

July 19, 2004

Colonel Yvonne J. Prettyman-Beck  
District Engineer  
Norfolk District, Corps of Engineers  
Fort Norfolk, 803 Front Street  
Norfolk, Virginia 23510-1096

Attn: Kathy Perdue  
Regulatory Branch

Re: Route 460 Bridge Replacement,  
Tazewell County, Virginia VDOT  
Project # 0460-092-1007, Permit  
Application # 03-4009-09

Dear Colonel Prettyman-Beck:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the Virginia Department of Transportation's (VDOT) proposed Route 460 bridge replacement located in Cedar Bluff, Tazewell County, Virginia, and its effects on the federally listed endangered purple bean (*Villosa perpurpurea*) and tan riffleshell (*Epioblasma florentina walkeri*). This biological opinion 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.*). Your March 3, 2004 request for formal consultation was received by the Service on March 5, 2004.

This biological opinion is based on information provided in the January 2004 biological assessment, the November 15, 2003 project proposal, telephone conversations, field investigations, and other sources of information. A complete administrative record of this consultation is on file in this office.

#### Consultation History

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

### **BIOLOGICAL OPINION**

#### **I. DESCRIPTION OF PROPOSED ACTION**

VDOT has applied for a Department of the Army permit to replace the existing U.S. Route 460 Business, 2-lane bridge over Indian Creek in Tazewell County, Virginia (Figure 1). VDOT proposes to replace the existing bridge with a new composite steel beam span, 2-lane bridge in the same location (Figure 2). The bridge would be widened from 26 feet, 6 inches to 32 feet. A Kansas corral railing would be constructed on the downstream side of the bridge and a 5-foot

cantilevered sidewalk would be constructed on the upstream side of the bridge. Construction would take approximately 16 months, beginning during the summer or fall of 2004. The construction of the new superstructure would require a 24-foot by 70-foot temporary work bridge that would span the creek. Construction would require placement of two, instream cofferdams on the east and west sides of Indian Creek. The eastern cofferdam would be placed to allow removal of the existing instream pier. The cofferdam on the west bank of Indian Creek would facilitate the replacement of the abutment seat and the safe removal of the existing bridge. Placement of six instream piles (two of which would be in the stream and outside of the cofferdams) would be required to support the temporary debris-containment system.

The total project would result in temporary placement of 54 cubic yards (481 square feet) of fill below ordinary high water for the cofferdams and piles.

The work at the site would involve the following steps and timeline:

- 1) Mobilize, place traffic signs, place erosion and sediment control structures, clear and grub, place non-erodible cofferdams around the sites of the western abutment and existing instream pier workbridge location, and place the rock/stone access road for the temporary workbridge (within 2 months of the Notice to Proceed).
- 2) Complete the workbridge; place support for the work bridge on the bank, spanning Indian Creek behind the non-erodible cofferdams. No excavation would take place for placement of the cofferdams.
- 3) Construct debris containment system to collect any debris from demolition of the bridge superstructure. This would involve the temporary installation of two support columns into the streambed. Additional temporary supports would be placed at the top of the footer of the abutment, spanning to the top of the footer of the pier or could be supported from the tops of the in-stream cofferdams (within 3 to 4 months of the commencement of construction).
- 4) Demolish one lane of the bridge deck and remove half of the existing pier. Remove the concrete deck and pier in sections (all cooling water from sawcutting operations would be prevented from entering the stream). Lift bridge sections to an upland area with a crane. All demolition debris would be prevented from entering the stream.
- 5) Repair abutment seat within 6 to 7 months of commencement of construction.
- 6) Install girders and pour concrete deck of Phase II, Construction of Maintenance of Traffic.
- 7) Re-route traffic to the newly constructed bridge lane (within 8 to 9 months following commencement of construction).
- 8) Demolish the second lane of bridge deck and remaining portion of pier (within 9 to 11 months from the commencement of construction).

- 9) Repair the remaining abutment seats (within 9 to 11 months from the commencement of construction).
- 10) Install girders and pour concrete deck of Completion Phase of Maintenance of Traffic (within 12 to 14 months from the commencement of construction).
- 11) Remove debris containment system (within 14 to 16 months of the commencement of construction).
- 12) Remove work-bridge (within 14 to 16 months of the commencement of construction).
- 13) Remove cofferdams (within 14 to 16 months of the commencement of construction).
- 14) Finalize the project (within 16 to 18 months of the commencement of construction).

In a letter dated April 20, 2004, VDOT proposed, as part of this project, to contribute \$83,739 for the replacement of mussels that would be “taken” due to bridge construction. These funds would be transferred from VDOT to Dr. Richard Neves at Virginia Polytechnic Institute and State University, prior to permit issuance (Appendix B). In a telephone conversation on May 12, 2004, VDOT agreed that up to \$20,000 of the \$83,739, could be expended on muskrat and/or beaver removal in Indian Creek and nearby sections of the Clinch River, at the discretion of Dr. Neves in consultation with the Service.

In their June 3, 2004 letter, VDOT proposed to perform bank stabilization upstream of the project action area, in an area 200 feet in length by 20-25 feet in width (Appendix B).

VDOT has also proposed to relocate purple bean and tan riffleshell mussels within the action area, within one week prior to the initiation of instream work on this project. All mussels would be relocated to suitable habitat, upstream of the action area.

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 that portion of Indian Creek between 100 feet upstream of the existing bridge and 80 feet downstream of this bridge to the confluence of Indian Creek and the Clinch River. The maximum reach of any construction activity would take place no more than 100 feet upstream. The Clinch River currently supports no purple bean or tan riffleshell mussels below its confluence with Indian Creek. Therefore, the downstream extent of the action area terminates at the confluence of Indian Creek and the Clinch River, which is approximately 80 feet downstream of the existing bridge. On the eastern and western shore of Indian Creek, the action area consists of a riparian corridor 60 feet in width, located 100 feet upstream and 80 feet downstream of the existing bridge. The eastern and western shorelines consist of herbaceous/shrub vegetation and the existing roadway.

## II. STATUS OF THE PURPLE BEAN RANGEWIDE

Species Description - The purple bean is a small to medium-sized mussel that reaches a

maximum length of approximately 55 millimeters (mm) (2.1 inches). 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, 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.

Life History - The purple bean mussel is considered to be a long-term brooder. 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 (U.S. Fish and Wildlife Service 2003). Unlike most other long-term brooders however, the purple bean releases glochidia in the early spring (Neves 2004b). The purple bean requires a fish host for completion of its life cycle. The species releases its glochidia into the water column, where the larvae 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. The fish hosts of this species include the greenside darter (*Etheostoma blennioides*), fantail darter (*Etheostoma flabellare*), and the banded sculpin (*Cottus bairdi*) and/or mottled sculpin (*Cottus carolinae*) (Neves 1996). The purple bean is a riverine, riffle-dwelling benthic species that is restricted to headwater rivers and streams of the Upper Tennessee River system in Virginia and Tennessee. It is found in moderate to fast-flowing water in clean-swept sand, gravel, and cobble substrata, and under large flat rocks. It rarely occurs in pools or slack water areas but has been observed adjacent to water-willow beds (Ahlstedt 1984).

Population Dynamics - It is difficult to estimate the relative variability or stability of this species. No comprehensive/rangewide surveys exist and surveys are typically conducted sporadically and locally for construction activities.

Status and Distribution - 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).

Recovery Goals and Accomplishments - The ultimate goal for recovery of the purple bean is to restore viable populations within a significant portion of its historical range, eliminate threats to its continued existence, and remove it from the Federal List of Endangered and Threatened Wildlife and Plants (U.S. Fish and Wildlife Service 2003).

Removing the purple bean 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 following criteria (U.S. Fish and Wildlife Service 2003):

1. Through the protection of existing populations, reestablishment of historical populations, and/or discovery of currently unknown populations, there exists at least four distinct viable purple bean populations in the upper Tennessee River system.
2. Two distinct naturally reproduced year classes exist within each of the viable populations.
3. Studies of the mussel's biological and ecological requirements have been completed and recovery measures developed and implemented from these studies have been successful, as evidenced by an increase in population density and/or an increase in the length of the river reach inhabited in each of the viable populations.
4. No foreseeable threats exist that would likely threaten the survival of any of the viable populations.
5. The viable populations of the species are separated to the extent that it is unlikely that a single event would eliminate or significantly reduce more than one of the populations.

Several accomplishments to further identify the status and initiate recovery of the species have occurred since the draft recovery plan for this species was published in 1988. They are listed below:

- o Spring-Fall, 2004 - Twenty purple bean to be collected from Indian Creek for propagation at the Buller Fish Hatchery (U.S. Fish and Wildlife Service 2004).
- o 2004 (ongoing) - Status survey of the purple bean is being conducted jointly by Virginia Tech and U.S. Fish and Wildlife Service to include propagation of this species to augment the existing population in Indian Creek (Neves 2004b).
- o 1999-2003 (ongoing) - Release of approximately 21,860 individuals in the Clinch River (Tazewell County, Virginia and Hancock County, Tennessee) and Indian Creek (Tazewell County, Virginia) (Neves 2004c).
- o 2000 Publication of the paper entitled, "Species Composition and Biotic Condition of the Fish Community of Indian Creek, Tazewell County, Virginia" (Pinder and Jones 2000).
- o 1999 - Completion of an M.S. Thesis by Brian 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).
- o Identification of the black sculpin (*Cottus baileyi*) as a host species of the purple bean. This discovery was made by Virginia Tech with funding from the Tennessee Wildlife

Resources Agency (Neves 1999a).

- o 1999 - A series of public and interagency meetings were held to discuss the degradation of Copper Creek, Scott and Russell Counties, Virginia, and explore means by which to rehabilitate the waterway (Koch 1999).
- o Evaluation by Virginia Tech of the effects of sedimentation on mussels and methods to augment or reintroduce populations (Neves 1999a).

#### STATUS OF THE TAN RIFFLESHELL RANGEWIDE

Species Description - *Epioblasma f. walkeri* 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 60 mm (2.3 inches) 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).

Life History - The tan riffleshell mussel is considered to be a long-term brooder. 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 (Butler and Biggins 2003). The fish hosts of this species include the greenside darter (*Etheostoma blennioides*), fantail darter (*Etheostoma flabellare*), redline darter (*Etheostoma rufilineatum*), snubnose darter (*Etheostoma simoteron*), and one or two cottids: banded sculpin (*Cottus bairdi*) or mottled sculpin (*Cottus carolinae*) (Rogers et al. 2001). This species inhabits relatively shallow riffle or shoal areas with stable, silt-free substrate consisting of mixed sand, gravel, cobble, and rubble; it is frequently found among dense patches of water willow or aquatic weeds (USFWS 1984).

Population Dynamics - The relative stability of this species is considered highly unstable. Of the two known populations of this species (Indian Creek, Tazewell County, Virginia and Big South Fork Cumberland River, Scott County, Tennessee), recent genetics analyses have resulted in questions as to whether they comprise the same subspecies. Therefore, the Indian Creek population could be the only population of tan riffleshell in the world. Coupled with the urban setting of this waterway, and the upstream coal mining activity, the future of this species appears tenuous.

Status and Distribution - The genus *Epioblasma* has been considered to be the most highly

developed and recently evolved genus of freshwater mussels (US Fish and Wildlife Service 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. 1999). 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 (S. Bruenderman, Missouri Department of Conservation, pers. comm., 1999).

The tan riffleshell was once found throughout Tennessee and southwestern Virginia in the Tennessee River system (U.S. Fish and Wildlife Service 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 South Fork Cumberland River in Scott County, Tennessee. Live specimens have been found in the Clinch River, Middle Fork 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 South Fork Cumberland River. During surveys conducted from 1999 through 2002, 113 tan riffleshell individuals were surveyed in the Big South Fork Cumberland River (Ahlstedt et al. 2002).

Recovery Goals and Accomplishments – The Recovery Plan for the species was finalized in 1984 (U.S. Fish and Wildlife Service) and has not been updated. At that time, the only known population of the tan riffleshell was in the Middle Fork Holston River in Smyth and Washington Counties, Virginia. The species has not been found during recent surveys in the Middle Fork Holston River and it is believed to be extirpated from this river. The Indian Creek and Big South Fork 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.

Several accomplishments to identify the status and initiate recovery of the species have occurred since the draft recovery plan for this species was published (U.S. Fish and Wildlife Service 1984). They are listed below:

- o Spring-Fall, 2004 - Twenty tan riffleshell to be collected from Indian Creek for propagation at the Buller Fish Hatchery (U.S. Fish and Wildlife Service 2004).
- o 2004 (ongoing) - Status survey of the tan riffleshell being conducted jointly by Virginia Tech and U.S. Fish and Wildlife Service to include propagation of this species to augment the existing population in Indian Creek (Neves 2004b).
- o 2004 - Completion of 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).
- o 1999-2003 (ongoing) - Release of approximately 39,690 juvenile tan riffleshell individuals in the Clinch River (Tazewell County, Virginia and Hancock County, Tennessee), Hiwassee River Tennessee, and Indian Creek (Tazewell County, Virginia)

(Neves 2004c).

- o 2000 - Publication of the paper entitled, “Species Composition and Biotic Condition of the Fish Community of Indian Creek, Tazewell County, Virginia” by M.J. Pinder and J.W. Jones (Pinder and Jones 2002).
- o Evaluation by Virginia Tech of the effects of sedimentation on mussels and methods to augment or reintroduce populations (Neves 2004b).
- o 1999 - Completion of an M.S. Thesis by Brian 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, and augmented it with juveniles from his host fish identification research (Watson 1999).

Threats to the purple bean and tan riffleshell - Industrial, residential, and agricultural development of the Tennessee and Cumberland Valleys since the early 1900s has had a significant impact upon the mussel fauna inhabiting rivers in these areas. Dam construction, coal mining effluent, mineral extraction, gravel mining, contaminants, agricultural runoff, stream channelization and degradation, and untreated 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 (U.S. Fish and Wildlife Service 1984 and 2003).

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, including the purple bean (U.S. Fish and Wildlife Service 2003) and tan riffleshell (U.S. Fish and Wildlife Service 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 1936). Land use changes may also affect the purple bean and tan riffleshell mussel. Removal of streambank vegetation affects the physical and biological processes of streams (U.S. Fish and Wildlife Service 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 (U.S. Fish and Wildlife Service 1993). Excessive grazing and tree and other vegetation removal can also undermine stream stability.

On August 27, 1998, a tanker truck overturned on U.S. Route 460 in Tazewell County, Virginia. The truck released approximately 1,350 gallons of Octocure 554-revised, a rubber accelerant, into an unnamed tributary about 530 feet from its confluence with the Clinch River. The spill turned the river a snowy white color and caused a significant fish kill. The spill also killed most aquatic benthic macroinvertebrates for approximately 6.6 miles downstream. Using a conservative correction factor, an estimated 18,600 or more freshwater mussels were killed by the spill, including 750 individuals of three federally endangered mussel species including purple

bean and tan riffleshell populations. This spill is likely the single largest take of federally listed endangered species since the enactment of the Endangered Species Act. This spill destroyed one of the last three known remaining reproducing populations of the tan riffleshell mussel, at that time. The tan riffleshell in the Big South Fork Cumberland River is threatened by coal mining and oil and gas extraction. Wastes for oil and gas extraction and at least one oil well blowout have occurred in recent years in that watershed (Ahlstedt 2004).

The Service is concerned about the potential, future threat from the exotic zebra mussel (*Dreissena polymorpha*). While not currently known to occur in the upper Tennessee River basin of Virginia, it could be introduced purposely or otherwise. If so, this mussel could occupy a similar niche as the purple bean and tan riffleshell, thereby competing for food and space. Due to its propensity to colonize hard substrate, the zebra mussel could present a threat to the purple bean and tan riffleshell by adhering to their valves, having sublethal or even lethal effects. As rare as the purple bean and tan riffleshell are, even minor sublethal impacts could result in extinction.

The nonindigenous Asian clam (*Corbicula fluminea*) was first reported in the Cumberlandian region around 1959 (Sinclair and Isom 1961). It is believed to be a competitor of native mussels for food, nutrients, and space. Exotic fish species that are potential threats include the black carp (*Mylopharyngodon piceus*) and round goby (*Neogobius melanostomus*).

### III. ENVIRONMENTAL BASELINE

Status of the Purple Bean and Tan Riffleshell Within the Action Area - An abbreviated mussel survey of the action area was conducted by representatives of the Virginia Cooperative Fish and Wildlife Research Unit of Virginia Tech on March 27, 2003. During this survey, two live specimens of the purple bean and two fresh dead shells of the tan riffleshell were found in Indian Creek approximately 10 m upstream and 12 m downstream of the Route 460 bridge. Survey procedures and sampling consisted of using waterscopes within the designated reach to collect and identify all live mussels and valves. Additionally, stream banks were searched for muskrat middens and miscellaneous shells in order to develop a complete list of species present at the site. The survey consisted of approximately 2 work hours (Neves 2004a).

Watson (1999) conducted a more comprehensive mussel survey of Indian Creek in 1996 and 1997 comprising approximately 1,066 feet and including the action area. The survey included all appropriate mussel habitat in Indian Creek except for one stream reach where access permission could not be obtained. He found 25 tan riffleshell and 4 purple bean during this survey. It is estimated that for every one individual found during a survey, there are a total of 24 adult and juveniles that are not found (Neves 2003). When adjusted for the length of the action area (180 feet) and the estimated number of adult and juvenile mussels not discovered during the survey, it is estimated that 18 purple bean and 115 tan riffleshell individuals (Table 2) are located within the action area.

For all of Indian Creek, Watson (1999) found 130 tan riffleshell during his survey. When adjusted for the estimated number of adult and juvenile mussels not discovered during the survey, it is estimated that there are approximately 702 purple bean and 3,510 tan riffleshell

mussels (Table 1) within the entire length of Indian Creek that was surveyed.

According to Watson (1999), approximately 12% of the live purple bean population in Indian Creek was below the estimated mean reproductive size of 36.0 mm (the smallest gravid individual observed was 37.3 mm). The sex ratio for this population was not calculated because most shells were not clearly sexually dimorphic. If a 1:1 sex ratio is assumed, then approximately 15% of the females found were gravid. This proportion of gravid females is thought to be below average for a healthy reproducing population of freshwater mussels (Neves 1999b). An age class frequency distribution was not calculated for either the live population or shell material, since the annuli on the exterior of the shells were difficult to observe (Watson 1999).

Approximately 30% of the live tan riffleshell population found in Indian Creek by Watson was below reproductive size. Further assessment shows that the population had an approximately 1:1 sex ratio (51% males to 49% females), and that 38% of the females found were gravid. This proportion of gravid females is considered to be about average for a healthy reproducing population of freshwater mussels (Neves 1999b). The age of selected valves was obtained by counting the annuli on the exterior of the valves. The estimated age of the valves was then compared to the corresponding length, and a total length-age calculation was derived using linear regression (Sokal and Rohlf 1995). Based on the estimated ages, the tan riffleshell population in Indian Creek appeared to be relatively young and healthy. However, when several of the calculated ages were compared to the ages using visual assessment, it was noticed that the calculated ages tended to underestimate the ages of the mussels. If this is the case, then it is possible that the tan riffleshell population is older than estimated (Watson 1999).

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).

Indian Creek has been heavily impacted by coal mining and residential/commercial development. There are currently five underground mines, one haul road, and two above-ground scalp rock disposal areas in the Indian Creek watershed, upstream from the project action area. All are permitted by Virginia Department of Mines Minerals and Energy, Division of Mined Land Reclamation. In April 2004, coal fines and water discoloration were discovered in Indian Creek. Chronic water quality degradation from this mining activity is a major threat to the Indian Creek population of purple bean and tan riffleshell. An investigation is currently underway to determine the extent of the potential threats to the mussels found in Indian Creek.

The lower several miles of the Indian Creek watershed are characterized primarily by 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, 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/grassways 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 the purple bean and tan

riffleshell in this drainage.

The mussel fauna of Indian Creek receives heavy predation by muskrats (*Ondatra zibethica*). According to Dr. Richard 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% (assuming no recruitment) and the tan riffleshell population by roughly 25% (assuming no recruitment).

#### IV. EFFECTS OF THE ACTION

Beneficial Effects – VDOT has proposed to replace the mussels that will be affected by this project and conduct stream stabilization on Indian Creek, upstream of the action area. This stream stabilization should have long-term positive effects on the Indian Creek mussel fauna by improving water quality through siltation reduction. This stream stabilization project could also help convince other riparian landowners to agree to allow such work on additional sections of Indian Creek, further benefiting the mussel fauna. VDOT has also proposed removal of the existing Route 460 bridge pier in Indian Creek, which will not be replaced. This action should help stabilize Indian Creek in this location.

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 direct and indirect effects of the action on the species. Direct impacts include the potential to kill and/or injure tan riffleshell and purple bean mussels during construction through the use of heavy equipment, construction materials, siltation, and human traffic in and near Indian Creek. Mussels inhabit the substratum of the streambed and are not highly mobile, and thus may be crushed by the placement of the cofferdam, concrete, or rock-filled timber crib, removal of the existing pier, and/or during removal of the old bridge. The purple bean and tan riffleshell may also be killed or stressed due to siltation in Indian Creek from construction activities. Heavy siltation can result in the impairment of feeding, spawning, and larval survival of these mussels, and can also result in reduced oxygen levels, which can adversely impact the mussels' metabolic processes. Direct effects to both mussel species are anticipated to occur within the action area 100 feet upstream of the existing bridge and 80 feet downstream of the bridge to the confluence of Indian Creek and the Clinch River.

Because of the rarity of the purple bean and tan riffleshell mussels, the Service worked with VDOT to estimate the number of mussels that could be injured or killed in the project area (a worse case analysis) and to develop mitigation to offset the potential loss of mussels. Watson conducted a comprehensive mussel survey in Indian Creek in 1996 and 1997 (Watson 1999). Table 1 presents an estimate of the likely population of purple bean and tan riffleshell mussels in Indian Creek when Watson conducted his surveys. Based on Watson's results, and the fact that mussel surveys likely miss a majority of the mussels in a particular area (Neves 2003), the Service calculates that in 1996/1997, the population of the purple bean mussel in Indian Creek was likely to be about 700 individuals, and the population of the tan riffleshell was likely to be about 3500 individuals.

In March 2003, Neves (2004b) conducted an abbreviated mussel survey in Indian Creek from 10 m upstream to 12 m downstream of the existing Route 460 bridge. Neves found two live purple bean mussels and two fresh dead tan riffleshell mussels in this 22 m (~40 ft.) area. During the 1996/1997 survey, Watson (1999) found 4 purple bean and 25 tan riffleshell mussels in a 1,066 ft. survey section of lower Indian Creek, which encompasses the Route 460 action area and Neve's 2003 abbreviated survey area. While this information is too limited to assess population trends for either species in Indian Creek, it is clear that both species continue to persist in the lower section of the watershed.

The Service used Watson's more comprehensive survey information to estimate the number of purple bean and tan riffleshell mussels that are likely to occur in the Route 460 project action area. Table 2 presents this analysis. The Service estimates that approximately 18 purple bean and 115 tan riffleshell mussels are likely to occur in the project action area. Under a worse case scenario, it could be postulated that all of these mussels would be killed or injured by the project. This would amount to the loss of approximately 3 percent of the purple bean and 3 percent of the tan riffleshell mussels in Indian Creek. However, the Service does not believe that this worse case scenario is likely. VDOT plans to conduct a survey within the action area and move the mussels that are found to an upstream location in Indian Creek within a month prior to construction. It is not likely that the survey will locate all mussels in the action area. The Service anticipates that about one third of the larger, older mussels (which are the breeding individuals) will be found and translocated upstream, but most of the juvenile mussels are unlikely to be found (based on Neves 2003). Translocated adult mussels have a high likelihood of survival as long as the translocation is conducted by skilled mussel experts. Not all of the undetected mussels (mainly juveniles) that remain in the action area are likely to be killed or harmed. The bridge construction and removal operations will not impact the entire creek bottom in the action area. Conversely, the project has an approximately 18 month duration, so chronic siltation into Indian Creek could occur if sedimentation and erosion control measures are not strictly carried out and maintained over the life of the project.

To offset the potential loss of individual mussels that are not translocated upstream, VDOT has proposed to replace the estimated total number of purple bean and tan riffleshell mussels in the action area, including the estimated number of offspring these mussels would have produced throughout their lifetimes (Appendix B). The Service provided VDOT with a "resource equivalency analysis" (Skrabis 2004) to project the number of mussels that would have to be replaced in Indian Creek to offset the loss of 18 purple bean and 115 tan riffleshell mussels. This type of analysis, which is normally conducted to evaluate monetary losses, has been adapted by economists for use in natural resource restoration. Skrabis's analysis shows that the direct loss of 18 purple bean and 115 tan riffleshell mussels would result in the indirect loss of 25,975 purple bean and 61,389 tan riffleshell "mussel years," when the life expectancies and reproductive potential of those mussels and their offspring are calculated over time. A 100 percent replacement of this lost valuation over a three year period was calculated as a reasonable timeframe for mitigation of project impacts. A three year restoration period would insure that any physicochemical perturbations in any one year in Indian Creek would not result in a total loss of the mussels that were reintroduced. The number of purple bean mussels required to be restored in Indian Creek to provide 100 percent replacement would be 918 over a three year period, and the number of tan riffleshell mussels would be 6,289 over the same period. Mussel

restoration would be conducted by growing juvenile mussels at an established “mussel hatchery” facility at Virginia Tech using proven techniques with a good track record of success.

Since VDOT has committed to relocate mussels upstream of the action area prior to construction and to provide, within three years, 100 percent replacement of the mussels that could be injured or killed by the project, the Service anticipates that there will be no net reduction in the population of the purple bean and tan riffleshell mussels in Indian Creek over time due to this project.

No designated critical habitat for the purple bean or tan riffleshell exists in the action area. Therefore, no destruction or adverse modification of critical habitat is anticipated.

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 the purple bean and tan riffleshell may result from continuing erosion of the construction site after project completion during rain events, if the site is not adequately stabilized and revegetated. Indirect effects to these species may also occur if their host fish are adversely affected by siltation. Any loss of host fish could result in a lower recruitment of larval mussels in the year following the construction period. Such a loss of recruitment would be expected to be low.

## 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 biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Endangered Species Act.

Cumulative effects likely to impact these species include ongoing coal mining in the Indian Creek watershed, siltation from upland activities, and non-point source pollution inputs into Indian Creek from the bridge and roadway and surrounding upland development. Spills of toxic materials into Indian Creek from accidents on the bridge and roadway are also possible. These ongoing activities have the potential to result in the chronic and acute deterioration of water quality and habitat for the purple bean and tan riffleshell. Continued habitat degradation could result in the eventual loss of these species in Indian Creek.

## VI. CONCLUSION

Regulations implementing Section 7(a)(2) of the ESA (50 CFR 402) require the FWS to formulate its biological opinion 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 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 is defined as, a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.

In reaching a decision of whether the Route 460 bridge replacement is or is not likely to jeopardize the continued existence of the purple bean and tan riffleshell, the FWS must factor into its analysis previous biological opinions and any incidental take permits issued to private individuals pursuant to Section 10 of the ESA involving the species.

Although previous biological opinions have been issued on these species, take has not occurred or has been very difficult to quantify. Other biological opinions have been based on incomplete survey information and inability to locate the species prior to project consultation.

In a 1999 biological opinion for the Route 665 bridge replacement over Copper Creek in Scott County, Virginia, 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 biological opinion, the Service authorized incidental take, “in the form of harm of an unknown but small number of individuals . . . (U.S. Fish and Wildlife Service 1999).”

In 1997, the Service issued a biological opinion for the Route 72 bridge construction over the Clinch River in Scott County, Virginia, for two federally listed fish species and fourteen federally listed mussel species, one of which included the purple bean. In this biological opinion, the Service did not quantify take but stated that, “take of these species can be anticipated . . .” (U.S. Fish and Wildlife Service 1997).

On February 16, 1977, the Service issued a biological opinion to the Tennessee Valley Authority (TVA) on the construction of the Columbia Dam on the Duck River in Maury County, Tennessee. The tan riffleshell was not considered in this biological opinion because the species was not federally listed as endangered until August 23, 1977. In a May 26, 1978 biological opinion to the U.S. Army Corps of Engineers 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 since 1978). In 1979, TVA requested reinitiation of consultation. In its 1979 biological opinion, the Service stated that the project was not likely to jeopardize the continued existence of the tan riffleshell because no tan riffleshells were found during intensive surveys of the Duck and Powell Rivers in 1979 (U.S. Fish and Wildlife Service 1979). In a March 1999 biological opinion for land disposition by TVA in 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 biological opinion, the Service concluded that there would be no incidental take of tan riffleshell mussels due to the proposed TVA land disposition project (U.S. Fish and Wildlife Service 1999).

By far the biggest kill of purple bean and tan riffleshell mussels in recent history occurred on August 27, 1998, when a tanker truck overturned on U.S. Route 460 in Tazewell County, Virginia. The spill killed most aquatic benthic macroinvertebrates for about 6.6 miles downstream in the Clinch River. This spill was likely the single largest take of federally listed endangered species since the enactment of the Endangered Species Act and destroyed one of the last three known remaining reproducing populations of the endangered tan riffleshell mussel that existed at that time. Restoration of 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.

The cumulative impacts of the anticipated incidental take on the purple bean and tan riffleshell from the Route 460 bridge replacement were evaluated within the context of: (1) the percentage of the Indian Creek populations that would be taken by the Route 460 project, (2) VDOT's proposal to replace mussels that would be incidentally taken during project construction, including placement of 918 purple bean and 6,289 tan riffleshell mussels in Indian Creek over three years, (3) VDOT's proposal to conduct stream restoration on Indian Creek to improve mussel habitat, and (4) VDOT's proposal to relocate all purple bean and tan riffleshell mussels within the action area, to an upstream location, within one month prior to the initiation of instream work on this project. The Service anticipates that there will be no net reduction in the long-term numbers of purple bean and tan riffleshell mussels in Indian Creek as a result of the Route 460 bridge replacement due to these mitigative measures. Therefore, the Service does not believe that this project will contribute to rangewide cumulative population declines of either species.

After reviewing the current status of the purple bean 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 the continued existence of the purple bean or tan riffleshell. No critical habitat exists for these species, therefore this project would not destroy or adversely modify designated critical habitat.

### **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 the Corps and VDOT so that they become binding conditions of any permit issued to the applicant for the exemption in section 7(o)(2) to apply. The Corps of Engineers has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, VDOT 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 that incidental take of the purple bean and tan riffleshell may occur during construction in the form of harm, harassment, and take of up to 18 purple bean and 115 tan riffleshell individuals due to physical relocation of individual mussels, crushing of individuals, and physical impacts due to siltation and other water quality degradation, in that portion of Indian Creek from 100 feet upstream of the existing Route 460 bridge to 80 feet downstream of the existing bridge.

#### EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy or destruction or adverse modification of 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 purple bean and tan riffleshell:

- o Instream construction must be conducted during the time of year when impacts to the purple bean and tan riffleshell reproductive cycle are minimized.
- o Siltation of the water column of Indian Creek must be minimized to avoid stress or death of the purple bean and tan riffleshell.
- o Construction activities within Indian Creek must be minimized to avoid siltation and physical injury to the purple bean and tan riffleshell.

#### TERMS AND CONDITIONS

To be exempt from the prohibitions of Section 9 of the Endangered Species Act, the Corps and VDOT 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. No instream work will be conducted during the time period of April 15 through June 15 and August 15 through September 30 of any year, in order to protect the purple bean and tan riffleshell during spawning and glochidial release.
2. Within one month prior to the initiation of construction, VDOT must perform a mussel survey of the action area. Any purple bean or tan riffleshell mussels found during this survey must be relocated to suitable habitat in Indian Creek or the Clinch River, outside of the action area at a location to be determined by the Service and the Virginia Department of Game and Inland Fisheries or their designees. Appendix C is a list of individuals who are qualified to conduct surveys and mussel translocations. If the individuals on this list are not available, contact this office. To ensure that an adequate survey and translocation are conducted, the names and proposed designs must be submitted to the Service for approval, before any work is conducted. Results of the survey and translocation must be submitted to the Service no later than 60 days following completion. The report must include the name of surveyor/s, dates of surveys, methods, results, and the number and location of mussels moved.
3. Population monitoring for the purple bean and tan riffleshell must be conducted annually, for five consecutive years following mussel relocation. If for any reason, construction is delayed following mussel relocation, monitoring must begin the year that construction is resumed and continue for four years thereafter. Monitoring must consist of an annual survey from the confluence of Indian Creek and the Clinch River, upstream 1,066 feet or 325 m [that area comprising Section 1 in Watson (1999)]. Appendix C is a list of individuals who are qualified to conduct surveys. If the individuals on this list are not available, contact this office. To ensure that adequate surveys are conducted, the names and proposed designs must be submitted to the Service for approval, before any work is conducted. Results of the surveys must be submitted to the Service no later than 60 days following completion and a final report, summarizing the findings of all 5 years of monitoring must be submitted to the Service within 120 days following completion of the final survey. The reports must include the name of surveyor/s, dates of surveys, methods, results, and the number and location of mussels found.
4. All water removed from Indian Creek from cofferdams, etc., must be pumped into filter bags constructed of non-woven geotextile fabric that are placed on uplands as far away from Indian Creek as practical.
5. No mechanized equipment will be allowed in Indian Creek or the Clinch River.
6. Vegetation removal adjacent to the streambank must be minimized.
7. Human traffic within the river during construction must be minimized.
8. All portions of the existing bridge will be removed from its existing location and will not be allowed to enter Indian Creek after removal. All debris will be contained and

removed from the site.

9. Erosion and sediment controls will be strictly adhered to in accordance with the Virginia Erosion and Sediment Control Handbook. All floodplain fill must be removed from the construction area immediately upon the termination of construction. All exposed soils must be stabilized and seeded immediately following disturbance. Initial stabilization may be with annual rye or orchard grass; permanent vegetation must be with native species.
10. Silt fences must be erected and maintained wherever there is the possibility of silt or sediments entering Indian Creek from instream work and/or due to bank erosion.
11. A representative (inspector) of VDOT Environmental Division, Bristol District must visit the site at least once every two weeks during construction to inspect the work area and confirm that the contractor is complying with the project description and Terms and Conditions found in this biological opinion, and permit conditions included in the Section 10/404 permit issued for this project by the U.S. Army Corps of Engineers, Norfolk District (Corps). If the inspector finds that there is non-compliance, he must stop all construction and contact this office within 24 hours. The inspector must visit the site unannounced and on differing days of the week from the previous visit.
12. All fuel, hydraulic fluid, oil, lubricants or similar products must be stored outside of the action area and in a secure location as far as practicable from the action area and Indian Creek. Adding and/or changing oil, fuel, hydraulic fluids, lubricants, or similar products must be accomplished outside of the action area and as far as practicable from the action area and Indian Creek.
13. Within three years following initiation of construction, VDOT must reintroduce 6,289 tan riffleshell and 918 purple bean mussels into the action area. These numbers are based on the number of individuals estimated to currently inhabit the action area. The Service, in consultation with VDOT and Dr. Richard Neves of Virginia Tech University, has determined that the collection, propagation, and reintroduction of this number of individual mussels over the next three years would cost \$83,739. VDOT proposed to provide this funding in their letter dated April 20, 2004 from Ms. Doris Bush of VDOT to Ms. Karen Mayne of the Service. Such funds must be provided to Virginia Tech prior to initiation of construction, with confirmation provided to the Service and the Corps of Engineers.
14. As proposed by VDOT in their letter dated June 3, 2004, VDOT must stabilize a 200-foot section of Indian Creek using natural channel design, in order to improve water quality and shade the waterway. Stabilization must be accomplished concurrent with project construction.
15. Care must be taken in handling any dead specimens of proposed or 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 imply 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.

16. VDOT is required to notify the Service at least 10 days before initiation of construction and 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

The Service anticipates that incidental take of the purple bean and tan riffleshell may occur during construction in the form of harm of up to 18 purple bean and 115 tan riffleshell individuals. 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. The Corps 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 project vicinity is urban/residential and the riparian corridor of Indian Creek in the action area is largely composed of early successional vegetation dominated by grasses, forbs, and shrubs that is periodically maintained by mechanical means. Runoff from nearby impervious surfaces and grassy areas may contain relatively high levels of nutrients and suspended solids. The water quality of Indian Creek, and the tan riffleshell and purple bean, would benefit from a more permanent riparian buffer dominated by trees.

The Service recommends that VDOT insure that the riparian zone of Indian Creek, within the action area, be protected from frequent and periodic mowing in order to allow trees and older shrubs to dominate. Please contact this office if we can provide further assistance with such an

initiative.

In their April 20, 2004 letter, VDOT stated that they have been instrumental in working with other parties to encourage them to undertake three initiatives to improve water quality in Indian Creek and the Clinch River. These measures include:

- a rain garden demonstration project to intercept and purify runoff from the Route 460 bridge,
- an approximate 150-acre hillside conservation easement,
- construction of infiltration trenches in a nearby shopping area to help purify runoff prior to entry into nearby waterways.

The Service recommends further investigation into these projects. Please contact this office if we can provide assistance with any of these initiatives.

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 the Corps and/or VDOT.

#### REINITIATION NOTICE

This concludes formal consultation on the action outlined in the Corps request letter dated March 3, 2004. 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 opinion; 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 the Corps in fulfilling our mutual responsibilities under the Endangered Species Act. Please contact William Hester of this office at (804) 693-6694, ext. 134 if you require additional information or wish to discuss our comments further.

Sincerely,

Karen L. Mayne  
Supervisor

Virginia Field Office

cc: Leo Snead, VDOT Headquarters, Richmond, VA  
George Young, VDOT, Bristol District Office

## REFERENCES

- 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.
- \_\_\_\_\_. 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.
- \_\_\_\_\_. 2004. Personal communication. U.S. Geological Survey, Knoxville, Tn.
- Beaty, B.B. and R.J. Neves. 1998. 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, Blacksburg, Va. 6 pp.
- Bogan, A.E. and P.W. Parmalee. 1983. Tennessee's rare wildlife. Volume II: the mollusks. Tenn. Wildl. Resour. Agency, Tenn. Heritage Prog., Tenn. Dep. Conserv., Univ. Tenn., Knoxville, NT. 123 pp In U.S. Fish and Wildlife Service. 1984. Tan riffle shell pearly mussel recovery plan. U.S. Fish and Wildlife Service, Atlanta, Ga. 59 pp.
- Bruenderman, S. 1999. Personal communication. *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. Master's Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Va. 111 pp.
- Ellis, M. M. 1936. Erosion silt as a factor in aquatic environments. *Ecology* 17:29-42.
- 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*). *in* Federal Register Vol. 62, No. 7, Friday, January 10, 1997. pp.1647-1658.
- 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). Master's Thesis. Virginia Polytechnic Institute and State University., Blacksburg, Va.
- Koch, L. 1999. Personal communication. U.S. Fish and Wildlife Service, Abingdon, Va.

- 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, Environ. Sci. Div. Publ. No. 1565, Oak Ridge, Tn. 134pp.
- Neves, R.J. 1996. Unpublished notes dated July 23, 1996. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, Va. 2 pp.
- \_\_\_\_\_. 1999a. Personal communication. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, Va.
- \_\_\_\_\_. 1999b. Personal communication. *in* Watson, B. 1999. Population biology and fish hosts of several federally endangered freshwater mussels (Bivalvia: Unionidae) of the upper Tennessee River drainage, Virginia and Tennessee. MS Thesis, Virginia Tech, Blacksburg, Va. 134 pp.
- \_\_\_\_\_. 2003. Electronic mail from Service to 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.
- \_\_\_\_\_. 2004c. Electronic mail from Dr. Richard Neves to the Service. Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech, Blacksburg, Va.
- Parmalee, P.W. and A.E. Bogan. 1998. The freshwater mussels of Tennessee. The University of Tennessee Press. Knoxville, Tn. 328 pp.
- Pinder, Michael J. and J. W. Jones. 2000. Species composition and biotic condition of the fish community of Indian Creek, Tazewell County, Va. *Banisteria*, No. 16. 14 pp.
- Rogers, Susan O. 1999. Population biology of the tan riffleshell (*Epioblasma florentina walkeri*) and the effects of substratum and light on juvenile mussel propagation. Master's Thesis. Virginia Polytechnic Institute and State University, 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). *J. N. Am. Benthol. Soc.* 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. 2003. Agency draft recovery plan for Cumberland elktoe, oyster mussel, Cumberlandian combshell, purple bean, and rough rabbitsfoot. Atlanta, Ga. 176 pp.
- Sinclair, R.M. and B.G. Isom. 1961. A preliminary report on the introduced Asiatic clam, *Corbicula*, in Tennessee. *in* U.S. Fish and Wildlife Service. 2003. Agency draft recovery plan for Cumberland elktoe, oyster mussel, Cumberlandian combshell, purple bean, and rough rabbitsfoot. Atlanta, Ga. 176 pp.
- Skrabis, K.E. 2004. Evaluation of a take under the Endangered Species Act: Rte. 460 bridge mitigation, Tazewell County, Virginia. U.S. Department of the Interior, Washington, DC. 13 pp.
- Sokal, R. R. and F. J. Rohlf. 1995. Biometry: the principles and practice of statistics in biological research. *in* Watson, B. 1999. Population biology and fish hosts of several federally endangered freshwater mussels (Bivalvia: Unionidae) of the upper Tennessee River drainage, Virginia and Tennessee. MS Thesis, Virginia Tech, Blacksburg, Va. 134 pp.
- Stansbery, D.H. 1976. Status of endangered fluviatile mollusks in central North America: *Epioblasma walkeri* (Wilson and Clark 1914). Ohio St. Univ. Res. Found. Rep., Dep. Interior, Fish Wildl. Serv., Bur. Sport Fish. Wildl. 7 pp. *in* U.S. Fish and Wildlife Service. 1984. Tan riffle shell pearly 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. *in* Rogers, Susan O. 1999. Population biology of the tan riffleshell (*Epioblasma florentina walkeri*) and the effects of substratum and light on juvenile mussel propagation. Master's Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Va. 111 pp.
- U.S. Fish and Wildlife Service. 1979. Biological opinion from the U.S. Fish and Wildlife Service, Washington, DC to the Tennessee Valley Authority, Norris, Tn. 15 pp.
- \_\_\_\_\_. 1984. Tan riffle shell pearly mussel recovery plan. U.S. Fish and Wildlife Service, Atlanta, Ga. 59 pp.
- \_\_\_\_\_. 1993. Dwarf wedge mussel recovery plan. Hadley, Ma. 52pp.
- \_\_\_\_\_. 1997. Biological opinion from the U.S. Fish and Wildlife Service to the Norfolk District U.S. Army Corps of Engineers on the Route 72 bridge construction over the Clinch River, Scott County, Virginia dated October 28, 1997. U.S. Fish and Wildlife Service, Gloucester, Va. 18 pp.

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

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

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\_\_\_\_\_. 2003. Agency draft recovery plan for Cumberland elktoe, oyster mussel, Cumberlandian combshell, purple bean, and rough rabbitsfoot. Atlanta, Ga. 176 pp.

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\_\_\_\_\_. 2004. 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.

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

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

Figure 1

Site map.

Figure 2

Constuction plans.

Table 1. Calculation of purple bean and tan riffleshell mussel populations likely to occur in Indian Creek\*.

	Purple Bean	Tan Riffleshell
# of mussels detected in 1996/1997 survey areas <sup>1</sup>	26	130
Likely # of adult mussels >2 years of age in survey areas (3 times the # detected) <sup>2</sup>	$26 \times 3 = 78$	$130 \times 3 = 390$
Likely # of juvenile mussels <2 years of age in survey areas (8 times the total # of adults) <sup>2</sup>	$78 \times 8 = 624$	$390 \times 8 = 3,120$
Total # of mussels likely in surveyed sections of Indian Creek	$78 + 624 = 702$	$390 + 3,120 = 3,510$

\*Not all appropriate habitat was surveyed.

<sup>1</sup>Watson (1999).

<sup>2</sup>Neves (2003).

Table 2. Calculations of purple bean and tan riffleshell mussels likely to be killed or injured by the replacement of the U.S. Route 460 bridge.

	Purple Bean	Tan Riffleshell
# of adult mussels detected in 1996/97 survey area <sup>1</sup>	4	25
Likely # of adult mussels >2 years of age in survey area (3 times the # detected) <sup>2</sup>	$4 \times 3 = 12$	$25 \times 3 = 75$
Likely # of juvenile mussels <2 years of age in survey area (8 times total # of adults) <sup>2</sup>	$12 \times 8 = 96$	$75 \times 8 = 600$
Total # of mussels likely in survey area	$12 + 96 = 108$	$75 + 600 = 675$
Total # of mussels likely to be in the project action area [action area (180 ft.) divided by survey area (1,066 ft.) = 0.17]	$108 \times 0.17 = 18$	$675 \times 0.17 = 115$

<sup>1</sup>Watson (1999).

<sup>2</sup>Neves (2003).

**Appendix A**

## Consultation History

- 10-10-02 VDOT presents project at the Interagency Coordination Meeting in Richmond, VA.
- 12-2-02 Service letter to the Corps stating that formal consultation for this project would not be necessary, provided there was no work below ordinary high water.
- 1-14-03 VDOT presents project at the Interagency Coordination Meeting in Richmond, VA.
- 1-31-03 Service letter to the Corps stating that this project is likely to affect the purple bean and tan riffleshell.
- 4-8-03 VDOT presents project at the Interagency Coordination Meeting in Richmond, VA.
- 7-23-03 Service letter to the Corps regarding comments on the draft biological assessment from VDOT.
- 8-18-03 Interagency site visit and meeting at proposed project location.
- 9-15-03 Service letter to the Corps documenting avoidance and habitat rehabilitation efforts discussed during the 8-18-03 interagency site visit and meeting.
- 10-15-03 VDOT presents project at the Interagency Coordination Meeting in Richmond, VA.
- 12-8-03 Interagency conference call to discuss habitat rehabilitation.
- 1-20-04 Service letter to the Corps regarding the estimated cost to replace mussels that may be affected by the Route 460 Bridge Replacement, and recommending riparian restoration.
- 2-9-04 Service letter to the Corps providing additional information on riparian restoration and the estimated cost of mussel replacement.
- 3-5-04 Service receives request from Corps of Engineers, dated March 3, 2004, to initiate formal consultation. Request includes final biological assessment.
- 3-15-04 Service letter to the Corps acknowledging that the Corps' March 3, 2004 letter

requesting initiation of formal consultation was complete.

- 4-20-04 Letter from VDOT to the Service proposing to contribute \$83,739 for mussel propagation and reintroduction, and establishment of a 200-foot by 35-foot riparian buffer on Indian Creek, upstream of the action area.
- 6-3-04 Letter from VDOT to the Service proposing to stabilize a 200-foot section of Indian Creek owned by Mrs. Faye Shrader. VDOT would stabilize a 125-foot section with large rip rap covered with soil. This section would be planted with native vegetation. The remaining 75 feet would consist of lowering the floodplain, above the bankfull elevation.

**Appendix B**

VDOT Letters Date April 20 and June 3, 2004

## Appendix C

### TENNESSEE RIVER DRAINAGE FRESHWATER MUSSELS SURVEY CONTACTS

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(WHESTER: 7-19-04)