

Releasing Mussels to Recovering Waters

by Shane D. Hanlon



A handful of 3-month-old juveniles of the wavyrayed lampmussel (*Lampsilis fasciola*) propagated at Virginia Polytechnic Institute and State University and reared at the Virginia Department of Game and Inland Fisheries' Aquatic Wildlife Research Center.

Photo by Shane D. Hanlon

Site along the lower French Broad River, Tennessee, where common mussels are being released to test the suitability for the reintroduction of endangered mussels.

Photo by Richard Biggins/USFWS

One of our nation's biological hot spots, the 21,390 square miles (55,379 sq. kilometers) of the Upper Tennessee River Basin (UTRB) provides habitat for a remarkable diversity of aquatic life. More than 85 of the approximately 300 described North American freshwater mussel species have been recorded here, representing one of the most diverse mussel assemblages in the world, with many occurring nowhere else. Five major Tennessee River subbasins (the Clinch/Powell, Holston, French Broad, Hiwassee, and Little Tennessee) contribute to the UTRB, which stretches its extensive network of tributaries through parts of Tennessee, Virginia, North Carolina, and Georgia.

Prior to the industrial revolution, freshwater mussels thrived in these waters. Over the past century, however,

mussels have been plagued by numerous human activities and are now considered the most endangered faunal group in North America. Mussel populations have been decimated by impoundments; poorly managed mining operations; toxic spills; industrial, domestic, and agricultural pollution; and silt-laden waters from eroding landscapes. The Fish and Wildlife Service currently lists 30 mussel species of the UTRB under the Endangered Species Act (ESA) as endangered. Eleven species native to the basin in historical times are believed to be extinct. Only 26 of the nonlisted species are considered stable.

Freshwater mussels provide us with important ecological benefits. They are a significant food source for many aquatic and terrestrial animals. They filter particulates and excess nutrients from our rivers, thus improving water quality. Declining mussel populations signal potentially serious environmental and



public health problems. Because mussels are long-lived and virtually immobile, they cannot escape pollutants. Therefore, mussels have been referred to as “silent sentinels” that indicate chronic impacts to water quality. In addition, mussels’ lack of mobility renders them susceptible to massive die-offs from acute stresses, such as chemical spills. Without mussels, these spills might go unnoticed, because more mobile aquatic fauna can exit or drift downstream of an impacted area before perishing, leaving no visible trace of the harm that can be done to the aquatic ecosystem.

Prior to the first ESA listings of freshwater mussels in 1976, declining freshwater mussel populations were largely ignored. Today, numerous federal, state, tribal, and local agencies; conservation groups; and local communities are recognizing the value of these animals and are advocating mussel conservation. In the UTRB, local watershed groups are growing in number. In the Virginia portion alone, more than 20 nongovernmental organizations and coalitions have spearheaded the demand for improved water quality for biological diversity, as well as for human use.

Given the large scale at which the UTRB watershed has been altered, it is a daunting task to protect and restore it. Nevertheless, agencies and conservation groups are making significant accomplishments. Since the early 1980s, under the leadership of the Service and with the commitment of many partners, a major mussel recovery program is underway. These partners include the Virginia Department of Game and Inland Fisheries (VDGIF), U.S. Forest Service, U.S. Geological Survey (USGS), Tennessee Wildlife Resources Agency (TWRA), Tennessee Valley Authority, Soil and Water Districts, Upper Tennessee River Round Table, Nature Conservancy, and Black Diamond Resource Conservation and Development, Inc.

Many streams throughout the UTRB have been degraded by poor land management practices. Since 1991, the Service’s Partners for Fish and Wildlife

program has collaborated with private landowners and other community partners to conduct hundreds of stream restoration projects on private lands in the UTRB. More than 50 miles (80 km) of riparian corridor have been restored to benefit endangered mussels and a rich diversity of native fishes, snails, crayfish, amphibians, and other aquatic organisms. Improving habitat for mussels also benefits sport fisheries, improves water quality for people, and increases aesthetic value.

For many endangered mussel species, habitat improvement alone may not be enough to prevent extinction. Densities have become so low that natural reproduction can no longer sustain the population. With support from the Service, TWRA, and VDGIF, researchers from the USGS/Biological Resources Division at Virginia Polytechnic Institute and State University have worked diligently to develop captive propagation techniques for endangered and threatened mussels. From 1998 through 2001, nearly 260,000 juvenile mussels of eight endangered species and one of special concern were propagated and released to two major river systems (Clinch/Powell and Hiwassee River systems) to augment declining mussel populations. These species include the fanshell (*Cyprogenia stegaria*), dromedary pearlymussel (*Dromus dromas*), Cumberlandian combshell (*Epioblasma brevidens*), oyster mussel (*Epioblasma capsaeformis*), tan riffleshell (*Epioblasma florentina walkeri*), snuffbox (*Epioblasma triquetra*), purple bean (*Villosa perpurpurea*), birdwing pearlymussel (*Lemiox rimosus=Conradilla caelata*), and cracking pearlymussel (*Hemistena lata*).

In 1998, the VDGIF established the Aquatic Wildlife Conservation Research Center to expand propagation activities. The facility, located at their Buller Fish Culture Station near Marion, Virginia, has shown promising results in rearing juvenile mussels using water from the nearby Holston River to simulate natural river conditions. The VDGIF conducted its first release of hatchery-reared

mussels in 2001. More than 2,300 juvenile mussels were released to the Clinch River in Clinchport, including juveniles of the wavyrayed lampmussel (*Lampsilis fasciola*) and two endangered species, the Cumberlandian combshell and oyster mussel. Researchers at the Virginia Cooperative Fish and Wildlife Research Unit developed the propagation techniques and assisted in the release. Research is underway to develop propagation technologies for other endangered mussels and to identify additional stream reaches suitable for augmentation. The Service and its partners plan to produce and release juvenile mussels of several imperiled species to augment additional populations within the Clinch/Powell and North Fork Holston in Virginia.

Using an ecosystem approach, the Service’s conservation initiatives and partnerships are fundamental to prevent the extinction of many freshwater mussel species. Through these efforts, populations of imperiled species may once again be able to sustain themselves and thrive in restored habitats, benefitting not only one of the richest aquatic communities in the nation, but ultimately the human communities that depend on good water quality and the conservation of aquatic biodiversity.

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