WILD MITIGATION SITE, OBIDS CREEK, ASHE COUNTY

Year 3 Monitoring Report

Period covered: June 30, 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

2007

This report summarizes the 2006 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 was to improve in-stream habitat and reduce bank erosion of a previously channelized stream reach impacted by cattle grazing. This monitoring report is submitted as partial fulfillment of the off-site stream mitigation requirements for the North Carolina Department of Transportation's (NCDOT) R-0529 US 421, Transportation Improvement Project in Watauga County. For that project, a total of 14,814 linear feet of stream mitigation is required by the United States Army Corps of Engineers (USACE) Section 404 permit and 7,407 linear feet of mitigation is 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 methods used in 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 19 and 22. These data are compared with the as-built and previous years' monitoring data (Mickey and Scott 2003; Mickey and Wasseen 2005). The 2006 monitoring survey included a longitudinal profile survey, channel cross-section dimension measurements, a pebble count, and woody vegetation stem counts (planted trees/live stakes). A photographic log of the site was maintained at 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.

Bankfull rain events were monitored through review of the United States Geological Survey's South Fork New River gage (gage number 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 16 bankfull or greater than bankfull events at the site (Table 1).

Longitudinal Profile

Visual observations prior to the longitudinal survey indicated that the channel thalweg had changed little from previous surveys, therefore a decision was made to collect longitudinal profile data only from stations 10+56 to 17+00 (Figure 2). Had the initial 2006 data revealed a significant change in the channel profile, then the entire project reach would have been surveyed. No appreciable change in the longitudinal profile occurred between 2003 and 2006. A longitudinal profile survey was not conducted in 2005. The longitudinal profile indicates the thalweg has remained stable with minimal degradation occurring where pools are present. These

minor changes in the longitudinal profile are expected natural occurrences and not the result of disturbances associated with the stream enhancement activities.

Cross-sections

Nine cross-sections were surveyed during May 2006. Changes in some cross-sections' dimensional features, following the September 8, 13, and 27, 2004 hurricanes, were still apparent when compared with the 2004 survey data (Figures 3.1-3.9). While there have been some adjustments in thalweg depths, there was no noticeable lateral movement except at cross-section 12+74. Most of the cross-sections exhibited some build up of the streambanks due to deposition of soil materials (silt, sand, and 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 crossvane. There has been little change in the cross-section from 2003 thru 2006. The thalweg aggraded slightly. This cross-section has remained stable with no lateral movement (bank erosion) observed along either streambank. The left bank has increased in height due to the riparian vegetation capturing streambed materials (silt, sand, and gravel) during flood events Minor repairs were made to the crossvane in June of 2006. Two boulders were repositioned in the middle of the crossvane to increase the upstream pool's depth.

CROSS-SECTION 7+36 – pool (Figure 3.2): This cross-section is located over the tail end of a long pool just above a crossvane. There has been some channel migration along the right bank at cross-section position 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 traverses a riffle. The thalweg has remained stable, exhibiting only minor adjustments due to storm events. The unusual high point seen in the as-built data represents a measurement taken on top of a root wad. The build up of the bank from cross-section position 0+30 to 0+50 is due to cattle no longer having access to this area and streambed materials (silt, sand, and gravel) being captured by riparian vegetation during flood events. This cross-section has remained stable with no lateral movement (bank erosion) observed along the streambanks. However, a few minor holes have developed behind the root wads. These were repaired on June 16, 2006 by filling the holes with cobble.

CROSS-SECTION 9+16 – run (Figure 3.4): This cross-section is located over a run below a crossvane with root wads located along the right bank. However, it could also be considered a fast pool. The 2006 monitoring survey indicates no major changes in the thalweg of the cross-section when compared with the as-built survey. However, as bank vegetation continued to increase in density, bank height has increased as streambed materials (silt, sand, and gravel) were captured by the riparian vegetation during flood events. This cross-section has remained stable with no lateral movement (bank erosion) of the stream channel.

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 crossvane with root wads installed along the left bank. There has been little change in this cross-section since construction.

CROSS-SECTION 12+31 – riffle (Figure 3.6): This cross-section is located over a riffle. The only change at this site has been a 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 through a pool below a crossvane with root wads installed along the left bank. The thalweg has deepened next to the root wads. Cross-section position 0+17.9 identifies a hole behind the root wads, whereas the high point at position 0+19.0 is on top of the root wads. A series of three hurricanes in September 2004 moved a large boulder at this location causing the right bank to be cut away and resulting in an increase in channel depth between the boulder and the right bank. The large boulder was subsequently repositioned along the right bank and cobble placed in front of the boulder to alleviate pressure on the bank. Future monitoring should capture the effectiveness of the repairs.

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 2006 is the creation of a run feature from cross-section position 0+30 to 0+40. This site is stable and well vegetated. During the 2002 construction, transplants of tag alder *Alnus serrulata* and ninebark *Physocarpus 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. A hole that developed behind the root wads was repaired on June 16, 2006.

CROSS-SECTION 16+52 – pool (Figure 3.9): This cross-section is located below the lower ford and immediately below a crossvane. 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 due to the capture of streambed materials (silt, sand, small gravel) during flood events.

Substrate

Bed material was collected from a riffle at cross-section 8+19. Substrate analyses indicate most particle size classes have shown slight increases when compared to the as-built data. The exception to this is the D_{16} where a slight decrease has occurred. Since 2003 the D_{50} fraction has changed from a coarse to a very coarse gravel classification. 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 scouring of the finer bed material following the three September 2004 floods. Visual observations conducted following these events confirmed the data in Figure 4 that the stream substrate contained 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 (Table 2). Of the 2.6 acre conservation easement only one acre was disturbed during construction. The majority of the 716 plants were planted along these construction areas. Total stem counts (trees and live stakes) were made in five vegetation plots. The 2006 vegetation survey revealed 329 of the original 716 live stems had survived at the five sites. This translates into survival of 46% of the original plantings and 329 stems per acre (329/1) (Table 2). Of the 11 tree/shrub species planted, those having a greater than 50% survival in 2006 were elderberry *Sambucus canadensis* (51%), black walnut *Juglans nigra* (52%), black locust *Robinia pseudoacacia* (65%), and tag alder *Alnus serrulata* (229%). The density of stems surviving from the original plantings is well above the 288 stems/acre required for woody species planted at mitigation sites through year three (USACE 2003). A reason for the high count of planted stems is the survey was conducted during April 2006 when stems were easy to locate among the newly emerging dense grasses and forbs.

It should be noted that multiflora rose *Rosa multiflora* is present at the Wild mitigation site. According to Miller (2004) it is a nonnative invasive shrub. The plant is aggressively competing with the native riparian flora along the streambanks at the Wild site. It was also noted that a 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 adjacent pasture was not grazed during 2006, over 50 Gray's lilies were observed growing outside the conservation easement area.

Livestock Exclusion

The livestock management program developed for this project included the installation of two stream-crossings, three watering tanks, and fencing to exclude livestock from the riparian zone. These agricultural best management practices, installed as a part of the restoration management plan, are functioning properly.

Repairs

During the 2006 monitoring survey, four sites needing minor repairs were identified. A small excavator with a hydraulic thumb was used to make the repairs on June 16, 2006. Two large boulders were repositioned in the middle of the cross-vane at station 3+55. The shifting of the boulders could be attributed to the upstream landowner removing all of the vegetation off the banks of the unnamed tributary to Obids Creek in 2005, which increased the stream's velocity coming into this cross-section and redistributed the aforementioned boulders. At station 8+50 two boulders on the left bank were repositioned to make a mini-rock vane. As stated previously the damage at cross-section 12+74 was caused by flooding associated with 2004 hurricanes. That repair involved repositioning a large boulder on the right bank, backfilling the void with cobble and filling a scour hole behind the root wads. The fourth site was located at station 13+80 and required filling voids behind the root wads.

Summary

Since completion of the as-built report (Mickey and Scott 2003) Obids Creek at the Wild mitigation site has remained stable as seen in the photographic log (Appendices 1-4). There have been no bank failures or serious structural failures, except at cross-section 12+74. All necessary repair work was completed. The stream is stable and functioning properly. The riparian vegetation is thriving and helping to re-build and stabilize the streambanks.

Recommendations

The NCWRC recommends that a thorough effort be made to control the growth of multiflora rose at the Wild site. The plant should be controlled using an herbicide applied to the leaves, or if the stems are too tall, by cutting the plants to ground level and immediately treating the stumps (Miller 2004). Vegetation counts should be conducted in late April or early May before the forbs become too tall as to make it difficult to locate planted stems. Annual monitoring surveys will continue in 2007 until the project meets the required success criteria.

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, North Carolina.

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, North Carolina.

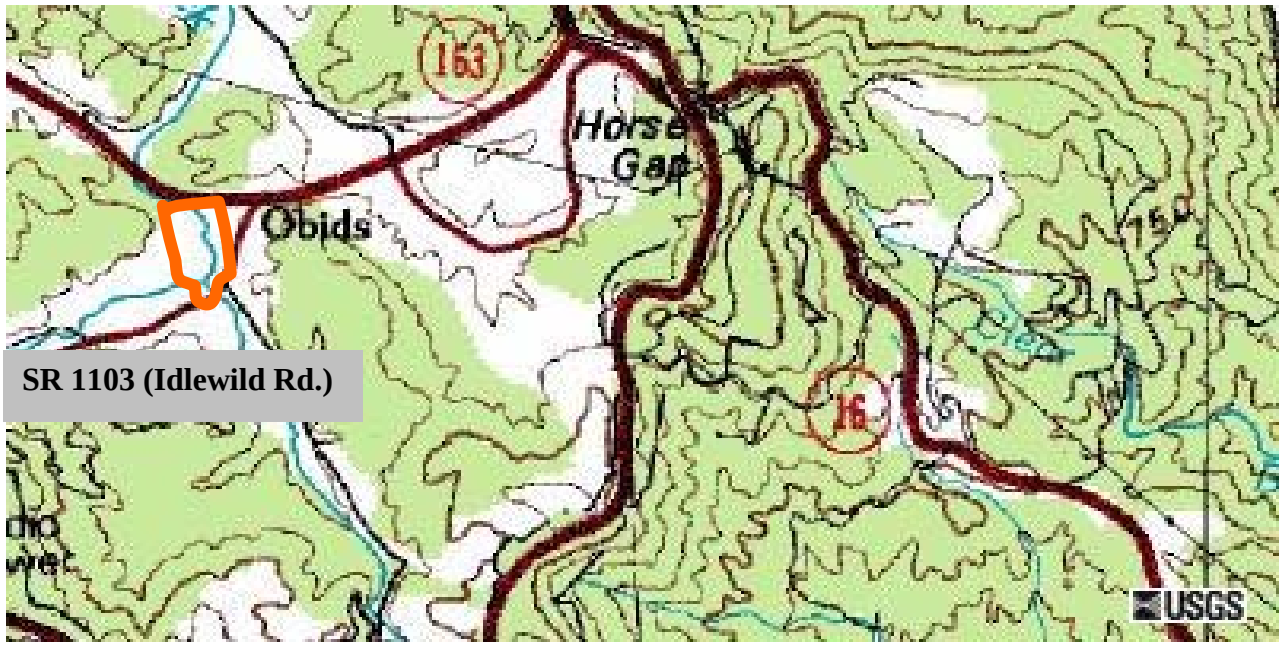
Mickey, J. H. and J. A. Wasseen, 2005. 2004 - 2005 monitoring report for the Wild mitigation site on Obids Creek, Ashe County. North Carolina Wildlife Resources Commission, Raleigh, North Carolina.

Miller, J. H. 2004. Nonnative invasive plants of southern forests a field guide for identification and control. Southern Research Station, Asheville, North Carolina

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.—Location of the Wild stream mitigation site, Obids Creek, Ashe County, North Carolina.



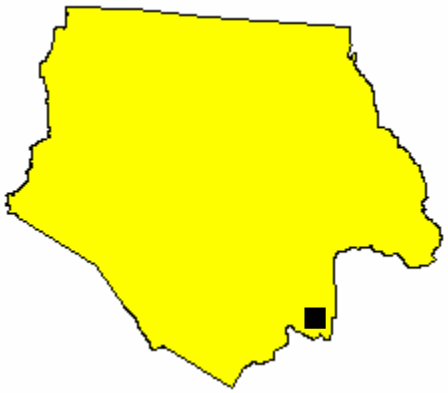


FIGURE 2.—Longitudinal profile comparisons, Wild site, Obids Creek, Ashe County, 2003-2006.

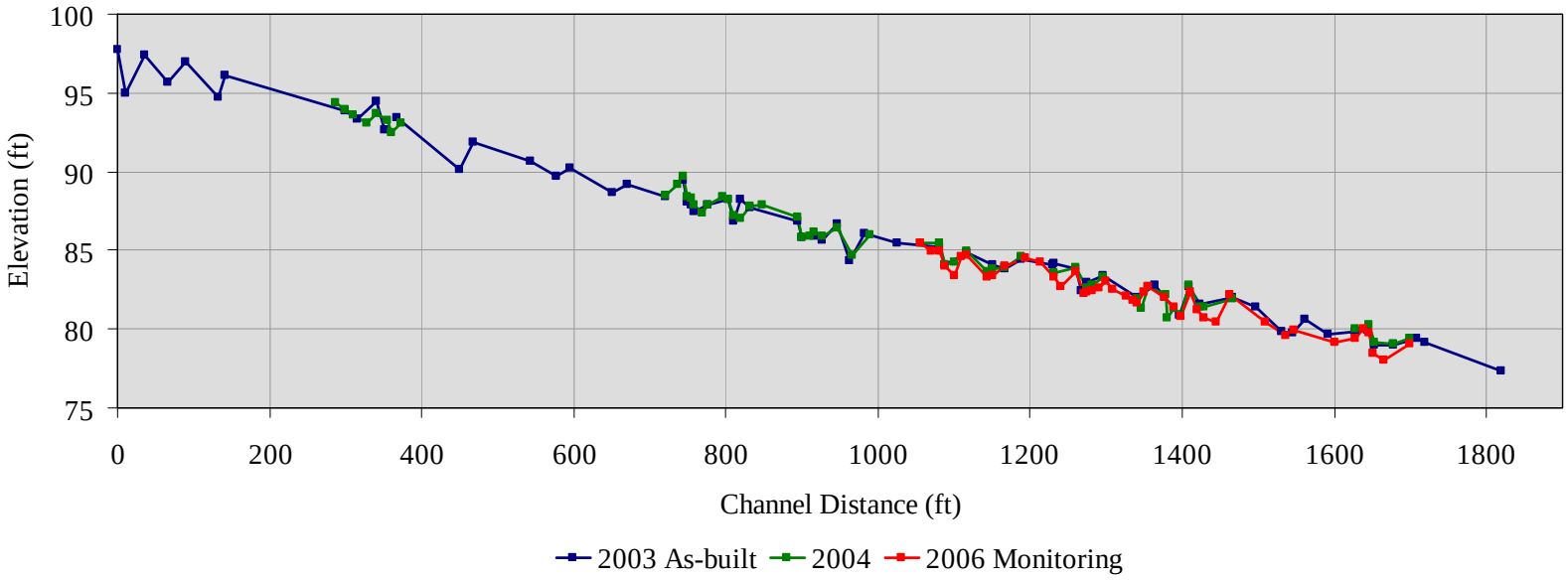


FIGURE 3.—Cross-section comparisons, Wild mitigation site, Obids Creek, Ashe County, North Carolina 2003-2006.

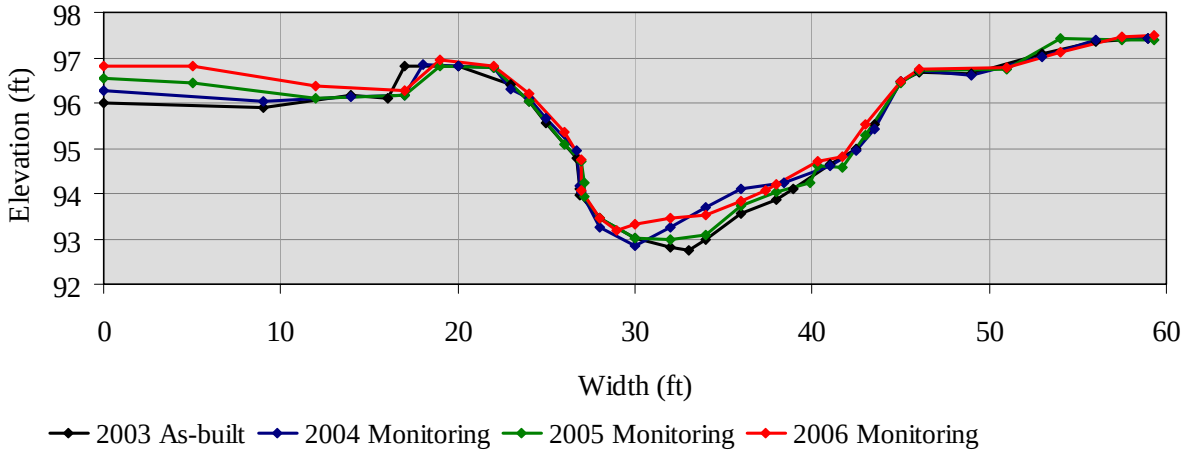


FIGURE 3.1.—Cross-section station 3+55, riffle.

FIGURE 3.—Continued.

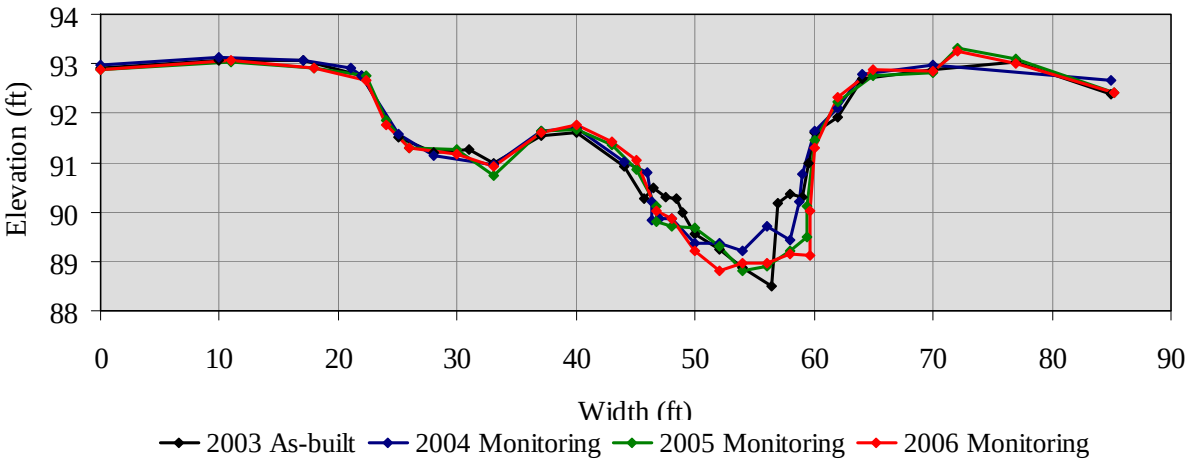


FIGURE 3.2.—Cross-section station 7+36, pool.

FIGURE 3.—Continued.

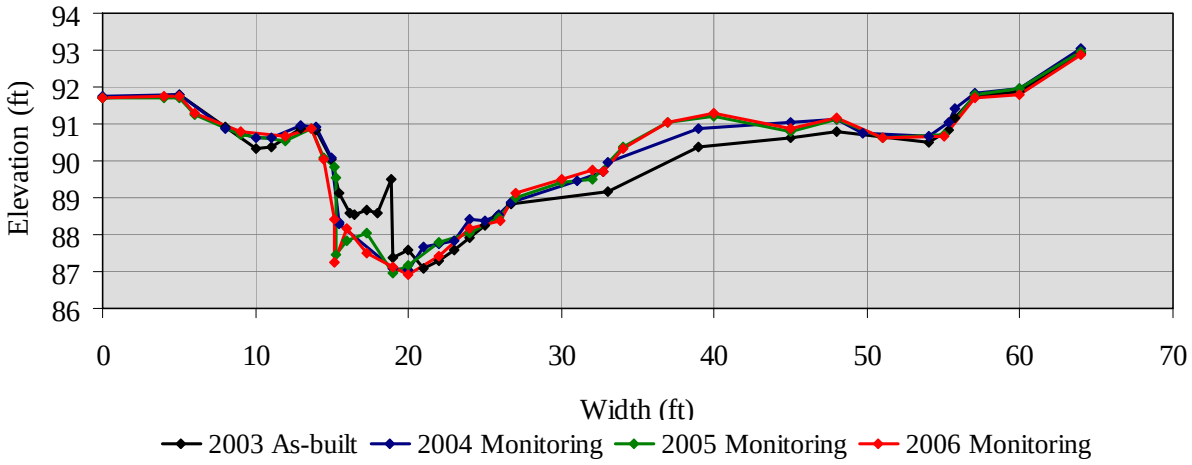


FIGURE 3.3.—Cross-section station 8+19, riffle.

FIGURE 3.—Continued.

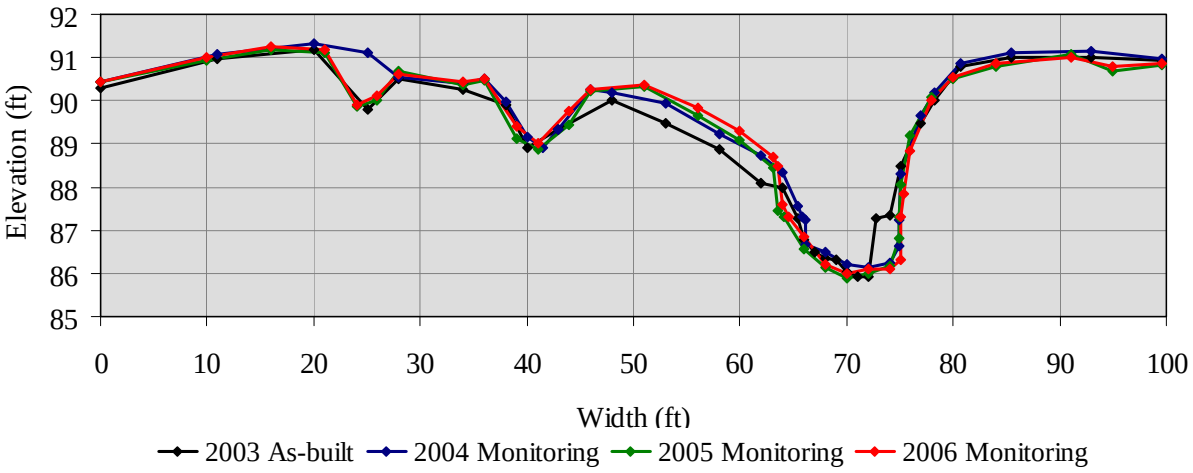


FIGURE 3.4.—Cross-section station 9+16, run.

FIGURE 3.—Continued.

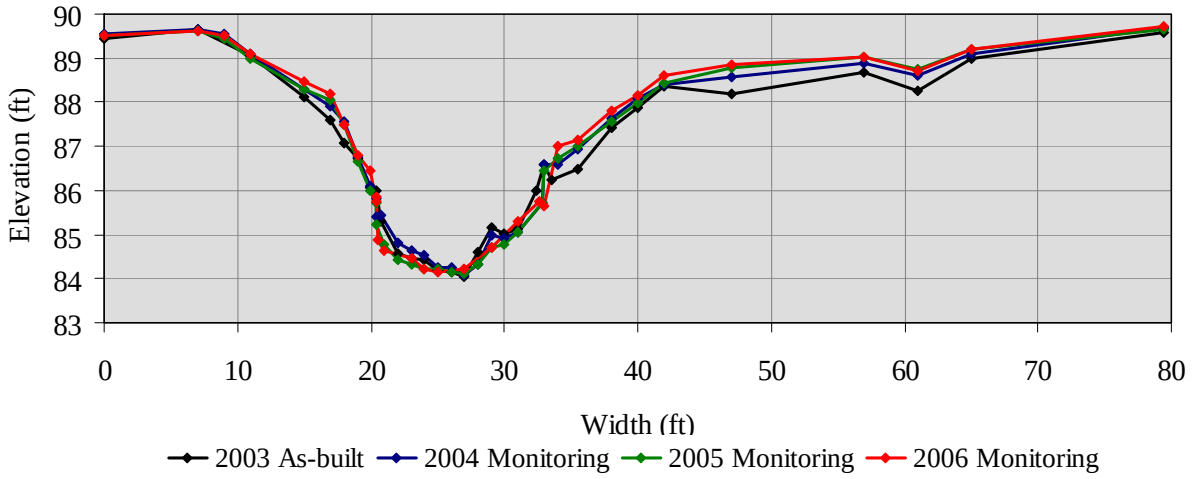


FIGURE 3.5.—Cross-section station 10+88, pool.

FIGURE 3.—Continued.

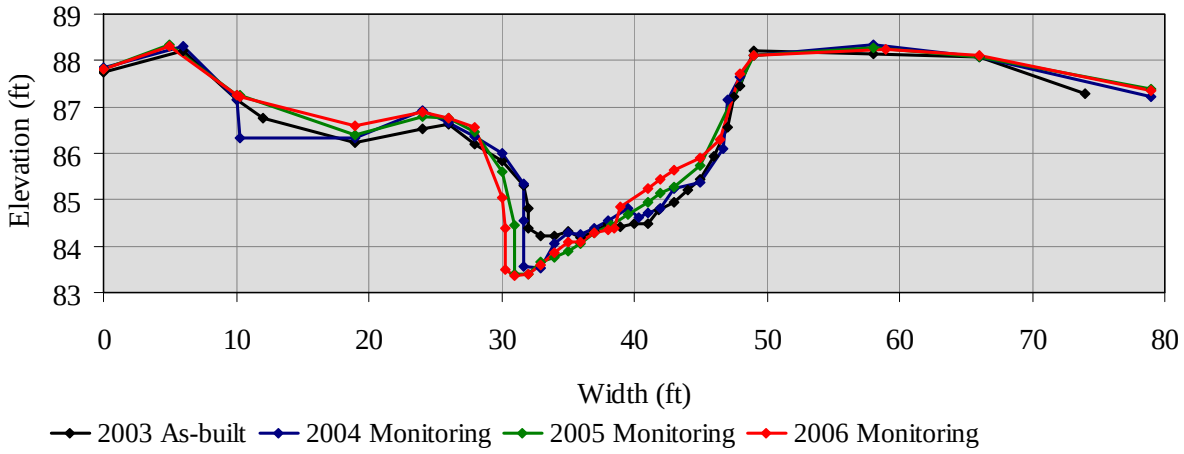


FIGURE 3.6.—Cross-section station 12+31, riffle.

FIGURE 3.—Continued.

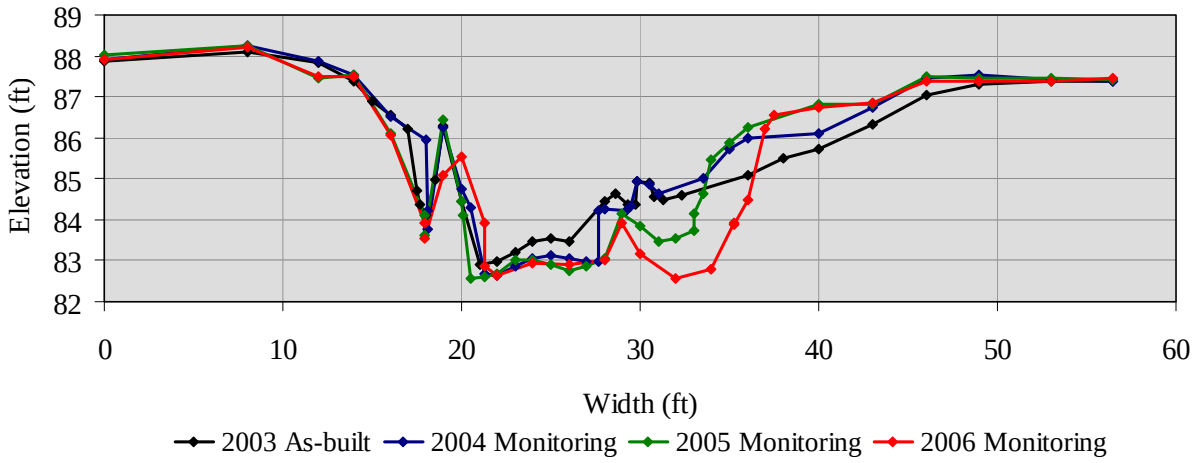


FIGURE 3.7.—Cross-section station 12+74, pool.

FIGURE 3.—Continued.

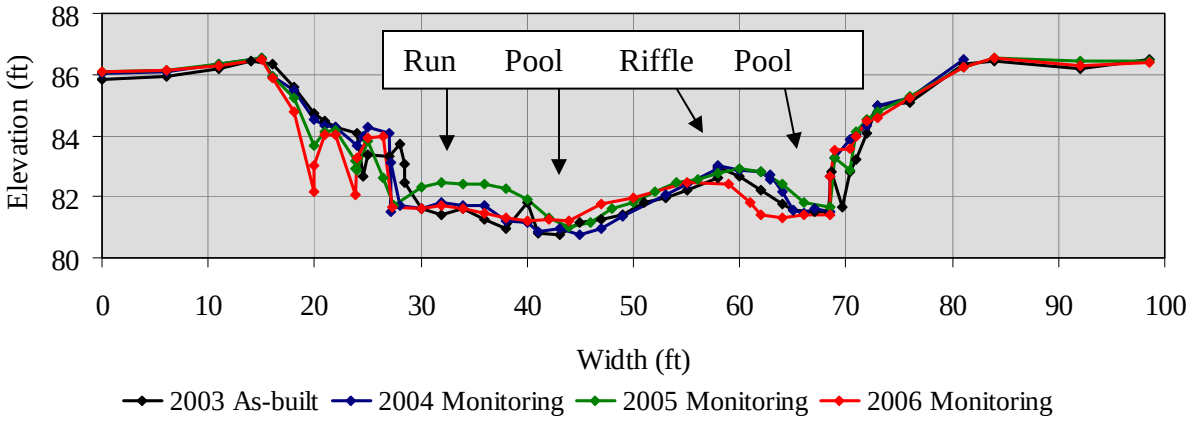


FIGURE 3.8.—Cross-section station 13+80-14+29. This cross-section incorporates two different restoration sites into one. The cross-section was taken at an S-curve that encompasses a run, pool, riffle, and a second small pool sequence.

FIGURE 3.—Continued.

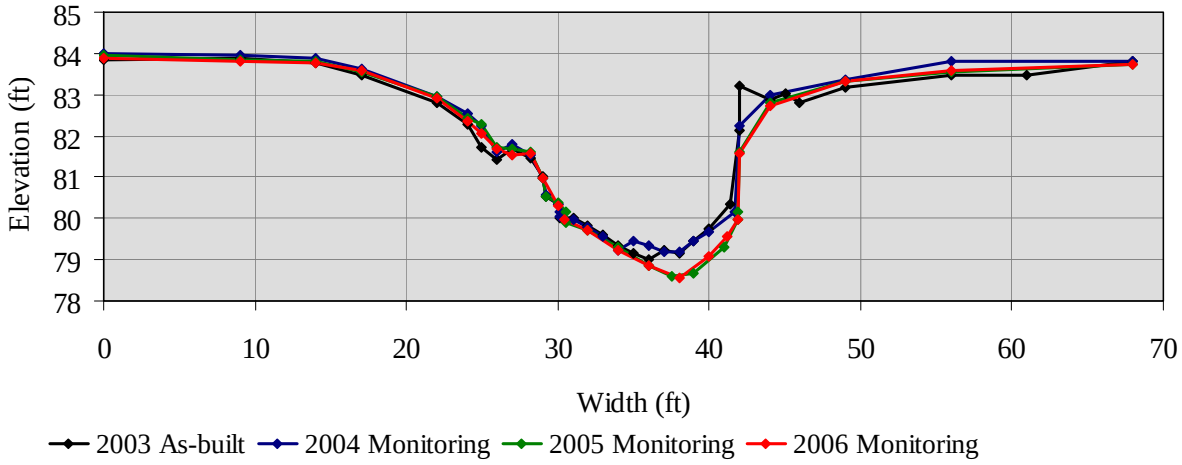
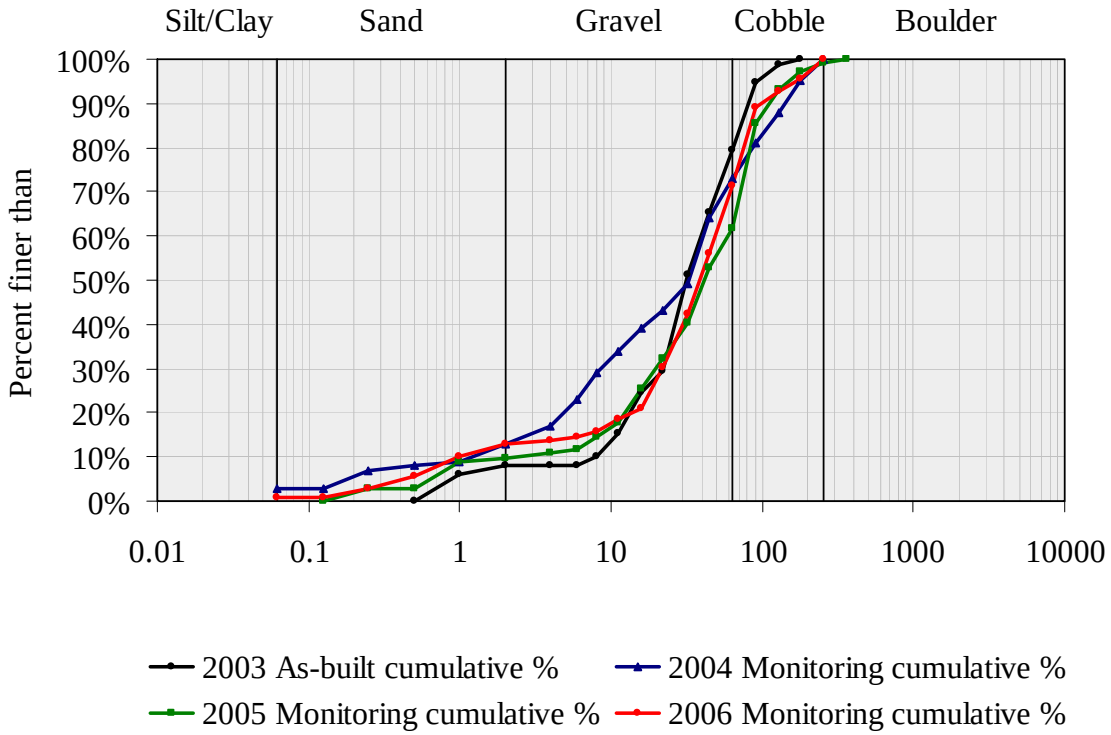


FIGURE 3.9.—Cross-section station 16+52, pool.

FIGURE 4.—Pebble count comparisons, Wild site, Obids Creek, Ashe County, 2003-2006.



Size class index	2003 As-built particle size (mm)	2004 Monitoring particle size (mm)	2005 Monitoring particle size (mm)	2006 Monitoring particle size (mm)
D 16 (mm)	11	3	9	8
D 35 (mm)	24	12	25	26
D 50 (mm)	31	33	42	39
D 84 (mm)	71	100	88	82
D 95 (mm)	91	180	150	170

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 (gage number. 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)
7/8/05	4.6	2,000	Bankfull event (tropical storm)
7/15/05	[a]	[a]	Bankfull event
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
6/27/06	5.7	3,130	Bankfull event

[a]Landowner observations not correlated to gage data.

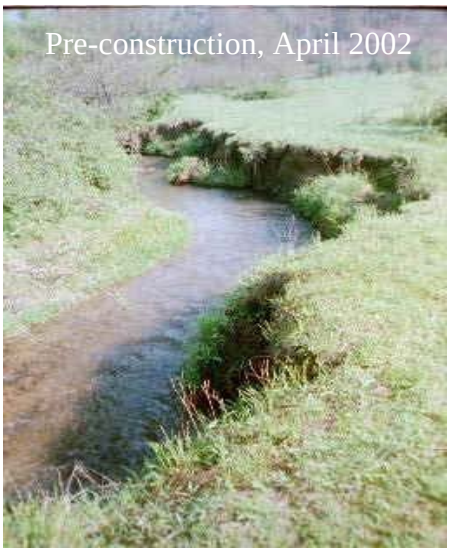
TABLE 2.—Vegetation monitoring data for the Wild mitigation site, Obids Creek, Ashe County, North Carolina, April 24, 2006.

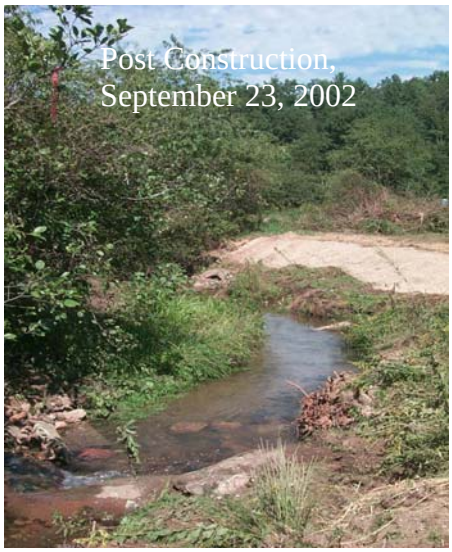
Plant type		Number planted						Number counted on April 24, 2006.						
Scientific name	Common name	Area 1[a]	Area 2[b]	Area 3[c]	Area 4[d]	Area 5[e]	Total	Area 1	Area 2	Area 3	Area 4	Area 5	Total	% survival
Live stakes														
Cornus amomum	Silky dogwood	60	55	53	50	15	233	15	14	18	8	2	57	24%
Salix nigra	Black willow				10		10							
Salix sericea	Silky willow				130	70	200				55	17	72	36%
Sambucus canadensis	Elderberry				20	15	35		1	5	2	10	18	51%
Bare-root nursery stock														
Alnus serrulata	Tag alder	11	11	11	11	11	55	12	9	50	28	27	126	229%
Celtis laevigata	Sugarberry	2	3	3	15	7	30			1			1	3%
Diospyros virginiana	Persimmon	2	3	3	15	7	30			1	3	2	6	20%
Juglans nigra	Black walnut	2	3	3	18	7	33		1	1	12	3	17	52%
Quercus alba	White oak	2	3	3	10	7	25							
Quercus rubra	Red oak	2	3	3	10	7	25	1			2	3	6	24%
Robinia pseudoacacia	Black locust	2	3	3	25	7	40	1	2	2	16	5	26	65%
Volunteers														
Crataegus spp.	Hawthorne								1				1	
Physocarpus opulifolius	Nine bark								15	15	37	25	92	
Prunus serotina	Black cherry									2	5	4	11	
Totals		83	84	82	314	153	716	29	43	95	168	98	433	46%[f]

[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
[f]Omits the 104 volunteer plants, 52% survival with them.

Appendix 1: Photo log of the Wild mitigation site looking downstream from station 7+75 to 8+50, Obids Creek, Ashe County, April 2002 – May 2006.

Appendix 2: Photo log of the Wild mitigation site looking downstream from station 8+65 to 9+60, Obids Creek, Ashe County, April 2002 – May 2006.





Appendix 2: Continued.

Appendix 3: Looking downstream to the upper ford at station 10+64 to 11+27, Wild mitigation site, Obids Creek, Ashe County, April 2002 – May 2006.

Appendix 3: Continued.

Appendix 4: Looking downstream from station 12+29 to 13+41, Wild mitigation site, Obids Creek, Ashe County, April 2002 – May 2006.

Appendix 4: Continued.