Merritt 2006

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Memo

To: Tim Merrit, FWS

From: Dick Neves, USGS

Date: August 25, 2006

Re: 5-year review of oyster mussel

I have reviewed the documents provided by your office on the 5-year review of the oyster mussel as endangered and concur with your assessment. There are a few comments that I include below to provide additional information on the narratives under Recovery Criteria and Updated Information and Current Species Status:

1. Recovery criteria
   2. Reestablishing 3 viable stream populations

In my opinion, the relocation of 200 adults as an NEP to the river reach below Wilson Dam in Alabama was a high risk (for survival) and low probability (for establishment) effort, as judged by the differences between habitats in the source and recipient sites. There are better locations for such efforts to re-establish viable populations, in rivers and habitats more similar to conditions in the Duck River. Before this newly described species is moved to other locations, a more orderly analysis of its historic distribution and potential sites of reintroduction should be done.

The planned release of oyster mussels to the upper Clinch River at Cleveland has an excellent chance of success, given the planning and experience with the fauna and habitat at the source and recipient sites. Expansion of the Clinch River population to upstream sites should be of high priority, given the ongoing rebound of the oyster mussel population in the Clinch River, TN. For clarification, it is the Virginia Cooperative Fish and Wildlife Research Unit of USGS, and not the "Fisheries Unit" that is conducting this translocation with the U.S. Fish and Wildlife Service (Jess Jones).

I am waiting for Steve Bakale to implement the reintroduction plan for the oyster mussel into the Big South Fork, as we received funding to assist him with the reintroduction of this and other species. If he proceeds with this project in 2007, then I can provide labor to assist him.

4. Research studies
   Recovery task 1.4.1

Jess's MS thesis has provided additional life history information on this species, to include things such as micro-lures, preferred host fishes, etc. His thesis should be mentioned as a response to that recovery task.

In my opinion, the experiences gained by culturing juveniles of this species have contributed to a better understanding of habitat use/need of the juvenile stage. Again, Jess has observations on the juvenile stage under culture conditions that are useful to understanding habitat use. Also Brett Ostby has collected physical habitat data on this species.

The dissertation research of Jess will have significance in application to this recovery task.

5. No foreseeable threats
   Recovery task 1.4.3

The threat of coal mining wastes from Virginia processing plants should be identified as a foreseeable threat to the Clinch River population.

6. Within longer streams
   Recover Task 4.1

We have produced juveniles of at least 25 species, including 12 that are federally listed.

C. Update Information
   e. Habitat or ecosystem conditions

I would change the second sentence to read: This same phenomenon could be taking place...

Factor C

The level of depredation by muskrats on oyster mussels has declined dramatically in the Clinch River, presumably due to the introduction of river otters. Any negative effect from depredation on adult mussels has been ameliorated by the presence of river otters.

D. Synthesis

1. I would give the citation (Jones et al. 2006) of the publication so that it can be identified in the References.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

August 2, 2006

Dr. Richard Neves
Virginia Cooperative Fish and Wildlife Research Unit
Virginia Polytechnic Institute and State University
Department of Fisheries and Wildlife Services
Blacksburg, Virginia 24061-0321

Dear Dr. Neves:

The U.S. Fish and Wildlife Service (Service) is conducting a 5-year review of the appropriateness of the current listing of the oyster mussel (*Epioblasma capsaeformis*) as an endangered species under provisions of the Endangered Species Act of 1973, as amended (Act). On September 20, 2005, we published a notice in the Federal Register announcing our intent to conduct this review on this species for which our office has the lead responsibility under section 4(c)(2)(A) of the Act. At that time, we requested any new information on the oyster mussel since the time of its listing in 1997. In order to support the Service's interest in making its decision based on the best available science, portions of the draft review need to be subjected to an appropriate level of peer review. Due to your expertise regarding this species, we request that you peer review the enclosed portion of the document. We must receive your review comments within 30 days of the date of this letter (August 31, 2006) in order to consider them in our final review document.

The goals of peer review during this process are (1) to ensure that the best available biological data, scientifically accurate analyses of those data, and the reviews of recognized experts are used in the decision-making process; and (2) to indicate to the public, to other agencies, to conservation organizations, and to personnel within the Service that the best available data and scientific analyses were used in the decision-making process.

The following materials are enclosed for use during your review:

Guidance for Peer Reviewers of Listing/Reclassification/Delisting Proposals - This Southeast Region document provides general background information on the peer review process, as well as definitions and detailed instructions for reviewers. Please review this guidance carefully before beginning your review.

Peer Review in Endangered Species Act Activities - This July 1, 1994, *Federal Register* notice established a peer review process for all listing and recovery actions taken under the authorities of the Endangered Species Act.

The Biological Portion of the Draft 5-Year Review – This is the draft material that we hope you will review.

A list of the Literature Cited section of the proposal - The list is enclosed.

We appreciate your assistance in ensuring that this review is based on the best available science. If you have any questions or if we can provide additional information, please contact Timothy Merritt of my staff by telephone at 931/528-6481, ext. 211, or via email at *timothy_merritt@fws.gov*.

Sincerely,

Lee A. Barclay, Ph.D.
Field Supervisor

Enclosures

Guidance for Peer Reviewers of Recovery Proposals

U.S. Fish and Wildlife Service, Southeast Region

March 17, 2003

The Fish and Wildlife Service routinely has solicited comments from parties interested in, and knowledgeable of, taxa for which actions are being proposed. A July 1,1994, policy statement established the formal requirement that a minimum of three peer reviewers be asked to provide input into our rule-making decisions under the Endangered Species Act.

As a volunteer peer reviewer, you are asked to adhere to the following guidance to ensure that your review complies with that policy statement, and conforms with the statutes and regulations which are applicable to the Federal experimental population designations for threatened or endangered species.

Peer reviewers should:

1. Review all materials provided by us.

2. Identify, review, and provide other relevant data apparently not used by us.

3. Provide written comments on:
   - Validity of data, especially those data cited in the proposal.
   - Adequacy of the data (e.g., are the data sufficient to support the designation?).
   - If data are inadequate, identify additional data or studies that are needed to adequately justify the proposal.
   - Adequacy of the proposed designation for the conservation of the species.

4. Use the definitions found in the Endangered Species Act and implementing regulations:
   - Endangered species - any species which is in danger of extinction throughout all or a significant portion of its range.
   - Threatened species - any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
   - Species - includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.
   - Take - harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.
   - Conservation - the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the Act is no longer necessary.
   - Experimental populations - any population (including any offspring arising solely therefrom) authorized by the Secretary for release, but only when, and at such times as, the population is wholly separate geographically from nonexperimental populations of the same species.

5. Keep in mind the requirement that we must use the best available scientific data in making proposed and final experimental population designations. This does not mean we must have

statistically significant data on population trends or data from all known populations. All peer reviews and comments will be public documents, and portions may be incorporated verbatim into our final decision document with appropriate credit given to the author of the review.

Questions regarding this guidance, the peer review process, or other aspects of the Fish and Wildlife Service's rulemaking process should be referred to Kelly bibb, Regional Listing Biologist, at 404/679-7378 (fax: 404/679-7081; email: kelly_bibb@fws.gov). Questions regarding reports, publications, or other data dealing with a specific taxon, or the proposed nonessential experimental population rule should be referred to Timothy Merritt, Cookeville, Tennessee, Ecological Services Field Office, at 931/528-6481, ext. 211 (fax: 931/528-7075; email: timothy_merritt@fws.gov.

[From *The Federal Register* for Friday, July 1, 1994 (Vol. 59), p. 34270]

Fish and Wildlife Service

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Endangered and Threatened Wildlife and Plants: Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities

AGENCIES: Fish and Wildlife Service, Interior, and National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of policy statement.

SUMMARY: The Fish and Wildlife Service and National Marine Fisheries Service (hereafter referred to as Services) announce interagency policy to clarify the role of peer review in activities undertaken by the Services under authority of the Endangered Species Act of 1973 (Act), as amended, and associated regulations in Title 50 of the Code of Federal Regulations. This policy is intended to complement and not circumvent or supersede the current public review processes in the listing and recovery programs.

EFFECTIVE DATE: July 1, 1994.

SUPPLEMENTARY INFORMATION:

Background

The Act requires the Services to make biological decisions based upon the best scientific and commercial data available. These decisions involve listing, reclassification, and delisting of plant and animal species, critical habitat designations, and recovery planning and implementation.

The current public review process involves the active solicitation of comments on proposed listing rules and draft recovery plans by the scientific community, State and Federal agencies, Tribal governments, and other interested parties on the general information base and the assumptions upon which the Service is basing a biological decision.

The Services also make formal solicitations of expert opinions and analyses on one or more specific questions or assumptions. This solicitation process may take place during a public comment period on any proposed rule or draft recovery plan, during the status review of a species under active consideration for listing, or at any other time deemed necessary to clarify a scientific question.

Independent peer review will be solicited on listing recommendations and draft recovery plans to ensure the best biological and commercial information is being used in the decisionmaking process, as well as to

ensure that reviews by recognized experts are incorporated into the review process of rulemakings and recovery plans developed in accordance with the requirements of the Act.

Policy

A. In the following endangered species activities, it is the policy of the Services to incorporate independent peer review in listing and recovery activities, during the public comment period, in the following manner:

(1) Listing

(a) Solicit the expert opinions of three appropriate and independent specialists regarding pertinent scientific or commercial data and assumptions relating to the taxonomy, population models, and supportive biological and ecological information for species under consideration for listing;

(b) Summarize in the final decision document (rule or notice of withdrawal) the opinions of all independent peer reviewers received on the species under consideration and include all such reports, opinions, and other data in the administrative record of the final decision.

(2) Recovery

(a) Utilize the expertise of and actively solicit independent peer review to obtain all available scientific and commercial information from appropriate local, State and Federal agencies; Tribal governments; academic and scientific groups and individuals; and any other party that may possess pertinent information during the development of draft recovery plans for listed animal and plant species.

(b) Document and use, where appropriate, independent peer review to review pertinent scientific data relating to the selection or implementation of specialized recovery tasks or similar topics in draft or approved recovery plans for listed species.

(c) Summarize in the final recovery plan the opinions of all independent peer reviewers asked to respond on an issue and include the reports and opinions in the administrative record of that plan.

Independent peer reviewers should be selected from the academic and scientific community, Tribal and other native American groups, Federal and State agencies, and the private sector; those selected have demonstrated expertise and specialized knowledge related to the scientific area under consideration.

B. Special Circumstances

(1) Sometimes, specific questions are raised that may require additional review prior to a final decision, (e.g. scientific disagreement to the extent that leads the Service to make a 6-month extension of the statutory rulemaking period). The Services will determine when a special independent peer review process is necessary and will select the individuals responsible for the review. Special independent peer review should only be used when it is likely to reduce or resolve the unacceptable level of scientific uncertainty.

(2) The results of any special independent peer review process will be written, entered into the permanent administrative record of the decision, and made available for public review. If the peer review is in the context of an action for which there is a formal public comment period, e.g., a listing, designation of critical habitat, or development of a recovery plan, the public will be given an opportunity to review the report and provide comment.

Scope of Policy

The scope of this policy is Servicewide for all species of fish and wildlife and plants, as defined pursuant to section 3 of the Act (16 U.S.C. 1532).

Authority

The authority for this policy is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544).

Dated: June 27,1994.

Mollie H. Beattie,

Director, U.S. Fish and Wildlife Service, Department of the Interior.

Dated: June 24,1994.

Rolland A. Schmitten,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

[FR Doc. 94-16021 Filed 6-30-94; 8:45 am]

BILLING CODE 4310-55-P

1. Recovery criteria

a. Criteria for downlisting to threatened status

Through the protection of extant stream populations (e.g., continuing to use existing regulatory mechanisms, establishing partnerships with various stakeholders, using BMPs, minimizing or eliminating threats), discovery of currently unknown stream populations, and/or reestablishment of historical stream populations, there exists at least six distinct viable stream populations of the oyster mussel in the Cumberland River system, upper Tennessee River system, and/or lower Tennessee River system. This will be accomplished by:

1. **Protecting all extant populations (i.e., lower Clinch River, Nolichucky River in the upper Tennessee River system, and Duck River in the lower Tennessee River system) and ensuring that all these streams have viable population status.**

   While we have not met this criterion yet, we are working with our State and Federal partners and The Nature Conservancy (TNC) to protect all three extant populations of the oyster mussel. Our Partners for Fish and Wildlife program has had projects in all three watersheds and continues to look for additional opportunities to work with landowners in Tennessee to improve stream habitats for the oyster mussel. The Tennessee Wildlife Resources Agency has purchased the Kyles Ford tract on the lower Clinch River using Recovery Land Acquisition monies. This is one of the most important mussel shoals in Tennessee and the oyster mussel is abundant at this site.

2. **Reestablishing three viable stream populations in any of the following streams: (a) Cumberland River system (e.g., Rockcastle River, Buck Creek, Big South Fork, Little South Fork, Red River); (b) upper Tennessee River system (e.g., upper Clinch River, Powell River, upper Holston River/North Fork Holston River, lower Holston River, French Broad River); and/or (c) lower Tennessee River system (e.g., Paint Rock River, Elk River, Tennessee River at Muscle Shoals, Shoal Creek, Bear Creek, Buffalo River).**

   This criterion has not been met. We have moved 200 oyster mussels from the Duck River to the non-essential experimental population (NEP) area below Wilson Dam in the Tennessee River in Alabama. These mussels are being monitored by the Alabama Department of Conservation and Natural Resources. Recently (FY 2006) monies have become available to fund the relocation of 200 oyster mussels per year for three years from the lower Clinch River in Tennessee to the upper Clinch River in Virginia. The Fisheries Unit at Virginia Polytechnic Institute (VPI) will move this species and monitor both the originating and receiving sites to ensure

survival. The Service also has proposed a NEP for the lower French Broad and lower Holston Rivers that would include the oyster mussel. Big South Fork National River and Recreational Area has a mussel reintroduction plan that includes the oyster mussel and should have funding in FY 2007 to reintroduce this species.

3. **One distinct naturally reproduced year class exists within each of the viable populations. The year class must have been produced within 5 years prior to the time the species are reclassified from endangered to threatened. Within 1 year before the delisting date, gravid females of the mussels and their host fish must be present in each viable population.**

This criterion has not been met. There are presently only three extant populations (Clinch River, Nolichucky River and Duck River). The Clinch and Duck Rivers meet this criterion (Jones 2005 and Ahlstedt 2004). The remaining extant population (Nolichucky River) is small and of doubtful viability (Service 2004). Only a single live specimen was found during sampling at 20 sites in 2000 (Tennessee Valley Authority 2002). The recently reintroduced population below Wilson Dam in the lower Tennessee River has not been there long enough to show a naturally reproduced year class.

4. **Research studies of the mussels' biological and ecological requirements have been completed and any required recovery measures developed and implemented from these studies are beginning to be successful (see Recovery Tasks 1.4.1, 1.4.2, 1.4.5, and 1.4.6), as evidenced by an increase in population density of approximately 20 percent and/or increase in the length of the river reach of approximately 10 percent inhabited by the species as determined through biennial monitoring (see Recovery Task 5).**

Recovery task 1.4.1 involves conducting life history research on the oyster mussel. Seven native fish species have been identified as hosts: wounded darter (*Etheostoma vulneratum*), redline darter (*E. rufilineatum*), bluebreast darter (*E.* camarum), dusky darter (*Percina sciera*), banded sculpin (*Cottus carolinae*), black sculpin (*C. baileyi*) and mottled sculpin (*C. bairdi*) (Service 2004). No additional life history research has occurred since the Recovery Plan was approved in May 2004.

Recovery task 1.4.2 involves characterizing the species' habitat for all life history stages. No additional work has occurred on this task since the Recovery Plan was approved.

Recovery task 1.4.5 deals with investigating the need for management, including habitat improvement.

No additional work has occurred on this task since the Recovery Plan was approved.

Recovery task 1.4.6 involves determining the number of individuals and the sex ratio required to maintain long-term viable natural populations. No additional work has occurred on this task since the Recovery Plan was approved.

5. **No foreseeable threats exist that would likely impact the survival of any of the species over a significant portions of their ranges (see Recovery Tasks 1.4.3 and 1.4.4).**

Recovery task 1.4.3 involves addressing present and foreseeable threats. Our Partners for Fish and Wildlife biologist in Tennessee is looking for additional opportunities to work with private landowners to protect watersheds that contain threatened and endangered species, including the oyster mussel. Our State partners are working with us to identify and address threats to mussel resources throughout the Cumberlandian region. No threats have been addressed since the Recovery Plan.

Recovery task 1.4.4 deals with determining contaminant sensitivity for each life history stage. We have an ongoing project that is looking at sediment toxicity in the Clinch, Powell and Big South Fork systems. The results of this study are not available yet.

6. **Within larger streams (e.g., Clinch River, Duck River, Powell River), the species is distributed over a long enough reach that a single catastrophic event is not likely to eliminate or significantly reduce the entire population in that stream to a status of nonviable (see Recovery Task 4.1).**

Recovery task 4.1 involves refining techniques and methodologies for propagating and translocating mussels as a prelude to potential augmentation and reintroduction efforts. VPI is at the forefront of this work, having propagated and released juvenile mussels from 13 species, including six that are federally listed. VPI released 17,274 juvenile mussels into the Clinch River in 2005 and 11, 637 juvenile mussels into the Powell River in 2004. The States of Kentucky and Tennessee are also working on refining mussel propagation techniques and methodologies. However, neither State has propagated oyster mussels. The Service, with our partners, is developing a comprehensive plan for mussel augmentations and reintroductions in the Tennessee and Cumberland watersheds. This plan is in draft form and should be finalized in FY 2007.

7. **Biennial monitoring of the five species yields the results outlined in "criterion 1 and 2" over a 10-year period (see Recovery Task 5).**

Biennial monitoring has not occurred to date, primarily due to insufficient funds. Some yearly monitoring does occur by our partners on a site-by-site basis.

a. Criteria for delisting

Through the protection of extant stream populations (e.g., continuing to use existing regulatory mechanisms, establishing partnerships with various stakeholders, using BMPs, minimizing or eliminating threats), discovery of currently unknown stream populations, and/or reestablishment of historical stream populations, there exists at least **nine** (six for downlisting) distinct viable stream populations of the oyster mussel in the Cumberland River system, upper Tennessee River system, and Duck River in the lower Tennessee River system. **Two** (one for downlisting) distinct naturally reproduced year classes exist within each viable population. All other downlisting criteria remain the same for the delisting criteria. All the work to-date for this species has been described above under the "Criteria for downlisting." There are presently only three extant populations of the Oyster mussel.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance/population trends: The oyster mussel population in the lower Clinch River appears to have increased dramatically in recent years with conservative estimates at 250,000+ individuals based on 2004 and 2005 quadrat data from VPI (Jones 2005).

The Nolichucky River population is small and of doubtful viability. Only a single live specimen was found during sampling at 20 sites in 2000 (Tennessee Valley Authority 2002). The Duck River population appears to be doing well in the lower portion of this river (Ahlstedt 2004).

b. Genetics: Based on extensive molecular, morphological and life history data, the population of *Epioblasma capsaeformis* from the Duck River in Tennessee has been proposed as a separate species from the *E. capsaeformis* in the upper Tennessee watershed (J. Jones et al. 2006). The name of this new species will be published some time in 2007. This new data has been peer reviewed. Once accepted by the Service, this will reduce the *E. capsaeformis* populations to two extant locations in the upper Tennessee watershed. The new species in the Duck River will have only one know extant location.

c. **Taxonomic classification or changes in nomenclature:** The Duck River population of *Epioblasma capsaeformis* will become a separate species. In 2007 or later, the Service will have to address this issue and possibly draft a rule change.

d. **Spatial distribution:** Changes will have to be made to the historical range of the oyster mussel. It will now be restricted to the upper Tennessee and Cumberland watersheds. The lower Tennessee watershed will contain a separate species.

e. **Habitat or ecosystem conditions:** The oyster mussel in the Powell River was thought to disappear because of coal mining throughout the watershed. This same phenomenon ~~is taking~~ place in the Clinch River in Virginia and coal fines are showing up in increasing amounts in the lower Clinch River in Tennessee. There is a concern among the mussel experts that this may lead to a crash in the mussel populations similar to what occurred in the Powell River. Unfortunately, we do not understand what effects these coal fines may or may not have on the mussel populations. Studies are underway to try to understand this issue and its potential effects on mussel populations before the mussels start to disappear. The habitat in the lower French Broad and Powell Rivers appears to be improving to the point that we can reintroduce oyster mussels back into these areas in hopes of ~~developing~~ a viable population.

2. Five Factor Analysis (threats, conservation measures and regulatory mechanisms).

Factor A. The present or threatened destruction, modification, or curtailment of its habitat or range: Oil, gas, and coal exploration and development are on the increase in the upper Clinch River watershed (J. Jones, U. S. Fish and Wildlife Service biologist, personal communication (pers. comm.), 2006) and the New River watershed (Steve Bakaletz, National Park Service biologist, pers. comm., 2006). The largest oyster mussel populations occur in the lower Clinch River and coal fines are already being found in increasing amounts in these populations (D. Hubbs, Tennessee Wildlife Resources Agency biologist, pers. comm., 2006). The New River is a major tributary to the Big South Fork that influences the quality of the oyster mussel habitat. The potential negative impacts to mussels and their habitat will have to be monitored closely as exploration and development increase. We have an ongoing project that is looking at the sediment toxicity in the both systems. The results of this study are not available yet.

There are no known additional habitat threats to the oyster mussel populations in Nolichucky and Duck Rivers beyond the ones listed in the Recovery Plan.

Factor B. Overutilization for commercial, recreational, scientific or educational purpose: The overutilization for commercial, recreational, scientific or educational purposes was not considered to be a limiting factor in the Recovery Plan. We have no new information to indicate that this has changed.

Factor C. Disease and predation: The Recovery Plan stated that there is little data indicating that disease or predation are limiting factors for this species. We have no new information on disease or predation of the oyster mussel. We continue to believe that disease or predation are not limiting factors for this species. river otter Lack natural predators

Factor D. Inadequacy of existing regulatory mechanisms: We have no new information on the inadequacy of existing regulatory mechanisms for protecting the oyster mussel and its habitat. The sediment toxicity studies being conducted on the Clinch River, Powell River and Big South Fork systems may provide some insights into potential water quality issues associated with the Clean Water Act. However, the results of these studies are not available yet.

Factor E. Other natural and manmade factors affecting its continued existence: The Recovery Plan listed the presence or potential introduction of alien species (especially zebra mussels and black carp), insufficient densities of host fish species, inbreeding depression and other genetic considerations, and possible weak links in the species' life cycles. We have no new information on any of these issues.

D. Synthesis

The oyster mussel was historically one of the most widely distributed Cumberlandian mussel species. Its range historically included four physiographic provinces (Interior Low Plateau, Cumberland Plateau, Ridge and Valley, and Blue Ridge) and six States (Alabama, Georgia, Kentucky, North Carolina, Tennessee, and Virginia). In the Cumberland River, it occurred from the base of Cumberland Falls, McCreary and Whitely Counties, Kentucky, downstream to Stewart County, Tennessee. In the Tennessee River, it occurred throughout the main stem, downstream to Colbert and Lauderdale Counties, Alabama. Dozens of tributaries in the Cumberland and Tennessee River systems also harbored this species historically. The oyster mussel is now considered extirpated from the entire Cumberland River system. Oyster mussels have also been eliminated from the entire Tennessee River main stem and numerous tributaries. The remaining extant populations occur in the Clinch River in Scott County, Virginia, and Hancock County, Tennessee; Nolichucky River in Cocke and Hamblen Counties, Tennessee; and Duck River in Marshall County, Tennessee. The Duck River population has been determined to be a separate species and the name change should be published sometime in 2007. This will result in only two extant

>250K

populations of the true oyster mussel, *Epioblasma capsaeformis*. The Clinch River populations are thriving, with an estimated population of 250,000+ individuals. The Nolichucky population is small and of questionable viability.

The Recovery Plan listed excessive sedimentation (primarily resulting from nonpoint-source loading), coal mining, gravel mining, reduced water quality below existing dams, developmental activities, water withdrawal, impoundments, and alien species as threats to the oyster mussel and its habitat. Due to the restricted range of the remaining three extant populations, toxic spills are also a threat that could wipe out an entire population. All of these threats remain. As discussed above in Section C, the Clinch River watershed is also experiencing an increase in oil, gas, and coal exploration and development. The effects of an increase in these activities on the oyster mussels and its habitat are unknown at this time.

Since the Recovery Plan was written in May 2004, the following has occurred:

1. A peer-reviewed publication recommending that the Duck River population of the oyster mussel be recognized as a separate species.

2. The Service's Partners for Fish and Wildlife program is working with landowners in the watersheds where oyster mussel occur and continues to look for additional opportunities.

3. The Tennessee Wildlife Resources Agency has purchased a tract of land along the Clinch River that includes Kyles Ford. Kyles Ford is one of the most important mussel beds on the Clinch River.

4. VPI continues to raise and release juvenile oyster mussels into the Clinch and Powell Rivers.

5. Approximately 200 oyster mussels from the Duck River have been moved to the NEP area below Wilson Dam in the Tennessee River.

6. A NEP has been proposed for the lower French Broad/lower Holston rivers below the dams.

7. A proposal has been developed with VPI to move 200 oyster mussels per year for three years from the Clinch River in Tennessee to the Clinch River in Virginia above the influences of the coal mining activities occurring in the watershed.

8. A study of the toxicity of the water column and sediments in the Clinch, Powell and Big South Fork Rivers is ongoing.

The recovery criteria listed in Section B above have not been met for delisting or downlisting the species. Because of the oyster mussel's limited distribution and

continued threats to the three extant populations, it remains in danger of extinction throughout all or a significant portion of its range. Therefore, the status of the oyster mussel should remain as endangered.

At the time of listing (USFWS 1997), this species had a high degree of threat and a low recovery potential, which results in a Recovery Priority Number of 5 for the taxonomic level of species. The Recovery Plan (USFWS 2004) also describes this species as having a high degree of threat and a low recovery potential. Oil, gas, and coal exploration and development are an increasing threat in the upper Clinch River watershed. Pollution and sedimentation continue to be threats to all the extant populations. A detailed description of the past and present threats to this species can be found in the Recovery Plan.

V. REFERENCES

Ahlstedt, S. 2004. Historical and current examination of freshwater mussels (Bivalvia: Margaritiferidae: Unionidae) in the Duck River basin, Tennessee. Unpublished report to Tennessee Wildlife Resources Agency. 200 pp.

Jones, J. 2005. Estimate of population size for the oyster mussel in the Clinch River. Unpublished data, Virginia Polytechnic Institute, Blacksburg, Virginia.

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Tennessee Valley Authority. 2002. Nolichucky Reservoir flood remediation. Draft Environmental Impact Statement, Tennessee Valley Authority, Norris, Tennessee.

U. S. Fish and Wildlife Service. 1997. Endangered and Threatened Wildlife and Plants; Endangered Status for the Cumberland Elktoe, **Oyster Mussel**, Cumberlandian Combshell, Purple Bean, and Rough Rabbitsfoot (FR Vol 62, No. 7; Friday, January 10, 1997; 1647-1658).

U. S. Fish and Wildlife Service. 2004. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Five Endangered Mussels in the Tennessee and Cumberland River Basins (FR Vol. 69, No. 168; Tuesday, August 31, 2004; 53136-53180).

U. S. Fish and Wildlife Service. 2004. Recovery Plan for Cumberland Elktoe, **Oyster Mussel**, Cumberlandian Combshell, Purple Bean, and Rough Rabbitsfoot. Atlanta, Georgia. 168 pp.