Cumberland bean
(*Villosa trabalis*)

5-Year Review:
Summary and Evaluation

(Photo by M. McGregor, KDFWR)

U.S. Fish and Wildlife Service
Southeast Region
Kentucky Ecological Services Field Office
Frankfort, Kentucky

Cumberland Bean (*Villosa trabalis*)
5-Year Review

I. GENERAL INFORMATION

A. Methodology used to complete the review: The lead recovery biologist for this species in the Kentucky Field Office completed this review for the Cumberland bean. In conducting this 5-year review, we relied on available information pertaining to historic and current distributions, life histories, and habitats of this species. Our sources for this 5-year review include the final rule listing these species under the Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by Service, State and other experienced biologists; unpublished survey reports; and notes and communications from other qualified biologists or experts on this species. All literature and documents used for this review are on file at the Kentucky Field Office and are cited in the References section. Public notice was given in the *Federal Register* July 26, 2005 and a 60-day comment period was opened. No public comments were received. The 5-year review was peer reviewed by three experts (see Appendix A) familiar with the species. Peer reviewers provided additional information and references which were incorporated as appropriate.

B. Reviewers

Lead Region – Southeast Region: Kelly Bibb, 404-679-7132

Lead Field Office – Frankfort, Kentucky Ecological Services: Leroy Koch, 502-695-0468

Cooperating Field Office(s) – Geoff Call, Cookeville, TN Ecological Services Field Office (FO), 931-528-6481, ext 213; Shane Hanlon, Abingdon, VA Ecological Services FO, 276-623-1233; Bob Butler, Asheville, NC Ecological Services FO, 828-258-3939.

C. Background

1. **Federal Register Notice citation announcing initiation of this review:** July 26, 2005: 70 FR 43171

2. **Species status:** Stable; 2009 Recovery Data Call; No change in threats to the species and no new threats known. Threats continue to impact the species, but the species continues to be observed throughout its range and is considered to be stable. Best populations of the species continue to be found in Sinking Creek (KY) and Hiwassee River (TN). Populations in Big South Fork (KY and TN) and Buck Creek (KY) continue to show reproduction but with low recruitment and low densities. The species was collected by KDFWR on several occasions during FY07, FY08, and FY09 at Sinking Creek and at one site on Big South Fork Cumberland River.

3. Recovery achieved: 1 (0-25% recovery objectives achieved)

4. Listing history

Original Listing
FR notice: 41 FR 24062
Date listed: June 14, 1976
Entity listed: Species
Classification: Endangered

5. Associated rulemakings

66 FR 32250; June 14, 2001; Establishment of Nonessential Experimental Population (NEP) Status for 16 Freshwater Mussels and 1 Freshwater Snail (Anthony's Riversnail) in the Free Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL

6. Review History

2009, 2008, 2007, 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998 Recovery Data Call

The Service conducted a five-year review for the mussel in 1991(56 FR 56882). In this review, the status of many species was simultaneously evaluated with no in-depth assessment of the five factors or threats as they pertain to the individual species. The notice stated that the Service was seeking any new or additional information reflecting the necessity of a change in the status of the species under review. The notice indicated that if significant data were available warranting a change in a species' classification, the Service would propose a rule to modify the species' status. No change in the mussel's listing classification was found to be appropriate.

Recovery Plan for the Cumberland Bean Pearly Mussel

7. Species' Recovery Priority Number at start of review (48 FR 43098): 5c (the 5 indicates a high degree of threat and low recovery potential; the "c" reflects a high degree of conflict).

8. Recovery Plan

Name of plan: Recovery Plan for the Cumberland Bean Pearly Mussel, *Villosa trabalis* (Conrad, 1834)
Date issued: August 22, 1984

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. Is the species under review listed as a DPS? No. The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population of a species of

vertebrate wildlife. This definition limits listing a DPS to only vertebrate species of fish or wildlife which interbreeds when mature. Because the species under review is an invertebrate, and the DPS policy is not applicable, the application of the DPS policy to the species listing is not addressed further in this review.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria? Yes

2. Adequacy of recovery criteria.

a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat? Yes

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria? Yes

3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.

There are four recovery criteria listed in the Recovery Plan. They are addressed below:

1. A viable population of *Villosa trabalis* exists in Buck Creek, Rockcastle, and the Little South Fork Cumberland Rivers. These three populations are dispersed throughout each river so that it is unlikely that one event would cause the total loss of either population.

Note: The Recovery Plan defines a viable population as "a reproducing population that is large enough to maintain sufficient genetic variation to enable it to evolve and respond to natural habitat changes. The number of individuals needed to meet this criterion will be determined as one of the recovery tasks."

The Service has no information that a viable population of this species currently exists in the mainstem of Buck Creek or the Rockcastle River. Although both of these populations are not considered viable based on the definition in the Recovery Plan, there is evidence the species is reproducing; however, recruitment is thought to be low. The Service is working with state partners and The Nature Conservancy (TNC) to improve the status of this species in these streams. When the recovery plan was written, the population in the Little South Fork Cumberland (LSF) River was considered to contain the greatest concentration of this species; however, we currently believe this population is extirpated due to coal-related spills and water quality changes in the 1980's. Of these three streams, the population in Sinking Creek, a tributary of the Rockcastle River, contains the best population, and it is currently thought to be viable (see further population information in Section C. 1. a. below).

2. Through reestablishment and/or discoveries of new populations, viable populations exist in two additional rivers (to include at least one in the Tennessee River system). Each of these rivers will contain a viable population that is distributed such that a single event would be unlikely to eliminate *Villosa trabalis* from the river system.

This species is included in an NEP designation for 16 mussels and 1 snail in the free-flowing reach of the Tennessee River below Wilson Dam in Colbert and Lauderdale Counties, Alabama. Currently, no individuals of this species have been reintroduced at this location.

Since the recovery plan was written, a population of *Villosa trabalis* was discovered during 1992 in Sinking Creek in Kentucky. Additional information on the status of this population needs to be obtained, but it is currently thought that the Sinking Creek population is viable.

3. The species and its habitat are protected from present and foreseeable human related and natural threats that may interfere with the survival of any of the populations.

Some limited progress has been made regarding this criterion; however, we do not anticipate being able to meet this criterion in the near future. We are working with our state partners and TNC to protect extant populations of this species. In Buck Creek, there are current Partners for Fish and Wildlife projects that are intended to repair and restore stream banks, riparian areas, and instream habitats. These efforts have provided protection for approximately seven miles of stream bank in the Buck Creek watershed. In Buck Creek, TNC is also planning habitat improvements on their own property and that of other landowners that should benefit *Villosa trabalis*. These TNC projects include improvements of riparian areas and reconstruction of a portion of the mainstem of Buck Creek, both of which should provide additional improved stream habitat for this species. Gravel mining in Buck Creek is a significant threat to *V. trabalis* that is causing unstable habitat and substrate conditions. In addition, the Rockcastle River, Buck Creek, Sinking Creek, and the lower Big South Fork Cumberland River (BSF) have been designated by the state of Kentucky as Outstanding State Resource Waters, and the Rockcastle River also has a Wild Rivers designation.

4. Noticeable improvements in coal-related problems and substrate quality have occurred in the upper Cumberland and Tennessee drainages and no foreseeable increase in coal-related siltation exists in streams containing *Villosa trabalis*.

At the present time, there are no noticeable improvements in coal-related problems and substrate quality in the upper Cumberland and Tennessee River drainages supporting *Villosa trabalis*. With the current emphasis and need for

coal as an energy source, we do not foresee this situation improving in the near future.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends, demographic features, or demographic trends:

Cumberland River drainage:
Buck Creek (Kentucky): The Kentucky Department of Fish and Wildlife Resources (KYDFWR) and Eastern Kentucky University have sampled small segments of Buck Creek within the last few years. The overall status of this species in Buck Creek appears to be declining and/or vulnerable to decline; however, a few sub-adult individuals have been observed from at least one location indicating some recent evidence of recruitment. This species is still apparently able to reproduce in Buck Creek; however, recruitment is low and the overall population appears low based on limited survey data. Host fish availability may also be a limiting factor. During 2005, the KDFWR released 151 juvenile *Villosa trabalis* into Buck Creek that had been propagated at their Center for Mollusk Conservation (CMC) located in Frankfort, Kentucky.

Rockcastle River drainage (Kentucky): Since completion of the recovery plan, very few individuals of *V. trabalis* have been observed in the Rockcastle River. In 2008, Dr. Monte McGregor of the Kentucky Department of Fish and Wildlife Resources observed 6 individuals in the mainstem of the Rockcastle River. Additional survey effort needs to be done in the mainstem Rockcastle River to determine the extent of the population. In 1992, a population was discovered in Sinking Creek, a tributary of the Rockcastle. Survey efforts have not been extensive in Sinking Creek, but an initial survey in 2000 (Groves 2000) and repeated observations at selected sites in recent years indicate that the population may be viable. The Sinking Creek population is currently considered the best population of this species in Kentucky. A recent survey effort in Horse Lick Creek (Haag and Warren 2004) indicates that the mussel fauna, including *V. trabalis*, has experienced continued decline. In 2009, 42 juveniles, averaging about 25 millimeters in length, that were propagated at the KDFWR CMC facility, were released into Sinking Creek along with 43 adult striped darters, *Etheostoma virgatum*, a known host fish for the Cumberland bean mussel. This area will be monitored to determine the success of released individuals as recovery efforts continue in Sinking Creek. At the CMC facility, they are currently holding 4 adults and 16 juveniles. Note: Individuals from both Buck Creek and Sinking Creek have been taken to the Center for Mollusk Conservation for propagation purposes. Dr. Monte McGregor, KDFWR, operates this facility.

Big South Fork drainage (Kentucky and Tennessee): A total of 49 live individuals were reported from 7 collection sites on the BSF (1999-2002) in

Tennessee and Kentucky (Ahlstedt et al. 2005). One live female was also found at Station Camp Creek (BSF) on April 19, 2006. Researchers at Virginia Tech have done some limited work with *Villosa trabalis* from the BSF drainage. Four gravid females were collected and used for fish host identification and propagation of juveniles in 2004-2007 (Guyot 2005). As a result of these efforts it was determined that the banded sculpin, *Cottus carolinae*, striped darter, *Etheostoma virgatum*, fantail darter, *E. flabellare*, greenside darter, *E. blennioides*, and redline darter, *E. rufilineatum*, could all serve as hosts for this species (Guyot 2005). In addition, approximately 1,200 glochidia were transformed into juveniles in 2005 and 2006; however, only 10 were raised to the age of 6-7 weeks old, at which time they were released into the BSF River (Petty and Neves 2007; Mair et. al. 2004. There is currently no information on the success of these releases. *Villosa trabalis* is considered relatively rare in BSF, but size-class distribution of measured individuals (30-90 mm) suggests that there is some low level of recruitment. Host fish availability may be a limiting factor. The population is considered to be vulnerable to decline in BSF due primarily to coal mining activities in the headwaters (New River system).

Tennessee River drainage:
Hiwassee River (Tennessee): A population of *V. trabalis* in the Hiwassee River is considered to be actively recruiting and viable. A total of 111 live and 3 fresh dead *V. trabalis* were collected in 2002 at three sites in the free-flowing reaches of the Hiwassee River upstream of the TVA powerhouse, and data for all measured individuals ranged from 26 to 59 mm. Two live and 1 relict *V. trabalis* were collected in 2003 at four upper Hiwassee River sites above and below the Highway 68 bridge crossing. The two live individuals measured 21 and 39 mm, but *V. trabalis* are rare in the upper reaches of this section of river between the TVA powerhouse and Apalachia Dam. Three live and one fresh-dead (FD) *V. trabalis* were collected in 2005 from six sites on the Hiwassee River. The three live individuals measured 31, 46 and 48 mm. Paul Johnson, Alabama Aquatic Biodiversity Center (AABC) in Marion, Alabama, propagated 55 juvenile *V. trabalis* from the Hiwassee River and released them to the Hiwassee River in 2005 along with the adults. This population is currently considered the only viable population in the Tennessee River drainage, and is the best remaining population known in Tennessee. In 2010 the AABC facility transformed *658* juvenile *V. trabalis* which will be cultured at their facility until release later this year or in 2011. It is anticipated these individuals will be released either in the Paint Rock River and/or Elk River in Tennessee (Paul Johnson, 2010).

Little Chucky Creek (Tennessee): Occasionally a fresh dead individual has been observed in Little Chucky Creek, a tributary of the Nolichucky River in the French Broad River system. Although *V. trabalis* may still occur in this stream, the population is not considered viable. This stream is heavily impacted by agriculture and sedimentation.

b. Genetics, genetic variation, or trends in genetic variation:

No information on the genetic status of *V. trabalis* is currently available. See also II.C.1 .d. below.

c. Taxonomic classification or changes in nomenclature:

There has been no change in the classification or nomenclature of this species since it was listed.

d. Spatial distribution, trends in spatial distribution, or historic range:

Historically, this species occurred in the upper portions of the Tennessee and Cumberland Rivers. The six currently known populations of *V. trabalis* are only remnants within this species historical range and exist as fragmented and separate entities. Even within the Cumberland River drainage, populations in Buck Creek, Rockcastle River, and BSF are separated by large distances by Cumberland Reservoir and are not experiencing genetic exchange between populations.

e. Habitat or ecosystem conditions:

As a member of the Cumberlandian Region fauna *V. trabalis* is restricted typically to tributary streams of the upper reaches of the Tennessee and Cumberland Rivers. This species is most often found associated with clean, fast-flowing water in stable substrate, which contains relatively firm rubble, gravel, and sand swept-free from siltation. Typically, *V. trabalis* is found buried in shallow riffle and shoal areas, often located under large rocks that must be removed by hand to inspect the habitat underneath. Ideal habitat conditions are difficult to find; much of the historical habitat for the species has likely been degraded and may be incapable of currently harboring the species.

2. Five-Factor Analysis

a. Present or threatened destruction, modification or curtailment of its habitat or range:

The recovery plan for this species lists impoundments, siltation, and pollution as major causes for this species decline; however, it also indicates reasons for this species decline are not totally understood. Acid mine wastes and resulting impacts to water quality are either known and/or suspected causes in streams like the LSF, BSF, and Rockcastle River drainages. The LSF population is now considered extirpated due to coal-related activities in the 1980's. An assessment of potential restoration sites was conducted in the BSF (Guyot, J.A., 2005), but threats from transportation corridors, coal mines, and oil and gas wells were still considered dominant threats to these sites. In-stream gravel mining and non-point source pollution to water quality and habitat are considered impacts in Buck

Creek. The Service and its partners, (e.g., KDFWR, TNC) are working on improving stream habitat conditions in Buck Creek and in Sinking Creek through Partners for Fish and Wildlife projects and other stream bank and riparian restoration activities. In the Hiwassee River, the only known population of *V. trabalis* exists in an unimpounded section of the river downstream of Apalachia Dam. Minimum flow concerns for this species have resulted in the Tennessee Valley Authority's 2005 decision to provide a minimum flow of 25 cubic feet per second (cfs) in the Hiwassee River downstream of Apalachia Dam from May to October. Jim Herrig (U.S. Forest Service) believes this could provide some improvement to habitat conditions for this species; however, these flow conditions will need to be monitored and evaluated to determine if any additional changes will be necessary.

b. Overutilization for commercial, recreational, scientific, or educational purposes:

Over utilization 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. Currently, the only known individuals of *Villosa trabalis* in captivity are located in the Center for Mollusk Conservation propagation facility operated by KDFWR in Frankfort, Kentucky, and at the Alabama Aquatic Biodiversity Center in Marion, Alabama. The number of individuals that have been used in propagation facilities in the past, and that are currently being held, is not considered to be sufficient to constitute overutilization of the species.

c. Disease or predation:

The Recovery Plan does not discuss disease or predation as limiting factors for this species. We have no new information on disease or predation that would indicate either is a limiting factor.

d. Inadequacy of existing regulatory mechanisms:

In Kentucky, streams with federally listed mussels are regulated as Outstanding State Resource Waters and/or designated as a Wild River, which limits or prevents alterations in water quality to those sream reaches.

e. Other natural or manmade factors affecting its continued existence:

Other natural or manmade factors affect this mussel. Natural droughts, as well as water withdrawals for human use, can impact water levels. Changes in land use in the recharge area can accelerate pollutants delivery. Other potential threats include contaminant spills, mining (e.g. coal, oil, gas, gravel), siltation from land use practices, and stream impoundments. A portion of the headwaters of Sinking Creek are impacted from development and other urban activities in the

community of London, Kentucky, and from historical surface coal mining. A portion of the upper section of Sinking Creek has been recently purchased and is held in conservation ownership by The Nature Conservancy. The intent is to restore this upstream segment of Sinking Creek which should help improve water quality conditions downstream where known populations of *V. trabalis* occur. It is also possible that once restored this segment of stream may be suitable for introduction of the species and/or its fish hosts.

II.D. Synthesis

Threats such as siltation, pollution, and impoundment to the species likely remain similar to what they were in 1976 when this species was listed as endangered. Since the recovery plan was completed in 1984, the LSF population has been likely extirpated, but a new population has been discovered in Sinking Creek, a tributary of the Rockcastle River, Laurel County, Kentucky. Of the two populations currently considered the best for this species, one is in the Cumberland River drainage (Sinking Creek), and one is in the Tennessee River drainage (Hiwassee River). Both of these populations are considered viable with evidence of reproduction and recruitment. Two additional populations, both in the Cumberland River drainage (BSF and Buck Creek), show recent evidence of reproduction; however, recruitment and the overall population numbers for both streams are considered low, with these populations remaining vulnerable to further decline.

The population in the mainstem of the Rockcastle River needs to be surveyed to determine its status. There is also concern that the number of host fish, such as darters, may not be adequate in the Big South Fork Cumberland River and Buck Creek to promote successful recruitment of *V. trabalis* (Monte McGregor, personal communication). Host fish work has been most successful using sculpins and darters. Propagation efforts on this species have been conducted at the CMC with a release into Buck Creek of 151 juveniles. Virginia Tech (Blacksburg, VA) has been involved in multiple releases into the BSF totaling approximately 2,000 juveniles from six to eight weeks old, but none since 2007. No information is available to determine if these releases have been successful beyond the actual release itself. It also is not known if juveniles released into the Hiwassee River by AABC have been successful. Overall, it is still too early to tell if the limited augmentations of juveniles and/or subadults have resulted in adding adult individuals to existing populations.

It is still appropriate to consider this species as endangered since there have been no significant improvements to the species habitat or population status and because the threats to the species continue.

III. RESULTS

A. Recommended Classification:

__x__ No change is needed

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Based on our review of *Villosa trabalis*, we believe the following measures are appropriate:

1. Augment and expand extant populations through propagation of juveniles.

2. Determine status and viability of known populations in Sinking Creek, Hiwassee River, Big South Fork of the Cumberland River, Little Chucky Creek, Rockcastle River, and Buck Creek.

3. Reestablish viable populations in other streams within the historical range that have suitable habitat and water quality conditions, including the upper Clinch River in Tennessee and the Nolichucky, Paint Rock and Elk in Alabama.

4. Determine the degree of threat (e.g., coal mining, oil and gas drilling and water withdrawals, etc.) to each stream in which this species occurs. This could include assessments and/or a threats analysis using GIS.

5. Determine the genetic status of this species and *V. perpurpurea*, which appears to be a sister taxon to *V. trabalis*.

6. Conduct surveys on Rockcastle River, Barren Fork, Rocky River, and Falling Water River (tributaries to Caney Fork), West Harpeth and Jones Creek (tributaries to the Harpeth River in Tennessee), North and South Prongs Clear Fork and Brimstone Creek (tributaries to the Big South Fork Cumberland River), Obey River (West and East Forks) and Spring Creek (tributaries to the Cumberland River), and in the lower Hiwassee River downstream of the TVA Powerhouse in the Tennessee River system.

7. Evaluate TVA's minimum flow of 25 cubic feet per second downstream of the Hiwassee River to determine it the best appropriate flow regime to benefit *V. trabalis*.

V. REFERENCES

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Guyot, J. A. 2005. Restoration of the endangered Cumberland elktoe (*Alasmidonta atropurpurea*) and Cumberland bean (*Villosa trabalis*) in the Big South Fork National River and Recreation Area, Tennessee and Kentucky. Master of Science thesis, Virginia Polytechnic Institute and State University, Blacksburg.

Haag, W. R., and M. L. Warren, Jr. 2004. Species richness and total population size of freshwater mussels in Horse Lick Creek, Kentucky in 2003. Final Report: U.S.D.A. Forest Service, Oxford, MS. 43 pp.

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Mair, R., J. W. Jones, and R. J. Neves. 2002. Annual Progress Report 2002 – Life History and Artificial Culture of Endangered Mussels. Report for National Park Service, Big South Fork National River and Recreation Area, Oneida, TN. 9 pp.

U.S. Fish and Wildlife Service. 1984. Cumberland Bean Pearly Mussel Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, GA. 58 pp.

Note: Steve Ahlstedt (retired USGS biologist) provided much of the species information, especially on species status in Tennessee. Information provided by Mr. Ahlstedt is on file at the Kentucky Field Office. Dr. Monte McGregor provided verbal information on species status in Kentucky. Mr. Jim Herrig of the U.S. Forest Service provided information on the population in the Hiwassee River. Dr. Paul Johnson (AABC) provided information on propagation efforts of *V. trabalis* in the Hiwassee River.

Peer Reviewers:

Steve Ahlstedt, retired USGS biologist, P.O. Box 460, Norris, TN 37828
Telephone # 865-545-4140 ext. 17

Dr. Monte McGregor, KYDFWR, #1 Sportsman Lane, Frankfort, KY 40601
Telephone # 502-564-7109 ext. 371

Dr. Guenter Schuster, Eastern Kentucky University, 521 Lancaster Avenue, Richmond, KY 40475 Telephone # 859-622-1016.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Cumberland bean (*Villosa trabalis*)

Current Classification Endangered
Recommendation resulting from the 5-Year Review

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_x__ No change is needed

Review Conducted By: Leroy Koch, Frankfort, Kentucky Ecological Services Field Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 6/10/10

The lead Field Office must ensure that other offices within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. The lead field office should document this coordination in the agency record.

REGIONAL OFFICE APPROVAL:

The Regional Director or the Assistant Regional Director, if authority has been delegated to the Assistant Regional Director, must sign all 5-year reviews.

Acting
Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 6-21-10

APPENDIX A: Summary of peer review for the 5-year review of *Villosa trabalis*

Reviewers: Steve Ahlstedt, retired U.S. Geological Survey biologist; Dr. Monte McGregor, Kentucky Department of Fish and Wildlife Resources; Dr. Guenter Schuster, Eastern Kentucky University.

A. Peer Review Method: A draft 5-year review of *V. trabalis* was sent to each of the three reviewers as an attachment to an email requesting their review and any other comments or additions that should be included in the document. All three reviewers have extensive knowledge of this species and have worked with the species in field conditions.

B. Peer Review Charge: Reviewers were charged with providing a review of the document including any other comments and/or additions appropriate to include. We did not ask peer reviewers to evaluate our status recommendation.

C. Summary of Peer Review Comments/Report: Reviewers responded verbally and/or by email. All reviewers thought the information in the draft 5-year review of *V. trabalis* provided to them was accurate. They did provide some additional references and recommendations that were incorporated into the 5-year review as appropriate.

D. Response to Peer Review: Recommendations from the reviewers were included in the document. These consisted primarily of references to mussel surveys and/or additions to the species status and/or recommendations for future actions.