

NATURAL RESOURCES TECHNICAL REPORT

**Replace Bridge 61 on NC 801 over Fourth Creek
Rowan County, North Carolina**

**TIP B-5778
WBS Element No. 45734.1.1**



**THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Project Development and Environmental Analysis Unit
Natural Environment Section**

September 2016

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1.0 INTRODUCTION

The North Carolina Department of Transportation (NCDOT) proposes to replace bridge number 61 on NC 801 over Fourth Creek (TIP B-5778) in Rowan County, North Carolina (Figure 1). The following Natural Resources Technical Report (NRTR) has been prepared to assist in the preparation of a Categorical Exclusion (CE) for the project.

2.0 METHODOLOGY AND QUALIFICATIONS

All work was conducted in accordance with the NCDOT Natural Environment Section standard operating procedures and July 2012 NRTR template. Field work was conducted from April 4, and September 8, 2016.

Jurisdictional areas identified in the study area do not require verification by the United States Army Corps of Engineers (USACE) or the North Carolina Division of Water Resources (NCDWR) at this time, as the only resource within the study area is a perennial stream.

The principal personnel contributing to this document were:

Principal

Investigator:	Paul Gerlach
Education:	M.S. Environmental Management 2013 B.S. Biological Sciences, 2011
Experience:	Environmental Scientist, AECOM, 2014–Present
Responsibilities:	Wetland and stream delineations, GPS data collection, stream assessment, natural communities assessment, T/E species assessment, Schweinitz's sunflower surveys

Investigator:	Chris Inscore
Education:	B.S. Fisheries, Wildlife and Conservation Biology, 2015
Experience:	Environmental Scientist, AECOM, 2016–Present
Responsibilities:	GIS analysis, document preparation, wetland and stream delineations, stream assessment, natural communities assessment, T/E species assessment, Schweinitz's sunflower surveys

Additional personnel who contributed to portions of the field work and/or documentation for this project were Charles Benton, Peyton Daly, Ron Johnson, and Paul Masten. Appendix D lists the qualifications of these contributors.

3.0 PHYSICAL RESOURCES

The study area is geographically situated in the Piedmont physiographic province in Rowan County, North Carolina (Figure 2). Elevations in the study area range from approximately 644 feet above mean sea level (MSL) to 692 feet above MSL. Land use in the project vicinity consists primarily of agricultural land and residential single family homes.

3.1 Soils

The Rowan County soil survey identifies one soil series within the study area (Table 1).

Table 1. Soils in the study area

Soil Series	Mapping Unit	Drainage Class	Hydric Status
Poindexter-Rowan complex, 8 to 15, 15 to 25, and 25 to 45 percent slopes	PxC, PxD, and Px E	Well drained	Non-hydric

3.2 Water Resources

Water resources in the study area are part of the Yadkin-Pee Dee River Basin (U.S. Geological Survey Hydrologic Unit 03040102). One stream was identified in the study area (Table 2). The location of this water resource is shown on Figure 3. The physical characteristics of this resource are provided in Table 3. No ponds are located in the study area.

Table 2. Water resources in the study area

Stream Name	Map ID	NCDWR Index Number	Best Usage Classification
Fourth Creek	Fourth Creek	12-108-20	Class C

Table 3. Physical characteristics of water resources in the study area

Map ID	Bank Height (ft)	Bank Width (ft)	Water Depth (in)	Channel Substrate	Velocity	Clarity
Fourth Creek	15	70-90	12	Sand, Silt	Moderate	Slightly Turbid

There are no designated anadromous fish waters or primary nursery areas present in the study area. No streams within the study area are designated as trout water by the North Carolina Wildlife Resources Commission (NCWRC). No streams within the study area or within 1.0 mile downstream are classified as high quality water, outstanding resource waters, WS-I or WS-II water supply watershed, or identified in the North Carolina 2014 *Final 303(d) List of Impaired Waters*. No fish or benthic monitoring data are available within or within 1.0 mile downstream of the study area.

4.0 BIOTIC RESOURCES

4.1 Terrestrial Communities

Three terrestrial communities were identified in the study area: maintained/disturbed, Piedmont bottomland forest, and dry-mesic oak-hickory forest. Figure 4 shows the location and extent of these terrestrial communities in the study area. A brief description of each community type follows. Scientific names of all species identified are included in Appendix B.

4.1.1 Maintained/Disturbed

This community incorporates several land cover types, including residential, commercial, utility rights-of-way, and cleared/maintained transportation corridors. The majority of the study area is designated maintained/disturbed land, which includes NC 801 shoulders, several residences, and a utility right-of-way on the east side of the highway. Plant communities in residential areas often contain relict species, usually canopy trees, that reflect their historic assemblages. Typically, introduced species predominate in maintained areas and weedy species are opportunistic in recently disturbed areas. There are no canopy/subcanopy trees present within the disturbed/maintained community at the site. Shrubs include Carolina silverbell, blackberry, giant cane, and boxelder. The herb layer includes various species of upland grasses, carpetweed, poison ivy, and muscadine. Invasive species include Chinese privet, multiflora rose, sericea, ground ivy, and Japanese honeysuckle.

4.1.2 Piedmont Bottomland Forest

The Piedmont/mountain bottomland forest occurs in small pockets of the study area mostly along the floodplain levees and terraces. Tuliptree, sweetgum, red maple, American sycamore, and river birch dominate the overstory canopy, while boxelder, Carolina silverbell, dwarf hackberry, and pawpaw are in the understory. The herbaceous layer is sparse and is mostly regeneration of tuliptree, sweetgum, greenbrier, and poison ivy. Invasive species include multiflora rose, Japanese honeysuckle, and Japanese stilt grass.

4.1.3 Dry-Mesic Oak-Hickory Forest

The dry-mesic oak-hickory forest occurs on the outer-most edges of the study area mostly on mid slopes and other drier upland areas. Canopy trees include white oak, southern red oak, black oak, mockernut hickory, pignut hickory, tuliptree, shortleaf pine, and loblolly pine. Mid-story trees include flowering dogwood, black gum, sourwood, American holly, and black cherry. The shrub layer includes various species of blueberry and many of the over-story hardwoods in the sapling stage. The herb and vine layers are fairly sparse but include poison ivy and greenbrier. Invasive species include multiflora rose, Chinese privet, and Japanese honeysuckle.

4.1.4 Terrestrial Community Impacts

Terrestrial communities in the study area may be impacted by project construction as a result of grading and paving of portions of the study area. At this time, decisions regarding the final location and design of the project have not been made. Therefore, community data are presented in the context of total coverage of each type within the study area (Table 4). Once a final

alignment and preliminary design have been determined, probable impacts to each community type will be calculated.

Table 4. Coverage of terrestrial communities in the study area

Community	Coverage (ac)
Maintained/Disturbed	2.4
Piedmont Bottomland Forest	0.1
Dry-Mesic Oak-Hickory Forest	0.2
Total	2.7

4.2 Terrestrial Wildlife

Terrestrial communities in the study area are comprised of both natural and disturbed habitats that may support a diversity of wildlife species (those species actually observed are indicated with *). Scientific names of all species identified are included in Appendix B.

Mammal species that commonly exploit forested habitats and stream corridors found within the study area include species such as beaver*, coyote*, eastern chipmunk, eastern cottontail, gray fox, red fox, gray squirrel*, groundhog, raccoon*, Virginia opossum*, white-footed mouse, and white-tailed deer*. Birds that commonly use forest and forest edge habitats include the American crow*, barn swallow, blue jay*, brown thrasher*, Carolina chickadee*, Carolina wren*, Cooper's hawk, downy woodpecker, European starling, mourning dove*, northern cardinal*, northern mockingbird*, red-bellied woodpecker*, red-tailed hawk, red-winged blackbird, song sparrow, tufted titmouse* and turkey vulture. Reptile and amphibian species that may use terrestrial communities located in the study area include the American toad, copperhead, eastern box turtle, eastern fence lizard, five-lined skink*, marbled salamander, rat snake, spotted salamander, and wood frog.

4.3 Aquatic Communities

Aquatic communities in the study area consist of one perennial stream, Fourth Creek. Aquatic species expected to occur in Fourth Creek include bluehead chub, common snapping turtle, eastern silvery minnow, fathead minnow, flat bullhead, red shiner, rosefin shiner, satinfish shiner, spotted sucker, white perch and yellow perch.

4.4 Invasive Species

Six species from the NCDOT Invasive Exotic Plant List for North Carolina were found to occur in the study area. The species identified were sericea (threat), Chinese privet (threat), Japanese honeysuckle (moderate threat), Japanese stilt grass (threat), ground ivy (moderate threat), and multiflora rose (threat). NCDOT will manage invasive plant species associated with the project as appropriate.

5.0 JURISDICTIONAL ISSUES

5.1 Clean Water Act Waters of the U.S

One jurisdictional stream was identified in the study area (Table 5). The location of this stream is shown on Figure 3. A USACE stream assessment form is included in Appendix C. The jurisdictional stream in the study area has been designated as a warm water stream for the purposes of stream mitigation.

Table 5. Jurisdictional characteristics of water resources in the study area

Map ID	Length (ft)	Classification	Compensatory Mitigation Required ¹	River Basin Buffer
Fourth Creek	230	Perennial	Yes	Not Subject
Total	230			

Note: ¹ Assumes permanent impacts to jurisdictional features

No jurisdictional wetlands were identified within the study area.

5.2 Clean Water Act Permits

The proposed project has been designated as a CE for the purposes of National Environmental Policy Act documentation. As a result, a Nationwide Permit (NWP) 23 will likely be applicable. A NWP No. 33 may also apply for temporary construction activities such as stream dewatering, work bridges, or temporary causeways that are often used during bridge construction or rehabilitation. The USACE holds the final discretion as to what permit will be required to authorize project construction. If a Section 404 permit is required then a Section 401 Water Quality Certification from the NCDWR will be needed.

5.3 Coastal Area Management Act Areas of Environmental Concern

Rowan County is not one of the twenty coastal counties of North Carolina, therefore there are no areas of environmental concern in the study area that fall under the jurisdiction of the Coastal Area Management Act.

5.4 Construction Moratoria

Rowan County is not a designated trout county; therefore, no trout moratoria will apply to any streams or waters in the study area.

5.5 N.C. River Basin Buffer Rules

No NCDWR riparian buffer rules apply to the project.

5.6 Rivers and Harbors Act Section 10 Navigable Waters

No surface waters have been designated as Section 10 navigable waters within the study area.

5.7 Wetlands and Stream Mitigation

5.7.1 Avoidance and Minimization of Impacts

The NCDOT will attempt to avoid and minimize impacts to streams and wetlands to the greatest extent practicable in choosing a preferred alternative and during project design. At this time, no final decisions have been made with regard to the location or design of the preferred alternative.

5.7.2 Compensatory Mitigation of Impacts

The NCDOT will investigate potential on-site stream mitigation opportunities once a final decision has been rendered on the location of the preferred alternative. If on-site mitigation is not feasible, mitigation will be provided by North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS).

5.8 Endangered Species Act Protected Species

As of April 2, 2015, the U.S. Fish and Wildlife Service (USFWS) lists two federally protected species for Rowan County (Table 6). A brief description of each species' habitat requirements follows, along with the Biological Conclusion rendered based on survey results in the study area. Habitat requirements for each species are based on the current best available information as per referenced literature and USFWS correspondence.

Table 6. Federally protected species listed for Rowan County

Scientific Name	Common Name	Federal Status	Habitat Present	Biological Conclusion
<i>Helianthus schweinitzii</i>	Schweinitz's sunflower	E	Yes	No Effect
<i>Myotis septentrionalis</i>	Northern long-eared bat	T	Unknown	Unresolved

E – Endangered

T – Threatened

Schweinitz's sunflower

USFWS optimal survey window: late August through October

Habitat Description: Schweinitz's sunflower is endemic to the Piedmont of North and South Carolina. The few sites where this rhizomatous perennial herb occurs in relatively natural vegetation are found in Xeric Hardpan Forests. The species is also found along roadside rights-of-way, maintained power lines and other utility rights-of-way, edges of thickets and old pastures, clearings and edges of upland oak-pine-hickory woods and Piedmont longleaf pine forests, and other sunny or semi-sunny habitats where disturbances (e.g., mowing, clearing, grazing, blow downs, storms, frequent fire) help create open or partially open areas for sunlight. It is intolerant of full shade and excessive competition from other vegetation. Schweinitz's sunflower occurs in a variety of soil series, including Badin, Cecil, Cid, Enon, Gaston, Georgeville, Iredell, Mecklenburg, Misenheimer, Secrest, Tatum, Uwharrie, and Zion, among others. It is generally found growing on shallow sandy soils with high gravel content; shallow, poor, clayey hardpans; or shallow rocky soils, especially those derived from mafic rocks.

Biological Conclusion: No Effect

The roadside, powerline right-of-way, and agricultural edges of the upland areas may provide suitable habitat for Schweinitz's sunflower. A pedestrian survey by AECOM biologists for Schweinitz's sunflowers on September 8, 2016, did not find any Schweinitz's sunflower plants. A search of the North Carolina Natural Heritage Program (NCNHP) database, accessed on March 15, 2016, found no occurrences of Schweinitz's sunflower within 1.0 mile of the study area.

Northern long-eared bat

USFWS optimal survey window: May 15 through August 15

Habitat Description: In North Carolina, the Northern long-eared bat (NLEB) occurs in the mountains, with scattered records in the Piedmont and coastal plain. In western North Carolina, NLEB spend winters hibernating in caves and mines. Since this species is not known to be a long-distance migrant, and caves and subterranean mines are extremely rare in eastern North Carolina, it is uncertain whether or where NLEB hibernate in eastern North Carolina. During the summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees (typically ≥ 3 inches dbh). Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat also been found, rarely, roosting in structures like barns and sheds, under eaves of buildings, behind window shutters, in bridges, and in bat houses. Foraging occurs on forested hillsides and ridges, and occasionally over forest clearings, over water, and along tree-lined corridors. Mature forests may be an important habitat type for foraging.

Biological Conclusion: Unresolved

A search of the NCNHP database, accessed on April 18, 2016, found no known occurrences of Northern long-eared bat within 1.0 miles of the project study area. A survey request has been submitted to NCDOT Biological Surveys Group for this species. Once a survey is complete, a Biological Conclusion will be rendered.

5.9 Bald Eagle and Golden Eagle Protection Act

Habitat for the bald eagle primarily consists of mature forest in proximity to large bodies of open water for foraging. Large, dominant trees are utilized for nesting sites, typically within 1.0 mile of open water.

A desktop-GIS assessment of the project study area, as well as the area within a 1.13 mile radius (1.0 mile plus 660 feet) of the project limits, was performed on April 15, 2016, using color aerials from the year 2014. No water bodies large enough or sufficiently open to be considered potential feeding sources were identified. Since there was no foraging habitat within the review area, a survey of the project study area and the area within 660 feet of the project limits was not conducted. In addition, a review of the NCNHP records, accessed on April 18, 2016, indicated no known bald eagle occurrences within 1.0 mile of the study area. Due to the lack of habitat, known occurrences, and minimal impact anticipated for this project, it has been determined that this project will not affect this species.

5.10 Endangered Species Act Candidate Species

As of April 2, 2015, the USFWS lists one candidate species for Rowan County (Table 7). A review of NCNHP records, updated April 18, 2016, indicates no known occurrences of Georgia aster within 1.0 mile of the study area.

Table 7. Candidate species listed for Rowan County

Scientific Name	Common Name	Habitat Present
<i>Symphyotrichum georgianum</i>	Georgia aster	Yes

The roadside, powerline right-of-way, and agricultural edges of the upland areas may provide suitable habitat for Georgia aster.

5.11 Essential Fish Habitat

No essential fish habitat has been designated by the National Marine Fisheries Service in the study area.

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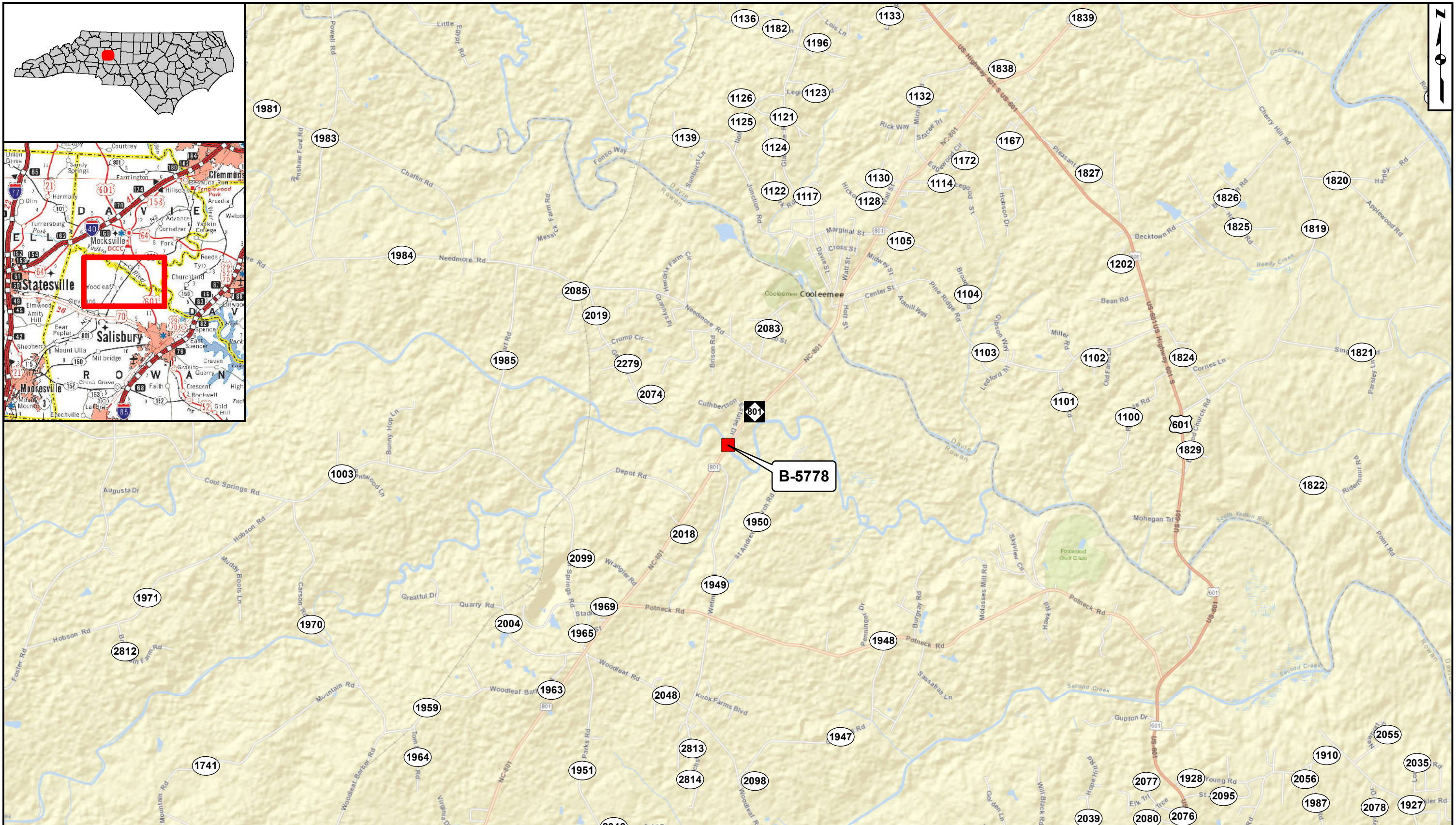
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Appendix A

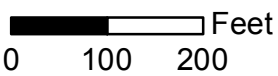
Figures

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 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS UNIT	PROJECT STUDY AREA MAP Replace Bridge No. 161 on NC 801 over Fourth Creek in Rowan County TIP Project B-5778	Legend  B-5778 Study Area	Source: USGS Historical Topographic Map Collection Cooleemee, NC 1992	Yadkin-Pee Dee HUC 03040102  0 100 200 Feet	<table border="1"><tr><td>Div: 9</td><td>TIP# B-5778</td><td rowspan="2">Figure 2</td></tr><tr><td colspan="2">Date: September 2016</td></tr></table>	Div: 9	TIP# B-5778	Figure 2	Date: September 2016	
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Date: September 2016										



NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board



NORTH CAROLINA DEPARTMENT
OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND
ENVIRONMENTAL ANALYSIS UNIT

JURISDICTIONAL FEATURES MAP

Replace Bridge No. 161 on NC 801
over Fourth Creek in Rowan County

TIP Project B-5778

Legend

- B-5778 Study Area
- Perennial Stream

Yadkin-Pee Dee
HUC 03040102

0 50 100 Feet



Div: 9	TIP# B-5778
Date: September 2016	

Figure
3



NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board



NORTH CAROLINA DEPARTMENT
OF TRANSPORTATION
DIVISION OF HIGHWAYS
PROJECT DEVELOPMENT AND
ENVIRONMENTAL ANALYSIS UNIT

TERRESTRIAL COMMUNITIES MAP

Replace Bridge No. 161 on NC 801
over Fourth Creek in Rowan County

TIP Project B-5778

Legend

- | | |
|------------------------------|----------------------------|
| B-5778 Study Area | Piedmont Bottomland Forest |
| Dry-Mesic Oak-Hickory Forest | Open Water |
| Maintained/Disturbed | |

Yadkin-Pee Dee
HUC 03040102

0 50 100 Feet



Div: 9	TIP# B-5778
Date: September 2016	

Figure
4

Appendix B

Scientific Names of Species Identified in Report

Plants

<u>Common Name</u>	<u>Scientific Name</u>
--------------------	------------------------

American holly	<i>Ilex opaca</i>
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American sycamore	<i>Platanus occidentalis</i>
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Black cherry	<i>Prunus serotina</i>
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Black gum	<i>Nyssa sylvatica</i>
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Black oak	<i>Quercus velutina</i>
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Blackberry	<i>Rubus fruticosus</i>
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Blueberry	<i>Vaccinium</i> sp.
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Boxelder	<i>Acer negundo</i>
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Carpetweed	<i>Mollugo verticillata</i>
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Carolina silverbell	<i>Halesia tetrapera</i>
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Chinese privet	<i>Ligustrum sinense</i>
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Dwarf hackberry	<i>Celtis tenuifolia</i>
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Flowering dogwood	<i>Cornus florida</i>
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Giant cane	<i>Arundinaria gigantea</i>
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Grasses	<i>Gramineae</i> spp.
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Greenbrier	<i>Smilax</i> sp.
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Ground ivy	<i>Glechoma hederacea</i>
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Japanese honeysuckle	<i>Lonicera japonica</i>
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Japanese stilt grass	<i>Microstegium vimineum</i>
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Loblolly pine	<i>Pinus taeda</i>
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Mockernut hickory	<i>Carya tomentosa</i>
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Multiflora rose	<i>Rosa multiflora</i>
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Muscadine	<i>Vitis rotundifolia</i>
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Pawpaw	<i>Asimina triloba</i>
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Pignut hickory	<i>Carya glabra</i>
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Poison ivy	<i>Toxicodendron radicans</i>
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Red maple	<i>Acer rubrum</i>
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River birch	<i>Betula nigra</i>
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Sericea	<i>Lespedeza cuneata</i>
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Shortleaf pine	<i>Pinus echinata</i>
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Sourwood	<i>Oxydendrum arboreum</i>
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Southern red oak	<i>Quercus falcata</i>
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Sweetgum	<i>Liquidambar styraciflua</i>
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Tuliptree	<i>Liriodendron tulipifera</i>
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White oak	<i>Quercus alba</i>
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AnimalsCommon NameScientific Name

American crow

Corvus brachyrhynchos

American toad

Anaxyrus americanus

Barn swallow

Hirundo rustica

Beaver

Castor canadensis

Blue jay

Cyanocitta cristata

Bluehead chub

Nocomis leptcephalus

Brown thrasher

Toxostoma rufum

Carolina chickadee

Poecile carolinensis

Carolina wren

Thryothorus ludovicianus

Common snapping turtle

Chelydra serpentina

Cooper's hawk

Accipiter cooperii

Copperhead

Agkistrodon contortrix

Coyote

Canis latrans

Downy woodpecker

Dryobates pubescens

Eastern box turtle

Terrapene carolina carolina

Eastern chipmunk

Tamias striatus

Eastern cottontail

Sylvilagus floridanus

Eastern fence lizard

Sceloporus undulatus

Eastern silvery minnow

Hybognathus regius

European starling

Sturnus vulgaris

Fathead minnow

Pimephales promelas

Five-lined skink

Plestiodon fasciatus

Flat bullhead

Ameiurus platycephalus

Gray fox

Urocyon cinereoargenteus

Gray squirrel

Sciurus carolinensis

Groundhog

Marmota monax

Marbled salamander

Ambystoma opacum

Mourning dove

Zenaida macroura

Northern cardinal

Cardinalis cardinalis

Northern mockingbird

Mimus polyglottos

Raccoon

Procyon lotor

Rat snake

Pantherophis alleghaniensis

Red fox

Vulpes vulpes

Red shiner

Cyprinella lutrensis

Red-bellied woodpecker

Melanerpes carolinus

Red-tailed hawk

Buteo jamaicensis

Red-winged blackbird

Agelaius phoeniceus

Rosefin shiner

Lythrurus ardens

Satinfin shiner

Cyprinella analostana

Song sparrow
Spotted salamander
Spotted sucker
Tufted titmouse
Turkey vulture
Virginia opossum
White perch
White-footed mouse
White-tailed deer
Wood frog
Yellow perch

Melospiza melodia
Ambystoma maculatum
Minytrema melanops
Baeolophus bicolor
Cathartes aura
Didelphis virginiana
Morone americana
Peromyscus leucopus
Odocoileus virginianus
Lithobates sylvaticus
Perca flavescens

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Appendix C

Stream Form

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STREAM QUALITY ASSESSMENT WORKSHEET



Provide the following information for the stream reach under assessment:

- | | |
|---|--|
| 1. Applicant's name: NCDOT | 2. Evaluator's name: C. Benton/AECOM |
| 3. Date of Evaluation: 4/4/2016 | 4. Time Of evaluation: 12:45:24 PM |
| 5. Name of stream: SA-Fourth Creek | 6. River basin: South Yadkin - 03040102 |
| 7. Approximate drainage area: 170 square miles | 8. Stream Order: 4th |
| 9. Length of reach evaluated: 220 ft | 10. County: Rowan |
| 11. Site coordinates (if known): prefer in decimal degrees. | 12. Subdivision name (if any): |
| Latitude (ex. 34.872312): 35.79093083 | Longitude (ex. -77.556611): -80.57103267 |

Method location determined (circle): ☒ GPS ☐ Topo Sheet ☐ Ortho (Aerial) Photo/GIS ☐ Other GIS ☐ Other _____

13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):

Where NC-HWY 801 passes over Fourth Creek

14. Proposed channel work (if any): Bridge replacement

15. Recent weather conditions: 0.08 inches within previous 48 hours

16. Site conditions at time of visit: Sunny, 61 degrees average temp (F), Wind 7 mph SSW

17. Identify any special waterway classifications known: ☐ Section 10 ☐ Tidal Waters ☐ Essential Fisheries Habitat
☐ Trout Waters ☐ Outstanding Resource Waters ☐ Nutrient Sensitive Waters ☐ Water Supply Watershed _____ (I-IV)

18. Is there a pond or lake located upstream of the evaluation point? ☒ YES ☐ NO If yes, estimate the water surface area: 40 acres

19. Does channel appear on USGS quad map? ☒ YES ☐ NO 20. Does channel appear on USDA Soil Survey? ☒ YES ☐ NO

21. Estimated watershed land use: ☐ 10% Residential ☐ 5% Commercial ☐ 5% Industrial ☐ 55% Agricultural
☐ 25% Forested ☐ 0% Cleared/Logged ☐ 0% Other (_____)

22. Bankfull width: 70-90 ft 23. Bank height (from bed to top of bank): 15 ft

24. Channel slope down center of stream: ☐ Flat (0 to 2%) ☒ Gentle (2 to 4%) ☐ Moderate (4 to 10%) ☐ Steep (>10%)

25. Channel sinuosity: ☐ Straight ☐ Occasional bends ☒ Frequent meander ☐ Very sinuous ☐ Braided channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 39

Comments:

Large named perennial stream with incised banks and large floodplain.

Evaluator's Signature

Charles Benton

Date: 4/4/2016

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 06/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	Presence of flow / persistent pools in stream (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	Evidence of past human alteration (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	3
	3	Riparian zone (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	Evidence of nutrient or chemical discharges (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	Groundwater discharge (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	Presence of adjacent floodplain (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	3
	7	Entrenchment / floodplain access (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	Presence of adjacent wetlands (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	Channel sinuosity (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	Sediment input (extensive deposition = 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	Size & diversity of channel bed substrate (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	2
STABILITY	12	Evidence of channel incision or widening (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	0
	13	Presence of major bank failures (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	0
	14	Root depth and density on banks (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	0
	15	Impact by agriculture, livestock, or timber production (substantial impact = 0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	Presence of riffle-pool/ripple-pool complexes (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	2
	17	Habitat complexity (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	Canopy coverage over streambed (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	Substrate embeddedness (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	Presence of stream invertebrates (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	Presence of amphibians (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	Presence of fish (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	Evidence of wildlife use (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						39

* These characteristics are not assessed in coastal streams.

Appendix D

Qualifications of Contributors

Contributor:	Charles Benton, PWS
Education:	B.S. Environmental Science, 1996
Experience:	Senior Environmental Scientist, AECOM, 2002–Present Environmental Scientist, Frederick P. Clark Associates, 2000-2002 Environmental Scientist, EcolSciences 1998-2000 Environmental Scientist, Booz Allen Hamilton, 1996-1998
Responsibilities:	Wetland and stream delineations, GPS data collection, stream assessment, natural communities assessment, T/E species assessment
Contributor:	Peyton Daly
Education:	B.S. Environmental Technology and Management, 2016
Experience:	Environmental Scientist, AECOM, 2016–Present
Responsibilities:	Document review
Contributor:	Ron Johnson
Education:	M.S. Biological Sciences 1982 B.S. Biological Sciences, 1978
Experience:	Senior Biologist, AECOM, 1987–Present
Responsibilities:	Document review
Contributor:	Paul Masten, PWS, LSS, LEED-AP
Education:	B.A., Environmental Science, 1998
Experience:	Project Biologist, AECOM, 2016 – Present S&ME, Inc., 2005-2016 Spangler Environmental, Inc., 2002-2005 Applied Environmental, Inc., 1999-2002
Responsibilities:	Document review