As-built report for the Charles/McGinnis Mitigation Site, South Fork Big Pine Creek, Madison County

North Carolina Wildlife Resources Commission

Micky Clemmons and Brent Burgess

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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 South Fork Big Pine Creek. This was done by reshaping the stream banks to a more stable cross-sectional profile. Areas of high bank stress were protected using rootwads or veins. The riparian zone will be planted with native vegetation. Initially grasses, sedges, rushes, and herbaceous vegetation was seeded throughout the riparian zone. During the dormant winter season of 2000 a variety of rooted trees and live stakes were also planted. Livestock management practices installed at this site include a watering system and fencing to exclude livestock from the creek and riparian area.

Specific objectives for the Charles site were the following:

1. Increase the floodplain area and stabilize the bankfull elevation along the reach.

2. Install boulder veins, log veins or root wads at eroding sites in the stream to reduce erosion and provide fish habitat.

3. Install small vortex weirs to create pool habitat in sections where long riffles now exist.

4. Slope and vegetate the stream banks so they are more resistant to flooding.

5. 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. Work began on August 10, 1999 and was completed on August 25, 1999. A total of 11 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 accomplished by borrowing some temporary crossing mats from the N.C. Forest Service. These mats were laid across the existing old bridge and used to cross the stream. Work began at the bridge and moved upstream. When this section was complete we began working downstream from the bridge to the end of the site. Existing rock and soil berms were removed, banks sloped, and structures installed. Soil was graded into the pasture or trucked to a disposal site near the barn on the same property. The Natural Resources Conservation Service (NRCS) installed livestock management practices. These practices included watering tanks, hardened high-use areas, and fencing. Only two significant problems occurred at this site: the highest watering tank has not filled and the support under one end of the old bridge broke. We continue to monitor the tank and hope that under normal rain conditions it will fill. The support of the bridge had deteriorated and needed maintenance prior to our work at this site. We were able to lift the bridge and replace the support with some large boulders that we excavated during bank sloping. The site was vegetated with a native perennial seed mix and cover crop. The cover crop developed well and provided excellent stabilization to the site. During the winter of 2000, we returned to this site and extensively planted live stakes and bare rooted trees. A review of this site in July 2000, indicated excellent stability and survival of most trees. We will be collecting stability data during this fall or winter. At this site, this project has resulted in the restoration and protection of 1100 linear feet of stream and riparian area.

Channel Modifications:

At this site, the channel is a B type stream channel with cobble substrate and an interberm feature below the bankfull elevation. Prior to this project the site was vegetated with reed canary grass planted by the NRCS. High water was causing erosion of the bank in a number of areas, including areas supporting the road shoulder. The channel was entrenched along most of this reach due to the presence of a berm and past channelization. There were also few pool features at this site.

Two rock vanes and one rootwad revetment were installed at this site to control erosion of the stream bank on the outside of small meanders (see the attached map for the location of all structures). Rock for the vanes was obtained on site, as the banks of the stream were sloped. The top vane was built on the left bank to turn water off of a 5-foot high bank that was nearly vertical. The lower vane was built on the right bank to turn water off of an area that was eroding into the road right-of-way and extended downstream for about 15 feet. To eliminate this problem the vane was built and the channel was changed so that it meandered to the left side of the easement alignment. The old channel was filled to an elevation equal to the interberm and seeded with native vegetation. A rootwad revetment was installed downstream of the bridge at a site where the stream bends sharply right and the bank was eroding. The revetment was constructed out of materials obtained on site during bank sloping. Throughout the entire reach the interberm was maintained, enhanced or created as channel modifications were installed. It was felt that this feature was developing naturally and that it 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.

One objective of this project, which was not met, was the installation of vortex weirs to enhance pool habitat. At the time these structures were proposed they were considered feasible for this purpose; however, later we learned that the designer Dave Rosgen, had concerns about there application. We also had limited material onsite with which to build these structures. For these reasons we did not construct these structures. The rock vanes and rootwad revetment provided some pool habitat enhancement at this site. However, greater pool habitat enhancement at this site would have been desirable.

During the last visit to this site at 10 months post-construction, all channel modifications were stable and functioning properly. A scour hole had developed below the second vane, providing enhanced pool habitat. The interberm was well vegetated with a diversity of grasses and woody vegetation. Instability was not seen at any location along the channel. We will continue to monitor these parameters.

Riparian Improvements:

The pre-construction condition of the riparian zone at this site was not favorable for trout habitat. Above the interberm the banks were vertical over most of the reach and had little woody vegetation. Resulting in low bank stability and little shade. The herbaceous vegetation was dominated by reed canary grass, which provided little cold season bank protection. Erosion was evident at a number of locations. Much of the reach was lined by a berm that was created by past dredging and dumping of fieldstone. This berm caused the channel to be entrenched and its high rock content discouraged substantial plant growth.

The first step in restoring the riparian zone of this stream was to remove the rock/soil berm. Some of the larger rocks were used in the structures that were built. After the berm was removed

sloping was carried out on the reach. 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 was 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 quickly and grew through the erosion control materials. This provided a very stable ground surface. At the first frost the millet was killed. The winter wheat stayed green all winter long and in the spring grew vigorously. It headed up and died by mid-summer. By this time some wild seed and some of the native mix had started growing. It may take 2 to 3 years for the perennial mix to establish a good population with high densities. A large quantity of live stakes was planted at this site during the dormant season of winter 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. The total number of live stakes and bare rooted trees planted 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 the site visit at 10 months following construction, we found the riparian area stabile and planted vegetation in excellent condition. It was impossible to photograph the vegetative plots because the vegetation was so high the flags that marked off the plots could not be see. These plots as well as tree survival will be evaluated this spring.

Livestock Management Practices:

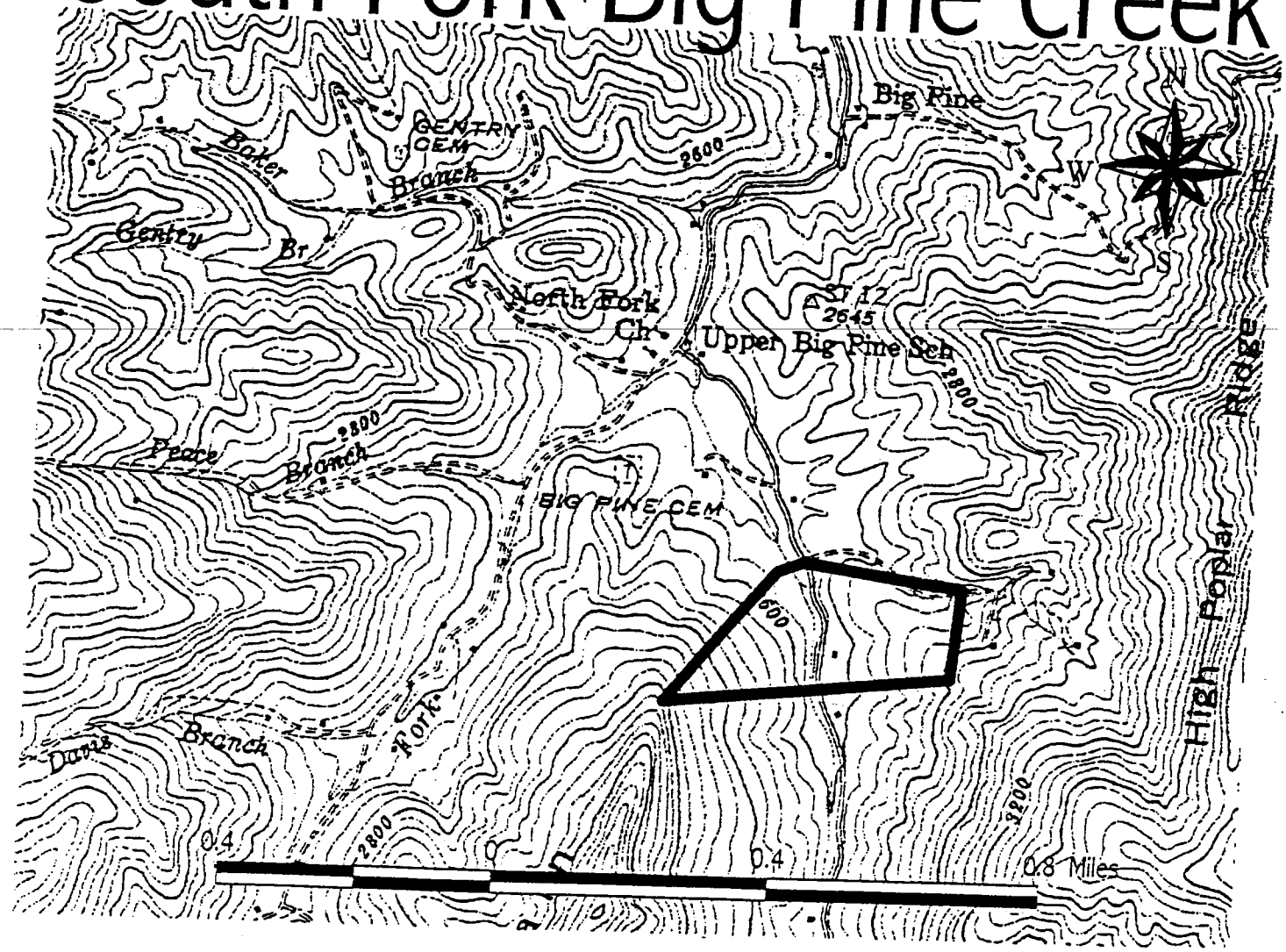
The NRCS was responsible for planning and installing the livestock management practices associated with this project. Practices were installed during or immediately following the stream restoration construction. Three watering tanks were installed at this site. Water was supplied from springs that were developed and piped to the tanks. The areas around the tanks were hardened to avoid degradation by livestock use. After the stream work was completed, a 4-strand barbed-wire fence was constructed to exclude livestock from the stream. The fence was built along the conservation easement line with turning post at calls along the survey.

Other Benefits:

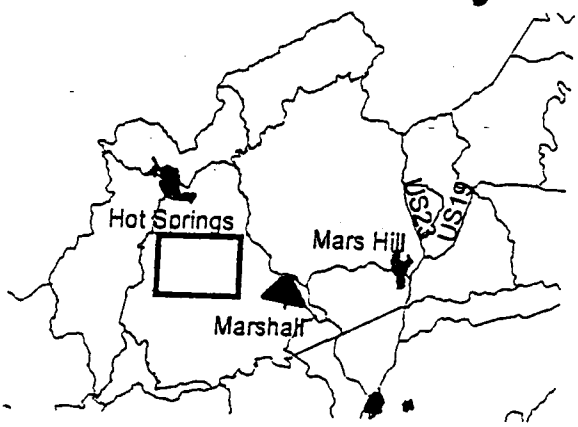
In addition to the benefits that will be realized from the mitigation work that has been described above, additional conservation measures were put in place at this site. The landowner worked through the NRCS's WHIP program to exclude cattle from a small wetland area that is on his property. Fencing livestock out of the wetland could not be done with mitigation funds, but since we were improving stream habitat the landowners wanted to protect this area also.

Charles Site

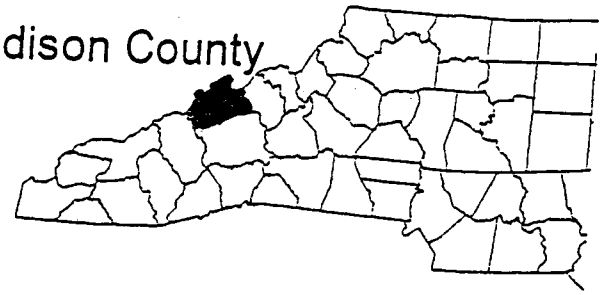
South Fork Big Pine Creek



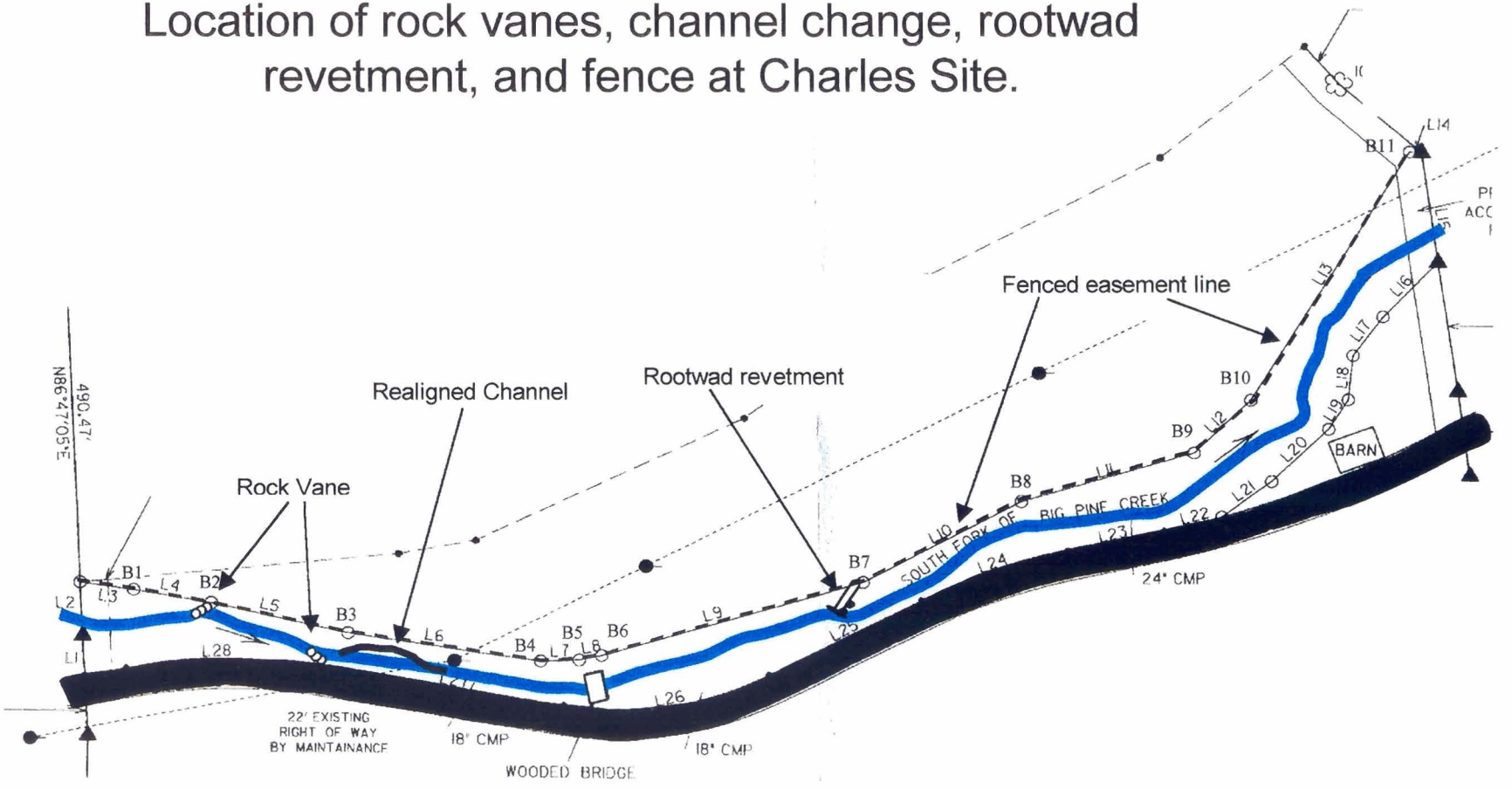
Madison County



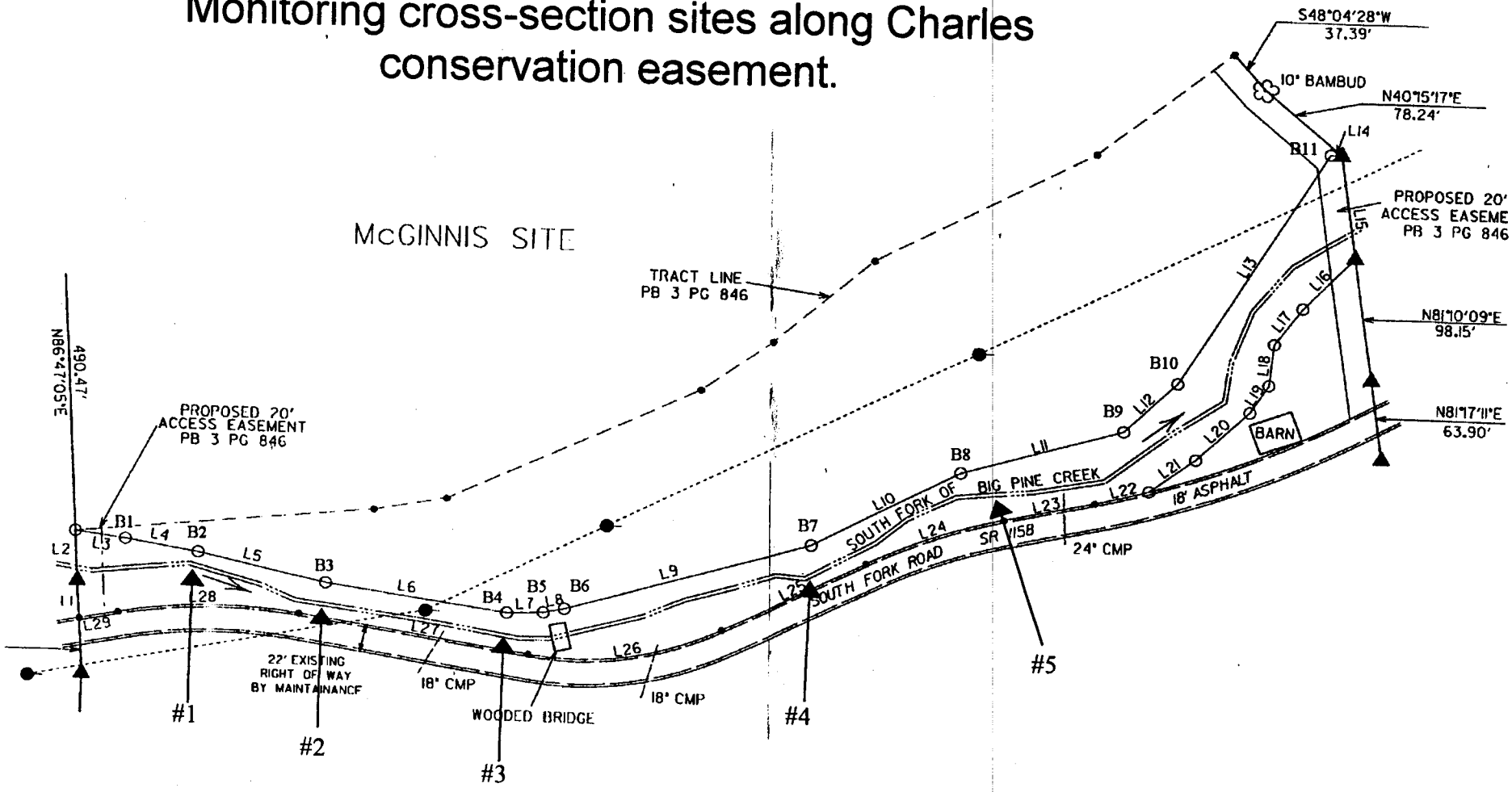
North Carolina



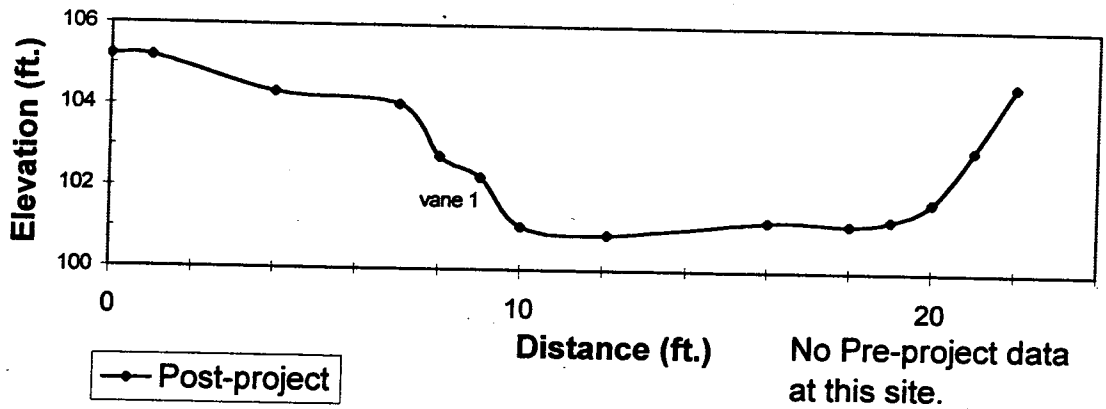
Location of rock vanes, channel change, rootwad revetment, and fence at Charles Site.



Monitoring cross-section sites along Charles conservation easement.

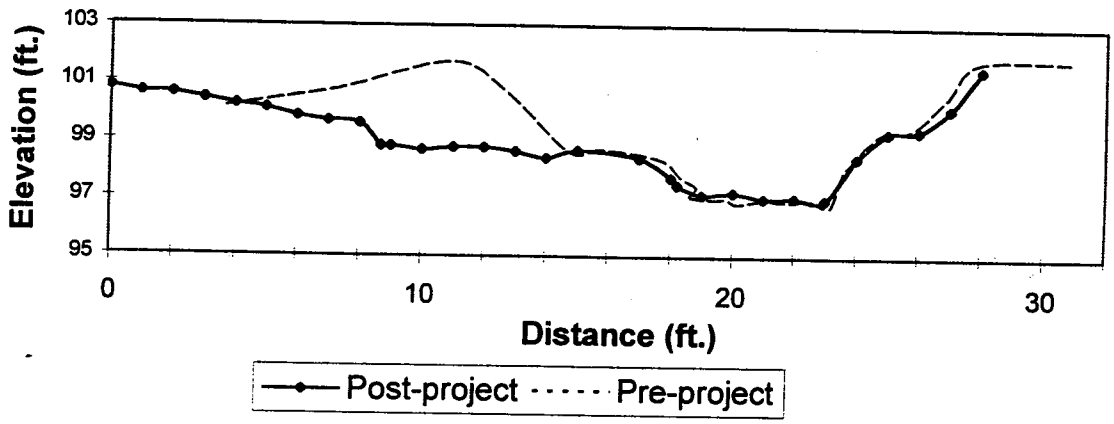


Cross-section 1

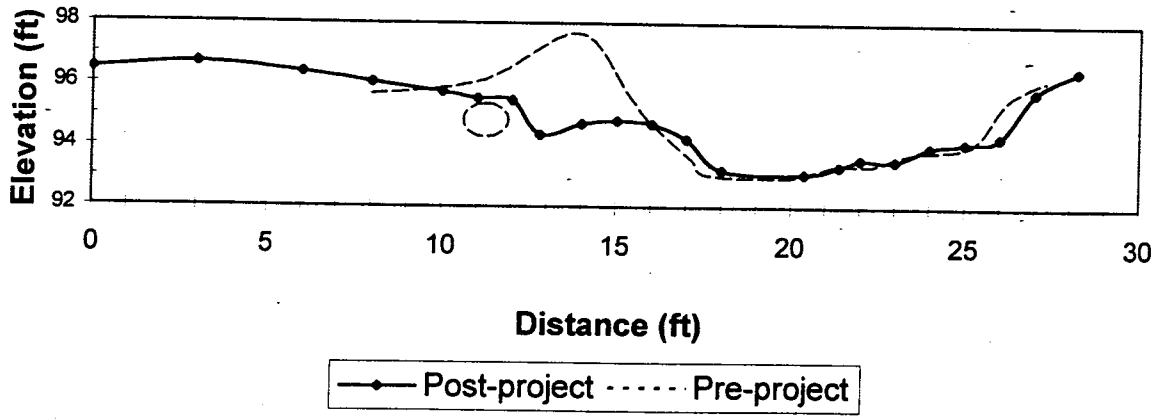


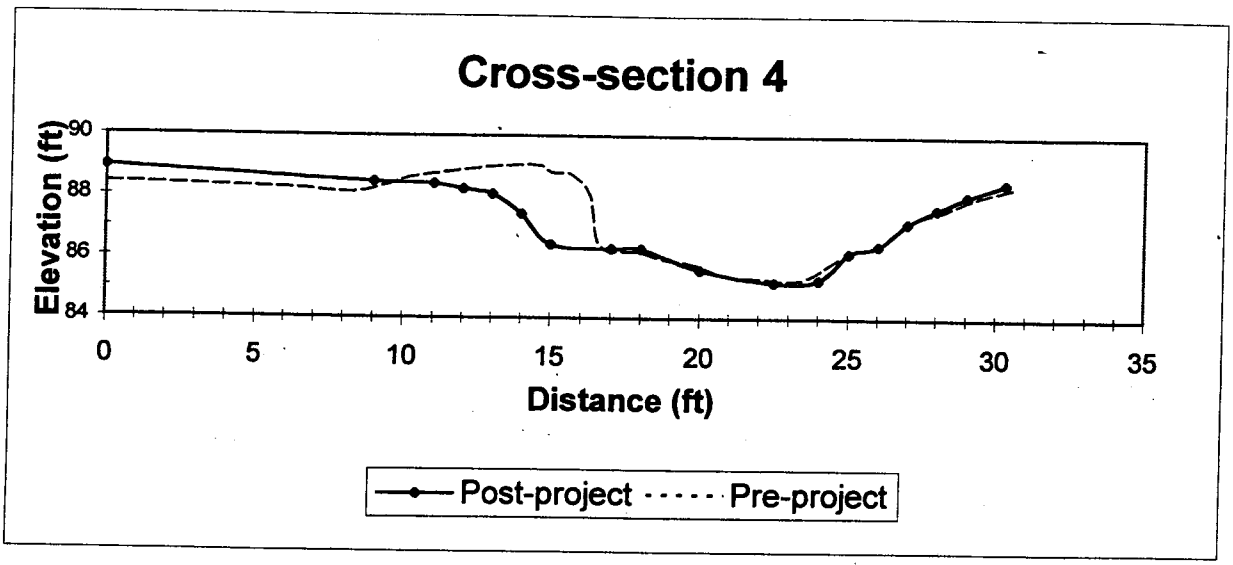
No Pre-project data at this site.

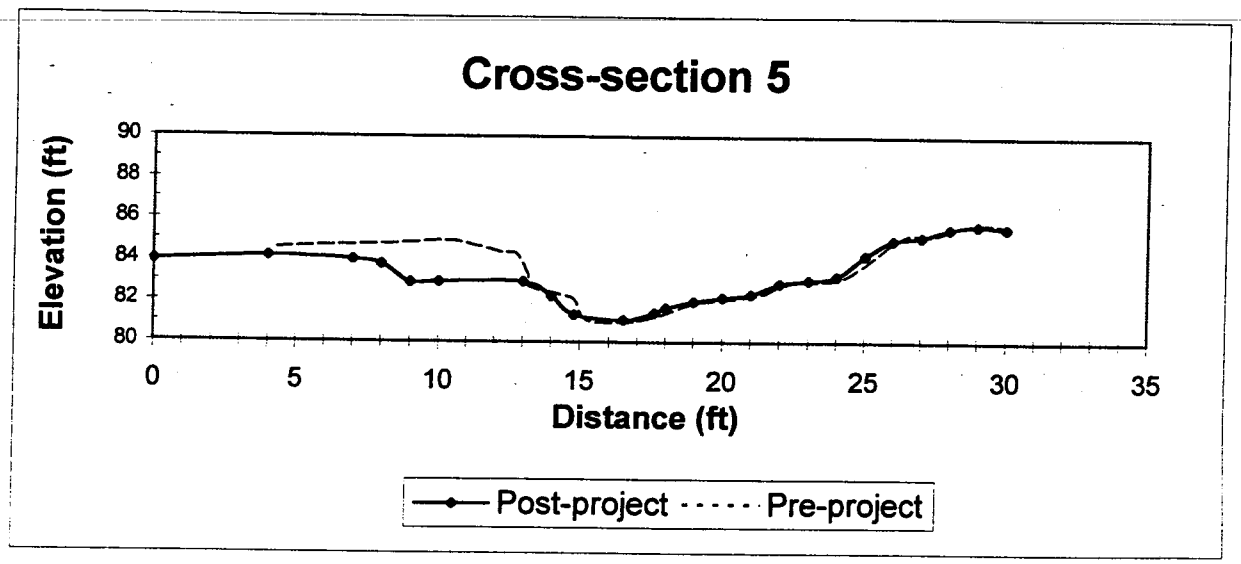
Cross-section 2



Cross-section 3




Cross-section 4
Elevation (ft)
90
88
86
84
0
5
10
15
20
25
30
35
Distance (ft)
Post-project
Pre-project


Cross-section 5
Elevation (ft)
90
88
86
84
82
80
0
5
10
15
20
25
30
35
Distance (ft)
Post-project
Pre-project

Looking upstream from power pole, showing sloping, erosion controls, vegetation and fencing. Top photo shows reach before construction, middle photo shows constructed channel and lower photo shows the same site 10 months after construction.

Looking upstream from the wooden bridge, top photo showing preconstruction condition of the channel. Middle photo shows channel after construction and lower photo shows the same channel 10 months after construction.

Looking upstream from point F7 in the top two photos and from point F9 in the bottom photo showing fencing an growth of ground cover. Bottom photo shows the same general reach after 10 months.

Looking downstream from road showing vane 1 and small channel change.

Four photos showing ground cover within the easement area. The two photos on the left are survival plots showing good vegetative cover through the erosion control blanket. Top right photo shows the diversity of grasses seeded and growing below the coir log. The lower right photo shows a live stake that has sprouted and is growing vigorously.