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In Pursuit of Preserving Freshwater Mussels

North America is home to the largest number of species of freshwater mussels (clams) in the world, about 300 species compared to less than 20 species found in most other countries of the world. Unfortunately, over half of the taxa are extinct, endangered, or threatened.

Why worry about mussels? It doesn't seem, at first glance, that these sedentary animals, often mistaken for rocks, can have much value to humans. The answer lies in the fact that mussels are adaptable creatures. They can move to more favorable environmental conditions, close their shells to avoid short term exposure to toxins, and adapt to constantly changing river and stream conditions. These are tough animals, and so the fact that so many mussel species are threatened shows that there has been significant, long-term changes to our nation's waterways. If these changes can affect adaptable species like mussels, how many other more delicate species have also been dramatically affected?

Actually, fresh water mussels have a rich history of benefiting the United States. In addition to being a food source, they have historically been of major commercial importance, their shells harvested to make pearl buttons. Until the early 1900's, mussels were harvested along the banks of the Mississippi River, when over-harvesting and the use of plastic buttons closed down the pearl button industry. In the latter half of the 20th century, the cultured pearl industry in Japan greatly expanded, creating a new commercial use for freshwater mussels that again triggered the over-harvesting of mussels. This new commercial use of mussels is not to produce fresh-water pearls in the mussels, but rather to speed the production of cultured pearls by oysters. Natural pearls are formed when pieces of sand or grit become trapped within oysters, where they become encased within layers of silicate, creating a pearl. As many layers of silicate must be layed down, the process takes many years. To speed things up, cultured pearls are created by inserting into oysters small pearl-sized spheres cut from mussel shell. Only a few layers of silicate are required to cover the sphere and creating a pearl.

Mussels also play an important role in the aquatic ecosystem. They are filter feeders, which means that they filter water through their gills, capturing microscopic organisms. In doing so, they help purify the water, the aquatic system. They also help to stabilize the substrate in rivers and condition the substrate which increases aquatic insect populations.

Why are mussels so threatened? To answer this question it is necessary to learn how the characteristics of their environment affect the distribution and ultimate survival of these species. Like many endangered species, changes in habitat, contamination, and introduction of exotic species are threatening the very existence of fresh water mussels. The creation of dams along many rivers has disrupted the natural habitats of mussel populations. Mussel populations gather in groups called "beds," which require a rocky or sandy sediment to anchor the mussels. Dams lead to deposits of silt on the floor of the river, creating an unstable sediment. Mussels also require fish to distribute their larvae. Dams cause barriers to the migration of fish up and down rivers and waterways. Agricultural runoff is another threat to mussel populations, bringing harmful agricultural and industrial chemicals into the rivers and streams.

Exotic Species Threaten Native Mussel Species. The European Zebra mussel, shown here clinging to a larger mussel, threatens the existence of the Winged mapleleaf mussel. (courtesy of Daniel Hornbach).

The introduction of exotic species into an environment can cause serious disruption of native species. In this instance, the introduction of the zebra mussel from Europe into U.S. waterways has created a very real threat to native mussel populations. When zebra mussels move into a mussel habitat, they quickly come to dominate all available food and space resources, killing other mussels.

One endangered mussel species, close to extinction, is the winged mapleleaf, *Quadrula fragosa*. Once abundant throughout the Midwest, the only living population is found in the St. Croix River in Wisconsin. In an attempt to save this native mussel species, Daniel Hornbach and colleagues from Macalester College, Nels Troelstrup, Jr., from South Dakota State University, and James Perry from the University of Minnesota, set out to study the *Quadrula fragosa* population in the St. Croix River and characterize its habitat and community relationships.