As-built report for the Fosson Mitigation Site, Paint Fork Creek, Madison County

North Carolina Wildlife Resources Commission

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Project Objective

The objectives at this mitigation site were to improve water quality, riparian quality and stability, and fisheries habitat of Paint Fork Creek and an unnamed tributary. These objectives were met using a number of practices. The stream bank was reshaped to a more stable cross-sectional profile. Areas of high bank stress were protected using rootwads or vanes. At some locations these structures also improved habitat through pool creation. The riparian zone was planted with native vegetation. Initially grasses, sedges, rushes, and other herbaceous vegetation was seeded throughout the riparian zone. During the dormant, winter season live stakes and a variety of rooted trees were also planted.

Specific objectives at the Fosson mitigation site were the following:

1. Increase the floodplain area of the creek and small tributary along the Fosson property.

2. Slope and vegetate the south creek bank so that it would be more resistant to flooding.

3. Install rootwads or vanes at eroding bends in the river to reduce erosion and provide fish habitat.

4. Plant native trees, bushes and ground cover that will stabilize the creek banks, shade the stream, and provide wildlife cover and food.

General Construction Narrative

Construction at this site was carried out through an informal contract with Appalachian Environmental Services. Equipment work began on August 26, 1999 and was completed on September 20, 1999. A total of 17 days were spent working at this site. The contractor provided one track-hoe, one back-hoe/loader, two dump trucks and hand labor, as needed. Access to the site was gained from the landowner's access road and by the construction of a soil ramp from the road to the floodplain. Work began at the landowners bridge and moved up Paint Fork Creek and then up the unnamed tributary. A small amount of work below the bridge was done at the end of the project. Vertical eroding banks were sloped, vegetated and erosion control materials installed. Soil was graded or moved into the adjoining field. Rock vanes and rootwad revetments were constructed at particular locations along the channel to address erosion problems. The site was vegetated with a native, riparian, seed mix and a cover crop. The cover crop developed well and stabilized the ground surface. During the winter of 2000, we returned to this site and extensively planted live stakes and bare rooted trees. A review of this site during the summer of 2000, indicated good stream bank stability and survival of most trees. We will be collecting stability data at this site during fall or winter 2000. At this site, this project has resulted in the restoration and protection of 1700 linear feet of stream and riparian area.

Channel Modifications:

The channel at this site is a C4b type stream channel based on the low sinuosity, entrenchment, width/depth ratio and substrate type. The unnamed tributary was a B type channel that had degraded along the lower reach into a G channel type. The condition of both channels was strongly influenced by past channelization and agriculture on the adjoining land and in the watershed. Prior to this project the site was vegetated with reed canary grass planted by the NRCS. Woody vegetation was limited to a few walnuts, locusts, willow and Balsam Poplar. Because of the height of the south bank the limited tree cover did not stabilize the bank or

provide sufficient shade. The channel was eroding along most of this reach a condition that was aggravated by the presence of a berm on the north bank and row cropping on the south bank. This row cropping had limited the width of riparian vegetation between the field and steam. Deep-water habitat was rare at this site with few pools present. In part, deeper habitat was limited by the presence of bedrock throughout this reach. This combination of factors caused trout habitat to be limited at this site.

Bedrock was the cause of erosion at two locations on the reach. The bedrock directed water against the south bank because it was lower on that side of the channel. This problem was addressed by constructing rock vanes that crossed the south ends of these seams and raised the water level on the south bank. This reduced the water velocity on this bank and stopped the erosion. Since these vanes were built on bedrock they were not able to create scour holes to enhance habitat. A J-hook vane was constructed upstream of the second bedrock seam to enhance pool formation in this area, as well as to begin moving water to the north side of the channel. Rootwad revetments were constructed at two sites toward the upper part of the reach (see the attached map for all structure locations). These revetments were constructed out of large hemlock log/root balls obtained off site. They were installed at sites along the bank where the water flow was directed into the bank. Unfortunately, due to the bedrock along this reach they could not be installed deep enough to provide high quality aquatic habitat. However, these revetments are diverting high flows off of the banks and deeper scour holes are developing below the revetments. Throughout the entire reach the interberm was maintained, enhanced or created as channel modifications were made. It was felt that this feature was developing naturally and benefited the stream by slowing high water. As this feature was enhanced or created it was seeded and protected with a jute erosion control fabric. The only structures installed along the unnamed tributary were floodplain benches at two bends. These were constructed to move the water flow off of high vertical banks. These benches were built with boulders and covered with soil. The area was then vegetated to provide a stabile creek bank and footer to the high bank.

This is one of the only sites that we have dealt with where we have had only one side of the stream in the easement. When we started work at this site both landowners were interested in this program. So we developed plans for the site and made recommendations for both landowners. The adjoining landowner pulled out of the program after plans were developed but he agreed to carry out the recommendations himself. During this spring he did complete the recommended work. This primarily involved removing the berm that had been constructed over a number of years and vegetating the site. These actions will increase the likelihood that this will become a stable, functioning reach. This site was last visited during the summer of 2000; all channel modifications were stable and functioning properly. The vanes and rootwads were all controlling erosion at vulnerable locations and beginning to-develop some instream habitat. The interberm is well vegetated with a diversity of herbaceous plants. The interberm has in-fact captured some sediment on the few high water events that have occurred during the last year. Instability in the form of excessive erosion or deposition has not been observed at any location along the channel.

Riparian Improvements:

The pre-construction condition of the riparian zone at this site was not good and did not favor trout. The banks were vertical and eroding over most of the reach. Woody vegetation was spotty and provided little stability or shade. The herbaceous vegetation was dominated by reed

canary grass, and provided little protection outside of the growing season. Bank erosion was accelerated at some spots due to the bedrock substrate, the sandy soil and the narrow width of vegetation between the stream and the adjoining tobacco field. The unnamed tributary along the eastern border of this property had developed a G channel due to head cutting up from the main channel. The riparian vegetation above this cut was excellent within the easement, but degraded along the cut. At two bends in the stream the flow was cutting into relatively high, clay banks causing sedimentation of the stream.

The entire south stream bank of this site was sloped, stabilized and vegetated. Where a natural interberm had developed its integrity was maintained, and the bank sloped from the back of this feature. If the bank was vertical, an interberm feature created as part of the active channel. This was done to copy what was found at the stable reference condition. A coir log was placed on the interberm and staked into place. Coir logs were used to define bankfull by placing the top of the log at the bankfull elevation. After the logs were pinned in place soil was filled in behind the log and sloped from the top of the log to the easement line. Banks were cut to approximately a 2:1 or lower slope in order that a floodplain could be created. Both the floodplain and the interberm were fertilized, limed and seeded. After seeding, either an eight-foot wide, coir/straw blanket or coir "net" type blanket was used to cover the area above the log. Above these erosion control blankets a 4-foot width of jute fabric was also laid down. All of these erosion control materials were pinned in place using landscape staples. Two types of blankets were used to test which blanket would be better for this application on future projects.

Seeding was done with a native riparian mix and cover crops of millet and winter wheat. Both cover crops germinated and quickly grew through the erosion control materials. This provided a very stable ground surface. At the first frost the millet was killed, but we did have some head formation. The winter wheat stayed green all winter long and in the spring grew vigorously. It headed up and died by mid-summer. Some wild seed and some of the native mix had started growing by that time. It may take 2 to 3 years for these perennials to establish good populations and coverage. A large quantity of live stakes was planted at this site during the dormant winter season of 1999-2000. These consisted of black willow, silky willow, and silky dogwood. We also planted a number of bare rooted trees during late winter, which consisted of black willow, red-osier dogwood, willow oak, river birch, black walnut, persimmon, green ash and red maple. Total numbers of live stakes and bare rooted trees were not determined, but densities exceeded 500/acre. We decided that we would over plant and thin trees later if desired. While we observed excellent growth during the summer we will assess numbers of surviving trees during the spring of 2001.

During a number of site visits in the summer of 2000 we found the riparian zone stable and vegetation in excellent condition. It was impossible to photograph the vegetative plots because the vegetation was so high you could not see the flags that marked these areas. This thick herbaceous cover also made it difficult to access tree survival but a large number of trees where found to be growing. Vegetative plots, tree survival and riparian stability will be evaluated this spring.

Livestock Management:

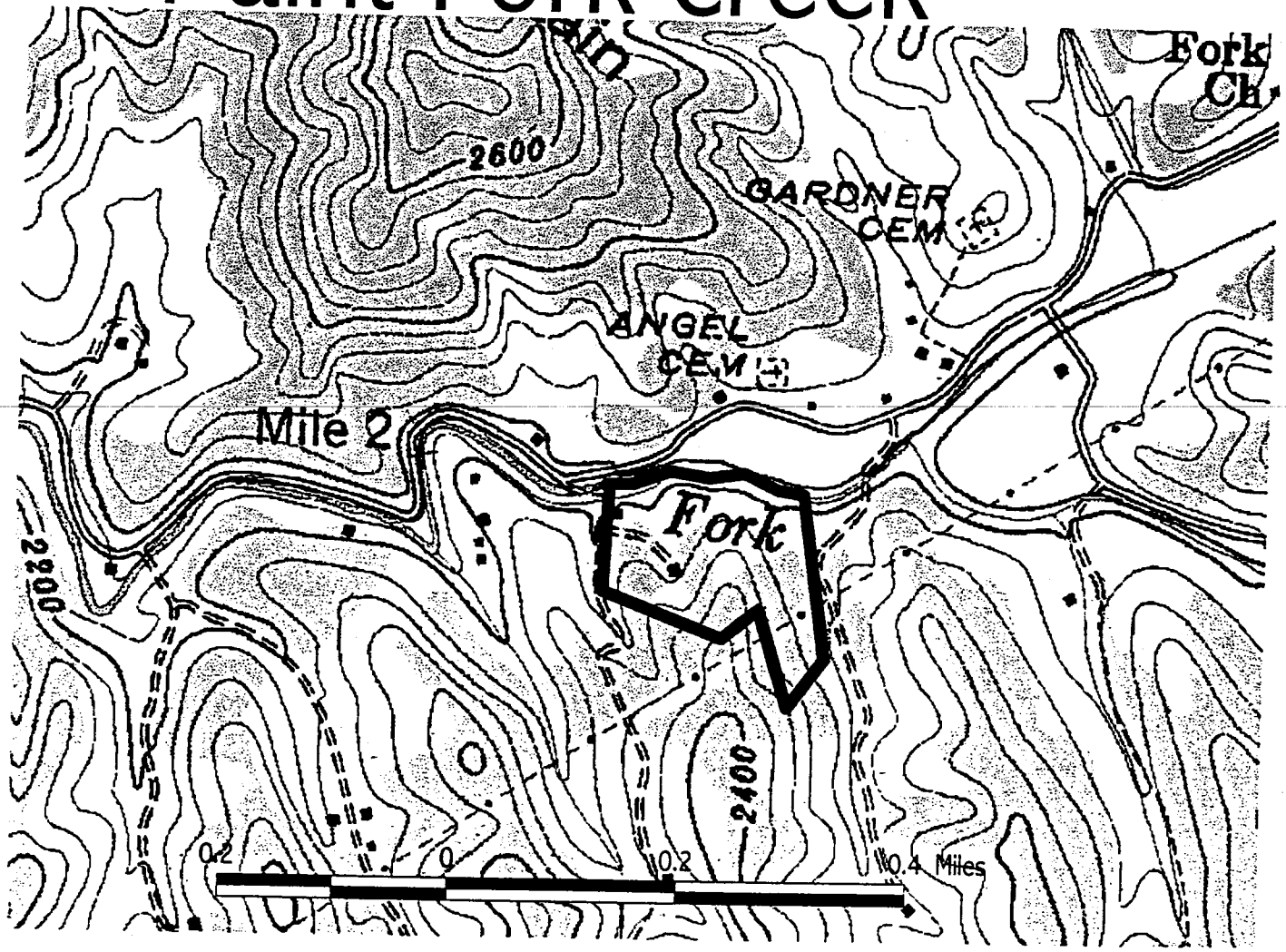
Initially, a fence and one watering tank were planned for this site. However, once the restoration work was completed the landowner decided that he did not want the fence or tank and would not use the adjoining field for livestock in the future. It was suggested to him that he install these practices so he would have them if needed, but he said that he was sure about his

decision. Fencing of easements under these conditions has not been required and was not in this case. However, within the conservation easement agreement the WRC has reserved the right to install a fence if future land uses on the adjoining field jeopardize the restored riparian zone.

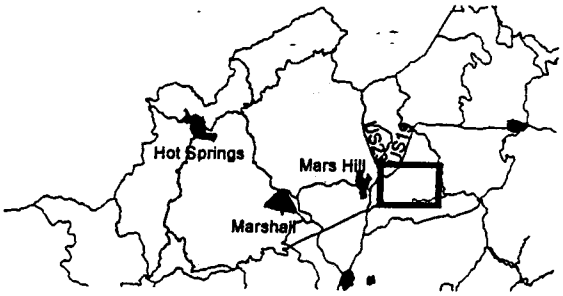
Other Benefits:

The are two primary benefits that have been realized at this site over and above what we might normally have been able to accomplish. When the first easement line was set the landowner was asked for approximately 30 to 40 feet of easement width. When the landowner reviewed the line he said that he was willing to make it wider in some places. So the line was adjusted to approximately 40-50 feet of riparian width and agreed to. This will allow for greater stability and wildlife habitat as this area grows in with trees. In addition, technical assistance was provided to the adjoining landowner that pulled out of the mitigation program because of the easement. The mitigation plan that was developed had recommendations that were specific to his property. He agreed to implement this plan with his money if guidance was provided to his personnel. This was done so that the improvements to the riparian zone were implemented according to the plan. This will provide a stable floodplain on both sides of the stream, which will contribute to overall stream function and stability.

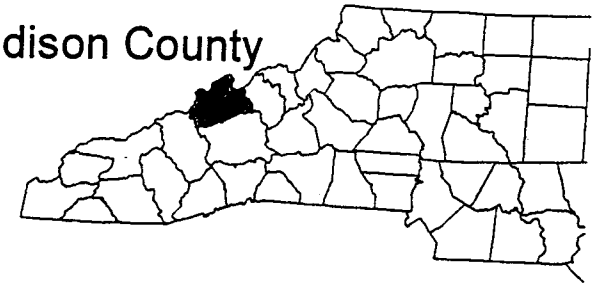
Fosson Site
Paint Fork Creek

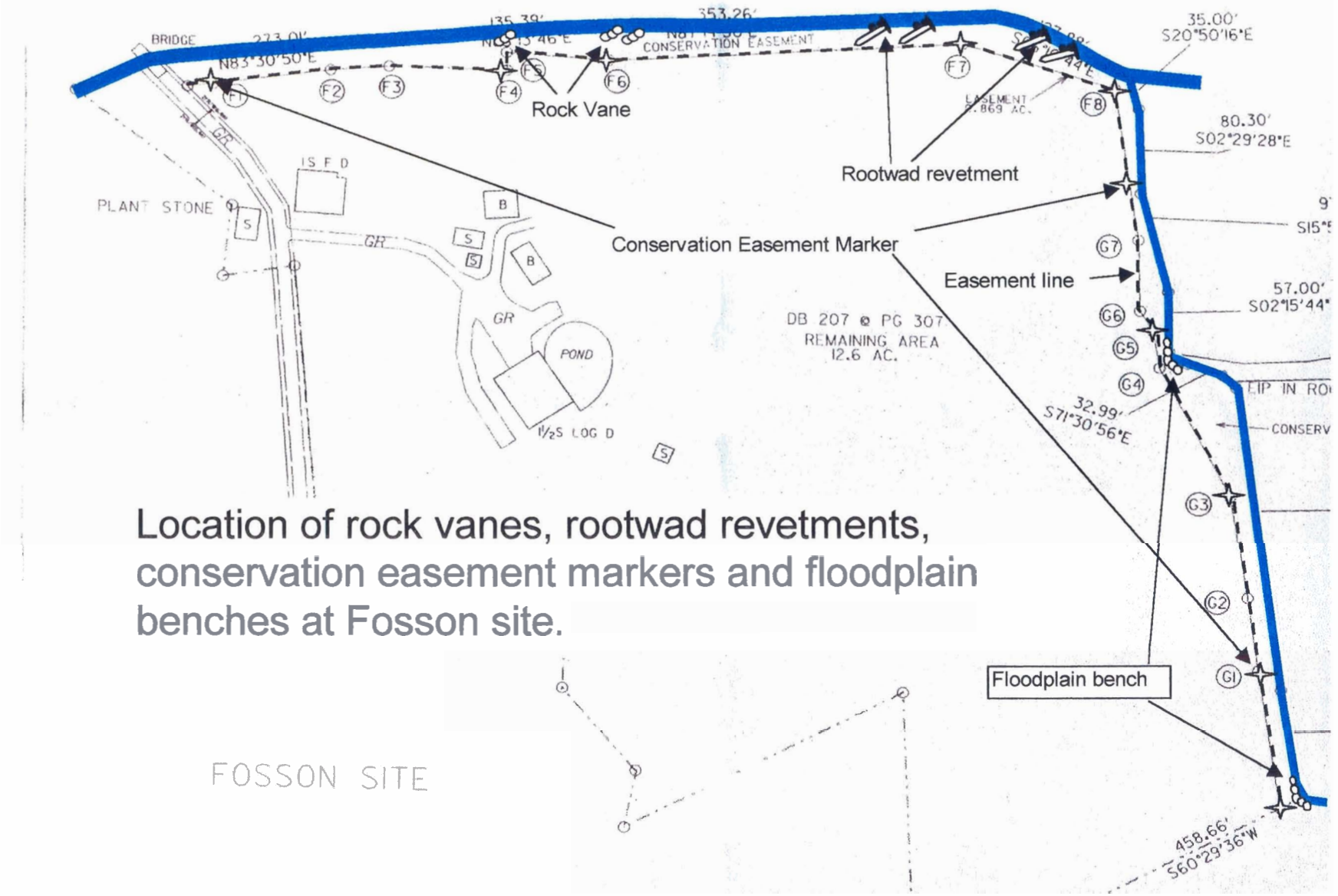


Madison County

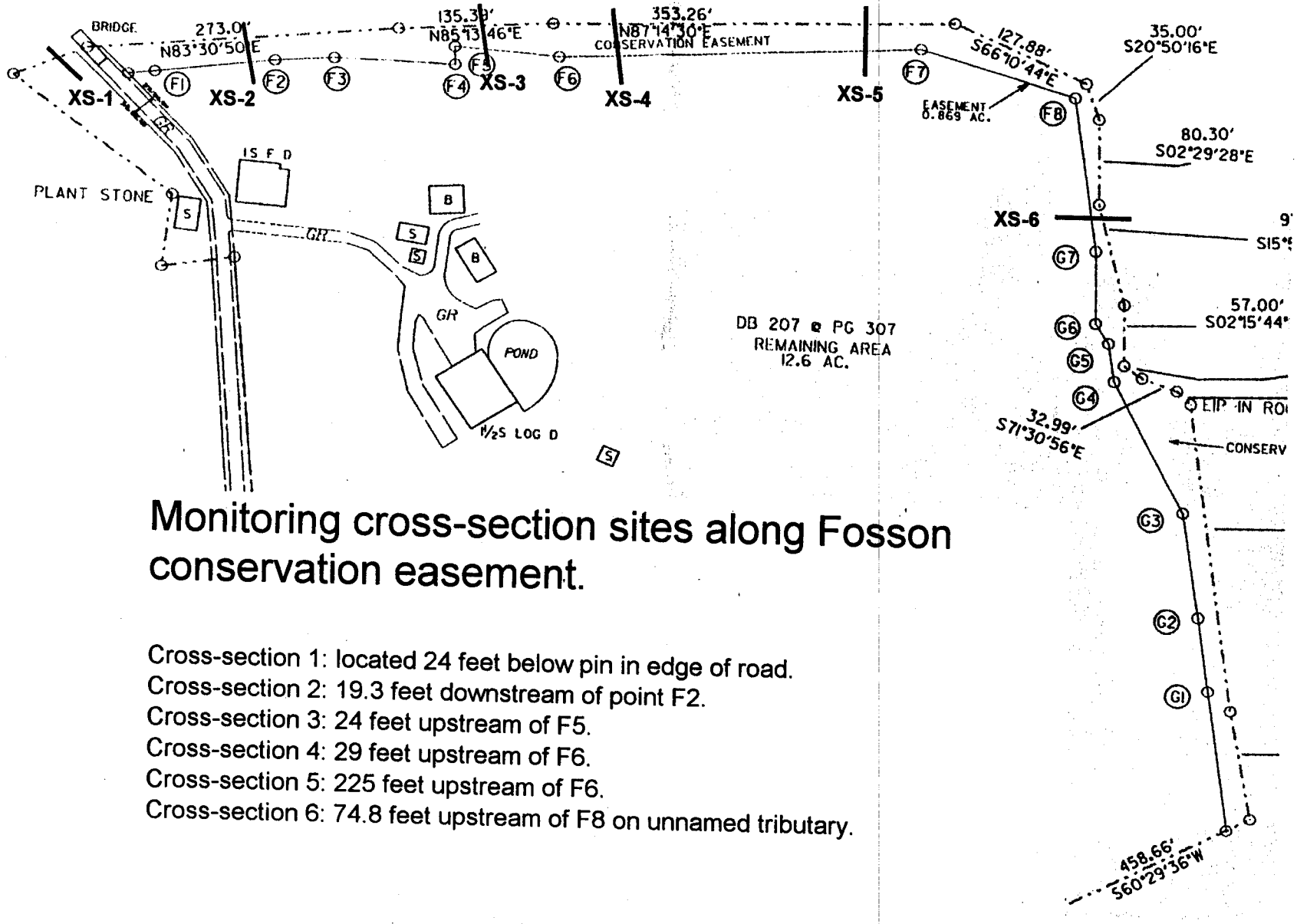


North Carolina



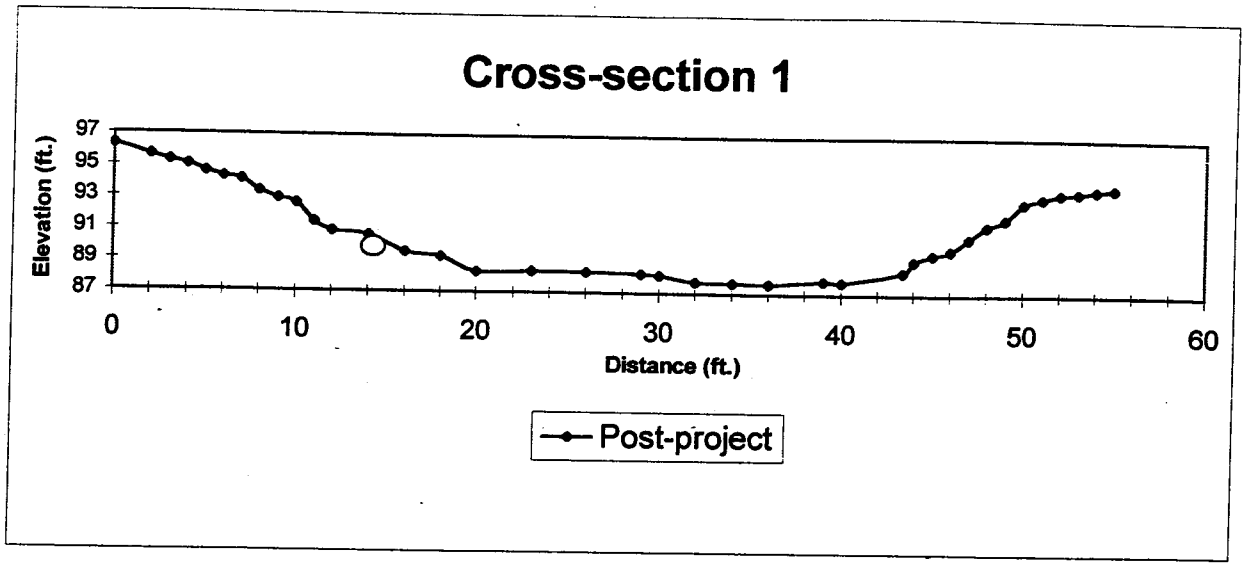


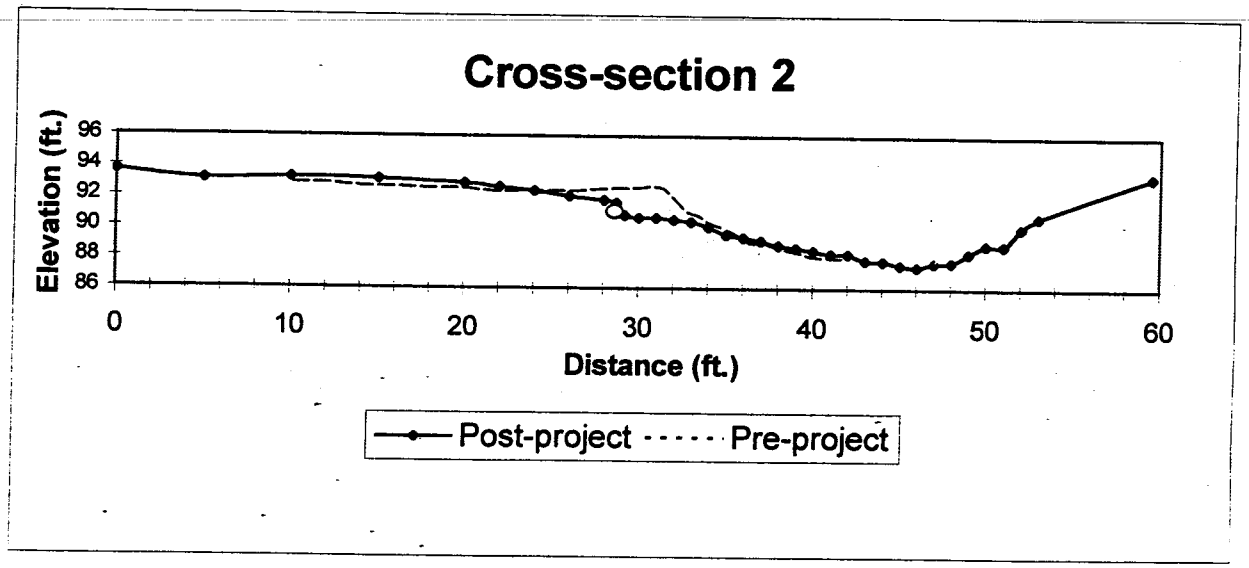
Location of rock vanes, rootwad revetments, conservation easement markers and floodplain benches at Fosson site.

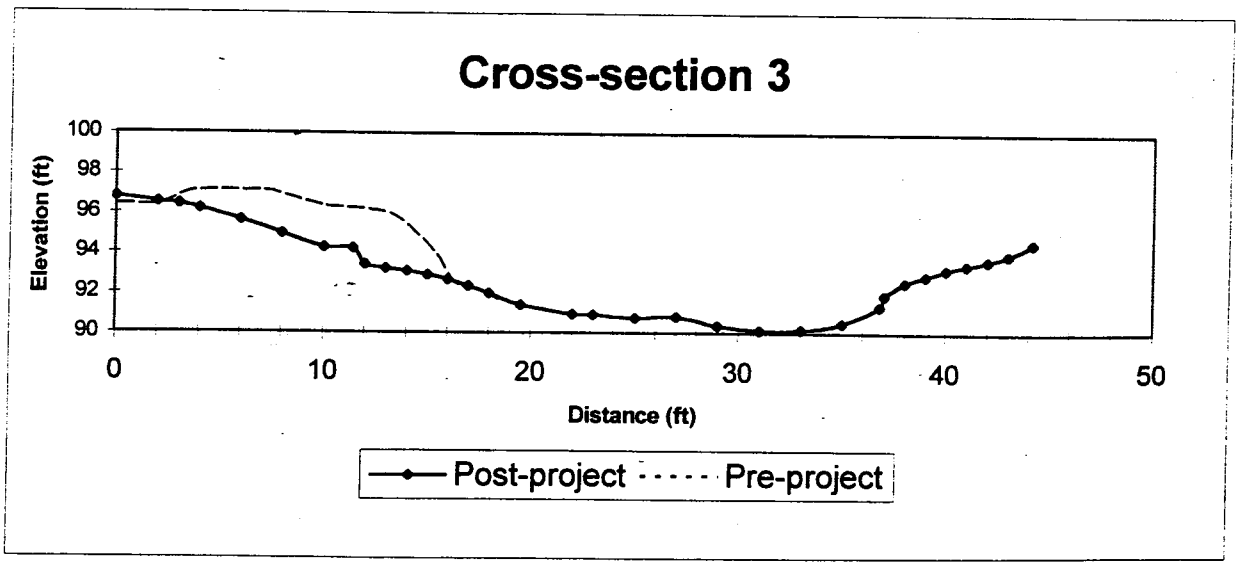


Monitoring cross-section sites along Fosson conservation easement.

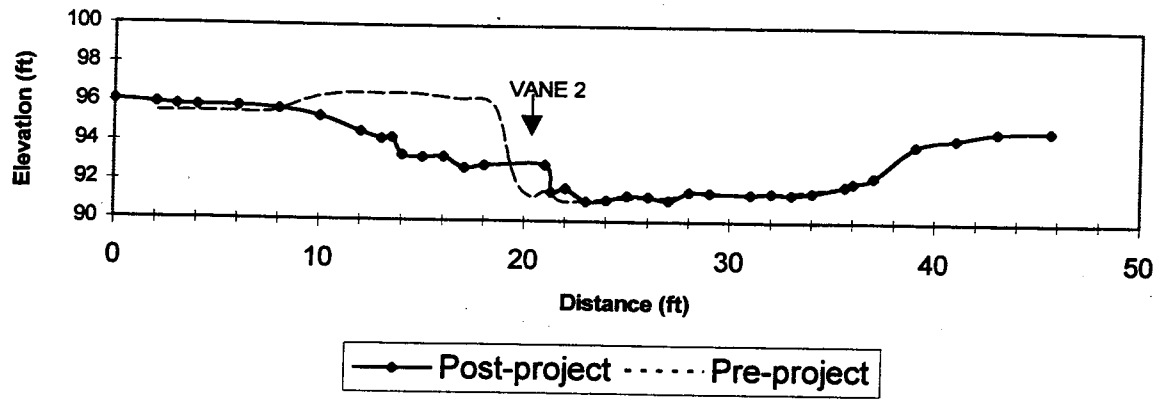
Cross-section 1: located 24 feet below pin in edge of road.
Cross-section 2: 19.3 feet downstream of point F2.
Cross-section 3: 24 feet upstream of F5.
Cross-section 4: 29 feet upstream of F6.
Cross-section 5: 225 feet upstream of F6.
Cross-section 6: 74.8 feet upstream of F8 on unnamed tributary.


Cross-section 1
Elevation (ft.)
97
95
93
91
89
87
0
10
20
30
40
50
60
Distance (ft.)
Post-project


Cross-section 2
Elevation (ft.)
96
94
92
90
88
86
0
10
20
30
40
50
60
Distance (ft.)
Post-project
Pre-project

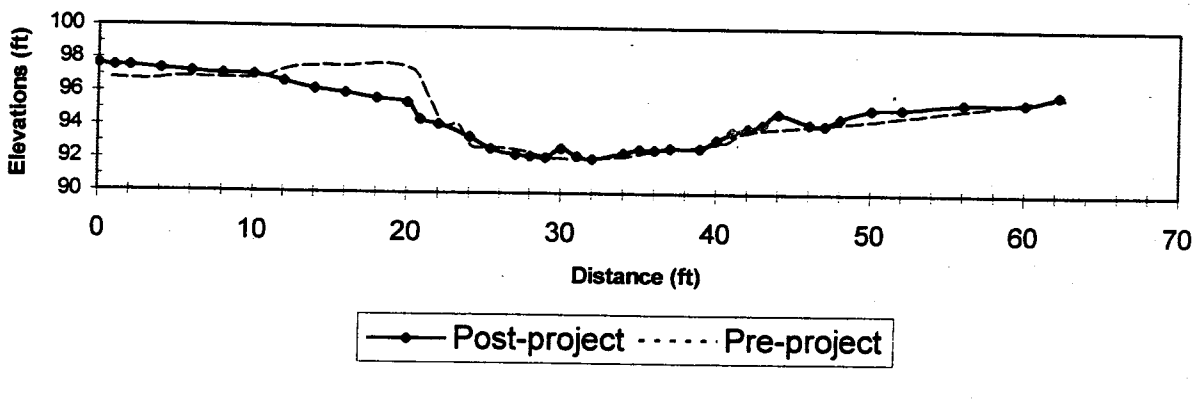

Cross-section 3
Elevation (ft)
100
98
96
94
92
90
0
10
20
30
40
50
Distance (ft)
Post-project
Pre-project

Cross-section 4



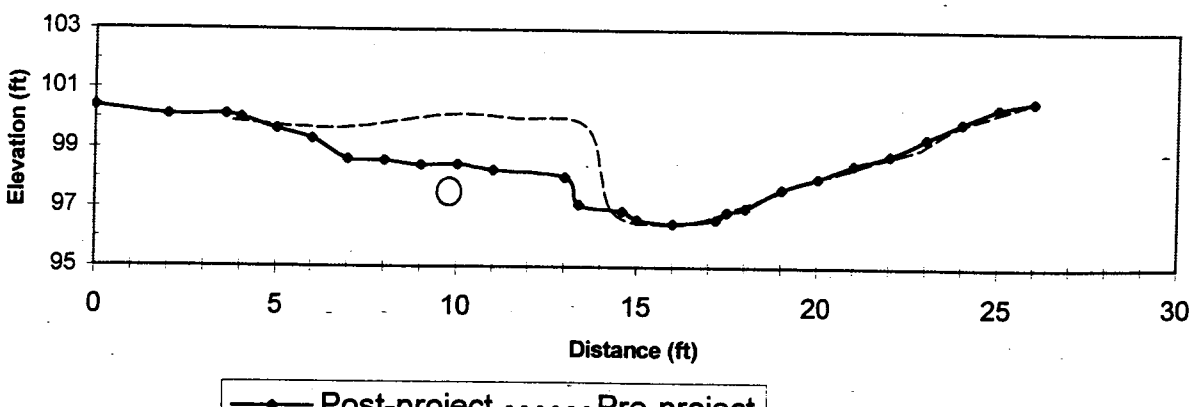
Post-project ----- Pre-project

Cross-section 5

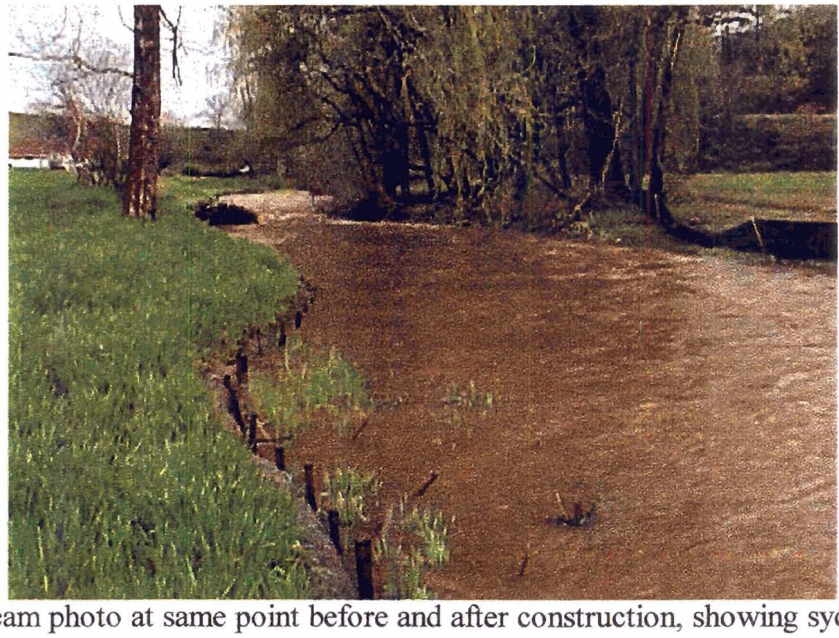


Post-project ----- Pre-project

Cross-section 6 on tributary



Post-project ----- Pre-project



Downstream photo at same point before and after construction, showing sycamore for reference. Bottom photo shows same site during bankfull event.

Downstream photo of same location showing lower rootwad revetment and banks before and after construction

Upstream photo along lower end of site, showing the same location before and after construction. Note the willow tree and walnut trees (center top of photos) for reference. Vertical, eroding stream banks have been sloped and vegetated for greater stability.

Photo downstream at same location before and after construction. Photos show the change in stream bank profile, stabilization with vegetation and erosion control materials and a rock vane constructed to direct flow toward the thalwag and reduce preassure on the near bank region.