

# QUALIFICATIONS



Cary, North Carolina • Charlotte, North Carolina • Atlanta, Georgia  
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Responsible Engineering and Science for a Better Environment

## General Information

### Principals

*James A. Buck, PE, President.* Mr. Buck is a registered professional engineer specializing in civil engineering.

*William A. Harman, PG, Vice President.* Mr. Harman is a registered professional geologist specializing in stream restoration and watershed management.

### Office Locations

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### Federal Tax Identification Number

56-2193726

### Boards of Engineering Licensures

Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and West Virginia

## Company Overview

### Who We Are

Buck Engineering is an environmental engineering firm with a nationally recognized stream and wetland restoration program.

We offer a full range of environmental planning, assessment, design, and restoration services. We are committed to providing clients with excellent consulting services that meet their environmental planning, assessment, and restoration needs.



### Services Offered

- Environmental Restoration
- Environmental Planning
- Education and Training
- Applied Research
- Monitoring
- Transportation Services

#### *Environmental Restoration Services*

Buck Engineering is a national leader in stream and wetland restoration using natural channel design and biological stabilization techniques. With expertise in hydrology and hydraulics, fluvial geomorphology, sediment transport, construction management, biology, and environmental science, our team is well prepared to complete the most challenging restoration projects. We take an ecosystem approach to environmental restoration, considering both the long-term physical stability and the biological habitat value of the completed project.

Our completed projects include newly constructed stream channels, in-stream structures, created floodplains, streambank stabilization treatments, stormwater management systems, riparian wetlands, and stream buffers. In addition to design and construction management, we are involved in applied research projects and offer training workshops for practitioners in environmental restoration.

Buck Engineering has restored more than 15 miles of stream. We have also prepared restoration designs for more than 600 acres and constructed more than 120 acres of wetlands.

#### *Environmental Planning*

Our environmental planning services assist federal, state, and municipal organizations with their watershed management and regulatory compliance needs. Buck Engineering's watershed assessment services include stream and watershed characterizations, water quality monitoring and modeling, geographic information system (GIS) analysis, pollution source identification, development of best management practices, stormwater management, and stakeholder coordination.

We also have extensive experience with National Environmental Policy Act (NEPA) and related planning. Our staff has expertise in planning, environmental impact assessment, and permitting. We have worked with cities, states, and federal agencies to help communities participate in the planning process. We have prepared all types of environmental documents (e.g., Environmental Impact Statements, Environmental Assessments, and Categorical Exclusions) for both federal and state clients.

#### *Education and Training*

Buck Engineering offers courses in stream hydrology, geomorphology, and natural channel design. Our clients include natural resource agencies, departments of transportation, consultants, watershed associations, and municipal governments throughout the eastern United States. We tailor each course to the client's needs. Special emphasis is placed on applying natural channel design techniques to gravel and sand bed streams in the Eastern United States. The courses blend classroom instruction with exercises and field activities to reinforce concepts and techniques.

#### *Applied Research*

Buck Engineering is committed to advancing the science of natural channel design through applied research. Our team of scientists and engineers are working to expand the knowledge base and apply innovative solutions to restoration projects. Our research includes development of regional curves and application of the Rosgen classification system to Southeastern streams. We are experienced at preparing grant applications and guiding clients through the award process.

#### *Monitoring*

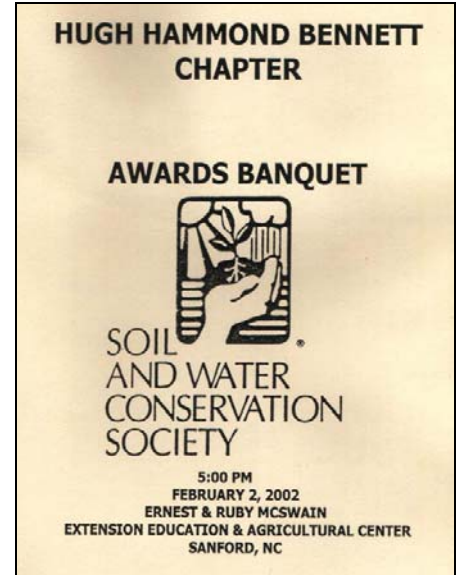
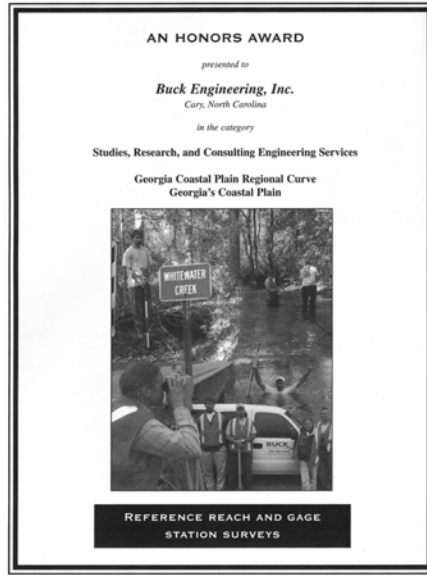
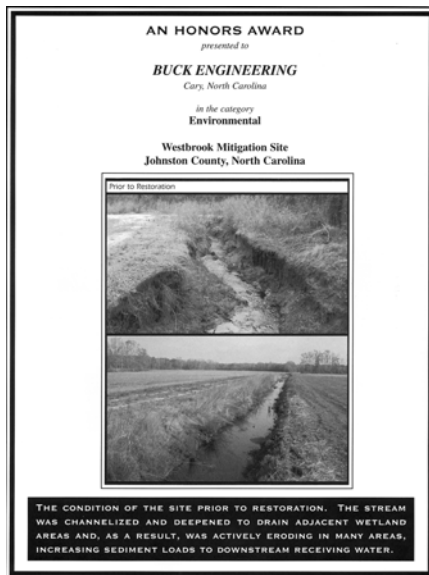
Our monitoring services include both stream and wetland monitoring for regulatory and other needs. We complete each restoration project with an as-built survey to set the stage for future monitoring. Our expertise includes monitoring stream dimension, pattern, profile, and bed materials; photograph reference points; vegetative survivability; and biological monitoring. We conduct monitoring activities across the Southeast, from the mountains to the coast.

#### *Transportation Services*

The Buck Engineering transportation team provides planning for roadway and rail related projects, as well as hydraulic design, utilizing the latest CADD technology. We have successfully prepared all types of environmental documents and have a full understanding of the NEPA process and permitting requirements for projects including train stations, bridge replacements, complex interchanges, roadway widening, and new location highways. Our staff prepares high quality plans, specifications, bid documents, and permit applications associated with transportation projects for clients such as the North Carolina Department of Transportation.

## Awards

- Buck Engineering was the recipient of the *American Council of Engineering Companies Honors Award* in the 2004 Engineering Excellence for our work on the Westbrook Mitigation Site project for Environmental Banc & Exchange.
- Buck Engineering was the recipient of the *American Council of Engineering Companies Honors Award* in the 2003 Engineering Excellence for our work on the Coastal Plain Bankfull Regional Curve project for the Georgia Department of Transportation.
- Buck Engineering was the recipient of the Design Award for Best Environmental Enhancement in the 2002-2003 *Georgia Department of Transportation Georgia Quality Initiative* for our work on the Coastal Plain Bankfull Regional Curve project for the Georgia Department of Transportation.
- Buck Engineering was the recipient of the *American Council of Engineering Companies Honors Award* in the 2002 Engineering Excellence for our work on Boyd Woods and Brendle Reach, Mitchell River Watershed Restoration project.
- Buck Engineering was the recipient of the 2002 Industrial Award for Excellence in Resource Management presented by the *Hugh Hammond Bennett Chapter of the Soil and Water Conservation Society*.



*Awards recently won by Buck Engineering*

## Project Experience

Buck Engineering has initiated over 100 projects since the company was founded in May of 2000. Several examples are listed below.

### ***Environmental Restoration - Rural Projects***

**Soco Creek Restoration, Eastern Band of Cherokee Indians, Jackson County, NC.** Buck Engineering completed a restoration design and provided construction management for more than 2,200 feet of incised Mountain rural stream in 2001. Objectives were to improve water quality, fish habitat, and stream stability in Soco Creek using natural channel design techniques. The project included existing condition surveys, data analyses, design development based on reference reaches, construction plans and specifications, on-site construction management, and project management. The project design was based on a Rosgen Priority 3 approach for restoring incised stream channels. It included channel geometry modifications, bankfull benches, in-stream structure installation, streambank stabilization, and riparian vegetation planting and management. Project support was provided by the Eastern Band of Cherokee Indians, US EPA, and private landowners.



*J-Hook and cross vane structures on Soco Creek*

**UT to Briery Run (Crescent Road), NCDOT, Lenoir County, NC.** Buck Engineering completed natural channel design and construction management for restoration of over 2,200 feet of straightened and incised Coastal Plain rural stream in 2001 and 2002. The project is being used by NCDOT for on-site mitigation of stream impacts from a new roadway project. The project involved increasing the length of a straightened stream by over 650 feet through a Rosgen Priority 2 restoration. A new channel and floodplain was excavated, vernal pools were constructed, and stream sinuosity was increased from 1.03 to 1.35. Objectives were to improve stream stability and floodplain functionality, enhance aquatic habitat, and create a planted riparian buffer. Buck Engineering's role included data analyses, design development based on reference reaches, construction plans, construction surveying, and on-site construction oversight.



*Channelized stream before restoration*



*Restored channel with floodplain construction*

**Little Grassy Creek Restoration, NCDOT, Granville County, NC.** Buck Engineering is conducting existing condition surveys and preliminary design for restoration of over 15,000 feet of incised Piedmont rural streams. The project is being used by NCDOT as mitigation for off-site impacts. The goals of the project are to improve stream stability, reduce bank erosion, improve water quality, and create fish habitat using natural channel design techniques. The project design will include Rosgen Priority 1 and Priority 3 restorations based on reference reach data, as well as preservation and enhancement of riparian buffers.

**Knapps Creek Restoration, Natural Resources Conservation Service, West Virginia.** Buck Engineering was hired by the West Virginia Natural Resources Conservation Service to complete a natural channel design on a 2,000-foot reach of Knapps Creek. The project drainage area is 47 square miles. Knapps Creek is impacted by overgrazing, which has caused widespread bank erosion and channel aggradation. The Buck Engineering design applies a dimension, pattern, and profile that can transport sediment through the project reach to prevent aggradation or degradation. J-hook vanes and root wads were incorporated into the design to provide streambank protection, deep pools, and optimum aquatic habitat.

**Brasstown Creek Restoration, Hiawassee River Watershed Coalition, Cherokee County, NC.** Buck Engineering completed construction oversight for restoration of approximately 8,000 feet of incised Mountain rural stream. The restoration involved a Rosgen Priority 3 approach. Bankfull benches, in-stream boulder structures, and root wad revetments were constructed on three separate reaches. The goals of the project included preservation of adjacent agricultural land, reduction in sediment pollution, and improvement of aquatic habitat. Landowners, the Natural Resources Conservation Service, and the NC Clean Water Management Trust Fund provided project support.



*Brasstown Creek prior in-stream structure*



*In-stream structures were placed in the channel to improve habitat and protect streambanks*

**New River Restoration, New River Community Partners, Ashe and Alleghany Counties, NC.** Buck Engineering completed a restoration design and provided construction management for more than 2,500 feet of Mountain rural streams in New River State Park in 2001. The project drainage area is 220 square miles. Objectives were to improve water quality, fish habitat, and stream stability in the New River using natural channel design techniques. The project included existing condition surveys, data analyses, design development based on reference reaches, permitting, construction plans and specifications, on-site construction management, and project management. The design included in-stream structure installation, streambank stabilization, and riparian vegetation planting and management. Project support was provided by New River State Park, the New River Community Partners, National Fish and Wildlife Foundation, NC Division of Water Resources, and the NC Division of Parks and Recreation.

**Florida Regional Curve, Florida Division of Transportation (FDOT) and the US Fish and Wildlife Service (USFWS), Various Locations throughout FL.** Buck Engineering is developing regional curves for the Northern Region and Central Highlands in the panhandle of Florida. The regional curves will relate hydraulic geometry (i.e., bankfull width, mean depth, area, and discharge) to drainage area for streams and rivers in the Florida panhandle region. These regional curves will assist in predicting bankfull discharge and

channel attributes in un-gaged stream reaches and aid in natural channel design for FDOT and USFWS projects. This study will provide a model for future efforts to analyze streams statewide. In furthering the understanding of regional stream stability, improved guidelines can be developed for designing culverts and bridges to preserve natural bankfull channel dimensions and their associated floodplains and wetlands.

**Coastal Plain Bankfull Regional Curve, GADOT, Various Locations throughout GA.** Buck Engineering developed the Coastal Regional Curve for the Georgia Department of Transportation. The purpose of the study was to provide empirical equations that relate bankfull cross sectional area, discharge, width, and depth to drainage area. These equations will be used by natural channel designers to verify bankfull stage in un-gaged watersheds and as an aid in designing channel dimension for stream restoration projects. The project included field surveys of USGS gage stations and reference reach sites throughout the Georgia coastal plain. Buck Engineering was the recipient of the *American Council of Engineering Companies Honors Award* in the 2003 Engineering Excellence competition for this project.



*Georgia Regional Curve Project*

**Casey/King Wetland Restoration, Environmental Banc and Exchange, Lenoir County, NC.** Buck Engineering completed construction for restoration of approximately 30 acres of riparian wetlands in Lenoir County for NCDOT mitigation purposes in 2002. Historically, the main drainage channel through the site had a drainage area of approximately 1.5 square miles. Past alterations to local drainage patterns reduced the watershed to approximately 90 acres. The main drainage channel was a large drainage ditch, with several lateral ditches that flowed into the main ditch. Restoration of the site involved filling the drainage ditches on the site and topographic alterations that restored the site to a “coastal plain small stream swamp” system. Surface water flow was routed from the upstream end of the site through a series of wide saturated swamp flats connected by more narrow areas of shallow flow following multi-thread channels.



*Drainage canal at Casey/King prior to restoration      Same location months after construction was completed*

**Westbrook Wetland and Stream Restoration, Environmental Banc and Exchange, Johnston County, NC.** Buck Engineering restored approximately 5,500 feet of Johannah Creek and 65 acres of associated drained wetlands for mitigation purposes. The goal of the project was to restore stream, wetland, and habitat functions that had been lost due to alteration. The stream was channelized in the past to improve drainage of the site and increase agricultural production. Site assessment work included biological surveys and sampling, quantification of stream and habitat degradation, hydrologic modeling and flood studies, and evaluation of design alternatives. The selected restoration design for the site involved restoring a stable meandering stream pattern and returning flooding processes to the site. Aquatic habitat was improved by using in-stream structures that incorporated logs and natural transplanted vegetation. Buck Engineering was the recipient of the *American Council of Engineering Companies Honors Award* in the 2004 Engineering Excellence competition for this project.



*Westbrook Wetland and Stream Project before and after restoration*

**Nahunta Swamp Wetland Mitigation Bank, Environmental Banc and Exchange, Wayne County, NC.** Buck Engineering restored approximately 8,000 feet of incised streams and 120 acres of associated riparian and bottomland wetlands for NCDOT mitigation purposes in Wayne County. The restoration sites were located on agricultural fields with hydric soils adjacent to a large stream system. Small tributaries that flow through the fields were channelized and straightened in the past to improve drainage. These tributaries were restored by building new meandering channels across the existing agricultural fields. By raising the streams to the elevation of their original floodplain, the water table was also raised, restoring wetland hydrology to the sites.



*Nahunta Swamp Wetland Mitigation Bank Project*

**Marsten Wetland Mitigation Bank, Environmental Banc and Exchange, Jones County, NC.** Buck Engineering restored approximately 4,000 feet of incised stream and 30 acres of associated riparian and bottomland wetlands for NCDOT mitigation purposes in Jones County. The restoration site was located on land that has been historically used for row crop agriculture. The main stream that flows through the site has a drainage



area of approximately 1.8 square miles and was channelized in the past to improve drainage. Restoration of the site involved a Priority Level I restoration, in which the main stream through the site was restored to a meandering pattern across the original floodplain. By raising the stream, the water table across the site was raised, and flooding of the hydric soils will be increased, restoring wetland hydrology. The system was restored down to an existing wetland system, such that the restored and existing wetland areas became one contiguous system.



*Marsten Wetland Mitigation Bank Project*

**Boyd Woods Reach, Mitchell River Watershed Restoration, Surry Soil & Water Conservation District, Surry County, NC.** Buck Engineering prepared a restoration design and provided construction management for restoration of 1,000 feet of incised Piedmont rural stream in 2001. Objectives were to improve water quality, fish habitat, and stream stability in the Mitchell River Watershed using natural channel design techniques. The project included existing condition surveys, data analyses, design development based on reference reaches, permitting, construction plans and specifications, on-site construction management, and project management. The natural channel design was based on a Rosgen Priority 2 restoration approach. Specific project components included channel geometry modifications; construction of bankfull benches; in-stream structure such as vanes, cross vanes, deflectors, and root wads, and riparian vegetation planting and management. Project support was provided by the Surry Soil and Water Conservation District, USDA-NRCS, the NC Clean Water Management Trust Fund, and private landowners. Buck Engineering was the recipient of the *American Council of Engineering Companies Honors Award* in the 2002 Engineering Excellence competition for this project.



*Woods Reach before and after construction, South Fork Mitchell River*

**Schumak Reach, Mitchell River Watershed Restoration, Surry Soil & Water Conservation District, Surry County, NC.** Buck Engineering prepared a restoration design and provided construction management for restoration of 2,000 feet of incised Piedmont rural stream in 2001. Objectives were to improve water quality, fish habitat, and stream stability in the Mitchell River Watershed using natural channel design techniques. The project included existing condition surveys, data analyses, design development based on reference reaches, permitting,

construction plans and specifications, on-site construction management, and project management. The natural channel design was based on a Rosgen Priority 3 restoration approach. Specific project components included construction of bankfull benches; in-stream bank stabilization structures such as j-hook vanes, cross vanes, single and double-wing deflectors and root wad; and riparian vegetation planting and management. Project support was provided by the Surry Soil and Water Conservation District, USDA-NRCS, Pilot View Resource Conservation & Development Council, NC Division of Water Resources, and private landowners.



*Restored Schumak Reach, Mitchell River*

**Hanging Rock Creek Restoration, NCDOT, Avery County, NC.** Buck Engineering initiated planning and design for restoration of over 2,500 feet of incised Mountain streams in 2000. Objectives were to improve water quality, fish habitat, and stream stability in Hanging Rock Creek using natural channel design techniques. The restoration project met mitigation requirements for off-site impacts caused by NCDOT. The project included existing condition surveys, data analyses, design development based on reference reaches, permitting, construction plans and specifications, on-site construction management, and project management. The project design was based on a Rosgen Priority 1 approach for restoring incised stream channels. It included channel geometry modifications based on reference reach data, in-stream structure installation, streambank stabilization, and riparian vegetation planting and management. In addition, stormwater treatment facilities were installed, and floodplain wetland areas enhanced and restored as part of the project. Project support was provided by the NC Department of Transportation and private landowners.

**Little Brasstown Creek Restoration, Hiwassee River Watershed Coalition, Cherokee County, NC.** Buck Engineering completed restoration of over 1,200 feet of incised Mountain rural stream to improve water quality and fish habitat. Water quality was degraded from sedimentation and bacteria. Sources of sedimentation include agriculture, mining operations, development, and silviculture. The Hiwassee River Basin as a whole has a large number of high quality and outstanding resource water classifications and is well known for its trout fishery. In fact, there are 11 aquatic species listed by North Carolina as Endangered, of Special Concern, or Significantly Rare. A Rosgen Priority 1 restoration was constructed in March 2001, which included channel geometry modifications based on reference reach data, in-stream structure installation, streambank stabilization, and riparian vegetation planting and management. Project goals were met by implementing a natural channel design that restored the channel's dimension, pattern and profile to a natural, stable form. In addition, floodplain wetland areas were enhanced and restored as part of the project.



*Floodplain pool adjacent to restored stream*



*Little Brasstown Creek 1.5 years after construction*

**Mill Branch Stream Restoration and Wetland Design, Mid-East RC&D, Pitt County, NC.** Buck Engineering restored/enhanced more than 1,000 feet of Coastal Plain stream channel and 10 acres of wetlands to improve water quality and habitat along an unnamed tributary to Mill Branch near Greenville, North Carolina. The tributary was an incised channel along much of its length with limited access to a floodplain. Prior to restoration, streambank erosion was severe in areas with minimal vegetation and high streambanks. Plans called for stream channel geometry modification based on reference reach data, construction of in-stream structures, streambank stabilization, riparian vegetation planting and management, and the use of restored and constructed wetland systems.



*Mill Branch before and after construction*

### ***Environmental Restoration - Urban Projects***

**Peters Creek Restoration, The Communities Group, Winston-Salem, NC.** Buck Engineering completed design for restoration of 2,900 feet of Peters Creek in July 2002 and began providing construction oversight in September 2002. The site is located in an urban park and adjacent to HUD Hope VI revitalization project within the Winston-Salem city limits. Objectives were to improve enhance stream bank stability, reduce flooding, improve water quality, and create a focal point for the urban park and surrounding neighborhood. The project involved constructing 1,700 feet of new channel using a Rosgen Priority 2 approach and restoring 1,200 feet of existing stream using a Priority 3 approach. Approximately 650 feet of box culvert was removed and a new bottomless arch culvert was constructed.

Buck Engineering's design phase services included existing condition surveys, data analyses, design development based on reference reaches, construction plans and specifications, hydrologic and hydraulic modeling, and preparation of a conditional letter of map revision (CLOMR) for FEMA map revisions. Construction phase services included preparation of bid documents, coordination of a pre-bid meeting and review of bids, on-site construction stakeout, and technical oversight.



*Peters Creek before and after restoration*

**Privateer Farms Full Delivery Project, NCDOT, Fayetteville, NC.** Buck Engineering is restoring 430 acres of prior converted wetlands and 33,000 feet of Harrison Creek. This full delivery project requires us to procure the land, develop the mitigation plan, gain resource agency approval, construct the project, and monitor it for five years, submitting annual monitoring reports. The project will restore a Streamhead Atlantic White Cedar Forest and Coastal Plain Small Stream Swamp system, as described by Schafale and Weakley (1990). Streamhead Atlantic White Cedar Forest is one of only two known Atlantic white cedar communities.

The design will allow stream flows larger than bankfull flows to spread onto the floodplain, dissipating flow energies and reducing stress on streambanks. In-stream structures will be used to control streambed grade, reduce stresses on streambanks, and promote bedform sequences and habitat diversity. The in-stream structures will consist of root-wads, log vanes, log weirs, and other wood structures that will promote a diversity of habitat features in the restored channel.

**Dairy and Sedgefield Branches Restoration, City of Charlotte, Mecklenburg County, NC.** Buck Engineering initiated planning and design for restoration of over 6,500 feet of incised Piedmont urban streams in 2000. Objectives were to improve water quality and stream stability in Dairy and Sedgefield Branches and to meet mitigation requirements for off-site impacts in Charlotte. The project included existing condition surveys, data analyses, design development based on reference reaches, permitting, and construction plans and specifications. The project design was based on Rosgen Priority 2 and 3 approaches for restoring incised stream channels. It included channel geometry modifications based on reference reach data, bankfull benches, in-stream structure installation, streambank stabilization, and riparian vegetation planting and management. Project support was provided by the City of Charlotte.

**Clemson Restoration Project, Clemson University, Clemson, SC.** Buck Engineering is implementing a stream restoration demonstration project using natural channel design techniques for restoration of 1,000 feet along Little Garvin Creek, located on the Clemson University Simpson Research Farm. The project site is located in a rural area where adjacent land use is woodland and pasture. The project involves excavating a new meandering stream channel and floodplain. The new channel will be stabilized with in-stream structures, erosion control matting, and vegetation. Project goals include restoring a section of Little Garvin Creek to a naturally

stable channel, improving floodplain functionality, improving aquatic habitat and the natural aesthetics of the stream corridor, and demonstrating the effectiveness of a natural channel design.

Buck Engineering was also responsible for teaching approximately 25 state and federal agency representatives, consultants, and university students the natural channel design process. The workshop participants actively participating in the existing condition survey, reference reach analyses, design, permitting, construction management, planting, and evaluation.



*Longitudinal profile of Little Garvin Creek prior to restoration    Little Garvin Creek after restoration and a 100 year flood event*

**SC 72, North Campbell Creek Stream Mitigation, SCDOT, Laurens County, SC.** Buck Engineering completed a morphological assessment of North Campbell Creek. This work was performed as part of a feasibility study for the South Carolina Department of Transportation’s SC 72 road-widening project. The purpose of the assessment was to determine if North Campbell Creek is suitable for a stream restoration project that could be used for compensatory mitigation for the SC 72 widening. Furthermore, the study provided conceptual designs for the restoration of North Campbell Creek.

**Smith and Austin Creeks Restoration, NC Wetlands Restoration Program, Wake County, NC.** Buck Engineering restored over 10,000 feet of incised Piedmont urban streams in Wake Forest, NC. Objectives were to improve water quality and stream stability in Smith and Austin Creeks using natural channel design techniques. The project was completed in 2002 to meet mitigation requirements for off-site impacts. The project included existing condition surveys, data analyses, design development based on reference reaches, permitting, construction plans and specifications, on-site construction management, and project management. The project design was based on Rosgen Priority 2 and 3 approaches for restoring incised stream channels. It included channel geometry modifications based on reference reach data, bankfull benches, in-stream structure installation, streambank stabilization, and riparian vegetation planting and management. Project support was provided by the NC Wetlands Restoration Program.



*Smith & Austin Creeks before and after restoration*

**Greensboro Parks/Buffalo Creeks Watershed Projects, NC Ecosystem Enhancement Program (NCEEP), Greensboro, NC.** This project involved using natural channel design methods to restore approximately 11,830 linear feet of stream in the North and South Buffalo Creek watersheds in Greensboro, NC. The project area consists of four city parks, including a golf course, which resulted in a four-phase construction project. Buck Engineering conducted watershed analyses, performed existing condition and reference reach surveys, prepared 401/404 permitting documents, developed construction documents, and is providing construction oversight. Construction has been completed for the Gillespie Golf Course and Hillsdale Park. Construction is currently underway for Benbow Park and Brown Bark Park.



*Before restoration at Greensboro Parks/Buffalo Creeks Watershed project*

**Cedar Fork Creek, Stern Property, Chapel Hill, NC.** Buck Engineering was tasked by a private landowner to develop a natural channel design to relocate 150 feet of channel that was undermining a stone wall. The design included proper bankfull dimensions, floodplain functionality, and rock cross vanes to develop a step-pool system. This design relocated the channel away from the wall and restored stability to the channel.



*Cedar Branch before construction. High shear stresses were exposing the footers of the rock wall.*



*Cedar Branch 2 years after construction. The cross vanes are used to reduce stress next to the rock wall and dissipate energy through a step pool channel*

**Enfield Randolph Park, NCDOT, Halifax County, NC.** Planning was initiated in 2000 for restoration of over 2,500 feet of incised Coastal Plain urban stream in Enfield to meet mitigation requirements for off-site impacts. The project reach was an unnamed tributary of Burnt Coat Swamp in the Fishing Creek watershed of the Tar-Pamlico Basin. Plans called for Rosgen Priority 1, 2, and 3 restoration efforts on various reaches. Specific components included incised stream conditions, channel geometry modification based on reference reach data, construction of bankfull benches, in-stream structure installation, streambank stabilization, and riparian vegetation planting and management. NCDOT provided footbridge stream crossings in several locations to allow the Town of Enfield to incorporate walking trails to enhance the character and functionality of the existing park. Visual characteristics were also taken into account when planning buffers so that traditional town ceremonies held within the park could continue after the restoration was completed.

### ***Environmental Planning***

**Environmental Impact Statement for the Southeast High Speed Rail Corridor, NCDOT and VDOT, Petersburg, VA to Raleigh, NC.** Buck Engineering is preparing a Tier II Environmental Impact Statement for implementing a 136-mile section of high speed rail along the former Seaboard Air Line railroad. This is part of an overall plan to extend high speed passenger rail service from the Northeast Corridor (Boston to Washington, DC) southward from Washington, DC to Charlotte, NC. This study includes alternatives analysis, preliminary engineering studies, public and interagency involvement, evaluations of natural resources, historic and archaeological resources, noise and air quality, and socio-economic issues. Buck Engineering's natural resource responsibilities for the project include conducting habitat assessments, surveying for threatened and endangered species, delineating wetlands and streams, assessing ecological resource impacts, determining probable permit types, and identifying conceptual mitigation opportunities.

**Middle Cape Fear Local Watershed Plan, NCEEP, Wake, Harnett, and Chatham Counties, NC.** Buck Engineering performed a technical assessment of three 14-digit hydrologic units (HUs) in the Middle Cape Fear River Basin as part of the development of a local watershed plan for the NC Ecosystem Enhancement Program (EEP). The study area consisted of a series of small watersheds that drain to the Cape Fear River and include the towns of Apex, Holly Springs, and Fuquay-Varina. The focus of the effort was to investigate all sources of pollution/degradation in the local watershed and recommend a comprehensive strategy for improving water quality. The EEP works to replace functional watershed losses through stream, buffer, and wetland improvement and protection projects. Project components included summarization of existing watershed and land use information; collection of detailed field data on specific stream reaches throughout the study area; calibration of an empirical watershed model, the Soil and Water Assessment Tool (SWAT), to assess general land use impacts to water quality in the study area and provide an estimate of baseline watershed conditions; a functional status

overview of the study area in terms of water quality, hydrology, and habitat; and recommendations for management actions.

**Environmental Assessment for US 301, NCDOT, Harnett County, NC.** Buck Engineering assessed the environmental impacts for a proposed US 301 bridge over the CSX Railroad in Dunn, NC. Four alternatives were considered for constructing a US 301 overpass of the CSX Railroad tracks. The environmental study included assessing impacts to streams and wetlands, threatened and endangered species, water quality, potential hazardous material sites, cultural resources, traffic noise, air quality, visual impacts, community impacts, and environmental justice. Buck Engineering prepared preliminary designs for each alternative to evaluate impacts of each alternative.

**French Broad Watershed Assessment, NCEEP, Buncombe County, NC.** Buck Engineering is developing a comprehensive watershed management plan for the South Hominy Creek watershed within the French Broad watershed. South Hominy Creek is on the North Carolina Clean Water Act Section 303(d) list for impairment to habitat and water quality due to agricultural impacts. Buck Engineering is characterizing the existing watershed, assisting with stakeholder development and education, and identifying BMP opportunities to improve overall stream health.

**Environmental Assessment for US 221, NCDOT, Rutherford and McDowell Counties, NC.** Buck Engineering is responsible for developing an environmental assessment and preliminary roadway designs for the proposed improvements to US 221. The environmental assessment will include a purpose and need, detailed study alternatives, a community impact assessment, visual characteristics, environmental justice concerns, and socio-economic factors. Buck Engineering will also prepare a comprehensive evaluation of natural resources (including wetlands, streams, and protected species), cultural resources (historic architectural and archaeological resources), hazardous materials, traffic noise, and air quality, as well as a hydraulics study. The effort will also include public involvement outreach. Our team will guide this project through the NEPA/ 404 Merger Process, an interagency agreement enabling the earliest possible consideration of environmental issues, (particularly waters of the US and wetlands) in transportation planning, design, and implementation. The interagency merger team will assemble during the project development phase to reach consensus on purpose and need, alternatives for detailed study, a preferred alternative, and impact minimization.

**Riparian Area Management – Assessment and Case Studies, US Forest Service.** Buck Engineering assessed eight streams to provide examples of proper functioning condition (PFC) application in Southeastern forests. The PFC assessment process was developed in the Western part of the United States to provide a consistent approach for considering the hydrologic, vegetative, and erosional/depositional characteristics of riparian-wetland systems. “Functional,” “Functional–At Risk,” and “Nonfunctional” streams were selected for survey and PFC team assessment. Results were compared to existing survey data for assessed streams. Buck Engineering prepared a case study report of PFC implementation in North Carolina and evaluation of the value of PFC methods for the Forest Service.

**Environmental Impact Statement for Improvements to NC 215, NCDOT, Transylvania County, NC.** Buck Engineering is assessing the environmental impacts of proposed improvements to a state road in Transylvania County, NC. A four-mile new location alternative will be assessed and compared against the improvement of the existing roadway and the no-build alternative. The alternative to improve the existing NC 215 consists of widening as much of the existing roadway as possible and realigning sharp curves where the existing roadway cannot be retained. The current route has very poor alignment that provides hazards to motorists. Also, conflicts with busses and commercial trucking are becoming more common due to severe curvature in some locations. Therefore, improvements are immediately warranted to accommodate traffic growth and insure safety. This will increase traffic mobility and enhance safety by providing an adequately designed roadway versus the existing substandard route. The length of the existing NC 215 in the project area is approximately 5.9 miles. Assessments have included watershed assessment, macro-invertebrate and fish surveys,



stream evaluation and Rosgen Level II classification, natural resource inventories including threatened and endangered species, noise impacts, air quality analysis, and habitat assessment. An Environmental Impact Statement is being prepared for this project.



*Data Collection for NC 215*

**Beaverdam Creek Watershed Monitoring and Assessment, City of Charlotte Storm Water Services, Charlotte NC.** Buck Engineering is monitoring baseline watershed conditions along 10 miles of streams in a relatively undisturbed 3,000-acre watershed that drains to Lake Wylie in Mecklenburg County, NC. The watershed will undergo significant development in coming years. Within its boundaries, a 1,000 acre development is being planned and a new interstate highway, I-485, is currently being constructed. This assessment is an initial effort in a planned five to ten year watershed assessment to determine the impacts of these developments. Sampling locations were selected to characterize four tributary sub-watersheds as well as conditions above and below I-485. Analysis included stream classification and condition assessment, sub-watershed comparison, assessment of conditions upstream and downstream of I-485, sediment source identification, and habitat assessment. Data from this monitoring effort, and a concurrent water quality monitoring effort as it becomes available, will be used to rate stream reaches as opportunities for preservation, damage minimization, and restoration in light of development plans. Specific recommendations are being developed to minimize the impacts of development on stream and riparian habitat.

### ***Education and Training***

**South Carolina Department of Transportation (SCDOT) Training.** Buck Engineering conducted two days of training for the SCDOT on stream classification, restoration, and innovative uses of in-stream structures in highway projects. The training course covered an introduction to fluvial processes and natural channel design, Rosgen stream classification, floodplain and channel evolution, priority levels of incised river restoration, in-stream structures, and case studies demonstrating these principles and techniques.

**Clemson University Training, Clemson University, Clemson, SC.** Buck Engineering partnered with Clemson University and Dr. Greg Jennings, PhD, PE, to teach a four-part workshop to state and federal permitting agencies. The workshop included the restoration of 1,200 feet of stream along Little Garvin Creek, with major tasks mirrored with the design so that participants experienced all aspects of the project including existing condition survey, reference reach analysis, natural channel design, construction, buffer establishment, and monitoring.

**Kentucky Department of Fish and Wildlife Resources Training.** Buck Engineering partnered with Clemson University and Dr. Greg Jennings, PhD, PE, to teach a four-day workshop on stream restoration. The course was offered for state and federal permitting agencies to provide an overview of the natural channel design process. Field and indoor exercises focused on important design components important to reviewers.

**Charlotte Training, City of Charlotte, Charlotte, NC.** Buck Engineering conducted a one-day training workshop for the City of Charlotte Engineering staff on natural channel design for urban streams. The training course covered fluvial processes in urban streams, Rosgen stream classification, channel evolution and stream stability, sediment transport in natural channels, in-stream structures, road crossing considerations, plunge pool designs, vegetation considerations, restoration options for incised streams, and urban case studies.

**West Virginia University Training.** Buck Engineering was selected by West Virginia University to teach natural channel design courses in West Virginia. The courses are sponsored by the American Council of Engineering Companies (ACEC), West Virginia University, and the Division of Highways. The workshops included hands-on instruction on basic and advanced natural channel design.

### ***Transportation Services***

**Airport Boulevard Widening, NCDOT, Wake County, NC.** Buck Engineering is currently preparing right-of-way plans for the widening of Airport Boulevard (SR 3015). Airport Boulevard serves as a connector between NC 54 and I-40. This 0.65 mile section currently carries over 12,000 vehicles per day. Future traffic is expected to exceed 22,000 vehicles per day by design year 2024, therefore requiring the improvements. The design will upgrade the two/three-lane roadway to a five-lane curb and gutter facility from NC 54 to McCrimmon Parkway near Morrisville. Traffic will be maintained on existing location during construction. This project is scheduled to be let for construction in October 2004.