

**Purple Bean**  
**(*Villosa perpurpurea*, I. Lea)**

**5-Year Review:**  
**Summary and Evaluation**

U.S. Fish and Wildlife Service  
Southwestern Virginia Field Office  
Abingdon, Virginia

September 2006

## **5-YEAR REVIEW**

Species reviewed: Purple bean (*Villosa perpurpurea*)

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**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Purple Bean (*Villosa perpurpurea*)**

**1.0 GENERAL INFORMATION**

**1.1 Reviewers**

**Lead Regional Office:** Region 5, Ms. Mary Parkin, (617) 876-6173  
mary\_parkin@fws.gov

**Lead Field Office:** Southwestern Virginia Field Office, Mr. Shane Hanlon  
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**Cooperating Field Office(s):**

Region 5

Virginia Field Office, Eric Davis, (804) 693-6694 ext. 104, eric\_davis@fws.gov

Region 4

Asheville Field Office, Bob Butler, (828) 258-3939 ext. 235, bob\_butler@fws.gov  
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**Cooperating Regional Office(s):** Region 4, Kelly Bibb, (404) 679-7132,  
Kelly\_bibb@fws.gov

**1.1 Methodology Used to Complete the Review**

This 5-year review was conducted as an individual effort by the lead endangered species biologist for the purple bean. It summarizes and evaluates information provided in the finalized recovery plan and current scientific research and surveys related to the species. All pertinent literature and documents on file at the Southwestern Virginia Field Office were used for this review. The primary source of information used in this analysis was the final recovery plan (USFWS 2004).

**1.3 Background**

**1.3.1 FR Notice citation announcing initiation of this review:** FR notice Vol. 71,  
No. 77, April 21, 2006

### 1.3.2 Listing history:

FR notice: December 6, 1996

Date listed: January 10, 1997

Entity listed: species

Classification: endangered

### 1.3.3 Associated rulemakings:

#### Designation of Critical Habitat

Title: Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Five Endangered Mussels in the Tennessee and Cumberland River Basins; Final Rule

FR notice: August 31, 2004

Effective date: September 30, 2004

**1.3.4 Review history:** Since federal listing of the purple bean in 1997, no status review or 5-year review has been conducted for this species. However, an analysis of the purple bean extant populations and distribution was conducted in 2003 for purposes of designating Critical Habitat. In addition, the recovery plan for this species was finalized recently (U.S. Fish and Wildlife Service 2004) and reflects the most up-to-date information on the species and its status.

**1.3.5 Species' Recovery Priority Number at start of review:** The purple bean is taxonomically categorized as a species and has a high degree of threat and low recovery potential. On this basis, a RPN of 5 has been assigned to the species.

### 1.3.6 Recovery Plan or Outline

**Name of plan:** Recovery Plan for Cumberland Elktoe (*Alasmidonta atropurpurea*), Oyster Mussel (*Epioblasma capsaeformis*), Cumberland Combshell (*Epioblasma brevidens*), Purple Bean (*Villosa perpurpurea*), and Rough Rabbitsfoot (*Quadrula cylindrica strigillata*)

**Date issued:** May 4, 2004

## 2.0 REVIEW ANALYSIS

### 2.1 Application of the 1996 Distinct Population Segment (DPS) Policy

**2.1.1 Is the species under review a vertebrate?** No, the species is an invertebrate; therefore, the DPS policy is not applicable.

## 2.2 Recovery Criteria

**2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes. The recovery plan for this species is current and is used as general guidance for recovery.

**2.2.2 Adequacy of recovery criteria:**

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

**2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?** Yes.

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

Destruction of habitat and poor water quality are the predominant factors that are currently inhibiting the recovery of the purple bean. Therefore, the following downlisting and delisting criteria primarily address listing factor #1 (Present or threatened destruction, modification or curtailment of its habitat or range).

Downlisting from endangered to threatened status will occur when the following criteria are met for the protection of extant stream populations, discovery of currently unknown stream populations, and/or reestablishment of historical stream populations [*Delisting criteria, where different, are italicized and in brackets*].

(1) Four [*five*] streams with distinct viable populations of the purple bean have been established.

The status of all extant populations of the purple bean is presently tenuous. In particular, recent surveys of Beech Creek have indicated decreasing numbers of purple bean over the last 5 years (S.A. Ahlstedt, pers. comm. 2001). Similarly, numbers and recruitment of purple bean have significantly decreased over the last 20 years in Copper Creek (Fraley and Ahlstedt 2000). Agricultural practices related mainly to livestock grazing seem to be the dominant impact associated with these declines. The status of the Indian Creek population is uncertain; however, this small population is facing increased threats from activities associated with coal and natural gas exploration. The largest aggregation of the purple bean known in the mainstem of the Clinch River was extirpated by a chemical spill in 1998. Although individuals of the purple bean still occur throughout the mainstem of the Clinch River, the population appears to be sparsely distributed. Purple bean in the Emory and Obed Rivers continue to occur in very low numbers (Ahlstedt et al. 2001).

(2) One [two] distinct naturally reproduced year class exists within each of the viable populations.

Steve. J. Fraley (North Carolina Wildlife Resources Commission, unpub. data) reported that recruitment had occurred in Beech Creek in 2001. In 2004, a juvenile purple bean was observed in Indian Creek (J. Jones, U.S. Fish and Wildlife Service, pers. comm.). There are no data on other populations of the purple bean that would indicate distinct year classes have been naturally reproduced.

(3) Research studies of the mussel's biological and ecological requirements have been completed and any required recovery measures developed and implemented from these studies are beginning to be successful, as evidenced by an increase in population density of approximately 20 percent and/or an increase in the length of the river reach of approximately 10 percent inhabited by the species as determined through biennial monitoring.

Since its listing in 1997, there have been no data to suggest an increase in density or distribution in any of the remaining populations. In fact, the current data suggest that populations are continuing to decline. However, life history research on the purple bean (Watson 1999) has led to captive propagation and augmentation efforts of the species (see attachments 1 and 2).

(4) No foreseeable threats exist that would likely impact the survival of the species over a significant portion of its range. [no foreseeable threats exist that would likely threaten the survival of any of the viable populations.]

Increasing threats from agriculture, mainly livestock grazing, development, and coal mining activities continue to hamper recovery efforts.

(5) Within larger streams, the species are 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.

Current population distribution and densities of all extant populations of the purple bean do not ensure the continued viability of the entire population in a stream following a single catastrophic event.

(6) Biennial monitoring yields the results outlined in criterion (1) above over a 10-year period.

## **2.3 Updated Information and Current Species Status**

### **2.3.1 Biology and Habitat**

The recovery plan for the purple bean (USFWS 2004) was finalized on May 4, 2004 and includes current and detailed biological and ecological information.

### **2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)**

The recovery plan for the purple bean (USFWS 2004) was finalized on May 4, 2004 and includes a current and detailed five-factor analysis.

## **3.0 Synthesis**

The purple bean is endemic to the upper Tennessee River system above its confluence with the Clinch River. Primarily a species of the Ridge and Valley Physiographic Province, it also occurs at the eastern edge of the Cumberland Plateau. The entire range of the purple bean occurs in northeastern Tennessee and southwestern Virginia.

This species has apparently been extirpated from the Powell River, North Fork Holston River, Emory River, Daddys Creek, and North Fork Beech Creek. Although tenuous, extant populations still occur in isolated portions of the Clinch River, Tazewell, Russell, and Scott Counties, Virginia; Indian Creek, Tazewell County, Virginia; Copper Creek, Scott County, Virginia; Obed River, Cumberland County, Tennessee; and Beech Creek, Hawkins County, Tennessee.

The population in the upper Clinch River was significantly reduced as a result of a chemical spill in late 1998. The Copper Creek population is most likely the largest, but that population has been decimated in recent years (Neves 1991, Fraley and Ahlstedt 2000). The viability of the populations in the Emory River and Obed River systems is questionable (Ahlstedt et al. 2001). The Beech Creek population, the only extant purple bean population in the Holston River system, is also thought to be declining (S.A. Ahlstedt, pers. comm. 2001).

Currently, the species and its habitat continue to be impacted by excessive sediment bed loads and increased suspended solids, primarily resulting from nonpoint-source loading from poor land-use practices, riparian degradation, and pesticides. Activities associated with coal and gas exploration also pose a serious threat to the continued existence of the Indian Creek and mainstem Clinch River populations. Toxic spills and alien species are also a possible threat to all extant populations. Despite an improved understanding of these consequences leading to regulatory actions (e.g., the CWA), voluntary landowner measures (e.g., BMPs for agricultural, silvicultural, and construction activities), and improved land-use practices (e.g., maintaining riparian buffers, practicing no-till agriculture), the remaining purple bean populations show no signs of recovery from historical habitat losses and continual chronic non-point source impacts.

Given its highly restricted distribution, the vulnerability of remaining populations and its currently declining status, the purple bean continues to meet the definition of endangered.

### 3.0 RESULTS

3.1 **Recommended Classification:** Because of its current level of endangerment, no change to the purple bean's listing status is warranted.

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

3.2 **Recommended Recovery Priority Number**   5  

According to the recovery priority table, the purple bean is taxonomically categorized as a species, has a high degree of threat, and has low recovery potential. Therefore, no change is recommended for the recovery priority number.

### 4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Continue to augment extant populations and where appropriate, repopulate extirpated populations via captive propagation.
- Through various means of land protection (land acquisition, BMP programs, conservation easements), abate non-point source impacts and direct habitat loss.
- Continue to use existing legislation and regulations to protect the species and its habitat.
- Pursue and establish protective criteria for known and suspected pollutants.
- Educate the public about impacts to habitat and water quality.
- Foster support for recovery through partnerships and landowner participation.

## 5.0 REFERENCES

- Data and literature are located with the U.S. Fish and Wildlife Service's Southwestern Virginia Field Office, 330 Cummings Street, Abingdon, Virginia 24210.
- Ahlstedt, S. A., J. F. Connell, S. Bakaletz, and M. T. Fagg. 2001. Freshwater mussels of the National Park Service Obed Wild and Scenic River. Unpublished report, National Park Service, Oneida, Tennessee. 40 pp.
- Fraley, S. J., and S. A. Ahlstedt. 2000. The recent decline of the native mussels (Unionidae) of Copper Creek, Scott County, Virginia. Pp. 189-195 *in*: P. D. Johnson and R. S. Butler, eds. Freshwater Mollusk Symposia Proceedings--Part II: Proceedings of the First Symposium of the Freshwater Mollusk Conservation Society, Chattanooga, Tennessee, March 1999. Ohio Biological Survey, Columbus.
- Neves, R. J. 1991. Mollusks. Pp. 251-319 *in*: K. Terwilliger, coordinator. *Virginia's endangered species*: Proceedings of a symposium. McDonald & Woodward Publishing Co., Blacksburg, Virginia.
- U.S. Fish and Wildlife Service. 2004. Recovery plan for Cumberland elktoe, oyster mussel, cumberlandian combshell, purple bean, and rough rabbitsfoot. Atlanta, Georgia. 167 pp.
- Watson, B. T. 1999. Population biology and fish hosts of several federally endangered freshwater mussels (Bivalvia: Unionidae) of the upper Tennessee River drainage, Virginia and Tennessee. Unpublished M.S. Thesis, Virginia Polytechnic Institute and State University, Blacksburg. 124 pp.
- Watson B. T., and R. J. Neves. 1996. Host fishes for two federally endangered species of mussels. Unpublished report in Triannual Unionid Report 10:13.

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Current Classification: Endangered  
Recommendation resulting from the 5-Year Review

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Listing/Reclassification Priority Number, if applicable NA

Review Conducted By: Shane D. Hanlon

**FIELD OFFICE APPROVAL:**

Lead Field Supervisor, Fish and Wildlife Service

Approve *Rebecca E. Hutton* Date *Aug. 31, 2006*

*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.*

**Lead Regional Director, Fish and Wildlife Service**

Approve *Jamie M. Deign* Date *10/20/06*

*The Lead Region must ensure that other regions within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. If a change in classification is recommended, written concurrence from other regions is required.*

**Cooperating Regional Director, Fish and Wildlife Service**

Concur  Do Not Concur

Signature *See attached* Date \_\_\_\_\_

**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Purple Bean (*Villosa perpurpurea*)**

**Current classification:** Endangered

**Recommendation resulting from the 5-Year Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

**Appropriate Listing/Reclassification Priority Number, if applicable:** Not applicable

**Review conducted by:** Shane D. Hanlon

**FIELD OFFICE APPROVAL:**

Lead Field Supervisor, Fish and Wildlife Service

Approve \_\_\_\_\_ Date \_\_\_\_\_

**REGIONAL OFFICE APPROVAL:**

Lead Regional Director, Region 5, Fish and Wildlife Service

Approve \_\_\_\_\_ Date 10/24/06

*Assistant*  
Cooperating Regional Director, Region 4, Fish and Wildlife Service

Concur  Do Not Concur  
Signature *Noreen E. Walsh* Date 10/11/07

## **Attachment 1: Chronology of purple bean accomplishments**

- 2005: The U.S. Fish and Wildlife Service contracted with U.S. Department of Agriculture, Wildlife Services to conduct predator control of muskrats to protect the Indian Creek purple bean population.
- 2004-2005: Status survey of purple bean and other mussel fauna was conducted in Copper Creek.
- 2004: Twenty purple bean were collected from Indian Creek to establish an ark population and to augment the stream population. Mussels were propagated at the Aquatic Wildlife Conservation Center (AWCC) at the Buller Fish Cultural Station. Maintenance of an ark population and propagation efforts are ongoing at both the AWCC and Virginia Tech.
- 1999-2006: Release of approximately 28,000 individuals in the Clinch River (Tazewell County, Virginia and Hancock County, Tennessee), Indian Creek (Tazewell County, Virginia), and Copper Creek (Scott County, Virginia).
- 2000: Publication of the paper entitled, "Species Composition and Biotic Condition of the Fish Community of Indian Creek, Tazewell County, Virginia".
- 1999: Completion of an M.S. Thesis by B.T. Watson of Virginia Tech. Watson's thesis included a description of the mussel fauna of Indian Creek and their distribution. During his research, Watson identified several host fishes, collected demographic data on the purple bean population, and augmented it with juveniles from his host fish identification research.

## Attachment 2: Purple bean augmentation summary

Numbers of Juveniles of the purple bean (*Villosa perpurpurea*) produced via captive propagation and released to various sites within the Upper Tennessee River Basin.

Year	Location of Release	Number Released
2006	Copper Cr. Scott Co., VA	997
2005	Copper Cr. Scott Co., VA	83
2005	Indian Cr., Tazewell Co., VA	945
2005	Clinch R., Tazewell Co., VA	954
2004	Copper Cr. Scott Co., VA	16
2004	Clinch R., Tazewell Co., VA	2,101
2003	Clinch R., Tazewell Co., VA	5,500
2002	North Fork Holston R., Hawkins Co., TN	1,123
2002	Clinch R., Tazewell Co., VA	10,573
2002	Clinch R., Hancock Co., TN	616
2001	Indian Cr., Tazewell Co., VA	124
2000	Indian Cr., Tazewell Co., VA	3,088
1999	Clinch R. Hancock Co., TN	138
1999	Indian Cr., Tazewell Co., VA	1,822
TOTAL		28,080