table 2). The density of counted stems is well below the 288 stems/acre required for woody species planted at mitigation sites through year three (USACE 2003). There are three reasons for the low count of planted stems. First, only portions of the 2.6 acres were disturbed during construction. At many locations, streambanks were not disturbed in order to maintain the dense tree cover along the riparian zone; trees were not planted in these areas (Appendix 1). Second, stems were only planted along streambanks that were re-shaped and the area of all these sites is less than one acre. Third, the stem counts were attempted during May 2004, making them difficult to locate among the dense grasses and forbs.

An attempt was made to count planted stems in area four (left bank going downstream from the upper ford to the lower easement boundary) on June 30, 2005 but the riparian zone forbs were five to six feet high, making it extremely difficult to locate any of the stems planted during 2003. Three hundred fourteen stems were planted in this area, 114 were counted in 2004 (Table 2) and 78 counted in 2005 for a survival of 24 percent (Table3). Only three species (tag alder, locust and walnut) were taller than the surrounding forbs. As these plants grow, they should be easier to find and identify in 2006. We also noted natural regeneration of tag alder (16 more stems counted than planted), black cherry *Prunus serotina* (3 stems) and ninebark *Physocaupus opulifolius* (2 stems). Future stem counts should be conducted in early May.

It should be noted that one North Carolina threatened plant species, Gray's lily *Lilium grayi* was found inside the fenced conservation easement area. In the past, cattle have grazed the tops of the Gray's lilies, keeping them from blooming (landowner observation). However, since the pasture was not grazed during 2005, over 50 Gray's lilies were observed growing outside the conservation easement area.

Livestock Exclusion

The livestock management program includes two stream-crossing sites, three water tanks and fencing to exclude livestock from the riparian zone. Since construction was completed in September 2002, minor repairs have been made to the two crossing sites. The fencing and watering tanks are functioning properly.

Conclusion

Since completion of the as-built report (Mickey and Scott 2003) Obids Creek at the Wild mitigation site has remained stable. There have been no bank or structure failures and the stream is stable and functioning properly. The riparian vegetation is thriving and helping to re-build and stabilize the streambanks. In order to better locate planted stems, future vegetation counts should be conducted in late April or early May before the forbs growth becomes so tall as to make it difficult to locate planted stems. The annual monitoring surveys will continue until the project meets the five year permit requirement in 2007.

References

Mickey, J. H. and S. Scott. 2002. Stream stabilization and enhancement plan, Wild site, Obids Creek, Ashe County. North Carolina Wildlife Resources Commission, Raleigh.

Mickey, J. H. and S. Scott. 2003. As-built report for the Wild mitigation site, Obids Creek, Ashe County. North Carolina Wildlife Resources Commission, Raleigh.

Rosgen, D. L. 1996. Applied river morphology. Wildland Hydrology Books. Pagosa Springs, Colorado.

USACE (US 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. Wild stream mitigation site, Obids Creek, Ashe County, July 14, 2005

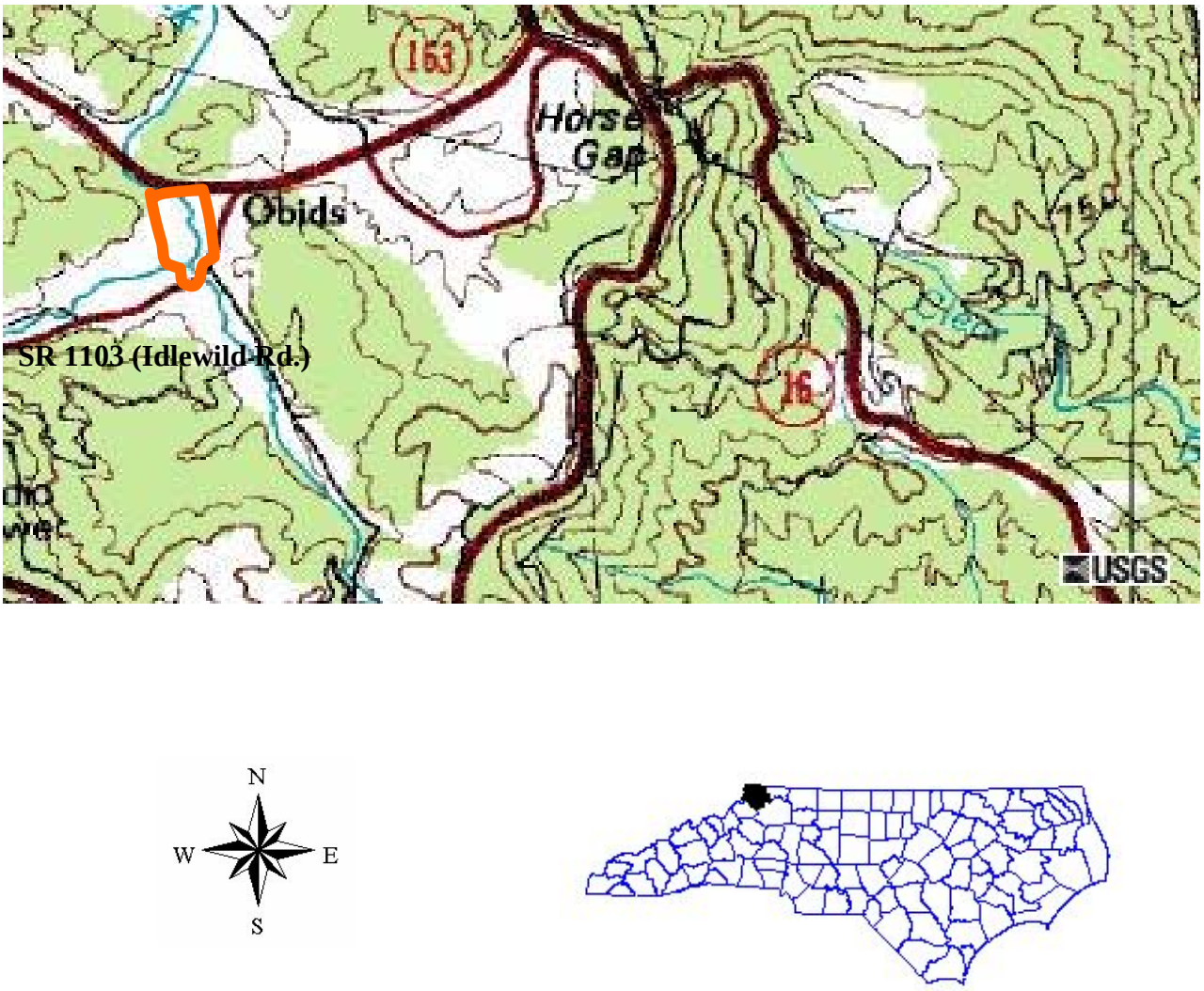


FIGURE 2. Longitudinal profile comparisons, Wild site, Obids Creek, Ashe County, 2003-2004.

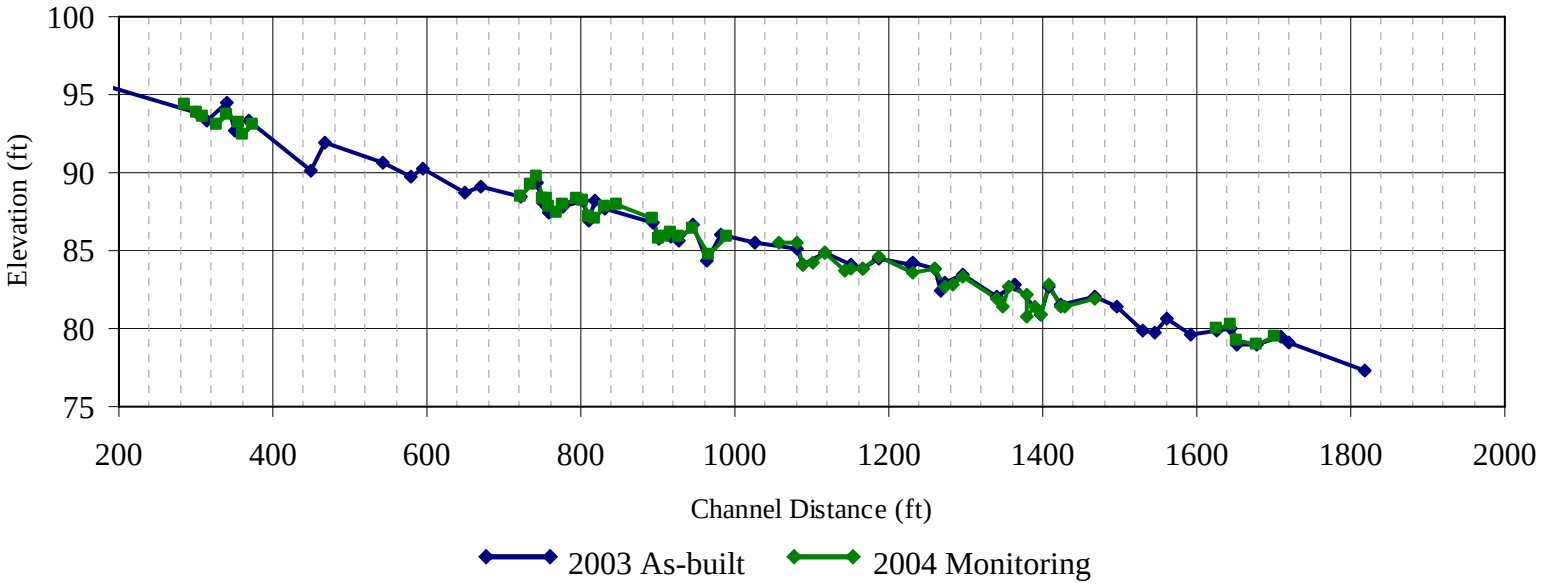


FIGURE 3. Cross-section comparisons, Wild mitigation site, Obids Creek, Ashe County, 2003-2005.

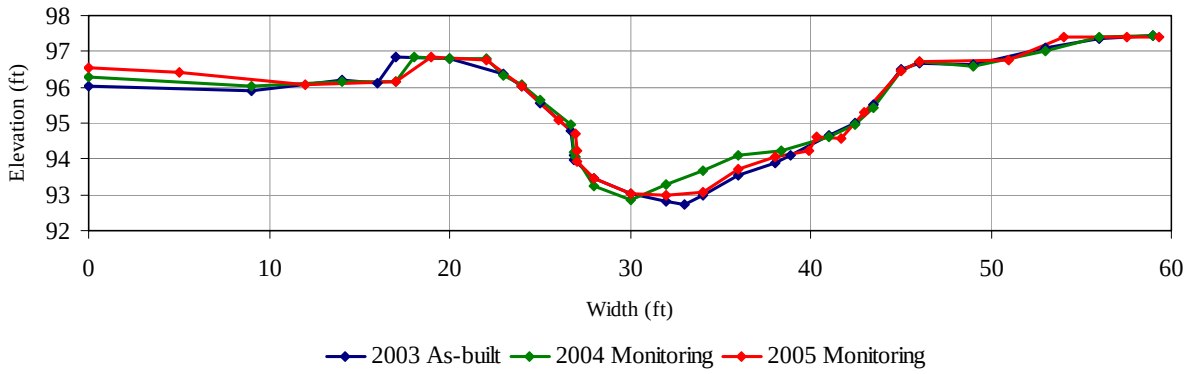


FIGURE 3.1. Cross-section station 3+55, riffle.

FIGURE 3. Continued.

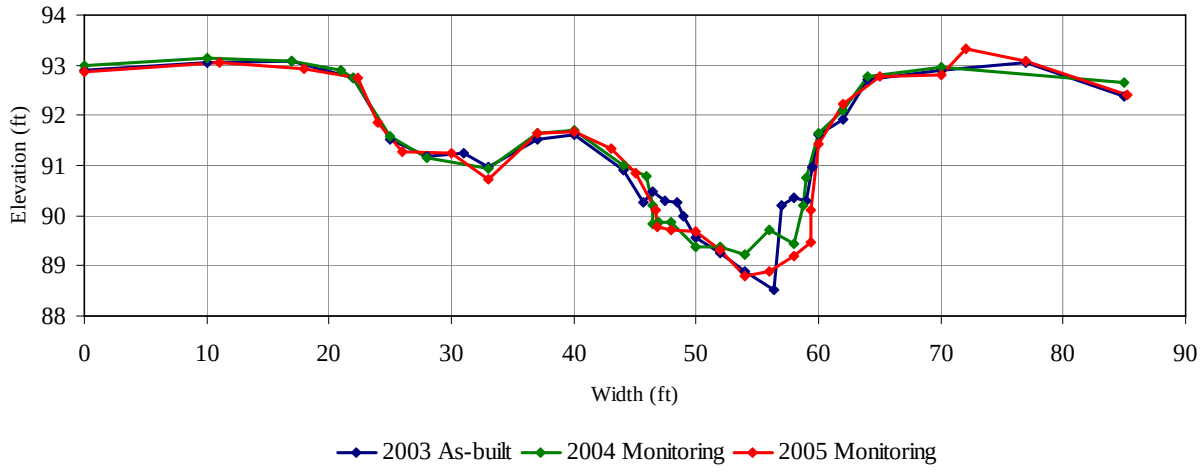


FIGURE 3.2. Cross-section station 7+36, pool.

FIGURE 3. Continued.

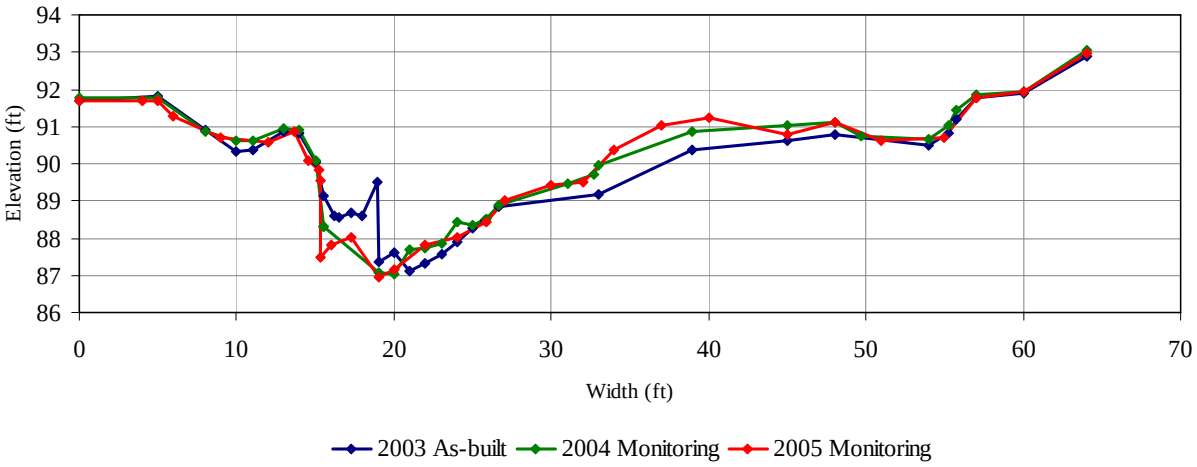


FIGURE 3.3. Cross-section station 8+19, riffle.

FIGURE 3. Continued.

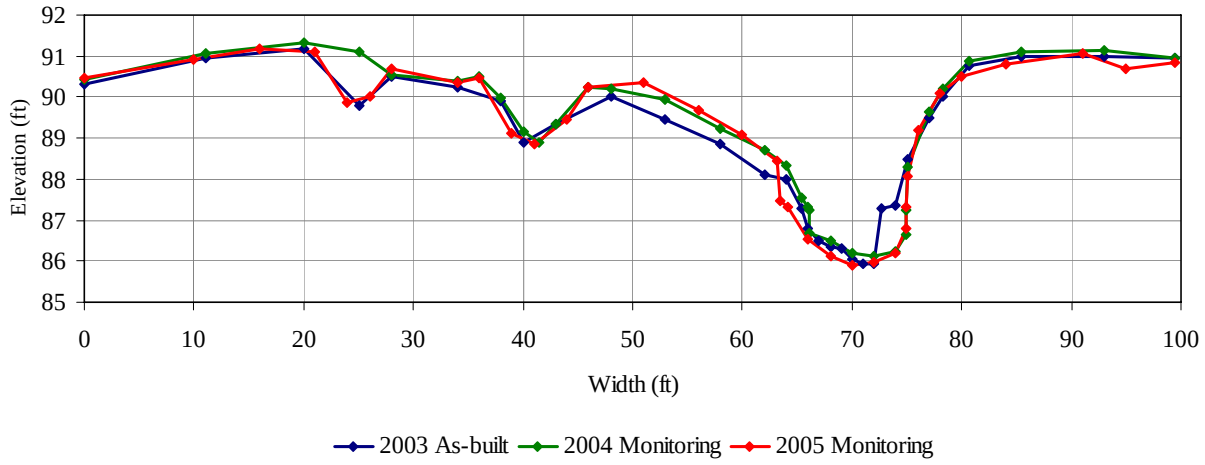


FIGURE 3.4. Cross-section station 9+16, run.

FIGURE 3. Continued.

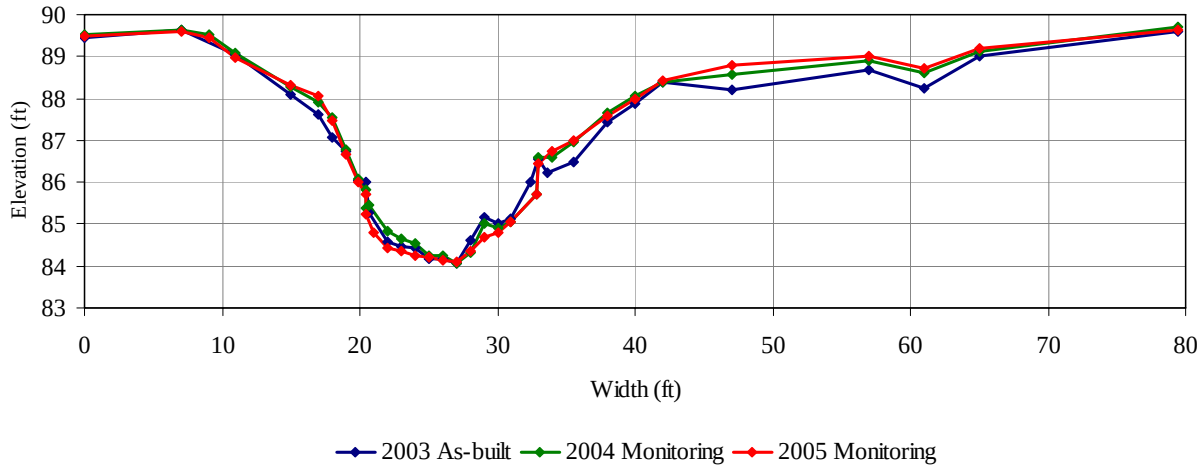


FIGURE 3.5. Cross-section station 10+88, pool.

FIGURE 3. Continued.

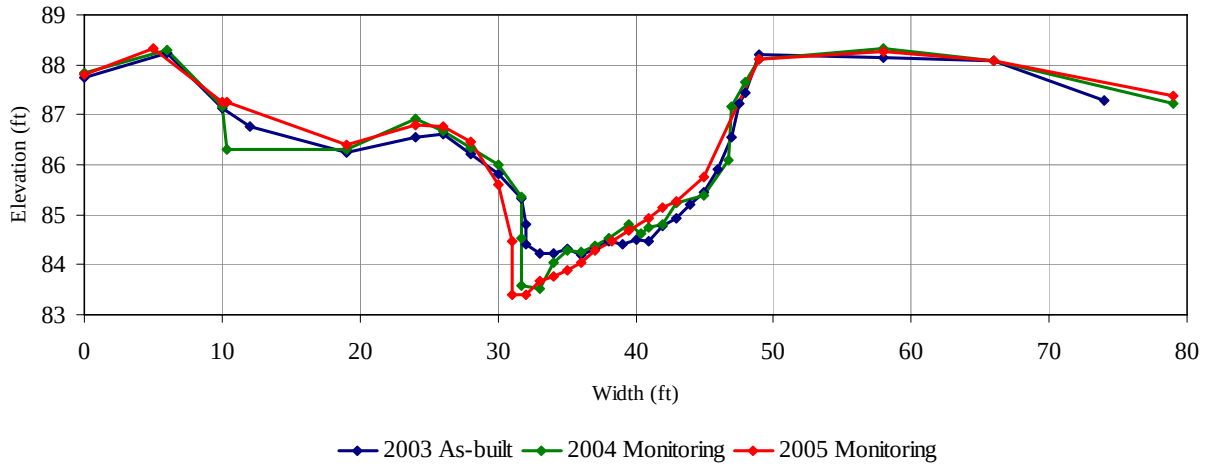


FIGURE 3.6. Cross-section station 12+31, riffle.

FIGURE 3. Continued.

FIGURE 3.7. Cross-section station 12+74, pool.

FIGURE 3. Continued.

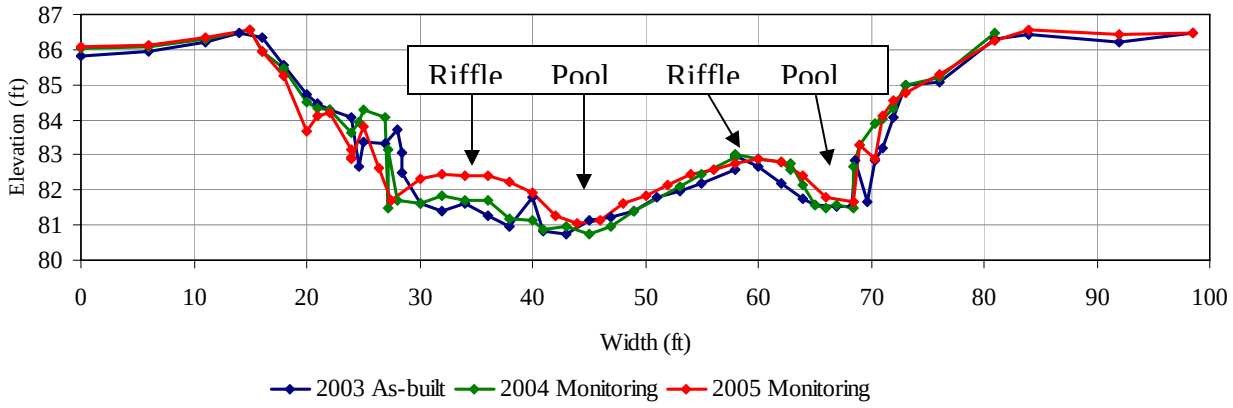


FIGURE 3.8. Cross-section station 13+80-14+29. This cross-section incorporates two different restoration sites into one. The cross-section was taken at an S-curve; it encompasses a riffle, pool, riffle and another small pool.

FIGURE 3. Continued.

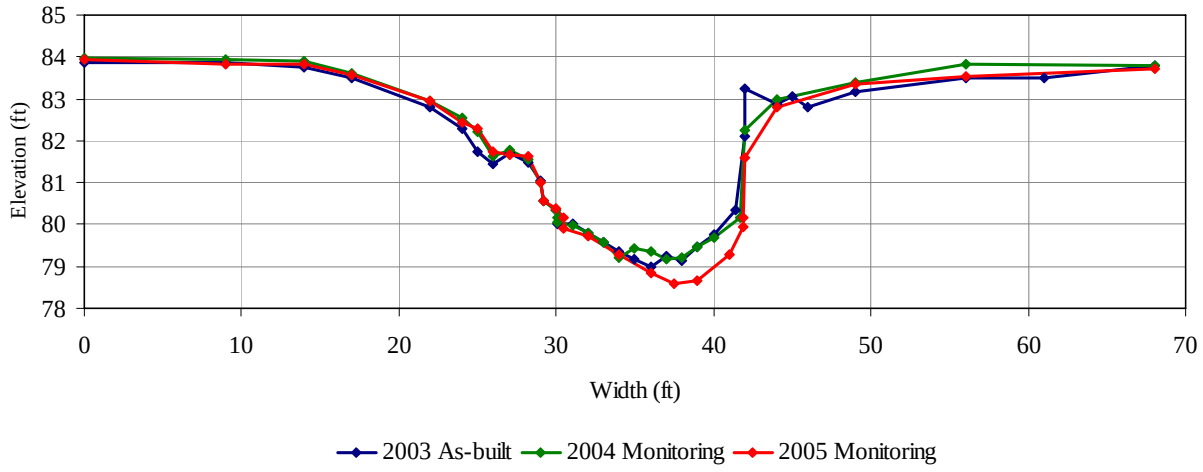
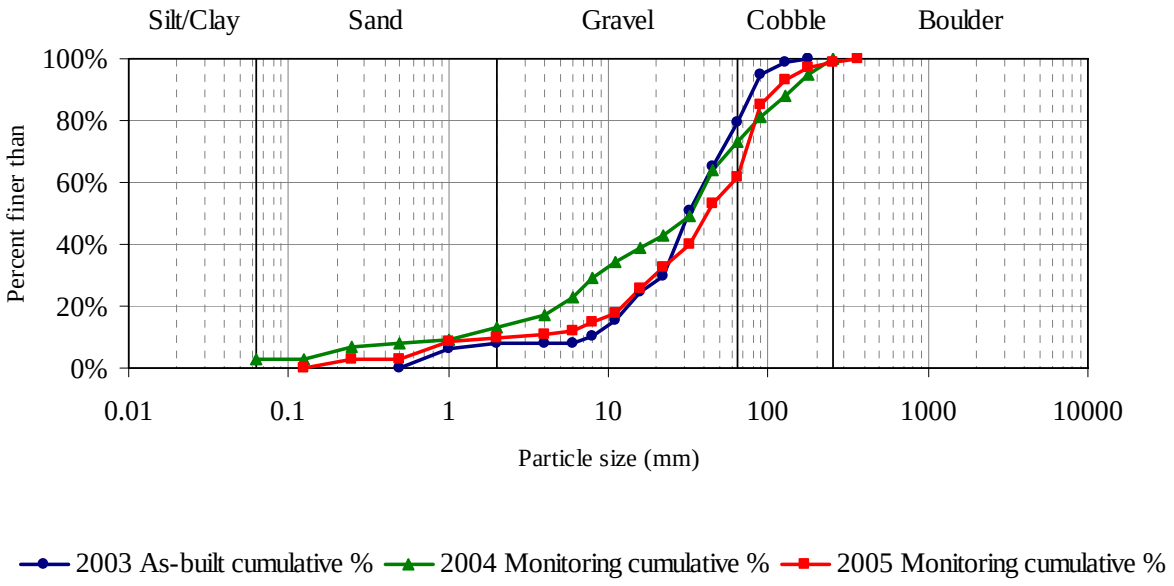


FIGURE 3.9. Cross-section station 16+52, pool.

FIGURE 4. Pebble count comparisons, Wild site, Obids Creek, Ashe County, 2003-2005.



Size	2003 As-built Particle size (mm)	2004 Monitoring Particle size (mm)	2005 Monitoring Particle size (mm)
D 16 (mm)	11	3.4	9.2
D 35 (mm)	24	12	45
D 50 (mm)	31	33	42
D 84 (mm)	71	100	88
D 95 (mm)	91	180	150

TABLE 1. Monitoring of inner berm and bankfull events at the Wild mitigation site based on data from the United States Geological Survey South Fork New River gage (No. 03161000) near Jefferson, Ashe County, North Carolina and from visual observations.

Date	Gage height (ft)	Flows (ft^3/s)	Comments
2/27/02			Bankfull event (photo log)
2/22-23/03	5.0	2,250	Bankfull event
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)
6/2-3/05			Inner berm event (observation 6/14/05)

[a]This event produced major local flooding at the Bare, Carp, Racey and Miller stream mitigation sites, causing some damage to the Bare and Miller sites. According to eyewitness accounts, some local rains were in excess of 6 inches.

TABLE 2. Vegetation monitoring at the Wild mitigation site, Obids Creek, Ashe County, May 12, 2004.

	Number planted						Number counted on May 12, 2004						
Species	Area 1[a]	Area 2[b]	Area 3[c]	Area 4[d]	Area 5[e]	Total	Area 1	Area 2	Area 3	Area 4	Area 5	Total	% survival
Live stakes													
Cornus amomum silky dogwood	60	55	53	50	15	233	24	23	37	10	8	102	44
S*alix nigra* black willow	0	0	0	10	0	10	0	0	0	0	0	0	0
Salix sericea silky willow	0	0	0	130	70	200	0	0	0	63	36	99	50
Sambucus canadensis elderberry	0	0	0	20	15	35	0	0	0	1	7	8	23
Bare root nursery stock													
Alnus serrulata tag alder	11	11	11	11	11	55	2	3	2	4	3	14	25
Celtis laevigata sugarberry	2	3	3	15	7	30	1	0	2	3	1	7	23
Diospyros virginiana persimmo	2	3	3	15	7	30	0	0	2	0	0	2	7
Juglans nigra black walnut	2	3	3	18	7	33	1	0	1	14	6	22	67
Quercus alba white oak	2	3	3	10	7	25	0	0	0	0	0	0	0
Quercus rubra red oak	2	3	3	10	7	25	1	0	2	7	5	15	60
Robinia pseudoacia locust	2	3	3	25	7	40	2	2	1	12	11	28	70
Totals	83	84	29	314	153	716	31	28	47	114	77	297	42

[a]Area 1. Station 7+39 area, right bank.

[b]Area 2. Station 8+19 area left bank

[c]Area 3. Station 9+00 downstream to upper ford, right bank.

[d]Area 4. Upper ford to lower property line, left bank

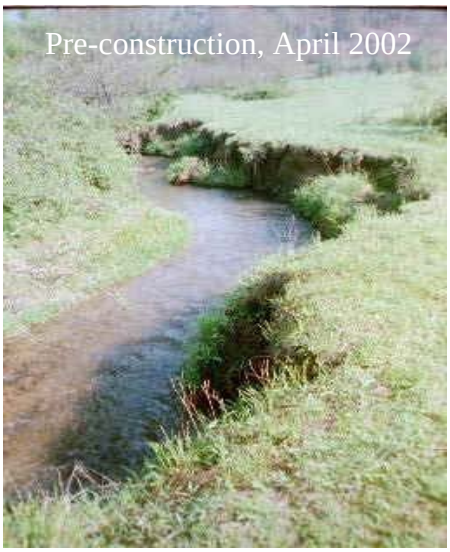
[e]Area 5. Upper ford to lower property line, right bank

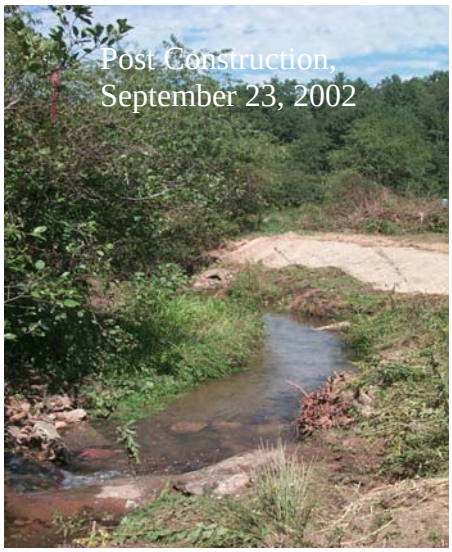
TABLE 3. Area four vegetation monitoring at the Wild mitigation site, Obids Creek, Ashe County, June 30, 2005. Area four begins on the left bank below the upper crossing and continues downstream to the lower conservation easement boundary.

	Number planted 2003	Number counted 2004	Number counted 2005	Percent survival 2005
Species				
Live stakes				
Cornus amomum silky dogwood	50	10	4	8
Salix nigra black willow	10	0	0	0
Salix sericea silky willow	130	63	6	5
Sambucus Canadensis elderberry	20	1	0	0
Bare root nursery stock				
Alnus serrulatta tag alder	11	4	27	100
Celtis laevigata sugarberry	15	3	1	7
Diospyros virginiana persimmon	15	0	2	13
Juglans nigra black walnut	18	14	17	94
Quercus alba white oak	10	0	0	0
Quercus rubra red oak	10	7	0	0
Robinia pseudoacacia locust	25	12	18	72
Totals	314	114	75	24

Appendix 1. Photo log of the Wild mitigation site looking downstream from station 7+75 to 8+50, Obids Creek, Ashe County, April 2002 – June 2005.

Appendix 2. Photo log of the Wild mitigation site looking downstream from station 8+65 to 9+60, Obids Creek, Ashe County, April 2002 – June 2005.





Appendix 3. Looking downstream to the upper ford at station 10+64 to 11+27, Wild mitigation site, Obids Creek, Ashe County, April 2002 – June 2005.

Appendix 4. Looking downstream from station 12+29 to 13+41, Wild mitigation site, Obids Creek, Ashe County, April 2002 – June 2005.