

**As-Built Report for the Greene Mitigation Site on Goose
Creek, Mecklenburg County**

Prepared for the

North Carolina Department of Transportation Stream Mitigation
Program

Transportation Improvement Project R-2420B

Joseph H. Mickey, Jr.
James A. Wasseen II

North Carolina Wildlife Resources Commission

Division of Inland Fisheries

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This as-built 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-2420 B road improvement project in Mecklenburg County. Under this agreement, a total of 903 linear feet of stream mitigation is required by the United States Army Corps of Engineers (USACE) and the North Carolina Division of Water Quality (DWQ). The purpose of this report is to summarize those practices used for bank stabilization and habitat enhancement along 783 linear feet of Goose Creek known as the Greene mitigation site, Mecklenburg County (Figure 1). Mickey and Scott (2003) described pre-construction site conditions and project objectives.

Mussel surveys

The Carolina heelsplitter *Lasmigona decorata*, a federally endangered freshwater mussel, is found in Goose Creek. Approximately 4.5 miles of Goose Creek have been designated as critical habitat for this species. This area extends from the NC 218 bridge in Union County to its confluence with the Rocky River. The Greene mitigation site is located several miles upstream of the designated critical habitat area. To ensure that the Carolina heelsplitter was not present at the Greene mitigation site, a mussel survey was conducted on March 18, 2004 by the Catena Group using batiscope and tactile surveys along the banks (Savidge 2004). The Carolina heelsplitter was not found at the site, however, one individual of the Carolina creekshell *Villosa vaughaniana* (Federal species of concern and North Carolina endangered species) was found upstream of Country Woods Drive, outside of the mitigation site impact area (Savidge 2004).

An USACE permit condition also required the WRC to conduct a mussel survey at the site immediately before construction started. Any mussels found at this time or during construction would be relocated upstream of the construction area. On January 10, 2005, WRC nongame aquatic biologists conducted a mussel search. No live mussels were found; however, one Carolina creekshell shell was located and moved. During construction, no mussels or mussel shells were observed.

Conservation Easement and Land Purchases

In order to ensure long term protection of the site, NCDOT obtained a 50 ft buffer conservation easement (CE) totaling 0.47 acres from James and Christy Tyndal, and purchased 1.58 acres from Lisa Gabbard and 3.71 acres from George and Linda Greene (Figure 2). Riparian buffer widths range from 100 ft to >300 ft along the purchased properties. The CE and land purchases permanently protect 5.75 acres and encompass 783 linear ft of Goose Creek. Right-of-way access to the site is from Country Woods Drive (SR 4220), which borders the northern end of the site. The site will be maintained by the WRC in perpetuity.

Site Improvements

Channel Modifications

Construction was carried out through an informal contract with Todd Hodges Construction of Patterson, N.C. The contractor provided a dump truck, loader, and trackhoe with hydraulic

thumb. Access to the site was through a temporary construction access along an old road bed off Country Woods Drive. Before the contractor could move to the site, the local DOT maintenance shop had to remove a guard rail and install one 12 inch and two 36 inch corrugated metal culverts in ephemeral stream channels to allow site access. Gravel and ballast stone were then placed over the pipes and on the temporary access road. Stream work began on February 8 and was completed on February 23, 2005.

Six rock vanes, two rock toe benches, three root wad structures, and four log structures were installed to prevent channel headcutting, to divert flows away from streambanks, and to create or maintain pool habitat (Table 1, Appendix 1). Large footer rocks were installed to support top boulders in the vanes. Large boulders were also placed behind root wad structures and used as log structure anchors. Holes were dug below the vanes and root wads to hasten and maintain pool formation. Excess streambed materials were excavated at rock vanes and placed upstream of the structure near the bank where natural deposition would be expected. Rock vanes were used to divert water away from eroding banks and for habitat diversity. In addition to these structures, several existing large boulders were repositioned to direct flows away from streambanks. At seven locations totaling 675 linear feet, streambanks were reshaped on a 1:1 or 2:1 slope to eliminate vertical, eroding banks (Table 1, Appendix 1). At six of the bank sites a bankfull bench was constructed and the bank reshaped on a 1:1 or 2:1 slope (Table 1, Appendix 1). By the end of each working day, all disturbed soils were seeded, limed and fertilized, and covered with erosion control matting or with straw.

The as-built survey, conducted on March 2, 3 and 14, 2005, included a longitudinal profile, eight channel cross-sections, pebble counts, and establishment of vegetation monitoring plots. The purpose of the as-built survey is to establish post-construction baseline data that can be compared with future surveys to monitor channel stability and vegetation survival. A water level staff gage is located in the lower right corner (facing downstream) of the multi-cell box culvert at station 0+00. The water level at the time of the as-built survey was 0.18 ft.

The pre-construction longitudinal survey was 773 ft in length whereas the as-built survey began at station 1+10 and ended at station 7+78, a total of 668 ft (Figure 3). The as-built survey did not include the first 109 ft of the project site since no stream work occurred in this section. The pre-construction survey found 49% of the stream was pool habitat whereas the as-built survey contained 37% pool habitat. The reason for the decrease in pool habitat between the two surveys is directly related to two factors. First, the pre-construction survey identified a long shallow pool from stations 3+52 – 4+60 whereas the as-built survey found a pool – riffle – run – pool complex at the same stations. Second, the pre-construction survey contained a long pool that had developed behind a large log/debris jam (Figure 3) from stations 4+82 – 5+68. This log/debris jam is no longer present and the as built survey identified a pool – riffle – pool – riffle – pool – run complex at these same stations. There is a rapid rise in the thalweg at the head of a riffle at station 6+24 (Figure 3). This 0.5 ft rise is attributed to the presence of bedrock located in the pool above this station.

Eight cross-sections were established for the as-built survey (Figure 4). Two cross-sections were located at pools (Figures 4.5, 4.6) and six at riffles (Figures 4.1, 4.2, 4.3, 4.4, 4.7, and 4.8). Data from the six riffle cross-sections was used to determine the stream type following

construction (Table 2). The pre-construction survey (Mickey and Scott 2003) classified the stream at the Greene site as an unstable F4 and G4 stream type (Rosgen 1996). Using the North Carolina rural regional curve data (RRC) (Harman 1999), the as-built survey classified the constructed stream reach as a stable F4 at two locations and a B4c at the other four locations (Table 2). The project goal to construct a stable F4 and C4 channel through this reach was achieved. However, when comparing the same six riffle cross-sections to the North Carolina urban regional curve data (URC) (Doll et al. 2002), four of the six cross-sections are C4 and two are slightly entrenched E4 stream types (Table 3). The reason for using the RRC and URC is that the present condition of the stream channel alludes to the stream's stable F4 and B4c conditions evolving in an urban setting to stable C4 and E4 channels. The Goose Creek watershed contains approximately 10% impervious area (M. Fowlkes, personal communication). With the completion of the I-485 project, the area is rapidly transforming from a rural to urban landscape. The C4 and E4 channels are more representative of the newly constructed channel cross-sections (Figure 4).

Channel bed material was analyzed using the reachwide pebble count and cross-section survey methods (NCSRI 2003). Riffle pebble counts were conducted in the vicinity of cross-section stations 1+39 and 6+24. The D_{50s} observed in the two riffles and reach ranged from 11.7 mm to 25.4 mm with a weighted d_{50} of 18.4 mm (Figure 5). Sixty-four percent of the bed material in this reach of Goose Creek is considered gravel, 17 % silt and sand, and 16 % cobble (Figure 5).

Riparian Improvements

Disturbed streambanks and soil disposal areas were seeded with a WRC native riparian mix (Mickey and Hining 2003) and a cover crop of winter wheat and rye. After seeding, bare soils were limed, fertilized, and covered with erosion control blankets or with straw. Erosion control blankets were used to stabilize the soil surface on steep slopes until vegetation can become established.

A total of 981 stems (live stakes and rooted trees) were planted during and following construction (Table 4). Sixty-four percent of the planted stems were composed of silky dogwood *Cornus amomum* (28%) and silky willow *Salix sericea* (36%). Three vegetation plots totaling 0.085 acres and 195 stems (20% of total planted) were established on March 3, 2005 (Table 5, Appendix 2). These three plots will be used to determine stem survival rates through the monitoring period. The vegetation plots can also be used to monitor volunteer stem growth. Based on planting guidelines established for mitigation sites, a total of 320 stems/acre should be counted through year three (USACE 2003). At the Greene site, approximately 0.8 acres were disturbed during construction, requiring that 256 stems be counted at the site in the winter of 2008.

The terrestrial exotic invasive plants of wild olive *Elaeagnus spp.* and Chinese privet *Ligustrum sinense* exist at the site. These invasive species need to be monitored and if they become a nuisance, some form of cutting/chemical control may be required.

Project Costs

The WRC project cost for stream enhancement work was \$30,454.17 or \$ 38.89 per linear foot of stream enhancement (Table 6). Project cost includes: meetings with landowners, DOT, DWQ, and U.S. Fish and Wildlife Service personnel; field survey work; preparation of project conceptual design; construction and as-built report; tree purchase and planting; erosion control materials (seed, fertilizer, fabric); and WRC personnel and administrative costs. Taking into account DOT personnel, equipment, materials expenses, and CE and land purchase costs, project costs increase to \$101,871.36 or \$131.79 per foot (Table 6). Site monitoring and repair costs will be added to the cost total as they accrue during the monitoring period.

Summary

Using natural stream design techniques, stream dimension and profile was improved at this site. Based on North Carolina RRC data (Harmon et al. 1999), an unstable F4 and G4 stream type was converted to a stable F4, B4c stream type. However, when taking into account that the watershed is rapidly urbanizing, North Carolina URC data (Doll et al. 2002), indicate this reach of Goose Creek would be classified as a C4 and slightly entrenched E4 stream type. Water quality will be improved through reduced sedimentation from previously eroding banks. In-stream habitat for fish and aquatic invertebrates has been increased with the installation of rock vanes, log vanes, and root wads. Both aquatic and terrestrial species will benefit with the return of a functioning riparian corridor. Stream aesthetics have also been improved. Trends in pool development and channel narrowing tend to be positive from pre-construction to as-built conditions. However, monitoring will be necessary to determine if the scour action created by rock vanes, log vanes, and root wads can be maintained or increased. The reshaped banks should remain stable following bankfull and flood events.

References

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FIGURE 1. Greene mitigation site on Goose Creek, Yadkin River drainage, Mecklenburg County

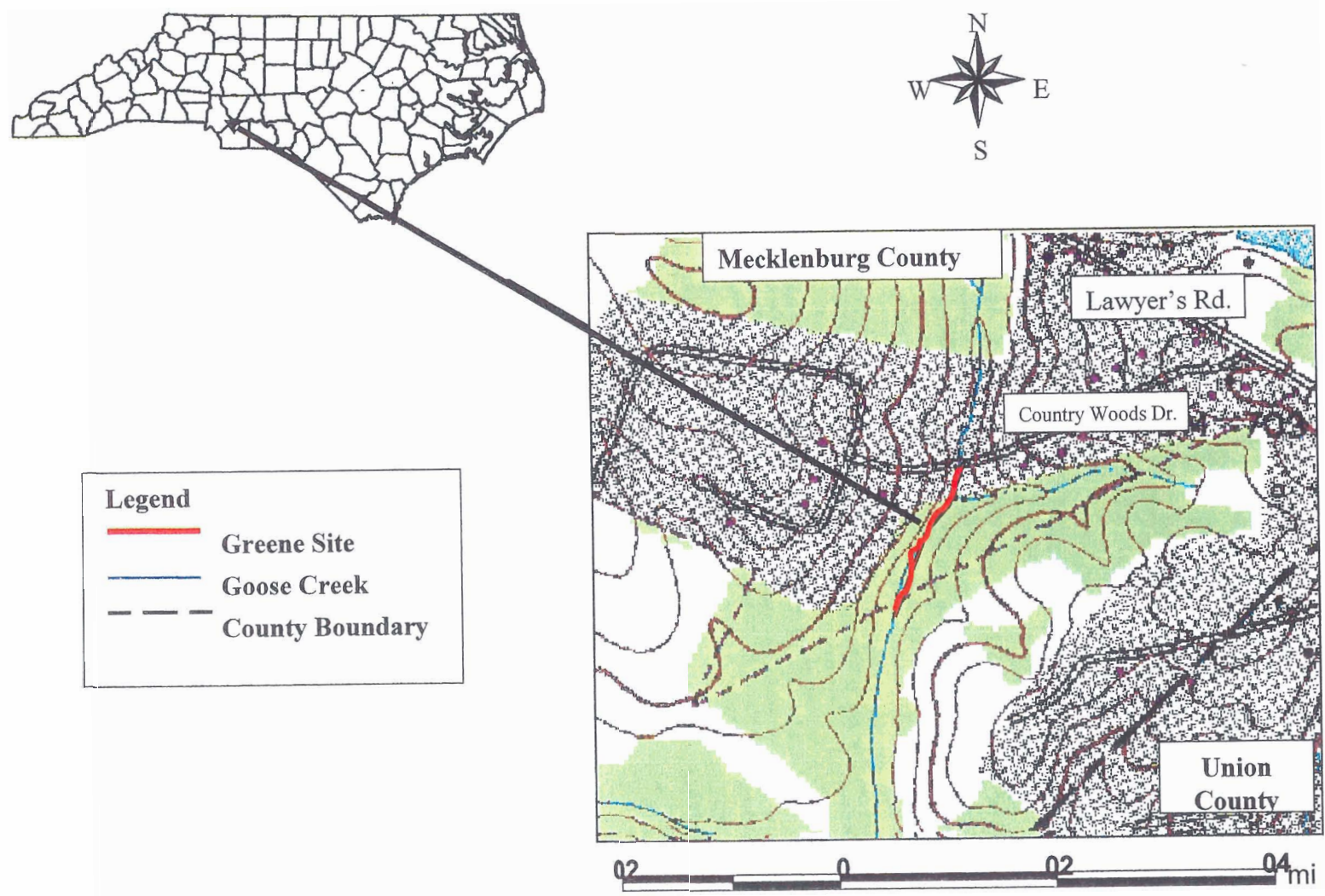


FIGURE 3. Longitudinal profile, Greene mitigation site, Goose Creek, Yadkin River drainage, Mecklenburg County, pre-construction and as-built surveys, March 2005.

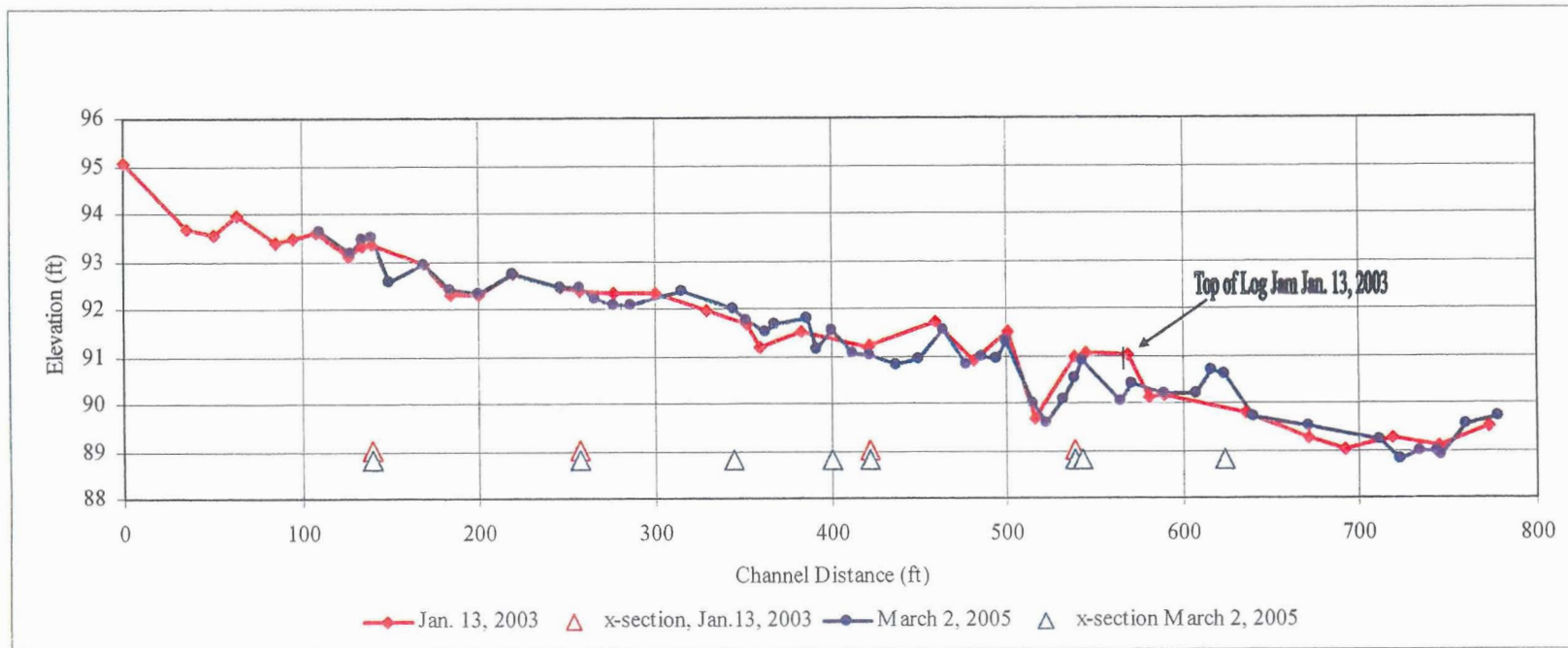


FIGURE 4. Details of pre-construction and as-built cross-sections established at the Green mitigation site, Goose Creek, Yadkin River drainage, Mecklenburg County, March 2005.

URC – Urban Regional Curve
 RRC – Rural Regional Curve

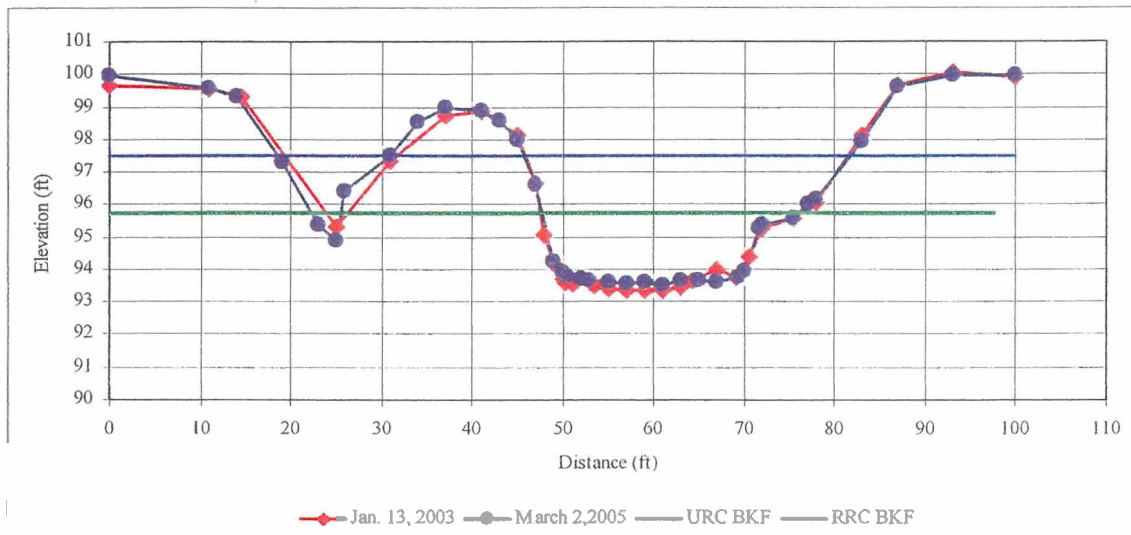


FIGURE 4.1. Cross-section 1+39, riffle. (Photograph not available)

FIGURE 4. Continued.

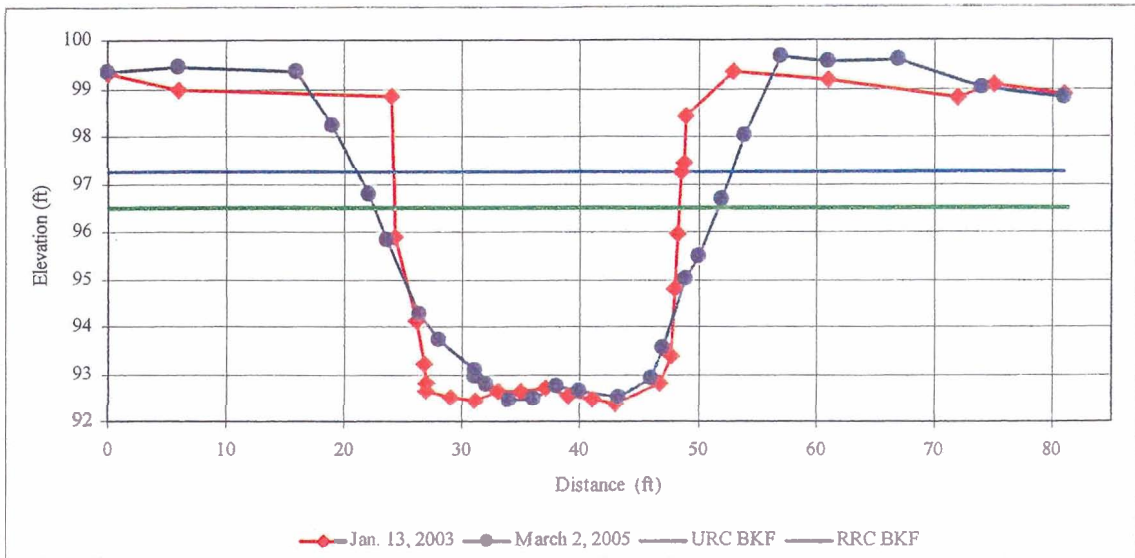


FIGURE 4.2. Cross-section 2+57, riffle.

FIGURE 4. Continued.

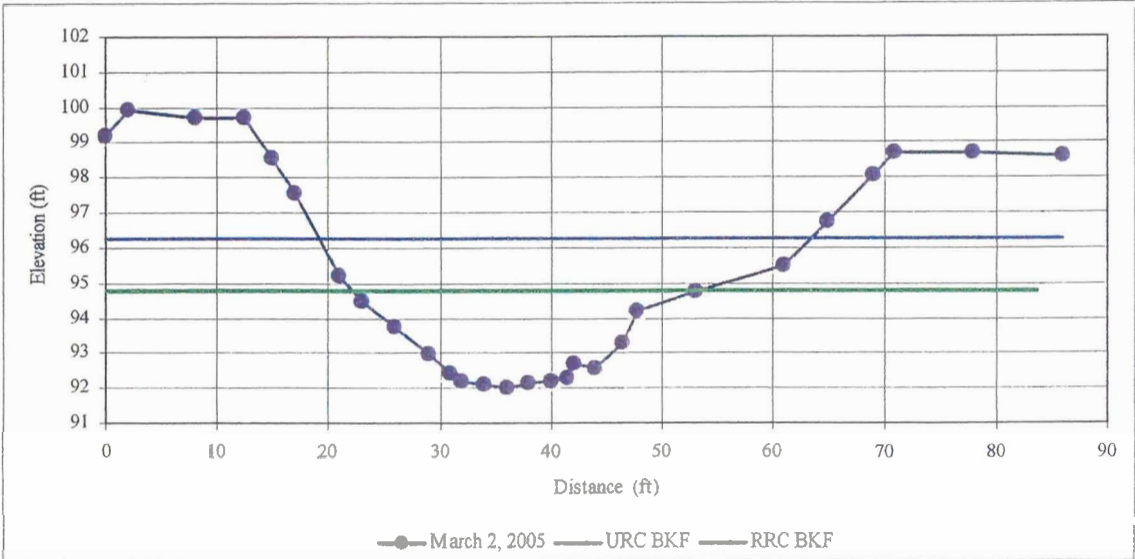


FIGURE 4.3. Cross-section 3+44, riffle.

FIGURE 4. Continued.

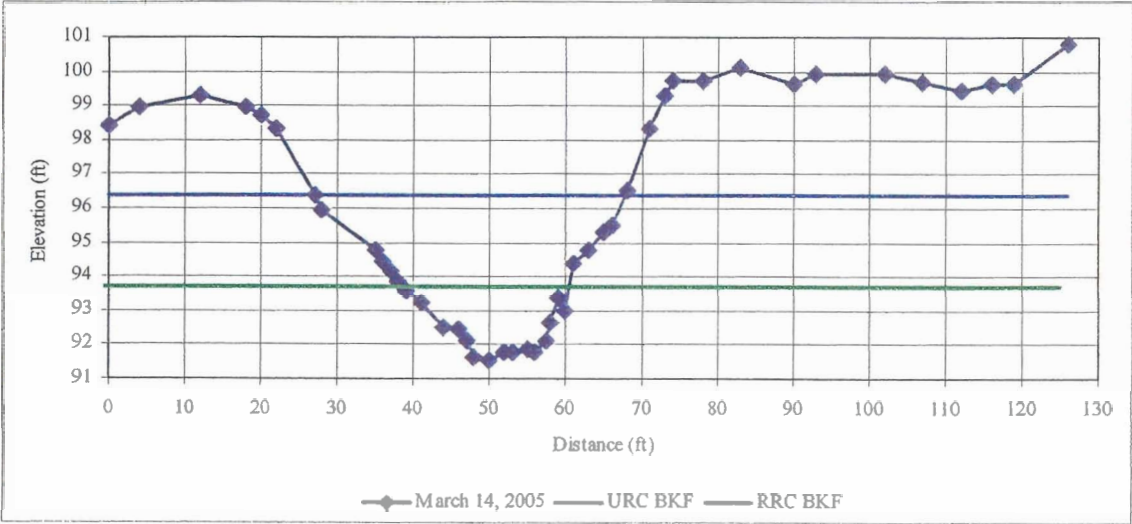


FIGURE 4.4. Cross-section 4+04, riffle.

FIGURE 4. Continued.

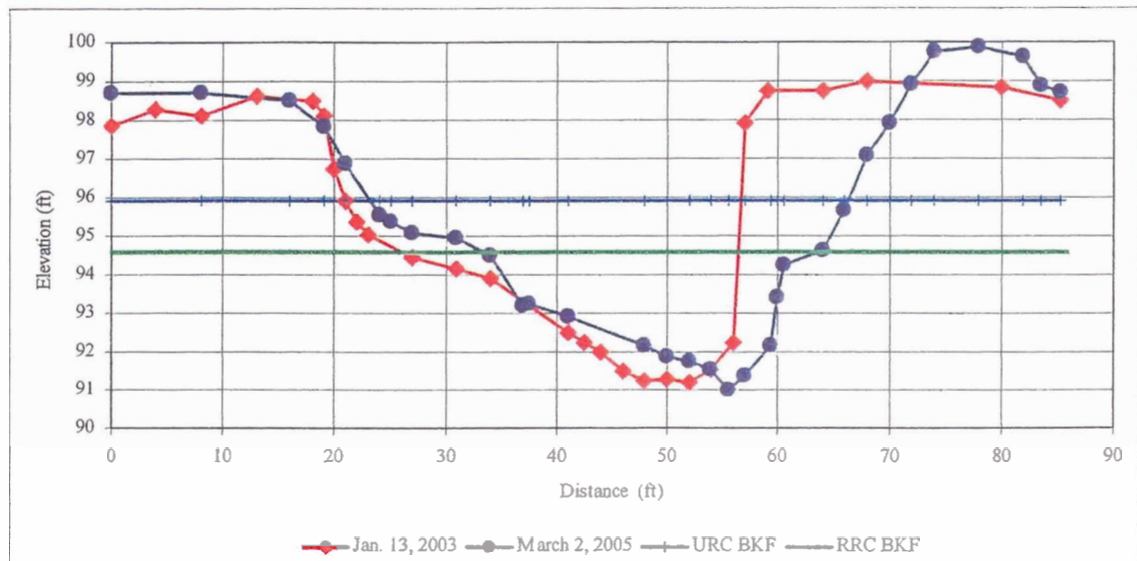


FIGURE 4.5. Cross-section 4+22, pool.

FIGURE 4. Continued.

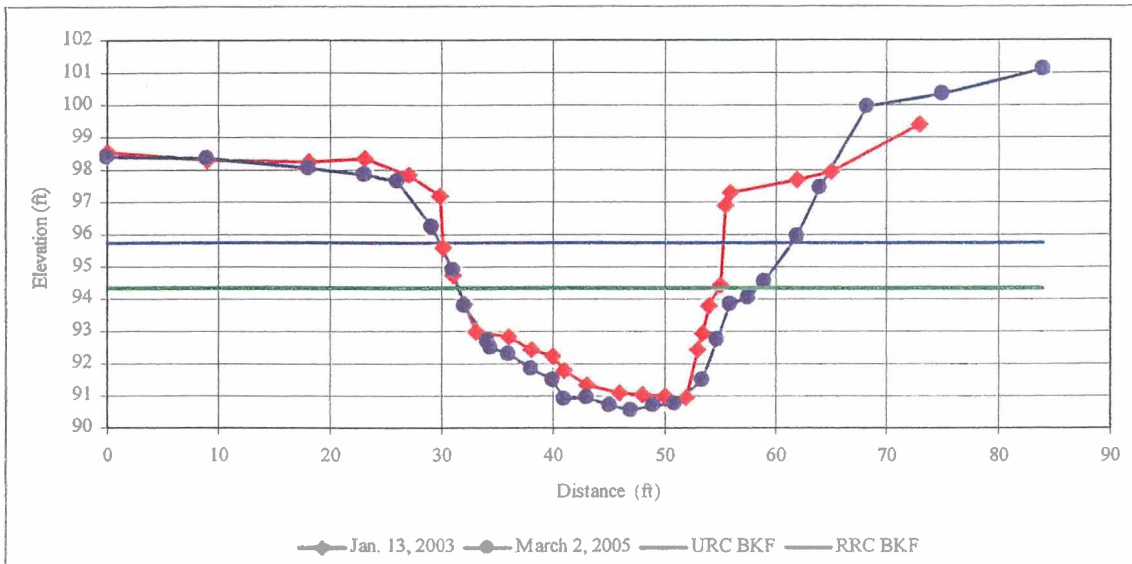


FIGURE 4.6. Cross-section 5+39, pool.

FIGURE 4. Continued.

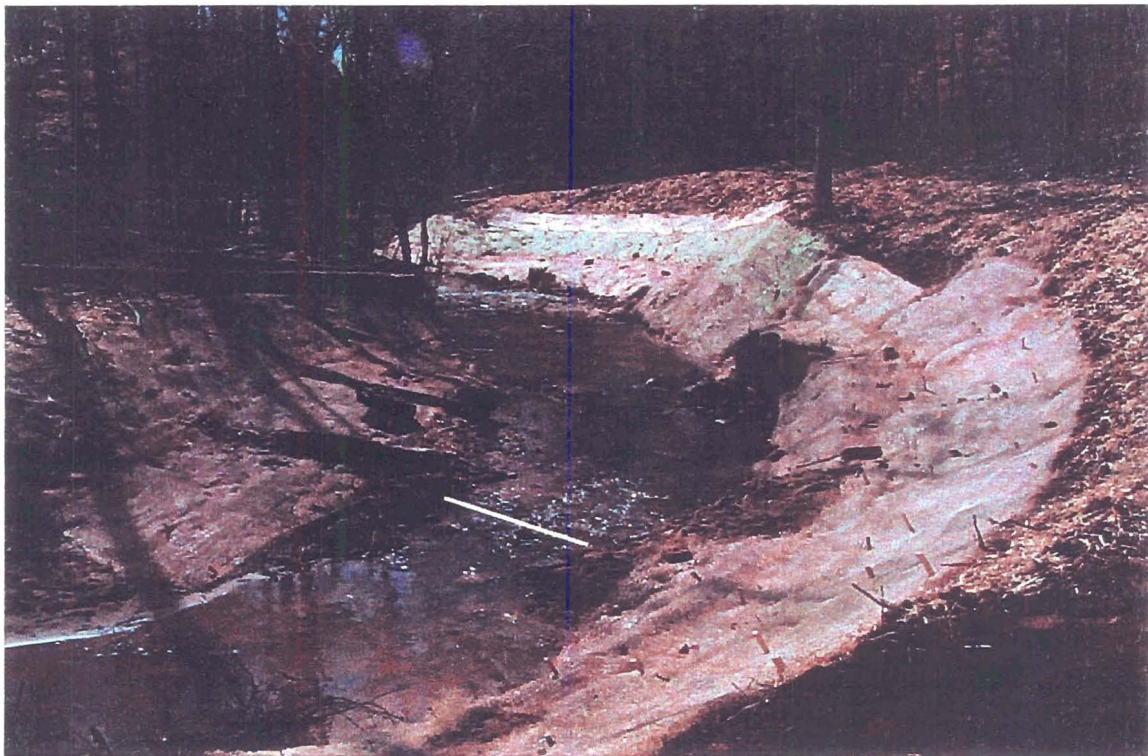
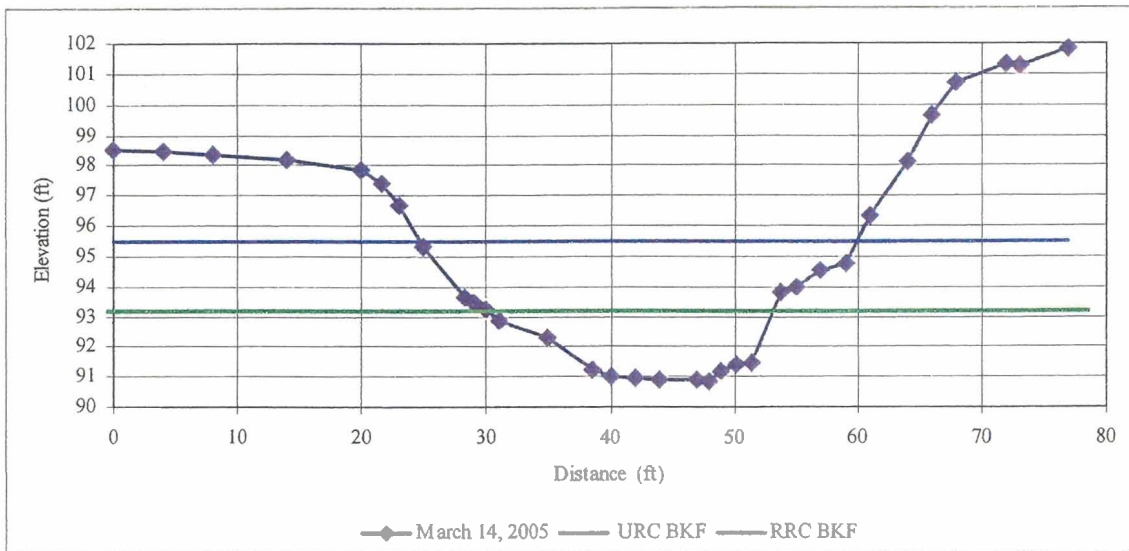


FIGURE 4.7. Cross-section 5+55, riffle.

FIGURE 4. Continued.

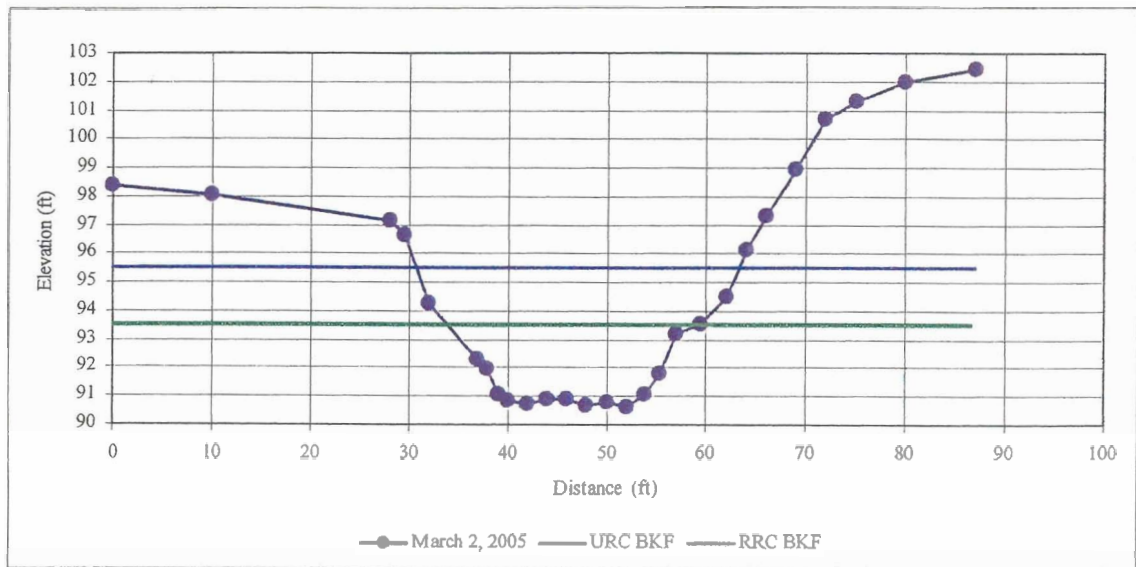
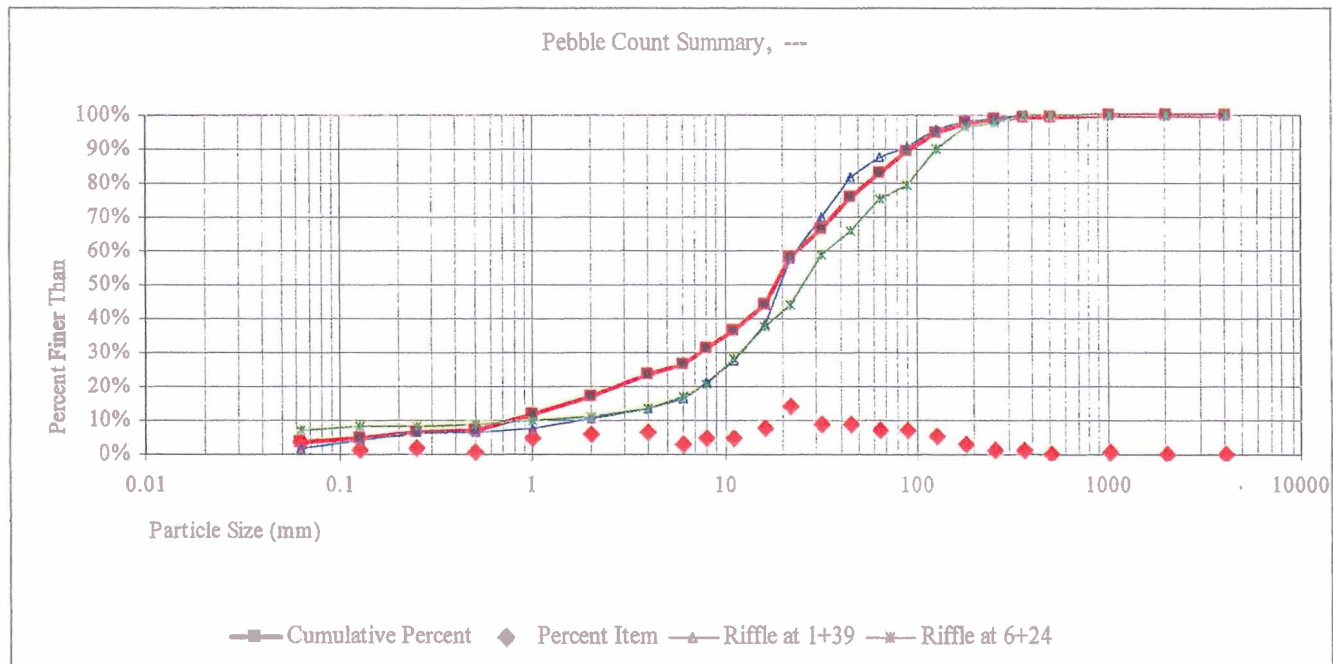


FIGURE 4.8. Cross-section 6+24, riffle.

FIGURE 5. Pebble count summary for the Greene mitigation site on Goose Creek, Yadkin River drainage, Mecklenburg County, March, 2005.



| | Size percent less than (mm) | | | | | Percent by substrate type | | | | | |
|----------|-----------------------------|-------|------|-----|-----|---------------------------|------|--------|--------|---------|---------|
| | D16 | D35 | D50 | D84 | D95 | Silt/clay | Sand | Gravel | Cobble | Boulder | Bedrock |
| Weighted | 1.709 | 10.8 | 18.4 | 68 | 134 | 3% | 14% | 64% | 16% | 1% | 2% |
| XS 1+39 | 5.715 | 14.15 | 19.4 | 52 | 119 | 2% | 9% | 77% | 12% | 1% | 0% |
| XS 6+24 | 5.298 | 14.43 | 25.4 | 105 | 166 | 7% | 4% | 61% | 22% | 2% | 4% |
| Reach | 0.880 | 3.06 | 11.7 | 81 | 157 | 6% | 21% | 46% | 22% | 2% | 4% |

TABLE 1. Channel modifications for the Greene mitigation site on Goose Creek, Yadkin River drainage, Mecklenburg County, February 8-23, 2005.

| Longitudinal profile station | Work location | Work performed |
|------------------------------|---------------|---------------------------------|
| 2+19 - 2+75 | Right bank | Bench & reshape bank |
| 3+00 | Right bank | Log vane |
| 2+38 - 3+00 | Left bank | Bench & reshape bank - Rock toe |
| 2+84 | Left bank | Rock vane |
| 3+25 - 4+41 | Left bank | Reshape bank |
| 3+29 | Left bank | Rock vane |
| 3+64 | Left bank | Log vane |
| 3+81 - 4+84 | Right bank | Bench & reshape bank |
| 4+09 | Right bank | Root wads |
| 4+41 | Right bank | Rock vane |
| 4+41 | Left bank | Log vane |
| 4+64 | Left bank | Rock vane |
| 4+86 | Left bank | Rock vane |
| 5+00 - 6+96 | Right bank | Bench & reshape bank |
| 5+15 | Right bank | Root wads |
| 5+43 | Right bank | Rock vane |
| 5+41 - 6+00 | Left bank | Bench & reshape bank - Rock toe |
| 6+72 - 7+55 | Right bank | Bench & reshape bank |
| 7+19 | Right bank | Root wads |
| 7+43 | Right bank | Cross log vane |

TABLE 2. Cross-section analysis using the rural regional curve data (Harmon et al. 1999); and stream classification summary for the Greene mitigation site on Goose Creek, Yadkin River drainage, Mecklenburg County, March, 2005. Water surface slope is 0.008 and the sinuosity is 1.22

| Cross-section Station | Stream feature | Cross-section area (ft ²) | Width bankfull (ft) | Maximum depth (ft) | Mean depth (ft) | Width flood prone area (ft) | Width/depth ratio | Entrenchment ratio | Stream type |
|-----------------------|----------------|---------------------------------------|---------------------|--------------------|-----------------|-----------------------------|-------------------|--------------------|-------------|
| RRC ^a | | 47 | 21 | 2.2 | | | | | |
| 1+39 | Riffle | 47.9 | 31.4 | 2.2 | 1.5 | 38 | 20.5 | 1.2 | B4c |
| 2+57 | Riffle | 46.3 | 24.0 | 2.6 | 1.9 | 32 | 12.4 | 1.3 | F4 |
| 3+44 | Riffle | 50.7 | 30.8 | 2.8 | 1.6 | 54 | 18.7 | 1.7 | B4c |
| 4+04 | Riffle | 47.5 | 25.4 | 2.9 | 1.9 | 44 | 13.6 | 1.5 | B4c |
| 5+55 | Riffle | 47.8 | 25.3 | 2.8 | 1.9 | 38 | 13.4 | 1.7 | B4c |
| 6+24 | Riffle | 51.7 | 25.6 | 2.9 | 2 | 34.5 | 12.7 | 1.3 | F4 |

^aRural regional curve data

TABLE 3. Cross-sectional analysis using the urban regional curve data (Doll et al. 2002); and stream classification summary for the Greene mitigation site on Goose Creek, Yadkin River drainage, Mecklenburg County, March, 2005. Water surface slope is 0.008 and the sinuosity is 1.22

| Cross-section Station | Stream feature | Cross-section area (ft ²) | Width bankfull (ft) | Maximum depth (ft) | Mean depth (ft) | Width flood prone area (ft) | Width/depth ratio | Entrenchment ratio | Stream type |
|-----------------------|----------------|---------------------------------------|---------------------|--------------------|-----------------|-----------------------------|-------------------|--------------------|-----------------|
| URC ^a | | 109 | 36 | 3.6 | | | | | |
| 1+39 | Riffle | 104 | 36.0 | 4 | 2.9 | 24 | 12.5 | 6.7 | C4 |
| 2+57 | Riffle | 109 | 31.8 | 4.8 | 3.4 | 175 | 9.3 | 5.5 | E4 ^b |
| 3+44 | Riffle | 109 | 44.2 | 4.2 | 2.5 | 200 | 18 | 4.5 | C4 |
| 4+04 | Riffle | 112 | 40.7 | 4.8 | 2.8 | 240 | 14.8 | 5.9 | C4 |
| 5+55 | Riffle | 105 | 35.2 | 4.7 | 3 | 170 | 11.8 | 4.8 | C4 |
| 6+24 | Riffle | 109 | 32.5 | 4.9 | 3.4 | 160 | 9.7 | 4.9 | E4 ^b |

^aUrban regional curve data

^bSlightly entrenched

TABLE 4. Trees and shrubs planted at the Greene Mitigation Site along Goose Creek, Mecklenburg County, February 15-25, 2005.

| Type of plant | Scientific name | Common name | Number planted |
|----------------------------|---|-------------------|----------------|
| Trees | | | |
| | <i>Acer negundo</i> | Boxelder | 10 |
| | <i>Acer rubrum</i> | Red maple | 9 |
| | <i>Alnus serulata</i> | Tag alder | 99 |
| | <i>Carpinus caroliniana</i> | American hornbeam | 13 |
| | <i>Fagus grandifolia</i> | American beech | 45 |
| | <i>Juglans nigra</i> ^a | Black willow | 50 |
| | <i>Juniperus virginiana</i> | Eastern red cedar | 18 |
| | <i>Liriodendron tulipifera</i> | Yellow poplar | 9 |
| | <i>Pinus virginiana</i> | Virginia pine | 23 |
| | <i>Quercus palustris</i> | Pin oak | 2 |
| | <i>Quercus spp.</i> | | 2 |
| | <i>Prunus serotina</i> | Black cherry | 3 |
| | <i>Salix nigra</i> | Black walnut | 1 |
| | Unknown species ^b | | 21 |
| Shrubs | | | |
| | <i>Cephalanthus occidentalis</i> ^a | Buttonbush | 23 |
| | <i>Comus amomium</i> ^a | Silky dogwood | 275 |
| | <i>Euonymus americanus</i> | Strawberry bush | 2 |
| | <i>Salix sericea</i> ^a | Silky willow | 356 |
| | <i>Sambucus canadensis</i> ^a | Elderberry | 20 |
| Total stems planted | | | 981 |

^aPlanted as live stakes.

^bUnknown species are probably hornbeam, beech, and maple trees. These trees will be identified upon leafing out in the spring of 2005.

TABLE 5. As-built vegetation survey plot totals for the Greene mitigation site, Goose Creek, Mecklenburg County, March 3, 2005.

| Species | Area 1 (0.028 acre) | Area 2 (0.017 acre) | Area 3 (0.040 acre) |
|----------------------------------|------------------------|------------------------|------------------------|
| <i>Cephalanthus occidentalis</i> | 2 | | 4 |
| <i>Comus amomium</i> | 8 | 13 | 22 |
| <i>Juglans nigra</i> | 25 | | 1 |
| <i>Salix sericea</i> | 19 | 14 | 21 |
| <i>Acer rubrum</i> | 2 | 1 | |
| <i>Alnus serrulata</i> | 13 | 4 | 10 |
| <i>Carpinus caroliniana</i> | | 1 | 1 |
| <i>Fagus grandifolia</i> | | 2 | 7 |
| <i>Juniperus virginiana</i> | | | 3 |
| <i>Liriodendron tulipifera</i> | | | 3 |
| <i>Quercus palustris</i> | 1 | | |
| <i>Quercus spp.</i> | | | 2 |
| <i>Pinus spp.</i> | 5 | 2 | |
| <i>Prunus serotina</i> | | | 1 |
| <i>Salix nigra</i> | | | 1 |
| <i>Sambucus canadensis</i> | | | 3 |
| Unknown species | 4 | | |
| Totals | 79 | 37 | 79 |

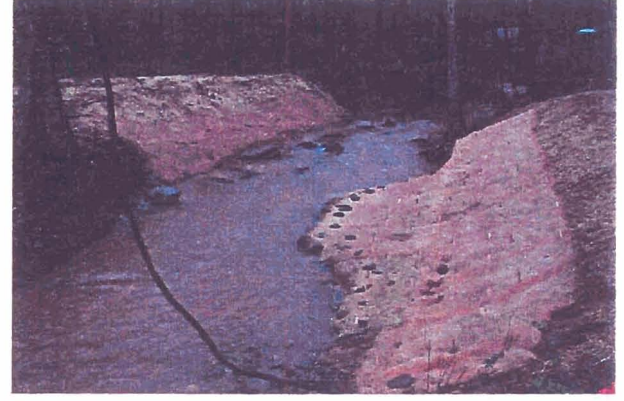
TABLE 6. Project costs for Greene mitigation site, Goose Ck, Yadkin River drainage, Mecklenburg Co. March 18, 2005.

| Expense category | Amount |
|--|---------------|
| WRC Administration | |
| hours | \$ 1,305.03 |
| mileage | \$ 185.25 |
| WRC Pre-Planning | |
| hours | \$ 4,706.74 |
| mileage | \$ 351.00 |
| WRC Construction | |
| hours | \$ 7,658.30 |
| mileage | \$ 1,029.38 |
| WRC As-Built | |
| hours | \$ 3,104.44 |
| mileage | \$ 286.13 |
| WRC Monitoring | |
| hours | \$ - |
| mileage | \$ - |
| Construction Contract | \$ 5,325.00 |
| Construction Materials | \$ 2,758.23 |
| Livestock Exclusion Contract | |
| NRCS Administrative Cost | |
| Tree Purchase | \$ 25.00 |
| Livestake Purchase | |
| Miscellaneous Purchases | \$ 72.00 |
| WRC Overall 485 Project Administration | |
| hours | \$ 453.45 |
| mileage | \$ 145.18 |
| project equipment / office expenses / supplies | \$ 2,864.54 |
| WRC Total Project Cost as of 2/05 | \$ 30,269.66 |
| WRC Cost per foot (783ft) | \$ 38.66 |
| DOT Easement Payment/Land Acquisition | \$ 65,822.00 |
| DOT Access Preparation | \$ 5,595.19 |
| DOT Total | \$ 71,417.19 |
| Overall Project Cost | \$ 101,686.85 |
| Overall Cost per foot | \$ 131.55 |

Appendix 1. Before and as-built construction photographs of the Greene mitigation site, Goose Creek, Yadkin River drainage, Mecklenburg County. February 14 – 25, 2005. Key: Stn. = station location, LDS = looking downstream, LUS = looking upstream, RB = right bank, LB = left bank.



LDS before and after construction from stn. 2+19 – 2+75 RB and stn. 2+38 – 3+00.



LUS before and after construction from stn. 2+75 – 2+19 RB and stn. 3+00 – 2+38 LB. Notice rock toe bench on right of picture (LB).



LDS before and after construction from stn. 3+35 – 4+41 LB and RB.

Appendix 1. Continued.



LDS before and after construction from stn. 3+81-4+84 RB.



LUS before and after construction from stn. 4+84 – 3+81 RB.



LDS before and after construction from stn. 4+64 – 5+55 RB.

Appendix 1. Continued



LDS before and after construction from stn. 5+41 – 6+00 LB and stn. 5+35 – 6+96 RB.

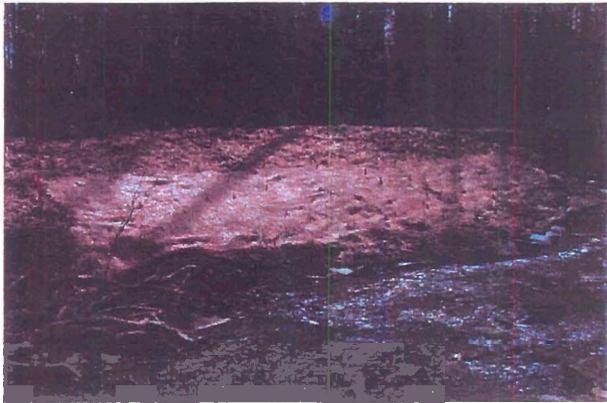


LUS before and after construction from stn. 6+96 – 5+50 RB.



LDS before and after construction from stn. 6+72 – to 7+55 LB.

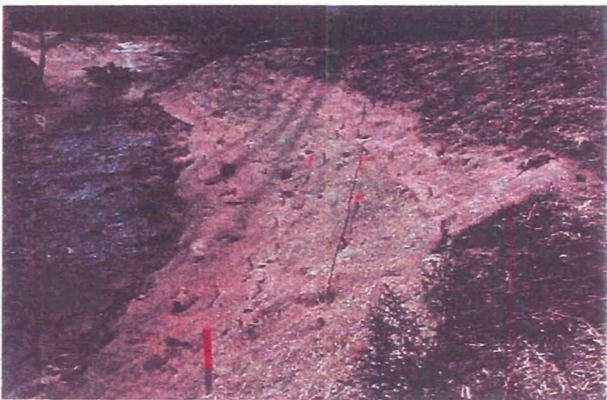
Appendix 2. As-built vegetation monitoring plots, Greene mitigation site, Goose Creek, Yadkin River drainage, Mecklenburg County, February 25, 2005. Note that station locations (stn) are approximate locations of these monitoring plots.



Vegetation plot 1, 0.028 acre, 79 stems, at stn 2+38 – 2+75, LB



Vegetation plot 2, 0.017 acre, 37 stems, at stn 5+41 – 6+00, RB



Vegetation plot 3, 0.040 acre, 79 stems, at stn 6+50 – 6+96, RB

R-2420
GREENE SITE



North Carolina Wildlife Resources Commission

Richard B. Hamilton, Executive Director

MEMORANDUM

TO: John Hennessy, NC Division of Water Quality
Steve Lund, US Army Corps of Engineers
LeiLani Paugh, NC Department of Transportation
Marella Buncick, US Fish and Wildlife Service

FROM: Joe Mickey and Jim Wasseen, WRC Stream Mitigation Program *JM*

DATE: April 7, 2005

SUBJECT: As-built report for the Greene stream mitigation site, ~~R-529-US-421~~ ^{R-2420B}
Project, Mecklenburg County

We are pleased to submit the Greene as-built report which summarizes 783 linear feet of stream enhancement completed in February 2005. This site is partial fulfillment of the off-site stream mitigation agreement between the North Carolina Department of Transportation (NCDOT) and North Carolina Wildlife Resources Commission for the R-2420 B road improvement project in Mecklenburg County. Under this agreement, a total of 903 linear feet of stream mitigation is required by the United States Army Corps of Engineers and North Carolina Division of Water Quality (DWQ).

This site has been protected from future disturbance by one conservation easement and two land purchases negotiated by NCDOT Division 10 right-of-way personnel. The conservation easement and land purchases have been recorded with the Mecklenburg County Registry.

Thank you for your time and consideration of this plan. If you have any questions about the as-built report please contact me at P. O. Box 387, Elkin, NC 28621, phone 336/527-1547 or 1549, email: joemickey@surry.net.

cc: Shannon Deaton, NCWRC
Larry Thompson, NCDOT
Michael Wood, Catena Group

COPY

DWQ Project No.: 04-1616 County: Mecklenburg
Applicant: NC Wildlife Resources Commission (for DOT)
Project Name: Greene Mitigation Site: TIR-2420B
Date of Issuance of 401 Water Quality Certification: October 13, 2004

Certificate of Completion

Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401/Wetlands Unit, North Carolina Division of Water Quality, 1621 Mail Service Center, Raleigh, NC, 27699-1621. This form may be returned to DWQ by the applicant, the applicant's authorized agent, or the project engineer. It is not necessary to send certificates from all of these.

Applicant's Certification

I, Joe H. Mickey, Jr., hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: Joe H. Mickey, Jr. Date: 4/7/05

Agent's Certification

I, _____, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: _____ Date: _____

Engineer's Certification

_____ Partial _____ Final

I, _____, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project, for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature _____ Registration No. _____

Date _____