United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

February 26, 2002

Lt. Colonel Steven W. Gay
District Engineer
U.S. Army Corps of Engineers
P.O. Box 1070
Nashville, Tennessee 37202-1070

Attention: Mr. Wayne Easterling, Planning Branch

Re: FWS #01-3529

Dear Colonel Gay:

Enclosed is the Biological Opinion for the proposed Chickamauga Lock Project at Chickamauga Dam in Hamilton County, Tennessee. This completes formal consultation for the project as required by the Endangered Species Act (Act) and fulfills the Corps of Engineers' obligations in accordance with Section 7 of the Act.

Thank you for the opportunity to provide comments on this project. If you have any questions, please contact Jim Widlak of my staff at 931/528-6481, ext. 202.

Sincerely,

Lee A. Barclay, Ph.D.
Field Supervisor

Enclosure

BIOLOGICAL OPINION
FOR THE PROPOSED
CHICKAMAUGA LOCK PROJECT
HAMILTON COUNTY, TENNESSEE

Prepared by:

James C. Widlak
Ecological Services Field Office
446 Neal Street
Cookeville, Tennessee

February 2002

INTRODUCTION

Fish and Wildlife Service (Service) biologists have reviewed the biological assessment and final environmental impact statement for the Chickamauga Dam Navigation Lock Project located in Hamilton County, Tennessee. Your September 7, 2001, request for formal consultation was received on September 10, 2001. This document represents our biological opinion on the effects of that action on the endangered pink mucket pearly mussel (*Lampsilis abrupta*) and orange-foot pimpleback (*Plethobasus cooperianus*), and on the threatened snail darter (*Percina tanasi*) in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

0 Consultation History

This biological opinion is based on information provided in your August 2001 biological assessment; the March 1996 final environmental impact statement; a field investigation on May 1, 2001, attended by Jim Widlak of the Cookeville Field Office and Corps' personnel to inspect the project site and discuss alternatives; a February 5, 2002, request by John Jenkinson of the Tennessee Valley Authority to include that agency in this consultation and to include the threatened snail darter; and other sources of information. A complete administrative record of this consultation is on file in the Cookeville Field Office, 446 Neal Street, Cookeville, Tennessee 38501; telephone, 931/528-6481.

BIOLOGICAL OPINION

0 Project Description

Since completion, Chickamauga Dam has been negatively affected by a phenomenon known as concrete growth. A reaction between the alkali in the cement and the aggregate rock used in the construction of the lock and dam causes physical expansion of the concrete structures. The first indication of concrete growth at Chickamauga Dam was the appearance of surface cracks on the spillway deck and the lock; eventually cracks appeared over the entire dam. In time, significant structural cracks developed in the lock chamber and approach walls. Instrumentation has been installed to monitor structural movement and internal stress; however, at the present time, there is considerable concern about the structural integrity of the lock. Repairs have been made, some of which have required unscheduled closure of the lock. It is estimated that the life expectancy of the lock due to concrete growth is no more than 10 years.

To remedy the problems with the current navigation lock and to alleviate concerns regarding the structural integrity of the lock and dam, several alternatives were considered, but the following is the preferred alternative:

Construction of a New 110 Foot X 600 Foot Navigation Lock - A new lock representing the general standard for navigation locks on the lower Tennessee River would be constructed. Construction on the new lock would be initiated five years before de-commissioning of the existing lock; this would allow the new lock to be opened for service before closure of the existing lock.

The new lock would be located on the riverward side of the existing lock and downstream from the dam. Construction would require removal of four spillway gates and bays and part of the downstream approach wall. A sheet pile cofferdam would be constructed downstream during construction; the dam would provide the upstream water barrier during construction. Upstream and downstream approach walls, each 800 feet in length, would also be constructed on the spillway side. Approximately 1,000 feet of the navigation channel would be widened downstream from the dam to the railroad bridge. The realignment of the navigation channel would also require some riverbank excavation in the vicinity of the downstream railroad bridge. Two new 30-foot mooring cells would be constructed upstream and downstream from the new lock. Lake Resort Drive would be relocated and two new bridges would be constructed: one over North Chickamauga Creek and one between Lake Resort Drive and the access road to the North Chickamauga Creek Greenway. A "laydown" (i.e., temporary storage) area would be located downstream from the dam; a construction railhead and a contractor barge mooring slip would potentially be constructed in this area. An upland spoil area would be located adjacent to the North Chickamauga Greenway.

The existing lock would be monitored during construction of the new lock until 2010 (or sooner), at which time it would be closed. A portion of the lock chamber and culverts would be plugged with

concrete and the mitre gates would be removed. The lock walls would be strengthened by post-tensioning, and wide slots would be cut in the approach walls to alleviate problems associated with concrete growth. Miscellaneous buildings and equipment would be removed. This process would require construction of needle dams (similar to cofferdams) and de-watering of the lock chamber.

To avoid project-related impacts to federally listed species in the study area, protective measures have been incorporated into the project plans. Prior to dredging downstream, divers will be employed to search for individuals of the pink mucket pearly mussel and orange-foot pimpleback that exist within the impact area. All native mussels found, including the pink mucket pearly mussel and orange-foot pimpleback, will be relocated to suitable habitat downstream within the State-designated mussel sanctuary. The footprint of the new lock and lower approach wall will also be searched. All native mussels, including any pink mucket pearly mussels and orange-foot pimpleback mussels, found will be similarly relocated. This effort will occur when water temperature is above 60 degrees Fahrenheit and during the dry season (August-September). Trained malacologists and divers with experience in conducting mussel collections will be employed to conduct this relocation. To avoid adverse effects to the snail darter, construction crews will set off small, non-destructive charges prior to beginning work in the river to flush any fish from the construction area.

In addition to the protective measures incorporated into the project, two additional measures will be implemented to enhance aquatic habitat and protect listed species. Upon completion of the new lock, the cobble material from the cofferdams will be spread over the dredged area in the temporary lock approach to restore the substrate habitat over approximately 11 acres of river bottom.

0 Background Information

Because of its age and the fact that it did not undergo glaciation, the Tennessee River Basin has long been considered to be a primary center of freshwater mussel speciation. More than 100 species historically occurred and evolved in the Tennessee River and its tributaries. Since the 1800's, however, populations of many species of freshwater mussels have undergone significant declines, some to extinction and others reduced to remnants restricted to isolated portions of their former ranges. Several species in the genus *Epioblasma* have not been recorded from any stream in the entire Tennessee or Cumberland River drainages for more than 50 years and are presently believed to be extinct. At present, of the more than 60 species which still inhabit streams and rivers in the basin, 26 are officially listed as endangered species. Within the Tennessee River Basin, mussels are found in the main stem of the river, as well as in large tributaries and medium-sized and small headwater streams. Some species are more tolerant than others, occurring in mud-bottomed pool habitats. However, most species of freshwater mussels are found in riffle or shoal habitat with relatively swift current over substrate consisting of mixed sand, gravel, and cobble. Swift currents maintain high levels of dissolved oxygen and sweep the bottom clean of silt and other fine particulate materials. Being filter feeders, freshwater mussels consume algae, zooplankton, diatoms, detritus, and other matter suspended in the water column.

Freshwater mussels are sedentary animals. Unless their habitats are de-watered or they are dislodged from the stream bottom, they may remain in one general location throughout their lives. Mussels are filter feeders, siphoning food particles from the water. Because of their sedentary nature and feeding habits, they tend to accumulate certain pollutants (e.g., pesticides, heavy metals) and they are considered to be excellent indicators of water quality.

Reproduction among freshwater mussels is unique. Individuals of most species become sexually mature at three to four years of age. Males release sperm into the water column which are siphoned from the water by females during normal respiration and feeding activities. Fertilized eggs are stored in specially modified gills (marsupia) that act as brood pouches for the developing larvae (glochidia). Fully developed glochidia are released into the water column separately or in masses (conglutinates), and they drift with stream currents. Within three or four days, the glochidia must attach (i.e., encyst on the gill filaments, opercles, or fins) to a suitable fish host in order to survive. To increase the potential for successful attachment to a fish host, some mussel species have developed specialized mantle flaps which mimic fish prey items and act as a lure for the host fish. Those glochidia not successfully attaching to a host fish probably settle to the stream bottom eventually and perish or serve as prey for fish or invertebrate predators. During the period of encystment, which lasts up to several weeks depending on water temperatures and other factors, the glochidia metamorphose. When metamorphosis is complete, the glochidia detach from their host and, again drifting with the current, settle to the stream bottom as fully developed, free-living juvenile mussels. It is thought that there are two stages in this complex life cycle that are critical: attachment to the host and settling to the bottom after detachment. Significant mortality likely occurs at both stages as a result of glochidia attaching to unsuitable hosts (some mussel species have been shown to be highly host-specific) or not successfully attaching, and from settling onto unsuitable habitat after detaching from the fish host. To compensate for high mortality, most species of freshwater mussels have high reproductive capacities; depending on the size of the mussel, tens of thousands of glochidia may be released by each female annually. Thus, high reproductive capacities, coupled with long life spans (freshwater mussels are known to live as long as 56 years, or longer), indicate that low but consistent annual recruitment may be adequate to maintain a mussel population.

Two reproductive modes have been identified for freshwater mussels. Fertilization of eggs, release of glochidia, and metamorphosis on fish hosts occur from spring through late summer in short-term breeders. In long-term breeders, fertilization and glochidial development occur from summer through early winter, but glochidia are retained in the gill pouches and released the following year. In streams supporting several species of long- and short-term breeders, glochidia may be present in the water column year-round.

A number of factors have been identified as causes in the decline of freshwater mussel populations in the Tennessee River Basin. Construction of impoundments altered miles of riverine habitat and eliminated significant populations of riffle-dwelling mussel species throughout large portions of the Tennessee River. Prolonged or excessive sedimentation of streams and rivers resulting from many types of land uses blanketed the stream bottoms, causing mussels to cease siphoning and induced significant stress as a result of reduced feeding and respiration. Development and changes in land

use also resulted in introduction of pollutants into the streams and rivers in the Tennessee River Basin. Pollutants such as pesticides and heavy metals may result in direct mortality to mussels, or they may accumulate in body tissues causing stress-related mortality or chronic effects. Exploitation of mussel populations, during the early 1900's by commercial harvesters for the pearl button industry and currently for the cultured pearly industry, has resulted in significant population declines. Additionally, recently reported die-offs of unknown cause have significantly reduced remaining mussel populations. Many endangered mussel species presently exist only in river reaches below dams, and in headwater stream and river reaches that have not been impounded. Although species of mussels that are tolerant of lentic conditions still exist or have re-colonized habitats in the upper reaches of some reservoirs, these communities are neither as abundant nor diverse as those existing prior to impoundment.

- Pink mucket pearly mussel

The pink mucket pearly mussel, *Lampsilis abrupta*, was listed as an endangered species on June 14, 1976 (U.S. Fish and Wildlife Service 1999). It is an Ohioan species with a relatively wide range. Historical records indicate that this species once occurred in large rivers in Alabama, Arkansas, Illinois, Indiana, Iowa, Kentucky, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. Presently, known populations occur only in the Big River, Black River, Clinch River, Cumberland River, Current River, Gasconade River, Green River, Kanawha River, Little Black River, Meramec River, Ohio River, Osage River, Paint Rock River, and Tennessee River (U.S. Fish and Wildlife Service 1985, 1992; Parmalee and Bogan 1998). Of these extant populations, only four (i.e.,Cumberland River, Meramec River, Paint Rock River, and Tennessee River) have shown recent evidence of reproduction. Some taxonomists have recently postulated that the reproducing population west of the Mississippi River is not *Lampsilis abrupta*, but rather are sub-species of another endangered species–i.e., *Lampsilis higginsi*. If this is true, then only three known reproducing populations of *L. abrupta* are extant. Although it has a relatively wide distribution and is apparently more tolerant of lentic habitat conditions than other listed mussel species, the pink mucket pearly mussel is reported to be rare where it occurs.

This species inhabits primarily shoal areas in large rivers with swift currents, depths of 0.5 to 8.0 meters (1.6 feet to 26.2 feet), and mixed sand/gravel/cobble substrate. Notwithstanding, the pink mucket pearly mussel appears to have adapted to lentic conditions in the upper reaches of some impoundments. Life history aspects of this species are presently unknown, although it may be a long-term breeder, as are other *Lampsilis* species. The glochidia are un-described and the fish host is unknown (U.S. Fish and Wildlife Service 1985, 1992; Parmalee and Bogan 1998).

The proposed project is within the range of the pink mucket pearly mussel. Personnel from the Tennessee Valley Authority (TVA) conducted a mussel survey on May 8-10, 2001; 918 mussels representing 12 species were collected during that survey (Fraley 2001). No pink mucket pearly mussels were collected during the survey; however, 2 specimens were collected in the same area during a previous survey (Jenkinson 1992).

- Orange-foot pimpleback

The orange-foot pimpleback, *Plethobasus cooperianus*, is also an Ohioan species. It was listed as endangered on June 14, 1976 (U.S. Fish and Wildlife Service 1999). This species historically occurred in the Clinch, Cumberland, Duck, French Broad, Holston, Kanawha, Ohio, Rough, Tennessee, and Wabash Rivers. It was reported to be an abundant species in the Cumberland, Ohio, and Wabash Rivers; however, it was rare in the Tennessee River and its tributaries above Knoxville. Presently, the orange-foot pimpleback is known to occur in the Tennessee River for an undetermined number of miles below Pickwick Dam; the Cumberland River at Bartlett's Bar and Rome Landing; and the lower Ohio River near Metropolis and Olmstead, Illinois, and McCracken County, Kentucky. Of these three populations, only the one in the Tennessee River is known to be reproducing (U.S. Fish and Wildlife Service 1984, 1992; Parmalee and Bogan 1998).

As are most freshwater mussel species, the orange-foot pimpleback is a shoal species. It occurs in large rivers, inhabiting mixed sand/gravel/cobble substrate in water depths of 4.6 to 8.8 meters (15 to 29 feet). The species' life history is unknown, but gravid females have been collected during the summer, indicating that it is a short-term breeder. The glochidia are un-described and the fish host is unknown (U.S. Fish and Wildlife Service 1984, 1992; Parmalee and Bogan 1998).

The proposed project is also within the known range of the orange-foot pimpleback. Although this species was not found during the 1990 or 2001 mussel surveys conducted by TVA divers, habitat conditions are suitable for mussel species inhabiting shoal areas, as evidenced by collection of 12 species of mussels. It is possible that the orange-foot pimpleback exists in the project area in low numbers.

The Tennessee River Basin also supports a diverse fish fauna, including unique species of minnows and darters. Many of the fish species are endemic to the Tennessee River drainage or are restricted to small ranges in unique types of habitat (e.g., springs). Many of the factors identified as threats to freshwater mussels in the Tennessee River Basin have also had significant effects on the fish fauna.

- Snail darter

The snail darter, *Percina tanasi*, was officially listed on October 12, 1975. The original listing designated the snail darter as an endangered species. Critical habitat for the species was designated on April 1, 1976, to include the Little Tennessee River from River Mile 0.5 to River Mile 17. Subsequent to listing, additional populations were discovered and, on July 5, 1984, the snail darter was re-designated as a threatened species. The critical habitat designation was eliminated because that reach of the Little Tennessee River was impounded when the Tellico Dam project was completed.

The snail darter is described as a robust member of the subgenus *Imostoma*, growing to maximum total length of 85 millimeters. Coloration above the lateral line is generally brown with occasional traces of green. The area behind the origin of the dorsal fin is crossed by four prominent dark brown saddles. Body color below the lateral line is lighter and is interspersed with dark blotches. The belly is usually white and the dorsal area of the head is dark brown. Cheeks are mottled brown with traces of yellow (USFWS 1983).

Since pre-impoundment fish surveys of the mainstem of the Tennessee River and its major tributaries are lacking, it is not possible to delineate the historical range of the snail darter. It is thought, however, that this species occurred in the main channel of the Tennessee River and the lower reaches of its major tributaries from Fort Loudon Dam downriver to the confluence of the Paint Rock River in Alabama (USFWS 1983). Populations likely existed in the mainstem Tennessee River in north-central Alabama and eastern Tennessee, and in the lower reaches of the Hiwassee, Clinch, Little Tennessee, French Broad, and Holston Rivers in Tennessee (USFWS 1983).

Since listing of the snail darter, additional populations have been discovered and several attempts have been made to establish populations in the upper Tennessee River drainage. Currently, populations are known to occur in the Tennessee River below Watts Bar Dam (Loudon County, Tennessee), Nickajack Dam (Marion County, Tennessee; Jackson County, Alabama), and Chickamauga Dam (Hamilton County, Tennessee), Sewee Creek (Meigs County, Tennessee), South Chickamauga Creek (Hamilton County, Tennessee; Catoosa County, Georgia), Sequatchie River (Marion County, Tennessee), and Paint Rock River (Jackson and Madison counties, Alabama) (USFWS 1983). Populations were re-introduced in the Elk River (Giles County, Tennessee), Holston River (Knox County, Tennessee), Hiwassee River (Polk County, Tennessee), and Nolichucky River (Greene County, Tennessee); low numbers of snail darters have subsequently been found in the Nolichucky, Elk, and Sequatchie Rivers, but populations may have become established in the Holston and French Broad Rivers as a result of the transplant into the Holston River.

The snail darter inhabits shoal areas having relatively swift flow over mixed substrate of sand, gravel, cobble, and rock ledges. The species inhabits shallow water areas, but may also occur in shoals with water depth of 12 to 20 feet (USFWS 1983). Snails comprise approximately 60 percent of the diet of the species, but caddisfly and black fly larvae are also consumed seasonally (USFWS 1983).

Approximately 25 percent of snail darter populations reach maturity at one year of age. Mature males migrate to spawning shoals from November through late January. Spawning occurs through mid-March. Eggs are deposited on gravel or cobble substrate and hatch within 20 days. Newly hatched larval snail darters drift with river currents to pool habitats which serve as nursery areas. Juvenile darters may spend five to seven months in the nursery areas, after which they migrate upstream to shoal and riffle habitats where they spend the remainder of their lives (USFWS 1983).

The project area is within the range of the snail darter. Shoal habitats below Chickamauga Dam likely support the species, and pool habitats may provide important nursery habitat for larval snail darters.

0 Environmental Baseline

The aquatic habitats in the Tennessee River Basin have been significantly altered and impacted since European settlement of the area. The main stem of the Tennessee River has been impounded from near its mouth in Kentucky upstream to Knoxville for flood control, navigation, and other purposes. These impoundments have effectively altered the riverine habitat into a series of lake-like pools. At times, discharges from some of these dams contain low levels of dissolved oxygen (i.e., less than 5 parts per million), which can have significant adverse impacts on downstream aquatic communities. Portions of the remaining riverine habitat below the dams have been dredged to maintain a navigable channel for commercial vessels. Urban development in Florence and Decatur, Alabama; Chattanooga and Knoxville, Tennessee; and smaller communities along the river has continued to increase and has consequently affected aquatic habitats. Removal of sand and gravel from the river for commercial purposes has significantly altered aquatic habitat. And, other land uses such as agriculture, mining, and timber harvest have affected aquatic habitats in the Tennessee River and the species that utilize them.

The exotic zebra mussel was introduced into the Great Lakes from Europe in 1988, and has rapidly spread throughout the eastern United States. It is presently known to exist in the Ohio, Tennessee, Mississippi, and Cumberland Rivers. This species does not require a fish host to complete its life cycle and it can produce one or more generations per year. Consequently, this species can quickly reach densities of thousands of individuals per square meter. At these densities, the zebra mussel has the ability to filter tremendous quantities of water, reducing the availability of food for native mussels. In addition, zebra mussels attach to any hard surface, including the shells of living mussels and snails, reducing the ability of the mussel or snail to feed and respire. Although densities of zebra mussels in the Tennessee River have not exhibited dramatic increases as in other waters, and although populations of native mussels appear to have survived high infestations of zebra mussels in some areas, the long-term impacts to native freshwater mussel species associated with zebra mussel infestations are presently unknown.

The Tennessee River in the project area is approximately 1,050 feet in width and 8 to 35 feet deep. It is in a transition zone between the riverine habitat in the tailwater of Fort Loudon Dam and the headwaters of Watts Bar Lake. The aquatic fauna in this reach of the river is likely being adversely affected as a result of water quality degradation from a number of sources. Fort Loudon Dam frequently discharges water with two to three parts per million dissolved oxygen (TVA 1990). Release of water with low oxygen content coupled with discharges from large commercial facilities located immediately upstream from the project site may result in degradation of water quality in the river and stress to aquatic species. Furthermore, the project area is subject to commercial barge traffic which likely affects aquatic habitats. Recently, the Tennessee Valley Authority has made efforts to improve the quality of water discharged from some of its facilities on the Tennessee River. Aeration of the water used for hydropower generation prior to discharge has reduced the degree of adverse impacts to downriver aquatic species.

An attempt was recently made by TVA to improve habitat conditions for juvenile mussels in the Tennessee River below Watts Bar Dam. Large boulders were placed in the tailwater area below the dam. It is anticipated that fine gravel and sand will settle immediately downstream from the boulders, providing suitable habitat for newly transformed juvenile mussels to settle and grow. Long-term monitoring of this boulder "field" will reveal if the effort has succeeded.

Over the past five years, there have been a number of actions conducted in the project impact area, primarily on Tennessee River tributaries. Housing developments have been constructed in the City of Loudon and along the Little Tennessee River, and an industrial park was constructed in Loudon. A new wastewater treatment plant was constructed in Loudon on Sweetwater Creek and a recreational impoundment was constructed on Town Creek in the town of Lenoir City. A bank stabilization project was completed on Tellico Lake and several private boat docks, boathouses, and boat launching ramps were constructed on Tellico Lake and the Little Tennessee River. On the main stem of the Tennessee River, additions were made to an existing barge terminal, a sewer line crossing and water intake structure were constructed, and a bank stabilization project consisting of placement of riprap on the riverbank was completed. Some of these projects likely have had minimal impacts on the aquatic habitats in the Tennessee River and the species that inhabit them, including the orange-foot pimpleback and pink mucket pearly mussel. Others, such as the housing and industrial developments, boat ramps, and barge terminal, may have had more significant direct effects and could potentially continue to adversely effect aquatic species in the Tennessee River.

0 Direct/Indirect Effects

Implementation of the preferred alternative could adversely impact aquatic resources downstream. The new lock and approach wall would be constructed on the riverward side of the existing lock and would require removal of four spillway gates. Construction of the downstream cofferdam will cause some level of sedimentation. Project-related construction on the riverbanks at and downstream from the dam will also be sources of sedimentation. Bank excavation and dredging downstream to align the navigation channel will cause sedimentation, and will disturb the river bottom. Increased number of tows and horsepower of towboats using the new lock will result in new areas of scour on the river bottom, which will likely eliminate benthic organisms from the scoured areas. Runoff from spoil disposal areas could also be a source of sediment in the river. Additionally, discharges from those areas and from settling basins could introduce various pollutants.

Dredging to provide access to the new lock and to improve the navigation channel downstream from the dam could have adverse impacts on mussel resources in the river. Portions of the mussel beds adjacent to the riverbank and navigation channel could be destroyed by dredging activities; substrate could be destabilized on areas adjacent to those dredged. Individual mussels could suffer direct mortality from dredging and others could be dislodged from the substrate and moved downstream by river currents.

Dredging and other project-related activities in the river could alter or destroy suitable habitat for the snail darter. Sediment could deposit on gravel substrates, smothering eggs. Pollutants running off from construction areas and equipment cleaning/staging areas could cause direct mortality to adult and larval snail darters.

0 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 ESA.

Construction of new navigation facilities can make a reach of river more attractive to industry associated with river-related activities. Industries may choose to locate manufacturing facilities along the river for convenience of loading and shipping products. Barge loading and fleeting facilities may also choose to construct their own support facilities in the vicinity of the new Federal facilities. However, the new lock at Chickamauga Dam will replace the existing lock. River and barge-related industries have already located sites along the river in the vicinity of the dam. Although construction of the new lock may lead to further development, there is no reasonable certainty that future development will occur. Therefore, cumulative effects, as defined by the Endangered Species Act, are not anticipated to occur.

0 Conclusion

After reviewing the current status of the pink mucket pearly mussel and orange-foot pimpleback, the environmental baseline for the action area, the effects of the proposed navigation lock construction, and the cumulative effects, it is our biological opinion that the construction of a new lock at Chickamauga Dam, as proposed, is not likely to jeopardize the continued existence of the pink mucket pearly mussel, orange-foot pimpleback, or the snail darter. Additionally, the proposed project is not likely to destroy or adversely modify designated critical habitat. No critical habitat has been designated for the two mussel species, therefore, none will be affected. Critical habitat was designated for the snail darter between River Miles 0.5 and 17 on the Little Tennessee River in Loudon County, Tennessee; however that habitat is not within the project impact area and was eliminated as critical habitat upon its destruction by the Tellico Lake impoundment. Therefore, the proposed project will not affect critical habitat for the snail darter.

INCIDENTAL TAKE

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as 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 any take of listed animal species that results from , but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. 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 a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in Section 7(o)(2) to apply. The Corps of Engineers and Tennessee Valley Authority have a continuing duty to regulate the activity covered by this incidental take statement. If the Corps of Engineers and Tennessee Valley Authority (1) fail to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fail to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse.

0 Amount or Extent of Incidental Take

The Service anticipates that incidental take of the orange-foot pimpleback, pink mucket pearly mussel, and snail darter will be difficult to detect for the following reasons: 1) the Tennessee River at the project site is wide and deep. The water is not clear, thus incidental take could only be determined by divers. 2) Although the orange-foot pimpleback and pink mucket pearly mussel are sedentary, they are almost completely buried in the substrate for most of their lives. If disturbed, dislodged from the substrate, or if a spill occurred, individuals would tend to cease siphoning and burrow completely into the river bottom. 3) Because of their rarity, intensive efforts by divers in limited visibility conditions would be needed to collect dead or injured specimens. 4) It would be extremely difficult to attribute death or injury of the listed mussels to project-related activities. 5) Any sedimentation or spill is likely to be diluted within a short distance of the site of the source. 6) Any fish that served as glochidial hosts that were killed or injured would be quickly moved downriver. 7) The snail darter is a small, benthic species. It inhabits gravel shoals, occurring under and amongst the rock substrate. Larval snail darters occupy pool habitats; any individuals killed by project-related activities would likely be located under rocks or they would be quickly moved downriver. However, because of the sedentary nature of the mussel species, incidental take of these

listed species can be anticipated as a consequence of loss of habitat or degradation of water quality. No mussel density data or population estimates are available for the project impact area, thus it is not possible to estimate a level of take of the pink mucket pearly mussel or orange-foot pimpleback. However, it is anticipated that all of the mussels within the area that will be disturbed or altered during work on the lower approaches and lock could be taken. Snail darters migrate between shoal habitats to spawn, and larval snail darters drift into pool habitats. Incidental take can be anticipated as a result of loss or degradation of those habitats below Chickamauga Dam.

0 Effect of the Take

In the accompanying biological opinion, the Service determined that this level of take is not likely to result in jeopardy to the orange-foot pimpleback, pink mucket pearly mussel, and snail darter; or in the destruction or adverse modification of critical habitat.

0 Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the orange-foot pimpleback mussel, pink mucket pearly mussel, and snail darter:

1. Best Management Practices for sediment control and protection of water quality will be implemented and strictly enforced. These practices have been developed to avoid or minimize adverse, project-related impacts to fish and wildlife resources. When properly implemented, these practices have been shown to prevent excessive sedimentation of streams and to maintain water quality.

2. If pouring of concrete onsite is required, it will be done in such a way as to avoid spillage into the river.

0 Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the Corps of Engineers and Tennessee Valley Authority must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. Strict sediment control measures will be maintained at all times around construction sites, equipment cleaning/staging areas, and access roads. These measures will include, but are not necessarily limited to: 1) silt fences, 2) staked hay bales, 3) brush barriers, 4) rock checks, 5) settling basins, and 6) diversion ditches. They will be

used singly or in combination as needed to provide the maximum level of sediment control. They will be constructed prior to earth-moving activities and will be inspected, cleaned, and repaired regularly to ensure that they function properly. If project-generated sediment is observed entering the river, construction activities will cease until appropriate remedial actions have been completed.

2. All areas disturbed by construction activities will be stabilized as soon as possible. Stabilization will be achieved by planting native grasses, shrubs, and/or trees. Those areas on which plantings can not be conducted immediately will be stabilized by placement of straw mulch.

3. Petroleum, oil, grease, solvents, detergents, and other such materials will be stored away from the river in such a manner that runoff of these materials will not enter the river.

4. Pouring of concrete for the new lock will be accomplished in the dry within coffer dams. Water pumped from the cofferdams will be filtered or pumped into settling basins before being returned to the river. If spillage or leakage of concrete into the river is observed, pouring will cease immediately and corrective actions will be taken. Pouring of concrete will not resume until the source of the spill or leak has been identified and remedial actions taken to prevent further spillage.

5. Prior to beginning construction, divers will sweep the "footprints" of the cofferdams, the area to be de-watered by the cofferdams, and the lower approach to remove any mussels present in those areas. The sweeps will continue until divers are confident that at least 75 percent of the mussels present have been removed. All mussels found during these sweeps will be relocated to suitable habitat downriver from the project site. Selection of the relocation site will be coordinated with Cookeville Field Office biologists.

6. The Corps of Engineers and Tennessee Valley Authority will inspect the construction sites regularly. Any spills or sedimentation observed resulting from project-related activities that will reach the downriver mussel bed will be reported to the Cookeville Field Office. Immediate corrective actions will be taken to remediate problems or prevent subsequent spill events. Divers will inspect downriver mussel habitat to assess the effects of such spills.

7. Prior to beginning in-river construction activities, a series of non-lethal explosive charges will be set off in the construction area to frighten fish out of the area.

8. To avoid adverse effects to the snail darter during its spawning season, in-river construction activities will not be conducted between December 15 and March 31.

Upon locating a dead, injured, or sick specimen of an endangered or threatened species, initial notification must be made to the nearest Fish and Wildlife Service Law Enforcement Office (Mr. Steve Middleton, 150 Trademark Business Center, 220 Great Circle Road, Nashville, Tennessee 37228; telephone, 615/736-5532). Care should be taken in handling sick or injured specimens to ensure effective treatment and care, and in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. With implementation of these measures, we believe that no orange-foot pimpleback mussels, pink mucket pearly mussels, or snail darters will be incidentally taken. Incidental take will be assumed to have occurred if divers assessing the effects of a spill or significant project-related sedimentation event in the river observe dead fish and/or mussels in the impact area of the spill or sedimentation event. If, during the course of the action, incidental take occurs, such incidental take represents new information requiring review of the reasonable and prudent measures provided. The Corps of Engineers and Tennessee Valley Authority must immediately provide an explanation of the causes of the taking and review with Service biologists the need for possible modification of the reasonable and prudent measures or reinitiation of consultation.

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 minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

We believe that this provision of the ESA places an obligation on all Federal agencies to implement positive programs to benefit listed species, and a number of recent court cases appear to support that belief. Agencies have some discretion in choosing conservation programs, but Section 7(a)(1) places a mandate on agencies to implement some type of program.

We offer the following conservation recommendations for consideration:

1. The Corps of Engineers and Tennessee Valley Authority should conduct studies to determine if opportunities exist to create, enhance, or restore mussel and/or snail darter habitat in the vicinity of navigation facilities on the Tennessee River. Freshwater mussels are one of the most imperiled faunal groups in the world and would benefit from increased habitat availability and quality. The snail darter would also benefit from increased or enhanced habitat.

2. The Corps of Engineers and Tennessee Valley Authority should seek opportunities to provide funding for ongoing and future mussel propagation efforts aimed at restoring and augmenting mussel populations in the Tennessee River Basin.

3. The Corps of Engineers and Tennessee Valley Authority should actively support ongoing activities of organizations such as Conservation Fisheries, Incorporated, in its efforts to recover rare and endangered fish species.

In order for us to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the consultation request. As provided in 50 CFR Sec. 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified to include activities that cause 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.

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Lee A. Barclay, Ph.D. Date
Field Supervisor

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