United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
6669 Short Lane
Gloucester, VA 23061

April 17, 2006

Ms. Magalie Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, Northeast
Washington, DC 20426

Attn: Shannon Jones and Gas Branch 3

Re: Biological Opinion on the Jewell Ridge Gas Pipeline, East Tennessee Natural Gas, FERC Docket # CP05-413-000, FWS Project # sec7-3511, Smyth and Tazewell Counties, Virginia

Dear Ms. Salas:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion based on our review of East Tennessee Natural Gas, LLC's (East Tennessee) proposed Jewell Ridge Gas Pipeline in Smyth and Tazewell Counties, Virginia and its effects on federally listed species and federally designated critical habitat. This Biological Opinion (BO) is submitted in accordance with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.). The Service received your December 13, 2005 request for formal consultation on December 16, 2005.

This BO is based on information provided in the November 2005 Biological Evaluation (BE) (East Tennessee 2005), the December 2005 Biological Assessment (BA) (FERC 2005a), the December 2005 Environmental Assessment (EA) (FERC 2005b), meetings, telephone conversations, field investigations, the Federal Energy Regulatory Commission's (FERC) February 8, 2006 Certificate (FERC 2006), and other sources of information. A complete administrative record of this consultation is on file in this office.

FERC identified 20 Federal and state listed species that have been documented in the vicinity of the pipeline (Appendix A). Of these, there are eleven federally listed species, two Federal candidate species, and two overlapping sections of federally designated critical habitat within the project area.

FERC determined that the following six species are not likely to be adversely affected by the proposed action:

Gray bat	*Myotis grisescens*	Endangered
Indiana bat	*Myotis sodalis*	Endangered
Virginia big-eared bat	*Corynorhinus townsendsii virginianus*	Endangered
Cumberlandian combshell	*Epioblasma brevidens*	Endangered
Oyster mussel	*Epioblasma capsaeformis*	Endangered
Virginia spiraea	*Spiraea virginiana*	Threatened

East Tennessee performed bat, mussel, and plant surveys using qualified surveyors. The bat surveyor found no gray or Indiana bats but did find one Virginia big-eared bat. The Service anticipates approximately 350 acres (ac) of forested habitat will be cut (32 miles [mi] [actual pipeline as opposed to project length to account for elevation variation] x 5280 feet (ft) / mi x 100-ft [corridor width] x .90 [the Service estimates 90 percent of the pipeline route is currently forested] / 43,560 ac/sqft [square feet] = 350 ac). The 350 ac of forested habitat is narrow and linear, offering bats immediately adjacent foraging habitat. Because the Virginia big-eared bat is a year-round cave dweller and no hibernacula were found in the project area, the Service believes the project is not likely to adversely affect the Virginia big-eared bat.

While both the Cumberlandian combshell and oyster mussel are known from the Clinch River, a waterbody that the pipeline will cross, no specimens were found. Additionally, no records of these animals exist within the project area or anywhere upstream of the pipeline crossing. The closest known population of the Cumberlandian combshell or the oyster mussel is over 50 mi downstream. Therefore, we believe that neither species is likely to occur, even at low densities, within the action area.

The plant surveyor did not find any Virginia spiraea. The Service concurs with FERC that the proposed action is not likely to affect the six federally listed species listed above. These species will not be discussed in the BO.

The Service believes that the following five federally listed endangered species are likely to be adversely affected by the proposed action and will be the subject of the BO:

Little-wing pearlymussel	*Pegias fabula*
Purple bean	*Villosa perpurpurea*
Rough rabbitsfoot	*Quadrula cylindrica strigillata*
Shiny pigtoe	*Fusconaia cor*
Tan riffleshell	*Epioblasma florentina walkeri*

Federally designated critical habitat in Indian Creek for the following species may also be affected by the proposed action:

Purple bean	*Villosa perpurpurea*
Rough rabbitsfoot	*Quadrula cylindrica strigillata*

This BO does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

Consultation History

The consultation history of this project is provided in Appendix B.

BIOLOGICAL OPINION

I. DESCRIPTION OF PROPOSED ACTION (East Tennessee 2005, FERC 2005a, FERC 2005b, FERC 2006)

FERC issued a certificate to East Tennessee to construct a 32-mi pipeline in Tazewell and Smyth Counties, Virginia (horizontal distance is 30.5 mi but accounting for elevation changes raises the total length to 32 mi). Figure 1 shows the general location of the Project, and Figure 2 shows the Project broken down by watershed. Further detailed project descriptions, maps, and drawings, found in FERC 2005a, FERC 2005b, and East Tennessee 2005, are hereby incorporated by reference as part of the Project Description for this BO. Clarifications in TRC's (East Tennessee's consultant) March 10, 2006 letter to the Service are also incorporated.

The purpose of the Project is to connect CNX Gas Company, LLC's (CNX Gas), a subsidiary of CONSOL Energy, Inc., existing Cardinal States Gathering System in Tazewell County, Virginia, to the East Tennessee interstate pipeline system in Smyth County, Virginia. The new pipeline would allow CNX Gas to move natural gas from its production fields, which are collected at the CNX Gas compressor station, into new markets in the southeast. Currently, the pipeline system that transports CNX Gas's natural gas to market is physically constrained during certain periods of the year and is operating at capacity. CNX has stated that, due to existing pipeline constraints, they have built a curtailment of three billion cubic feet of natural gas into their 2005 production estimates. The new capacity provided by the Jewell Ridge Lateral Project would alleviate these physical constraints and allow an increased supply of natural gas to flow to market. The new pipeline would also allow CNX to increase new gas production in southern Virginia (FERC 2006). After 15 years, CNX will have the option to purchase the Jewell Ridge pipeline from East Tennessee (FERC 2006).

The Project would provide an alternate supply source to southeastern natural gas consumers, creating supply diversity and protecting them from potential disruptions. Currently, consumers in the southeastern United States receive the vast majority of their natural gas supply from the Gulf Coast. Events, such as hurricanes, can cause producers to curtail production and significantly limit supply from the Gulf Coast area. Providing a new supply source for this region would help alleviate potential supply constraints as well as enhance supply area pricing competition. Additionally, East Tennessee's existing pipeline system customers in Virginia, Tennessee, North Carolina, and Georgia would have enhanced access to new natural gas supplies

from the Appalachian basin. The new pipeline would provide some areas, such as Richlands, Cedar Bluff, and Claypool Hill, Virginia, with potential access to natural gas for the first time, allowing them the opportunity to take advantage of a price competitive energy source for their residential and commercial heating needs (FERC 2005a).

The Project would involve construction and operation of approximately 30.5 mi (based on milepost [MP] distances) of 20-inch (in)-diameter natural gas pipeline and associated aboveground facilities, including a meter station and launcher at MP 0.15, a tap at MP 5.89, a mainline valve (MLV) and tap at MP 10.68, a MLV at MP 19.96, and a regulator and receiver at MP 30.48. CNX's Cardinal gathering system compressor station is located at MP 0 and will be the only gathering system compressor station for this pipeline (K.A. Chesler, East Tennessee, pers. comm. 2006). In addition, East Tennessee would install two anode beds, one at MP 16.08 and one at MP 25.14. The new pipeline would have the capacity to carry 235,000 dekatherms of natural gas per day. Approximately 20.9 mi of the pipeline would be located in Tazewell County, and the remaining 9.6 mi would be located in Smyth County.

East Tennessee will install the taps at MP 5.87 (State Route 621/Middle Creek Road) and MP 10.68 adjacent to the MLV (U.S. Route 19/460). Although any of the local communities or future distribution companies would have access to the natural gas transported in the Jewell Ridge pipeline if desired, only two taps would be installed at this time. No supply laterals are planned as part of the Jewell Ridge Lateral Project. Table 1 summarizes the Project facilities.

Table 1: Project Facilities

Project Component	Length (miles)	Milepost	State	County
Pipeline:				
20-in-diameter pipeline	20.9	0.0 – 20.9	VA	Tazewell
20-in-diameter pipeline	9.6	20.9 – 30.5	VA	Smyth
Aboveground Facilities:				
Meter Station, launcher	--	0.2	VA	Tazewell
Tap at State Route 621	--	5.9	VA	Tazewell
MLV & Tap at U.S. Route 19/460	--	10.7	VA	Tazewell
MLV at State Route 601	--	20.0	VA	Tazewell
Regulator, receiver, tap valves	--	30.5	VA	Smyth
Anode Beds:				
Anode Bed 1	0.5	16.1	VA	Tazewell
Anode Bed 2	0.5	25.1	VA	Smyth

East Tennessee would construct the proposed pipeline using a 100-ft-wide construction right-of-way (ROW), of which 50 ft would be maintained as the permanent easement for operation of the

pipeline. The 100-ft-wide construction ROW would allow for topsoil segregation in hay fields and improved pasture, mild side slope and steep slope construction, and rock storage. The construction ROW typically would consist of 65 ft on the working (or west) side and 35 ft on the spoil (or east) side. The permanent ROW typically would consist of 35 ft on the west side of the pipeline and 15 ft on the east side of the pipeline. The anode beds would be installed within a 50-ft-wide construction ROW, of which 20 ft would be maintained as the permanent easement for operation.

To allow for staging of equipment and materials for the pipeline, additional temporary workspace would be required for steep side slope construction and crossings of railroads, major roads, and waterbodies. In addition to the additional temporary workspace, East Tennessee proposes to temporarily store smaller quantities of equipment and materials in four staging areas near the pipeline ROW between MPs 0.0 and 2.0. All four staging areas are in open areas. East Tennessee also identified five contractor/pipe yards that would be used to store larger quantities of materials and equipment near the pipeline. These include the Belfast Yard 3 (3.7 ac), Smithfield Yard 6 (3.5 ac), Raven Yard 7 rail siding and ware yard (6.9 ac), and Raven Yard 7A contractor yard (1.5 ac). All four of these yards are disturbed and either entirely graveled or partially graveled. In addition, East Tennessee would use the Chilhowie pipe yard, an approximate 10-ac parcel that was previously used for pipeline construction and is still used to store pipe.

Access to the construction ROW would be from state and county roads, and from 40 existing private and new access roads, totaling approximately 29.9 mi, that have been identified by East Tennessee. Of the 40 total roads, 11 will be new, and their total length will be approximately 4,660 ft. Minor upgrading of existing, non-paved roads may be required to support construction equipment. This may include road surface grading, gravel installation, and tree trimming. New extensions from existing access roads to the construction ROW would require grade and gravel, and tree clearing in forested areas. Five access roads would be maintained as permanent East Tennessee access roads to the meter station at MP 0.15, the tap at MP 5.9, the MLV and tap at MP 10.7, the MLV at MP 20.0, and the regulator at MP 30.5.

Construction of the Project would affect a total of approximately 503 ac of land, comprised of 396 ac for the construction ROW and additional temporary workspace, 26 ac for contractor yards, 3 ac for construction of the above ground facilities, 6 ac for construction of the anode beds, and 72 ac of access roads. A total of 192 ac of this land would be used for operation of the pipeline, including the permanent ROW (185 ac), above ground facilities (2 ac), permanent access roads (4 ac), and anode beds (2 ac).

The Jewell Ridge Lateral Project would be designed, constructed, and operated in accordance with applicable Federal regulations and guidelines, including:

- United States Department of Transportation (DOT) regulations in 49 Code of Federal Regulations (CFR) Part 192 - Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards,

- 18 CFR Part 2.69 - Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing and Maintenance of Rights-of-Way,
- East Tennessee's Erosion and Sedimentation Control Plan, and
- East Tennessee's Spill Prevention Control and Countermeasure Plan.

Conventional overland pipeline construction methods would be used to install the pipeline. This involves installation of the pipeline as a moving assembly line (e.g., construction spread) with activities typically proceeding from one end of the construction spread to the other in the following sequence: surveying and flagging of the ROW, clearing and grading, trenching, stringing and bending, welding, lowering-in, backfilling, hydrostatic testing, cleanup and restoration, and post-construction monitoring. Smaller crews may be used for specialized construction procedures such as stream crossings, mountainous terrain, and road bores. Although segments of the pipeline can be constructed independently of other segments, the Project would be constructed at one time to avoid multiple disturbances along the ROW.

East Tennessee would employ at least three full-time environmental inspectors during active construction and restoration of the Project. The environmental inspectors would be responsible for ensuring compliance with the requirements of the erosion and sedimentation control plan, the construction drawings, the environmental conditions of the FERC certificate, proposed mitigation measures, and other Federal and state environmental permits and approvals. In addition, East Tennessee would conduct environmental training for both company and contractor personnel whose activities would affect the environment during pipeline construction.

East Tennessee also proposes to hire and fund a third-party monitor during construction of the pipeline to work under the direction of the FERC staff for the purpose of monitoring compliance with its proposed mitigation measures and the applicable environmental conditions identified in FERC's Certificate.

East Tennessee estimates the entire construction sequence will be completed in approximately 15 to 18 weeks, including restoration. Construction is likely to begin in the early summer of 2006 and end by the late summer of 2006. Actual duration would depend on specific conditions at the time of construction.

The pipeline would cross 45 waterbodies and three others would be crossed by the construction ROW. Of these, four are state designated Threatened and Endangered Species Waters because of documented occurrences of Federal and state listed species: Indian Creek, Clinch River, Little River, and North Fork (NF) Holston River. These waterbodies contain federally and state-listed freshwater mussel species and/or federally designated critical habitat for freshwater mussels. The following table lists occurrences of federally listed species by waterbody:

Table 2: Federally Listed Species and Critical Habitat by Waterbody

Waterbody	Mileage within Watershed	Species	Status	Critical Habitat
Indian Creek	1.4	purple bean rough rabbitsfoot tan riffleshell	all endangered	purple bean rough rabbitsfoot
Clinch River	3.5	little-wing pearlymussel purple bean rough rabbitsfoot	all endangered	
Little River	1.4	little-wing pearlymussel	endangered	
NF Holston River	6.1	little-wing pearlymussel shiny pigtoe	both endangered	

All waterbodies, except the main stem of Indian Creek, would be crossed using a dry crossing method consisting of either a standard dam and pump or flumed crossing, or a combination of both. With both methods, stream flow is conveyed around the disturbed work area using a system of sand bag dams, pumps, and piping (dam and pump) or sand bag dams and a flume pipe (flume) to create a "dry" work site and maintain uninterrupted downstream flow of water. Once the stream flow is directed over (with a flume) or around (dam and pump) the work site, the work site would be dewatered and the trench would be excavated in the area between the sand bag dams. Blasting to excavate the area will be used at the Clinch, Little, and NF Holston River crossings but not at Indian Creek.

For the larger (or sensitive) waterbodies where the crossing would be installed as a separate construction activity, the crossing pipe string would be welded together and bent to allow for a minimum of five feet of cover below the stream bottom before the waterbody crossing begins. After the trench is excavated, the pipe string would be installed by slipping it under the flume (or around the pump system) and into the trench. The trench would be backfilled, and the banks restored before removing the flume or dam and pump system and returning the stream flow to across the completed crossing. Construction crossing activities in waterbodies (not including blasting) would be completed in 24 horrs (hrs) (waterbodies less than ten ft wide) or 48 hrs (waterbodies between 11 and 100 ft wide). East Tennessee would make every attempt to complete construction activities in the NF Holston River (approximately 116 ft wide) within 72 hrs. Bank stabilization and installation of temporary sediment barriers would be completed in 24 hrs following completion of the crossing.

Equipment bridges (i.e., mats, railroad car, rock and flume with agency approval, etc.) will be installed during clearing and grading operations. Furthermore, all heavy equipment will cross the waterbodies on equipment bridges. Until the equipment bridge is installed, only clearing equipment and equipment necessary for installation of equipment bridges may cross the waterbody and the number of crossings shall be limited to one crossing per piece of equipment. Span type bridges will be utilized for the crossing of the Clinch, Little, and NF Holston Rivers, and to the extent possible at other waterbodies. The bridge crossing of the Clinch River will be

removed immediately upon completion of the crossing, while other bridges will be removed as soon as practical upon completion of the crossing.

Indian Creek will be crossed using a conventional bore crossing. This construction method involves excavating bore pits on both sides of the crossing equal to the depth of the pipeline (i.e., a minimum of five ft below the stream bottom at the top of the pipe), boring under the waterbody, and then pushing the pipeline through the borehole. With a cased bore, the auger is placed inside a casing pipe to remove the cuttings, and both are pushed forward as the hole is cut. Once the bore is completed, the pipeline would be pushed through the casing pipe and pulled into place. The casing pipe would be left in place, and any voids between the pipeline and the casing pipe would be filled with grout (a sand-cement mix). Based on an analysis of substrate present on each side of Indian Creek at the proposed crossing location, the substrate was found to be bedrock overlain by fine silty sand and fine sandy silt, which creates excellent conditions for a bore to be successful. East Tennessee discussed this crossing with several construction industry professionals, and all felt that this crossing is very suitable for a conventional bore crossing.

The U.S. Department of Transportation (DOT) requires natural gas pipelines to be hydrostatically tested to verify the integrity of the pipeline prior to being placed into service. East Tennessee proposes to segment the pipeline into seven test sections, using eight manifolds that would be located at MPs 0.0, 10.6, 13.3, 18.6, 20.1, 24.2, 26.5, and 30.5. The northern three test sections (MPs 0.0 to 18.6) would be tested with approximately 1.6 million gallons (gal) of water taken from the Clinch River. The southern four test sections would be tested with approximately 1 million gal taken from the NF Holston River. These rivers were identified as hydrostatic test water sources because they contain sufficient flow to accommodate hydrostatic test water withdrawals without negatively affecting downstream uses (Table 3). After completion of the test, water would be discharged at any one, or all, of the upland manifold sites within the watershed from which it was withdrawn. Table 3 summarizes proposed hydrostatic source and discharge locations.

Table 3: Hydrostatic Test Water Source/Discharge Locations

Withdrawal Milepost	Source	Volume (gal)	Designation a/	State Water Quality Class-ification b/	Discharge Milepost(s)
Tennessee and Big Sandy River Basin; Clinch River Sub Basin					
10.36	Clinch River	1.6 million	Yes	IV	0.0, 10.60, or 13.34
Tennessee and Big Sandy River Basin; Holston River Sub Basin					
24.20	North Fork Holston River	1 million	Yes	IV	18.6, 20.1, 24.2, 26.5, or 30.5

a/ Virginia designated Threatened and Endangered Species Water.
b/ From Virginia Water Quality Standards (February 12, 2004). VDEQ Class IV = Mountainous Zone Waters

The pipeline would be tested after construction is complete and before the pipeline is put into service. East Tennessee anticipates that water withdrawal for hydrostatic testing would occur between late July and October 2006. Using a withdrawal rate of 6,000 gal per min, or 13.4 cubic ft per sec (ft^3/s), water withdrawal of 1.6 million gal from the Clinch River would take approximately 4.4 hrs. At the NF Holston River, water withdrawal of 1.0 million gal would take approximately 2.8 hrs.

All water withdrawal and discharge would be done in accordance with the measures described in East Tennessee's Erosion and Sedimentation Control Plan (E&SCP). These measures include the following:

- Intake hoses would be screened and elevated off the bottom of the waterbody to prevent entrainment of fish and other benthic organisms;
- During water withdrawal, adequate flow rates within the waterbody would be maintained to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users;
- Operation and refueling of pumps would be done in accordance with East Tennessee's standard operating procedures;
- Following hydrostatic testing, water would be discharged at a regulated rate, and energy dissipating devices (i.e., splash plate) and discharge filtering structures would be used to prevent erosion, streambed scour, suspension of sediments, and excessive flow;
- There would be no chemical treatment of the hydrostatic test water; and
- All water discharge would be conducted in accordance with the conditions of the state hydrostatic discharge permit to be obtained from the Virginia Department of Environmental Quality on February 6, 2006.

The Project would be operated and maintained by East Tennessee in the same manner as East Tennessee currently operates and maintains its major interstate pipeline facilities and in accordance with requirements of the DOT. East Tennessee personnel regularly perform visual inspection of the pipeline to identify potential problems. These inspections are routinely done on foot, by vehicle, and air. Aerial inspections of the entire pipeline are done at least once a week, weather permitting. The ROWs are also routinely inspected at road crossings. Any conditions or problems that may affect the safety and reliability of the pipeline are identified and corrected. All permanent erosion control devices installed during construction would be inspected to assure that they are functioning properly and that no new erosion hazards have developed. Cathodic protection units, supplied by the anode beds installed along the pipeline, would be regularly monitored and regularly scheduled gas-leak surveys would be conducted to identify any pipeline anomalies that may require repair. Cathodic protection is the process of applying a safe, low voltage direct current to all surfaces of the pipeline to protect it from the effects of corrosion. Additionally, in accordance with DOT requirements, regularly scheduled in-line inspection surveys would be conducted to identify any pipeline anomalies that may require repair.

East Tennessee will not use herbicides or pesticides for ROW maintenance. Other maintenance functions would include periodic seasonal mowing of the ROW in accordance with the vegetative maintenance restrictions outlined in East Tennessee's E&SCP as summarized below:

- Routine maintenance clearing would be conducted no more frequently than once every three years, except for a ten-ft-wide corridor centered on the pipeline that may be maintained annually in an herbaceous state to facilitate periodic corrosion and leak surveys:
- No routine vegetation maintenance would occur between April 15 and August 1 of any year; and
- A riparian strip that measures 25 ft back from the mean high water mark would be allowed to permanently revegetate with native plant species across the entire ROW adjacent to waterbodies, except for a 10-ft-wide corridor centered on the pipeline that may be maintained in an herbaceous state to facilitate periodic corrosion and leak surveys and a 30-ft-wide corridor centered on the pipeline where trees and shrubs greater than 15 ft in height may be cut and removed from the ROW. FERC (2006) requires East Tennessee to increase the buffer width to 50 ft in the following watersheds: Indian Creek, Clinch River, Little River, and the NF Holston River.

East Tennessee states that they have no plans to expand the pipeline in the future. A 16-in diameter pipe would satisfy current demand, but it would require the gas to be continuously pumped under a higher pressure than East Tennessee would prefer. CNX requested a 20-in pipeline to avoid the high pressure and to allow for increased gas production in the future (FERC 2006). East Tennessee states that they are "over designing the pipeline to accommodate the potential for future expansion that might be associated with increased CNX Gas output, thus allowing CNX Gas to increase its future output without the need to upgrade to the pipeline system by adding a parallel pipeline.

It is difficult to quantify the expected lifetime of this pipeline because there is no timetable for abandonment or removal. The FERC Certificate has no expiration date. We believe it is reasonable that the pipe will still be in place in 50 years. Therefore, for the purposes of this consultation, we will consider the life of the pipeline to be 50 years.

The "action area" is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The Service has determined that the action area for this project consists of the pipeline corridor (32 mi long and 100 ft wide) and several waterbodies that will incur impacts beyond the pipeline corridor. Due to sediment transport downstream, the action area for all waterbody crossings will extend 100 meters (m) upstream and 3,600 m downstream except for Indian Creek. The action area for Indian Creek will end at the mouth of the creek because sediment being transported would be diluted by the high volume of water in the Clinch River to a point below the background level of sedimentation in the Clinch River.

There is little scientific literature regarding specific distances of sediment transport downstream. Coal fines can serve as an appropriate surrogate for sediment. Mair (2004) observed coal fines

in the dense mussel assemblage at Indian Creek. It is possible that the coal fines blew off train cars carrying coal. The nearest railroad crossing over the creek is 3,600 m upstream of the dense mussel assemblage, making the minimum coal fine transport distance in Indian Creek to be 3,600 m. It is also possible that the coal fines came from a coal mine. The nearest coal mine is located over 15,000 m upstream.

While 3,600 m is farther than our typical action area for non-contaminants impacts to aquatic listed species, we believe the extra caution is supported by our observations of coal fines in Indian Creek, which extend at least this distance and possibly much further. We view the in-stream work associated with the project as more than minimal due to the blasting and trenching, so the action area needs to extend beyond our standard of 800 m. Also, given the extreme rarity of some of the species involved in this consultation, we believe it prudent to give the benefit of the doubt to the species and consider a larger action area.

II. STATUS OF THE SPECIES RANGEWIDE AND CRITICAL HABITAT

Species Descriptions

Little-wing Pearlymussel – The little-wing pearlymussel is a small mussel whose largest size is 1.5 in long and 0.5 in wide. The shell's outer surface (periostracum) is typically eroded, giving the shell a chalky appearance. When the periostracum is present, the shell is light green or dark yellowish brown with dark rays of variable width along the shell's anterior surface. The nacre is whitish on the anterior border and usually salmon or flesh colored in the beak cavity. Valves are sexually dimorphic, with female valves having an obvious posterior ridge and truncated posterior end (Bogan and Parmalee 1983, Ahlstedt 1986). The little-wing pearlymussel is a filter feeder, taking algae and other microorganisms from the water column. It requires clean water and a relatively silt-free substrate.

Purple Bean – The purple bean is a small to medium-sized mussel that reaches a maximum length of approximately 2.1 in (55 mm). Its shell's outer surface is dark brown to black with numerous closely spaced, fine, green rays. The inside of the shell ranges from deep purple to whitish purple, or purple with a blush of salmon inside the pallial line. Valves of the males and females are sexually dimorphic (Simpson 1914). Male valves are straight or slightly concave on the ventral margin whereas valves of females are more ovate and slightly emarginate below the faint marsupial swelling. The purple bean is often confused with the Cumberland bean (*Villosa trabalis*), but the two can be differentiated by color of the interior shell (purple versus white) (Ahlstedt 1991). The purple bean is a filter feeder, taking algae and other microorganisms from the water column. It requires clean water and a relatively silt-free substrate.

Rough Rabbitsfoot – The rough rabbitsfoot valves are approximately three times as long as high and have an irregular thickness. A row of knobs extends over an inflated posterior ridge, and there are wrinkles on the dorsal ridge. The foot is typically orange with a black striped background, though the foot can appear white. The nacre is silvery white and iridescent. The beak cavities are deep, and the pseudocardinal teeth are radially split while the lateral teeth are long and straight (USFWS 2004a). The rough rabbitsfoot is a filter feeder, taking algae and

other microorganisms from the water column. It requires clean water and a relatively silt-free substrate.

Shiny Pigtoe – The shiny pigtoe mussel derives its common name from the smooth and shiny nature of the periostracum. It is also distinguished by the prominent, wide dark green to blackish rays on a yellow to brown background. Old individuals tend to become darker brown with faint rays, which fade toward the valve margins. The valves are subtriangular with a median sulcus (indentation) and concentric growth rings. The beak is turned forward and anterior from the midline with moderately deep beak cavities (Bogan and Parmalee 1983). There are two pseudocardinal teeth present on the left valve and two lateral teeth while the right valve has three pseudocardinal teeth and one lateral tooth. The nacre is white and is marked by a well-defined pallial line. There is no sexual dimorphism apparent in the valves (Beaty and Neves 1997). The shiny pigtoe is a filter feeder, taking algae and other microorganisms from the water column. It requires clean water and a relatively silt-free substrate.

Tan Riffleshell – The tan riffleshell is a medium-sized mussel species characterized by dull brownish-green or yellow-green periostracum with numerous faint green rays evenly distributed over the valve surface (Bogan and Parmalee 1983). It is a small mussel, seldom exceeding 2.3 in (60 mm) in length (Parmalee and Bogan 1998). Valves are inequilateral and subinflated, with uneven growth checks. Both valves contain two small triangular pseudocardinal teeth. Lateral teeth are short and curved, double in the left valve and single (sometime double) in the right valve. The pallial line is distinct anteriorly, and the nacre color is bluish-white. Sexual dimorphism is readily apparent in this species. The posterior ridge of the male shell appears faintly doubled, ending in a slight biangulation posteriorly; umbo is full, elevated, and slightly anterior in the middle. The female shell has a pronounced marsupial swelling posteriorly, defined by anterior and posterior sulci and often serrated along the ventral margin. Umbo location is in the anterior third of the shell, and the posterior ridge is scarcely visible. The posterior swelling of female *E. f. walkeri* is very thin and typically has one or more constrictions, which give the shell a multilobed appearance (Stansbery 1976). The tan riffleshell is a filter feeder, taking algae and other microorganisms from the water column. It requires clean water and a relatively silt-free substrate.

Life History of Short-Term Brooders (Rough Rabbitsfoot, Shiny Pigtoe)

Short-term brooders spawn in late May through early June with gravidity lasting from mid-June until mid-July (Kitchel 1985). Freshwater mussels typically require a fish host for completion of its life cycle. Mussels release their glochidia (larvae) into the water column, where some encyst on the gills of host fish. After a period of time, the larvae fall off the fish's gills and settle to the stream bottom, where they mature.

Laboratory-identified host fish species for the shiny pigtoe include the whitetail shiner (*Cyprinella galactura*) and the common shiner (*Luxilus cornutus*) (Kitchel 1985, Neves 1991). Other potential host species include the warpaint shiner (*L. coccogenis)* and telescope shiner (*Notropis telescopus*) (Kitchel 1985). Host fish for the rough rabbitsfoot are unknown, though cyprinid fishes may serve as glochidial hosts. The shiny pigtoe and rough rabbitsfoot occupy

lotic habitats in shallow areas with moderate to fast currents (Bogan and Parmalee 1983). A stable substrate of sand, gravel, and cobble is generally required for suitable habitat. The mussels are usually well burrowed in the substrate and appear to be relatively sedentary (Kitchel 1985, USFWS 2004a). Water quality is also of importance to these mussels as they are only found in clear unimpounded sections of streams.

Life History of Long-Term Brooders (Little-wing Pearlymussel, Purple Bean, Tan Riffleshell)

Long-term brooders typically have a late summer or early fall fertilization period, with the glochidia incubating over winter, and being expelled the following spring or early summer (Beaty and Neves 1997, USFWS 2004a). Unlike most other long-term brooders however, the purple bean releases glochidia in the early spring (Neves 2004b).

Host fish for the little-wing pearlymussel include the greenside darter (*Etheostoma blennioides*), fantail darter (*E. flabellare*), redline darter (*E. rufilineatum*), snubnose darter (*E. simoterum*), and one or two cottids: banded sculpin (*Cottus bairdi*) or mottled sculpin (*C. carolinae*) (Rogers et al. 2001). Host fish for the purple bean include the greenside darter, fantail darter, banded sculpin, black sculpin (*C. baileyi*), and/or mottled sculpin (Neves 1996, 1999). Host fish for the tan riffleshell include the greenside darter, fantail darter, redline darter (*E. rufilineatum*), Tennessee snubnose darter (*E. simoterum*), and banded and/or mottled sculpin (Neves 1996, Rogers et al. 2001).

Host fish for all of these mussels require habitats with flowing water and clean substrates composed of sand and gravel. Shoal or riffle areas in small to large rivers are detrimentally impacted by the addition of fine sediments. The loss of such habitat through siltation could be detrimental to the mussel community through the loss of suitable host fish. Without an abundance of these host fish, the mussel populations will be unable to recruit new individuals and will eventually decline (Beaty and Neves 1997).

Status and Distribution

Little-wing pearlymussel – The little-wing pearlymussel is found in the Big South Fork (SF) Cumberland River, Little SF Cumberland River, and Horselick Creek in Kentucky; Cane Creek in Tennessee; and the Clinch and NF Holston Rivers in Virginia (Ahlstedt 1986). In 2005, it was found in the Little Tennessee River (M. Floyd, USFWS, pers. comm., 2006). It has previously been found in the Little River in Virginia. The little-wing pearlymussel was federally listed as endangered on December 14, 1988. It is extremely rare throughout its range.

Purple Bean – The purple bean was federally listed as endangered on January 10, 1997. It was found historically in the upper Tennessee River basin in Tennessee and Virginia. Presently, it survives in limited numbers at a few locations in the upper Clinch River basin in Scott, Tazewell, and Russell Counties, Virginia; Copper Creek, Scott County, Virginia (Gordon 1991); Indian Creek, Tazewell County, Virginia (Watson and Neves 1996); Obed River, Cumberland and Morgan Counties, Tennessee; Emory River, Morgan County, Tennessee; and Beech Creek,

Hawkins County, Tennessee (Gordon 1991). The species was federally listed as endangered on January 10, 1997.

Rough rabbitsfoot – The rough rabbitsfoot is found in the Upper Tennessee River Basin. It is found above the Norris Reservoir (Powell and Clinch Rivers) and in the NF and SF Holston River in Tennessee and Virginia. In Virginia, it is found in the Clinch River (Scott and Tazewell Counties), Copper Creek (Scott County), and Powell River (Lee County) (Bates and Dennis 1978, Bogan and Parmalee 1983, USFWS 2004a). The rough rabbitsfoot is declining throughout its range. The species was federally listed as endangered on January 10, 1997.

Shiny pigtoe – The shiny pigtoe was first collected in 1834 in the Elk River in Alabama. It has also been found in the Flint and Paint Rock Rivers in Alabama. The shiny pigtoe has been found extensively in the Clinch, Powell, and NF Holston Rivers in Tennessee and Virginia. In the Clinch River, this species has been reported at many sites from Anderson County, Tennessee, to Tazewell, Virginia (Ortmann 1918, Stansbery 1973). Ortmann (1918) reported the shiny pigtoe in the Powell River from Claiborne County, Tennessee to Lytton Mill in Lee County, Virginia, and Stansbery (1973) also found this species in the Powell River. In the NF Holston River, this species was found from Hawkins County, Tennessee, to Holston in Washington County, Virginia (Ortmann 1918). Its distribution in the Tennessee River was reported to be from Cypress Creek near Florence, Alabama, upstream to Knoxville, Tennessee (Ortmann 1918, 1925).

The shiny pigtoe is endemic to the Tennessee River system and currently known from the Clinch River in Virginia and Tennessee, the Powell River in Virginia and Tennessee, the NF Holston River, Virginia, and the Paint Rock River / Estill Fork, Alabama. Populations in the Elk River and elsewhere in the middle and upper Tennessee River system are deemed extirpated (S.A. Ahlstedt, USGS retired, pers. comm., 2005). The Clinch population has some recruitment occurring in the Virginia portion of the river (R.S. Butler, USFWS, pers. comm., 2005). Like most mussel species, it is probably declining in the NF Holston and Powell Rivers. The shiny pigtoe was listed as endangered on June 14, 1976.

Tan riffleshell – The tan riffleshell was once found throughout Tennessee and southwestern Virginia in the Tennessee River system (USFWS 1984). Currently, the only known reproducing populations are in Indian Creek, a tributary of the Clinch River, in Tazewell County, Virginia, and in the Big SF Cumberland River in Scott County, Tennessee. Live specimens have been found in the Clinch River, Middle Fork (MF) Holston River, and the Hiwassee River, but these are not believed to be members of viable populations (Rogers 1999). During October 1998, seven tan riffleshell individuals were found (Shute 1998) the Big SF Cumberland River. During surveys conducted from 1999 through 2002, 113 tan riffleshell individuals were surveyed in the Big SF Cumberland River (Ahlstedt et al. 2002). The species was federally listed as endangered on August 23, 1977.

The genus *Epioblasma* has been considered to be the most highly developed and recently evolved genus of freshwater mussels (USFWS 1984). All of its members have highly specific habitat requirements that cause them to be notably susceptible to habitat alterations. Of the 25

taxa within the genus *Epioblasma*, 16 are presumed to be extinct, and all but *E. triquetra* of the remaining 9 are federally listed (Turgeon et al. 1998). The tan riffleshell may be the last extant subspecies in the *Epioblasma florentina* complex, as *E. f. curtisi* has not been found alive in many years.

Current data suggest that the tan riffleshell population in Indian Creek may warrant a separate sub-species status (Jones 2004). Jones (2004) proposes a new name, the golden riffleshell, *Epioblasma florentina aureola*. Jones et al. (in press) are attempting to publish the proposed taxonomy. For the purposes of this consultation, we are retaining the name tan riffleshell to include the Indian Creek population because the new name has neither been published nor established by common use.

Population Dynamics

Most native mussels in the upper Tennessee River drainage have many factors contributing to their decline. The main causes of decline are siltation, impoundment of rivers, water pollution, and invasion of exotic species. In most instances, the combined effects of numerous contaminants and induced physiological stresses are the ultimate cause for acute or chronic mortality in a population of mussels (Neves 1993). Siltation and sedimentation from farming, mining, and other land-use practices are implicated in the decline of mussels (Ellis 1931, Coon et al. 1977). Excessive siltation degrades water quality and substrate, clogs gills, reduces feeding efficiency and growth, and can eventually smother mussels if sufficient accumulation occurs (Ellis 1931; Marking and Bills 1980).

The tan riffleshell, in particular, is considered highly unstable. There are only two known reproducing populations of this species (Indian Creek, Tazewell County, Virginia, and Big SF Cumberland River, Scott County, Tennessee). Coupled with the urban setting of the Indian Creek waterway, and the upstream coal mining activity, the future of this species appears tenuous.

Recovery Goals and Accomplishments

The ultimate goal for recovery of listed species is to restore viable populations within a significant portion of the historical range, eliminate threats to their continued existence, and remove them from the Federal List of Endangered and Threatened Wildlife and Plants. Removing species from the Federal endangered and threatened species list will be considered when the likelihood of extinction in the foreseeable future has been eliminated by achieving the criteria enumerated in each species' Recovery Plan (USFWS 2004a).

Little-wing pearlymussel

Downlisting criteria [Delisting criteria, where different, are in brackets]:

1. At least 8 [13] distinct, viable populations in the Cumberland and Tennessee Rivers.
2. Expanding populations, either by density or length [not a delisting criterion].

Accomplishment: Virginia Tech propagated and released 569 juveniles into the Big SF Cumberland River (B.T. Watson, VDGIF, pers. comm., 2006).

Purple Bean

Downlisting criteria [Delisting criteria, where different, are in brackets]:

1. At least four [five] distinct, viable populations in the upper Tennessee River.
2. One [two] distinct, naturally reproduced year class in each of the viable populations.
3. Expanding populations, either by density or length [not a delisting criterion].
4. No foreseeable threats to the survival of the species.
5. Sufficient geographic population size so that a single catastrophic event would not be likely to render the population unviable.
6. Biennial monitoring over a 10-year period.

Accomplishments:

1. Survey completed in Copper Creek, 2004-2005.
2. Twenty purple bean were collected in 2004 from Indian Creek to establish an ark population and to augment propagatation at the Aquatic Wildlife Conservation Center at the Buller Fish Cultural Station (AWCC) (USFWS 2004b). Ark population and propagation are ongoing at both the AWCC and Virginia Tech.
3. Status survey of the purple bean was conducted jointly by Virginia Tech and the Service to include propagation of this species to augment the existing population in Indian Creek (Neves 2004b).
4. VDGIF completed survey of Cleveland Island, Russell County, Virginia in 2002.
5. Release of approximately 25,000 individuals in the Clinch River (Tazewell County, Virginia, and Hancock County, Tennessee) and Indian Creek (Tazewell County, Virginia) from 1999-2005 (Neves 2004b).
6. Publication of the paper entitled, “Species Composition and Biotic Condition of the Fish Community of Indian Creek, Tazewell County, Virginia” (Pinder and Jones 2000).
7. Completion of a M.S. Thesis by B.T. Watson of Virginia Tech. Watson’s thesis included a description of the mussel fauna of Indian Creek and their distribution. During his research, Watson identified several host fishes, collected demographic data on the purple bean population, and augmented it with juveniles from his host fish identification research (Watson 1999).
8. Identification of the black sculpin (*Cottus baileyi*) as a host species of the purple bean. Virginia Tech made this discovery with funding from the Tennessee Wildlife Resources Agency (Neves 1999).
9. A series of public and interagency meetings were held to discuss the degradation of Copper Creek, Scott and Russell Counties, Virginia, and explore ways to rehabilitate the waterway (Koch 1999).
10. Evaluation by Virginia Tech of the effects of sedimentation on mussels and methods to augment or reintroduce populations (Neves 1999).

Rough rabbitsfoot

Downlisting criteria [Delisting criteria, where different, are in brackets]:

1. At least three [four] distinct, viable populations in the upper Tennessee River.
2. One [two] distinct, naturally reproduced year class in each of the viable populations.
3. Expanding populations, either by density or length [not a delisting criterion].
4. No foreseeable threats to the survival of the species.
5. Sufficient geographic population size so that a single catastrophic event would not be likely to render the population unviable.
6. Biennial monitoring over a 10-year period.

Accomplishment: Virginia Tech is working on host fish studies and propagation (B.T. Watson, VDGIF, pers. comm., 2006).

Shiny pigtoe

Delisting criteria (there are no downlisting criteria):

1. A reproducing population (with individuals under age five) exists in the following:
   a) NF Holston River above Saltville, Smyth County, Virginia.
   b) Clinch River from the Norris Reservoir upstream to Nash Ford, Russell County, Tennessee.
   c) Powell River from the Norris Reservoir upstream to Flanary Bridge, Lee County, Virginia.
   d) Elk River in Lincoln County, Tennessee.
   e) Paint Rock River in Jackson County, Alabama.
   f) Copper Creek in Scott County, Virginia.
2. A viable, reproducing population exists in one additional river or two additional river corridors that historically contained the species.
3. No foreseeable threats to the survival of the species.
4. Noticeable improvements in coal-related problems and substrate quality in the Powell River and no increase in coal or other energy-related impacts in the Clinch River.

Accomplishment: Host fish studies revealed four cyprinids are suitable host fish (B.T. Watson, VDGIF, pers. comm., 2006).

Tan riffleshell

The Service finalized the Recovery Plan for the species in 1984, and it has not been updated. At that time, the only known population of the tan riffleshell was in the MF Holston River in Smyth and Washington Counties, Virginia. The species has not been found during extensive recent surveys in the MF Holston River and it is believed to be extirpated from this river. The Indian Creek and Big SF Cumberland River populations have been discovered since 1984. For these reasons, the recovery goals found in the 1984 Recovery Plan are no longer current and are not printed in this biological opinion.

Accomplishments:

1. Twenty tan riffleshell were collected in 2004 from Indian Creek for an ark population and propagation at the AWCC (USFWS 2004b). Some deaths occurred, and all living mussels were returned to the rivers. The ark population was discontinued.
2. Status survey of the tan riffleshell being conducted jointly by Virginia Tech and the Service to include propagation of this species to augment the existing population in Indian Creek (Neves 2004b).
3. Completion of a M.S. Thesis by J.W. Jones entitled, "A Holistic Approach to Taxonomic Evaluation of Two Closely Related Endangered Freshwater Mussel Species, the Oyster Mussel (*Epioblasma capsaeformis*) and Tan Riffleshell (*Epioblasma florentina walkeri*) (Bivalvia: Unionidae)" (Jones 2004).
4. Release of approximately 41,000 juvenile tan riffleshell individuals in the Clinch River (Tazewell County, Virginia, and Hancock County, Tennessee), Hiwassee River Tennessee, and Indian Creek (Tazewell County, Virginia) from 1996-2003 (Neves 2004b).
5. Publication of the paper entitled, "Species Composition and Biotic Condition of the Fish Community of Indian Creek, Tazewell County, Virginia" (Pinder and Jones 2002).
6. Evaluation by Virginia Tech of the effects of sedimentation on mussels and methods to augment or reintroduce populations (Neves 2004b).
7. Completion of a M.S. Thesis by B.T. Watson of Virginia Tech. Watson's thesis included a description of the mussel fauna of Indian Creek and their distribution. During his research, Watson (1999) identified several host fishes, and augmented it with juveniles from his host fish identification research.
8. Completion of a M.S. Thesis by S.O. Rogers of Virginia Tech. Rogers's thesis advanced understanding of the population biology and life history of the tan riffleshell (Rogers 1999, Rogers et al. 2001).

Threats to freshwater mussels

Industrial, residential, and agricultural development of the Tennessee and Cumberland Valleys since the early 1900s has had a significant impact upon the mussel fauna. Dam construction, coal mining effluent, mineral extraction, gravel mining, contaminants, agricultural runoff, stream channelization and degradation, and residential and urban point and non-point effluent continue to threaten these species. These and other agents have resulted in a significant decline in mussel populations of the Tennessee and Cumberland Rivers and their tributaries. Habitat destruction in the form of reservoir construction and stream degradation has reduced the number of native fish species inhabiting rivers and, therefore, has reduced the reproductive potential of mussels by removing fish hosts essential for glochidial metamorphosis (USFWS 1984, 2004a).

Non-point runoff and siltation from construction, agriculture, silviculture, roads, and removal of streambank vegetation is an important factor in the decline of many freshwater mussels (USFWS 1984). Feeding mollusks will close their valves during periods of heavy siltation to avoid irritation and clogging of feeding structures (Loar et al. 1980). Excessive siltation can result in death from suffocation and interference with feeding (Ellis 1931). Land use changes may also affect these five species. Removal of streambank vegetation affects the physical and biological

processes of streams (USFWS 1993). Tree removal alters the amount of organic material and light reaching the stream, impacting both the temperature and dissolved oxygen, which are critical factors for both mussels and fish (USFWS 1993). Excessive grazing and tree and other vegetation removal can also undermine stream stability.

In reaching a decision whether the construction and maintenance of the Jewell Ridge gas pipeline is likely to jeopardize the continued existence of the freshwater mussels or is likely to result in the adverse modification of critical habitat for the purple bean or the rough rabbitsfoot, the Service must factor into its analysis previous incidental take of the species authorized under Section 7 or Section 10 of the ESA. There have not been any incidental take permits issued to private individuals pursuant to Section 10 of the ESA involving the species or critical habitat.

Although previous BOs have been issued on these species, incidental take associated with these Federal actions has been difficult to quantify. We believe that the recent survey information supersedes the take analyses for the oldest BOs. The anticipated take and terms and conditions from BOs for projects from the 1970s and 1980s are not highly relevant in determining baselines in 2006 because of the number and frequency of surveys in the 1990s and 2000s that provide more recent information.

In 2004 (modified in 2005), the Service provided a BO to the U.S. Army Corps of Engineers (Corps), Norfolk District, for the U.S. Route 460 bridge replacement over Indian Creek, Tazewell County, Virginia. The Service anticipated take of 13 purple bean and 10 tan riffleshell mussels. The Service also anticipated temporary effects to critical habitat of the purple bean and rough rabbitsfoot that will be over before the Jewell Ridge gas pipeline is constructed. We anticipated 481 sq ft of temporary fill (work bridges and cofferdams) and reduced habitat suitability due to siltation (USFWS 2004c, 2005).

In 2000, the Service issued a programmatic BO to the U.S. Forest Service for the Land and Resource Management Plan at the Daniel Boone National Forest (Cumberland River basin). The Service anticipated no take of little-wing pearlymussel (the BO addressed other species as well) for the Plan itself. Implementation of individual projects with adverse effects would require separate formal consultation (USFWS 2000).

In a 1999, the Service issued a BO to the Corps' Norfolk District for the State Route 665 bridge replacement over Copper Creek, Scott County, Virginia. The Service stated that Beaty and Neves (1998) found two live purple bean mussels and two shells within the project action area. The live mussels were found approximately 80 m and 170 m downstream of the bridge location. In this BO, the Service authorized incidental take, "in the form of harm of an unknown but small number of individuals" (USFWS 1999a).

In 1999, the Service issued a BO to the Tennessee Valley Authority (TVA) on the disposition of lands acquired by the TVA for the Columbia Dam project, Maury County, Tennessee. The Service stated that a fresh dead tan riffleshell mussel was collected in the Duck River in Tennessee at river mile 151 in 1988, but that no individuals had been found since that time. In

the BO, the Service concluded that there would be no incidental take of tan riffleshell mussels due to the proposed TVA land disposition project (USFWS 1999b).

In 1997, the Service issued a BO to the Corps' Norfolk District for the State Route 72 bridge construction over the Clinch River, Scott County, Virginia, for two federally listed fish species and fourteen federally listed mussel species, one of which included the purple bean. In this BO, the Service did not quantify take but stated that, "take of these species can be anticipated" (USFWS 1997).

In 1993, the Service issued a BO to the Corps' Nashville District for State Route 32 adjacent to the Powell River in Claiborne and Grainger Counties, Tennessee. Due to lack of information regarding the location and densities of the shiny pigtoe, the Service was unable to quantify take. Because of the species' rarity, no take was authorized (USFWS 1993).

In 1992, the Service issued a BO to the Corps' Nashville District and the TVA for chip mill terminals on the Tennessee River, Tennessee (alternatives 2, 3a, 3b, and 3c). The Service issued a jeopardy opinion for the tan riffleshell and shiny pigtoe and a no jeopardy opinion for the little-wing pearlymussel. The Service was not able to quantify take (USFWS 1992). The Service identified one reasonable and prudent alternative. It required TVA to demonstrate that a mechanism existed that would enable them to implement the reasonable and prudent alternative. Further, if the TVA were unwilling or unable to implement any part of the reasonable and prudent alternative, that alternative would also be unavailable to the Corps. The reasonable and prudent alternative was that TVA needed to review each pre-harvest plan proposal and review it for potential impacts to federally listed species or critical habitat. TVA must implement several elements described in the Draft Environmental Impact Statement. TVA must provide oversight during timber harvests to ensure Best Management Practices (BMP) are being properly implemented and that the BMPs are providing adequate protection to federally listed species and their habitats. TVA shall provide biannual reports to the Service. TVA decided not to issue the permit.

In 1991, the Service issued a BO to the Environmental Protection Agency (EPA) for the nationwide registration of the fungicide Aliette for use on strawberries. The Service determined it was impossible to quantify take for the little-wing pearlymussel but stated that no take would be likely to occur if the terms and conditions were implemented (USFWS 1991).

In 1980, the Service issued a BO to the Corps' Nashville District concerning a sand and gravel excavation proposal in the Powell River in Claiborne County, Tennessee. The Service issued a jeopardy opinion on the shiny pigtoe and other species and an adverse modification decision on critical habitat of some species (USFWS 1980). The Service offered the Corps one reasonable and prudent alternative: hold the permit in abeyance until a study could be completed that could confidently predict the effects of the proposed action. Once the study was completed, the applicant would have at least three alternatives: 1) find a source of gravel that would not result in a jeopardy or adverse modification biological opinion, 2) find a source of gravel that would not require a Federal permit, or 3) purchase gravel from a commercial supplier. The Corps never issued the permit.

On February 16, 1977, the Service issued a BO to the TVA on the construction of the Columbia Dam on the Duck River in Maury County, Tennessee. The tan riffleshell was not considered in this BO because the species was not federally listed as endangered until August 23, 1977. In a May 26, 1978 BO to the Corps for the Columbia Dam project, the Service stated that the project was likely to jeopardize the continued existence of the tan riffleshell clam (*Epioblasma walkeri*) (nomenclature has changed to *E. florentina walkeri* since 1978). In 1979, TVA requested reinitiation of consultation. In its 1979 BO, the Service stated that the project was not likely to jeopardize the continued existence of the tan riffleshell because no tan riffleshell mussels were found during intensive surveys of the Duck and Powell Rivers in 1979 (USFWS 1979).

On August 27, 1998, a tanker truck overturned on U.S. Route 460 in Tazewell County, Virginia. The truck released approximately 1,350 gal of Octocure 554-revised, a rubber accelerant, into an unnamed tributary about 530 ft from its confluence with the Clinch River. The spill killed most aquatic benthic macroinvertebrates for about 6.6 mi downstream in the Clinch River. Using a conservative correction factor, an estimated 18,600 or more freshwater mussels were killed by the spill, including 750 individuals of populations of three federally endangered mussel species including purple bean, rough rabbitsfoot, and tan riffleshell. This spill likely killed more individuals of federally listed endangered species than any other incident since the enactment of the ESA in 1973. It severely degraded one of the last two reproducing populations of the endangered tan riffleshell mussel. The population of tan riffleshell in Indian Creek is the remnant of the population that previously extended into the Clinch River. Purple bean and tan riffleshell mussels (among others) injured by that spill are being restored in the Clinch River in accordance with a 2003 settlement agreement between the responsible party and the United States and the Commonwealth of Virginia.

Two potential threats exist from exotic mussels. Based on current data, the zebra mussel (*Driessena polymorpha*) is not a threat to any of the federally listed species in this BO (J.W. Jones, USFWS, pers. comm., 2006; B.T. Watson, VDGIF, pers. comm., 2006). The Asian clam (*Corbicula fluminea*) may be a competitor of native mussels for food, nutrients, or space, but data are inconclusive (J.W. Jones, USFWS, pers. comm., 2006; B.T. Watson, VDGIF, pers. comm., 2006).

Status of the Critical Habitat for the Purple Bean and Rough Rabbitsfoot

On August 31, 2004, the Service issued a final rule for designating critical habitat for five mussels in the Upper Tennessee River Basin. Two of the five mussels in the August 31, 2004 final rule have critical habitat in this project's action area: the purple bean and the rough rabbitsfoot.

The Service used the best scientific data available to designate critical habitat, giving consideration to those physical and biological features that are essential to the conservation (i.e., recovery) of the mussels. The Service determined the Primary Constituent Elements (PCEs) for the mussels from studies of their habitat requirements, life-history characteristics, and population biology, include, but are not limited to, the following:

-Space for individual and population growth and for normal behavior;
-Food, water, air, light, minerals, or other nutritional or physiological requirements;
-Cover or shelter;
-Sites for breeding, reproduction, and rearing (or development) of offspring; and
-Habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species (Federal Register, August 31, 2004).

The Primary Constituent Elements for both the purple bean and the rough rabbitsfoot are as follows (per Federal Register, August 31, 2004):

1) Permanent, flowing stream reaches with a flow regime (*i.e.*, the magnitude, frequency, duration, and seasonality of discharge over time) necessary for normal behavior, growth, and survival of all life stages of the mussels and their host fish;
2) Geomorphically stable stream and river channels and banks (structurally stable stream cross section);
3) Stable substrates, consisting of mud, sand, gravel, and/or cobble/boulder, with low amounts of fine sediments or attached filamentous algae;
4) Water quality (including temperature, turbidity, oxygen content, and other characteristics) necessary for the normal behavior, growth, and survival of all life stages of the mussels and their host fish; and
5) Fish hosts with adequate living, foraging, and spawning areas for them.

III. ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have undergone Section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress.

Status of the Species within the Action Area

East Tennessee performed mussel surveys at all crossings requested by the Service or the Virginia Department of Game and Inland Fisheries (VDGIF). They found one little-wing pearlymussel at the Little River action area and fluted kidneyshell at the NF Holston River but no other federally listed species at the other crossings. Mussels are difficult to survey for via visual techniques, as they are hard to detect when buried in the sediment. Mussels that occur in very low densities are difficult to detect by visual survey. Because of the difficulties in surveying, the Service relies on old, as well as current, surveys and appropriate mussel habitat to predict whether a particular mussel species is present. Neves (2003) estimates that for every one individual found during a survey, there are a total of 24 adult and juveniles that are not found.

Indian Creek

Indian Creek has been surveyed for mussels on many occasions. In 1996, Watson found one purple bean 500 m downstream of the proposed crossing site. The rough rabbitsfoot and tan riffleshell are located downstream approximately 1,800 m. While the dense mussel assemblage is located 1,800 m downstream, mussels do occur in patches up to the pipeline crossing site. The section of Indian Creek at and downstream of the crossing site is federally designated critical habitat for the purple bean and rough rabbitsfoot.

Based on surveys (Watson 1999) from the late 1990s, and the estimate by Neves (2003), the Service estimated the purple bean population in Indian Creek to be 702 individuals. Jones and Neves (2005) conducted a comprehensive, quantitative mussel survey during July 2004 in the same area of Indian Creek surveyed by Watson (1999). In this survey, the Indian Creek purple bean population was estimated to be 465 individuals (Jones and Neves 2005). The survey results suggest that the population in Indian Creek has undergone a decline since the late 1990s.

The rough rabbitsfoot was confirmed in Indian Creek in 2004 (J.W. Jones, USFWS, pers. comm., 2006).

Based on surveys (Watson 1999) from the late 1990s, and the estimate by Neves (2003), the Service estimated the tan riffleshell population in Indian Creek to be 3,510 individuals. Jones and Neves (2005) conducted a comprehensive, quantitative mussel survey during July 2004 in the same area of Indian Creek surveyed by Watson (1999). In this survey, the Indian Creek tan riffleshell population was estimated to be 366 individuals (Jones and Neves 2005).

The survey results show that the population of the tan riffleshell in Indian Creek has undergone a precipitous decline since the late 1990s. The Indian Creek population of the tan riffleshell is the only known reproducing population left in Virginia and one of two in the world. Therefore, this decline is extremely significant. Biologists are in the process of trying to determine the reasons for this serious decline and what recovery actions are needed to prevent the extinction of this species.

Clinch River

The Clinch River, like Indian Creek, has been surveyed for mussels often. The little-wing pearlymussel has been documented 1,000 m upstream and 10,000 m downstream of the pipeline crossing site. The Service believes it is likely that the species occurs between these two sites at low densities. Critical habitat for the purple bean and rough rabbitsfoot is located 8,000 m downstream, and we predict presence of the species in low densities in the patchy appropriate habitat that occurs from upstream of the proposed crossing site to the critical habitat waters. The purple bean, rough rabbitsfoot, and tan riffleshell occur in low numbers within the action area for the Clinch River.

Little River

East Tennessee's surveyor found one shell of the little-wing pearlymussel at the Little River crossing. We determine that the species is present in the vicinity of the crossing site. The actual construction corridor, however, does not have appropriate mussel habitat.

NF Holston River

The NF Holston River contains known populations of the little-wing pearlymussel and shiny pigtoe approximately 2,000 m downstream. In the NF Holston River, the little-wing pearlymussel was found as recently as 2000 (Jones and Neves 2005). The shiny pigtoe numbers in the hundreds in the NF Holston River (J.W. Jones, USFWS, pers. comm., 2006). The Service believes that sediment plumes can travel at least 3,600 m, so these populations are included in the action area.

In all four waterways, the five listed mussels are extremely rare and likely declining. However, in the Indian Creek watershed, the tan riffleshell and purple bean populations have undergone the most dramatic decline since the 1990s.

In addition to the anthropogenic effects, the mussel fauna of Indian Creek receives periodic heavy predation by muskrats (*Ondatra zibethica*). According to Neves (2004a) during the 1996 and 1997 field seasons, nearly 100 valves of dead purple beans were collected in Indian Creek. Based on population surveys and the discovery of these valves, Neves estimated that in 1997, muskrats reduced the adult and juvenile segments of the purple bean population by roughly 20 percent (assuming no recruitment) and the tan riffleshell population by roughly 25 percent (assuming no recruitment).

Following the heavy muskrat predation on mussels in 1996 and 1997, intense muskrat control occurred in 1998. Since that time, low levels of control have reduced muskrat predation to low levels (J.W. Jones, USFWS, pers. comm., 2006). The Service and the Virginia DOT have funded the muskrat control.

Factors Affecting Species Habitat Within the Action Area

This analysis describes factors affecting the environment of the species within the action area (*e.g.*, state, local, tribal, and private actions already affecting the species or that will occur contemporaneously with the proposed project; unrelated Federal actions affecting the species that have already gone through Section 7 consultation; and actions that may benefit the listed species or critical habitat).

Sedimentation and contaminant effects from agricultural activities, energy operations, and residential/commercial development have heavily impacted Indian Creek. There are five underground mines, haul roads, and above ground scalp rock disposal areas in the Indian Creek watershed, upstream from the project action area. All five mines are permitted by Virginia Department of Mines Minerals and Energy, Division of Mined Land Reclamation (DMLR). In

addition to the five existing coal mines in the Indian Creek watershed, DMLR permitted the P-11 mine in 2005, which is located approximately 6,000 m upstream from the proposed pipeline-crossing site. DMLR has cited CONSOL for six mining related violations since December 2002 for unpermitted activities within the Indian Creek watershed. Also, abandoned mine lands are known within the area. Railroad and road ROWs are typically herbicided to control vegetation, and these chemicals may be conveyed downstream. In April 2004 (Mair 2004) and on other occasions, coal fines and water discoloration were discovered in Indian Creek, over 15,000 m from the nearest coal mine. Such coal fines in Indian Creek may also be associated with the railroad in the watershed. Chronic water quality degradation is a major threat to the aquatic fauna in Indian Creek. An investigation is currently underway to determine the extent of the potential threats to the mussels found in Indian Creek.

The lower section of the Indian Creek watershed is characterized primarily by agricultural and residential development, which has resulted in streambank erosion and a reduction in shading of the waterway. The upper reaches of the watershed are composed of sparse residential development, mining, gas wells, and forestland. Portions of the stream appear to have been channelized in the past, and much of the riparian zone of Indian Creek has been converted to lawns/grass ways or impervious surfaces. Portions of the Indian Creek floodplain have been filled for decades. These and future anthropogenic impacts on Indian Creek will continue to threaten freshwater mussels in this and other drainages.

Water quality issues affect mussel habitat in the action area. Overall, the majority of the Indian Creek watershed is forested. However, erosion from poor land use practices adds sediment to the water. The extent of untreated sewage in the watershed is unknown. Impervious surface areas increase stormwater runoff into the creeks. This type of runoff creates a flashy system with abrupt changes in flow. Additionally, stormwater runoff carries oils and other contaminants from roads, driveways, and similar areas.

Habitat within the NF Holston, Little, and Clinch Rivers is similar to habitat within Indian Creek. In the NF Holston and Little Rivers, there are similar impacts from agriculture/forestry, fewer impacts from residential/commercial development, and no impacts from either energy operations or vegetation control along railroads. In the Clinch River, there are more impacts from residential/commercial development and road and railroad vegetation control, similar impacts from agriculture/forestry, and fewer impacts from energy operations. An additional factor affecting habitat in the Clinch River derives from the wastewater treatment plant, which is located approximately 40 river miles upstream.

The purple bean and the rough rabbitsfoot have federally designated critical habitat in Indian Creek from Van Dyke to the confluence with the Clinch River. The Indian Creek section of the action area falls entirely within the critical habitat. A description of the constituent elements of the critical habitat is provided on pages 21-22. All five primary constituent elements of the critical habitat are present in Indian Creek (B.T Watson, VDGIF, pers. comm., 2006). The factors affecting the species' habitat explained above are the same factors that are affecting the critical habitat.

IV. EFFECTS OF THE ACTION

Regulations define effects of the action as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the actions, that will be added to the environmental baseline" (50 CFR §402.02).

Beneficial Effects – There are no beneficial effects of the proposed action.

Direct Effects - In evaluating the effects of the Federal action under consideration in this consultation, 50 CFR 402.2 and 402.14(g)(3) requires the Service to evaluate the effects of the action on the species. Even though East Tennessee found no live federally listed mussels during their surveys, the Service believes that the mussels are present within the action area (see Table 2) in low densities. The Service relies on current and past surveys to determine mussel presence.

The Service anticipates no direct take at the Indian Creek crossing because East Tennessee will bore under the creek. There will be no direct take at either unnamed tributary to Indian Creek because no mussel habitat exists at either site. There will be no direct take at the Clinch River or Little River site because poor habitat exists within the actual construction corridor, which we estimate as 50 ft wide (B.T. Watson, VDGIF, pers. comm., 2006). The construction ROW is generally 100 ft, but the permanent ROW is 50 ft.

The Service anticipates direct take of the little-wing pearlymussel and shiny pigtoe at the NF Holston River crossing site. The crossing site at the NF Holston River is excellent mussel habitat (B.T. Watson, VDGIF, pers. comm., 2006). The habitat is shallow and approximately 50 ft wide. Given a construction width of 100 ft, we anticipate approximately 5,000 sq ft (50 ft x 100 ft) of excellent mussel habitat will be affected. While East Tennessee's surveys did not find either mussel at the crossing site, we conclude that both mussels are present at the crossing site in low densities. We base our conclusion on the difficulty in visually surveying for mussels when the mussels are buried in the substrate. Given the mussels' presence in low densities and the 5,000 sq ft of excellent mussel habitat in the construction corridor, we anticipate up to two little-wing pearlymussel and two shiny pigtoes may be crushed as a result of the proposed action (J.W. Jones, USFWS, pers. comm., 2006). In addition to crushing, immediate sedimentation impacts will directly impact the two species at the NF Holston River crossing site action area. We anticipate sedimentation effects may temporarily harm a small and unquantifiable number of individuals, but we do not anticipate these effects to kill any animals.

Water Withdrawal: Hydrostatic testing of the pipeline is required before the pipeline would be put into operation. It is possible that, during water withdrawal, fish hosts with attached mussel larvae, would be entrained on the water withdrawal device. Entraining fish hosts without attached, federally listed mussels would not affect the mussels because there are sufficient host fish to service the mussel population. Fish hosts are not a limiting factor in mussel reproduction. When hydrostatic testing is completed, water would be discharged during daylight hours to the maximum extent possible at a regulated rate in a single event per test section or combination of test sections into a well-vegetated upland area.

The U.S. Geological Survey (USGS) provides data of stream flow at http://nwis.waterdata.usgs.gov. While there is historical stream flow data for the Clinch River at Richlands, there are no currently active USGS stream gauges in Tazewell County. The closest stream gauge to the proposed water withdrawal from the Clinch River is located at Saltville in Smyth County. That gauge is located in the NF Holston River.

The average mean stream flow at the Clinch River in August is 77.6 ft^3/s and in September is 56.7 ft^3/s (average of both months is 67 ft^3/s) (USGS 2006). Indian and Middle Creeks flow into the Clinch River between the Tazewell County gauge site and the upstream crossing/withdrawal location. Based on the drainage areas for these two creeks (approximately 27 sq mi), it is estimated that the flow at the withdrawal site would be less than that reported at the gauging station. Assuming (conservatively) that Indian and Middle Creeks contribute 20 percent of the flow measured at the Richlands gauging station, the average flow at the crossing location can be estimated at approximately 53.6 ft^3/s using the average August-September flow. With a withdrawal rate of 13.4 ft^3/s, this would reduce the flow in the Clinch River by 25 percent. However, if the withdrawal were done during the average September flow (and reduced by 20 percent to a monthly average of 45.4 ft^3/s), withdrawal at the same rate would reduce the flow by 30 percent.

The average flow in the NF Holston River averages 105 ft^3/s (121 in August and 88.5 in September) for the months of August and September at the nearest gauging station. Laurel, Locust Cove, and Beaver Creeks with a drainage area of approximately 50 sq mi, flow into the NF Holston River between the upstream crossing/withdrawal location and the downstream Saltville gauging station. Assuming (conservatively) that these creeks contribute 23 percent of the flow measured at the Saltville gauging station, the average flow at the crossing location can be estimated at approximately 80.7 ft^3/s. With a withdrawal rate of 13.4 ft^3/s, this would reduce the flow in the NF Holston River by 16.7 percent. If the withdrawal were done during the average September flow (and reduced by 23 percent to 68.1 ft^3/s), withdrawal at the same rate would reduce the flow by 20.0 percent.

Because the historical data from the two gauges roughly correspond, the Service believes using the Saltville gauge is appropriate to determine the minimum flow requirements for both water withdrawals. We believe the gauge at Saltville will provide sufficient evidence of any regional drought. While rain events are localized, 10-year droughts are regional events. The minimum flow requirement will serve to ensure that the water withdrawal will not exacerbate an existing drought. During a 10-year drought year, removing any water could adversely affect aquatic fauna. To establish a minimum flow, the Service reviewed USGS's monthly stream flow data for the Saltville gauge.

There is a great deal of variability around the average flow data. For example, September's average flow is 88.5 ft^3/s with a range from 25.8 to 458 ft^3/s. For the last 30 years, the average flow in September has exceeded 40 ft^3/s for 8 out of 10 years and has exceeded 34 ft^3/s for 9 out of 10 years. We believe that flow should not fall below the tenth percentile. Taking into account

the contributions of Laurel, Locust Cove, and Beaver Creeks, the tenth percentile would be reduced by 23 percent to 26.2 ft^3/s in September.

For example, if East Tennessee desires to withdraw water from either the Clinch River or the NF Holston River in September, they need to observe the current stream flow data from the gauge at Saltville. To ensure a minimum flow at the withdrawal site of 26.2 ft^3/s, East Tennessee must ensure a flow of at least 34 ft^3/s at the Saltville gauge. Furthermore, East Tennessee will not withdraw water at a rate that would exceed ten percent of the instantaneous flow. Therefore, the stream gauge at Saltville must read in excess of 38 ft^3/s to ensure both the minimum flow requirement and the ten percent reduction requirement. If the gauge at Saltville shows a lesser flow, water may not be withdrawn at the rate East Tennessee proposes until flow exceeds 38 ft^3/s.

Interrelated and Interdependent Actions - An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. The Service is not aware of any such actions.

Indirect Effects - Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). Indirect effects to federally listed species and federally designated critical habitat can be evaluated together because the listed species and candidates are all freshwater mussels and because both portions of federally designated critical habitat support freshwater mussels.

The project area runs through four endangered species waters. Approximately 1.4 mi of pipeline will occur in the Indian Creek watershed. Approximately 3.4 mi of pipeline will occur in the Clinch River watershed. Approximately 5.3 mi of pipeline will occur in the Little River watershed. Approximately 9.1 mi of pipeline will occur in the NF Holston River watershed.

Indian Creek's main stem will be bored, but the tributaries will be blasted (if required), trenched, and flumed (if wet). The Clinch River will be flumed, blasted, and trenched in the dry at MP 10.6. The Little River will flumed, blasted, and trenched at MP 13.3. The NF Holston River will be blasted, trenched, and flumed at MP 24.2.

All work will occur from the northwest and move southeast. Installing the pipe will take longer than clearing the vegetation. The crew clearing vegetation will work straight through the corridor, as will other crews. Road construction; pipeline corridor grading, blasting, and/or trenching; pipe laying; re-grading; and seeding are anticipated to occur from April to September but may extent beyond September, as required.

The primary indirect effect of the proposed action on freshwater mussels or critical habitat that is reasonably foreseeable is sedimentation. Sedimentation may result from erosion of the construction site during or after project construction during rain events. Southwestern Virginia experiences frequent thunderstorms in the summer, the time of year East Tennessee desires to construct its pipeline. These thunderstorms may cover the entire project area or may be

localized. Given that the project length is 32 mi, it is reasonably foreseeable and likely that a heavy rain event will occur before vegetation is re-established that will produce a sediment plume that will reach endangered species waters.

To evaluate the chances of significant levels of siltation entering waterbodies, the Service reviewed East Tennessee's construction of the Patriot Pipeline in southwestern Virginia in 2004. East Tennessee had an E&SCP for that pipeline project. However, some waterbodies turned chocolate brown due to the sediment from East Tennessee's project (M.J. Pinder, VDGIF, pers. comm., 2005). There is no available method to quantify the chances of a breach of East Tennessee's erosion control efforts. Consequently, we must rely heavily on their past practices. It is likely that some sediment will enter some streams. Because most of the stream crossings are upstream of endangered species waters, we believe that some sediment will reach endangered species waters. We cannot say exactly where or when the impact will occur, but we believe such an impact is likely to occur.

Because we cannot predict the location of the sediment impact, the Service believes that it is necessary to establish strict sedimentation controls for the six waterbody crossings nearest to known populations of federally listed species: Indian Creek, unnamed tributary to Indian Creek, unnamed intermittent stream to Indian Creek, Clinch River, Little River, and NF Holston River. The stretch of Indian Creek at and downstream of the pipeline crossing is also federally designated critical habitat for the purple bean and rough rabbitsfoot.

While the project proposed to bore under the main stem of Indian Creek, sedimentation is likely to occur from the adjacent areas, including the slopes in the watershed. The proposed pipeline is within the Indian Creek watershed (Tazewell County) from approximately MP 7.8 - 9.2. Trenching will occur at all other waterbody crossings following fluming of the water. Blasting will occur whenever the substrate prevents trenching. Blasting and trenching will occur in the wet, and sedimentation impacts are certain to occur during those activities.

Sedimentation will occur not only from streambed impacts but also as erosion from the exposed soil throughout the ROW. Erosion control devices are rarely 100 percent effective in preventing sediment from leaving a work site, and the steep slopes in the project area make erosion control particularly difficult. We believe that erosion control failures are reasonably likely for short durations. Land clearing is expected to begin in April 2006, and the earliest a vegetative cover can be expected is September 2006. Therefore, at least five months will elapse while sedimentation risks from the slopes are high.

Siltation can result in the impairment of feeding, spawning, and larval survival, and can also result in reduced oxygen levels, which can adversely impact the mussels' metabolic processes. Mussel gills can become overwhelmed with excessive sediment, causing a mussel to either reduce its water intake rate or close altogether. Indirect effects may also occur to host fish that are adversely affected by siltation. Generally, fish are less susceptible to sedimentation impacts than mussels due their greater mobility. Adult fish are likely to swim away from sediment-choked water and return after sufficient water quality returns. We anticipate impacts to host fish will be both non-lethal and short-term.

Sedimentation impacts to freshwater mussels have not been derived as clearly as for aquatic insects (macroinvertebrates). Nevertheless, it has been established that suspended or deposited fine sediment can adversely affect freshwater mussels simply via physical smothering or by impairing feeding, metabolism, reproduction, respiration, or growth (Ellis 1931). Further, it has been noted that shell erosion rates can increase significantly due to the scouring effect of increased suspended sand and larger size particles, as well as the displacement of larger substrates which serve as high-flow refugia. Declines in richness and abundance and the extirpation of freshwater mussels have also been linked to land use changes that caused high sedimentation.

Many species in the genus *Epioblasma*, of which the tan riffleshell is a member, are adapted to shoal or riffle habitats. Greater than half the members of the genus, 14 species, became extinct following impoundment of rivers and streams that inundated riffle and shoal habitats in North America (Bogan 1993), primarily in the 20th Century. In tandem with increased dam construction, many remaining unimpounded habitats were being smothered by fine sediment from increased land disturbance activities. Because the rate of extinction in *Epioblasma* far exceeds extinction rates of all other North American mussel genera, it is reasonable to infer that *Epioblasma* are particularly sensitive to changes in habitat quality induced by sedimentation. Corroborating this apparent high sensitivity, Peacock et al. (2005) reviewed archaeological data and found a strong correlation between the advent of maize (corn) agriculture and *Epioblasma* population declines that occurred approximately 1,000 years ago.

If siltation occurs in Indian Creek, it would affect critical habitat for the purple bean and rough rabbitsfoot. The Service believes that the conventional bore decreases, but does not eliminate, the chances of a sedimentation event affecting one or more constituent elements of critical habitat. Clearly, boring under the creek will result in less sedimentation than trenching through the creek. However, sedimentation is still likely to occur from adjacent areas, regardless of the method of crossing the creek itself.

East Tennessee will provide erosion and sedimentation control features that exceed the standards in the Virginia Erosion and Sediment Control Handbook. Erosion and sedimentation control devices (ECDs) will be installed and maintained throughout and following construction, as appropriate along the project ROW, with special attention within watersheds containing endangered aquatic fauna. East Tennessee will employ environmental crews with the responsibility to install and maintain ECDs throughout construction and until vegetation is re-established. Inspection of ECDs will be ongoing throughout and following construction by East Tennessee inspection staff. East Tennessee will employ a minimum of three full-time environmental inspectors who will ensure proper installation and maintenance of ECDs. Additionally, East Tennessee's craft and utility inspectors will also have the responsibility to report any environmental conditions to the environmental inspectors. In addition to East Tennessee's inspection staff, East Tennessee will fund one full-time FERC third party monitor, who will inspect the ROW and prepare inspection reports on behalf of the FERC, and one full-time Virginia Department of Conservation and Recreation (DCR) third party inspector, who will conduct inspections, prepare inspection reports, and ensure compliance with the Erosion and

Sedimentation Control Plan, as approved by the DCR, on behalf of the DCR. Typical erosion and sedimentation control devices will include the following:

- **Silt Fences:** Silt fence will be utilized to prevent sediment carried by sheet flow from leaving the site by slowing the runoff rate and filtering any sediment. Silt fence will be installed at the base of all slopes adjacent to waterbodies, wetlands, and road crossings, as well as along the edge of the ROW to protect waterbodies, wetlands, roads, residences, or other features. Silt fences will inspected throughout and following construction until the ROW is stabilized in accordance with the Erosion and Sedimentation Control Plan. Based on the inspections, any silt fence maintenance or repair will be conducted, including the removal of sediment that has reached one-half the height of the original barrier.

- **Staked Hay Bales:** Hay bales may be utilized to reinforce silt fence or in lieu of silt fence as a sediment barrier if site conditions warrant their use instead of silt fence. Hay bales will be placed, staked, maintained and inspected in accordance with the Erosion and Sedimentation Control Plan. Based on the inspections, hay bales will be maintained and repaired. Sediment will be removed when it has reached one-half the height of the original barrier.

- **Interceptor Dikes:** Interceptor dikes (i.e., earthen berms) will be installed across the ROW at regular intervals on all slopes greater than five percent. These controls help to divert water off the disturbed ROW into well-vegetated areas adjacent to the ROW. Sediment filter devices, such as silt fence or hay bales may be placed at the outfall end of each dike, as necessary, in order to filter sediment from water leaving the ROW. Interceptor dikes are maintained, as necessary, on a daily basis to ensure proper functioning.

- **Trench Plugs:** Trench plugs are barriers within the ditch that segment the continuous open trench. They are placed within the trench during construction (temporary plugs) and following pipe installation (permanent plugs) just upslope of interceptor dikes in order to direct water out of the trench and reduce erosion and sedimentation in the trench and minimize dewatering problems at the base of slopes where sensitive environments such as waterbodies and wetlands are typically located.

- **Filter Bags:** Filter bags or other sediment trapping devices will be used in the event it is necessary to dewater any excavations or open trenches. The filter bag will filter and contain sediment that may be present in the water pumped from an open ditch or pit. If the filter bag becomes full of sediment so as not to function properly, a new filter bag will be installed. Filter bags will be installed and used in accordance with the Erosion and Sediment Control Plan. All filter bags will be removed from the construction area prior to permanent seeding.

- **Dewatering Structure for Hydrostatic Test Water Discharge:** Dewatering structures will be constructed and utilized during any mainline dewatering activity following hydrostatic testing. The purpose is to dissipate the energy of the water discharges and filter any dirt or other debris from the discharge water. Discharges and implementation of the

discharge structure will be in accordance with the Erosion and Sedimentation Control Plan and the conditions of the hydrostatic discharge general permit.

- **Permanent Seeding:** Permanent seeding will be completed following the backfilling and restoration of the ROW pre-existing contours. Permanent seeding will be used to stabilize the site and protect the soil from surface erosion. A mix of seeds, as well as appropriate lime and fertilizer, will be utilized in accordance with the seeding mix, as approved by the Service, the DCR, and the landowners.

ECDs shall be installed prior or concurrent with any soil-disturbing activities within the Indian Creek watershed. ECDs will completely surround the construction site between the Norfolk Southern Railroad and Indian Creek, with the exception of the upslope edge along the railroad. Additionally, ECDs will completely surround the worksite east of Indian Creek with the exception of the upslope edge. These ECDs will consist of the installation of reinforced silt fence and hay bales. A ditch will be excavated along the eastern edge of the workspace west of Indian Creek to divert water into the bore pit as a collection and settling basin. Silt fence will be installed with a small hand operated ditch-witch machine, the ditch will be backfilled by hand, and the trench will be tamped to secure loose material in the trench and to further secure the silt fence. Hay bales will be installed on the backside of silt fence to ensure the integrity of silt fence where needed. All ECD installations will be done in a manner that minimizes soil disturbances to the greatest extent possible. Inspectors will be located in the Indian Creek crossing area for the duration of construction activity.

The five Primary Constituent Elements for both critical habitat designations are provided on pages 21-22. The proposed action is not likely to affect the flow regime. No water withdrawal from Indian Creek is proposed, and the chances of a frac-out are nil because boring, unlike directional drilling, uses no drilling mud during construction. Water quality will experience temporary impacts through sedimentation from the trenching through the unnamed tributaries and the erosion from the slopes within the watershed. If sedimentation causes any effect to fish hosts, it would be small and temporary as the fish would avoid the sections with sedimentation impacts and return after previous conditions return.

The Service believes that any sedimentation event resulting from the project would likely result in minor temporary impacts to the Primary Constituent Elements of the critical habitat of the purple bean and rough rabbitsfoot. These temporary impacts would not adversely modify federally designated critical habitat.

V. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

To determine whether a future non-Federal action is “reasonably certain to occur,” several

factors must be analyzed such as economic, administrative, and legal hurdles remaining before the action proceeds. While speculative actions that may never be implemented are not included in the cumulative effects analysis, "reasonably certain to occur" does not require a guarantee that the action will occur.

Cumulative effects likely to impact these species include ongoing coal mining, the transport of coal via rail, natural gas production, siltation from upland activities, and point and non-point source pollution inputs into waterbodies from roadways and surrounding upland development. Spills of toxic materials into creeks and rivers from accidents on roadways are also possible. These ongoing activities have the potential to result in the chronic and acute deterioration of water quality and habitat for the federally listed mussels and critical habitat. Continued habitat degradation could result in the eventual degradation or even loss of some species in any of the four major waterbodies but especially in Indian Creek.

We analyzed data on pipeline safety to determine whether a pipeline safety event (rupture, corrosion, etc.) is reasonably certain to occur (FERC 2005a). Pipeline accident data have been collected since 1970. DOT changed its reporting requirements in 1984 to require fewer incidents to be reported. Using the 14.5-year period 1970-1984, there were 5,862 service incidents over 300,000 mi of pipelines for a rate of 0.00135 incidents / year / mi of pipeline. The proposed pipeline is 32 mi (actual length accounting for elevation changes), and the lifetime of the project is 50 years. Using those old data, one would expect 2.16 incidents over the life of the project. Given that 1.41 mi (horizontal only) of the 30.5 mi (horizontal only) is within the Indian Creek watershed, one would expect 0.10 incidents in the Indian Creek watershed over the 50-year life of the project. The probability of incidents in the other watersheds is comparably low.

Newer pipelines are safer than older pipelines (FERC 2005a) for virtually every type of reportable incident. Outside forces resulted in 0.70 incidents from 1970-1984 but only 0.10 from 1986-2003. Corrosion resulted in 0.22 incidents from 1970-1984 but only 0.06 from 1986-2003. Construction or material defect resulted in 0.27 incidents from 1970-1984 but only 0.04 from 1986-2003. Overall incidents per 1,000 mi of pipeline dropped from 1.30 to 0.26. While a strict comparison of the recent data to the old data would lead to the conclusion that new pipelines have 80% fewer safety incidents, DOT relaxed its reporting requirements in 1984. While it is unknown how much safer newer pipelines are, improved anti-corrosion protection, at the least, makes newer pipelines safer than older ones. Given the improvement in pipeline safety in recent years, we find that a pipeline safety incident is not reasonably certain to occur even over the 50-year lifetime of the project.

Local Gas Distribution

FERC's EA states that, "East Tennessee agreed to install the taps to further the local communities' goals of increasing industry incentives and economic growth in the region" (FERC 2005b). The original project description did not include taps, and the change to include them in May 2005 indicates the communities' desire to encourage development (specifically Richlands, Cedar Bluff, and Claypool Hill). FERC is unaware of any plans for future development and views attempts to predict future secondary development as speculative (FERC 2005b). The

Service disagrees with FERC's assessment. The communities of Richlands, Cedar Bluff, and Claypool Hill have expressed interest in encouraging development, and they have the authority and power to provide industry incentives to attract new industries. We see no reason to question their intent to do so. While there are uncertainties in the success of the incentives, the Service finds the attraction of new industries to be reasonably foreseeable. Over the life of the project (50 years), we believe that, given the incentives, industry will be attracted. Because the community of Cedar Bluff is located within the Indian Creek watershed, we believe that it is reasonable to conclude that industry will be attracted to the Indian Creek watershed within the next 50 years and that these businesses will move to the Indian Creek watershed as a result of the industry incentives that the communities will provide that are a direct result of the pipeline. We recognize that both proposed taps are located outside the Indian Creek watershed, but development related to the pipeline could occur within the Indian Creek watershed.

In addition to the two proposed taps, additional taps may occur because this pipeline will be an open access pipeline. While tapping into a high-pressure pipeline would be expensive, the Service does not believe it will be prohibitively expensive given the incentives that the communities have expressed their intent to provide.

Given that new development that would not occur but for East Tennessee's pipeline, the next questions are where would this new development occur, what type and amount of development would be attracted, and what impact on federally listed mussels would occur. The topography of the entire region, to include the Indian Creek watershed, is mountainous. Therefore, most development would occur along the streams where the land is generally flatter. We believe that to anticipate the type of development, amount of development, or the impact to mussels would be speculative. While we believe that it is reasonably certain that the pipeline will cause secondary development, we are unable to relate that development to impacts on federally listed species.

Increased Gas Development

The purpose of the Project is to connect CNX Gas's existing Cardinal gathering system in Tazewell County, Virginia, to the East Tennessee interstate pipeline system in Smyth County, Virginia. The new pipeline would allow CNX Gas to move natural gas from its production fields, which are collected at the CNX Gas compressor station, into markets in the southeast. Currently, the pipeline system that transports CNX Gas's natural gas to market is physically constrained during certain periods of the year and is operating at capacity. FERC reports that CNX has stated that, due to existing pipeline constraints, they have built a curtailment of three billion cubic feet of natural gas into their 2005 production estimates (FERC 2005a). The new capacity provided by the Jewell Ridge Lateral Project would alleviate these physical constraints and allow an increased supply of natural gas to flow to market. We believe it is reasonably certain that CNX will expand gas production as a result of East Tennessee's pipeline. Without the Jewell Ridge pipeline, CNX would have no ability to transport additional gas to market. The construction of East Tennessee's pipeline alleviates that constraint.

The pipeline is being built larger than the current demand (S.K. Jones, FERC, pers. comm.,

2006). A 16-in-diameter pipe would be sufficient to meet the current demand, but the proposed action is to build a 20-in-diameter pipe. The 20-in-diameter pipe will allow normal operations to occur at a lower pressure, but it will also provide additional capacity that makes the construction of additional gas fields reasonably foreseeable. Pipeline capacity can be increased by constructing a larger pipe, by increasing pressure within the pipe, or by adding a parallel pipe. Increasing the pressure would not trigger a future, Federal action; therefore, cumulative effects must be addressed in this BO.

FERC's certificate (FERC 2006) states that CNX "intends to aggressively…increase gas production in southwestern Virginia" and has executed an agreement with East Tennessee to "pursue plans to expand gas production." FERC (2006) also states that CNX requested the pipeline be 20 in rather than 16 in to allow for future growth. The Service notes FERC is convinced that the proposed action will increase gas production in southwest Virginia. Because the effects of increased gas production are likely to reach the action area, it is appropriate to discuss those effects in this BO as cumulative effects.

East Tennessee's proposed pipeline will not directly cause increased gas production because coal mining drives gas production. However, the proposed pipeline will indirectly cause increased gas production infrastructure. Without the proposed pipeline, increased coal mining would still cause new gas wells that would theoretically need to be vented. The proposed pipeline would cause the construction of access roads and collection facilities to move the gas into the Cardinal gathering system rather than allowing the gas to be vented into the atmosphere. (CNX 2006a)

The Cardinal gathering system, located at MP 0, is the only gathering system for the Jewell Ridge pipeline (K.A. Chesler, East Tennessee, pers. comm., 2006). CNX is the sole supplier of gas that will be used in the pipeline. Natural gas is a by-product of coal mining, and coal mining drives the production of natural gas. For this reason, it is difficult to forecast the timing of natural gas production even though its production is reasonably certain to occur. Similarly, exact future well locations are unknown, but wells can be predicted in certain watersheds due to coal deposits.

CNX owns gas rights in the Indian Creek watershed. The proposed pipeline is within the Indian Creek watershed from approximately MP 7.8 - 9.2. CNX (2006b) provided their three-year planning horizon to the Service. CNX has the rights to drill 10 to 12 wells in the Indian Creek watershed in the next three years. An existing test well's results will determine whether CNX will drill or not. If CNX decides to drill, the closest well would be approximately seven miles from the dense mussel assemblage in Indian Creek. Each well would generally require land disturbance of one acre for the well site and a variable amount of land disturbance for access roads. On average, we believe an access road's land disturbance would be five acres (20 ft x 2 mi). Therefore, each well would disturb an average of six acres.

The Service concludes that the proposed pipeline will cause increased gas development around the Cardinal gathering system. The pipeline from MP 0 – 7.7 does not occur in endangered species watersheds, and the Service is less concerned about increased infrastructure from MP 0 – 7.7 than from 7.8 – 9.2 (the Indian Creek watershed). Should CNX develop 12 gas wells in the

Indian Creek watershed over the next three years, up to 60 ac of land disturbance and increased sedimentation would result. The Indian Creek watershed is approximately 35 sq mi, which is approximately equal to 22,400 ac. Sedimentation impacts from the 60 ac of land disturbance could reach the action area if appropriate erosion and sedimentation controls were not implemented.

We also believe that additional gas production is reasonably certain to occur after year three, but we are unable to anticipate the extent or timing that would be reasonably certain to occur.

VI. CONCLUSION

Regulations implementing Section 7(a)(2) of the ESA (50 CFR 402) require the Service to formulate its BO as to whether a Federal action that is the subject of consultation, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the adverse modification of critical habitat. "Jeopardize the continued existence of," is defined by this regulation 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 in the wild by reducing the reproduction, numbers, or distribution of that species." "Destruction or adverse modification of critical habitat" includes, but is not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.

The Service anticipates up to two individuals each of the little-wing pearlymussel and shiny pigtoe at the NF Holston River crossing site may be taken as a result of project construction. These two species are not in danger of extirpation due to their current distribution and abundance.

The most significant impact anticipated from the proposed action is sedimentation. The proposed action was modified to reduce sedimentation impacts by boring under, rather than trenching through, Indian Creek. East Tennessee's decision to 1) bore underneath Indian Creek and 2) move the proposed crossing site approximately 1.25 miles upstream of the dense mussel assemblage significantly reduced anticipated impacts. Sedimentation effects throughout the ROW corridor will be temporary and will be reduced by the extensive erosion control efforts that East Tennessee will enact. FERC, East Tennessee, a third-party inspector, the Service, and VDGIF will enforce the erosion control measures. We believe that the sedimentation control effort, to include its supervision component, is sufficient to ensure appreciable adverse effects are not likely to occur. What sedimentation will occur will be non-toxic, non-lethal, and of short duration. The residual impacts that we anticipate will be temporary and minor and are not likely to appreciably reduce the survival and recovery of any of the five listed mussels.

After reviewing the current status of the little-wing pearlymussel, purple bean, rough rabbitsfoot, shiny pigtoe, and tan riffleshell throughout their ranges and in the action area, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's Biological Opinion that the action, as proposed, is not likely to jeopardize their

continued existence. This project would not destroy or adversely modify the federally designated critical habitat for the purple bean or rough rabbitsfoot.

INCIDENTAL TAKE STATEMENT

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

The measures described below are nondiscretionary, and must be undertaken by FERC and East Tennessee so that they become binding conditions of FERC's certificate issued to East Tennessee for the exemption in section 7(o)(2) to apply. FERC has a continuing duty to regulate the activity covered by this incidental take statement. If FERC either fails to assume and implement the terms and conditions or fails to require East Tennessee to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the certificate, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, FERC and East Tennessee must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR Sec. 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service anticipates incidental take of up to two individuals each of the little-wing pearlymussel and shiny pigtoe at the NF Holston River crossing site. The individuals may be crushed if not found and translocated during the pre-construction survey.

The Service also anticipates take in the form of non-lethal harm to a small but unquantifiable number of the little-wing pearlymussel, purple bean, rough rabbitsfoot, shiny pigtoe, and tan riffleshell due to sedimentation effects in Indian Creek and the Clinch, Little, and NF Holston Rivers. All five species may be harmed from the time of land clearing until vegetation is re-established throughout the ROW. Sedimentation effects would likely include the interruption of feeding or breeding behavior. No lethal take of listed mussels in Indian Creek, Clinch River, or Little River is anticipated nor authorized.

Because it is difficult to quantify take due to sedimentation, we will use turbidity levels as a

surrogate for monitoring the level of harm to listed mussels in Indian Creek. We anticipate no more than a 50 percent increase in turbidity from the upstream to downstream collection point along either bank of Indian Creek sustained over a three-hour period. For the fifth turbidity monitor in the unnamed tributary to Indian Creek, we anticipate no more than a 50 percent increase in turbidity as compared to background levels as established during the pre-construction monitoring. We are focusing monitoring efforts on Indian Creek because the tan riffleshell is so imperiled.

EFFECT OF THE TAKE

In the accompanying BO, the Service determined that this level of anticipated take is not likely to result in jeopardy or destruction of any federally listed species or adverse modification of federally designated critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of the little-wing pearlymussel, purple bean, rough rabbitsfoot, shiny pigtoe, and tan riffleshell:

- Instream construction must be conducted during the time of year when impacts to the mussels' reproductive cycles are minimized.

- Siltation of the water columns of Indian Creek, Clinch River, Little River, and NF Holston River must be minimized to avoid stress or death to the mussels.

- Water withdrawals must occur when there is sufficient water to minimize adverse effects to the mussels, and intakes must be screened to minimize entrainment of larval mussels on their host fish.

- Impacts of sedimentation on the federally listed mussels and federally designated critical habitat must be monitored in Indian Creek because of the potential impact to the highly imperiled tan riffleshell.

- East Tennessee must allow reasonable access to the action area to allow the Service and its agents the ability to evaluate compliance and the effectiveness of the terms and conditions.

Monitoring is not required at the other waterbody crossings because the anticipated level of take is low.

While boring under Indian Creek poses less sedimentation risk than trenching through the stream bottoms of the unnamed tributary to Indian Creek and the Clinch, Little, and NF Holston Rivers, the risk of sedimentation from the cleared right-of-way is equal at all four endangered species watersheds. Although monitoring all four affected streams could be required, the Service

believes it will be most beneficial to concentrate monitoring efforts at Indian Creek to ensure that project impacts do not exceed those anticipated to the critically endangered tan riffleshell or other federally listed species or critical habitat.

Because direct monitoring of listed mussels is difficult and can cause take, using surrogates of turbidity and macroinvertebrate community metrics is warranted. Turbidity monitoring provides one of the most sensitive measures of habitat change in streams (D. Moyer, USGS, pers. comm., 2006). Macroinvertebrate monitoring provides a biotic measurement of another group of animals living in the same habitat as the mussels and provides the closest possible surrogate. Sampling using EMAP showed a significant correlation between increased sedimentation levels and impacts to macroinvertebrate fauna (Paul & McDonald 2005).

TERMS AND CONDITIONS

To be exempt from the prohibitions of Section 9 of the Endangered Species Act, the Federal Energy Regulatory Commission and East Tennessee must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline the required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. All instream work and all soil-disturbing work within 150 feet (ft) of Indian Creek, unnamed tributaries (ephemeral, intermittent, and perennial) to Indian Creek, Clinch River, Little River, and North Fork (NF) Holston River shall occur between June 1 and August 15 to minimize impacts on mussel reproduction and to ensure a vegetative cover can be established over the entire pipeline corridor prior to the onset of winter. During May, in the areas from 150 ft to 30 ft of the waterbodies, clearing, grading, ditching, stringing, placing the pipe, and backfilling may occur after erosion control measures are in place. Activities necessary for the installation of equipment crossing (clearing of the travel lane, etc.) may be completed outside of this time of year restriction. **The time of year restrictions for instream work apply to all terms and conditions.**

   Because Indian Creek is vitally important to many mussels, and especially to the tan riffleshell, boring under Indian Creek will also require the time of year restrictions mentioned above. Trenching any tributary to Indian Creek will require the time of year restrictions mentioned above with the following exception: clearing and minor grading for access road 12.1 (Figure 2, page 1 of 6, MP 7.8 – 9.2) may occur at any time but may not occur within 100 ft of Indian Creek.

   Construction equipment may require a span support in the largest waterbodies (Clinch, Little, and NF Holston Rivers). Based on the results of the pre-construction surveys, craning the instream structural support from the shore does not constitute instream work for this project. If the span support can be craned from shore, no time of year restrictions are necessary for that work. If the span supports cannot be craned from shore, the time of year restrictions mentioned above will be necessary. Similarly, installation of a section of a bridge from shore or from an already-installed bridge section would not require time

of year restrictions if no equipment would enter the stream.

2. Within one month prior to the initiation of construction, East Tennessee must perform a mussel survey and translocation at the NF Holston River crossing. The purpose of this survey is to remove all mussels (listed or not) from the construction corridor to reduce direct take. The survey will be restricted to the construction corridor plus 50 ft upstream and 200 ft downstream. Surveys will be conducted by snorkeling, brushing the surface, and flipping rocks (but not raking). East Tennessee will translocate all mussels to the closest upstream appropriate mussel habitat that is at least 50 ft upstream of the crossing. East Tennessee has a list of individuals who are qualified and authorized to conduct surveys and mussel translocations. If the individuals on this list are not available, contact this office. Results of the survey and translocation must be submitted to the Service and the Virginia Department of Game and Inland Fisheries (VDGIF) no later than 60 days following completion. The report must include the name of surveyor/s, dates of surveys, methods, results, and the species, number, and location of mussels moved.

3. Monitoring must be conducted the year of construction (2006). Monitoring shall be conducted in the Indian Creek watershed only (at Indian Creek proper and the unnamed tributary to Indian Creek) (Figure 2, page 1 of 6, MP 7.8 – 9.2).

   If monitoring data at Indian Creek indicate failures of existing erosion control methods, East Tennessee must cease further land-disturbing activities within the corresponding watershed and take corrective action before land-disturbing activities can resume. If data indicate a method of erosion control (rather than insufficient implementation of an otherwise acceptable method) is not sufficient, East Tennessee shall apply the improved method to comparable areas within all four endangered species waters watersheds: Indian Creek, Clinch River, Little River, and NF Holston River.

   Turbidity Monitoring

   Continuous turbidity monitoring data (optical measurements of suspended sediment) collected in 15-minute increments will enable East Tennessee to detect and immediately correct any erosion and sedimentation control failures as evidenced by spikes in real-time, downstream turbidity readings. Five in-stream turbidity monitors shall be placed in the Indian Creek watershed. Paired monitors, on opposite sides of Indian Creek, shall be located upstream and downstream of the pipeline crossing. Monitors shall be located close to the project site to preclude confounding factors. The fifth turbidity monitor shall be located downstream from the crossing and in the middle of the unnamed tributary to Indian Creek, approximately 0.25 miles below the pipeline crossing of the main stem of Indian Creek. East Tennessee has the option of using six turbidity monitors arrayed as three pairs. If this option is selected, the third pair will flank the crossing of the unnamed tributary in a similar manner as the first and second pairs flanking the main stem of Indian Creek. If the third pair is used, the comparison is between the upstream and downstream monitor rather than any pre-construction monitoring.

East Tennessee must have the ability to access the real-time data at its project management site in Raven, Virginia. The Service must be provided access to the real-time data. If there is a 15 percent increase in turbidity from the upstream to downstream collection point along either bank sustained over a one-hour period, East Tennessee must cease further land-disturbing activities within the corresponding watershed (Indian Creek, unnamed tributary to Indian Creek # 1, unnamed tributary to Indian Creek # 2), take corrective action before land-disturbing activities can resume, and notify the Service within 24 hours. For the fifth turbidity monitor, East Tennessee must cease further land-disturbing activities within the watershed of the unnamed tributary, take corrective action before land-disturbing activities can resume, and notify the Service upon detecting a 15 percent increase in turbidity levels, sustained over a one-hour period, either 1) above the established baseline for storm and non-storm events sustained over a one-hr period or 2) between the upstream and downstream monitors if a sixth monitor is installed. To establish this baseline, the fifth turbidity monitor must be in place and functioning at least 30 days prior to any project-related activity in the unnamed tributary's watershed. East Tennessee may either 1) average all readings for the pre-construction period or 2) create two categories of readings ("rain" and "no rain") and average readings within each category. The "rain" category shall begin with rainfall in the watershed and end no more than two hours after the rain ends in the watershed. If these data are collected, East Tennessee can compare "rain" and "no rain" events before and after construction.

If East Tennessee observes activities that may affect the turbidity monitoring that occurs between the paired monitors that is not part of East Tennessee's actions, they will notify the Service and provide as much documentation as possible. The Service will determine how to evaluate turbidity-monitoring data during periods of third-party effects.

If there is a 15 percent increase in turbidity from the upstream to downstream collection point along either bank sustained over a one-hour period or a 15 percent increase in turbidity levels above the established baseline for storm and non-storm events sustained over a one-hr period, East Tennessee must conduct a surface survey of mussels in the dense mussel assemblage in Indian Creek to determine whether any recent, lethal take of mussels has occurred. The surveyor must be approved by the Service prior to the survey and must report the findings to the Service within 10 days following the survey. The Service will try to determine the likely cause of death (sedimentation, muskrat predation, contaminants, unknown causes, etc.). Only take attributable to the proposed action is relevant in determining whether the level of incidental take authorized has been exceeded or whether reinitiation of formal consultation is required.

Turbidity monitoring must remain in place until the right-of-way (ROW) in the Indian Creek watershed is revegetated. East Tennessee can discontinue turbidity monitoring when both East Tennessee and the Service agree that sufficient vegetation has been re-established along the ROW within the Indian Creek watershed to prevent any likelihood of adverse effects on mussels from sediment runoff.

East Tennessee must provide the Service monthly reports summarizing the monitoring

data (due the 10th day of the following month). Within four months of the termination of turbidity monitoring, East Tennessee must submit a draft report to the Service summarizing the monitoring the data. The Service, FERC, and East Tennessee will agree to the contents of these reports prior to submission of the first report. A final report will be submitted as soon as possible following review of the draft.

During the first growing season following the determination of re-establishment of vegetation (in the next calendar year), the Service and East Tennessee shall review the vegetation of all four endangered species watersheds to verify that vegetation was, in fact, established.

Macroinvertebrate Monitoring

Macroinvertebrate monitoring shall be conducted at one site upstream and one site downstream of the Indian Creek crossing site, before and after construction. For the purposes of the macroinvertebrate monitoring, "before construction" means before any clearing of vegetation of the right-of-way in the Indian Creek watershed and "after construction" means after physical construction but before the Service and East Tennessee jointly determine revegetation has occurred in the watershed. East Tennessee must submit a report to the Service within six months following the last sampling of macroinvertebrates. The Service, FERC, and East Tennessee will agree to the contents of these reports prior to submission of the first report. Macroinvertebrate monitoring shall follow the procedures in the Environmental Monitoring and Assessment Protocol (EMAP) described in Lazorchak et al. (1998).

4. Erosion and sediment controls shall be strictly implemented and monitored in accordance with the Virginia Erosion and Sediment Control Handbook and East Tennessee's Erosion and Sedimentation Control Plan, as approved by the Virginia Department of Conservation and Recreation (VDCR). Erosion control measures must remain in place until vegetation is re-established, as determined by both the Service and East Tennessee. All floodplain fill must be removed from the construction area immediately upon the termination of construction. In addition, silt fences must be erected and maintained wherever there is the possibility of silt or sediments entering any waterbody (ephemeral, intermittent, or perennial). Silt fencing must be partially buried in accordance with the Virginia Erosion and Sediment Control Handbook. Within the Indian Creek watershed, all silt fencing must have wire reinforcement and must consist of a double row of fencing at waterbody crossings and in other areas as deemed by the Service and East Tennessee as necessary to prevent blow-outs that may add sediment to Indian Creek waterbodies. Hay bales must be used instead of straw bales because hay is better than straw at trapping sediment due to its finer composition. Hay bales must be replaced every three months because the hay bales will break down over time.

5. All exposed soils must be stabilized and seeded within six days following final grading, weather permitting, in accordance with the Virginia Erosion and Sediment Control Handbook and East Tennessee's Erosion and Sedimentation Control Plan, as approved by

VDCR and FERC. Initial stabilization may be with annual, non-native species such as German millet or rye; permanent vegetation must be with native species or as approved by the Service, the landowner, and VDCR. Species that were present prior to construction are acceptable. Within the Indian Creek watershed, East Tennessee must stake (not staple) 100% biodegradable erosion control matting (such as C125BN, or another type as approved by the Service) over all disturbed areas within 100 ft of all waterbodies—ephemeral, intermittent, and perennial as part of final seeding and grading. The Service shall take into account landowner desires regarding erosion control matting.

6. For all endangered species watersheds, East Tennessee must provide three full-time inspectors who will monitor the terms and conditions in this Incidental Take Statement. After seeding, mulching, and final clean-up, the number of full-time inspectors may decrease to one. Inspections are required from the commencement of soil disturbing activities until vegetation is re-established. From the time the third-party monitoring ends (see # 7 below) until the time vegetation is re-established, photo-documentation of typical areas and all problem areas must be included as part of the bi-weekly status report (required by FERC in the Certificate) and must be submitted to the Service.

7. For all endangered species watersheds, East Tennessee must provide an independent, third-party inspector who will report to FERC. The inspector must contact FERC and the Service within one working day of any non-compliance incident that causes sediment to enter any waterbody—ephemeral, intermittent, or perennial within an endangered species watershed (Indian Creek, Clinch River, Little River, and NF Holston River). Inspections are required from the commencement of soil disturbing activities through final grading and seeding.

8. Within the Indian Creek watershed, East Tennessee must inspect all erosion and sedimentation control measures daily from the day of first soil disturbance (including ROW clearing) until three weeks after final seeding. After that, weekly inspections are required until the Service and East Tennessee agree that vegetation is re-established except that an inspection is required within 24 hours after any rain in the watershed.

9. All fuel, hydraulic fluid, oil, lubricants or similar products must be stored in a secure location at least 100 ft from any waterbody crossing. Adding and/or changing oil, fuel, hydraulic fluids, lubricants, or similar products must be accomplished at least 100 ft from any waterbody crossing. Three exceptions are approved: refueling pumps required for the bore under Indian Creek, the water withdrawal for hydrostatic testing, and dewatering trenches. Both exceptions require secondary containment and must not occur within 20 ft of the waterbody.

10. Water withdrawals from the Clinch River and NF Holston River must not exceed ten percent of the instantaneous flow of each river withdrawal site. Additionally, a minimum amount of water must remain in the rivers to reduce adverse effects to federally listed species. East Tennessee must use the gauge at Saltville to determine whether water may be removed from either the Clinch River or the NF Holston River. See pages 26-28 to

determine how to calculate minimum flow requirements. No water may be removed if the rivers are experiencing a 10-year or greater drought.

11. Water withdrawal intake hoses must be screened with a one quarter inch fine mesh, elevated from the stream bottom, and placed perpendicular to the stream flow to avoid entrainment of host fishes of federally listed mussels. The intake screen must be positioned such that an unimpeded flow of water parallel to the screen surface occurs along the entire surface of the screen. The approach velocity of the water may not exceed 0.25 cubic feet per second.

12. Hydrostatic test water must not be discharged directly into any waterbody. Hydrostatic test water must be discharged into temporary storm water holding areas (hay bale structures) located in the same watershed as the associated intake source. The discharge must not produce a noticeable sedimentation plume in flowing waters. East Tennessee shall make every effort to discharge all water during daylight hours, though this may not be possible due to safety concerns regarding air pockets in the pipe. If East Tennessee is unable to complete any discharge during daylight hours, they must provide artificial lighting so that they can detect sedimentation plumes.

13. East Tennessee shall not use herbicides or pesticides to manage the ROW. If such use is ever proposed, reinitiation of consultation will be required.

14. East Tennessee must allow access to the Service and the VDGIF for all areas within the ROW until vegetation is re-established throughout the entire corridor. Service and VDGIF personnel must complete safety and environmental training at East Tennessee's Raven Field Office (355 Nash Road, Raven, VA 24639; 276-964-5070) prior to visiting any job site. Service and VDGIF personnel must provide a four-hour advance notice before visiting construction area.

15. Care must be taken in handling any dead specimens of listed species that are found in the project area to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not require enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead specimen, notify the Service at the address provided. The Service will provide guidance on the disposition of the specimen and other evidence.

16. East Tennessee has already notified the Service that initiation of construction is likely to occur during the first week of May 2006. East Tennessee must notify the Service within 30 days upon completion of the project, at the address given below. All additional information to be sent to the Service should be sent to the following address:

Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061
Phone (804) 693-6694
Fax (804) 693-9032
email: eric_davis@fws.gov

The Service anticipates that incidental take of the little-wing pearlymussel, purple bean, rough rabbitsfoot, shiny pigtoe, and tan riffleshell may occur during and/or after construction in the form of harm or crushing. Two individuals each of the little-wing pearlymussel and the shiny pigtoe may be crushed at the NF Holston River crossing site. No lethal take is anticipated nor authorized in Indian Creek, Little River, or Clinch River. We anticipate up to a 50 percent increase in turbidity from the upstream to downstream monitoring station along either bank of Indian Creek sustained over a three-hour period. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures. FERC must immediately provide an explanation of the causes of the take, and review with the Service the need for possible modification of the reasonable and prudent measures and the terms and conditions.

CONSERVATION RECOMMENDATIONS

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

The Service recommends East Tennessee install a stream gauge downstream of the proposed pipeline crossing to determine whether the pipeline causes any hydrologic changes in Indian Creek. Changes in hydrology are known to influence the distribution of mussels.

Monitoring both suspended and deposited sediment in Indian Creek would provide greater confidence in relating the turbidity monitoring to any impacts to the mussels (including no impacts).

In order for the Service to be kept informed of actions that minimize or avoid adverse effects or benefit listed species or their habitats, the Service requests notification of the implementation of any of these conservation recommendations by FERC and/or East Tennessee.

REINITIATION NOTICE

This concludes the BO on the action outlined in FERC's request letter dated December 13, 2005. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

The Service appreciates the opportunity to work with FERC in fulfilling our mutual responsibilities under the ESA. Please contact Mr. Eric Davis at (804) 693-6694, extension 104 or at eric_davis@fws.gov if you require additional information or wish to discuss our comments further.

Sincerely,

Karen L. Mayne
Supervisor
Virginia Field Office

cc: VDGIF, Richmond, VA (Andy Zadnik)
VDGIF, Lynchburg, VA (Brian Watson)
East Tennessee Energy, Houston, TX (Kim Chesler)
Congressman Rick Boucher, Abingdon, VA

Literature Cited

Ahlstedt, S.A. 1984. Twentieth century changes in the freshwater mussel fauna of the Clinch River (Tennessee and Virginia). *in* Terwilliger, K. 1991. Virginia's endangered species. McDonald and Woodward Publishing Co., Blacksburg, VA. 672 pp.

_____. 1986. A status survey of the little-winged pearly mussel *Pegias fabula*. Tennessee Valley Authority Final Report 14-16-0004-84-927.

_____. 1991. Virginia's endangered species. McDonald and Woodward Publishing Co., Blacksburg, VA. 672 pp.

_____, S. Bakaletz, M.T. Fagg, D. Hubbs, M.W. Treece, and R.S. Butler. 2002. Current status of freshwater mussels (Bivalvia: Unionidae) in the Big South Fork National River and Recreation Area of the Cumberland River, Tennessee and Kentucky (1999-2002). U.S. Geological Survey, Knoxville, TN. 68 pp.

_____. 2005. Personal communication. U.S. Geological Survey, retired, Knoxville, TN.

Bates, J.M. and S.D. Dennis. 1978. The mussel fauna of the Clinch River, Tennessee and Virginia. Sterkiana 69-70: 3-23.

Beaty, B.B. and R.J. Neves. 1997. Final report, survey of freshwater mussel fauna at the Route 665 crossing of Copper Creek, Scott County, Virginia. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA. 6 pp.

Bogan, A.E. 1993. Literature and taxonomic review for the federal candidate and endemic aquatics of the Tennessee River basin. American Zoology 33: 599-609.

Bogan, A.E. and P.W. Parmalee. 1983. Tennessee's rare wildlife. Volume II: the mollusks. Tennessee Wildlife Resource Agency, Tennessee Heritage Program, Tennessee Department of Conservation, University of Tennessee, Knoxville, TN. 123 pp. *in* U.S. Fish and Wildlife Service. 1984. Tan riffle shell mussel recovery plan. U.S. Fish and Wildlife Service, Atlanta, GA. 59 pp.

Butler, R.S. 2005. Personal communication. U.S. Fish and Wildlife Service, Asheville, NC.

Chesler, K.A. 2006. Personal communication. East Tennessee Natural Gas, Houston, TX.

Coon, T.G., J.W. Eckblad, and P.M. Trygstad. 1977. Relative abundance and growth of mussels (Mollusca: Eulamellibranchia) in pools 8, 9 and 10 of the Mississippi River. Freshwater Biology 7: 279-285.

CNX Gas Corporation. 2006a. February 8, 2006 letter regarding the scope of cumulative effects. South Park, PA. 4 pp.

CNX Gas Corporation. 2006b. March 24, 2006 letter regarding future gas development in the Indian Creek watershed. South Park, PA. 3 pp.

East Tennessee Natural Gas. 2005. Biological Evaluation: Jewell Ridge Lateral Project. Houston, TX. 31pp. plus appendices.

Ellis, M.M. 1931. Erosion silt as a factor in aquatic environments. Ecology 17(1) 29-42.

Federal Energy Regulatory Commission. 2005a. Biological Assessment for the Jewell Ridge Lateral Project. Washington, DC. 39 pp.

Federal Energy Regulatory Commission. 2005b. Environmental Assessment for the Jewell Ridge Lateral Project. Washington, DC. 105 pp.

Federal Energy Regulatory Commission. 2006. Certificate to East Tennessee Natural Gas, Docket No. CP05-413-000, February 8, 2006. Washington, DC. 34pp.

Floyd, M. 2006. Personal communication. U.S. Fish and Wildlife Service, Frankfort, KY.

Gordon, M.E. 1991. Species accounts for Cumberland elktoe (*Alasmidonta atropurpurea*), Cumberlandian combshell (*Epioblasma brevidans*), oyster mussel (*Epioblasma capsaeformis*), rough rabbitsfoot (*Quadrula cylindrica strigillata*), and purple bean (*Villosa perpurpurea*). Unpublished report, Tennessee Tech, Cookeville, TN.

Jones, J.W. 2004. A holistic approach to taxonomic evaluation of two closely related endangered freshwater mussel species, the oyster mussel (*Epioblasma capsaeformis*) and tan riffleshell (*Epioblasma florentina walkeri*) (Bivalvia: Unionidae). M.S. Thesis. Virginia Tech, Blacksburg, VA.

Jones, J.W. 2006. Personal communication. U.S. Fish and Wildlife Service, Blacksburg, VA.

Jones, J.W. and R.J. Neves. 2005. A status survey of freshwater mussel populations in the upper North Fork Holston River, Virginia. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA. 45 pp.

Jones, J.W., R.J. Neves, S.A. Ahlstedt, and E.M. Hallerman. In press. A holistic approach to taxonomic evaluation of two closely related endangered freshwater mussel species, the oyster mussel *Epioblasma capsaeformis* and tan riffleshell *Epioblasma florentina walkeri* (Bivalvia:Unionidae). Journal of Molluscan Studies.

Jones, S.K. 2006. Personal communication. Federal Energy Regulatory Commission, Washington, DC.

Kitchel, H.E. 1985. Life history of the endangered shiny pigtoe pearly mussel, *Fusconaia edgariana* in the North Fork Holston River, Virginia. M.S. Thesis, Virginia Tech, Blacksburg, VA. 120 pp.

Koch, L. 1999. Personal communication. U.S. Fish and Wildlife Service, Abingdon, VA.

Lazorchak, J.M., D.J. Klemm, and D.V. Peck (editors). 1998. Environmental monitroing and assessment program-surface waters. Field operations and methods for measuring the ecological condition of wadeable streams. EPA/620/R-94/004F. U.S. Environmental Protection Agency, Washington, DC.

Loar, J.M., L.L. Dye, R.R. Turner, and S.G. Hildebrand. 1980. Analysis of environmental issues related to small-scale hydroelectric development. Dredging. ORNL, Environmental Science Division Publication No. 1565, Oak Ridge, TN. 134 pp.

Mair, R. 2004. Unpublished notes dated April 21, 2004. Virginia Tech, Blacksburg, VA. 1 p.

Marking, L.L. and T.D. Bills. 1980. Acute effects of silt and sand sedimentation on freshwater mussels. pp. 204-211 *in* J.L. Rasmussen, ed. Proceedings of the symposium on Upper Mississippi River bivalve mollusks. Upper Mississippi River Conservation Committee, Rock Island, IL.

Neves, R.J. 1991. A survey of the freshwater mussel fauna at the Route 637 bridge crossing of the Clinch River, Tazewell County, Virginia. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA. 20 pp.

_____. 1993. A survey of the freshwater mussel fauna at the Route 19 crossing of Indian Creek, Tazewell County, Virginia. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA. 18 pp.

_____. 1996. Unpublished notes dated July 23, 1996. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA. 2 pp.

_____. 1999. Personal communication. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA.

_____. 2003. Electronic mail between the Service and Dr. Richard Neves dated December 15, 2003. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA.

_____. 2004a. Biological assessment: the potential effects of the Route 460 business repair project on the mussel fauna of Indian Creek, Tazewell County, VA.

_____. 2004b. Personal communication. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA.

Ortmann, A.E. 1918. The nayades (freshwater mussels) of the Upper Tennessee drainage. Proceedings of the American Philosophical Society 57 (2): 521-626.

_____. 1925. The naiad-fauna of Duck River in Tennessee. American Midland Naturalist 8: 18-62.

Parmalee, P.W. and A.E. Bogan. 1998. The freshwater mussels of Tennessee. The University of Tennessee Press, Knoxville, TN. 328 pp.

Paul, J.F. and M.E. McDonald. 2005. Development of empirical, geographically specific water quality critera: a conditional probability analysis approach. Journal of the American Water Resources Association, 41(5): 1211-1223.

Peacock, E, W.R. Haag, and M.L. Warren Jr. 2005. Prehistoric decline in freshwater mussels coincident with the advent of maize agriculture. Conservation Biology 19: 547-551.

Pinder, M.J. 2006. Personal communication. Virginia Department of Game and Inland Fisheries, Blacksburg, VA.

Pinder, M.J. and J.W. Jones. 2000. Species composition and biotic condition of the fish community of Indian Creek, Tazewell County, VA. Banisteria 16: 1-14.

Rogers, S.O. 1999. Population biology of the tan riffleshell (*Epioblasma florentina walkeri*) and the effects of substratum and light on juvenile mussel propogation. M.S. Thesis. Virginia Tech, Blacksburg, VA. 111 pp.

_____, B.T. Watson, and R.J.Neves. 2001. Life history and population biology of the endangered tan riffleshell (*Epioblasma florentina walkeri*) (Bivalvia: Unionidae). Journal of the North American Benthological Society 20(4): 582-594.

Shute, P. 1998. Electronic mail dated October 20, 1998 to the U.S. Fish and Wildlife Service, Virginia Field Office.

Simpson, C.T. 1914. *in* U.S. Fish and Wildlife Service. 2004. Recovery plan for Cumberland elktoe, oyster mussel, Cumberlandian combshell, purple bean, and rough rabbitsfoot. Atlanta, GA. 168 pp.

Stansbery, D.H. 1973. A preliminary report on the naiad fauna of the Clinch River in the Southern Appalachian Mountains of Virginia and Tennessee. Bulletin of the American Malacological Union, 20-22.

_____. 1976. Status of endangered fluviatile mollusks in central North America: *Epioblasma walkeri* (Wilson and Clark 1914). Ohio State University Research Foundation Reports, Department of the Interior, Fish Wildlife Service., Bureau of Sport Fisheries and Wildlife. 7 pp. *in* U.S. Fish and Wildlife Service. 1984. Tan riffle shell mussel recovery plan. U.S. Fish and Wildlife Service, Atlanta, GA. 59 pp.

Turgeon, D.D., J.F. Quinn, A.E. Bogan, E.V. Coan, F.G. Hochberg, W.G. Lyons, P.M. Mikkelsen, R.J. Neves, D.F.E. Roper, G. Rosenberg, B. Roth, A. Scheltema, F.G. Thompson, M. Vecchione, and J.D. Williams. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: mollusks. *in* Rogers, S.O. 1999. Population biology of the tan riffleshell (*Epioblasma florentina walkeri*) and the effects of substratum and light on juvenile mussel propogation. M.S. Thesis, Virginia Tech, Blacksburg, VA. 111 pp.

U.S. Fish and Wildlife Service. 1979. Biological opinion to the Tennessee Valley Authority. U.S. Fish and Wildlife Service, Washington, DC. 15 pp.

_____. 1980. Biological opinion to the Nashville District, U.S. Army Corps of Engineers, on sand and gravel excavation from the Powell River in Claiborne County, TN, dated July 24, 1980. U.S. Fish and Wildlife Service, Cookeville, TN. 8 pp.

_____. 1984. Tan riffle shell mussel recovery plan. U.S. Fish and Wildlife Service, Atlanta, GA. 59 pp.

_____. 1991. Biological opinion to the U.S. Environmental Protection Agency for the national registration of the fungicide Aliette for use on strawberries, dated June 14, 1991. U.S. Fish and Wildlife Service, Cookeville, TN. 22 pp.

_____. 1992. Biological opinion to the Nashville District, U.S. Army Corps of Engineers, and the Tennessee Valley Authority on chip mill terminals on the Tennessee River, Tennessee, dated November 1992. U.S. Fish and Wildlife Service, Cookeville, TN. 245 pp.

_____. 1993. Biological opinion to the Federal Highway Administration for construction on State Route 32 in Claiborne and Gainger Counties, TN, dated March 15, 1993. U.S. Fish and Wildlife Service, Cookeville, TN. 20 pp.

_____. 1997. Biological opinion to the Norfolk District, U.S. Army Corps of Engineers, on the Route 72 bridge construction over the Clinch River, Scott County, VA, dated October 28, 1997. U.S. Fish and Wildlife Service, Gloucester, VA. 18 pp.

_____. 1999a. Biological opinion to the Norfolk District, U.S. Army Corps of Engineers, on the Route 665 bridge replacement over Copper Creek, Scott County, VA, dated October 28, 1999. U.S. Fish and Wildlife Service, Gloucester, VA. 21 pp.

_____. 1999b. Biological opinion to the Tennessee Valley Authority on the disposition of lands acquired by the Tennessee Valley Authority for the Columbia Dam project, Maury County, TN, dated March 1999. U.S. Fish and Wildlife Service, Cookeville, TN. 47 pp.

_____. 2000. Biological opinion to the U.S. Forest Service on the Land and Resource Management Plan for the Daniel Boone National Forest, Kentucky, dated May 2000. U.S. Fish and Wildlife Service, Cookeville, TN. 60 pp.

_____. 2004a. Recovery plan for Cumberland elktoe, oyster mussel, Cumberlandian combshell, purple bean, and rough rabbitsfoot. Atlanta, GA. 168 pp.

_____. 2004b. May 3, 2004 notes of conference call to discuss March 16, 2004 discovery of coal fines in Indian Creek, Tazewell County, VA. Southwestern Virginia Field Office, Abingdon, VA.

_____. 2004c. Biological opinion to the Norfolk District, U.S. Army Corps of Engineers, on the Route 460 bridge replacement, dated July 19, 2004. U.S. Fish and Wildlife Service, Gloucester, VA. 34 pp.

_____. 2005. Biological opinion modification to the Norfolk District, U.S. Army Corps of Engineers, on the Route 460 bridge replacement of July 19, 2004, dated June 22, 2005. U.S. Fish and Wildlife Service, Gloucester, VA. 7 pp.

U.S. Geological Survey. 2006. Surface water data for Virginia. http://nwis.waterdata.usgs.gov/va

Watson, B.T. 1999. Population biology and fish hosts of several federally endangered freshwater mussels (Bivalvia: Unionidae) of the upper Tennessee River drainage, Virginia and Tennessee. M.S. Thesis, Virginia Tech, Blacksburg, VA. 134 pp.

Watson, B.T. 2006. Personal communication. Virginia Department of Game and Inland Fisheries, Forest, VA.

Watson, B.T. and R.J. Neves. 1996. Progress report - a survey of the freshwater mussel fauna of Indian Creek, Tazewell County, Virginia. Unpublished report, Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, VA. 10 pp.

Appendix A: Listed Species in the Vicinity of the East Tennessee Jewell Ridge Project Area.

Common Name (Scientific Name)	Status	Location Where Species May Occur
Mammals		
Gray bat (*Myotis grisescens*)	FE / SE	Tazewell, Smyth Counties
Indiana bat (*Mytosis sodalis*)	FE / SE	Tazewell, Smyth Counties
Virginia big-eared bat (*Corynorhinus townsendii virginianus*)	FE / SE	Tazewell, Smyth Counties
Fish		
Tennessee dace (Phoxinus tennesseensis)	-- / SE	Little Tumbling Creek, Laurel Creek, Locust Cove Creek, Walker Creek
Mollusks		
Cumberlandian combshell (*Epioblasma brevidens*)	FE / SE	Clinch River,Indian Creek
Fluted kidneyshell (*Ptychobranchus subtentum*)	FC / --	Indian Crk, North Fork Holston River
Little-wing pearlymussel (*Pegias fabula*)	FE / SE	Clinch River, Little River, North Fork Holston River
Oyster mussel (*Epioblasma capsaeformis*)	FE / SE	Clinch River, Indian Crk, Little River
Purple bean *(Villosa perpurpurea)*	FE / SE	Clinch River, Indian Creek, North Fork Holston River
Rough rabbitsfoot *(Quadrula cylindrica strigillata)*	FE / SE	Clinch River, Indian Creek
Slabside pearlymussel *(Lexingtonia dolabelloides)*	FC / ST	Clinch River, Indian Creek, North Fork Holston River
Tan riffleshell *(Epioblasma florentina walkeri*)	FE / SE	Clinch River, Indian Creek, Little River
Shiny pigtoe (*Fusconaia cor*)	FE / SE	North Fork Holston River
Plants		
Virginia spiraea (*Spiraea virginiana*)	FT / SE	Tazewell, Smyth

F = Federal, S = State; E = Endangered, T = Threatened, C = Candidate

Appendix B: Consultation Timeline

10-20-04	East Tennessee sends Service a letter to notify Service of the proposed action.
12-22-04	Service sends East Tennessee a letter (cc FERC) with endangered species issues.
1-31-05	FERC issues Notice of Intent to prepare an Environmental Assessment (EA).
2-10-05	Conference call between Service and VDGIF.
2-17-05	Service sends FERC a letter outlining formal consultation procedures.
2-22-05	Service attends FERC's Public Scoping meeting in Chilhowie, VA.
2-23-05	Service, FERC, and East Tennessee attend site visits along proposed pipeline route.
3-1-05	Service sends FERC a letter outlining ESA and NEPA concerns.
3-9-05	TRC (East Tennessee's consultant) sends Service a letter on Indian Creek alternatives.
3-18-05	TRC sends Service a letter with the results of the mussel surveys.
3-21-05	Service meets with FERC, VDGIF, VDCR-DNH, VMRC, and East Tennessee in Richmond, VA.
3-24-05	Service conducts site visit in Indian Creek watershed.
3-31-05	Service meets with mussel experts in Abingdon, VA.
4-6-05	Service calls TRC and states a crossing of Indian Creek would likely be jeopardy.
4-7-05	TRC calls Service and says East Tennessee understands and requests Service not to put in writing a preference for the alternative at Cedar Bluff due to local and county concerns.
4-13-05	Service sends FERC a letter clarifying critical habitat and requesting endangered species surveys.
5-23-05	Service meets with FERC, Corps, VDGIF, VDCR-DNH, VMRC, East Tennessee, and TRC (East Tennessee's consultant) in Richmond, VA. East Tennessee presents original proposed action.
6-8-05	Service sends FERC a letter outlining information needs for formal consultation.
7-7-05	TRC provides report of Indian Creek alternatives.

8-4-05	Service meets with FERC, Corps, VDGIF, VDCR-DNH, VMRC, East Tennessee, and TRC (East Tennessee's consultant) in Richmond, VA. East Tennessee modifies preferred alternative to make Indian Creek crossing approximately one mile upstream of the main section of the tan riffleshell.
9-2-05	East Tennessee files application with FERC.
9-9-05	East Tennessee sends applicant-prepared Draft EA to the Service.
10-12-05	Service sends FERC a letter providing comments on the Draft EA.
10-31-05	Service and VDGIF conduct site visits with East Tennessee in Tazewell, VA.
11-16-05	East Tennessee sends Service its Biological Evaluation (BE).
12-13-05	FERC sends the Service an EA and a Biological Assessment (BA) and requests initiation of formal consultation.
12-22-05	Service meets with VDGIF, VDCR-DNH, VMRC, East Tennessee, and TRC (East Tennessee's consultant) in Richmond, VA.
1-10-06	Service sends FERC a letter with concerns regarding the EA.
1-11-06	Service sends FERC a letter stating information gaps in the BA.
1-24-06	FERC sends Service a letter providing clarification on the contents of the BA.
1-31-06	Service send FERC a letter stating that formal consultation began on 12-16-05.
1-31-06	East Tennessee sends Service a letter responding to Service's 1-10-06 and 1-11-06 letters.
2-8-06	FERC issues Certificate to East Tennessee.
2-8-06	CNX sends Service a letter regarding the scope of cumulative effects.
3-3-06	Conference call between Service and East Tennessee to discuss cumulative effects.
3-6-06	Conference call with Service, East Tennessee, and CNX to discuss CNX's plans in the Indian Creek watershed.
3-6-06	CNX sends Service a letter outlining their future gas drilling plans in the Indian Creek watershed.

3-10-06	TRC provides Surface Water Mitigation Plan and clarifies proposed action.
3-17-06	Service and East Tennessee discuss potential terms and conditions.
3-24-06	East Tennessee sends Service a letter discussing the potential terms and conditions.
4-5-06	East Tennessee sends Service an email regarding erosion control measures.
4-7-06	Service sends draft BO to FERC and East Tennessee.
4-11-06	FERC and East Tennessee submit comments on the draft BO.

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