



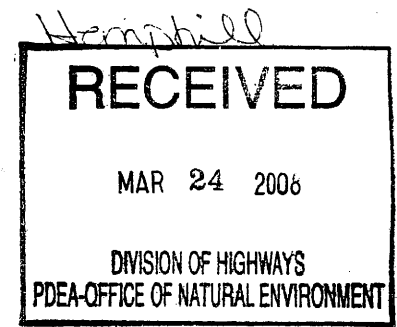
United States Department of the Interior

E. Lusk

FISH AND WILDLIFE SERVICE

Asheville Field Office
160 Zillicoa Street
Asheville, North Carolina 28801

March 14, 2008



Mr. Dave Baker
Asheville Regulatory Field Office
U.S. Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006

Dear Mr. Baker:

Subject: Proposed Widening of US 19 in Madison, Mitchell, and Yancey Counties, North Carolina, and Its Effects on the Federally Endangered Appalachian Elktoe and Its Designated Critical Habitat

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) based on our review of the Biological Assessment (BA) of the effects of the subject highway widening and associated bridge construction on the Appalachian elktoe (*Alasmidonta raveneliana*) and its designated critical habitat in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.) (Act).

This Opinion is based on information provided in the August 9, 2007, BA; supplemental information to the BA (received February 7, 2008); other available literature; personal communications with experts on the federally endangered Appalachian elktoe; and other sources of information. A complete administrative record of this consultation is on file at our office.

In the BA, the North Carolina Department of Transportation (NCDOT) determined that the following federally listed species would not be affected by the proposed project: Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Eastern cougar (*Puma concolor cougar*), spruce-fir moss spider (*Microhexura montivaga*), spreading avens (*Geum radiatum*), Heller's blazing star (*Liatris helleri*), Roan Mountain bluet (*Hedyotis purpurea* var. *montana*), Blue Ridge goldenrod (*Solidago spithamea*), spotfin chub (*Erimonax monachus*), gray bat (*Myotis grisescens*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), and rock gnome lichen (*Gymnoderma lineare*). In addition, the NCDOT determined that the project was "not likely to adversely affect" the Indiana bat (*Myotis sodalis*) or Virginia spiraea (*Spiraea virginiana*). We concur with these determinations. Therefore, we believe the requirements under section 7 of the

Act are fulfilled for these species. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

CONSULTATION HISTORY

A consultation history of this project is provided in Appendix A.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

As defined in the Service's section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas." The action area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present federal, state, or private activities, as well as the cumulative effects of reasonably certain future state or private activities within the action area. This Opinion addresses only those actions from which the Service believes adverse effects may result. In their BA, the NCDOT outlined those activities involved in the widening of US 19 that would affect the Appalachian elktoe and its designated critical habitat; they include the following: adding lanes of pavement, lengthening existing culverts, adding a bridge over the Cane River, and replacing a bridge over the South Toe River. This Opinion addresses whether the widening of US 19 (and associated activities) is likely to jeopardize the continued existence of the Appalachian elktoe or adversely modify or destroy its designated critical habitat.

The NCDOT proposes to widen existing US 19 and US 19E from I-26 (US 23) in Madison County east to State Route (SR) 1336 in Yancey County (R-2518A and R-2518B) and then from SR 1336 in Yancey County to an existing multilane section west of the Town of Spruce Pine in Mitchell County (R-2519A and R-2519B). The proposed project, combined, will be 29.3 miles (mi) long, with about 21 mi occurring in the Nolichucky River basin, portions of which are occupied by the Appalachian elktoe. The elktoe has been found in the vicinity of proposed project crossings of the Cane River and South Toe River. The South Toe River crossing occurs within designated critical habitat for this species. The entire area within R-2518B, R-2519A, and R-2519B and a small portion at the eastern terminus of R-2518A eventually drain into occupied habitat and into some reaches of designated critical habitat for the Appalachian elktoe within the Cane, South Toe, or North Toe Rivers.

In order to minimize impacts to the natural and human environments, the preferred design uses a "best fit" combination of symmetric and asymmetric widening. The typical section

consists of a four-lane divided shoulder section with a 17.5-foot raised median on R-2518A, and R-2519A and a 20-foot raised median on the remaining nonurban areas. The urban sections of the road will have a right-of-way width of between 200 and 400 feet (ft), depending on terrain. The right-of-way through the town of Burnsville will be 150 ft to 230 ft wide and will consist of a curb-and-gutter section from station 252+00 –L- to station 299+76 –L-. A total of 169 stream crossings/stream-impact areas were identified in the preliminary impact summary sheets for projects R-2518A and B, and R-2519A and B. Of the 169 crossings, 108 occur in the Nolichucky River basin.

As part of this project, the NCDOT has incorporated measures that minimize impacts in the design of the roadway improvements and new bridge structures. The NCDOT also is committing to a number of protective measures that will be implemented during construction of the highway and the bridges and in postconstruction monitoring and follow-up remediation where necessary. Specific measures addressing stream stability at tributary crossings, storm-water runoff controls, and erosion and sediment controls are described in more detail below.

As individual stream crossings are evaluated and designs are determined, the NCDOT will consider a variety of measures to help ensure stream stability and fish passage at culverted stream crossings. Possible measures, alone or in combination, include:

1. The incorporation of low-flow sills with a low-flow channel in new culvert installations or retrofitting existing culverts where enough hydraulic conveyance exists.
2. On multiple-barrel culverts, the use of sills at the entrance of one or more barrels to maintain normal flow depth through the remaining barrel(s).
3. The construct of a low-flow floodplain bench at the entrance and outlet of the culvert to maintain normal channel dimensions where the existing or new culvert is larger than the stream channel.
4. Burying new culverts below the streambed to allow natural bed material to deposit in the culvert bottom. On steeper stream grades, baffles should be placed in the culvert bottom to aid retention of natural bed material.
5. The use of natural rock energy-dissipater basins at pipe outlets to lower velocities.
6. The use of rock cross vanes to maintain stream grade, alleviate stream-bank erosion, and maintain stream grade control near culvert outlets and/or inlets.
7. The use of riprap on stream banks only at pipe outlets, not in the streambed.
8. The removal of existing culverts that are perched, replacing them with new culverts that have low-flow sills and/or low-flow channels.

9. The removal of existing undersized pipe culverts, replacing them with properly sized and aligned pipe culverts.

The NCDOT has documented major stream-crossing designs and measures taken to protect stream stability and fish passage in Stormwater Management Plans (SMPs) for each section of the project. An SMP for the R-2519B section will also be prepared and document the stream-crossing designs and measures taken to protect stream stability and fish passage for that section of the project. Complete SMPs for R-2518A, R-2518B, and R-2519A are located in Appendix C.

The NCDOT will use a number of Best Management Practices (BMPs) to minimize impacts from postconstruction increases in storm-water runoff from the project. These BMPs include grass swales, preformed scour holes, hazardous spill basins, dry detention basins, and grass-lined roadway ditches and shoulders. In the first three sections of this project, the NCDOT has designed over 32,000 linear feet (lf) of grass swales, 29 preformed scour holes, and at least 1 dry detention basin. These BMPs will cover 14 mi of the total 21-mi project. The remaining 7 mi, when designed, will meet or exceed the standards in the first three sections. The current BMPs are designed to treat the amount of roadway that will be drained and are tailored for each segment of the highway. Individual designs can be found in Appendix C. The storm drainage systems for the project have been designed to avoid the direct discharge of storm drainpipes into receiving surface waters. Direct discharge was minimized to the greatest extent possible; but because of steep terrain, roadway grades, and urban development (in the Town of Burnsville area), this could not be done in all cases.

Grass swales are used extensively on this project. Grass swales are vegetated channels designed to convey and treat runoff from small drainage areas, reduce flow velocity, and promote infiltration while removing suspended solids, metals, and nutrients through sedimentation, vegetative filtration, infiltration, and biological uptake.¹ The typical roadway ditch section along existing US 19 has been enhanced. The ditches for the project are wider with flatter slopes and provide a 66% increase in vegetated flow length on the shoulders when compared to existing cross sections. In addition to grass swales, preformed scour holes will be used extensively throughout this project. Preformed scour holes are riprap-lined depressions constructed at the outlet of a point discharge to dissipate energy and promote diffuse flow.²

¹Studies have shown that vegetated roadway swales, designed as described previously, are effective in removing pollutants (Wisconsin Department of Transportation [WisDOT] 2007, NCDOT unpublished data). NCDOT research has shown that a grassed filter strip removed from 68% and 97% of Total Suspended Solids (TSS) and grassed shoulders showed a 40% removal of TSS. In a synthesis report prepared by the WisDOT, studies of grass swales and grassed shoulders from seven state departments of transportation demonstrate reductions in a number of pollutants other than TSS, including metals. Results varied by type of vegetation, time of year, and distance of treatment run available (WisDOT 2007).

²Preformed scour holes reduce the amount of end-of-pipe erosion by eliminating unabated scour. By inducing diffuse flow conditions, preformed scour holes promote runoff infiltration and reduce downgrade erosion. Preformed scour holes will be used throughout the length of the project. Many will be used in flat floodplain areas where the discharge will be allowed to diffuse and infiltrate in the floodplain areas.

Two hazardous spill basins will be constructed on the R-2518B project at the Cane River crossing. At least two more will be provided on the R-2519B section of the project at the South Toe River crossing.

In their SMPs, the NCDOT has documented BMPs that will be used to offset impacts due to postconstruction storm-water runoff for the R-2518A, R-2518B, and R-2519A sections of the project (Appendix C). An SMP for R-2519B will be prepared during final design for that section of the project and will incorporate the same or greater protections.

Where curb-and-gutter was used through the town of Burnsville, an effort was made to discharge the storm drain systems into grass-lined ditches, grass swales, and preformed scour holes behind the curb-and-gutter before entering into surface waters. Along this portion of the project, 1,000 ft of grass swales, eight preformed scour holes, and 550 ft of grass-lined ditches have been designed. This information is documented in the SMP for project R-2519A (Appendix C).

In addition to the control measures described previously, the NCDOT has a statewide National Pollutant Discharge Elimination System (NPDES) storm-water permit. This permit requires the NCDOT to perform 14 programs to manage storm-water runoff. While all programs have provided benefits to the Nolichucky River basin, the following are noteworthy:

1. **Illicit Discharge and Detection and Elimination Program:** The NCDOT facilitates a web-based system that allows their field staff to report illicit discharges to the storm-water system. The reports are then forwarded to the North Carolina Division of Water Quality (DWQ) for appropriate action. If the discharge is within the NCDOT right-of-way, the NCDOT will take appropriate action to remove the source.
2. **BMPs Retrofits:** This program requires the NCDOT to develop structural or nonstructural BMPs to treat storm-water runoff on existing facilities. This program can be used to retrofit existing facilities or address future storm-water runoff concerns. Although the current project design incorporates storm-water BMPs in the design, the NCDOT will investigate retrofit opportunities on other existing facilities in the Nolichucky River basin.
3. **BMPs Inspection and Maintenance Program:** The NPDES permit requires the NCDOT to develop an inspection and maintenance program for structural storm-water controls. A program is currently being piloted in NCDOT's Divisions 3, 4, and 5 and will be implemented across the state in the next few years. The NCDOT Hydraulics Unit and Division 13 will coordinate to determine whether projects R-2518B and R-2519 can be included in this pilot program.
4. **Research and Program Assessment:** The NCDOT performs research on the characterization of highway pollutants as well as the performance of structural storm-water controls. This program is currently looking at the effectiveness of

storm-water controls in North Carolina. The previously mentioned BMPs Inspection and Maintenance pilot program is for maintenance, while the research program objective would be for quantitative assessment. The NCDOT has an annual research cycle where proposals are submitted on an annual basis. The NCDOT plans to propose further research on the performance of the grass swales along the 19E project. This research will be proposed to the NCDOT Research Program in the summer of 2008, when the program annually solicits proposals.

Given the length of this project and the sensitivity of the watershed, the NCDOT has developed specific erosion-control measures for this project that are designed to protect environmentally sensitive areas. In addition, they are committed to enhanced monitoring and reporting to achieve the highest level of compliance with standards for sediment and erosion control for this project. To help ensure accountability, there are a number of inspections required at specific times (Appendix B).

The NCDOT Erosion and Sediment Control Program requires that all land-disturbing activities comply with the Sedimentation Pollution Control Act of 1973 (SPCA). Inspections will be performed by certified Level I or II erosion- and sediment-control/storm-water professionals to ensure that all erosion- and sediment-control devices are installed and maintained according to the approved plan. Inspections will include weekly written reports or within 24 hours of a ≥ 0.5 -inch (in) rainfall event that will document the progress of the project and what items need attention. All erosion- and sediment-control/storm-water BMPs will be installed by a contractor supervised by a Level I or II certified professional.

A certified Level II erosion- and sediment-control/storm-water supervisor will perform erosion- and sediment-control management for the project and will be responsible for coordinating the grading operations, with phasing and implementation of the erosion- and sediment-control plan. When corrective actions are identified, the supervisor will coordinate efforts to resolve issues and coordinate the overall inspection of the project to ensure that the necessary documentation is being completed and maintained for review by the regulatory agencies. A contractor's Level II foreman will be present on the project to ensure compliance. A certified Level III erosion- and sediment-control/storm-water designer will design reclamation plans. The designer will be responsible for ensuring that the reclamation plans comply with the SPCA and all project permit conditions.

The NCDOT's Division 13 (Division) construction staff will provide secondary oversight for erosion and sedimentation control on the project. They will perform routine inspections to see if installation, maintenance, and project documentation are occurring as required. All inspection documents completed by the Division staff will be maintained on site for review by the regulatory agencies. Division construction inspection staff will hold Level I or II certification, as applicable.

Roadside Environmental Unit's Field Operations (REUFO) will provide the third level of oversight for erosion and sedimentation control on the project. REUFO will perform reviews that will document the condition of the project's erosion- and

sediment-control/storm-water compliance and the progress on needed corrective actions. REUFO will also review revisions to the erosion- and sedimentation-control plan and provide advice on design modifications. REUFO's reviews will be maintained for on-site inspection by regulatory agencies or delivered electronically upon request. REUFO personnel who perform reviews will be certified professionals in erosion and sediment control and/or certified professionals in storm-water quality.

In the event a violation to the SPCA occurs, the REUFO will issue an Immediate Corrective Action that will initiate project suspension. If a violation of a permit condition occurs, the REUFO staff will issue a Permit Consultation Needed. The lead engineer and the Division's environmental officer will be notified, and the appropriate corrective actions will be taken. The Division staff may suspend work at any time they deem necessary to correct an issue, and the Division's environmental officer may review and recommend corrective actions in order to comply with permit conditions. The NCDOT will notify the Service of any violations to the SPCA.

A. Action Area

The action area ("all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action") for the proposed project includes: (1) the area directly impacted by construction activities, primarily the existing roadway and land immediately adjacent; (2) areas potentially affected by indirect impacts, defined as a 2-mi-wide "potential growth area" on either side of the existing highway; and (3) proposed conservation areas to help offset impacts to the Appalachian elktoe and its designated critical habitat. Within the action area (Figure 1) there are about 10.2 mi of the main stem of the Cane River, 10.5 mi of the main stem of the South Toe River, and 8.7 mi of the main stem of the North Toe River in Mitchell and Yancey Counties. Additional streams within the project area include Middle Fork Creek, Bald Creek, Price Creek, Pine Swamp Branch, Little Crabtree Creek, and Big Crabtree Creek. Middle Fork Creek flows to the south from Bethel to the French Broad River. Bald Creek flows to the north from the top of Ivy Gap to the Cane River. Price Creek flows north from Chestnut Mountain to the Cane River. The Cane River flows north from the Pisgah National Forest, converging with the North Toe River (also known as the Toe River downstream of its confluence with the South Toe River; in this Opinion, when we refer to the Toe River, we are speaking of that portion of the North Toe River downstream of its confluence with the South Toe River) to form the Nolichucky River. Pine Swamp Branch flows to the west from Burnsville and is a tributary to the Cane River. Little Crabtree Creek flows to the east from Burnsville and is a tributary to the South Toe River. Big Crabtree Creek flows north along the Yancey/Mitchell County line into the North Toe River. Brushy Creek is a tributary to Big Crabtree Creek.

Physical Characteristics within the Action Area - The South Toe flows into the North Toe River west of the Town of Spruce Pine. The Toe River then flows northwest and combines with the Cane River to form the Nolichucky River, a tributary to the French Broad River. The North Toe River originates in central Avery County, 5 mi northeast

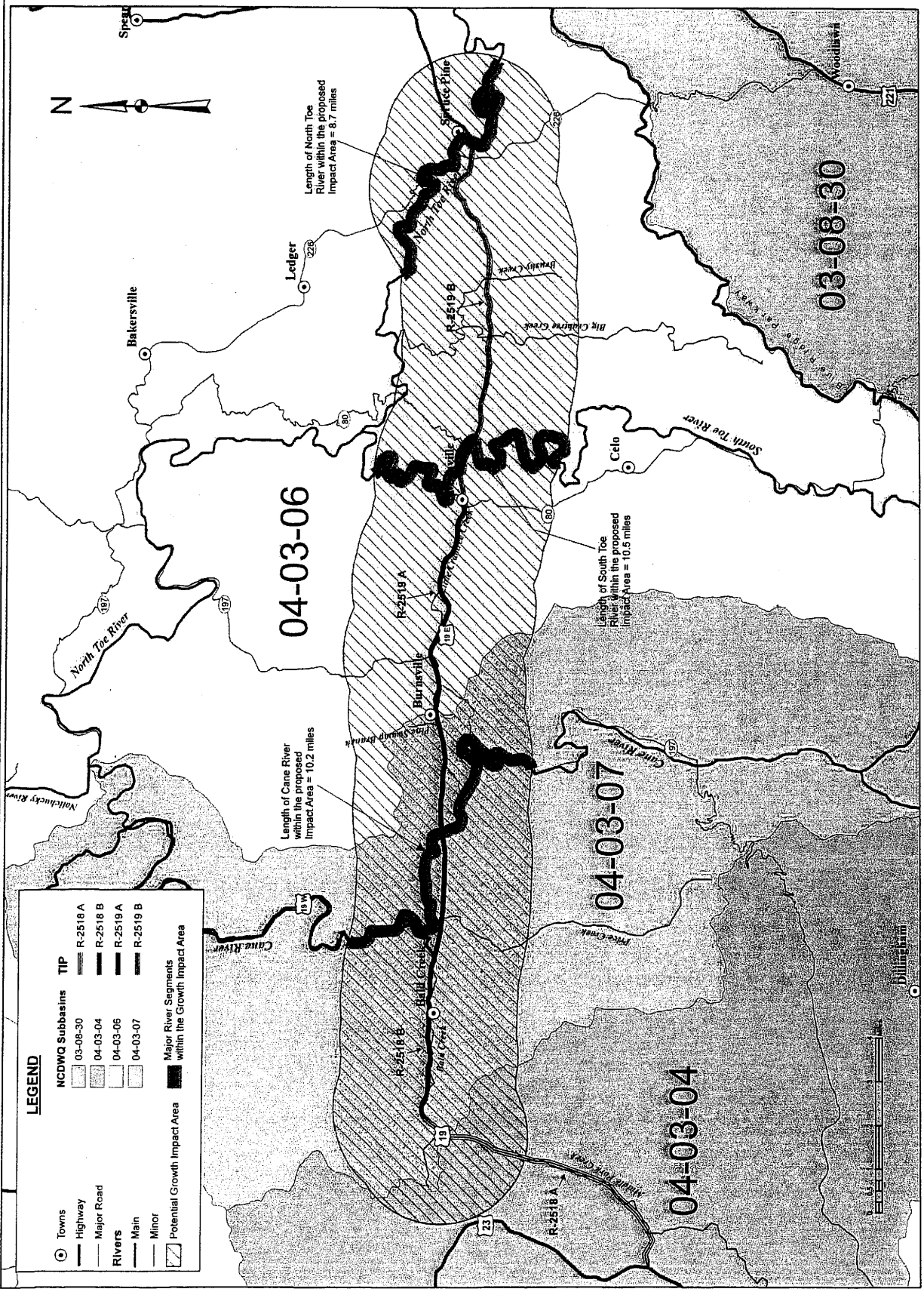


Date: November 2006
 Scale: As Shown
 Job No.: 3157

Title: **Action Area Map**
 Appalachian Elktoe Biological Opinion
 US 19 Widening R-2518 & R-2519
 Mitchell and Yancey Counties, North Carolina

Client: **NCDOT**

Figure **1**



of Newland. From Newland, the river flows west for 4 mi to Minneapolis. The river generally flows in a southwesterly direction from Minneapolis, through the city of Spruce Pine in Mitchell County, where it is joined by the South Toe River near Kona. The Toe River continues to flow northwest along the Mitchell/Yancey County border through Toecane and Relief until its confluence with the Cane River near Hunt Dale. The headwaters of the Cane River arise in Mount Mitchell State Park in Yancey County. The Cane River flows generally north for 40 mi before joining the Toe River near Hunt Dale to form the Nolichucky River.

The Nolichucky River watershed occupies parts of two physiographic provinces. The upstream parts of the watershed (upstream from about Dry Creek, at river mile [rm] 87.5) and the higher slopes along the eastern side of the river are in the Blue Ridge Province. The remainder of the watershed and most of the length of the Nolichucky River are located in the Valley and Ridge Province. One-third of the watershed is located in the Blue Ridge Province and is characterized by high, steep ridges with narrow valleys. The mountains in this part of the watershed rise 1,000 ft to 2,500 ft above the adjacent lowlands. The western part of the Blue Ridge Province has long and narrow individual ridges, aligned parallel to the trend of the range and similar to the more subdued ridges of the Valley and Ridge Province. The main mountain mass along the Tennessee/North Carolina state line is a tumbled confusion of peaks and valleys that appear to have no regular pattern.

Land Use – The dominant land use in the action area is forested/wetland (85%), with about 13% of the area in pasture/managed herbaceous. Urban area comprises less than 1% of the action area. Both the South Toe and the Cane Rivers originate in Mount Mitchell State Park, and two-thirds of the Cane River watershed is in the Pisgah National Forest. A significant portion of land along the alluvial areas of the middle North Toe, the South Toe, and Toe Rivers is cultivated cropland and pasture (14%), with a small portion (<1%) in residential/golf course (North Carolina Department of Environment and Natural Resources [NCDENR], DWQ, 2005). Historically, the economy of the entire Nolichucky River basin depended on natural resources. The mining of mica, feldspar, kaolin, or olivine in the Spruce Pine mining district within the North Toe and South Toe watersheds was the main source of income for the area. Feldspar, mica, and kaolin have been extensively mined in this watershed in North Carolina since the early 1900s (Muncy 1981). Nearly half of the nation's mica is produced in this region.

Ecological Significance – The Nolichucky River basin supports a number of rare fish and freshwater mussel species (Table 1). The stonecat (*Noturus flavus*) is found only in North Carolina, in the Nolichucky and Little Tennessee River watersheds. The Cane River contains several rare animals, the most notable of which is almost the entire North Carolina population of the sharphead darter (*Etheostoma acuticeps*).

The lower stretches of the North Toe and Nolichucky Rivers provide habitat for the olive darter (*Percina squamata*), logperch (*Percina caprodes*), and tangerine darter (*Percina aurantiaca*), as well as the federally endangered Appalachian elktoe mussel.

Table 1. Rare Aquatic Species in the North Toe, Toe, and Cane Rivers.

Scientific Name	Common Name	North Carolina Status	Federal Status
Mussels:			
<i>Alasmidonta raveneliana</i>	Appalachian elktoe	Endangered	Endangered
<i>Lampsilis fasciola</i>	Wavy-rayed lampmussel	Special Concern	None
Amphibians:			
<i>Cryptobranchus alleganiensis</i>	Hellbender	Special Concern	Federal Species of Concern
Fishes:			
<i>Etheostoma acuticeps</i>	Sharphead darter	Threatened	Federal Species of Concern
<i>Etheostoma vulneratum</i>	Wounded darter	Special Concern	Federal Species of Concern
<i>Percina squamata</i>	Olive darter	Special Concern	Federal Species of Concern
<i>Noturus flavus</i>	Stonecat	Endangered	None

The wavy-rayed lampmussel (*Lampsilis fasciola*) and the hellbender (*Cryptobranchus alleganiensis*) have been found in the same reaches of the upper Nolichucky River subbasin where the Appalachian elktoe occurs. The North Carolina Natural Heritage Program (NCNHP) describes the aquatic habitat of the South Toe, a portion of the North Toe, the Toe, and the Nolichucky River as having “National Significance,” and the aquatic habitat of the Cane River as having “Statewide Significance.”

Water Quality Assessment and Best Usage Classification - Sedimentation from mining and agricultural practices in the basin is well-documented (Tennessee Valley Authority [TVA] 1981, Ahlstedt and Rashleigh 1996). Historically, sedimentation and pollution from mining operations throughout the Nolichucky River basin (primarily in the North Toe watershed) significantly degraded cool-warm water habitats (North Carolina Wildlife Resources Commission [NCWRC] 2005). However, the North Carolina Mining Control Act of 1971 and the Sedimentation and Pollution Control Act of 1973 have helped improve the water quality of this basin (NCDENR 2003, Ahlstedt and Rashleigh 1996). In 2002, bioassessments, including benthic macroinvertebrate and fish sampling, in the Nolichucky River basin by the DWQ indicated improving conditions in the basin (Tables 2 and 3).

Table 2. EPT Scores for Water Bodies Monitored in Nolichucky River Basin for Basinwide Assessment.

Water Body	County	Location	1997	2002
North Toe River	Mitchell	SR 1321	Good	Good
North Toe River	Avery	US 19E	Good	Good
North Toe River	Mitchell	SR 1162	Fair	Good
North Toe River	Yancey	SR 1314	Good	Good
Big Crabtree Creek	Mitchell	US 19E	Excellent	Excellent
South Toe River	Yancey	SR 1167	Excellent	Excellent
Big Rock Creek	Mitchell	NC 197	Good	Excellent
Jacks Creek	Yancey	SR 1337	Fair	Fair
Pigeonroost Creek	Mitchell	SR 1349/NC 197	Excellent	Excellent
Cane River	Yancey	US 19E	Excellent	Excellent
Bald Mountain Creek	Yancey	SR 1408	Good	Excellent
Price Creek	Yancey	SR 1126	Good/Fair	Good

Sampling conducted by the DWQ indicates overall water quality is good in the Nolichucky River basin (based on the parameters that are sampled and evaluated by the DWQ), but sediment is a growing concern. Sedimentation has been considered a significant problem in the Nolichucky River system for many years. Mining impacts are widespread, and croplands and development contribute to nonpoint-source pollution, including pesticides, fertilizers, oil, heavy metals, animal waste, and eroded sediment, that is washed from land or paved surfaces when it rains. Habitat in the North Toe River between Spruce Pine and its confluence with the South Toe River continues to be degraded, seemingly from discharges and runoff from mining operations and the town of Spruce Pine. Floodplain gravel mining in the upper Cane River watershed, both permitted and unpermitted actions, presents a potential threat to long-term channel stability and habitat quality.

In 2006, the DWQ added two river reaches in the action area to North Carolina's list of impaired streams (303(d) list). These include a reach of the lower Cane River (~3.5 rm) and a reach of the North Toe River (~11.3 rm). In addition, in 2008 the DWQ added the main stem of the Nolichucky River, throughout its entirety in North Carolina (~10.0 rm), to the draft 303(d) list. The portions of the Cane, North Toe, and Nolichucky Rivers that have been added to the state's list of impaired streams are all occupied, designated critical habitat for the Appalachian elktoe. Reasons for listing include turbidity standard violations for the Cane and Nolichucky Rivers and turbidity standard violations and impaired biological integrity in the North Toe River. The nonpoint-source runoff of silt/sediments is identified as the most likely cause of impairment of these three river reaches.

Table 3. Tennessee Valley Authority Fish Community Assessment in the Nolichucky River Basin (DWQ 2003).³

Water Body	County	Location	Date	Score/Rating
North Toe River	Mitchell	US 19	1999	50/Good
North Toe River	Yancey	NC 80	1997 1999	40/Good 50/Good
Toe River	Avery	SR 1314	1997 1999	40/Fair 56/Good - Excellent
Toe River	Mitchell	SR 1336	1997	48/Good
South Toe River	Mitchell	NC 80	1997	48/Good
Little Crabtree Creek	Yancey	US 19E	1997 1999	44/Fair 40/Fair
Cane Creek	Mitchell	NC 80	1997 1999	32/Poor 34/Poor
Big Rock Creek	Mitchell	NC 197	1997 2000	50/Good 50/Good
Jacks Creek	Yancey	SR 1336	2000	40/Fair
Cane River	Yancey	US 19E	1997 2000	44/Fair 50/Good
Cane River	Yancey	US 19W	1997 2000	40/Fair 48/Good
Cane River	Yancey	US 19W	1997	46/Fair - Good
Nolichucky River	Mitchell	SR 1321	1997 2002	50/Good 52/Good

The NCDENR assigns a best usage classification (15A NCAC 02B.0101 GENERAL PROCEDURES) to all the waters of North Carolina. These classifications provide for a level of water quality protection to ensure that the designated usage of that water body is maintained. The portions of the Toe, Cane, and North Toe Rivers that are occupied by the Appalachian elktoe have a "Class C, Trout," usage classification, and the Nolichucky River from its source to the North Carolina/Tennessee state line has a usage classification of "Class B."

³The Fish Community Assessment assigns an Index of Biotic Integrity (IBI), which is another method of assessing water quality. The IBI evaluates species richness and composition, trophic composition, and fish abundance and condition.

Point-source Pollution - Point-source pollution is defined as pollutants that enter surface waters through a pipe, ditch, or other well-defined conveyance. These include municipal (city and county) and industrial wastewater treatment facilities; small domestic discharging treatment systems (schools, commercial offices, subdivisions, and individual residences); and storm-water systems from large urban areas and industrial sites. The primary substances and compounds associated with point-source discharge include: nutrients; oxygen-demanding wastes; and toxic substances, such as chlorine, ammonia, and metals.

Under Section 301 of the Clean Water Act of 1977, the discharge of pollutants into surface waters is regulated by the Environmental Protection Agency. Section 402 of the Clean Water Act establishes the NPDES Permitting Program, which delegates permitting authority to qualifying states. In North Carolina, the DWQ is responsible for the permitting and enforcement of the NPDES Program. There were 23 NPDES permitted discharges in the Nolichucky basin in 2003 (NCDENR 2005), although additional discharges have been permitted recently (including a new wastewater treatment plant [WWTP] discharge into the South Toe River below Highway 19E). Most of these discharges are small WWTPs that serve schools or subdivisions, including the Spruce Pine WWTP, Newland WWTP, and Bakersville WWTP and multiple mining process discharges, including Unimin Mining Company's four discharges.

Nonpoint-source Pollution – Nonpoint-source pollution refers to runoff that enters surface waters through storm water or snowmelt. There are many types of land-use activities that are sources of nonpoint-source pollution, including land development; construction activity; animal waste disposal; mining, agricultural, and forestry operations; and impervious surfaces, such as roadways and parking lots. Various nonpoint-source management programs have been developed by a number of agencies to control specific types of nonpoint-source pollution (e.g., pollution related to forestry, pesticide, urban, and construction activities). Each of these management programs develops BMPs to control the specific type of nonpoint-source pollution.

The SECP applies to construction activities, such as roadway construction, and is established and authorized under the SPCA. This act delegates the responsibility for its administration and enforcement to the NCDENR's Division of Land Resources (Land Quality Section). The SECP requires, prior to construction, the submission and approval of erosion-control plans on all projects disturbing an acre or more. On-site inspections by the Division of Land Resources are conducted to determine compliance with the plan and to evaluate the effectiveness of the BMPs that are being used. The NCDOT, in cooperation with the DWQ, has developed a sedimentation-control program for highway projects using BMPs for the protection of surface waters. Additional erosion-control measures, outlined in Design Standards in Sensitive Watersheds (NCAC T15A:04B.0124), are implemented by the NCDOT for projects within WS-I or WS-II water supply watersheds, critical areas, waters designated for shellfishing, or any waters designated by the DWQ as "High Quality Waters." When crossing an aquatic resource containing a federally listed species, the NCDOT has

committed to implement erosion-control guidelines that go beyond both the standard BMPs and the Design Standards in Sensitive Watersheds, regardless of the DWQ classification. These areas are designated as “Environmentally Sensitive Areas” on the erosion-control plans.

B. Conservation Measures

Conservation measures represent actions, pledged in the project description, that the action agency will implement to minimize the effects of the proposed action and further the recovery of the species under review. Such measures should be closely related to the action and should be achievable within the authority of the action agency. The beneficial effects of conservation measures are taken into consideration in the Service’s determination of a jeopardy versus a nonjeopardy opinion and in the analysis of incidental take. However, such measures must minimize impacts to listed species within the action area in order to be factored into the Service’s analyses.

The NCDOT proposes to offset project-related impacts by implementing a number of conservation measures. Included in the overall proposal are measures that will help aid recovery by conserving or restoring habitat and measures intended to minimize direct impacts through project design, construction practices, and monitoring and remediation.

Habitat Conservation and Restoration

1. The NCDOT has committed to providing riparian habitat protection in at least five locations within the Nolichucky basin, to provide a total of 57.6 acres (ac) and 19,005 lf of protection. Sites will be reviewed by the Service before purchase.
2. The NCDOT is using on-site stream mitigation to offset unavoidable impacts to existing streams within the project alignment. A total of 29,783 lf of on-site mitigation has been identified for the entire project. Of the total, 11,299 lf is identified and planned within the Nolichucky River basin and includes a variety of practices to restore stream pattern, dimension, and profile; correct channel instability; restore riparian buffers; and preserve stable stream reaches. These sites will be purchased as part of the NCDOT right-of-way and will be permanently protected from future development. Stream restoration and buffer preservation in the project corridor will help offset project-related impacts and will benefit downstream resources, including the Appalachian elktoe, by correcting existing problems in the watershed. Mitigation plans are developed in coordination with the U.S. Army Corps of Engineers (Corps), DWQ, and the Service.
3. The NCDOT will relocate all native mussels, including the Appalachian elktoe, from the footprints of the bridge construction projects to an appropriate relocation site as determined in coordination with the Service and the NCWRC. The procedure for relocation will be detailed in a site-specific plan developed in cooperation with the Service, NCWRC, and NCDOT. The relocation procedures will emphasize relocating freshwater mussels in such a way as to reduce stress and

minimize the risk of injury while the animals are in transit. If at any time during the relocation it is determined that these procedures are not meeting the stated objectives, more stringent methods may be developed, in cooperation with the NCWRC and the Service, to ensure that the mussels are relocated successfully. The relocation site(s) will be monitored for the survival of relocated mussels and the movement of mussels a month after they have been removed from the defined salvage areas. The relocation site(s) will then be monitored for recovery, survival (of recovered mussels), movement, and growth of the mussels once a year for 5 years after project completion. Annual reports will be provided to the Service and the NCWRC.

4. Japanese knotweed (*Fallopia japonica*), an aggressive and invasive nonnative plant, is colonizing floodplain and stream-bank areas in the Nolichucky River basin. Japanese knotweed can quickly form dense thickets that exclude native vegetation and greatly alter the natural riparian ecosystem. The NCDOT has identified Japanese knotweed within the project limits of R-2518 and R-2519. To minimize the potential spread of this species from construction-related activities, the NCDOT proposes to attempt to suppress the knotweed within their right-of-way at the following locations: R-2518A Mitigation Site 1, R-2518B Mitigation Site 4, R-2518B Bridge at Sta. 223+50 (Cane River Bridge), and R-2519B Bridge at Sta. 121+00 (South Toe River Bridge).
5. The contract(s) for this project will stipulate that any Japanese knotweed material disturbed through construction activities at the two bridges and at the identified mitigation sites will be buried within the project boundaries in fill or waste areas below the depth of the topsoil. The NCDOT prefers on-site disposal to ensure proper disposal. Any chemical treatment will be proposed and planned in coordination with the Service and the NCDOT. The NCDOT also has initiated a research project with North Carolina State University to further investigate techniques to control Japanese knotweed. Control tests in the project area will be coordinated with the Service.

Design Measures

1. In some road sections, where streams run parallel to the current road alignment and opportunities to avoid impacts or relocate streams are limited, the NCDOT will construct retaining walls. In these cases, retaining walls replace fill slopes, thereby reducing the linear feet of stream that must be culverted and placed under fill. The NCDOT has avoided impacts to 4,704 lf of streams throughout the project, including 3,569 lf of streams in the Nolichucky River basin. Although these stream segments do not provide suitable habitat for the Appalachian elktoe, they flow into a reach of either the South Toe River or North Toe River, both of which are occupied by the Appalachian elktoe and are designated critical habitat for this species. Reducing impacts in these streams will minimize potential downstream impacts, such as sedimentation, erosion, and stream-bank instability, to the Appalachian elktoe and its designated critical habitat.

2. The existing culvert crossing of Bald Creek at Station # 175+60 –L- is being replaced with a bridge. This crossing is 0.7 mi from the confluence of Bald Creek and the Cane River, in a reach of the Cane River that is occupied by the Appalachian elktoe.
3. Deck drains will be placed at the ends of the replacement bridges. Storm water will be directed into catch basins and will then flow through a vegetated buffer so that no drainage will occur over the Cane River or South Toe River. Currently, drainage from the decks of both the existing structures flows directly into the river. Storm water coming off the approaching roadways at the bridge locations will be managed in a similar manner.
4. The design of the Cane River Bridge and the South Toe River Bridge minimized or eliminated piers in the rivers.
5. Bridge designs at Price's Creek and at Bald Creek will direct deck drainage to a vegetated buffer and will span the respective Creeks.

Construction Measures

1. In addition to relocating all mussels found in the footprint of the impact area, the NCDOT will conduct final mussel surveys in the project footprints just prior to construction and will move any additional mussels found to the appropriate relocation area.
2. For the entire 21-mi-long project within the Nolichucky River basin, the NCDOT will implement erosion-control measures that exceed the standard BMPs and incorporate the Design Standards in Sensitive Watersheds [15A NCAC 04B.0124 (b) – (e)], regardless of the DWQ stream classification.
3. The areas adjacent to jurisdictional water bodies in the watersheds of the Cane, North Toe, and South Toe Rivers will be identified as “Environmentally Sensitive Areas” on the Sedimentation and Erosion Control Plans for this project. By definition, an “Environmentally Sensitive Area” will be identified as a 50-foot buffer zone on both sides of the stream, measured from the top of the stream bank. Within the identified 50-foot Environmentally Sensitive Areas, the following shall apply:
 - a. The contractor may perform clearing operations, but not grubbing operations, until immediately prior to beginning grading operations;
 - b. Once grading operations begin, work shall progress in a continuous manner until complete;

- c. Erosion-control devices shall be installed immediately following the clearing operation;
 - d. Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment; and
 - e. Seeding and mulching shall be done in stages on cut and fill slopes that are greater than 20 ft in height, measured along the slope, or greater than 2 ac in area, whichever is less.
4. All sedimentation- and erosion-control measures, throughout the project limits, must be cleaned out when half full with sediment to ensure proper function of the measures.
 5. The contractor will be required to submit a bridge demolition plan to the resident engineer and the bridge construction engineer for their approval. This plan must be sealed by a registered North Carolina professional engineer and must use demolition techniques that minimize the amount of debris that will enter the river. The plan should be reviewed by the Service prior to the approval and initiation of bridge removal.
 6. In order to avoid and minimize environmental impacts associated with this project, all standard procedures and measures, including the NCDOT's BMPs for construction and maintenance activities and TVA's Water Management Standard Conditions, will be strictly enforced during the project. Provisions to preclude contamination by toxic substances during the project will also be strictly enforced.
 7. The NCDOT's Project Development and Environmental Analysis Branch and the Service will be invited to the preconstruction conference to discuss with the contractor the provisions of this Opinion. Prior to construction the contractor will be required to give notification of the construction initiation date to the Service, NCWRC, and TVA.

Monitoring

1. The NCDOT will monitor fish and benthic macroinvertebrates at nine locations along the project corridor. These data will help detect differences in the two fauna communities above and below the project and will provide information on possible effects on the communities due to project construction. Baseline data have been gathered and will be compared to data collected after project completion (Table 4).
2. A DWQ Assessment Field Data Sheet will be completed at each biological monitoring site. This assessment tool provides an evaluation of physical stream-habitat parameters, such as bank stability, substrate embeddedness, sediment loads, and habitat complexity. These factors are important in determining the overall

Table 4. The NCDOT's Fish Community and Benthic Macroinvertebrate Sample Locations.

Stream	Location	Project Section	Collection Date(s)
California Creek	above US 19 at SR 1608	R-2518A	5/06, 5/07*
	below US 19 at SR 1541		5/06, 5/07*
Bald Creek	near SR 1134	R-2518B	5/06
Price Creek	above US 19 at SR 1126	R-2518B	5/06
	below US 19 at SR 1454		5/06
Bald Creek	above and Below US 19E near SR 1128	R-2518B	Not sampled yet
Cane River	below US 19	R-2518B	5/06
Little Crabtree Creek	above and below US 19 at NC 80 (Micaville)	R-2519A	5/06, 5/07*
Long Branch	below US 19 at SR 1424	R-2519B	5/07
Big Crabtree Creek	below US 19	R-2519B	5/06
Brushy Creek	above and below US 19 at SR 1235	R-2519B	5/06
*A subset of sites was sampled more than once in order to evaluate between year variations in the fish communities.			

stability and health of a stream and its ability to support aquatic life. See Appendix D for data sheets and location maps.

3. The NCDOT will monitor the river channel and banks at the Cane River Bridge and the South Toe River Bridge sites upstream, at the construction sites, and downstream to determine changes in habitat resulting from activities at these sites. If any problems with regard to stream stability are detected during the monitoring, the NCDOT will correct the problems. This monitoring also will help evaluate the impacts of construction on habitat in the rivers.
4. Stream stability at culvert replacement and extension sites will be monitored visually during construction, through the assessment described previously at the biological monitoring sites, and at a final field inspection by the NCDOT and agency representatives before close out of the contract for a particular segment.

II. STATUS OF THE SPECIES AND ITS CRITICAL HABITAT

A. Species Description, Life History, and Critical Habitat Description

The Appalachian elktoe has a thin, but not fragile, kidney-shaped shell, reaching up to about 4.0 in in length. Juveniles generally have a yellowish-brown periostracum (outer shell surface), while the periostracum of the adults is usually dark brown to greenish-black in color. Although rays are prominent on some shells, particularly in the posterior portion of the shell, many individuals have only obscure greenish rays. The shell nacre (inside shell surface) is shiny, often white to bluish-white, changing to a salmon, pinkish, or brownish color in the central and beak cavity portions of the shell; some specimens may be marked with irregular brownish blotches.

The Appalachian elktoe has been reported from relatively shallow, medium-sized creeks and rivers with cool, clean, well-oxygenated, moderate- to fast-flowing water. The species is most often found in riffles, runs, and shallow flowing pools with stable, relatively silt-free, coarse sand and gravel substrate associated with cobble, boulders, and/or bedrock (Gordon 1991; Service 1994, 1996, 2002). Stability of the substrate appears to be critical to the Appalachian elktoe, and the species is seldom found in stream reaches with accumulations of silt or shifting sand, gravel, or cobble (Service 2002). Individual specimens that have been encountered in these areas are believed to have been scoured out of upstream areas during periods of heavy rain and have not been found on subsequent surveys (Service 2002).

Like other freshwater mussels, the Appalachian elktoe feeds by filtering food particles from the water column. The specific food habits of the species are unknown, but other freshwater mussels have been documented to feed on detritus (decaying organic matter), diatoms (various minute algae) and other algae and phytoplankton (microscopic floating aquatic plants), and zooplankton (microscopic floating aquatic animals). The reproductive cycle of the Appalachian elktoe is similar to that of other native freshwater mussels. Males release sperm into the water column, and the sperm are then taken in by the females through their siphons during feeding and respiration. The females retain the fertilized eggs in their gills until the larvae (glochidia) fully develop. The mussel glochidia are released into the water and, within a few days, must attach to the appropriate species of fish, which they then parasitize for a short time while they develop into juvenile mussels. They then detach from their fish host and sink to the stream bottom where they continue to develop, provided they land in a suitable substrate with the correct water conditions. The banded sculpin (*Cottus carolinae*) was identified as a host species for glochidia of the Appalachian elktoe at the time the elktoe was listed, and the mottled sculpin (*C. bairdi*) was identified as a host species soon after the listing (Service 2002). Dr. Jim Layzer (Tennessee Technological University, unpublished data) has recently identified eight additional species of fish that successfully transformed glochidia of the Appalachian elktoe into juveniles under laboratory condition. These eight species include the wounded darter (*Etheostoma vulneratum*), greenfin darter (*E. chlorobranchium*), greenside darter (*E. blenniodes*), river chub (*Nocomis micropogon*), northern hogsucker (*Hypentilum*

nigracans), central stoneroller (*Campostoma anomalum*), longnose dace (*Rhinichthys cataractae*), and rosyside dace (*Clinostomus funduloides*). The life span and many other aspects of the Appalachian elktoe's life history are currently unknown.

Critical habitat was designated for the Appalachian elktoe in 2002 (Service 2002). The areas designated as critical habitat for the Appalachian elktoe total 144.3 mi of various segments of rivers in North Carolina and one river in Tennessee. Critical habitat identifies specific areas that are essential to the conservation of a listed species and that may require special management considerations or protection. Section 7(a)(2) of the Act requires that each federal agency shall, in consultation with the Service, ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of an endangered or threatened species or result in the destruction or adverse modification of critical habitat.

The following constituent elements are part of the critical habitat designation and are essential to the conservation of the Appalachian elktoe:

1. Permanent, flowing, cool, clean water;
2. Geomorphically stable stream channels and banks;
3. Pool, riffle, and run sequences within the channel;
4. Stable sand, gravel, cobble, and boulder or bedrock substrates with no more than low amounts of fine sediment;
5. Moderate to high stream gradient;
6. Periodic natural flooding; and
7. Fish hosts, with adequate living, foraging, and spawning areas for them.

In the Nolichucky River basin, critical habitat is designated for the Appalachian elktoe in the main stem of the Nolichucky River, Cane River, Toe River, South Toe River, and North Toe River.

B. Status and Distribution

The Appalachian elktoe is known only from the mountain streams of western North Carolina and eastern Tennessee. Although the complete historical range of the Appalachian elktoe is unknown, available information suggests that the species once lived in the majority of the rivers and larger creeks of the upper Tennessee River system in North Carolina, with the possible exception of the Hiawassee and Watauga River systems (the species has not been recorded from either of these river systems). In Tennessee, the species is known only from its present range in the main stem of the Nolichucky River.

Currently, the Appalachian elktoe has a fragmented, relict distribution. The species survives in scattered pockets of suitable habitat in portions of the Little Tennessee River system, Pigeon River system, Mills River, and Little River in North Carolina and the Nolichucky River system in North Carolina and Tennessee.

Little Tennessee River Subbasin - In the Little Tennessee River system in North Carolina, populations survive in the reach of the main stem of the Little Tennessee River, between the city of Franklin and Fontana Reservoir, in Swain and Macon Counties (McGrath 1999; Service 1994, 1996, 2002), and in scattered reaches of the main stem of the Tuckasegee River in Jackson and Swain Counties (McGrath 1998; Tim Savidge, NCDOT, personal communication, 2001; Service 2002), from below the town of Cullowhee downstream to Bryson City. Monitoring by the NCWRC of the Appalachian elktoe population in the Little Tennessee River over the last couple of years has revealed that the population is experiencing a significant decline. A single live individual and one shell were recorded in 2000 from the Cheoah River, below Santeetlah Lake, in Graham County (Service 2002). Biologists with the NCDOT, U.S. Forest Service, and the Service have recorded up to 11 live Appalachian elktoe specimens from the Cheoah River, below the Santeetlah Dam, during surveys of portions of the river in 2002, 2003, 2004, and 2005.

French Broad River Subbasin - In the Pigeon River system in North Carolina, a small population of the Appalachian elktoe occurs in small scattered sites in the West Fork Pigeon River and in the main stem of the Pigeon River, above Canton, in Haywood County (McGrath 1999, Service 2002). The Little River (upper French Broad River system) population of the species, in Transylvania County, North Carolina (Service 2002), is restricted to small scattered pockets of suitable habitat downstream of Cascade Lake. In the Mills River, Henderson County, North Carolina, the Appalachian elktoe occurs in a short reach of the river, from just above the Highway 280 bridge (Savidge, Catena Group, personal communication, 2003) to about 1 mi below the bridge (Jeff Simmons, NCWRC, personal communication, 2004). In addition, NCWRC biologists have recently discovered a few individuals of the species at a site in the main stem of the French Broad River, below the mouth of the Little River (Steve Fraley, NCWRC, personal communication, 2005).

Nolichucky River Subbasin - In the Nolichucky River system, the Appalachian elktoe survives in scattered areas of suitable habitat in the Toe River, Yancey and Mitchell Counties, North Carolina (McGrath 1996, 1999; Service 1994, 1996); the Cane River, Yancey County, North Carolina (McGrath 1997; Service 1994, 1996); and the main stem of the Nolichucky River, Yancey and Mitchell Counties, North Carolina, extending downstream to the vicinity of Erwin, Unicoi County, Tennessee (Service 1994, 1996, 2002). A cooperative and comprehensive mussel survey effort was undertaken between 2000 and 2003 by the NCWRC, NCDOT, NCNHP, and Service throughout the upper Nolichucky River system in Yancey, Mitchell, and Avery Counties, North Carolina. Given that many areas in the Nolichucky River system had not been surveyed since the 1990s, the primary goal for these surveys was a

reassessment of the Appalachian elktoe's population status. The survey efforts indicate that suitable habitat within at least 73 mi of stream in the Nolichucky River system is presently occupied by the Appalachian elktoe, an apparent 15-mi increase from reported occupied habitat prior to 2000 (Fraley and Simmons 2004). These surveys also indicate that this population appears to be growing in numbers as well. Sites where mussels were found during 2000 and 2003 produced higher catch per unit efforts than the nearest sites sampled prior to 2000 (Fraley and Simmons 2004). However, the available habitat in the basin is a limiting factor; therefore, the Appalachian elktoe is not evenly dispersed throughout the 15-mi increase in the basin.

During August and September of 2004, significant flooding from Hurricanes Frances and Ivan occurred in the Nolichucky River drainage. The NCWRC surveyed sites in the Nolichucky River drainage for federally listed and state-listed mussels after the hurricanes and compared the results to survey results prior to the hurricanes. As stated previously, based on the results in 2000 and 2003, prior to the 2004 floods, Appalachian elktoe populations in the Nolichucky basin were found to be increasing in abundance and expanding their range. The 2004 flooding resulted in stream-bank erosion and stream-channel scour in several areas in the upper Nolichucky River system, significantly reducing the species' numbers and distribution at several sites throughout this river system (Fraley and Simmons 2006). Fraley and Simmons (2006) reported decreases in numbers of the Appalachian elktoe at nearly all of the sites they surveyed. They also reported that they failed to detect the Appalachian elktoe in the Cane and South Toe Rivers at sites that represented the upstream limit of their distribution prior to the flooding; however, they noted that only a single individual had been found at each of these sites during previous surveys and these individuals may have been lost or may have not been detected during surveys after the flooding. Currently, the Nolichucky population appears to be a relatively large (at least in terms of spatial distribution) metapopulation that is more or less contiguous, with at least the opportunity for some level of gene flow throughout the basin (Fraley and Simmons 2006).

Extirpated Sites - Historically, the Appalachian elktoe has been recorded from Tulula Creek (Tennessee River drainage), the main stem of the French Broad River at Asheville, and the Swannanoa River (French Broad River system) (Clarke 1981), but it has apparently been eliminated (except from a small section of the main stem of the French Broad River at the confluence of the Little River) from these streams (Service 1994, 1996). There is also a historical record of the Appalachian elktoe from the North Fork Holston River in Tennessee (S. S. Haldeman collection); however, this record is believed to represent a mislabeled locality (Gordon 1991). If the historical record for the species in the North Fork Holston River is accurate, the species has apparently been eliminated from this river as well.

Available information indicates that several factors have contributed to the decline and loss of populations of the Appalachian elktoe and threaten the remaining populations. These factors include pollutants in wastewater discharges (sewage treatment plants and industrial discharges); habitat loss and alteration associated with impoundments,

channelization, and dredging operations; and the runoff of silt, fertilizers, pesticides, and other pollutants from land-disturbing activities that were implemented without adequate measures to control erosion and/or storm water (Service 1994, 1996). Mussels are known to be sensitive to numerous pollutants, including, but not limited to, a wide variety of heavy metals, high concentrations of nutrients, ammonia, and chlorine—pollutants commonly found in many domestic and industrial effluents (Havlik and Marking 1987). In the early 1900s, Ortmann (1909) noted that the disappearance of unionids (mussels) is the first and most reliable indicator of stream pollution. Keller and Zam (1991) concluded that mussels are more sensitive to metals than commonly tested fish and aquatic insects. The life cycle of native mussels makes the reproductive stages especially vulnerable to pesticides and other pollutants (Fuller 1974, Gardner et al. 1976, Ingram 1957, Stein 1971). Effluent from sewage treatment facilities can be a significant source of pollution that can severely affect the diversity and abundance of aquatic mollusks. The toxicity of chlorinated sewage effluents to aquatic life is well-documented (Bellanca and Bailey 1977, Brungs 1976, Goudreau et al. 1988, Tsai 1975), and mussel glochidia (larvae) rank among the most sensitive invertebrates in their tolerance of the toxicants present in sewage effluents (Goudreau et al. 1988). Goudreau et al. (1988) found that the recovery of mussel populations may not occur for up to 2 mi below the discharge points of chlorinated sewage effluent.

Land-clearing and -disturbance activities carried out without proper sedimentation and storm-water control pose a significant threat to the Appalachian elktoe and other freshwater mussels. Mussels are sedentary and are not able to move long distances to more suitable areas in response to heavy silt loads. Natural sedimentation resulting from seasonal storm events probably does not significantly affect mussels, but human activities often create excessively heavy silt loads that can have severe effects on mussels and other aquatic organisms. Siltation has been documented to adversely affect native freshwater mussels, both directly and indirectly (Aldridge et al. 1987, Ellis 1936, Kat 1982, Marking and Bills 1979). Siltation degrades water and substrate quality, limiting the available habitat for freshwater mussels (and their fish hosts), thereby limiting their distribution and potential for the expansion and maintenance of their populations; irritates and clogs the gills of filter-feeding mussels, resulting in reduced feeding and respiration; smothers mussels if sufficient accumulation occurs; and increases the potential exposure of the mussels to other pollutants. Ellis (1936) found that less than 1 in of sediment deposition caused high mortality in most mussel species. Sediment accumulations that are less than lethal to adults may adversely affect or prevent the recruitment of juvenile mussels into the population. Also, sediment loading in rivers and streams during periods of high discharge is abrasive to mussel shells. Erosion of the outer shell allows acids to reach and corrode underlying layers that are composed primarily of calcium, which dissolves under acid conditions (Harman 1974).

The effects of impoundments on mussels are also well-documented. For the most part, lakes do not occur naturally in western North Carolina and eastern Tennessee (most of them are man-made); and the Appalachian elktoe, like the majority of our other native mussels, fish, and other aquatic species in these areas, is adapted to stream conditions

(flowing, highly oxygenated water and coarse sand and gravel bottoms). Dams change the habitat from flowing to still water. Water depth increases, flow decreases, and silt accumulates on the bottom (Williams et al. 1992), altering the quality and stability of the remaining stream reaches by affecting water flow regimes, velocities, temperature, and chemistry. Cold water released from near the bottom of reservoirs lowers the water temperature downstream, changing downstream reaches from warm- or cool-water streams to cold-water streams, affecting their suitability for many native species that historically inhabited these stream reaches (Miller et al. 1984, Layzer et al. 1993). The effects of impoundments result in changes in fish communities (fish host species may be eliminated) (Brimm 1991) and in mussel communities (species requiring clean gravel and sand substrates are eliminated) (Bates 1962). In addition, dams result in the fragmentation and isolation of populations of species and act as effective barriers to the natural upstream and downstream expansion or recruitment of mussel and fish species.

The information available demonstrates that habitat deterioration resulting from sedimentation and pollution from numerous point and nonpoint sources, when combined with the effects of other factors (including habitat destruction, alteration, and fragmentation resulting from impoundments, channelization projects, etc.), has played a significant role in the decline of the Appalachian elktoe. We believe this is particularly true of the extirpation of the Appalachian elktoe from the Swannanoa River, most of the French Broad River, and long reaches of the Pigeon, upper Little River, and upper Little Tennessee River systems. We believe these factors also have contributed to the extirpation of the species from parts of the upper Tuckasegee River, Cheoah River, and Tulula Creek, though the effects of impoundments are believed to have played an even more significant role in the loss of the species in the upper reaches of these streams.

Immediate threats to the remaining populations of the Appalachian elktoe are associated with sedimentation and other pollutants (i.e., fertilizers, pesticides, heavy metals, oil, salts, organic wastes, etc.) from point and nonpoint sources, specifically from WWTPs. Much of the Nolichucky River in North Carolina contains heavy loads of sediment, primarily from past land-disturbing activities within its watershed, and suitable habitat for the Appalachian elktoe appears to be very limited in this river system. The species has not been found in the Nolichucky River system in substrates with accumulations of silt and shifting sand; it is restricted to small scattered pockets of stable, relatively clean, and gravelly substrates. The same is true of the other surviving populations of the species.

C. Analysis of the Species and Critical Habitat Likely to be Affected

Species - During the comprehensive mussel survey efforts mentioned previously, at least 73 mi of stream in the Nolichucky River system were found to be occupied by the Appalachian elktoe. Mussels were located immediately upstream of the Cane River Bridge on US 19 and in the footprint of the existing bridge over the South Toe on US 19. The highest catch per unit effort for the Appalachian elktoe during the comprehensive surveys in the basin was 16 per hour (total of 96 individuals); this occurred at a site in the South Toe River (Fraleay and Simmons 2004).

Appalachian elktoe densities vary, depending on the many factors that cause their distribution pattern to be scattered and difficult to generalize. Based on surveys for the Appalachian elktoe from other drainages, the number below the substrate surface is highly variable and dependent on the substrate. In general, mussels can be very difficult to locate in the substrate, and most mussel surveys detect only those specimens located at or on the surface of the substrate. It is likely that additional mussels were present in the survey areas but were overlooked or were not visible on the surface of the stream bottom. It is also likely that fewer mussels are currently present at the survey sites because of impacts from the 2004 hurricanes. Therefore, accurate estimates of the total number of Appalachian elktoes that will be impacted (both above and below the surface of the stream bottom) are not possible, but the numbers are likely different from those recorded during the surveys.

Critical Habitat – In the Nolichucky River basin, designated critical habitat (Unit 6) includes 3.7 mi of the main stem of the North Toe River, Yancey and Mitchell Counties, North Carolina, from the confluence with Big Crabtree Creek, downstream to the confluence of the South Toe River; 14.1 mi of the main stem of the South Toe River, Yancey County, North Carolina, from the SR 1152 crossing, downstream to its confluence with the North Toe River; 21.6 mi of the main stem of the Toe River, Yancey and Mitchell Counties, North Carolina, from the confluence of the North Toe River and South Toe River, downstream to the confluence of the Cane River; 16.5 mi of the main stem of the Cane River, Yancey County, North Carolina, from the SR 1381 crossing, downstream to its confluence with the Toe River; and 13.5 mi of the main stem of the Nolichucky River from the confluence of the Toe River and the Cane River in Yancey and Mitchell Counties, North Carolina, downstream to the US 23/19W crossing, southwest of Erwin, Unicoi County, Tennessee.

Given that the Appalachian elktoe occurs within the area of the Cane River Bridge and the South Toe River Bridge and throughout the area of the highway widening in the Nolichucky River basin, it follows that the constituent elements necessary for critical habitat are present within the project area. Following is a brief description of the status of the constituent elements within the project area:

1. Permanent, flowing, cool, clean water - There is variation in stream flow within critical habitat; however, there is always permanent flowing water. Based on the DWQ's bioassessments of benthic macroinvertebrate and fish sampling, the water appears to be cool and clean enough to sustain a population of the Appalachian elktoe.
2. Geomorphically stable stream channels and banks - Overall, the stream channels and banks are stable in the project area, although there are unstable areas on some river reaches
3. Pool, riffle, and run sequences within the channel - The Cane River, Toe River, and North Toe River have natural pool, riffle, and run sequences, varied by the local

stream gradient and bedrock influence. There is a natural pool, riffle, and run sequence at the sites of the Cane River Bridge and the South Toe River Bridge and over the total project area.

4. Stable sand, gravel, cobble, and boulder or bedrock substrates with no more than low amounts of fine sediment - The habitat within the project area at the South Toe Bridge site consists of large cobble with some exposed bedrock and small patches of gravel and coarse sand providing microhabitat for the Appalachian elktoe. The Cane River crossing has poor habitat, consisting primarily of fine sediments directly under the bridge. Habitat within the project area for the highway widening is patchy, with some areas having more fine sediments than others.
5. Moderate to high stream gradient - The Cane River, Toe River, and North Toe River are characterized as having a high stream gradient. Some portions of these reaches in the alluvial floodplain have some moderate stream gradient, but nowhere can the stream be characterized as having a low gradient.
6. Periodic natural flooding - Natural peak events occur throughout the Nolichucky River basin.
7. Fish hosts, with adequate living, foraging, and spawning areas for them - Recent sampling by the NCWRC and TVA identified fairly diverse fish communities, including many of the potential host fishes for the Appalachian elktoe in the Cane River, Toe River, and North Toe River.

III. ENVIRONMENTAL BASELINE

Under section 7(a)(2) of the Act, when considering the “effects of the action” on federally listed species, we are required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all federal, state, or private actions and other activities in the action area (50 CFR 402.02), including federal actions in the area that have already undergone section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline for this Opinion considers all projects approved prior to the initiation of formal consultation.

A. Status of the Species within the Action Area

Surveys occurring between 2000 and 2003 indicated that suitable habitat within at least 73 mi of stream in the Nolichucky River system were occupied by the Appalachian elktoe; an apparent 15-mi increase from reported occupied habitat prior to 2000 (Fraley and Simmons 2004). These surveys also suggest that the population was growing in numbers because sites occupied during surveys in 2000 and 2003 produced higher catch per unit efforts than the nearest sites sampled prior to 2000 (Fraley and Simmons 2004). The Appalachian elktoe is not evenly dispersed throughout the 73-mi range

within the basin because contiguous suitable habitat is a limiting factor. The NCWRC's sampling efforts after the floods of 2004 indicate that the flooding had a significant negative impact on the existing population; however, though apparently fewer in number, elktoe specimens were found throughout most of the occupied range known in 2003.

In addition to the NCWRC sampling conducted after the flooding, another set of sites was surveyed in 2005 (TCG 2006) to determine the presence of the Appalachian elktoe at specific sites where flood recovery work was proposed by the Natural Resources Conservation Service (NRCS). This set of surveys located elktoe specimens at a number of sites in the Cane, North Toe, and South Toe Rivers. Although these surveys were not as comprehensive as those conducted in 2003, they do indicate that the Appalachian elktoe was present at a number of specific sites in the year after the flooding.

The constituent elements necessary for critical habitat are present within the project area and could be affected by project construction and related activities. The following is a list of the constituent elements that may be impacted by the project:

1. Permanent, flowing, cool, clean water - There could be increases in the amount of sediment and other pollutants that enter the rivers from construction activities and the demolition of the South Toe River Bridge. There also may be impacts from the project after construction, including increases in the total discharge and pollutant loading from roadway runoff and increases in sediments from destabilized tributary channels after culvert extension or replacement.
2. Geomorphically stable stream channels and banks - The river channels will be temporarily impacted during the construction process at the bridge sites.
3. Pool, riffle, and run sequences within the channel - Tributaries that are impacted from the highway widening may be destabilized and impact the rivers downstream. The flow of the rivers could change while the temporary causeways are in place.
4. Stable sand, gravel, cobble, and boulder or bedrock substrates with no more than low amounts of fine sediment - As stated previously, the amount of sediment could increase during the construction period from the highway widening, bridge construction and demolition, and culvert extensions or replacements on tributaries.

B. Factors Affecting the Species' Environment in the Action Area

Some residential development and agricultural practices have impacted the aquatic habitat in the action area, particularly the riparian habitat. Because riparian areas have been cleared of trees and other woody vegetation and rock has been placed on the riverbanks, high-water events have resulted in bank erosion and failure at several areas in the Nolichucky River basin. The deforested and fragmented riparian buffer also reduces the effectiveness of the buffer to filter sediments and chemical pollutants. In

addition, Japanese knotweed has invaded riparian areas and essentially eliminated native deeper-rooted vegetation, creating riparian instability, particularly during high flows.

Two bridges along the Toe River--B-2081 and B-3089--have been replaced within the last 10 years. No mussels were discovered within the impact area of these bridges, and critical habitat was not designated at that time. During August and September of 2004, significant flooding occurred in the Nolichucky River drainage. The NRCS proposed the implementation of the Emergency Watershed Protection (EWP) Program to restore areas impacted by the flooding. In December 2005, a biological opinion was issued to the NRCS for implementation of the EWP Program. That biological opinion assessed the direct and indirect impacts to 3,325 lf of stream within the Nolichucky River basin and any additional indirect impacts to 1,312 ft downstream of each of the 18 individual restoration project "footprints." Other federal actions include two bridge replacements on the Toe River—B-1443 and B-2848--that are currently under construction. Formal consultation was completed for these projects in 2006. The biological opinion assessed impacts from the construction and demolition of the two bridges and permanent impacts to 89 ft² of river habitat. Mussels were relocated out of the footprint of the two construction sites. We do not have information concerning any additional federal actions ongoing or proposed for the action area at the present time.

IV. EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. The federal agency is responsible for analyzing these effects. The effects of the proposed action are added to the environmental baseline to determine the future baseline, which serves as the basis for the determination in this Opinion. Should the effects of the federal action result in a situation that would jeopardize the continued existence of the species, we may propose reasonable and prudent alternatives that the federal agency can take to avoid a violation of section 7(a)(2). The discussion that follows is our evaluation of the anticipated direct and indirect effects of the highway widening, the addition of a new bridge over the Cane River, and the replacement of the bridge over the South Toe River. Indirect effects are those caused by the proposed action that occur later in time but are still reasonably certain to occur (50 CFR 402.02).

A. Factors to be Considered

Proximity of the Action – Based on the 2002 mussel survey conducted by the NCDOT and subsequent surveys in 2004 and 2005 by the NCWRC and others, Appalachian elktoe mussels occur throughout the Cane, North Toe, and South Toe Rivers, downstream of the highway widening and in the vicinity of the existing bridges where construction will occur. Although measures to avoid and minimize impacts to the rivers and the Appalachian elktoe are included in the project plans, implementation of

the bridge projects and the highway widening will result in unavoidable impacts to the river habitat and to individual mussels.

Nature of the Effect – Permanent impacts to 108 tributaries from culvert extensions will occur along the 21 mi of highway widening within the Nolichucky River basin, with some impacts likely reaching the main stem of the Toe and Cane Rivers. Additionally, there will be impacts to the continuity of aquatic habitat in the project area from these culvert extensions.

About 50 ft² of in-stream habitat will be impacted permanently at the Cane River crossing by placing one pier at the wetted perimeter of the river. Temporary impacts of 700 ft² and 9,600 ft² will occur at the Cane and South Toe river crossings, respectively. Suitable in-stream habitat at both construction sites also will be affected for the duration of the construction and demolition and likely for some period after completion of the projects. Portions of the habitat may be impacted permanently by the construction and use of the causeways. A small portion of the riparian area at both sites may be cleared for equipment access, which could result in temporary increases in water temperature at each location until reforestation can occur.

Disturbance Duration, Frequency, and Intensity – The highway widening will create disturbance to tributaries and downstream resources that will be ongoing in different segments of the project for years. With appropriate sediment- and erosion-control measures, large inputs of sediment should be avoided during construction. After the project is completed and the roadway opens to traffic, there will be increases in storm-water runoff volume and pollutants, some of which may reach areas occupied by and designated as critical habitat for the Appalachian elktoe.

Disturbance to the riverbed from bridge construction will occur over a relatively short period of time from the construction of the bridge piers at the Cane River crossing. However, the disturbance to the river's flow pattern at the piers will exist throughout the life of the bridge. The causeways for construction and demolition will be in place for the length of time needed to construct and demolish the bridges; therefore, the disturbance to the riverbed associated with the causeways will be over an extended period of time. Although there will be direct impacts to the riverbed associated with the causeways, the construction of the causeways will be phased to limit the amount of causeway in the river at any one time, and only the causeways needed for an activity will be in place during that activity and will be removed when the action is completed. The causeways will be constructed with clean stone and pipes so that the river can flow through, not just over, the causeways. However, there will be temporary impacts to the hydrology of the river both upstream and downstream of the causeways.

B. Analyses of Effects of the Action

Potential Beneficial Effects - The construction and demolition of the existing bridges and the highway widening have negative impacts but also have some long-term beneficial effects, primarily because of the opportunity to change or augment structures

and designs to correct existing problems and minimize impacts to the environment. Specifically, the NCDOT has described the following beneficial effects that could result from these projects:

1. *Reduction of direct storm-water runoff at bridge locations.* Storm water from the existing bridges enters the river directly from the bridge decks. The new bridges will collect and direct storm water to the ends of the bridges and discharge the deck drainage into vegetated buffers before entering the river. Storm water coming off the approaching roadways at the bridge locations will be managed in a similar manner. The elimination of direct roadway discharge into the Cane and South Toe Rivers should result in localized improvement of water quality and potentially have some beneficial effect on the Appalachian elktoe. Additionally, hazardous spill catch basins will be constructed at the crossings to further provide protection for the rivers from possible future hazardous spills.
2. *Elimination of bents in the main river channel.* The existing crossing of the South Toe River has three sets of double piers in the river channel that will be eliminated with a new spanning structure. The elimination of these piers in the South Toe River is expected to reduce the bridge's effects on stream-flow patterns at this bridge site.
3. *Japanese knotweed control.* The NCDOT has committed to control Japanese knotweed at the two bridge construction sites and at other identified locations throughout the highway-widening project. Soil contaminated with the plant material will be removed and buried on-site to prevent spread to other areas, and areas occupied by the plant may be treated with appropriate herbicides.
4. *Replacing the existing culvert over Bald Creek with a bridge.* An existing box culvert on Bald Creek will be replaced with a bridge. The creek will be able to follow a more natural valley course and will be able to reestablish access to its floodplain when it is removed from the current culvert. This will restore connectivity and function in this reach of Bald Creek.
5. *On-site stream restoration.* The majority of the existing highway follows valley bottoms, where tributaries to the Cane and Toe Rivers have been moved and channelized and have little or no riparian buffer. As described previously in the "Conservation Measures" section, the NCDOT identified over 11,000 lf of on-site stream preservation, enhancement, and restoration that will be implemented in the Nolichucky River basin (see Appendix E). In addition to meeting regulatory requirements to mitigate unavoidable stream impacts, on-site mitigation provides an opportunity to improve these tributaries to the Cane and Toe Rivers, thereby improving water quality and habitat stability in the watershed.

Direct Effects - Actions associated with bridge replacement that may result in direct impacts include the installation of causeways for the construction of new structures and the demolition of an existing structure, land clearing for access, potential toxic spills,

removal of causeways after construction, and demolition of the existing bridge structure at the South Toe River. Actions associated with highway widening that may result in direct impacts include the replacement or lengthening of culverts on tributaries and increases in impervious surfaces and storm-water runoff along the highway widening. All of these activities have the potential to kill or injure mussels, either by crushing them; poisoning them with the release of some toxic substance; or causing siltation, which may suffocate them and/or destroy suitable habitat or their fish hosts. These actions may result in direct harm to individuals or negative changes in currently suitable habitat.

The following impacts section is separated into two discussions--(1) the impacts from bridge construction and demolition at the occupied river sites and (2) the impacts from the highway widening.

BRIDGE CONSTRUCTION AT THE CANE AND SOUTH TOE RIVERS

Substrate Disturbance and/or Habitat Loss

The existing bridge on US 19E over the Cane River (Bridge No. 9) will be widened during project construction. Widening the bridge involves constructing an adjacent structure to the north (downstream) of the existing bridge. The piers for the new bridge line up with the existing piers to reduce scour around the piers from accumulated debris. The east interior bent is currently on the bank. For bent construction, a stone work pad would be necessary but would not be installed in the river. The west interior bent is approximately 10 ft out in the river. The distance between the bank and the new west interior bent becomes smaller downstream of the existing bridge. A small causeway will be needed to construct the west interior bent. Temporary impacts to the streambed for this causeway are approximately 500 ft². A total of four drilled piers with 4-foot-diameter shafts would be needed for the new adjacent structure. The total direct impact to the streambed is 50 ft² for the four shafts.

The current proposal is to set the new bridge girders in place from the bank. If the girders cannot be set from the bank, a work bridge will be necessary. The streambed impacts from a work bridge would be temporary. A conservative estimate of streambed impact would be 5 ft by 20 ft (100 ft²) per bridge foundation. Two foundations would be needed for the work bridge. Total streambed impacts for the work bridge foundations would be 200 ft².

The proposed structure will result in 50 ft² of permanent impacts to the streambed as a result of bent placement in the river. Additionally, 500 ft² of streambed will be impacted by a causeway needed to construct the west interior bent, and 200 ft² of streambed will be impacted by the work bridge foundations.

The existing US 19E Bridge over the South Toe River (Bridge No. 43) is proposed to be replaced with a new dual structure on similar alignment, 40 ft south of the existing

structure. The US 19E South Toe Bridge preliminary design for R-2519B is proposed to span the river with a simple span plate girder bridge with a main span of 170 ft.

Based on current information, a total of five causeways are proposed for construction of the South Toe River Bridge. Two 40- by 60-foot causeways will be needed for placing the temporary bents in the water. Two 30- by 50-foot causeways are recommended for placing the girders. One 30- by 60-foot causeway will be needed for removing the existing bent. The total temporary impacts would be 9,600 ft², which is a worst-case scenario. Further details regarding removal of the existing Bridge No. 43 will be developed in coordination with the Corps, NCWRC, DWQ, and Service. It is assumed in this impact analysis that the bridge will be removed in a manner that will prevent debris from the bridge from entering the river.

Impacts from Sedimentation

Because of the topography and the erodible nature of the soils in the area adjacent to the bridge projects (fine loamy soils with moderate erodibility), project construction has the potential to result in some sedimentation in the Cane and South Toe Rivers. The amount of sedimentation will be minimized by the implementation and maintenance of specific erosion-control measures for these projects, designed to protect environmentally sensitive areas. The placement and removal of causeway stone will create some turbidity from disturbance of the channel bed, but the impacts will be negligible. The clearing of vegetation on the riverbanks will be minimized, and erosion-control measures will remain in place until vegetation is reestablished.

Impacts from Roadway Runoff

Direct highway ditch discharge will be eliminated at the two new bridges. Discharge will be routed through the spill basins or through a grass-lined ditch prior to reaching the respective rivers. This will reduce roadway runoff into the Cane River and South Toe River. The elimination/reduction of runoff to the rivers is expected to result in a decrease of daily pollutant loads in the receiving water. This may result in localized improvements to water quality and thus have a beneficial effect on the Appalachian elktoe or a reduction of the likely adverse effects. Upon completion of the combined projects, there will be a reduction in the amount of roadway runoff directly entering the Cane River and South Toe River at these respective crossings as a result of storm-water management and the elimination of direct discharge.

Impacts from Changes in Hydrology

The temporary causeways proposed at both bridge sites will narrow the channel and alter hydrology, resulting in localized changes in flow patterns at the respective sites. The change in hydrology and any associated scour could result in the loss or displacement of mussels. However, the change in hydrology will be temporary, during the life of the respective causeways, and the design of the causeways (allowing for flow through the causeways) should minimize the impacts to hydrology and associated

impacts. The NCDOT will monitor the riverbed and stream-bank stability before, during, and after construction at both bridge sites. If any problems with regard to stream stability are detected during the monitoring, the NCDOT will correct the problems.

The NCDOT will monitor river conditions at both bridge sites before and after the construction to document any negative changes to the stream cross section because of construction. In particular, at the Cane River crossing, if there are negative changes in river geomorphology related to the new bridge, the NCDOT will take appropriate steps to protect the mussel populations near the bridge. This may include placing other structures in the water to redirect the flow. The need for any in-stream structures will be determined through monitoring but may include cross vanes or other appropriate devices.

Impacts to Fish Hosts

In addition to the potential changes in hydrology as a result of the causeways, there is the potential for the causeways to act as velocity barriers to fish movement. The disruption of fish movement could impact the Appalachian elktoe if fish hosts for the elktoe are unable to move freely in the rivers. These temporary disruptions to fish movement may cause some loss in recruitment to upstream or downstream areas for the time the causeways are in place. The following design factors should reduce the impacts to fish movement: the causeways will be temporary structures in the river, at least 50% of the channel will be unrestricted by the causeways at any given time, and the causeways are designed to allow for linear flow. Given these design features, the causeways are not expected to have a significant long-term impact on fish movement or the life cycle or distribution of the Appalachian elktoe in the Cane or South Toe Rivers.

HIGHWAY WIDENING

Impacts to Tributaries in the Nolichucky River Basin

The primary impacts to tributaries will be through culvert extension and/or increasing diameter and may include stream destabilization and fragmentation of aquatic habitat. To accommodate the highway widening, existing tributaries crossed by a culvert will have the current culvert extended by adding to the existing structure or the culvert will be removed and replaced with a new, longer culvert. Some culverts will be replaced with structures that also have greater capacity. Culverts will be extended to approximately triple their current length. For example, if the stream crosses under the road perpendicular to the road alignment, a culvert will be extended from about 50 ft to 150 ft in length. This accounts for two additional lanes, a grassed median, and paved shoulders. The additional culvert lengths will be greater in situations where they must be placed at a skew to the road. These culvert extensions and/or increased diameters could significantly impact the stability of the tributaries and cause erosion, increased sediment, and downstream habitat degradation.

Increases in storm-water inputs to tributaries from the road surface and shoulders also can concentrate and convey chemical pollutants directly into larger streams. With the increased amount of paved surface, chemical pollutants (including a variety of metals, petroleum substances, and winter deicing chemicals) will increase. Concentrations of metals in stream sediments are positively related to the volume of traffic and accumulate in proportion to the length of highway drained, suggesting that pollution will be most severe when large highways are drained by small streams (Wheeler et al. 2005). In addition to changes in sediment and chemical loads, smaller tributaries, especially those on steeper gradients, will be fragmented (for some species) by longer culvert lengths. This aquatic fragmentation can change sediment inputs over time, isolate aquatic populations, and greatly decrease downstream habitat quality.

There are 108 tributaries to the Cane, South Toe, and North Toe Rivers that will be impacted by this project. The impacts vary in length from a 10-foot tail ditch to a 750-foot-long concrete box culvert. Forty-one percent of the impact area occurs within 1 mi of either the Cane River or the South Toe River, and seventy-seven percent of the impact area occurs within 3 mi or less of the Cane, South Toe and North Toe Rivers.

Cane River -There are 42 stream-impact sites within the Cane River subbasin. Bald Creek is the major tributary west of the project crossing of the Cane River, and Pine Swamp Branch is the major tributary on the east side of the project crossing of the river. The roadway corridor follows the valley formed by these two streams and crosses the streams multiple times, including 20 tributaries to Bald Creek and 3 tributaries to Pine Swamp Branch. Price Creek, Phipps Creek, and an unnamed tributary to the Cane River also are crossed.

Of the 42 tributaries crossed, 20 of the impact sites are within a mile of the Cane River. The majority of these crossings are small unnamed tributaries to Bald and Price's Creeks. Given the size of the streams and length of the culvert extensions, it is likely that the upstream and downstream portions of these tributaries will be effectively fragmented from each other. Thirty-eight of the tributary crossings are 3 mi or less from the Cane River. The total length of culvert extension impacts to tributaries within 3 mi of the Cane River is over 5,000 lf.

South Toe River - There are 48 tributary impact sites in the R-2519A and B sections of the proposed action that occur within the South Toe River subbasin. Little Crabtree Creek is the major tributary to the South Toe River, arising approximately 7.5 mi west of the South Toe River in Burnsville. Little Crabtree Creek flows through the town of Burnsville. Roadway plans for this urban section are curb-and-gutter, currently designed without storm-water treatment. Of the 48 tributaries impacted by these sections of the project, 24 sites are within a mile of the South Toe River. Thirty-six of the tributary crossings are 3 mi or less from the South Toe. The total length of culvert extension impacts to tributaries within 3 mi of the South Toe is over 6,200 lf.

North Toe River - The North Toe River is not crossed by the proposed action; however, a total of 18 stream segments within the North Toe River subbasin will be impacted

based on the preliminary design plans for the preferred alternative for this action. Of the tributaries affected by the project, three are crossed within 3 mi of the North Toe River. There are a number of North Toe tributary crossings affected by the project, but they are farther away from the main-stem river because of the existing road position in the valley.

Of particular concern are the project's impacts to Big Crabtree Creek and its tributaries. Big Crabtree Creek is very important to the North Toe River and the Appalachian elktoe because of its excellent water quality and relative lack of disturbance from the headwaters to the North Toe. Big Crabtree Creek is eligible for "Outstanding Resource Water" designation. This large, high-quality tributary drains a large area and provides suitable habitat for the Appalachian elktoe. At its confluence with the North Toe, it is designated critical habitat for the elktoe. The North Toe is occupied by the elktoe upstream and downstream of the confluence with Big Crabtree Creek, and the occupied range of the elktoe has expanded in this river reach over the last decade. The four-barrel box culvert that carries Big Crabtree Creek under US 19 has created overwidening of the channel upstream and scour downstream of the crossing.

The majority of these tributaries currently are impacted by the existing highway. The NCDOT has committed to culvert design and installation that will maintain stream stability and fish passage and correct existing problems, such as perched culverts and barriers to aquatic passage. Even with the careful design and installation of new culverts and culvert extensions, this project will result in negative impacts to overall aquatic function and connectivity in the watershed.

Impervious Surfaces and Roadway Runoff

According to the numbers provided in the BA, the new lanes of highway will create an additional 88.6 ac of impervious surface area in the Nolichucky River basin. This is about 4 ac of additional impervious surface per mile of road widening or roughly the equivalent of building a WalMart, including the parking area, along every mile of the roadway project. Without appropriate treatment for chemical and thermal pollutants and infiltration areas to absorb the additional volume, this added impervious surface area will have a negative impact on water quality and habitat in the Nolichucky River basin and on the Appalachian elktoe and its habitat. The NCDOT has designed this project with grass swales and other BMPs proven to treat storm water and remove significant percentages of sediment and other pollutants and provide for the infiltration and attenuation of runoff. With these measures in place, significant impacts to the Appalachian elktoe and its critical habitat are not expected.

Direct Impacts - Critical Habitat - There is a projected temporary loss of habitat from construction causeways at the South Toe River crossing that occurs in designated critical habitat (Unit 6). The 9,600 ft² of projected temporary impacts likely will be reduced as final construction and demolition plans are made. The projected temporary impact is very small compared to the total amount of habitat occurring in the 69.4 rm

comprising Unit 6. This temporary loss of habitat is not expected to significantly impact any of the primary constituent elements from the impacted river reach.

Project-related erosion and sedimentation coming from the multiple tributary crossings could potentially impact critical habitat in the Cane, South Toe, and North Toe Rivers. The potential for this type of impact decreases with increasing distance of the tributary from the receiving river. Erosion-control standards will be strictly enforced by the NCDOT to ensure that these potential impacts are minimal. The enforcement of the stringent erosion-control measures proposed for this project will minimize the potential for these impacts to occur.

Indirect Effects - Indirect effects are defined as those that are caused by the proposed action and are later in time but are still reasonably certain to occur (50 CFR 402.02). Indirect effects to the Appalachian elktoe may include a higher potential for toxic spills; highway widening effects on tributaries that lead to aquatic fragmentation or chronic instability and sedimentation; and changes in land use, induced development, and urbanization, including increases in impervious surface area in the watershed.

Potential for Toxic Spills

The current bridges on US 19 at the Cane and South Toe River crossings discharge deck drainage directly into the rivers and have no hazardous spill basins. The construction of new bridges at these locations will eliminate the direct discharge of bridge deck drainage to the Cane and South Toe Rivers, and hazardous spill basins will be constructed at both crossings. The elimination of direct discharge and the installation and proper use of hazardous spill basins in these locations will minimize the possibility of impacts from toxic spills to a level equal to or less than that which occurs with the current highway.

Tributaries

The negative effects of culverts on fish passage and stream geomorphology are well-documented (Baggett et al. 2001, Moser and Terra 1999, Carey and Wagner 1996, Formann et al. 2003). As previously described, many of the stream crossings along the project alignment are proposed to be extensions of existing structures. Although the design of the culverts incorporates measures that reduce the potential for impacts, many of these culverts will still act as barriers to some fish species, and some of the culverts will negatively impact stream geomorphology. The majority of the tributaries impacted do not support the Appalachian elktoe because they are too small, have too high a gradient, or have other habitat restrictions. However, all of the tributaries are important to overall aquatic ecosystem function. The smaller tributaries provide habitat for a number of important species not found in larger rivers and food sources and woody debris that support the larger streams and rivers. In addition, changes to the current structures in these tributaries can destabilize the streams, causing bed and bank erosion, adding to sediment in the receiving waters or over the longer term and permanently influencing sedimentation patterns and habitat quality. Appropriate design and

commitment to postconstruction monitoring and remediation will minimize future problems with stream stability. In addition, existing problems will be identified and corrected through implementation of the project.

Land Use

The 2004 Indirect and Cumulative Effects (ICE) analysis for this project (HNTB North Carolina 2004) identified a Potential Growth Impact Area (PGIA) of approximately 2.0 mi on either side of the existing roadway. Accounting for meanders and direction of flow (running parallel to the road), 10 mi of the Cane River, 6.5 mi of the South Toe River, and 3.5 mi of the North Toe River occur within the PGIA. The majority of the river reaches within the PGIA are occupied by the Appalachian elktoe. Additionally, the entire reach of the South Toe River in the PGIA is designated critical habitat, as well as 1.25 mi of the North Toe River and 0.25 mi of the Cane River.

The proposed project will improve access to future I-26 and I-40 and provide new construction and expansion opportunities for businesses. Highway-oriented commercial development is anticipated near the US 19 and future I-26 interchange (NCDOT 2001) as well as within or adjacent to Burnsville and Spruce Pine, where sewer and water services exist or are planned (NCDOT 2007). Although slight declines in the permanent population have occurred in the project study areas in recent years, additional new growth that is likely to occur may be related to second-home and retiree development and the associated tourism sectors of the economy as the number of new home starts has grown in recent years (NCDOT 2007).

Within the PGIA, areas with "High Potential for Impact" and "Medium Potential for Impact" are identified. The areas with the highest potential for impacts are at the western terminus of the project with I-26 in Madison County, within the Town of Burnsville, and at the eastern terminus of the US 19E widening in Spruce Pine. The 2007 ICE likewise recognized the western terminus of the project and the cities of Burnsville and Spruce Pine as having the highest potential for induced growth because these areas have, or are proposed to have, sewer and water service infrastructure. Development within unincorporated areas outside of these three identified areas is expected to continue at historic rates and patterns due to constraints associated with the lack of sewer and water services, steep topography, and other natural constraints (NCDOT 2007).

Yancey County experienced a 15.3% population growth from 1990 to 2000, compared to 3.2% from 1980 to 1990. Mitchell County experienced lower growth rates between these decades--0.1% from 1980 to 1990 to 8.6% from 1990 to 2000. The 16.2% growth rate of the demographic area studied in the 2004 ICE for this project is higher than the overall growth rates of the respective counties, suggesting that development patterns in these counties is largely occurring along the US 19/US 19E corridor. However, these growth rates are still less than the 21.4% statewide increase during the period from 1990 to 2000 (HNTB North Carolina 2004).

The difference in growth rate of Yancey County as compared to that of North Carolina appears to be due in part to distance from interstate highways and large metropolitan areas, the shortage of easily developable lands in the Appalachian region, and limited water and sewer services. However, development pressures do exist within this region. Tourism, an increasingly important part of the local economy, is assisting the market for second-home development. Regionally, the proposed improvements to US 19E, in combination with other area projects, will strengthen the link between the Asheville and Boone areas and will make the area more accessible to a greater number of tourists, enhance truck access to I-26 and I-40, and shorten the commute to metropolitan Asheville (NCDOT 2001).

Yancey County and the Town of Burnsville adopted a Land Development Plan in 2001. It directs intensive urban development away from environmentally sensitive areas and promotes cluster development adjacent to US 19/19E, where sewer and water services currently exist or are proposed and some development already exists (NCDOT 2007). Yancey County does not have a zoning ordinance but does implement a watershed water supply protection ordinance through its building permits and inspections office (NCDOT 2007). Despite the fact that a zoning ordinance is in place, local officials in Burnsville indicate that special permits and variances are commonly requested and granted (HNTB North Carolina 2004). There are no formal land-use plans in place for Mitchell County or the Town of Spruce Pine; however, Spruce Pine does have a zoning ordinance enforced by the Mitchell County Department of Inspections (NCDOT 2007).

Although existing land-use plans and zoning ordinances tend to discourage strip commercial development along the corridor (NCDOT 2007), some tourist-oriented businesses, which provide goods and services for through travelers, would likely locate along US 19E. The improved corridor would create better access and volume of business in addition to having water and sewer services available or proposed. This could result in linear sprawl, with its associated congestion and safety concerns. The use of medians with the proposed improvement should minimize this possibility (NCDOT 2001).

Recent development trends in Yancey County indicate that upscale residential communities of second homes and small-scale commercial uses (HNTB North Carolina 2004) are becoming more prevalent (NCDOT 2007). Additionally, the improved roadway may make commuting to areas outside the demographic area more attractive, bringing new permanent residents to the area. This effect diminishes from west to east as the distance from Asheville, the regions largest employment center, increases (NCDOT 2007). The amount of induced development will vary along the corridor but will most likely be greatest within areas that are currently, or proposed to be, serviced by water and sewer.

Substantial industrial development is not considered likely due to the steep topography of the area. Local officials, however, have stated that there are some available industrial sites and that “the communities have a desire to grow the manufacturing employment base” and are hopeful that the improved accessibility provided by the

widened roadway will encourage future development to locate in the area (HNTB North Carolina 2004). There are no known plans for any redevelopment of the closed industrial and manufacturing facilities or new plants for future manufacturing (NCDOT 2007).

Impacts from changes in land use can result in adverse impacts to the Appalachian elktoe and its designated critical habitat. The most likely induced land-use impact is small-scale residential community and commercial developments. Development activities can result in various adverse impacts to water quality, such as sedimentation/erosion while the sites are being developed, increased storm-water impacts from an overall increase in impervious surface area, and the potential for increases in point-source and nonpoint-source pollution as the population expands and the watershed is developed. Future residential developments and future businesses may propose new sites for wastewater discharge or tap into existing facilities, all of which would result in an increase in the amount of wastewater discharge into the watershed.

The land suitability development potential within the identified ICE study area was analyzed under: (1) existing conditions; (2) a No-Build scenario (R-2518/R-2519); (3) a Future-Build 1 scenario (R-2518/R-2519), along with water and sewer infrastructure improvements; and (4) a Future-Build 2 scenario (R-2518/R-2519), with a higher weighting factor for the proposed roadway improvements. The results of this model indicate that the potential for induced development in the ICE study area is primarily due to the expansion of water and sewer services, and the overall projected growth with the project build is only slightly higher than under a No-Build scenario (NCDOT 2007).

Impervious Surface Area

Impervious surface areas can result in adverse effects to water quality. Multiple studies have demonstrated that water quality and stream ecosystem degradation begins to occur when impervious surface area in a watershed begins to increase. The NCWRC recommendation for the management of protected aquatic species watersheds is to limit imperviousness to 6% of the watershed (NCWRC 2002).

Future development and associated future improvements in the respective watersheds within the project action area will result in an increase in impervious surface area in the form of rooftops, driveways, parking lots, etc. Land-development trends indicate that there was little change in the level of imperviousness, modeled at 5.1%, within the ICE study area from 1986 to 2001 (NCDOT 2007).

Further examination, using the 2001 land cover data of the three subbasins of concern to the Appalachian elktoe, was conducted by Earth Tech (Earth Tech 2007). The Earth Tech data are described, by subbasin, as follows:

“The North Toe River has 5.5 percent imperviousness. The North Toe subbasin contains 16,810 acres, of which 918 were impervious surface

acres. In order for the subbasin to reach six percent imperviousness an additional 91 acres of impervious surface would need to be built. Because of the coefficient or multiplier, this would be equivalent to 676 acres of low intensity residential, 311 acres of high intensity residential, or 186 acres of commercial/industrial land uses, or some combination thereof. The development of 676 acres of low intensity residential would represent a 41 percent increase over 2001 development levels. Likewise the 311 acres of high intensity residential would be a 93 percent increase and the 186 acres represents a 144 percent increase in commercial/industrial land uses.

“The South Toe subbasin contains 17,708 acres, of which 929 were calculated to be impervious surface acres (5.2 percent imperviousness). In order for the subbasin to reach six percent imperviousness an additional 134 acres of impervious surface would need to be built or the equivalent of 998 acres of low intensity residential, 459 acres of high intensity residential, or 275 acres of commercial/industrial land uses. The development of 998 acres of low intensity residential would represent a 53 percent increase over 2001 development levels. The 459 acres of high intensity residential would be a 180 percent increase and the 275 acres represents a 333 percent increase in commercial/industrial land uses.

“The Cane River subbasin contains 24,943 acres, of which 1,235 were impervious surface acres (4.9 percent imperviousness). In order for the subbasin to reach six percent imperviousness, an additional 263 acres of impervious surface would need to be built or the equivalent of 1,959 acres of low intensity residential, 902 acres of high intensity residential, or 539 acres of commercial/industrial land uses. The development of 1,959 acres of low intensity residential would represent a 91 percent increase over 2001 development levels. The 902 acres of high intensity residential would be a 435 percent increase and the 539 acres represents a 726 percent increase in commercial/industrial land uses.”

Based on this analysis, there will be changes in land use and a gradual increase in impervious surface area in the Nolichucky River basin over time. Growth is predicted to be in the areas already serviced by sewer and water; and while this project will induce some development, the contribution of the project is “slight” compared to the expansion of sewer and water services. Linear sprawl will be controlled somewhat by the use of medians along the corridor. Increases in impervious surface area in the watershed will occur, but the rate is expected to remain gradual.

Indirect Impacts - Critical Habitat - Indirect impacts to critical habitat for the Appalachian elktoe (Unit 6) resulting from the proposed action include possible water quality degradation from induced changes in land use in the form of residential and, to a lesser extent, commercial and industrial development projects induced by this project.

These water quality impacts may compromise the primary constituent element of “clean” water in localized areas within the Unit 6 but are not expected to be widespread.

The other primary constituent elements of the designated critical habitat within the action areas, including stable streams and the presence of fish host species, are not expected to be significantly compromised by any indirect impacts associated with the proposed project. The construction of the Cane River and South Toe River crossings is not expected to result in significant channel instability or habitat degradation over time. The careful design and installation of the various culvert and pipe crossings on tributaries will minimize the potential for channel instability, which could ultimately affect critical habitat downstream of the respective crossings in the Cane, South Toe, and North Toe Rivers. Monitoring and remediation at these sites will further reduce the likelihood of impacts to critical habitat. Likely fish host species for the Appalachian elktoe will not be eliminated from the action area as a result of project-related indirect impacts.

V. CUMULATIVE EFFECTS

Action Area

Cumulative effects include the combined effects of any future state, local, or private actions that are reasonably certain to occur within the action area covered in this Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

We are aware of several potential private actions that may occur and produce significant cumulative impacts. A proposed 40-unit affordable housing development is proposed on the north side of US 19E in Burnsville, near Mountain Heritage High School and near the confluence of the South and North Toe Rivers. In Mitchell County, just north of Spruce Pine, 2,000 to 5,000 ac within the North Toe River drainage area (owned by Penland Bailey Corporation) was sold for development but is currently on hold. A local watershed advocacy group is recommending the conservation of forested riparian buffers in this area, but at this time there has been no commitment to provide the buffers. A golf course development (planned to be patterned after the Mountain Air Country Club in Yancey County) is proposed near Altapass in Mitchell County, within the North Toe River watershed. A 100-ac development is being planned near Hunt Dale, in Yancey and Mitchell Counties, with over 13,000 lf of the Cane River and over 2,000 lf of the Toe River occurring within the property boundary.

Although these various actions have been discussed or proposed, it is uncertain if they will be developed or if they will need a federal permit or federal monies to construct them. Therefore, we will not address these developments further in this Opinion. We are not aware of other future state, local, or private actions that are reasonably certain to occur within the action area that would not be subject to section 7 review. Therefore, cumulative

effects, as defined by the Act, will not occur and will not be addressed further in this Opinion.

Cumulative Impacts of Incidental Take Anticipated by the Service in Previously Issued Biological Opinions

In reaching a decision as to whether the implementation of activities outlined in the BA are likely or are not likely to jeopardize the continued existence of the Appalachian elktoe, we must factor into our analysis previous biological opinions issued involving the species, especially those opinions where the Service quantified incidental take as the area of habitat disturbed instead of the number of individual mussels. There have been five biological opinions for the Appalachian elktoe. In May of 2005 we issued a biological opinion to the Corps on the effect of their permit on the Appalachian elktoe for a sewer line crossing along the Mills River. The amount of incidental take was limited to the disturbance of habitat 20 ft in width at the construction corridor and 100 ft downstream and upstream of the construction corridor. The three other biological opinions were rendered to the NRCS in 2005 for the implementation of the EWP Program in the Nolichucky, Pigeon, and Mills River subbasins. These biological opinions limited the amount of incidental take to all Appalachian elktoes within at least 3,325 lf of stream within the Nolichucky, Pigeon, and Mills River subbasins and any additional indirect impacts to the Appalachian elktoe 1,312 ft downstream of each of the 40 individual restoration project "footprints." In July 2006 we issued a biological opinion for two bridge replacements over the Toe River. Incidental take was limited to permanent habitat impacts of 89 ft² for both of those projects.

Cumulative Impacts - Critical Habitat

The proposed actions will directly and indirectly result in some adverse impacts to designated critical habitat for the Appalachian elktoe. However, these impacts will not appreciably diminish the value of the designated critical habitat. Future land-use impacts and infrastructure projects, combined with the project-related actions described above, have the potential to impact the "clean water" constituent element of critical habitat for the Appalachian elktoe (Unit 6) to the point where conservation values are compromised in localized areas. These localized areas are expected to be small and will not extend into the majority of the areas contained within Unit 6.

VI. CONCLUSION

After reviewing the current status of the Appalachian elktoe; the environmental baseline for the action area; the effects of bridge construction, demolition, and highway widening; measures identified in the NCDOT's BA to help minimize the potential impacts of the proposed project and assist in the protection, management, and recovery of the species; previously issued Service nonjeopardy biological opinions that allow various levels of incidental take; any potential interrelated and interdependent actions associated with the proposed action; and any potential cumulative effects, it is the Service's biological opinion that implementing this project is not likely to jeopardize the continued existence of the

Appalachian elktoe nor will adverse impacts to critical habitat be significant enough to destroy or adversely modify designated critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulations pursuant to section 4(d) of the Act prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not for the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act, provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount of Take Anticipated

The Service anticipates that incidental take of the Appalachian elktoe may occur as a result of the construction of the bridges at the Cane and South Toe Rivers. During construction, individual mussels may be crushed, harmed by siltation or other water quality degradation, or dislocated because of physical changes in their habitat.

There will be a combined permanent loss of 50.0 ft² of stream habitat at the two bridge project sites. There will also be a combined temporary loss of stream habitat from the construction/demolition causeways of 10,300 ft². Downstream impacts (sedimentation), if any, are expected to occur within 1,300 ft of the construction sites. Because there are no reliable data on the number of Appalachian elktoes buried in the substrate compared to those on the surface (and even those on the surface are difficult to detect), it is not possible to base the amount of incidental take on numbers of individual mussels. Rather, the amount of incidental take will be exceeded if the project "footprint" exceeds 700 ft² at the Cane River crossing and 9,600 ft² at the South Toe River crossing or downstream impacts are occurring more than 1,300 ft downstream from the "footprint" of each project. If incidental take is exceeded, all work should stop, and the Service should be contacted immediately.

EFFECT OF THE TAKE

In this Opinion the Service has determined that this level of take is not likely to result in jeopardy to the Appalachian elktoe or destruction or adverse modification of its critical habitat.

In addition to the subsequent measures listed in the “Reasonable and Prudent Measures” and “Terms and Conditions” sections of this Opinion, the measures listed in the “Conservation Measures” section of this opinion must be implemented. The conservation measures are project minimization measures for the construction of the projects that were described by the NCDOT in the BA. The conservation measures include, but are not limited to, the following:

1. The NCDOT will provide, or contract with biologists who have experience in mussel relocation techniques, for the removal of Appalachian elktoe mussels from the impact sites at the Cane and South Toe River bridge crossings and relocate them to approved relocation sites. Detailed procedures will be developed in coordination with the Service and will be approved by the Service. Procedures will include appropriate collection methods; tagging and recapture; handling and transportation of individuals; and monitoring protocols, which includes the monitoring of the relocation sites for recovery, survival (of recovered mussels), movement, and growth of mussels for a period of 5 years.
2. In coordination with the Service, the NCDOT will develop plans for monitoring the river channel and banks at upstream sites, at the bridge construction sites, and downstream to determine changes in habitat resulting from activities at these sites. If any problems with regard to stream stability are detected during the monitoring, the NCDOT will, in cooperation with the Service, develop a plan to address the problems.
3. As committed to by the NCDOT in the BA, the NCDOT will protect and/or restore riparian buffers for 19,000 lf of stream within the action area. Given that the conservation areas have not been determined or obtained by the NCDOT at the time of the issuance of this Opinion, the Service will continue to review sites that the NCDOT is considering and approve sites that are ultimately acquired.
4. To minimize the potential spread of Japanese knotweed from construction-related activities, the NCDOT has identified Japanese knotweed within the project limits of R-2518 and R-2519. The NCDOT proposes to attempt to suppress Japanese knotweed within their right-of-way, via mechanical means, at the following locations: R-2518A Mitigation Site 1, R-2518B Mitigation Site 4, R-2518B Bridge at Sta. 223+50 (Cane River Bridge), and R-2519B Bridge at Sta. 121+00 (South Toe River Bridge). Application of a glyphosate herbicide will require further planning and consultation with the Service.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the Appalachian elktoe. These nondiscretionary measures include, but are not limited to, the commitments in the BA addendum and the terms and conditions outlined in this Opinion.

1. This multiphase project will receive one Clean Water Act Section 404 permit from the Corps' Wilmington District. Individual sections of the highway project will be reviewed as impact numbers are refined, and the NCDOT will request a permit modification before proceeding with work on a new section. The Corps will coordinate with the Service to review permit modifications and monitoring results to determine if the project is meeting the terms and conditions set forth in this Opinion.
2. The NCDOT will ensure that contractors understand and follow the measures listed in the "Conservation Measures," "Reasonable and Prudent Measures," and "Terms and Conditions" sections of this Opinion.
3. The NCDOT will send copies of all monitoring reports to the Service's Asheville Field Office at specified times over the life of the project.
4. The NCDOT will notify the Service and the Corps immediately if monitoring reveals any significant problems so that remediation can occur as quickly as possible.
5. New or extended culverts on tributaries will be constructed in a manner that will not contribute to channel instability and downstream habitat changes.
6. The NCDOT will employ construction methods and mitigation actions that will minimize/prevent the spread of Japanese knotweed.
7. The NCDOT will minimize aquatic habitat fragmentation in the Nolichucky River basin by replacing perched culverts or other aquatic passage barriers and, where possible, enhancing aquatic life passage and stream habitat.
8. Containment systems will be developed for particular stages of the demolition and construction of the bridges in order to minimize impacts to the Appalachian elktoe and its habitat.
9. Bridge demolition activities and the relocation of mussels will be conducted during time periods that will result in fewer impacts to the Appalachian elktoe.
10. During the relocation of mussels, the Service may alter, if needed, methods and plans for moving the mussels.
11. All appropriate NCDOT BMPs for erosion control; storm-water management; and bridge maintenance, construction, and demolition will be followed or exceeded for the project, and any additional BMPs listed in the "Terms and Conditions" section of this Opinion will be followed.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the NCDOT must comply with the following terms and conditions, which implement the reasonable and

prudent measures described previously and outline required reporting and/or monitoring requirements. These terms and conditions are nondiscretionary and apply to the Toe and Cane Rivers and their affected tributaries.

1. The Corps will notify the Service of requests for permit modifications from the NCDOT and, if necessary, have a meeting to review the changes and status of the project before issuing the modified permit.
2. A Service biologist will be present at the preconstruction meeting(s) to cover permit conditions and discuss any questions the contractor has regarding implementation of the project. After the contractor submits plans for various stages of the project, a Service biologist will review and provide comments on the plans and will attend any meetings to discuss implementation of the plans.
3. The NCDOT will use special provisions that exceed the standard BMPs for erosion control. These erosion-control measures incorporate the Design Standards in Sensitive Watersheds (15A NCAC 04B.0124(b)-(e)).
4. The NCDOT will provide three levels of oversight for the control of erosion and sediment on the project.
5. The NCDOT will perform compliance inspections of the erosion-control devices weekly or within 24 hours of a ≥ 0.5 -in rainfall event during construction of the project.
6. The NCDOT will submit a proposal through their internal research group to study the effectiveness of storm-water-treatment and -control measures specific to this project.
7. During construction, culvert inlets and outlets will be evaluated by the engineer with regard to stream stability immediately following installation and quarterly for a period of 1 year at each location. Indicators of instability, such as headcutting, scour, aggradation, or degradation, will be used to determine the need for any corrective actions.
8. A final field inspection will be held with the contractor to evaluate culvert placement and stream stability before the project is considered complete. If instability is detected during any of these reviews, corrective actions will be performed when deemed necessary by the engineer or by the conditions of any federal and state permits required by Section 404/401 of the Clean Water Act.
9. In order to minimize effects to the Appalachian elktoe and its designated critical habitat, the NCDOT will replace the four-barrel box culvert at the crossing of US 19 and Big Crabtree Creek with a bridge. Replacing this culvert with a bridge will reduce aquatic fragmentation, correct downstream scour and upstream overwidening, reestablish a connection to the floodplain in this reach, and restore habitat in this important tributary to the North Toe.

10. The NCDOT will conduct the benthic macroinvertebrate monitoring proposed in the "Conservation Measures" section to provide a habitat assessment, including (but not limited to) parameters such as existing habitat structure and sediment load at each of the nine sites.

Measures Specific to Bridge Construction

1. The NCDOT will ensure that a qualified aquatic biologist is present at critical times to monitor certain phases of construction, including, but not limited to, initial clearing for construction, when the causeways are installed, when demolition begins, and when the causeways are removed. This individual will be present to ensure that the procedures listed in the "Conservation Measures," "Reasonable and Prudent Measures," and "Terms and Conditions" sections of this Opinion are being implemented and that all project plans are being implemented in a manner to ensure that the conditions of the Opinion are met.
2. A containment system will be developed and installed prior to the removal of the bridge deck and piers. The system should be of sufficient strength to capture material that may enter the river.
3. When constructing drilled shafts, a containment system will be developed so that material does not enter the river. Any material by-product will be pumped out of the shaft to an upland disposal area and treated through a proper stilling basin or silt bag.
4. The NCDOT will not relocate mussels between May 1 and June 30, the time at which the Appalachian elktoe releases glochidia. The NCDOT will relocate the mussels during low flow, low turbidity, and relatively cool weather; the most appropriate time to accomplish this would be in the fall.
5. In the BA, the NCDOT proposed to relocate all native mussels, including the Appalachian elktoe, from the project "footprints," extending downstream and upstream of the two bridge replacements. Representatives of the Service's Asheville Field Office may determine during relocation of the mussels that the area the mussels are moved from should be reduced.
6. A Service biologist will review and provide comments on plans proposed to correct problems that may be revealed in the monitoring of the river channel and banks within the project area.
7. The erosion-control plan will be in place prior to any ground disturbance. When needed, combinations of erosion-control measures (such as silt bags in combination with a stilling basin) will be used to ensure that the most protective measures are being implemented.
8. Activities in the floodplain will be limited to those needed to construct the proposed bridges and remove the existing bridge.

9. Work pads will be used when equipment must be staged in the floodplain to complete the project construction. The work pads will be constructed by placing fabric matting down prior to placing the stone work pad. All of the stone and matting will be removed and disposed of off-site, or the stone can be used in areas that require permanent stone protection after project completion.
10. Access roads and construction staging areas will be minimized to the maximum extent practicable. The access roads and construction staging areas should be established from the start of the project and designed with erosion-control measures. The placement of the access roads and staging areas will be discussed with the Service and determined at the preconstruction meetings.
11. Riparian vegetation, especially large trees, will be maintained wherever possible. If riparian areas are disturbed, they will be revegetated with native species as soon as possible after construction.
12. Upon completion of the project the existing approach fills will be removed to natural grade, and the area will be planted with native grasses and tree species.
13. Erosion-control measures will remain in place until riparian vegetation is successfully reestablished at each of the bridge sites.
14. Construction will be accomplished in a manner that prevents wet concrete from coming into contact with water entering or flowing in the river.
15. Unconsolidated material (such as sand and dirt) will not be placed directly on the causeways since the material could be washed off of the causeways or settle into the causeways and enter the river. Any equipment that is placed on the causeways will be removed anytime throughout a work day when the water level rises, or is expected to rise overnight, to a point where the equipment could be flooded or during periods of inactivity (two or more consecutive days). The only exception to this measure is that the drill rig may be left in place for periods of inactivity; however, it must also be removed if the water rises, or is expected to rise, to a point where the drill rig could be flooded.
16. All construction equipment should be refueled outside the 100-year floodplain or at least 200 ft from all water bodies (whichever distance is greater) and be protected with secondary containment. During crucial periods of construction and demolition, when the drill rig and crane cannot be moved, the drill rig and crane can be refueled while inside the 100-year floodplain provided that spill response materials (such as spill blankets and fueling diapers) are used during the refueling. Hazardous materials, fuel, lubricating oils, or other chemicals will be stored outside the 100-year floodplain or at least 200 ft from all water bodies (whichever distance is greater), preferably at an upland site. Areas used for borrow or construction by-products will not be located in wetlands or in the 100-year floodplain.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The following conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Where opportunities exist, work with landowners, the general public, and other agencies to promote education and information about the Appalachian elktoe and its conservation.
2. In order to address sources of impairment in the Nolichucky River basin and work toward removing habitat occupied by the Appalachian elktoe from the 303(d) list of impaired waters, consider funding a position with a conservation organization to help identify and pursue additional buffers and conservation opportunities along the main stem of the Cane River, North Toe River, and Toe Rivers and their tributaries, either individually or in concert with other conservation programs.
3. Establish an escrow account to provide funding for land acquisition and/or conservation easements/agreements to better take advantage of conservation opportunities as they arise.
4. Explore opportunities to work with local and state water quality officials in order to minimize or eliminate wastewater and storm-water discharges into the Cane River, North Toe River, and Toe River.
5. Work with Yancey and Mitchell Counties to develop tools such as land-use plans, ordinances, and incentives to protect the Appalachian elktoe and its designated critical habitat from the effects of development activities.
6. Consult with the Service on projects affecting aquatic habitat in the Nolichucky River basin, regardless of funding source, to ensure compliance with all provisions of the Act.
7. Work with partners to assess and prioritize structures that fragment aquatic habitat and create barriers to fish passage in the Nolichucky River basin and begin replacing those structures with more appropriate structures when opportunities arise.

In order for the Service to be kept informed about actions that minimize or avoid adverse effects or that benefit listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION/CLOSING STATEMENT

This concludes formal consultation on the actions outlined in the NCDOT's BA dated August 9, 2007. As provided in 50 CFR 402.16, the reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion, or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease, pending reinitiation. Consultation should also be reinitiated if new biological information comes to light that invalidates the assumptions made regarding the biology or distribution of the Appalachian elktoe within the project area of the Nolichucky River basin in North Carolina.

If you or your staff have any questions concerning this Opinion, please contact Ms. Marella Buncick of our staff at 828/258-3939, Ext. 237, or me, Ext. 223. We have assigned our Log No. 4-2-03-063 to this project; please refer to it in any future correspondence concerning this matter.

Sincerely,



Brian P. Cole
Field Supervisor

cc:

Dr. Gregory J. Thorpe, Manager, Project Development and Environmental Analysis Branch,
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Dr. Charles P. Nicholson, NEPA Policy Program Manager, Tennessee Valley Authority,
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Electronic copy with Appendix A (Appendices B-E available upon request):

Ms. Marla J. Chambers, Western NCDOT Permit Coordinator, North Carolina Wildlife
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Mr. Brian Wrenn, North Carolina Division of Water Quality, Central Office, 2321 Crabtree
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Mr. Chris Militscher, Environmental Protection Agency, 1313 Alderman Circle, Raleigh, NC
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Regional Director, FWS, Atlanta, GA (ES/TE, Attention: Mr. Ken Graham)

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