

by Richard G. Biggins and  
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# Bringing Mussels Back in the Southeast



**Mussel shells collected from a muskrat midden on the Conasauga River in Tennessee**

Photo by Richard Biggins/USFWS



**Tan riffleshell in Indian Creek, a Clinch River tributary in southwestern Virginia**

Photo by Richard Biggins/USFWS

The world's greatest diversity of freshwater mussels occurs in the continental United States. Early American naturalists marveled at this fauna's beauty and diversity. T.A. Conrad wrote in a paper presented to the Academy of Natural Sciences of Philadelphia in 1834, "The great variety and beauty of the fresh water shells of this country are truly surprising. Whilst the streams of Europe contain very few species, not remarkable for elegance of color or variety, the rivers of Ohio, Kentucky, Tennessee, Alabama, etc., contain at least one hundred species of almost every imaginable shape."

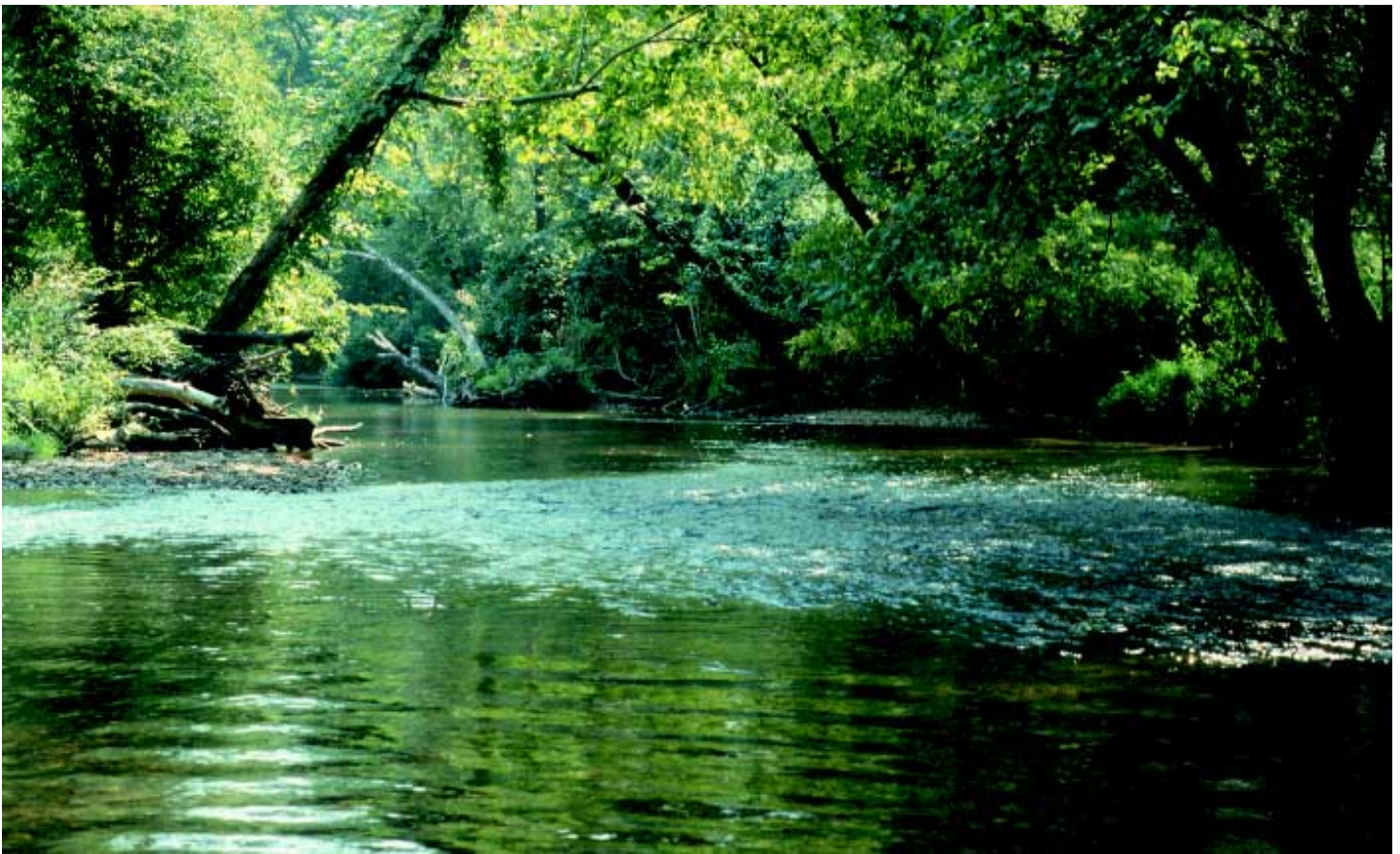
Native Americans made extensive use of this abundant natural resource. Mussels in unimaginable numbers once paved the shallow shoals of many rivers and provided an easily accessible food supply. Many of the shells were fashioned into spoons, plates, hoes, and an array of other tools, and some of the colorful and ornate shells were transformed into adornments. In spite of extensive use, this mussel fauna remained relatively unchanged for centuries prior to European settlement.

However, during the last 100 years, the habitat of this rich fauna (nearly 300 species) has been inundated by impoundments, smothered in silt, dredged for navigation, and polluted with toxins. The U.S. Fish and Wildlife Service currently recognizes about 12 percent of our mussel fauna as extinct and 23 percent as threatened or endangered. No other widespread North American animal group has experienced this level of collapse. For example, The Nature Conservancy (TNC) considers 68 percent of our nation's mussel

species at risk, compared to only 17 percent for mammals and 15 percent for birds. The American Fisheries Society estimates that 72 percent of our mussels need protection. The precipitous decline of freshwater mussels in the 20th century is unparalleled in our nation's history, and many more extinctions are likely without a coordinated conservation effort.

Freshwater mussels serve important ecological roles. They are a food source for many aquatic and terrestrial animals. They improve water quality by filtering contaminants, particulates, and excess nutrients from our rivers. Sensitive to toxic chemicals, they serve as an early warning of water quality problems before other biological resources are noticeably affected.

The economic value of some of the more common species is also significant. Native mussel shells are used in the cultured pearl and jewelry industries. In 1993, the mussel shell industry in the United States exported roughly 6,500 tons of shells. The annual value



**A mussel shoal on the Conasauga River, Tennessee**

*Photo by Richard Biggins/USFWS*

to the mussel shell industry has been estimated at \$40 to \$50 million, and the shell harvest provides employment to about 10,000 residents, primarily in the Mississippi River basin.

Although biologists have been documenting mussel declines since the early part of this century, only in the last 25 years have environmental laws been available to significantly reduce threats to these animals. Numerous federal, state, tribal, and local agencies; conservation groups; and concerned citizens now recognize the severity of the problem and the vulnerability of freshwater mussels. Many historical and current threats to this fauna are not economically or socially feasible to remedy. However, much can and is being done to help secure a future for this valuable national resource.

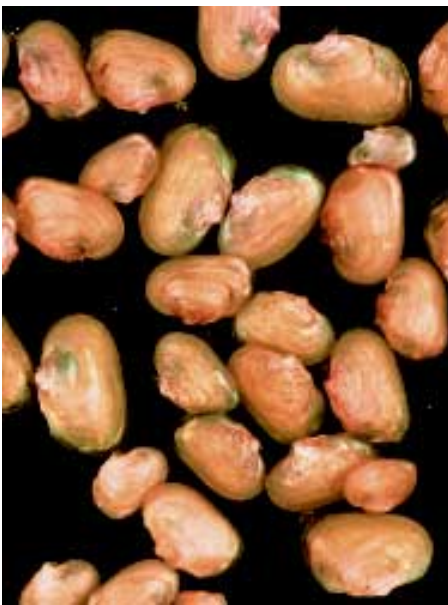
Since the early 1980s, the Service's Southeast Regional office, which encompasses an area containing more than 90 percent of the nation's mussel taxa and more than 95 percent of all federally listed mussels (70 species), has

actively supported mussel research and conservation initiatives. As a result, the Service's Asheville (North Carolina) Field Office, with its many partners (Alabama Division of Game and Fish, Kentucky Department of Fish and Wildlife Resources, North Carolina Wildlife Resources Commission, Tennessee Wildlife Resources Agency, Virginia Department of Game and Inland Fisheries, U.S. Geological Survey [USGS], U.S. Forest Service [USFS], National Park Service, Natural Resources Conservation Service, Resource Conservation and Development Councils, State Soil and Water Conservation Districts, Tennessee Valley Authority [TVA], Tennessee Aquarium/Southeast Aquatic Research Institute [SARI], and TNC) is poised to implement a major mussel recovery program in the Southern Appalachians and lower Tennessee-Cumberland River ecosystems.

Recent advances in mussel research make it possible to maintain and propagate some endangered mussel species in captivity, and research is

underway to develop propagation technology for other listed mussels. Captive propagated mussels can be used to augment existing populations and to reestablish populations into restored historical habitats.

Juveniles of the endangered tan riffleshell (*Epioblasma walkeri*) have been reared in captivity and for the past 3 years have been released into the Hiwassee River, a Tennessee River tributary in east Tennessee. This project, funded by the Service and the Tennessee Wildlife Resources Agency, is truly a cooperative venture. Gravid female riffleshells were provided by the Virginia Department of Game and Inland Fisheries. The young were produced at Virginia Polytechnic Institute and State University by the Biological Resources Division of USGS. The USFS, USGS, and TVA assisted with identification of the release sites in the Cherokee National Forest, and local school children assisted in the actual release of the juveniles. The Hiwassee River contains an extremely small and



**Artificially propagated mussels ready for release into the wild**

Photo by Richard Neves/U.S.G.S.

currently nonreproducing population of tan riffleshells.

Endangered mussel populations in two other upper Tennessee River tributaries have also been augmented. In 1999, the Tennessee portions of the Clinch and Powell Rivers above Norris Reservoir received over 100,000 juvenile of 6 endangered mussels, and more juveniles of these and other species are being released this year. In addition, SARI has released hundreds of juvenile fine lined pocketbook (*Lampsilis altilis*), a threatened mussel, this year into the Conasauga River. Through this and future augmentations, we hope that the population levels increase to the point where the species can again sustain itself. Research is underway to identify other endangered mussel populations and river reaches that could benefit from augmentations.

In addition to augmenting existing populations, the Service and its partners are evaluating the feasibility of reintroducing mussels into currently unoccupied historical habitats. Thanks to the water quality improvement efforts of TVA, the Environmental Protection Agency, State water resource and natural resource agencies, industries, and municipalities, some reaches of the

Tennessee River and its tributaries appear suitable for reintroducing their historic mussel fauna.

The Service and its partners have identified the lower French Broad River below Douglas Reservoir, Tennessee, as a potential mussel reintroduction site. This river reach historically supported approximately 60 mussel species. Thanks to TVA's reservoir release improvement program, the resident aquatic fauna has rebounded, and the habitat below the dam now appears suitable for mussel reintroduction. The area below Wilson Dam on the Tennessee River in north Alabama has also been identified for the reintroduction of 16 federally listed mussels. Historically, this river reach harbored the world's greatest mussel assemblage (more than 70 species).

The Asheville Field Office also has a cooperative riparian habitat restoration program that addresses the habitat needs of mussels and other imperiled aquatic organisms. This comprehensive effort, involving many of the same agencies and organizations mentioned above, restores and protects riverine habitat containing diverse aquatic communities. Many miles of important mussel streams have been degraded by poor land use practices, and efforts are underway to restore and protect the

habitat quality through partnerships with willing private landowners.

Because this recovery action is a Service program funded under the Endangered Species Act, the effort focuses on endangered mussel restoration. However, the program has much wider economic, aesthetic, and ecological benefits. Habitat improved for mussels benefits sport fisheries and other wildlife. Improved habitat and cleaner streams have increased aesthetic and recreational value, and reestablishing biodiversity helps to restore the complex ecological function of aquatic communities. There are few quick fixes to the problems that have plagued our rivers and their aquatic life for many years, but through public and private partnerships on an ecosystem scale, we can restore aquatic ecosystems for the public's use and enjoyment.

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**Biologists using snorkeling equipment release adult mussels into a marked-off area in the Holston River in eastern Tennessee so that the success of the release can be monitored.**

Photo by Richard Biggins/USFWS

