APPENDIX D

NATURAL RESOURCES CONSERVATION SERVICE

CPA-106 FORM

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING
FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request	4. Sheet 1 of 1
1. Name of Project: Interstate 73 Location Study (FEIS)	5. Federal Agency Involved: Federal Highway Administration	
2. Type of Project: New Interstate	6. County and State: Bedford, Botetourt, Roanoke, Franklin & Henry Counties in VA	

PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS	2. Person Completing Form: Part IV ALC - Jeannine Freyman 1/25/05	
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply – Do not complete additional parts of this form). Yes ☒ No ☐		4. Acres Irrigated: N/A	Average Farm Size: 92-189 acres
5. Major Crop(s): Hay, Dairy, Poultry	6. Farmable Land in Government Jurisdiction: Acres: Negligible %	7. Amount of Farmland as Defined in FPPA: Acres: Negligible %	
8. Name of Land Evaluation System Used: LESA	9. Name of Local Site Assessment System	10. Date Land Evaluation Returned by NRCS: 1/25/2005	

PART III *(To be completed by Federal Agency)*	Adopted Location Corridor (ALC)			
		ALC		
A. Total Acres To Be Converted Directly		1,145		
B. Total Acres To Be Converted Indirectly, Or To Receive Services		0		
C. Total Acres In Corridor		4,998		
PART IV *(To be completed by NRCS) Land Evaluation Information*				
A. Total Acres Prime and Unique Farmland		82		
B. Total Acres Statewide and Local Important Farmland		*		
C. Percentage of Farmland in County or Local Govt. Unit To Be Converted		<1%		
D. Percentage of Farmland in Govt. Jurisdiction with Same or Higher Relative Value		20%		
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 – 100 Points)*		78		

PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	Maximum Points				
1. Area in Nonurban Use	15		12		
2. Perimeter in Nonurban Use	10		10		
3. Percent of Corridor Being Farmed	20		1		
4. Protection Provided By State and Local Government	20		0		
5. Size of Present Farm Unit Compared to Average	10		7		
6. Creation of Nonfarmable Farmland	25		17		
7. Availability of Farm Support Services	5		5		
8. On-Farm Investments	20		20		
9. Effects of Conversion on Farm Support Services	25		0		
10. Compatibility with Existing Agricultural Use	10		5		
TOTAL CORRIDOR ASSESSMENT POINTS	160		70		
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100		78		
Total Corridor Assessment (From Part VI above or a local site assessment)	160		148		
Total Points *(Total of above 2 lines)*	260				

1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used? Yes ☐ No ☐

5. Reason For Selection:

*no important farmland acreage was tabulated for ALC, because Important Farmland lists did not exist when values were calculated for all other original options including Option 4. -- JCF,SRS, NRCS

Signature of Person Completing this Part: Jeannine C. Freyman, Soil Resource Specialist, NRCS completed PARTS II & IV — DATE 5/12/05

NOTE: Complete a form for each segment with more than one Alternate Corridor

APPENDIX E

BIOLOGICAL ASSESSMENT
ROANOKE LOGPERCH (PERCINA REX)
PROPOSED INTERSTATE 73
CROSSING OF THE PIGG RIVER
FRANKLIN COUNTY, VIRGINIA

BIOLOGICAL ASSESSMENT
ROANOKE LOGPERCH (*Percina rex*)
PROPOSED INTERSTATE 73 CROSSING OF THE PIGG RIVER
FRANKLIN COUNTY, VIRGINIA

The draft Biological Assessment does not take into account the six new sites where the populations of the Roanoke logperch that were discovered as a result of the Range-Wide Assessment of Habitat Suitability for the Roanoke logperch conducted by the Virginia Transportation Research Council. This information will be used in any future consultation with the USFWS to further refine knowledge concerning the status of the species and its distribution and included in any updates to the Biological Assessment at that time.

MARCH 2005

BIOLOGICAL ASSESSMENT
ROANOKE LOGPERCH (*Percina rex*)
PROPOSED INTERSTATE 73 CROSSING OF THE PIGG RIVER
FRANKLIN COUNTY, VIRGINIA

LIST OF FIGURES

1.0 THE PROPOSED ACTION AND FEDERALLY LISTED THREATENED OR ENDANGERED SPECIES OF THE PROJECT STUDY AREA

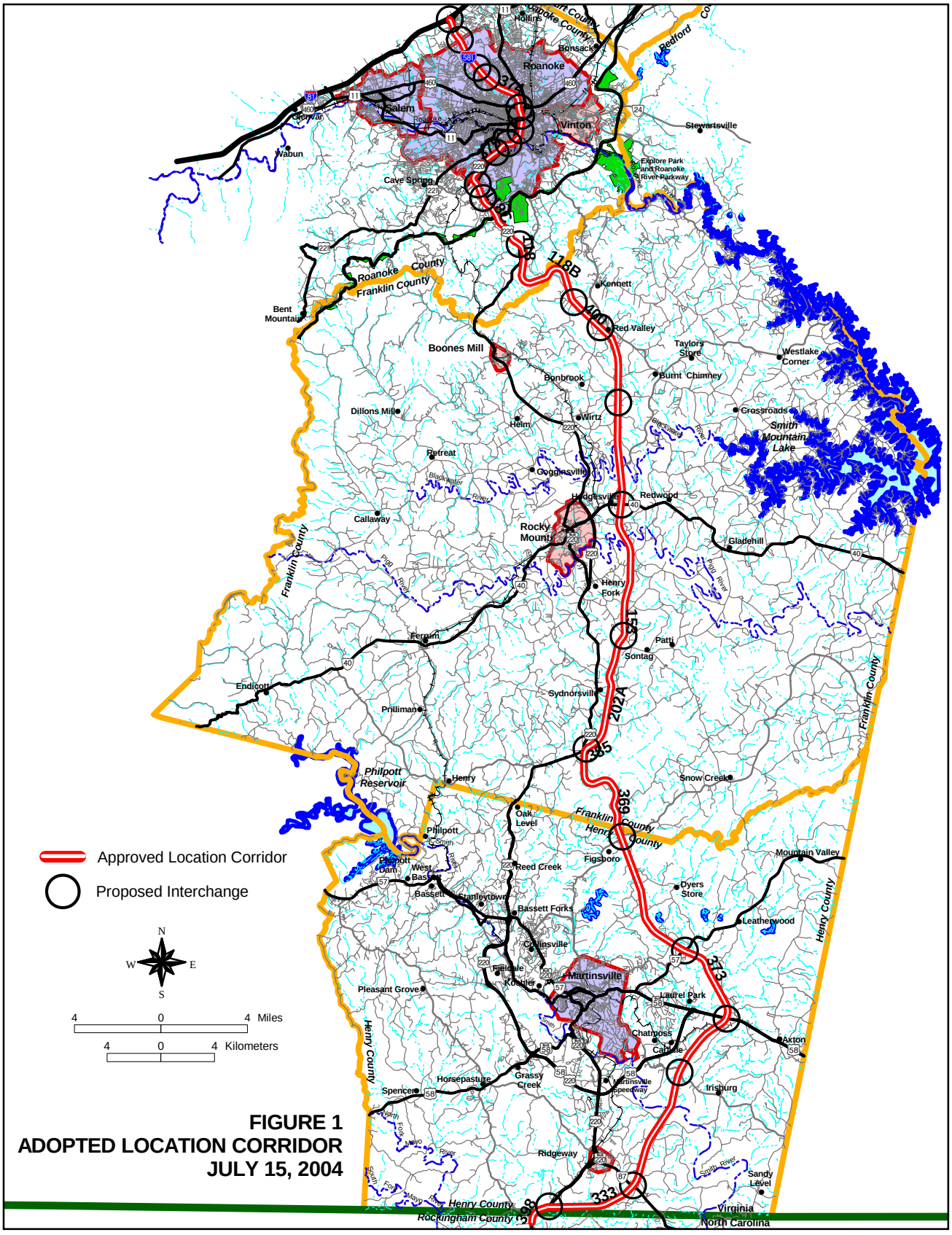
A new limited access highway location selected by the Virginia Commonwealth Transportation Board (CTB) in June of 2001 as “Virginia Interstate 73” (hereinafter referred to as “I-73”) would ultimately connect with other segments of I-73 alignments in West Virginia and North Carolina. The project (hereinafter referred to as the "Approved Location Corridor" or the "ALC") would comprise part of Virginia’s link in the planned I-73 addition to the National Highway System (NHS) that would extend between Sault Ste. Marie, Michigan and Myrtle Beach, South Carolina. The ALC, as approved by the CTB in June of 2001, is shown in Figure 1. On July 15, 2004, the CTB rescinded and amended its June 21, 2001, decision by removing segments 376, 287A and 399 from the approved location and including segments 375, 118C, 118, and 118B as part of the approved location.

In its 25 November 2002 letter to the Federal Highway Administration (FHWA), the U.S. Department of the Interior’s Fish and Wildlife Service (FWS) states that Roanoke logperch (*Percina rex*) occurring in the Pigg River near a proposed I-73 bridge crossing is the only species for which formal consultation under Section 7 of the Endangered Species Act of 1973 will be required. Using guidance set forth in the Endangered Species Act, federal regulations governing consultation under Section 7 of the Act (50 CFR 402), and FWS’s Section 7 Consultation Handbook, existing information and site-specific survey information was analyzed to assess direct, indirect, and cumulative effects to Roanoke logperch populations of the Pigg River associated with construction and operation of the proposed I-73 project (specifically the action known as the "ALC"). The results of the assessment along with FHWA conclusions are set forth in the following Biological Assessment. This Biological Assessment will serve as a primary basis for FWS’s issuance of a Biological Opinion addressing the proposed ALC action area as it pertains to Roanoke logperch populations of the Pigg River.

1.1 OVERVIEW AND HISTORY OF THE PROPOSED ACTION

Based on findings set forth in the October 2000 Draft Environmental Impact Statement (DEIS) along with comments received from the general public and reviewing agencies, the CTB in its 21 June 2001 resolution approved a 70.19-mile-long (113-kilometer-long) segment of limited access highway between the Virginia/North Carolina State Line and Interstate 81. As previously discussed, the new limited access highway (designated by the CTB as “Virginia Interstate 73”) would ultimately connect with other segments of I-73 alignments in West Virginia and North Carolina and would comprise part of Virginia’s link in the planned I-73 addition to the National Highway System (NHS) which the U.S. Congress has identified as a high priority corridor. That corridor, as defined and refined by law, extends between Sault Ste. Marie, Michigan and Myrtle Beach, South Carolina.

The limited access highway comprising proposed Virginia Interstate 73 would consist of 5.7 miles (9.2 kilometers) of existing Interstate 581 along with 64.49 miles (104 kilometers) of new highway constructed to interstate (freeway) design standards. The project approved by the CTB is comprised of Build Alternative segments 374, 375, 118C, 118, 118B, 400, 153, 202A, 385, 369, 373, 333, and 398 – all of which were assessed in the DEIS. Starting at the northern end of the ALC, the alignment for proposed I-73 would begin at the existing interchange of I-81 and I-581 and would continue along I-581 through the City of Roanoke to the Elm Avenue interchange and would continue along the existing U.S. Route 220 corridor south of Elm Avenue. The proposed corridor would then diverge from the U.S. Route 220 corridor in the vicinity of Route 668 (Yellow Mountain Road) intersection, extending southeast into Franklin County. In Franklin County, the alignment would extend to the south, remaining west of Route 116 and passing to the southwest of the community of Red Valley. Near Red Valley, the alignment would extend almost due south, crossing the Blackwater River and crossing Route 40 in the vicinity of Hodgesville. The ALC would then continue to the south, crossing the Pigg River approximately one mile (1.6 kilometer) east (downstream) of the Town of Rocky Mount. Continuing to the south, the alignment would extend west of Sontag and east of Sydnorsville. From this point, the proposed alignment would continue to the southwest towards Route 605. The alignment would then turn to the southeast near Route 605 and would enter Henry County to the east of Oak Level.


Approved Location Corridor
Proposed Interchange
N
W
E
S
4 0 4 Miles
4 0 4 Kilometers
Roanoke
Salem
Vinton
Hollins
Bonsack
Wabun
Cave Spring
Roanoke County
Franklin County
Bedford
Stewartsville
Explore Park and Roanoke River Parkway
Bent Mountain
Kennett
Red Valley
Boones Mill
Taylors Store
Westlake Corner
Burnt Chimney
Bonbrook
Dillons Mill
Helm
Wirtz
Crossroads
Smith Mountain Lake
Retreat
Goggins Ville
Hodges Ville
Redwood
Callaway
Rocky Mount
Gladehill
Henry Fork
Ferrum
Patti
Sontag
Endicott
Sydnorsville
Prillman
Philpott Reservoir
Henry
Snow Creek
Oak Level
Philpott
Figsboro
Mountain Valley
Reed Creek
Dyers Store
Bassett
Stanleytown
Bassett Forks
Leatherwood
Collinsville
Fieldale
Martinsville
Pleasant Grove
Laurel Park
Chatmoss
Axton
Carlisle
Horsepasture
Grassy Creek
Martinsville Speedway
Irisburg
Spencer
Ridgeway
Sandy Level
Henry County
Rockingham County
Virginia
North Carolina
Franklin County
Henry County
119B
220
40
460
58
57
87
333
FIGURE 1
ADOPTED LOCATION CORRIDOR
JULY 15, 2004

Continuing southeast through northern Henry County, the proposed alignment would pass to the east of Figsboro, crossing Route 57 and turning to the southwest as it crosses US Route 58 well east of Laurel Park.

Continuing on a southwesterly course east of Martinsville, the alignment would extend east of the communities of Carlisle and Ridgeway. After crossing Route 87, the alignment for proposed Virginia Interstate 73 would bear due west to existing U.S. Route 220 before turning south to the Virginia – North Carolina state line.

In total, the action approved on 21 June 2001 by the CTB and modified on July 15, 2004, would entail the construction of 71.71 miles of new or improved limited access highway (the proposed Virginia Interstate 73). In most cases, I-73 would be a four-lane divided highway typical section. Exceptions are I-581 and the portion of U.S. Route 220 between Elm Avenue and Route 419, which would be configured as listed in Table 1.

TABLE 1
PROPOSED LANE CONFIGURATIONS

Location	Number of Lanes	
	Existing	Build (I-73)
I-581 north of U.S. Route 460	6 lane divided	8 lane divided (with 2 lane collector-distributor roads, Route 117 to new Valley View Mall interchange only)
U.S. Route 220 – Elm Avenue to Route 419	6 lane divided with median barrier	6 lane divided with median barrier

Source: VDOT Traffic Data and 1987-1989 Transportation Improvement Program.
Notes: 1. Divided is intended to describe a grassed median.

Major river crossings include the Roanoke River in the vicinity of the Riverland neighborhood, the Blackwater River north of its crossing of Route 122, the Pigg River south of Hodgesville and the Smith River east of Eagleston Falls. The ALC would cross the Blue Ridge Parkway using the existing U.S. Route 220 crossing..

The ALC would be located, in part, within the Pigg River action area, which is described in sections 1.3.1.2 and 1.3.2.2 and as shown in Figure 2 of this report. That action area is bounded by the limits of the Pigg River watershed. That being the case, only that portion of the ALC extending from just north of Route 40 to just south of the Franklin/Henry county line (14.3 miles of proposed roadway) falls within the Pigg River action area.

In total, the CTB-approved project would entail modification of ten existing interchanges along I-581 and U.S. Route 220 and the construction of 13 new interchanges . The proposed locations and conceptual type of interchange are listed below. Those interchanges that would be located in whole or in part within the Pigg River watershed are shown in bold print.

• I-581 at I-81	Roanoke County	Directional – requires upgrade
• I-581 at Route 117 (Peters Creek Road)	Roanoke County	Cloverleaf – requires upgrade
• I-581 at Route 101 (Hershberger Road)	Roanoke City	Cloverleaf – requires upgrade
• I-581 at Valley View Road	Roanoke City	New flyover – requires upgrade
• I-581 at U.S. Route 460 (Orange Avenue)	Roanoke City	Cloverleaf – requires upgrade
• I-581 at Williamson Road	Roanoke City	Partial Cloverleaf – requires upgrade
• I-581 at Elm Avenue	Roanoke City	Diamond – requires upgrade
• U.S. Route 220 at Franklin Road	Roanoke City	Half Diamond – requires upgrade
U.S. Route 220 at Wonju Street	Roanoke City	Partial cloverleaf – requires upgrade
• U.S. Route 220 at Route 419	Roanoke City	Diamond – requires upgrade
• U.S. Route 220 at Route 679 (Buck Mountain road)	Roanoke County	Diamond

• U.S. Route 220 near Route 668 (Yellow Mountain Road)	Roanoke County	Diamond
• Route 657 at Red Valley	Franklin County	Diamond
• Route 697 southwest of Burnt Chimney	Franklin County	Diamond
• **Route 40 at Hodgesville**	**Franklin County**	**Diamond (54 % only)**
• **Route 619 northwest of Sontag**	**Franklin County**	**Diamond**
• **U.S. Route 220/Route 618**	**Franklin County**	**Diamond**
• **Route 890/108 north of Figsboro**	**Henry County**	**Cloverleaf (20% only)**
• Route 57 southwest of Dyers Store Road	Henry County	Diamond
• U.S. Route 58 east of Route 648/Route 620 intersection	Henry County	Diamond
• Route 650 near the Tanyard Creek Crossing	Henry County	Diamond
• Route 87 north of the Route 750 intersection	Henry County	Diamond
• U.S. Route 220 south of intersection with Route 689	Henry County	Trumpet

1.2 FEDERALLY LISTED THREATENED OR ENDANGERED SPECIES OF THE PROJECT STUDY AREA

Based on information provided by the FWS and the Virginia Division of Natural Heritage (DNH) during preparation of the DEIS, it was determined that one federal-listed endangered fish species (the Roanoke logperch or *Percina rex*) and one federal-listed endangered plant species (the smooth coneflower or *Echinacea laevigata*) are reported to occur within or in close proximity to the study area. Following preparation of the DEIS, the FWS determined that suitable habitat for a federal-listed freshwater mussel (the James spinymussel or *Pleurobema collina)* may also occur within or in close proximity to the study area.

1.2.1 Roanoke Logperch (*Percina rex)*

The Roanoke logperch (*Percina rex*) is a freshwater fish species that is presently listed as endangered by the FWS. The Roanoke logperch is endemic to the Roanoke River and Chowan River drainage basins, where it is encountered in relatively small numbers. Populations located to date are separated from one another by long segments of rivers or by large impoundments. Populations of the Roanoke logperch are threatened by instream channelization, impoundment, and dewatering activities, and by activities within the watershed that lead to pollution and increased siltation of receiving waters. Within the I-73 study area, populations of the Roanoke logperch are reported to occur in the upper Roanoke River and in the lower reaches of Mason Creek and Tinker Creek. The Roanoke logperch is also reported to occur in the Pigg River near its confluence with Big Chestnut Creek and in the extreme lower reach of Big Chestnut Creek. Roanoke logperch has been sampled in a segment of the Pigg River extending 820 feet (250 meters) upstream and 2,225 feet (800 meters) downstream of the U.S. Route 220 crossing (Angermeier, 1999). The Smith River upstream of the city of Martinsville is reported to support a small population of the logperch (Terwilliger and Tate, 1995). Although the species has not reported in other stream segments within the I-73 study area, field surveys were conducted within stream segments thought to contain suitable habitat which could be affected by the ALC. Results of these surveys confirm that a small population of Roanoke logperch occurs within the Pigg River in the vicinity of the bridge crossing proposed under the ALC. The results of the surveys for the Roanoke logperch were transmitted to the FWS, and the FWS concurred that sufficient surveys had been performed along the ALC for the Roanoke logperch. Based on the findings of these surveys, FWS determined that Interstate 73 is likely to effect the Pigg River population of the Roanoke logperch and that Section 7 consultation was required between FHWA and the FWS (25 November 2002 letter from FWS to FHWA).

1.2.2 Smooth Coneflower (*Echinacea laevigata*)

Smooth coneflower (*Echinacea laevigata*) is a perennial herb that is presently listed as endangered by the FWS. In Virginia, smooth coneflower has been reported from the southern Piedmont and the Valley and Ridge provinces (Ludwig, 1991). In the study area, smooth coneflower has been reported to occur in the Grassy Hill area west of the town of Rocky Mount (DCR, Division of Natural Heritage, 1998). Due, in part, to the presence of smooth coneflower, the DCR Division of Natural Heritage has designated the Grassy Hill area

as a Natural Area Preserve (NAP). Although the species has not reported in other portions of the I-73 study area, field surveys were conducted during mid-August of 2002 within areas exhibiting soils, rock types, and vegetation associations similar to those encountered on Grassy Hill. Results of these surveys confirm that smooth coneflower does not occur within the 600-foot-wide study corridor for the ALC. Based on these findings, FWS determined that sufficient surveys for the smooth coneflower had been performed along the alignment of the ALC and that additional consultation was not required for the smooth coneflower (25 November 2002 letter from FWS to FHWA).

1.2.3 James Spinymussel (*Pleurobema collina)*

The James spinymussel (*Pleurobema collina)* is a freshwater mussel that is endemic to Virginia. This species was listed as Federally Endangered by the U.S. Department of Interior (Federal Register #53:27693). The species is thought to be declining because of habitat degradation and reproductive isolation of subpopulations in the upper James drainage. This species is endemic to the James River drainage and is know to occur in the following streams: Craig, Johns, Dicks, Patterson, Catawba, and Potts creeks in Craig and Botetourt counties; the Mechums River, Rocky Run, and Licking Hole Creek in Albemarle County; and the Pedlar River in Amherst County (Terwilliger, 1995). Recent investigations have indicated that the James spinymussel may also occur within portions of the Dan River watershed in North Carolina. Because these recent investigations have indicated that the James spinymussel may occur outside of its historically documented range, second and third order streams of the Dan River watershed within the I-73 study area were surveyed to determine whether the species is present. Results of these stream surveys confirm that the James spinymussel does not occur within the I-73 study area. Based on these findings, FWS has determined that sufficient surveys for the James spinymussel had been performed along the ALC and that additional consultation was not required for the James spinymussel (25 November 2002 letter from FWS to FHWA).

1.3 DESCRIPTION OF THE ACTION AREA

For assessing effects to Roanoke logperch populations within the Pigg River watershed, the action area for the proposed ALC (hereinafter referred to as the “Pigg River action area”) has been defined to encompass 660 acres potentially affected by direct effects (paved surfaces plus managed landscape areas) and 5,046 acres potentially affected by indirect effects – for a total of 5,706 acres. Areas of potential direct effects and areas of potential indirect effects are shown in Figure 2. The direct effects action area is addressed in section 1.3.1 of this report. The indirect effects action area is addressed in section 1.3.2 of this report.

1.3.1 Direct Effects

1.3.1.1 Project Overview

The ALC along with proposed interchanges is shown in Figure 1. The corridor shown in Figure 1 encompasses construction limits that will range from 126 feet out-to-out for a typical six-lane section to 221.3 feet out-to-out for a typical six-lane section with two-lane collector-distributor roads (this does not include construction associated with the cut and fill slopes which would presumably be vegetated or graveled to control erosion). Best available information pertaining to preliminary limits of cut and fill along individual segments comprising the ALC consists of concept engineering sheets provided in the I-73 Location Study (VDOT, October 2000a). As previously discussed in section 1.1, only 14.3 miles of the total 71.71 miles of proposed roadway comprising the ALC would fall within the Pigg River action area (Figure 2).

Tentative interchange types are shown in the concept engineering sheets provided in the I-73 Location Study (VDOT, October 2000a). Because interchange types shown in the Location Study are tentative, a construction footprint having a one-quarter-mile radius was utilized to assess maximum anticipated direct impacts resulting from construction at each of the proposed interchange locations shown in Figure 1. Use of a one-quarter-mile radius was deemed appropriate to fully account for effects which could result from possible design modifications of interchange types currently shown, maximum expected grading limits, and construction of any associated drainage structures. Of the 23 interchanges associated with the ALC, only two entire interchanges and portions of two other interchanges would fall within the Pigg River action area (Figure 2).

1.3.1.2 Pigg River Watershed Action Area (Direct Effects Component)

As discussed in section 1.1 and as shown in Figure 2, the following areas of direct effects (paved surfaces plus managed landscape areas) would be located within the Pigg River watershed:

- 69 percent or 102.7 acres of the ALC/Route 40 interchange (comprised of 30.8 acres of paved ramps and 72 acres of managed landscape areas);
- the entire ALC/Route 619 interchange or 148.6 acres (comprised of 44.6 acres of paved ramps and 104 acres of managed landscape areas)
- the entire ALC/Route 220/Route 618 interchange or 148.6 acres (comprised of 44.6 acres of paved ramps and 104 acres of managed landscape areas)
- 14.3 miles of interstate facility (ranging from 126 feet out-to-out for a typical six-lane section to 221.3 feet out-to-out for a typical six-lane section with two-lane collector-distributor roads) comprised of approximately 159.7 acres of proposed paved road surface and 100.4 acres of associated right-of-way.

With respect to the Roanoke logperch population existing in the main stem of the Pigg River in the vicinity of the proposed ALC stream crossing, the nearest ALC interchange would be located at Route 40, approximately 1.7 miles north of the Pigg River. Only 69 percent (or 102.7 acres) of the ALC/Route 40 interchange footprint would affect areas that drain to the Pigg River (the remaining 31 percent draining to the Blackwater River, where no logperch populations have been documented). Land use within the portion of the ALC/Route 40 interchange 0.25-mile-radius construction footprint draining to the Pigg River is currently comprised of 58.5 acres of residential properties, 43.3 acres of cropland and pastureland, and 0.9 acre of forest land.

The next nearest interchange would be the proposed ALC/Route 619 interchange, which would be located approximately 3.3 miles south of the Pigg River. Land use within the 0.25-mile-radius construction footprint of the proposed ALC/Route 619 interchange is currently comprised of 116.3 acres of cropland and pastureland and 32.3 acres of forest land.

With respect to the Pigg River crossing, the next nearest interchange having direct effects within the Pigg River watershed would be the ALC/Route 220/Route 618 interchange to be located approximately 9.5 miles south of the Pigg River. Land use within the 0.25-mile-radius construction footprint of the proposed ALC/Route 220/Route 618 interchange is currently comprised of 6.5 acres of cropland and pastureland, 142.1 acres of forest land.

In total, construction of the ALC would convert approximately 660 acres of the aforementioned land uses to 237 acres of interchange ramps and road surface and 423 acres of associated managed landscaped areas. Based on preliminary design concepts depicted in the I-73 Location Study (VDOT, 2000a), the limits of construction width will range between 160 feet and 480 feet for the portion of the ALC extending through the Pigg River watershed.

1.3.2 Indirect Effects

1.3.2.1 Project Overview

A zone of potential influence having a one-mile radius (or 2,011 acres) was utilized at each of the ALC interchange locations shown in Figure 2. This zone of influence was developed based on consultation with the EPA early on in the development of the draft EIS to estimate reasonably foreseeable indirect effects attributable to the project in and around proposed interchanges including the ALC interchanges. After deducting the 0.25-mile radius of direct interchange effects and a 200-foot-wide interstate highway construction footprint, the acreage of indirect effects within each of the one-mile-radius assessment areas totals approximately 1,837 acres.

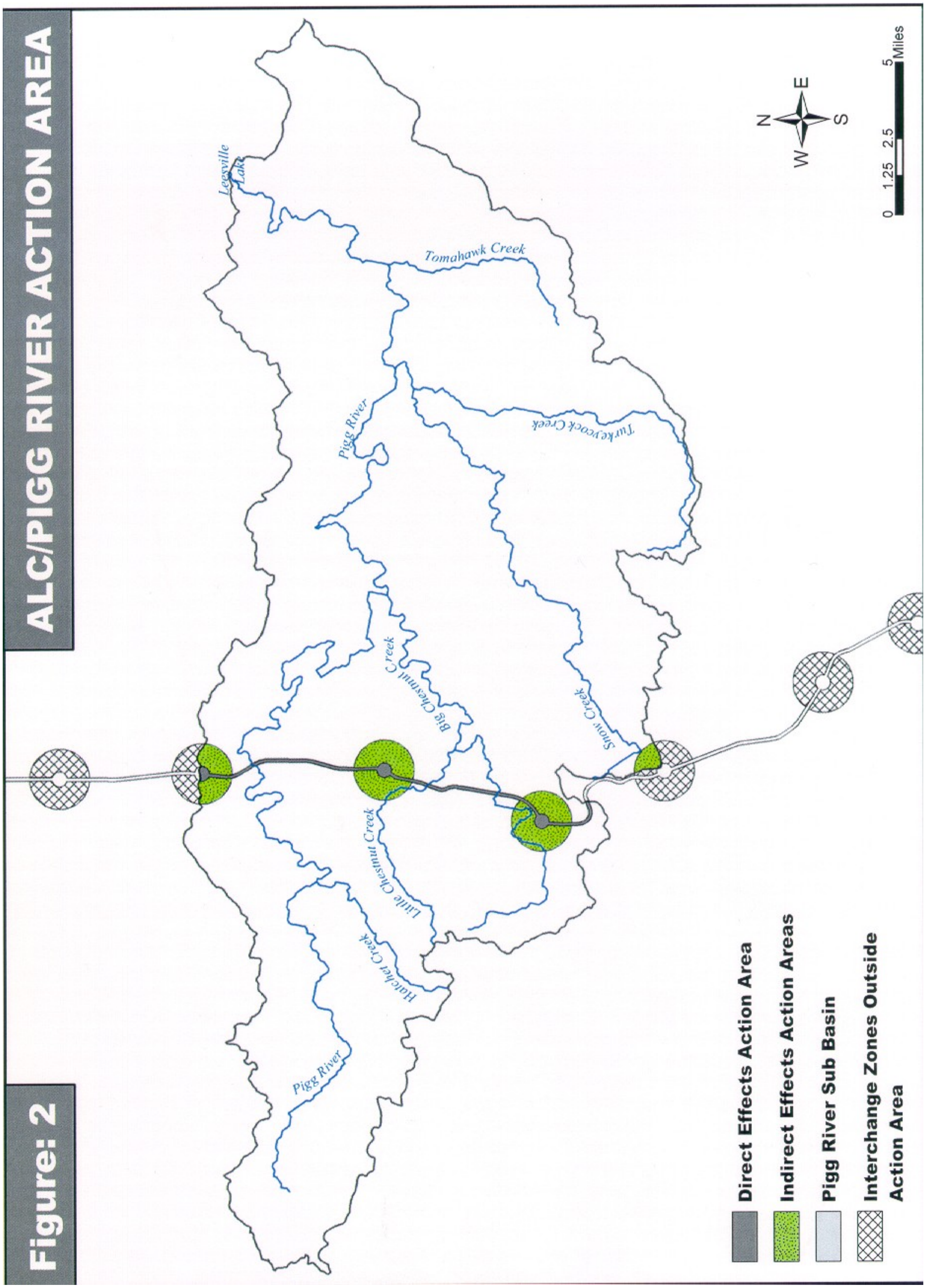


Figure: 2 ALC/PIGG RIVER ACTION AREA

1.3.2.2 Pigg River Watershed Action Area (Indirect Effects Component)

As discussed in section 1.1 and as shown in Figure 2, the following zones of reasonably foreseeable development (extending one mile around proposed interchanges) would be located within the Pigg River watershed:

- 54.3 percent (or 998 acres) of the potential development zone surrounding the proposed ALC/Route 40 interchange
- the entire one-mile-radius potential development zone surrounding the proposed ALC/Route 619 interchange (or 1,837 acres)
- the entire one-mile-radius potential development zone surrounding the proposed ALC/Route 220/Route 618 interchange(or 1,837 acres)
- 20.4 percent (or 374 acres) of the potential development zone surrounding the proposed ALC/Route 890 interchange.

The nearest zone of reasonably foreseeable development (with respect to the Roanoke logperch population in the main stem of the Pigg River) would be around the proposed ALC interchange located at Route 40, approximately 1.7 miles north of the Pigg River. Only 54.3 percent (or 998 acres) of the ALC/Route 40 interchange footprint and associated zone of influence would affect areas that drain to the Pigg River (the remaining 45.7 percent draining to the Blackwater River, where no logperch populations have been documented). Land use within the one-mile-radius zone of reasonably foreseeable development surrounding the portion of the ALC/Route 40 interchange draining to the Pigg River is currently comprised of 0.4 acre of commercial properties, 308.6 acres of cropland and pastureland, 408.6 acres of forest land, and 280.4 acres of residential properties.

The next nearest zone of reasonably foreseeable development would be around the proposed ALC/Route 619 interchange located approximately 3.3 miles south of the Pigg River. Land use within the one-mile-radius zone of potentially induced development surrounding the proposed ALC/Route 619 interchange is currently comprised of 1,076 acres of cropland and pastureland and 761 acres of forest land. All of the ALC/Route 619 interchange footprint and associated zone of influence would affect the Pigg River watershed.

With respect to the Pigg River crossing, the next nearest interchange having indirect effects within the Pigg River watershed would be the ALC/Route 220/Route 618 interchange to be located approximately 9.5 miles south of the Pigg River. Land use within the one-mile-radius zone of reasonably foreseeable development surrounding the proposed ALC/Route 220/Route 618 interchange is currently comprised of 566.5 acres of cropland and pastureland, and 1,270.5 acres of forest land. All of the ALC/Route 220/Route 618 interchange footprint and associated zone of influence would affect the Pigg River watershed.

With respect to the Pigg River crossing, the next nearest interchange having indirect effects within the Pigg River watershed would be the ALC/Route 890/Route 108 interchange to be located just north of Figsboro in Henry County (approximately 14 miles south of the Pigg River). Only 20.4 percent (or 374 acres) of the ALC/Route 890/Route 108 interchange footprint and associated zone of influence would affect areas that drain to the Pigg River (the remaining 79.6 percent draining to the headwaters of the Smith River basin). Land use within the one-mile-radius zone of reasonably foreseeable development surrounding the proposed ALC/Route 890/Route 108 interchange is currently comprised of 374 acres of cropland and pastureland.

2.0 STATUS OF THE SPECIES AND ITS HABITAT

2.1 SPECIES / GENERAL HABITAT DESCRIPTION

Roanoke logperch (*Percina rex)* is a large darter in the Percidae family that reaches 144 mm (5.5 inches) total length. It is characterized by an elongate, cylindrical to slab-sided body, conical snout, and complete lateral line. The back is dark green, the sides are greenish to yellowish, and the belly is white to yellowish.

The Roanoke logperch occupies medium to large warm-water streams and rivers of moderate gradient with relatively unsilted substrata. Habitat use by the species varies with age, spawning condition, and seasonal temperature (Burkhead 1983). During different phases of life history and season, every major riverine habitat is exploited by the logperch. Males are associated with shallow riffles during the reproductive period,

whereas females are common in deep runs over gravel and small cobble, which are the observed spawning areas. Young and juveniles usually occupy slow runs and pools with clean sand bottoms. Winter habitat of all individuals is assumed to be under boulders in deep pools. Except in winter, all age classes are intolerant of moderately to heavily silted substrata (Burkhead 1983).

The Roanoke logperch has not been studied to the extent that critical habitat can presently be defined. As a result, FWS has not designated critical habitat or prepared critical habitat maps for the species.

2.2 LIFE HISTORY

The species commonly lives five to six years (Simonson and Neves 1986). Males mature in two years and most females mature in three years (Burkhead and Jenkins 1991). Spawning occurs in April or May. In April of 1982, Noel M. Burkhead (1995 and 1982) observed the spawning of Roanoke logperch. Two males approached a gravid female. Upon locating the female, the males displayed to each other and fought until the loser retreated. At spawning, the pair was located on the gravelly stream substrate and gametes were released by both sexes simultaneously in various locations within an approximately 20 centimeter area. After eggs are laid, there is no subsequent parental care (Page and Swofford 1984). To feed, the Roanoke logperch flips stones over with its snout and ingests the exposed prey. The species does not actively select certain taxa, but consumes most food items encountered. Young feed primarily on chironomid larvae, and adults primarily consume caddisfly larvae and chironomids (Burkhead 1983).

2.3 POPULATION DYNAMICS

Rosenberger (2002) reports that although adult densities are comparable among the Roanoke, Pigg, and Nottoway Rivers, the subadult density is greatest in the Nottoway River. The Pigg River adult population is reported as sparse and no subadults were found. The variation in growth between year classes was greatest for the Nottoway River population. All four populations are now disjunct due to anthropogenic causes, the genetic pools cannot intermingle, and recruitment among the populations is physically lost. An abandoned concrete hydroelectric dam located on the main stem of the Pigg River approximately 1,200 feet downstream of the existing U.S. 220 Bypass has likely effectively isolated Roanoke logperch populations above and below the dam.

2.4 STATUS AND DISTRIBUTION

The Roanoke logperch was listed as an endangered species on July 18, 1989 (50 CFR 17.11).

2.4.1 Global Distribution

On a global basis, the Roanoke logperch is endemic to two river systems in Virginia - the Roanoke River drainage (including the Pigg River and the Smith River) and the Nottoway drainage (Figure 3). According to USFWS sources, comprehensive surveys for the Roanoke logperch have been conducted in 1986 and, to an extent, again in 1998-2000 in the Roanoke, Pigg, and Nottoway River systems. Based on these surveys, USFWS states that it is likely that the overall status of this species is stable to declining. Simonson and Neves (1986) stated that one or more logperch populations "may be in jeopardy of extirpation, and all but one population are of limited size." They concluded "The future outlook for the Roanoke logperch appears precarious without improvements or protection of existing water quality and habitat." This species is rare within most of its known range and when present, its relative abundance averaged only 1.2 individuals per site (Simonson and Neves 1986).

There is limited knowledge on the historical distribution of the Roanoke logperch. The species was first discovered by D.S. Jordan in 1889 in the upper Roanoke River near Roanoke, Virginia. In 1949, three specimens were taken in Sappony Creek, a tributary to Stony Creek and, ultimately, the Nottoway River. The logperch was taken in Stony Creek in 1966 and 1970, and the Nottoway River in 1967 and 1968 (Jenkins 1977). In the mid-1970s, the species was reported from the Roanoke River near Brookneal, Virginia (Jenkins 1977). The recent distribution of the Roanoke logperch was determined in 1985 and 1986 by Simonson and Neves (1986), and to an extent in 1998-2001 by Rosenberger (2002) during assessment of population structure and habitat use in the Nottoway, Pigg, and Roanoke Rivers. Currently, the largest populations appear to be in the Roanoke and Nottoway Rivers.

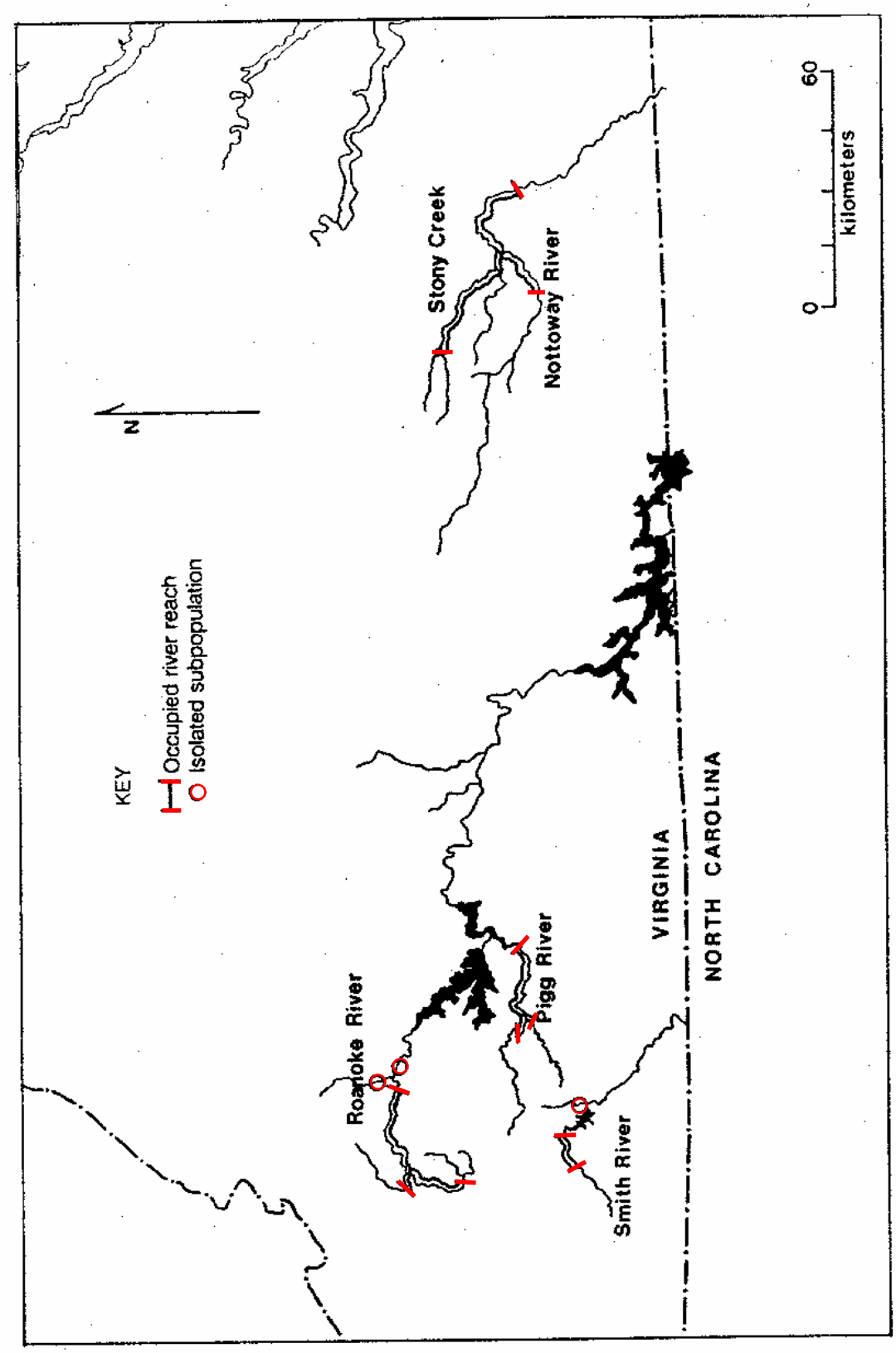


Figure 3. Current distribution of the Roanoke logperch. Modified from Simonson and Neves (1986).

Roanoke logperch is found in the upper Roanoke River system, approximately 9.3 stream miles (15 stream kilometers) up the North Fork Roanoke River and approximately 14.9 stream miles (24 stream kilometers) into the Smith River. In the North Fork of the Roanoke River, the species exists from just downstream of the State Route 603 bridge downstream to the Roanoke River. It has been found in the mainstem Roanoke River system from just upstream of the Leesville Reservoir in Pittsylvania County upstream to the State Route 890 bridge. It has been found in Tinker Creek approximately two stream miles (3.2 stream kilometers) above its confluence with the Roanoke River (Adams 1986). In 1986, one individual was found in Big Chestnut Creek.

In the Smith River system, the Roanoke logperch has been found upstream of Philpott Reservoir to just upstream of Charity, Virginia (Simonson and Neves 1986). It has been recently found in Town Creek two miles (3.2 kilometers) upstream from its confluence with the Smith River (Pinder, Virginia Department of Game and Inland Fisheries, 2001, pers. comm.). In the Nottoway River system, the species has been found from 0.6 mile (one kilometer) above the State Route 609 bridge downstream to just above the easternmost State Route 40 bridge (Angermeier, Virginia Tech, 2001, pers. comm.). It has also been found at several locations in Stony Creek and in Butterwood Creek.

Separate from this project, VDOT is funding a range-wide assessment of habitat suitability for the Roanoke logperch through the Virginia Transportation Research Council that involves surveys at sites in seven different watersheds, which includes watersheds within the study area. The assessment is scheduled to be completed in 2006 but a new population of the Roanoke logperch has been found on Goose Creek, upstream of the Leesville Reservoir. The results of the range-wide assessment of habitat suitability assessment, once completed, will be used in any future consultation with the USFWS to further refine knowledge concerning the status and distribution of the Roanoke logperch.

Table 2 summarizes the stream lengths occupied by the Roanoke logperch in each of the four river systems; however, because of variations in population size and densities, these stream lengths may not be indicative of the relative importance of each of the systems to the logperch.

Table 2. Distribution of the Roanoke logperch in Virginia

Stream System	Stream Miles (Kilometers) Occupied	
Roanoke River	52.3	(84.1)
Pigg River	**32.4**	**(52.2)**
Nottoway River	59.0	(94.9)
Smith River	2.5	(4.0)
Total	146.1	(235.2)

Source: Simonson and Neves (1986).

2.4.2 Local Distribution

Roanoke logperch is known from seven locations in a 15.5-mile (25-km) segment of the Pigg River extending from just above Smith Mountain Lake to Business U.S. Route 220 in Rocky Mount, Virginia (Angermeier, Virginia Tech, 2001, personal communication). The Pigg River system is rather sparsely inhabited by the logperch (Simonson and Neves, 1986). The geographic extremes reported by Simonson and Neves (1986) for the Pigg River are from the vicinity of Glade Hill downstream nearly to the backwaters of Leesville Reservoir. Their report indicates that no specimens of *Percina rex* were found near the previously reported upstream limit (State Route 220 bridge in Rocky Mount). The logperch has also been captured in Big Chestnut Creek, two stream miles (3.2 stream kilometers) above its confluence with the Pigg River. Two Roanoke logperch were collected from Leesville Reservoir (main stem impoundment of the Roanoke River) during sampling on August 24, 1989 (A.L. LaRoche, in litt.). These specimens appear to be upstream expatriates from the Pigg River, since no other specimens have been collected from the reservoir, despite rather intensive sampling there. Total range of the logperch in the Pigg River system encompasses approximately 32.4 stream miles (52.2 stream kilometers).

As previously discussed, the presence of an abandoned concrete hydroelectric dam on the main stem of the Pigg River approximately 1,200 stream feet (366 stream meters) downstream of the existing U.S. 220 Bypass has likely effectively isolated Roanoke logperch populations above and below the dam. Current research suggests that Roanoke logperch are widely distributed in the Pigg River, but at very low densities (Wheeler, Rosenberger, and Angermeier, 2002).

2.5 ANALYSIS OF THE SPECIES AND HABITAT LIKELY TO BE AFFECTED

2.5.1 Direct Effects

Several hundred feet of stream bed would be affected during installation of bridge piers and possible temporary causeways at the crossings of the Pigg River, Little Chestnut Creek, Big Chestnut Creek, and Muddy Creek. Several hundred feet of stream bed would also be affected during installation of box culverts at each of three other perennial tributaries of the Pigg River (Powder Mill Creek, Doe Run, and an unnamed tributary to Doe Run). In addition, *without implementation of appropriate mitigation measures, water quality and stream bottom quality could be affected by stormwater runoff for a certain distance downstream of each of these stream crossings.*

The Roanoke logperch occupies medium to large warm-water streams and rivers of moderate gradient with relatively unsilted substrata (Burkhead, 1983). Because of their relatively small size and position in the landscape (i.e., upper-most perennial to headwater), suitable habitat for the Roanoke logperch does not exist within the portions of Powder Mill Creek, Doe Run, Little Chestnut Creek, and Muddy Creek at or downstream of proposed ALC crossings. Although marginally suitable habitat for the Roanoke logperch is observed in portions of Big Chestnut Creek at or downstream of proposed ALC crossing, a survey conducted in August 2002 indicates that no population exists in the vicinity of the proposed crossing (McInnch and Garman, 2002). The nearest reported population within Big Chestnut Creek occurs two stream miles (3.2 stream kilometers) above its confluence with the Pigg River (approximately 9.8 stream miles [15.8 stream kilometers] downstream of the proposed ALC crossing).

As previously mentioned, several hundred feet of stream bed could be affected during installation of bridge piers and a possible temporary causeway at the crossing of the Pigg River. During an August 2002 survey, Roanoke logperch were collected in moderate numbers from the segment of the Pigg River that would be crossed via a proposed bridge (McInnch and Garman, 2002). As stated in the survey report, this segment of the Pigg River exhibits stretches of shallow, riffle habitat with hard substrates of gravel and rubble alternating with slower run habitat within which most of the substrate is moderately silted (due to nearby agricultural land uses). During the August 2002 survey, at least one logperch was collected from each of the riffle areas and two young-of-the-year were also collected within the survey area (indicating nearby spawning habitat). Total numbers sampled suggest “a moderately robust population” of Roanoke logperch at the proposed Pigg River crossing (McInnch and Garman, 2002). The survey reports states that siltation is already at moderate to high levels within the segment of the Pigg River sampled and points out that most of the logperch sampled were taken from clean substrate habitats where sufficiently high flows presently exist.

2.5.2 Indirect Effects

No placement of structures or fill in Roanoke logperch habitat can be reasonably foreseen as a result of reasonably foreseeable development around interchanges; however, any net increase in more intense land uses (such as residential, commercial, or industrial development) can be expected to alter both quantities and quality of surface runoff in affected portions of the Pigg River watershed. The stormwater constituents of greatest concern will be settleable solids (siltation) and nutrient loading. With respect to proposed I-73, stormwater runoff associated with potential interchange development would be tertiary in effect, in that, any new interchange development would be a secondary effect of roadway construction and any resulting stormwater runoff would, in turn, be secondary to potential interchange development.

None of the one-mile-radius zones of potential interchange development would encroach into any perennial streams reported to contain Roanoke logperch populations in the Pigg River watershed. As previously discussed in section 1.3.2.2 and as shown in Figure 2, the nearest zones of reasonably foreseeable development would be around the proposed ALC interchange located at Route 40 (approximately 1.7 miles north of the Pigg River) the proposed ALC/Route 619 interchange (located approximately 3.3 miles south of the Pigg River). Current land uses for each of the one-mile-radius zones of potential interchange development are discussed in section 1.3.2.2. Within zones of reasonably foreseeable development surrounding proposed interchanges, the bulk of development is anticipated to occur in upland areas; however, effects to water quality and quantity within headwater streams will be cumulative with respect to downstream segments of perennial streams, particularly the Pigg River.

3.0 ENVIRONMENTAL BASELINE

3.1 STATUS OF THE SPECIES WITHIN THE ACTION AREA

3.1.1 Species Baseline as Discussed in the Scientific Literature

The four disjunct Roanoke logperch populations (shown in Figure 3) are thought to represent the remnants of much larger populations that once occupied much of the Roanoke River and Nottoway River basins upstream of the fall line (Moser, 1992). Based on its fragmented range, it is thought that many Piedmont populations must have existed but that most of the populations perished within the last 150 years (Jenkins and Burkhead, 1993).

As previously discussed, comprehensive surveys for the Roanoke logperch were conducted in 1986 and, to an extent, again in 1998 to 2000 in the Roanoke, Pigg, and Nottoway river systems. Based on these surveys, FWS states that it is likely that the overall status of this species is stable to declining. Simonson and Neves (1986) stated that one or more logperch populations "may be in jeopardy of extirpation, and all but one population are of limited size." They concluded "The future outlook for the Roanoke logperch appears precarious without improvements or protection of existing water quality and habitat." In the Pigg River, This species is rare within most of its known range and, when present, its relative abundance averages only 1.2 individuals per site (Simonson and Neves 1986). Water quality degradation (primarily resulting from sedimentation associated with uncontrolled runoff from agricultural properties) and habitat loss (primarily resulting from stream impoundments, rechannelization, and sediment deposition) appear to be the primary factors contributing to species decline.

Historical surveys for the Roanoke logperch indicate that the Pigg River system was sparsely inhabited (James, 1979; (Jenkins and Burkhead, 1993). A discharge of copper sulfate and silver nitrate into Furnace Creek (a tributary of the Pigg River) in 1975 caused a severe fish kill for about 23 miles (37 kilometers) downstream (James, 1979), likely reducing or eliminating the logperch population in the Pigg River near Rocky Mount, Virginia. In addition, much of the Pigg River is reported to contain moderate to heavy silt deposits (Moser, 1992; Burkhead, 1983; McInnich and Garman, 2002) – a factor that is likely contributing to habitat loss and suppression of populations. Although the number of individuals is presently unknown, it is reported that the Pigg River system is somewhat sparsely inhabited by the Roanoke logperch (Moser, 1992).

Roanoke logperch is an indicator of higher-quality streams in uplands of the Roanoke River basin; however, it reported that the reduction in higher-quality waters has resulted in a reduction in species numbers and distribution. It is thought that the continued existence of the Roanoke logperch within the Pigg River watershed is tenuous due to low numbers of the species along with continued siltation of aquatic habitat (Jenkins and Burkhead, 1993). It is thought by some investigators that populations in the Pigg, Smith, and Nottoway river systems could perish with minor habitat degradation (Jenkins and Burkhead, 1993).

Although the Roanoke logperch remains rare in the Pigg River system, more recent investigators have been encouraged by findings indicating that adult logperch densities are comparable to densities observed in the Roanoke and Nottoway rivers (Rosenberger and Angermeier, 2002). Analyses performed by Rosenberger and Angermeier (2002) indicate that the Roanoke logperch population in the Pigg River may be recovering from the 1975 fish kill; however, their investigations found that adult densities remain very low in most Pigg River site and they failed to observe subadult logperch. According to Rosenberger and Angermeier (2002), these findings indicate that the Pigg River population, while recovering, remains sparse and at risk.

As discussed in greater detail in following sections, any substantial degree of development and even the significant conversion of forestlands to agricultural lands without implementation of appropriate long-term best management practices could lead to changes in surface water drainage patterns, peaks rates of runoff, and sediment/pollutant loading. At a minimum, though, any local government-sponsored new development would be subject to Virginia's Stormwater Management regulations. Construction of new roadways carrying a significant amount of commercial traffic could be expected to increase the probability of episodic stream contamination (from traffic accidents, overturned trucks, etc.) (Abkowitz *et al*, 1989; U.S. Environmental Protection Agency, 1996). If unaddressed, such changes or events could place cumulatively additive stressors on existing logperch populations or could lead to degradation or elimination of suitable habitat. Such transportation related issues are controlled by VDOT and the Commonwealth of Virginia; however,

Franklin County is responsible for zoning and its decisions pertaining to allowable population density will be the primary determinant of the magnitude of future growth within the Pigg River watershed.

3.1.2 Project-Specific Stream Surveys

As part of the proposed I-73 Location Study, environmental specialists from Virginia Commonwealth University (VCU) conducted quantitative and qualitative fisheries assessments within segments of the ten medium to large size perennial streams of the I-73 study area most likely to contain suitable Roanoke logperch habitat which would be crossed by the proposed ALC. The assessments were performed to determine whether or not populations of the Roanoke logperch are resident at sites of proposed stream crossings. The assessments were conducted between mid-April and early June 2002. In May of 2002, a team consisting of FHWA, VDOT, ACOE, FWS, EPA, and VDOT's consultants reviewed many of these crossings in the field over a two-day period. Locations of Roanoke logperch survey sites are provided in Table 3. The location of the sampled Pigg River population addressed by this Biological Assessment is shown in bold print. Results of the surveys are set forth in a report titled "Roanoke Logperch (*Percina rex*) Survey for the Proposed Interstate 73 Project" (McInnich and Garman, 2002).

Study sites include stream reaches associated with confirmed or likely records of Roanoke logperch (Type I study site; e.g. Pigg River), as well as area that may support the species based on zoogeography and available habitat (Type 2 study site; e.g. Leatherwood Creek). The survey locations include ten sites that represent river main stems (Roanoke, Blackwater, Pigg, and Smith rivers) and smaller tributaries representing a variety of riparian conditions (urban to undisturbed). Most sites were wadeable at normal flow conditions and could be effectively sampled with standard electrofishing gear. The Roanoke River site and the Smith River site were large enough to make single-gear sampling difficult and thus were snorkeled prior to sampling. Sampling was initiated in mid-April but was postponed due to the large numbers of spawning suckers that made darter identification and specimen recovery difficult. Sampling resumed in early June, 2002. Each Type 1 site was sampled using backpack electrofishing gear (Smith-Root model 12, pulsed D.C.) using standard methods. Voltage and pulse frequency settings were adjusted so as to minimize harm to the fish from the electrical field. As Percina species are known to react strongly to electrical fields and the low settings often resulted in non-catch of other species (e.g. sunfishes, minnows). Approximately 820 feet (250 meters) of stream, centered on the 600-foot (183-meter) roadway study corridor was sampled at all Type 1 sites. The Roanoke River and Smith River sites were snorkeled prior to electrofishing. Snorkeling observations were made in a downstream zigzag manner and covered approximately 1,312 feet (400 meters) of stream habitat. Type 2 sites were also sampled using standard electrofishing methods for 328 feet (100 meters) of stream, also centered within the roadway corridor. All fishes collected were identified and returned to the location of capture. Each study site was assessed visually for suitable habitat.

A total of 45 species, representing five families was collected from the ten sites. Roanoke logperch were only found at the Pigg River site. Minnows and suckers dominated the fish assemblage at most sites. A total of seven species of darter were collected, but most were infrequently encountered. This may be due to heavy siltation in many of the study areas.

At most of the proposed I-73 crossing locations, areas of preferred habitat for Roanoke logperch were uncommon or absent. Siltation was moderate to heavy at many of the sites and clean rubble and gravel habitats are wanting. An effort was made to look for variable habitat types near the proposed crossings, and sample those that appeared to be potential Roanoke logperch areas.

TABLE 3:
STREAM CROSSINGS SURVEYED FOR ROANOKE LOGPERCH
AS PART OF THE INTERSTATE 73 LOCATION STUDY

COUNTY	STREAM NAME	LATITUDE	LONGITUDE	QUADRANGE NAME
Roanoke	Roanoke River	37° 15' 8.8"	79° 55' 26.3"	Roanoke
Roanoke	Back Creek	37° 13' 36.6"	79° 52' 3.6"	Hardy
Franklin	Maggodee Creek	37° 5' 36.9"	79° 51' 8.0"	Redwood
Franklin	Maggodee Creek	37° 5' 47.5"	79° 51' 4.7"	Redwood

Franklin	Blackwater River	37° 3' 9.2"	79° 51' 2.3"	Redwood
Franklin	**Pigg River**	**36° 59' 27.5"**	**79° 50' 27.4"**	**Gladehill**
Franklin	Big Chestnut Creek	36° 52' 44.4"	79° 51' 26.3"	Gladehill
Franklin	Big Chestnut Creek	36° 51' 32.9"	79° 51' 53.6"	Snow Creek
Henry	Leatherwood Creek (2)	36° 38' 38.7"	79° 47' 20.3"	Martinsville East
Henry	Smith River	36° 36' 50.4"	79° 47' 55.9"	Northwest Eden

Roanoke logperch were collected in moderate numbers from the Pigg River site. This site had stretches of shallow riffle habitat with hard substrates of gravel and rubble alternating with slower run habitat where most of the substrate was moderately silted (apparently from nearby agricultural land uses). At least one logperch was collected from each of the riffle areas. Two young-of-the-year specimens were also collected at this site, indicating nearby spawning habitat. With the electrofishing equipment at low settings and a rapid sampling technique (to avoid harm to fishes), these numbers suggest "a moderately robust population" of *Percina rex* at the Pigg river site (McIninch and Garman, 2002).

3.1.3 Views of Species Experts

A review of relevant scientific literature specific to the Roanoke logperch and the region encompassing the range of the species was conducted pursuant to preparation of this Biological Assessment (see Section 8.0, References). It is reported that extensive siltation of stream habitats is likely hindering the recovery of the Roanoke logperch in areas investigated by Moser (1992) and Burkhead (1983).

As previously discussed, current research suggests that Roanoke logperch are widely distributed in the Pigg River, but at very low densities (Wheeler, Rosenberger, and Angermeier, 2002). Although the Wheeler, *et al*, report acknowledges that few studies have specifically addressed the Roanoke River watershed and acknowledges that conclusions set forth in the report have been synthesized from many areas, the report contends that increased fine sediment loads resulting from road construction is the most threatening component of potential threats.

According to survey results reported by McIninch and Garman (2002) of VCU, the proposed Pigg River crossing is probably the only site among the ten surveyed that may have an effect on the endangered Roanoke logperch. Because siltation is already at moderate to high levels, McIninch and Garman conclude that it is unlikely that short-term increases, due to construction, would have significant negative effects on the Pigg River population. McIninch and Garman state that most of the Roanoke logperch captured were taken from clean substrate habitats and that sufficient flow presently exists within the Pigg River survey area to keep areas of higher flow (swift runs and riffles) clean of siltation. The VCU study therefore recommended that every effort be made to keep siltation to a minimum and maintain river flows in the Pigg River study area. Conclusions and recommendations set forth in the McIninch and Garman study are directed at the 250 meters of stream segment surveyed and, because the investigators were not tasked with assessing watershed-wide issues, no conclusions or recommendations pertaining to indirect or cumulative effects were included in the report.

3.2 FACTORS AFFECTING THE SPECIES WITHIN THE ACTION AREA

The main causes of decline of this species are thought to be habitat loss and alteration due to turbidity and siltation, chemical spills and pollution, channelization, impoundments, and cold water releases (U.S. Department of the Interior, Fish and Wildlife Service, 1992). Of these, siltation is thought to be the most widespread problem across the range of the species. Excessive silt deposition reduces habitat heterogeneity and primary productivity; increases egg and larval mortality; abrades organisms; and alters, degrades, and entombs macrobenthic communities (Burkhead and Jenkins, 1991).

3.2.1 Factors Affecting Individuals

3.2.1.1 Effects of Increased Sedimentation

Benthic fishes that require silt-free habitat are particularly vulnerable to human impacts (Etnier, 1997). Roanoke logperch use their conical snout to flip gravel and feed on exposed benthic macroinvertebrates (Jenkins and Burkhead, 1993). This feeding behavior relies on the availability of loosely embedded substrate. Because of this feeding behavior, Roanoke logperch appear to be intolerant of moderately to heavily silted substrates.

Increases in water column turbidity and substrate siltation can result in:

- gill abrasion which can, in turn, render an individual more susceptible to respiratory distress and diseases
- a decrease in food source through elimination of bottom habitat necessary for preferred macroinvertebrate prey
- lower visibility during food foraging and
- potentially higher exposure to stormwater-introduced heavy metals which typically become bound to clay-sized particles

3.2.1.2 Effects of Microhabitat Loss

The Roanoke logperch uses a wide range of both microhabitat and mesohabitat throughout its various life stages (Rosenberger, 2002). Research indicates that adult Roanoke logperch specialize in microhabitat preferences but that they are capable of occupying a range of velocities and depths to find appropriate substrate for feeding. According to Rosenberger, this specialization indicates that micro-scale conditions are more relevant for Roanoke logperch than meso-scale conditions. This reliance on habitat mosaics over multiple scales points to the need to pursue conservation measures that are effective on a watershed-wide basis.

Investigations indicate that adult logperch in the Pigg River select fastest-flowing habitats available. Because of heavy silt loads in the Pigg River system, these higher velocity waters are sought out because they offer the lesser silted substrate necessary for bottom foraging. As a result, logperch of the Pigg River may experience higher energy costs of foraging resulting from the fact that they must navigate faster flowing waters than would be experienced in low-silt environments (Rosenberger and Angermeier, 2002). This greater energy expenditure may be particularly detrimental to individuals during winter months when food sources are lower and when swimming ability is reduced due to depressed metabolism (Rosenberger, 2002).

Evidence that human modifications of stream channel morphology (such as rechannelization or culvert installation) can reduce habitat diversity and gradually sloping stream banks which, in turn, can increase areas of unsuitable habitat having flow velocities that exceed young-of-year swimming speeds (Rosenberger, 2002). Increase siltation rates can lead to greater imbeddedness of substrate, which can result in the loss of interstitial cavities required by the species during periods of winter quiescence.

3.2.2 Factors Affecting Roanoke Logperch Populations

3.2.2.1 Effects of Increased Sedimentation

Water quality issues continue to be a concern throughout the range of this species. The consistent use of silt-free, loosely embedded gravel throughout its range suggests that substrate features are most important for adult Roanoke logperch (Rosenberger, 2002). Relatively large-scale urbanization is now occurring in the Roanoke River Valley. Urbanization within the range of this species will result in higher levels of siltation. The subsequent increase in impervious surfaces will change stream temperatures and hydrologic regimes resulting in higher peak flows and lower low flow conditions. Water supply and demand will also likely reduce instream flows as urbanization continues. Agricultural and deforestation runoff are likely to continue but potentially at a lower rates as urbanization occupies a larger portion of the landscape.

Contrary to findings set forth in the 2002 report by Wheeler, et al, that contended that sedimentation resulting from roadway construction is the most threatening component of potential threats to the Roanoke logperch,

Rosenberger (2002) found that uncontrolled agricultural runoff posed the primary source of sedimentation threatening Roanoke logperch habitat. In the Pigg River, the major concern for the well-being of the species is siltation from agricultural sources and specifically, cattle farms (Rosenberger, 2002). Rapid Bioassessment of benthic invertebrate communities conducted in the Pigg River watershed as part of the I-73 Location Study indicates that livestock incursions and runoff from pasturelands are contributing to nutrient loading and high fecal coliform counts which, in turn, are contributing to water quality and aquatic habitat degradation. The major stressor affecting populations in the upper Smith River is thought to be temperature stress resulting from cold water releases from Philpott Reservoir (Mike Pinder, VDGIF, 2 April 2003 personal communication).

The main stem of the Pigg River is 69.4 miles in length. Based on existing land coverage data maintained by the U.S. Environmental Protection Agency (EPA) under its BASINS database program (EPA, Office of Surface Water, 1998), geographic information system (GIS) analyses indicate 38.8 miles (62.4 kilometers) or 56 percent of the total length of the Pigg River is bordered by forested lands, the remaining 30.6 miles (49.2 kilometers) or 44 percent of the total length is bordered by cleared and/or altered lands (comprised of croplands, pasturelands, industrial properties, residential properties, and transportation/utility land uses). Riparian and aquatic habitat associated with the 30.6 miles (49.2 kilometers) of the Pigg River bordered by cleared and/or altered lands can be expected to exhibit functions and values that are relatively lower as compared to similar habitat associated with 38.8 miles (62.4 kilometers) of forested stream corridor.

As previously discussed, a 1975 discharge of copper sulfate and silver nitrate into Furnace Creek (a tributary of the Pigg River) caused a severe fish kill for about 23 miles (37 kilometers) downstream (James, 1979), likely reducing or eliminating the logperch population in the Pigg River near Rocky Mount, Virginia. In addition, much of the Pigg River is reported to contain moderate to heavy silt deposits (Moser, 1992; Burkhead, 1983; McIninch and Garman, 2002). Chemical spills are also likely to grow in frequency with urbanization.

Insufficient investigations have been conducted on the Roanoke logperch to determine population mobility. Should logperch populations migrate upstream/downstream for any significant distance, the abandoned concrete hydroelectric dam on the main stem of the Pigg River may have isolated once interactive populations and could be preventing population migrations that might otherwise occur.

Based on the Virginia Department of Environmental Quality's (DEQ) 2002 Clean Water Act §303(d) Impaired Waters Report, there are approximately 175 miles (282 kilometers) of impaired streams in the Roanoke River Basin where the endangered Roanoke logperch occurs. Through recent sampling required to prepare the Impaired Waters Report, the Virginia DEQ determined that these waters do not support, only partially support, or threaten the Clean Water Act aquatic life use goal. There are several causes for the impairment in these waters. In terms of the Roanoke logperch, as discussed above, sedimentation presents a tremendous threat due to alteration of the habitat. The sediment loads to the Roanoke River Basin are substantially anthropogenic in source. This habitat condition coupled with other impairment documented in the Virginia DEQ's Impaired Waters Report, such as bioaccumulation of contaminants in fish, metals, PCBs, and pesticides in sediments, and depressed macroinvertebrate diversity and numbers, is unacceptable for the species.

3.2.2.2 Effects of Mesohabitat Loss

Along with water quality degradation, habitat loss (primarily resulting from stream impoundments, rechannelization, and sediment deposition) appears to be a primary factor contributing to species decline. Investigations conducted in the mid-1980's estimated that stream lengths within the range of the Roanoke logperch totaled 146.1 river miles (rmi) (235.2 river kilometers (rkm)); however, habitat occupied or suitable for occupation by the species was estimated at only 21.3 rmi (34.2 rkm) (Jenkins and Burkhead, 1993) – or 14.5 percent of total stream length.

Although large-scale destruction of Roanoke logperch habitat from single-project or single-activity impacts (such as impoundments) is highly unlikely under current environmental regulatory programs, cumulative losses of microhabitat (described in section 3.2.1.2) from more numerous small-scale activities (such as culverts, channel modifications, etc.) should be assessed on a watershed-wide basis by Franklin County. In addition, potential interchange development resulting in the conversion of significant acreages of forestlands to developed properties and even the significant conversion of forestlands to agricultural lands without implementation of appropriate long term best management practices could lead to changes in surface water drainage patterns, peaks rates of runoff, and sediment/pollutant loading. Without implementation of

appropriate best management practices, these changes would likely result in unacceptably high losses of habitat within the Pigg River system.

4.0 EFFECTS OF THE ACTION

4.1 FACTORS TO BE CONSIDERED

4.1.1 Direct Effects

Factors to be considered when assessing potential direct effects of the action on Roanoke logperch populations within the Pigg River include:

- permanent habitat loss from placement of structures or fill
- temporary disturbance of aquatic habitat from construction access causeways, coffer dams, and other temporary measures
- immediate and/or progressive degradations of aquatic habitat from pollutant loading (primarily metals and petroleum products) and increased siltation rates associated with highway stormwater runoff

4.1.2 Indirect Effects

Indirect effects are those effects that are expected to be "caused" by the proposed action but are later in time or are removed in distance, but are still reasonably foreseeable (40 CFR 1508.8). It was once widely accepted that any substantial degree of development associated with new local access at and around proposed interchanges could be expected to contribute to potentially adverse effects to water quality and water quantity within nearby receiving waters. Interchange induced development would cumulatively affect surface water resources and aquatic habitat over a number of years. Specifically, potential interchange development resulting in the conversion of substantial acreages of forestlands to developed properties and even the substantial conversion of forestlands to agricultural lands without implementation of appropriate best management practices could lead to changes in surface water drainage patterns, peak rates of runoff, and sediment/pollutant loading; however, as discussed in the following sections of this document, recent studies indicate that the association between road construction and urbanization has been historically over-stated and that roads are, at best, an inefficient means for inducing or encouraging development in the absence of a combination of other necessary development factors (Hartgen, et al, 1990; Bly, 1998; Hartgen, 2003a) and that major road improvements appear to "accommodate, rather than spur, growth" (Hartgen, 2003b). Recently, at the direction of Congress, FHWA completed the Economic Development Highways Initiative which reached a similar conclusion. The overall results of the initiative support the general linkage between highway improvement and economic development, and validate the contention that highway improvements are a necessary but not sufficient condition for capturing economic growth potential. Construction of new roadways carrying a substantial amount of commercial traffic could be expected to increase the probability of episodic stream contamination (from traffic accidents, overturned trucks, etc.). If unaddressed, such changes or events could place cumulatively additive stressors on existing logperch populations or could lead to degradation or elimination of suitable habitat. As previously discussed, such transportation related issues are controlled by VDOT and the Commonwealth of Virginia; however, Franklin County is responsible for zoning and its decisions pertaining to allowable population density will be the primary determinant of the magnitude of future growth within the Pigg River watershed. It is also important to point out that figures which appear below regarding the conversion of forestland or agricultural land, assume that the entire acreage would be converted to development. Because the type of development or configuration of that development around the interchange is not known, it is not possible to determine how much green space or what acreage of tress might be retained by developers at this time.

4.2 ANALYSES FOR EFFECTS OF THE ACTION

4.2.1 Direct Effects

Assuming average construction limits of 200 feet (78 feet total average pavement width and 122 feet total average median and right-of-way width), the total combined area of the interchanges and roadway that would

be constructed within the Pigg River watershed is 660 acres. This translates to 0.26 percent of the total 250,983 acres comprising the Pigg River watershed. With respect to direct effects, the ALC would not result in the conversion of any currently developed land, but would convert all 660 acres of agricultural lands and forestlands to 237 acres of interchange ramps and road surface and 423 acres of associated managed landscaped areas.

4.2.1.1 Placement of Fill and Structures

As a location study, no detail design has yet been developed for the ALC crossing of the Pigg River beyond the fact that the crossing would be made on-structure (i.e., a bridge). It appears that, given the width of the Pigg River where the ALC would cross and the topographic features of the surrounding area, that VDOT will be able to span the Pigg River and that the placement of temporary fill for construction access and permanent fill for construction and the placement of piers or abutments would not occur in the channel or below the ordinary water line. A final commitment on the design of the crossing will be made during final design and formal consultation with the USFWS when the information needed to make an informed decision on the practicality of this method of construction will be developed; therefore, a worst-case assumption has been made for the biological assessment that construction activities would occur within the channel and below the ordinary water line.

Potential effects to Roanoke logperch habitat would include placement of fill material for box culverts and temporary construction causeways and the placement of bridge support structures (piles). Areas disturbed by temporary construction features would be restored immediately following construction; however, several hundred square feet of habitat (stream bottom) could be lost to installation of box culverts at three perennial stream crossings while another several hundred square feet of stream bottom could be lost to installation of bridge support structures at four stream crossings. Although this loss directly attributable to roadway construction is not considered to be severe with respect to total habitat available within the study area (i.e., the 52.2 stream miles (84 stream kilometers) within the Pigg River reported by Simonson and Neves in 1986), cumulative impacts within the watershed have been considered and feasible and prudent mitigation addressed.

4.2.1.2 Highway Stormwater Runoff

Other direct effects would consist of stormwater runoff draining from the roadway facility . The types and concentrations of pollutants in stormwater runoff typically vary among watersheds. These variations can be attributed largely to the land use, topography, soil chemistry, and hydrology of the watershed. Other factors contributing to concentrations of pollutants in runoff include the duration of a storm, the severity of a storm, and the number of dry days preceding a storm. Stormwater runoff from highways and associated rights-of-way typically contains a specific suite of pollutants, which can occur in widely varying concentrations. The most common contaminants in highway runoff consist of heavy metals, inorganic salts, aromatic hydrocarbons, and suspended solids (EPA, 1995; USDOT, FHWA, 1998). Deicing operations (salting and sanding), may leave measurable concentrations of chloride, sodium, and calcium on road surfaces. Salt levels in highway runoff will vary according to the amount of deicing chemicals applied and the intensity of subsequent precipitation events. Oil, grease, other hydrocarbons, rust, rubber particles, and metals resulting from normal vehicle operation are deposited on roadways. Normal wear of brakes, tires, and other vehicle parts can result in relatively higher concentrations of cadmium, chromium, copper, iron, lead, nickel, and zinc in highway runoff.

Effects of pollutant loadings will, naturally, vary along the corridor of any selected alternative. A major factor that determines concentrations of pollutants in highway stormwater runoff is the volume of traffic carried by a particular segment of roadway. Other factors that influence the extent and degree of pollutant loading include the type and size of the receiving water body, the potential for dispersion, the size of the catchment area, and the biological diversity of the receiving water ecosystem.

Currently 4,669 acres (or 1.86 percent) of the 250,983-acre Pigg River watershed is comprised of impervious surface. Construction of the ALC would add approximately 237 acres of impervious area (in the form of 135 acres of road surface and 102 acres of interchange ramps) to the 250,983-acre Pigg River watershed. Construction of the ALC would, thereby, increase the total impervious surface area within the Pigg River watershed from 1.86 percent to 1.95 percent. Without the provision of appropriate stormwater management

facilities, this net increase in impervious surface would result in increase pollutant loading for a certain distance downstream of proposed stream crossings.

Total annual stormwater runoff pollution loading along the entire 71.71-mile length of the ALC has been estimated at 34.87 tons (31,636.85 kilograms). For purposes of comparison, the severity of potential effects with respect to water quality is expressed in the DEIS in terms of percent increase over 1997 base year conditions (i.e. no-build). Compared to 1997 baseline conditions, the ALC would result in the smallest percent increase of stormwater runoff pollutant loading (at 6.9 percent) when compared to other Build Alternative Options considered in the DEIS. No stormwater pollutant loadings are available specifically for the Pigg River watershed; however, it is know that 14.3 miles (23 kilometers) of the 71.71 total miles (113 kilometers) comprising the ALC (or 19.94 percent) will traverse the Pigg River watershed. When this percent of total project length is applied to the total annual stormwater runoff pollutant loading for the entire ALC, it is estimated that the ALC could lead to an increase in stormwater pollutant loading within the Pigg River watershed in the amount of 6.95 tons (6,305.04 kilograms) annually (Note: This is the estimated tonnage that would be produced in the watershed and not the estimated tonnage that would reach receiving waters. Depending upon the distance to receiving waters, runoff would first be ameliorated by upland overland flow. Any runoff not absorbed through overland flow would be mitigated through the installation of stormwater management facilities designed to address point-specific loadings). Also, this estimate uses vehicle miles traveled (VMT) averaged over the entire length of the ALC. Considering that VMT is expected to be lower within the central or Franklin County portion of the ALC, the estimated loading of 6.95 tons annually can be considered a conservative estimate.

4.2.1.3 Contamination Resulting from Episodic Releases

Construction of the ALC could increase the probability of episodic stream contamination (from traffic accidents, overturned trucks, etc.); however, such an occurrence is not considered a reasonably foreseeable effect given the relatively low statistical probability such an event in the immediate vicinity of the Pigg River combined with current technologies designed to prevent, contain, and remediate such occurrences.

4.2.2 Indirect Effects

Past studies indicate that most stream corridor degradation can be directly attributed to land use practices and/or hydrologic changes at the watershed level that cause fundamental disruption of ecosystem functions (Beschta et al., 1994). Although roadway construction can contribute to changes at the watershed level (through direct, indirect, and cumulative effects), roadways comprise only one of many factors contributing to these changes. Agricultural and sylvicultural activities involve land use practices which are not necessarily dependent upon a well-developed roadway network capable of conveying large volumes of traffic, and are activities documented to contribute most heavily to nonpoint pollution in the region. Such practices remove the tree cover from the land exposing the soil to runoff and allowing pesticides, insecticides, herbicides, and animal waste to more readily enter receiving bodies of water. Urbanization is another source of nonpoint pollution that has been shown to be linked to road construction; however, recent studies indicate that the association between road construction and urbanization has been historically over-stated and that roads are, at best, an inefficient means for inducing or encouraging development in the absence of a combination of other necessary development factors (such as existence of water and sewer; distance from schools, primary settlement areas; etc.) (Hartgen, et al, 1990; Hartgen, 2003a) In a study of potential links between road construction and urban sprawl in Ohio; investigators concluded that major road improvements appear to “accommodate, rather than spur, growth” and that approximately 70 percent of population growth during the 1990s occurred within census tracts that had no major road improvements (Hartgen, 2003b). Before-and-after studies of seven new road links in Great Britain indicate that there was little overall growth in cases of bypasses and that growth seen in several cases was more connected with external changes than the road schemes themselves (Bly, 1998). Recently, at the direction of Congress, FHWA completed the Economic Development Highways Initiative which reached a similar conclusion. The overall results of the initiative support the general linkage between highway improvement and economic development, and validate the contention that highway improvements are a necessary but not sufficient condition for capturing economic growth potential. These recent studies conclude that development within an area is a complex phenomenon whose direct relationship to highways has been brought into question and that allowable population growth will be primarily determined by local zoning decisions.

Primary factors affecting growth and land management practices specific to the proposed action were identified in order to guide an analysis of reasonably foreseeable indirect effects at proposed stream crossings and interchange locations within the action area related to the Pigg River Roanoke logperch population. Existing land use maps were reviewed to identify a general inventory of currently developed and undeveloped land within the project impact zone. The most recently updated Franklin County Comprehensive Plan (1995) was used to estimate future land uses within the action area through year 2015. Coordination with the local government representatives was also conducted to obtain any development information that might not be addressed in the most recently available comprehensive plans.

Although the 1995 Franklin County Comprehensive Plan identifies two prospective alignments for a proposed I-73, one alignment is shown located to the west of the CTB-approved alignment (the ALC) and one alignment is shown located east of the ALC. In addition to development projected in the Franklin County Comprehensive Plan independent of the ultimately selected alignment (the ALC), it is reasonable to foresee that a certain degree of interchange development will ultimately occur in the vicinity of those interchanges proposed within the ALC/Pigg River action area. A zone of potential influence having a one-mile radius around each proposed interchange was used, based on consultation with the EPA early on in the development of the draft EIS, to estimate the amount of undeveloped land that could be developed for highway use that is not accounted for in the Franklin County Comprehensive Plan (Figure 2). As previously discussed, Franklin County is responsible for zoning and its decisions pertaining to allowable population density will be the primary determinant of the magnitude of future growth within the Pigg River watershed apart from any decision made on this project.

Currently 271 acres of the 5,046-acre footprint of indirect effects around proposed ALC interchanges within the Pigg River watershed are comprised of developed lands. Future land conversions projected under and/or accommodated by the Franklin County Comprehensive Plan would result in the conversion of an additional 57 acres of currently undeveloped land to developed properties within the indirect effects footprint of the ALC/Pigg River action area. Irrespective of construction of the ALC, land use conversions conforming to the local comprehensive plan would increase the amount of developed land within the action area from to 5.4 percent to 6.5 percent by the end of the year 2015 planning window.

Because a certain amount of new roadway development has occurred in recent years along the Route 40 corridor just east of its interchange with U.S. 220 and because the bulk of future development within the indirect effects footprint of the ALC/Pigg River action area is projected to occur along the existing Route 40 corridor, the ALC/Route 40 interchange was used as a “model by analogy” to predict the degree of induced development which would be reasonably foreseeable at the other proposed interchanges within the Pigg River watershed. Currently, 270.7 acres (27 percent) of the 998-acre portion of the ALC/Route 40 action area draining to the Pigg River basin is comprised of developed land (largely residential). Within this 998-acre portion of the ALC/Route 40 action area draining to the Pigg River basin, 56.5 acres of new development is projected by the Franklin County Comprehensive Plan. This suggests that throughout the year 2015 planning window used in the Comprehensive Plan, 34 percent of areas potentially subject to new interchange development could be comprised of developed land. This reflects a 5.7 percent increase in the vicinity of the ALC/Route 40 interchange development zone and an estimated 34 percent increase in the vicinity of the other two whole and the one partial interchange development zones within the Pigg River watershed. While the proposed Route 40 interchange will be near enough to Rocky Mount to be considered a suburban interchange, the other three interchanges falling wholly or partially within the Pigg River watershed will be rural interchanges. Past studies indicate that, for rural interchanges, growth has typically been limited to a narrow band along cross streets or no growth has occurred at all (Hartgen *et al*, 1990; Hartgen, 2003a; Hartgen, 2003b). Because the model by analogy used is a suburban interchange (i.e., Route 40), this 34 percent predicted increase in development at the other three interchanges may likely be overstated.

In the absence of appropriate stormwater management measures, this net increase in developed properties would lead to a net increase in stormwater pollutant loading within the watershed. For private development (which is anticipated to comprised the bulk of future development around proposed interchanges), such measures could only be required by Franklin County under local ordinance. This reasonably foreseeable situation emphasizes the need for a Pigg River watershed management plan administered by partnering agencies on a local, state, and federal level. VDOT's participation in and/or contribution to such a plan is consistent with the goals related to Public Involvement and Participation outlined in the VDOT Virginia

Pollutant Discharge Elimination System - Municipal Separate Storm Sewer System Permit (VPDES-MS4 Permit). These goals include VDOT's participation in local government watershed planning and watershed organizations, as well as partnering on regional watershed solutions when feasible.

Comparison of existing land use effects and future land use effects demonstrates (1) that a net loss of forestlands and agricultural lands is projected within the action area under the current Franklin County Comprehensive Plan, (2) that this net loss will occur independent of construction of the ALC, and (3) that the ALC could be expected to cumulatively contribute to indirect effects to water quality and aquatic habitat resulting from stormwater runoff associated with the conversion of forestland for purposes of accommodating interchange development. The projected net conversion of forestlands to developed lands would result in adverse effects to the Pigg River watershed (from both a water quality and water quantity perspective) if appropriate stormwater management is not implemented for new development and the roadways constructed for that development. By contrast, the bulk of current water quality problems within the Pigg River watershed are attributable to uncontrolled runoff from croplands and pasturelands. With implementation of appropriate stormwater management for new roadways and new development (measures currently required under state and local programs) at the local level along with the restoration/preservation of riparian buffers, the projected net conversion of agricultural lands to developed lands could contribute to improving water quality within the Pigg River watershed by reducing the amount of agricultural runoff (which contributes substantially to water quality degradation and sediment disposition by contributing silt, sediment, and chemical and bacterial constituents of fertilizer into receiving bodies of water) often associated with those land uses.

The proposed ALC would not provide any new access to currently undeveloped lands along the portion of the Pigg River known to support Roanoke logperch populations. For a 1.7-mile (2.7-kilometer) segment of the ALC north of the Pigg River and a 3.3-mile (5.3-kilometer) segment of the ALC south of the Pigg River, there would be no direct access to properties abutting the ALC right-of-way; therefore, there would be no indirect effects caused by the project as a result of any access changes or induced development along this more sensitive segment.

4.3 RESPONSE OF THE SPECIES TO THE PROPOSED ACTION

4.3.1 Direct Effects

The loss of several hundred square feet of stream bottom to bridge support structures is not considered to be an immediate or imminent threat to survival of logperch populations in the Pigg River watershed. Efforts would be made during later design phases to span the Pigg River on structure; thereby avoiding such effects.

Given already moderate to high siltation levels in the Pigg River in the vicinity of the proposed ALC and given the tenuous nature of populations surveyed to date, any increase in stormwater pollutant loading could be detrimental to survival of Pigg river populations. Stormwater runoff attributed to direct effects of the proposed action would be considered minimal if mitigation measures and best management practices set forth in the FEIS are properly implemented and maintained. Implementation of best available measures during later design of stormwater management facilities is critical to the maintenance and improvement of water quality and aquatic habitat downstream of the proposed ALC.

No interference with migration of the fish species would result from bridge construction on the Pigg River. The next nearest reported Roanoke logperch population occurs within Big Chestnut Creek, approximately two stream miles (3.2 stream kilometers) above its confluence with the Pigg River (approximately 9.8 stream miles [15.8 stream kilometers] downstream of the proposed ALC crossing). Accordingly, no reasonably foreseeable direct effects to known Roanoke logperch populations occupying other portions of the Pigg River watershed are anticipated to result from the aforementioned stream crossings. Although no logperch populations have yet been reported within other stream segments within the ALC action area, it appears that practicable measures to provide for the upstream/downstream movement of the logperch at proposed sites of culvert installation (such as those on Powder Mill Creek, Doe Run, and an unnamed tributary to Doe Run) could be implemented so as to not preclude expansion of the species' range should future recovery efforts prove successful. A final decision on the practicality of these measures will be made during final design when the information need to make that commitment is developed.

4.3.2 Reasonably Foreseeable Indirect Effects Associated with the ALC/Pigg River Action Area

Any substantial degree of development induced by new local access at and around proposed interchanges would contribute to potentially adverse effects to water quality and water quantity within certain portions of the Pigg River watershed. Potential interchange development in combination with development already projected under the Franklin County Comprehensive Plan (independent of the ALC) would cumulatively affect surface water resources and aquatic habitat over a number of years; however, the zones of potentially induced development surrounding ALC interchanges to be located within the Pigg River watershed are not located in proximity to known populations or stream segments containing suitable habitat. Considering the degree of development already projected under the Franklin County Comprehensive Plan combined with the fact that the ALC will not provide direct local access any nearer than 1.7 miles (2.7 kilometers) from the Pigg River, the proposed action would likely not contribute substantially to adverse indirect effects to water quality or water quantity.

Within portions of the Pigg River watershed important to the Roanoke logperch, reasonably foreseeable indirect effects associated with or resulting from construction of the ALC would include that proportion of induced development surrounding proposed interchanges which would exceed the degree of development already projected in the Franklin County Comprehensive Plan under the no-build scenario. Any net increase in developed lands within portions of the Pigg River drainage basin important to Roanoke logperch populations could, in turn, lead to tertiary effects with respect to surface water quantity and quality. As previously discussed, potential interchange development resulting in the conversion of substantial acreages of forestlands to developed properties and even the substantial conversion of forestlands to agricultural lands without implementation of appropriate best management practices at the local level could lead to changes in surface water drainage patterns, peaks rates of runoff, and sediment/pollutant loading. If unaddressed, such changes could place cumulatively additive stressors on existing logperch populations or could lead to degradation of suitable habitat. However, if we assume that the area around the interchange for one mile would develop over the life of the project, the closest this development would come to the Pigg River is 0.7 miles (1.7 miles – 1 mile) decreasing the likelihood that runoff associated with induced development would reach the Pigg River when accounting for overland flow and stormwater management facilities.

The Virginia Department of Environmental Quality (DEQ) and the Virginia Department of Conservation and Recreation (DCR) will be developing total maximum daily loads (TMDLs) for identified contaminants that cause impairment; however, FWS states that “the time line for developing and implementing many of these TMDLs may jeopardize the future existence of the species” (16 January 2003 e-mail from FWS to FHWA). Implementation of TMDLs occurs through watershed management including point source discharges limited by permits regulated by DEQ, and non-point source best management actions overseen by DCR (whose authority for water quality is non-regulatory). Regarding implementation of voluntary best management practices, timeliness is critical in order to benefit the Roanoke logperch. USFWS states that potential positive benefits will take time to be evidenced, perhaps 12 to 18 years. Adverse effects to the Roanoke logperch, as well as other species at risk in the watershed, will continue from already identified sources of impairment at least for the next ten years. To date, there has been no substantial improvement in the physical, chemical, and biological integrity of this watershed throughout years of voluntary implementation of best management practices. USFWS believes that, if the Roanoke logperch population in the Roanoke River main stem were to become extirpated, the survival of the species may be in jeopardy. One of the factors contributing to the CTB's selection of the ALC as the preferred alternative was the desire to avoid effects to Roanoke logperch populations known to inhabit the segments of the Roanoke River.

5.0 CUMULATIVE EFFECTS

Cumulative impacts are those which result from the incremental consequences of an action when added to other past and reasonably foreseeable future actions (40 CFR 1508.7). On page 4-31 of its March 1998 Section 7 Consultation Handbook, FWS states that:

> Cumulative effects include effects of future State, tribal, local, and private actions, not involving a Federal Action, that are reasonably certain to occur within the action area under consideration. Future Federal actions requiring separate consultation (unrelated to the proposed action) are not considered in the cumulative effects section.

For purposes of this biological assessment, the proposed ALC/Pigg River watershed action area is comprised of the following areas of direct effects:

- 69 percent or 102.7 acres of the ALC/Route 40 interchange (comprised of 30.8 acres of paved ramps and 72 acres of managed landscape areas);
- the entire ALC/Route 619 interchange or 148.6 acres (comprised of 44.6 acres of paved ramps and 104 acres of managed landscape areas)
- the entire ALC/Route 220/Route 618 interchange or 148.6 acres (comprised of 44.6 acres of paved ramps and 104 acres of managed landscape areas)
- 14.3 miles of interstate facility (ranging from 126 feet out-to-out for a typical six-lane section to 221.3 feet out-to-out for a typical six-lane section with two-lane collector-distributor roads) comprised of approximately 159.7 acres of proposed paved road surface and 100.4 acres of associated right-of-way.

For purposes of this biological assessment, the proposed ALC/Pigg River watershed action area is also comprised of the following areas of indirect effects (i.e., zones of reasonably foreseeable induced development extending one mile around proposed interchanges):

- 54.3 percent (or 998 acres) of the potential development zone surrounding the proposed ALC/Route 40 interchange
- the entire one-mile-radius potential development zone surrounding the proposed ALC/Route 619 interchange (or 1,837 acres)
- the entire one-mile-radius potential development zone surrounding the proposed ALC/Route 220/Route 618 interchange(or 1,837 acres)
- 20.4 percent (or 374 acres)of the potential development zone surrounding the proposed ALC/Route 890 interchange

Although historical land use data specific to the Pigg River action area is not available, regional studies provide general trends pertaining to historical changes for certain major land uses (primarily sylvicultural and agricultural). Accordingly, certain historical land use quantities for the Pigg River watershed and the Pigg River action area have been extrapolated from these regional studies.

5.1 PAST CUMULATIVE EFFECTS

5.1.1 Cumulative Effects of Past Agricultural Land Uses and Deforestation

Currently, only a minor proportion of forest loss within the Pigg River watershed can be attributed to residential/commercial/industrial development and road construction. By contrast, the vast majority of historical deforestation within the watershed can be attributed to land clearing for agricultural purposes (croplands and pasturelands). Thus, because there is a strong correlation between increased agricultural land uses and deforestation within the region, the following discussion of historical agricultural land use trends, also serves to assess historical deforestation trends within the Pigg River watershed.

In pre-European times, erosion on the Southern Piedmont was reportedly negligible (Trimble, 1974). This finding is supported by historical records of clear streams and dark, mature bottomland soils along with the fact that present erosion rates in well-vegetated or undisturbed areas are minimal. A degree of erosion appears to have occurred during this period, however, as a result of mass movement on steeper slopes, natural stream erosion, Native American agriculture, forest fires, and animal trails. During the Paleoindian period, the population density was very low and people lived in small, highly mobile bands. Hunting and gathering continued as the subsistence pattern during the Archaic, with a possible seasonal round of movement between base camps and hunting camps. In the Piedmont of Virginia, a steady increase in population, a continuing increase in sedentism, and an increasing reliance on domestic plant foods (such as corn, squash, and beans) occurred during the Late Woodland prehistoric period (i.e., from A.D. 1000 to 1600) (Hantman and Klein, 1992).

European settlement of the project area began in the early eighteenth century, at which time it appears that the Native Americans were no longer living in the region (Barber and Barfield 1992). The first European settlers appeared in the Franklin County region in the 1740s. Since that time, the region has a long agricultural history. The earliest settlers relied on subsistence farming and, although times have changed significantly, farming is still a way of life for many in the area. Crops included hemp, corn, barley, flax, hay,

beans, and root crops. Tobacco was becoming an increasingly important crop in Franklin County. Residents of the project area relied on agriculture as their primary source of income throughout the 18th Century and much of the 19th Century.

Although currently decreasing, the conversion of forests and natural plant communities to agricultural lands has been occurring within the Pigg River watershed since pre-European times. More intensive and wider scale clearing of land for agricultural purposes began with European settlement of the area around 1750. In a study titled Man-Induced Soil Erosion on the Southern Piedmont (Trimble, 1974), erosive land use (ELU) is considered to be eroding land that has been cleared for cultivation and such land that has been subsequently abandoned. In the portion of Virginia's Piedmont containing the Pigg River action area, ELU increased gradually up to 1860, reaching a medium to high intensity from about 1860 to 1920. It is reported that ELU had reached 25 to 35 percent of the total land area by 1860. With the increase in tenant farmers and tobacco cultivation after the Civil War, this figure increased to 35 to 45 percent by 1880. Throughout much of this period, the typical procedure was to clear the forest, farm exploitively until the soil became depleted, and then abandon the eroding fields. The abandonment of eroding fields resulted in an even greater and rapid loss of soils. Between 1880 and 1920, ELU declined by as much as 21 percent within the portion of Virginia's Piedmont containing the Pigg River action area - to values of 25 to 35 percent of the total land area in 1920. With the implementation of more effective soil conservation practices and a decline in agriculture, ELU within the portion of Virginia's Piedmont containing the Pigg River action area decreased to between eight and ten percent between 1920 and 1966 (Trimble, 1974).

The average depth of soil erosion resulting from two centuries of agricultural practices in the portion of Virginia's Piedmont containing the Pigg River action area is reported to be between 7.1 and 9.6 inches (Trimble, 1974). The redeposition of these massive volumes of soil lead to wholesale sedimentation of floodplains and siltation of streams and water bodies which, until the implementation of more effective soil conservation practices starting around the 1920s, resulted in progressive water quality degradation and, loss of incremental flood storage, and loss of aquatic habitat.

Agriculture continues to be the dominate land use within the Pigg River action area. Although greatly reduced through implementation of more effective soil conservation practices, the effects of uncontrolled runoff from agricultural lands remains a problem within the Pigg River watershed. Also, adverse effects associated with the abandonment of substantial acreage of agricultural lands continue to effect water quality and aquatic habitat. Lands that were abandoned 30 to 40 years ago may still exhibit considerable areas of erosion (Trimble, 1974).

Finally, it is worth repeating here that the 1975 discharge of copper sulfate and silver nitrate into Furnace Creek (a tributary of the Pigg River), which caused a severe fish kill for about 23 miles (37 kilometers) downstream (James, 1979), was a past action that likely severely reduced or eliminated the logperch population in the Pigg River near Rocky Mount, Virginia.

At present, it is estimated that 92,742 acres (or 36.95 percent of the total land surface) of the 250,983-acre Pigg River watershed is occupied by agricultural lands. At present, it is estimated that 2,575 acres (or 45.13 percent of the land surface) within the Pigg River action area is occupied by agricultural lands. At present, it is estimated that 152,534 acres (or 60.77 percent of the total land surface) of the 250,983-acre Pigg River watershed is occupied by forestlands. At present, it is estimated that 2,691 acres (or 47.16 percent of the land surface) within the Pigg River action area is occupied by forestlands.

5.1.2 Cumulative Effects of Past Residential, Commercial, and Industrial Development

During early European settlement of Franklin County, Rocky Mount was the only village of any size in the county, and construction of a courthouse was started in 1786 (Wingfield 1996). From 1789 to 1830, most of the early settlements in Franklin County were located between the Blackwater and Pigg rivers, and included Rocky Mount, Mount Pleasant, Jamestown, Wisenberg, and Germantown (J. R. Smith 1977). The town of Mount Pleasant was later included in the corporate boundaries and subsumed by Rocky Mount (Wingfield 1996).

Agriculture and the mining and manufacturing of iron were the main economic pursuits in the county throughout the nineteenth century (West Piedmont Planning District Commission 1973). Industry began growing in Franklin County during the late 1700s. As early as 1773, the Washington Iron Works was operating near the Pigg River. This iron works on Furnace Creek provided ore used to manufacture weapons

for the Revolutionary War (West Piedmont Planning District Commission 1976). By 1782, the enterprise was producing approximately 25 percent of the bar iron and 14 percent of the pig iron produced in the state. The Washington Furnace operated continuously until 1851, when the furnace was severely damaged during a flood (Salmon 1986; Salmon and Salmon 1993). Other early iron forges were located in Franklin County, including Elk Forge, Hill and Company Forge, Carron Furnace, Valley Forge, and Robert Harvey's Forge. Throughout the eighteenth and early nineteenth centuries, the iron industry formed the backbone of the Rocky Mount economy. Another iron furnace operated on the banks of the Pigg River, but the structures associated with it were torn down during the construction of the railway for the Roanoke and Southern Railroad (which later became the Norfolk and Western). A third furnace, known as the Sharon Iron Works, was located on Story (or Starry) Creek. Yet another furnace was operated by Robert Harvey and was located on the banks of the Blackwater River, and county deed books mention "the old Speedwell Furnace" and "Trigg's Iron Works." County records also mention a furnace owned by Owen Ruble located near the Patrick County line (J. R. Smith, 1977). The success of the iron industry in Franklin County is illustrated by the fact that as of 1860, the county supported both a pig iron plant and an iron bar plant (Hopkins, 1986a).

Permission was granted to more than 20 men to build mills on streams in Franklin County between 1786 and 1795. At least seven men were licensed to sell merchandise in 1787, and the list of peddlers and shopkeepers grew exponentially over the next few decades (E. W. Smith, 1977). In 1836, Rocky Mount, in Franklin County, consisted of 30 houses, three stores, two taverns, a printing office (which published a weekly newspaper), and a tanyard. Developments such as the construction of the railway system introduced new businesses, lifestyles, products, and methods to area residents. The population of Franklin County in 1870 was 18,264 – 1,834 people fewer than in 1860 (Hopkins, 1986b).

By 1900, the population had increased to 25,953, and by 1910 it had reached 26,480 (West Piedmont Planning District Commission, 1976). By this date, tobacco production in the county was only half of what it had been 50 years previously, but the dairying industry had begun to expand (Salmon and Salmon 1993). By 1900, the Norfolk and Western Railway was operating in addition to the Southern Railway (formerly Franklin and Pittsylvania Railway). By this time, neither the iron nor the tobacco industry employed many of the inhabitants of Franklin County. By the early twentieth century, the economy of the county was based on agriculture, furniture manufacturing, stave mills, and mining for talc, mica, and soapstone (Hopkins 1986c). Many of the farmers in the region stopped growing tobacco during the early years of the twentieth century and invested their efforts in apple orchards, poultry farming, truck gardening, and raising fodder for beef and dairy cattle (Hopkins 1986a). The arrival of the Norfolk and Western Railroad, along with the growth of the city of Roanoke, provided Franklin County with a much larger market for its farm products than it had had in the past (Hopkins 1986a). In 1920, tobacco was still the leading cash crop in Franklin County, supplemented by corn and wheat. At this time, there were 4,205 farms in the county. By 1945, there were 1,283 tobacco farms in the county with 4,031 acres planted. Most of the tobacco farms were located in the southern and eastern portions of the county. Other sections of the county were better suited to apple orchards. In 1929, there were 2,655 apple orchards in Franklin County, and in 1945, there were 2,850. Dairy farming continued to grow throughout this period as well (Salmon and Salmon 1993). Agriculture, mining, and the manufacturing of furniture continued to be important to the economy of Franklin County during this period. The population decreased dramatically from 1910 until the Depression years, in part due to the increased mechanization of farming and the effects of the Depression. The population of the county was 26,480 in 1910 and only 24,337 in 1930 (Hopkins 1986c; West Piedmont Planning District Commission 1976).

Franklin County became increasingly urbanized after the end of World War II, with approximately 50 percent of the county's population living within five miles of Rocky Mount. After World War II, however, the population of Franklin County began to decrease until the 1960s (Hopkins 1986c). It was not until the 1970s that the population finally exceeded the level it had reached by 1910 (Hopkins 1986c). Since approximately 1950, agriculture has become somewhat less significant in Franklin County, with manufacturing and industry becoming more prominent (West Piedmont Planning District Commission 1976); however, non-industrial pursuits remain vital to the region's economy. Poultry raising was important in Franklin County in the 1950s and early 1960s. Dairy farming outpaced poultry farming in the county during the 1960s. By the middle of the 1980s, Franklin County ranked third in Virginia in the number of dairy cows (Hopkins 1986a). At this time there were only 58 farms in the county that were producing apples for commercial sale. In 1986, one of the local papers stated that "small farms constitute the county's most important industry" (Salmon and Salmon 1993). In spite of this statement, during the twentieth century the county has made the transition from a predominantly agricultural economy to one based more on industries such as the manufacturing of wood products and textiles (Flora 1986).

Due primarily to the lack of public utilities and limited roadway access across much of the Pigg River action area, residential and commercial development has historically been concentrated along the Route 40 corridor east of Rocky Mount. The remainder of the Pigg River action area and adjoining areas is typified by scattered single-family dwellings and several smaller communities (such as Sontag). Although not located within the Pigg River actions area, the Rocky Mount Sewage Treatment Plant (STP) is located on the Pigg River approximately 0.5 mile upstream of the proposed ALC Pigg River crossing. Under the Virginia Pollution Discharge Elimination System (VPDES), the Rocky Mount STP is permitted to discharge to the Pigg River conditional on attainment of water quality standards for the following parameters: dissolved oxygen, biological oxygen demand, pH, total suspended solids, total flow, fecal coliform, and total nitrogen as ammonia. Only one violation of VPDES discharge limits was recorded in 1999, and the STP is currently in compliance with VPDES permit conditions (U.S. Environmental Protection Agency, 2003).

At present, it is estimated that 4,262 acres (or 1.7 percent of the land surface) of the 250,983-acre Pigg River watershed is occupied by developed properties. At present, it is estimated that 321 acres (or 5.63 percent of the land surface) within the Pigg River action area is occupied by developed properties. The bulk of this development is concentrated along the Route 40 corridor (in the northernmost portion of the Pigg River action area) and along U.S. Route 220 (in the vicinity of the proposed ALC/Route 618 interchange). Much of this development occurred during the middle to late 20th century and prior to the implementation of any local ordinances providing for the effective control and management of stormwater runoff.

5.1.3 Cumulative Effects of Past Transportation Projects

5.1.3.1 Railroads

By the late 1880s the arrival of the railroad made it possible to transport goods. The first railroad through Franklin County was constructed by the Franklin and Pittsylvania Railroad Company between 1878 and 1880 and operated until 1933 (Cundiff and Ramsey 1986). This railroad greatly facilitated the transportation of iron ore out of the region. In addition to iron, area mines yielded soapstone, talc, mica, coal, asbestos, and gold. By 1892, the Roanoke and Southern Railroad passed through Rocky Mount, then Martinsville, and on to Winston-Salem, North Carolina. Although cultivation of primarily tobacco and corn remained the predominant occupation within the county, the mining industry was growing. Coincidental with arrival of the railroads, more extensive industrial development began Franklin County around 1880.

Although no railroads traverse the Pigg River action area, the Norfolk Southern line roughly parallels U.S. Route 220 approximately one mile upstream of the proposed ALC Pigg River crossing.

5.1.3.1 Roads

Some early settlers in the region arrived by way of the Great Wagon Road, which followed the route of the old Warrior's Path from Pennsylvania to Georgia (Rouse, 1995). The Great Wagon Road consisted of old Native American trails, animal trails, and trading routes, and was actually not one large trail, but a combination of many small ones whose exact locations tended to fluctuate with the pattern of settlement in the region. The Wagon Road followed the Valley of Virginia, and a branch that turned south at Roanoke became the Carolina Road. The route of present U.S. Route 220 follows some of these old pathways.

By 1749, there were enough settlers at Big Lick (later known as Roanoke) that they were able to successfully petition for a ferry across the New River (Rouse 1995). Once Ingles' Ferry was in place, travelers with wagons could proceed down the Great Wagon Road as far south as the Yadkin River in North Carolina. The need for improvements to roads grew along with the population during the mid 1700s. Documents from the 1750s in Franklin County make frequent reference to the construction of new roads and the poor condition of old trails and paths (E. W. Smith 1977). The General State Road Act mandated the construction of roads, bridges, and causeways where necessary, and road crews made up of local citizens were expected to build and maintain roads without pay (Pawlett 1977). In 1789, however, the law was amended in recognition of the hardship that the rugged terrain imposed on the road builders in mountainous areas. This amendment relaxed the requirements for certain roads, allowing seven of the western counties to maintain "expedient" roads that were cleared and smoothed to a width of only 30 feet (Pawlett 1977).

Franklin County remained very isolated during the early 1800s. It appears that no real effort was made to improve the road between Franklin and Big Lick (now Roanoke) until 1828. During the 1830s, residents of Franklin County joined other mountain counties in petitioning the state for the construction of turnpikes to facilitate transportation in this isolated region. The Franklin Turnpike was built in 1840 and connected Danville, Rocky Mount, Big Lick, and Fincastle. In 1841, the construction of a turnpike from Salem heading west provided additional access to and from the region.

A number of roadways have been constructed and a substantial degree of residential, commercial, and institutional development has occurred within the Pigg River watershed during the past century. A network of paved primary and secondary roads began developing in the 1920s. Between 1925 and 1950, rapid industrial expansion brought a higher degree of residential and commercial development to the project area causing the push towards more automobile usage.

Primary roads presently occurring within the Pigg River action area include State Route 40 (which traverses the northernmost portion of the action area) and U.S. Route 220 (a short length of which will fall within a potential zone of development surrounding a proposed ALC interchange). Secondary roads presently occurring within the Pigg River action area include County Routes 954, 674, 707, 619, 827, 724, 718, 618, 632, and 890 (all of which traverse the action area).

At present, it is estimated that 194 acres (or 0.08 percent of the land surface) of the 250,983-acre Pigg River watershed is occupied by paved roads; however, paved roads are just one of several land uses contributing to impervious surface area within the Pigg River watershed. Currently 4,669 acres (or 1.86 percent) of the 250,983-acre Pigg River watershed is comprised of impervious surface. The paved portions of the ALC (roadway plus interchange ramps) will add another 237 acres of impervious surface to the 4,669 acres already existing within the Pigg River watershed, thereby increasing the total impervious surface area from 1.86 percent to 1.95 percent. As impervious surfaces, these paved roads cumulatively contribute to stormwater runoff, affecting both peak rates of runoff and water quality.

5.2 CUMULATIVE EFFECTS ASSOCIATED WITH REASONABLY FORESEEABLE FUTURE ACTIONS

Reasonably foreseeable projects which could cumulatively affect aquatic habitat and/or Roanoke logperch populations within the aforementioned direct and indirect action areas include:

- a presently undetermined portion of the residential and commercial development depicted in the Franklin County Comprehensive Plan within one mile of the proposed ALC/Route 40 interchange;
- a presently undetermined portion of the residential development depicted in the Franklin County Comprehensive Plan along the southern banks of the Pigg River;
- as identified in the FEIS, highway project number 32 of the 2002 VDOT Six-Year Plan (construction of a new South Main Street bridge over the Pigg River in Rocky Mount);
- as identified in the FEIS, highway project number 33 of the 2002 VDOT Six-Year Plan (improvements to Route 40 0.1 km east intersection Route 220 and 0.6 km east intersection Route 122);
- a presently undetermined portion of the 300-acre site of the Franklin County Regional Airport to be located near I-73 either just northeast of or southeast of the Town of Rocky Mount (Talbert & Bright, Inc., 2002).

Urbanization is often linked with new roadway construction based on conjecture and unsubstantiated claims of what could happen while acknowledging that this urbanization could be decades away. As cited previously, recent studies indicate that the association between road construction and urbanization has been historically over-stated and that roads are, at best, an inefficient means for inducing or encouraging development in the absence of a combination of other necessary development factors (such as existence of water and sewer; distance from schools, primary settlement areas; etc.) (Hartgen, et al, 1990; Hartgen, 2003a) In a study of potential links between road construction and urban sprawl in Ohio; investigators concluded that major road improvements appear to “accommodate, rather than spur, growth” and that approximately 70 percent of population growth during the 1990s occurred within census tracts that had no major road improvements (Hartgen, 2003b). Before-and-after studies of seven new road links in Great Britain indicate that there was little overall growth in cases of bypasses and that growth seen in several cases was more connected with external changes than the road schemes themselves (Bly, 1998). Recently, at the direction of Congress, FHWA completed the Economic Development Highways Initiative, which reached a

similar conclusion. The overall results of the initiative support the general linkage between highway improvement and economic development, and validate the contention that highway improvements are a necessary but not sufficient condition for capturing economic growth potential. Therefore, aside from land zoned in the existing Franklin County Comprehensive Plan for residential development and the potential for development around interchanges, no additional reasonably foreseeable "urbanization" has been identified in the Pigg River action area.

5.3 ANALYSIS OF CUMULATIVE EFFECTS

Although roadway construction can contribute cumulatively to changes at the watershed level, roadways comprise only one of many factors contributing to these changes. The main causes of decline of this species are thought to be habitat loss and alteration due to turbidity and siltation, chemical spills and pollution, channelization, impoundments, and cold water releases (U.S. Department of the Interior, Fish and Wildlife Service, 1992). Of these, siltation is thought to be the most widespread problem across the range of the species (Simonson and Neves 1986). In the Pigg River, the major concern for the well being of the species is siltation from agricultural sources and specifically, cattle farms (Rosenberger, 2002).

5.3.1 Cumulative Effects Associated with Agricultural Land Uses and Deforestation

As previously discussed, it is estimated that 92,742 acres (or 36.95 percent of the total land surface) of the 250,983-acre Pigg River watershed is currently comprised of agricultural lands. Also, as previously discussed, it is estimated that 2,575 acres (or 45.13 percent of the land surface) within the Pigg River action area is currently comprised of agricultural lands. Uncontrolled runoff and nonpoint pollution of water bodies and waterways resulting from the conversion of forests and other natural plant communities to agricultural land uses is reported to be the single-most adverse effect on water quality and aquatic habitat within the Pigg River watershed (Rosenberger, 2002). The conversion of 270 acres of agricultural lands to a transportation facility with effective stormwater management measures (the direct effects portion of the Pigg River action area) could result in a net reduction in uncontrolled runoff and non-point pollution within the Pigg River watershed although the ecological benefits of the agricultural land to wildlife would be lost.

As previously discussed, it is estimated that 152,534 acres (or 60.77 percent of the total land surface) of the 250,983-acre Pigg River watershed is currently comprised of forestlands. The ALC will result in the conversion of 318 acres of mixed hardwood forests to paved roadway, interchange ramps, and managed landscape areas within rights-of-way. This represents a 0.21 percent reduction in current forestland acreage within the Pigg River watershed. Although the unmitigated removal of forest for roadway construction can cumulatively contribute to adverse changes in hydroperiod and water quality, it is reported that the single-most critical effect of the conversion of natural plant communities to agricultural land uses has been the uncontrolled runoff and nonpoint pollution of water bodies and waterways (Simonson and Neves 1986; Jenkins and Burkhead, 1993; Rosenberger, 2002).

5.3.2 Cumulative Effects Associated with Residential, Commercial, and Industrial Development

As previously discussed, it is estimated that 4,262 acres (or 1.7 percent of the total land surface) within the Pigg River watershed is currently comprised of developed properties. Also, as previously discussed, it is estimated that 321 acres (or 5.63 percent of the land surface) within the Pigg River action area is currently comprised of developed properties. Much of this development occurred during the middle to late 20th century and prior to the implementation of any local ordinances providing for the effective control and management of stormwater runoff. The conversion of 50 acres of developed properties lacking effective stormwater management measures to a transportation facility with effective stormwater management measures (the direct effects portion of the Pigg River action area) could result in a net reduction in uncontrolled runoff and non-point pollution within the Pigg River watershed although the ecological benefits of the agricultural land to wildlife would be lost.

5.3.3 Cumulative Effects Associated with Transportation Projects

Several hundred feet of stream bed could be affected during installation of bridge piers and possible temporary causeways at the crossings of the Pigg River, Little Chestnut Creek, Big Chestnut Creek, and Muddy Creek. Several hundred feet of stream bed would be affected during installation of box culverts at

each of three other perennial tributaries of the Pigg River (Powder Mill Creek, Doe Run, and an unnamed tributary to Doe Run). In total, placement of fill and/or structures at these stream crossings could entail as much as 0.03 acre (1,400 square feet) of effects to stream beds. This impact directly attributable to roadway construction is not considered to be severe with respect to total habitat available within the study area (i.e., the 52.2 stream kilometers within the Pigg River reported by Simonson and Neves in 1986). No placement of structures or fill in Roanoke logperch habitat can be reasonably foreseen as a result of reasonably foreseeable development around interchanges.

As previously discussed, it is estimated that 194 acres (or 0.08 percent of the total land surface) within the Pigg River watershed is currently comprised of paved roadway. It is estimated that 16 acres (or 0.28 percent of the land surface) within the Pigg River action area is currently comprised of paved roadway. As previously discussed, paved roads are just one of several land uses contributing to impervious surface area within the Pigg River watershed. Currently 4,669 acres (or 1.86 percent) of the 250,983-acre Pigg River watershed is comprised of impervious surface. The paved portions of the ALC will add another 236 acres of impervious surface (135 acres of roadway and 101 acres of interchange ramps) to the 4,669 acres already existing within the Pigg River watershed, thereby increasing the total impervious surface area from 1.86 percent to 1.95 percent. As impervious surfaces, these paved roads and developed areas cumulatively contribute to stormwater runoff, affecting both peak rates of runoff and water quality. Given the relatively small increase of roadway impervious surface along with the fact that the ALC will be equipped with best available stormwater management measures to mitigate stormwater runoff, the incremental contribution of the project to stormwater runoff is not expected to be substantial.

5.4 SUMMARY AND CONCLUSIONS

Only 14.3 miles of the total 71.71 miles of proposed roadway comprising the ALC would fall within the Pigg River action area. In total, construction of the ALC would convert approximately 660 acres of residential/ commercial properties, agricultural lands, and forestlands within the Pigg River action area to 236 acres of road surface and interchange ramps along with 424 acres of associated managed landscape areas.

5.4.1 Paved Surfaces

Currently 4,669 acres (or 1.86 percent) of the 250,983-acre Pigg River watershed is comprised of impervious surface. Construction of the ALC would add approximately 236 acres of impervious area (in the form of 135 acres of road surface and 101 acres of interchange ramps) to the 250,983-acre Pigg River watershed. Construction of the ALC would, thereby, increase the total impervious surface area within the Pigg River watershed from 1.86 percent to 1.95 percent. No stormwater pollutant loadings are available specifically for the Pigg River watershed; however, it has been determined that 14.3 miles of the 71.71 total miles comprising the ALC (or 19.94 percent) will traverse the Pigg River watershed. When this percent of total project length is applied to the total annual stormwater runoff pollutant loading for the entire ALC determined for the DEIS, it is estimated that the ALC could lead to an increase in stormwater pollutant loading within the Pigg River watershed in the amount of 6.95 tons (6,305.04 kilograms) annually. This estimate uses vehicle miles traveled (VMT) averaged over the entire length of the ALC. Considering that VMT is expected to be lower within the central or Franklin County portion of the ALC, the estimated loading of 6.95 tons annually can be considered a conservative estimate. In addition, this is the loading from the ALC in the action area. It does not take into account pollutant loading that would settle out in stormwater management ponds or settle out during overland transport of runoff. Given the distance between the ALC and the receiving bodies of water as well as the location of known populations of the Roanoke logperch within those receiving bodies of water relative to the length that pollutants would have to travel, it is reasonable to assume that the pollutant loading reaching the receiving bodies of water would be significantly reduced from the 6.95 ton annual estimate to the point that it would not have an adverse impact on the long term viability of the Pigg River population of the Roanoke logperch.

5.4.2 Managed Landscape Areas

Currently 246,314 acres (or 98.14 percent) of the 250,983-acre Pigg River watershed is comprised of land uses characterized by pervious surfaces (primarily forestlands and agricultural lands). The ALC would directly convert 204 acres of forestlands and 174 acres of agricultural lands to managed landscape areas.

Through implementation of effective sediment/erosion control plans and provision of stormwater management facilities, the ALC would be designed to (1) avoid or minimize adverse water quality effects associated with stormwater runoff and (2) preserve or reduce peak rates of runoff from managed landscaped areas.

5.4.3 Indirect Effects

As previously discussed, recent studies indicate that the association between road construction and urbanization has been historically over-stated and that roads are, at best, an inefficient means for inducing or encouraging development in the absence of a combination of other necessary development factors (Hartgen, et al, 1990; Hartgen, 2003a) and that major road improvements appear to "accommodate, rather than spur, growth" (Hartgen, 2003b).

The proposed ALC would not provide any new access to currently undeveloped lands along the portion of the Pigg River known to support Roanoke logperch populations. With respect to the Roanoke logperch population existing in the main stem of the Pigg River in the vicinity of the proposed ALC stream crossing, the nearest ALC interchange would be located at Route 40, approximately 1.7 miles north of the Pigg River. None of the one-mile-radius zones of potential interchange development would encroach into any perennial streams reported to contain Roanoke logperch populations in the Pigg River watershed. Irrespective of construction of the ALC, land use conversions conforming to the local comprehensive plan would increase the amount of developed land within the action area from to 5.7 percent to 6.9 percent by the end of the year 2015 planning window. Within zones of reasonably foreseeable development surrounding proposed interchanges, the bulk of development is anticipated to occur in upland areas. Even then, this development around the Route 40 interchange would still be located 0.7 miles from the Pigg River at its closest location. Development associated with the next two closest interchanges in the Pigg River watershed (the Route 619 and Route 220/Route 618 interchanges) would be located approximately 3.3 miles and 9.5 miles respectively, from the Pigg River.

5.4.4 Conclusions

Although large-scale destruction of Roanoke logperch habitat from single-project or single-activity impacts (such as impoundments) is unlikely under current environmental regulatory programs, cumulative losses of microhabitat from numerous past small-scale activities (such as culverts, channel modifications, deforestation, etc.) has been evident on a watershed-wide basis. Comparison of existing land use effects and future land use effects demonstrates (1) that a net loss of forestlands and agricultural lands is projected by Franklin County within the action area under the current Comprehensive Plan, (2) that this net loss will occur independent of construction of the ALC, and (3) that the ALC could be expected to cumulatively contribute to indirect conversion of forest and agricultural land for purposes of accommodating interchange development which, in turn, could result in effects to water quality and aquatic habitat. Potential interchange development in combination with development already projected under the Franklin County Comprehensive Plan (independent of the ALC) could cumulatively affect surface water resources and aquatic habitat over a number of years; however, the zones of potentially induced development surrounding ALC interchanges to be located within the Pigg River watershed are not located in proximity to known populations or stream segments containing suitable habitat. Considering the degree of development already projected under the Franklin County Comprehensive Plan combined with the fact that the ALC will not provide direct local access any nearer that 1.7 miles from the Pigg River, the proposed action would not likely contribute substantially to adverse indirect impacts effecting the long-term viability of the Roanoke logperch in the Pigg River.

In summary, while the I-73 ALC may contribute to cumulative effects within the Pigg River action area with respect to certain resources and locations, the ALC would capture runoff that is currently associated, in part, with agricultural land use which has been identified as the primary factor contributing to the decline of the Roanoke logperch in the Pigg River watershed. Further, the incremental contribution of the project to stormwater runoff is expected, overall, to be relatively small.

6.0 CONSERVATION MEASURES

Certain components of the ALC would be located near enough to aquatic habitat which could serve as habitat for the Roanoke logperch as to necessitate special mitigation measures, both during and following

construction. In accordance with section 5.1 of the FWS Roanoke logperch Recovery Plan (Moser, 1992), management measures to (1) reduce erosion and excessive sedimentation and (2) minimize or avoid toxic introduction of toxic chemicals within waters supporting logperch populations will be implemented. In accordance with section 1.2 of the Recovery Plan, VDOT will solicit help from state and federal agencies in identifying and implementing measures designed to enhance or restore riparian corridors important to Roanoke logperch populations (as discussed in following sections). Silt fences, siltation curtains, and other practicable means to provide erosion and sedimentation control will be implemented during construction. Work in waters containing populations of the Roanoke logperch will be minimized to the fullest degree practicable through consultation with FWS under the Endangered Species Act. FWS typically calls for implementation of specific best management practices during the spawning period of mid-April through May.

A more detailed discussion of available and proposed measures to mitigate water quality degradation within aquatic habitat important to the Roanoke logperch has been prepared and will be presented in following sections. With implementation of appropriate mitigation measures and BMPs, the long-term operation and maintenance of the ALC would avoid adverse impacts to Roanoke logperch populations, habitat or waters which drain directly to such habitat.

6.1 AVAILABLE MEANS TO MITIGATE HABITAT LOSS

Given the width of the Pigg River where the ALC would cross and the topographic features of the surrounding area, it appears that VDOT will be able to span the Pigg River and that the placement of temporary fill for construction access and permanent fill for construction and the placement of piers or abutments would not occur in the channel or below the ordinary water line. Based on preliminary engineering work, VDOT has determined that the proposed ALC crossing of the Pigg River in the vicinity of the Roanoke logperch in Franklin County will be on a horizontal curve alignment, allowing for a perpendicular crossing of the Pigg River and eliminating the need for skewed piers. The grade of Interstate 73 at the crossing is approximately 50 feet above the flood elevation, and the overall length of the bridge is estimated at 530 feet. Economical spans for a bridge of this height and length would be in the range of 150 to 200 feet. Curved steel girders supporting a concrete deck are the likely choice for construction materials. The normal flow width of the Pigg River in this area is approximately 75 to 100 feet, which means that VDOT should be able to span the river and avoid any construction in the normal flow of the river. Likewise, it appears that practicable measures to provide for the upstream/downstream movement of the logperch at proposed sites of culvert installation (such as those on Powder Mill Creek, Doe Run, and an unnamed tributary to Doe Run) could be implemented so as to not preclude expansion of the species' range should future recovery efforts prove successful. A final commitment on these design measures will be made during final design and formal consultation with the USFWS when the information needed to make an informed decision on the practicality of these construction measures will be developed.

6.2 AVAILABLE MEANS TO MITIGATE SEDIMENTATION AND WATER QUALITY DEGRADATION

Water pollution controls typically used to mitigate highway stormwater runoff fall into the broad categories of (1) temporary erosion and sediment control during construction, (2) permanent stormwater management Best Management Practices for controlling surface runoff and its contaminants after construction is complete, and (3) prevention and remediation of hazardous material spills. This section covers the design and implementation of plans to address the first two: temporary erosion and sediment control and permanent stormwater management, while the next section will address the third.

VDOT will develop (or manage the development of) a project specific ESC and SWM plan for this project. The ESC Plan, in general, identifies the type, size, location, and construction details of temporary measures aimed at preventing both on-site and off-site damages associated with erosion and sedimentation. Temporary controls can consist of but not be limited to filter barriers, silt fences, sediment traps, jute mesh and EC-3 mat erosion control ditches lining, Type II rock check dams, culvert inlet protection, diversion dikes, block and gravel sediment filter curb inlet protection, block and gravel sediment filter drop inlet protection, stone outlet protection, and Type II turbidity curtains. Turbidity curtains would be used during construction at proposed stream crossings, thereby helping to reduce the amount of sediment that reaches the main body of the water course. Erosion and sediment control measures will be fully maintained until such time that all exposed or potentially erodible land surfaces have been effectively stabilized.

Implementing these erosion and sediment control measures would minimize sedimentation during the construction phase of the project. The magnitude of this reduction depends on the types of erosion and sediment controls used at the site, as well as the magnitude of changes in the grade and slope of the construction site (steeper constructed grades and slopes typically result in higher sedimentation loads). In addition, Erosion and Sediment Control Inspectors certified by the Virginia Department of Conservation and Recreation would be assigned to the project during construction as needed and VDOT will explore the possibility of employing a full-time erosion and sediment inspector while construction work is occurring in proximity to the Pigg River. In addition, all contractors working on site will be certified through the VDOT Erosion and Sediment Control Contractor Certification course. This enables the Inspector and contractor to adjust the plan as needed to provide continuing protection for adjacent and downstream resources.

Permanent stormwater BMPs will be implemented to reduce the discharge of pollutants associated with highway stormwater runoff. A Stormwater Management Plan will be developed in accordance with VDOT's ESC & SWM Program Specifications. This plan will provide the location, type, size, and construction details for stormwater management Best Management Practices (BMPs). Stormwater BMPs are designed to remove typical pollutants associated with highway runoff, such as metals, nutrients, sediments, and organics. Different BMPs provide different pollutant removal pathways; i.e.: physical removal such as settling and filtering; biological and chemical removal such as algal uptake and plant adsorption; etc.

The Virginia Stormwater Management Handbook (DCR, 1999) provides an accepted menu of stormwater BMPs intended to protect adjacent and downstream properties and resources from damages associated with stormwater runoff. The VDOT ESC and SWM Program Specifications utilize these BMPs in accordance with the SWM Handbook's selection criteria. When an alternative or innovative design is proposed, Hydraulics staff coordinates an evaluation by DCR to ensure compliance. It appears that BMPs can be implemented that will be effective in capturing runoff from the project and "treating" that runoff to remove pollutants that may have an adverse effect on the Roanoke logperch. A final commitment on the type, size, and location of stormwater management facilities along with measures that can be implemented to enhance their effectiveness will be made during final design and during formal consultation with the FWS when the hydrologic and hydraulic information needed to make that decision is known.

6.3 AVAILABLE MEANS TO MITIGATE TOXIC MATERIAL RELEASES

The third category of water pollution controls includes those aimed at the prevention and remediation of hazardous material spills. Best Management Practices designed to control surface runoff (category 1 and 2, above) can also serve to intercept the toxic materials released as a result of material handling or storage mishaps during construction, or traffic accidents after project completion. It appears that stormwater management facilities located within close proximity to receiving waters with known populations of the Roanoke logperch can be sized to accommodate the contents of a tanker truck in the event of a hazardous material spill and be incorporated into the project. A final commitment on the design of stormwater management facilities for this purpose and measures to enhance their effectiveness will be made during final design and during formal consultation with the FWS when the information needed to make that decision is known.

Pollution prevention plans will be developed as part of the VPDES Construction Permit program. Under the pollution prevention plan, all reasonable measures will be employed to prevent to the release of fuels, lubricants, and other contaminants into waters of the State during construction.

In the event of a spill resulting from a traffic accident, local spill response personnel would initiate a Level II response to contain the spill and prevent its spread through the use of absorbent booms and pads. This method is effective for containing petroleum-based spills (by far, the most common type of spill); however, this method may not be as effective for non-petroleum spills. If there is a requirement for response to other types or more severe spills, responsibility is transferred to the regional Department of Emergency Services. Regional Level ll hazmat response teams are based in Roanoke.

Following construction, a number of mitigation measures will be maintained to minimize impacts associated with ongoing use and maintenance of the interstate. Use of structural components requiring painting will be minimized to the fullest degree practicable in the vicinity of stream crossings. All stormwater management facilities will be inspected and properly maintained to ensure appropriate function in the protection of water quality on a long-term basis.

6.4 AVAILABLE MEANS TO MITIGATE WATERSHED LANDSCAPE CONVERSIONS

As previously mentioned, 38.8 miles (or 56 percent of the total length) of the Pigg River is currently bordered by forested lands, while the remaining 30.6 miles (or 44 percent of the total length) is bordered by cleared and/or altered lands (comprised of croplands, pasturelands, industrial properties, residential properties, and transportation/utility land uses). USFWS in its 11 September 2002 correspondence recommended that riparian restoration/enhancement be implemented to offset negative impacts associated with the proposed project. Stream segments within the study area recommended by USFWS for riparian restoration include the Pigg River and Big Chestnut Creek in Franklin County and the Smith River in Henry County. Stream segments outside the study area recommended by USFWS for riparian restoration include the North Fork and South Fork of the Roanoke River in Montgomery County; the South Fork and the North Fork of the Mayo River in Henry and Patrick counties; and the Smith River in Patrick County.

A stream corridor is an ecosystem that typically consists of the following three major elements: (1) the stream channel, (2) the floodplain, and (3) the transitional upland fringe (USDA, NRCS, 1998). Stream corridor restoration would have limited long-term effectiveness unless chronic land uses can be controlled or moderated within the entire watershed and unless all key elements of the stream system (such as headwaters) are included in the restoration plan (USDA, NRCS, 1998). Considering the fact that the vast majority of lands comprising the various watersheds within the I-73 study area are privately owned and considering the infeasibility of VDOT being able to acquire expanses of land large and contiguous enough to render stream restoration effective, this option is not considered viable through direct implementation by VDOT. Instead, payment in-lieu into a comprehensive landscape/watershed management program administered by the Natural Resources Conservation Service, the Virginia Department of Conservation and Recreation, or The Nature Conservancy can serve as an appropriate mechanism for riparian restoration . Another option is to pay money to the Virginia Association of Soil and Water Conservation Districts (SWCD) or to the FWS, which would then work with the SWCDs, to identify opportunities for riparian restoration and to implement them. The preferred area for mitigation efforts involving riparian corridor restoration and/or preservation is the Big Chestnut Creek–Pigg River Stream Conservation Unit (SCU) located just downstream of U.S. 220 in central Franklin County. This SCU not only supports several populations of Roanoke logperch, but also contains stream segments that are impaired due to high fecal coliform counts and sedimentation resulting largely from agricultural runoff. Accordingly, FHWA and VDOT are committed to riparian restoration in the study area and will work with the FWS during formal consultation to identify opportunities for restoration, determine the extent of the restoration, and to determine the parties and approach that is best suited for ensuring that the mitigation is carried out.

Although VDOT can appropriately mitigate stormwater impacts directly attributable to roadway construction, means to address cumulative effects within the watershed will require the implementation of watershed management plans on the part of local jurisdictions or interagency task forces. Other mitigation measures that FHWA and VDOT are willing to consider through the formal the consultation process that may help to conserve the Roanoke logperch and aid its viability, which may require coordination with other agencies, include:

- Removing or breaching the abandoned hydroelectric dam on the main stem of the Pigg River;
- Exploring the possibility with Franklin County of developing a Pigg River watershed management plan;
- Funding efforts with the FWS to reintroduce the Roanoke logperch into streams and rivers within the study area;
- Exploring with the FWS the practicality of creating habitat for the Roanoke logperch through the introduction of clean gravel and rubble;
- Exploring the practicality of redirecting runoff from the Pigg River crossing to stormwater management BMPs to eliminate the direct drainage of stormwater into the Pigg River;

It is important to point out that the Wilmington District of the Corps of Engineers is studying needs and opportunities for improvements at Philpott Dam and Lake that may look at regulating cold water releases from

the Philpott Dam and improve the thermal quality of water releases which has been identified as the primary factor (i.e. cold water releases) in the decline of the Roanoke logperch in the Smith River.

7.0 OVERALL AGENCY CONCLUSIONS

The four disjunct Roanoke logperch populations (shown in Figure 3) are thought to represent the remnants of much larger populations that once occupied much of the Roanoke River and Nottoway River basins upstream of the fall line (Moser, 1992). Based on its fragmented range, it is thought that many Piedmont populations must have existed but that most of the populations perished within the last 150 years (Jenkins and Burkhead, 1993). As previously discussed, comprehensive surveys for the Roanoke logperch were conducted in 1986 and, to an extent, again in 1998 to 2000 in the Roanoke, Pigg, and Nottoway river systems. Based on these surveys, FWS states that it is likely that the overall status of this species is stable to declining. The views of other experts echo similar sentiments. Simonson and Neves (1986) stated that one or more logperch populations "may be in jeopardy of extirpation, and all but one population are of limited size." They concluded "The future outlook for the Roanoke logperch appears precarious without improvements or protection of existing water quality and habitat." Despite years of voluntary implementation of best management practices, the FWS states that there has been no substantial improvement in the physical, chemical, and biological integrity of this watershed. Adverse effects to the Roanoke logperch, as well as other species at risk in the watershed, will continue from already identified sources of impairment at least for the next ten years. If potential positive benefits are to be realized from voluntary measures, it will likely take 12 to 18 years for those benefits to manifested. In the Pigg River, the conclusions are no different. It is thought that the continued existence of the Roanoke logperch within the Pigg River watershed is tenuous due to low numbers of the species along with continued siltation of aquatic habitat (Jenkins and Burkhead, 1993). Although McInnch and Garman found in 2002 that the total numbers sampled suggest “a moderately robust population” of Roanoke logperch at the proposed Pigg River crossing and Rosenberger and Angermeier believe that the Roanoke logperch population in the Pigg River may be recovering from the 1975 fish kill, they have concluded that the Pigg River population, while recovering, remains sparse and at risk.

The main causes of decline of this species are thought to be habitat loss and alteration due to turbidity and siltation, chemical spills and pollution, channelization, impoundments, and cold water releases (U.S. FWS, 1992). According to Simonson and Neves, of these, siltation is thought to be the most widespread problem across the range of the species. Excessive silt deposition reduces habitat heterogeneity and primary productivity; increases egg and larval mortality; abrades organisms; and alters, degrades, and entombs macrobenthic communities (Burkhead and Jenkins, 1991). Rosenberger has also concluded (December 2002) that the major concern for the well-being of the species in the Pigg River is siltation and goes on to identify agricultural sources and specifically, cattle farms, as the primary source of that siltation. Rosenberger also stated that the uncontrolled runoff and nonpoint pollution of water bodies and waterways resulting from the conversion of forests and other natural plant communities to agricultural land uses is the single-most adverse effect on water quality and aquatic habitat within the Pigg River watershed. In addition to sediment loading from agricultural practices, rapid bioassessment of benthic invertebrate communities conducted in the Pigg River watershed as part of the I-73 Location Study indicates that livestock incursions and runoff from pasturelands are also contributing to nutrient loading and high fecal coliform counts which, in turn, are contributing to water quality and aquatic habitat degradation. The extensive siltation of stream habitats is likely hindering the recovery of the Roanoke logperch in the study areas (Moser 1992, Burkhead 1983). This does not appear to be the case for the populations in the upper Smith River where the major stressor is thought to be temperature stress resulting from cold water releases from the Philpott Reservoir (Mike Pinder, VDGIF, 2 April 2003 personal communication).

Rosenberger and Angermeier are listed as a co-authors or contributors to the Wheeler-authored report titled “Potential Impacts of I-73 on Stream Habitat and Biota, with Emphasis on the Federally Endangered Roanoke Logperch” (prepared for Virginian’s for Appropriate Roads), which contends that increased fine sediment loads resulting from road construction is the most threatening of potential threats to the Roanoke logperch – a contention which appears to contradict some of the aforementioned experts (including Rosenberger and Angermeier, themselves), especially as it relates to existing populations in the Pigg River and Smith River systems. Further, the report is not based on any impact analyses conducted by the authors specific to I-73 but, instead, summarizes existing scientific literature and extrapolates those findings to I-73. In assessing the general impact of roads on stream biology, chemistry, and habitat, the authors rely on research results dating back to the late 1960s and early to mid-1970s (1936 in one case) but fail to describe the context in which this

research was done. For example, this research dates to a time when little, if anything, was done in the way of erosion and sediment control and treatment of stormwater runoff during and after construction. A 1977 research report of four streams in Virginia is cited; however, the conditions during construction are not described - raising questions about the applicability of the findings to the proposed I-73 project where erosion and sedimentation controls and stormwater management measures would be required. In many cases, the literature cited in the report predates the National Pollutant Discharge Elimination System (NPDES) and the routine incorporation of stormwater management BMPs into highway projects and, as such, the report fails to address what effect erosion and sediment controls would have on sediment loads or what effect stormwater management facilities or BMPs would have on runoff from roadways (nor does the report cite any research related to this topic). The authors erroneously conclude that such measures would not be implemented at the river crossings because few of the stream-crossing construction sites would be more than five acres (the threshold for when an approved plan is required); however, the five-acre threshold is based on the acreage of ground-disturbing activities for the project and not the size of the river crossings. The report's single-minded focus on the impact road construction would allegedly have on the Roanoke logperch, while ignoring the much greater contribution of non-roadway related factors (especially in the Pigg and Smith River systems) is disingenuous and leaves one with the false impression that, without roads, the species would not be facing the threat that it currently is facing. As stated earlier, only 0.08 percent of the total land surface in the Pigg River watershed is occupied by paved roads while approximately 37 percent of the total land surface in the Pigg River watershed is occupied by agricultural lands. Further, the authors assume widespread urbanization of the Pigg River watershed but offer little support for this assumption other than to cite its proximity to the Roanoke area and to recognize that the road would provide a shortcut (even though project opponents, in their comments on the DEIS, questioned whether the road would provide much of a time savings to justify its need). While much of the information presented in the report is fundamentally accurate, most of it is not tied to road construction but urbanized areas, agricultural use, etc. Very little of the report is related directly to the Roanoke logperch or the setting specific to the I-73 project.

With respect to the proposed I-73 crossing of the Pigg River, Roanoke logperch were collected in moderate numbers in the vicinity of the proposed crossing. The types of logperch collected (i.e. young-of-the-year) provided evidence of nearby spawning. Although the number of individuals is presently unknown, it is reported that the Pigg River system is somewhat sparsely inhabited by the Roanoke logperch (Moser, 1992). In the Wheeler report, work done by Jenkins and Burkhead (1993) is cited which concluded that the Roanoke logperch population in the Pigg River is tenuous and distributed between the Town of Rocky Mount and Leesville Reservoir with only 15 individuals collected from the Pigg River between 1967 and 1993. In contrast, in the next sentence, the report documents that "current research by Amanda Rosenberger suggests that Roanoke logperch are widely distributed in the Pigg River, but at very low densities (it is not clear from the report if this research involved surveys and sampling). The potential worst-case loss of several hundred square feet of stream bottom or potential suitable habitat to bridge support structures is not considered to be an immediate or long-term threat to survival of logperch populations in the Pigg River watershed; however, siltation at the proposed Pigg River crossing is already at moderate to high levels (McInnich and Garman, 2002) in the vicinity of the proposed ALC and given the tenuous nature of populations surveyed to date, any increase in stormwater pollutant loading during construction could be detrimental to survival of the Pigg river population in the vicinity of the crossing location. This impact would likely take the form of an incidental take of the species during construction (assuming in-stream construction) as well as potential short-term impacts to their reproductive cycle. Any substantial degree of development induced by new local access at and around proposed interchanges may contribute to potentially long term adverse effects to water quality and water quantity within certain portions of the Pigg River watershed if the locality does not require stormwater management measures be implemented with that development. Interchange induced development in combination with development already projected under the Franklin County Comprehensive Plan (independent of the ALC) would cumulatively affect surface water resources and aquatic habitat over a number of years; even then, the zones of potentially induced development surrounding ALC interchanges to be located within the Pigg River watershed are not located in proximity to known populations or stream segments containing suitable habitat and would, it is assumed, be located more than half a mile away. Any runoff from the facility after it is constructed would cycle through individual stormwater management basins or linear stormwater management basins. Even if basins weren't incorporated into the project (which is not the case), most of the runoff from the facility would have to travel a considerable distance over land before reaching a receiving body of water. Currently, development in the watershed is limited to the Route 40 corridor east of Rocky Mount due to the lack of public utilities or a real need for local infrastructure.

According to the VCU study, implementation of appropriate stormwater and erosion and sedimentation Best Management Practices will be critical to the maintenance and improvement of water quality and aquatic habitat downstream of the proposed ALC during construction. Every effort will be made to keep siltation to a minimum and maintain river flows in the Pigg River study area under this worst-case scenario. As stated previously in this report, approximately 50 acres of agricultural land whose runoff currently enters the watershed untreated would be acquired for the proposed roadway; the runoff from that acreage would be treated as part of the project.

Large-scale destruction of Roanoke logperch habitat from single-project or single-activity impacts (such as impoundments) is highly unlikely under current environmental regulatory programs; however, adverse effects to the Roanoke logperch will continue from already identified sources of impairment as well as past actions (e.g. converting forested land to agricultural uses - the average depth of soil erosion resulting from two centuries of agricultural practices in the portion of Virginia's Piedmont containing the Pigg River action area is reported to be between 7.1 and 9.6 inches) even if the project is not constructed. Based on discussions and meetings with FWS, it is FHWA's impression that, if the status quo is permitted to continue over the range of the Roanoke logperch, the continued existence of the Roanoke logperch will be in jeopardy regardless of the future of the Interstate 73 project. A comparison of existing and future land use effects demonstrates (1) that a net loss of forestlands and agricultural lands is projected by Franklin County within the action area under the current Comprehensive Plan (currently, approximately 37 percent of the Pigg River watershed is in agricultural use while less than one percent of the land has been converted to roads; approximately 1.9 percent is composed of impervious surfaces), (2) that this net loss will occur independent of construction of the ALC, and (3) that the ALC could be expected to cumulatively contribute to indirect effects to water quality and aquatic habitat resulting from construction and stormwater runoff associated with the conversion of forested land for purposes of interchange development. Potential interchange development in combination with development already projected under the Franklin County Comprehensive Plan (independent of the ALC) could cumulatively affect surface water resources and aquatic habitat over a number of years; however, the zones of potentially induced development surrounding ALC interchanges to be located within the Pigg River watershed are not located in proximity to known populations or stream segments containing suitable habitat. Considering the degree of development already projected under the Franklin County Comprehensive Plan combined with the fact that the ALC will not provide direct local access any nearer that 1.7 miles from the Pigg River, the proposed action would likely not contribute substantially to adverse indirect effects to the Roanoke logperch . Also, recent studies indicate that the association between road construction and urbanization has been historically over-stated and that roads are, at best, an inefficient means for inducing or encouraging development in the absence of a combination of other necessary development factors (Hartgen, et al, 1990; Hartgen, 2003a) and that major road improvements appear to "accommodate, rather than spur, growth" (Hartgen, 2003b). These recent studies conclude that population growth within an area is a complex phenomenon not strongly related to road improvement and that allowable population growth will be primarily determined by local zoning decisions.

In conclusion, FWS defines "jeopardize the continued existence" as "To engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species by reducing the reproduction, numbers, or distribution of that species." The Interstate 73 ALC and crossing of the Pigg River will likely have a direct effect on the species during construction given the assumptions made about the method of construction. These effects, with the implementation of erosion and sedimentation controls during construction, the incorporation of stormwater management measures into the project, the use of construction methods that appear feasible, and the identification of conservation measures that FHWA and VDOT are willing to pursue with the FWS during formal consultation are not expected to rise to the level of jeopardy. In addition, the ALC will have cumulative and indirect effects on the species as well. The contribution of the roadway to the cumulative impacts the species has experienced, is currently experiencing or will experience in the future in the watershed and across its range (represented by low level dams and impoundments, conversion of forested land to agricultural land, past chemical spills, development proposed under the existing Franklin County Comprehensive Plan, cold water releases, etc.) is considered relatively minor. In addition, the impacts the species may experience as a result of indirect impacts (represented by development around interchanges) is also considered relatively small given the distance this development would be from known populations and sections of river containing suitable habitat for the species. Based on the foregoing, it is anticipated that the direct, indirect, and cumulative impacts associated with the construction of the ALC, when taken into consideration with the proposed mitigation, construction and

conservation measures, will not have an adverse effect on the population of the Roanoke logperch in the Pigg River nor jeopardize the continued existence of the species.

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