



Rayed Bean (freshwater mussel) *Villosa fabalis*

The rayed bean is a freshwater mussel that the U.S. Fish and Wildlife Service has proposed to list as an *endangered species*. Endangered species are animals and plants that are in danger of becoming extinct. *Threatened species* are animals and plants that are likely to become endangered in the foreseeable future. Identifying, protecting, and restoring endangered and threatened species are primary objectives of the U.S. Fish and Wildlife Service's endangered species program.

What is the Rayed Bean?

Appearance: The rayed bean is a small freshwater mussel, usually less than 1.5 inches long. Its shell is smooth-textured and green, yellowish-green, or brown with numerous dark-green wavy lines. The male's shell shape is generally elongated, whereas the female's is smaller and elliptical.

Range: The rayed bean historically was found across a wide expanse that included parts of the Midwest, the eastern United States, and north to Ontario, Canada. Once found in at least 112 streams, canals, and lakes, the rayed bean now occurs in only 28 streams and 1 lake; a 75 percent reduction in the number of occupied streams and lakes. The species has been extirpated from Illinois, Kentucky, Tennessee, and Virginia but is still found in Indiana, Michigan, New York, Ohio, Pennsylvania, West Virginia and Ontario, Canada.



Photo by USFWS; Angela Boyer

The rayed bean, a small freshwater mussel of the upper Midwest and Eastern United States, has been proposed for listing as an endangered species.

Habitat: The rayed bean generally lives in smaller, headwater creeks, but they are sometimes found in large rivers and wave-washed areas of glacial lakes, including Lake Erie. They prefer gravel or sand substrates, and are often found in and around roots of aquatic vegetation.

Adults spend their entire lives partially or completely buried in substrate, filtering water through their gills to remove algae, bacteria, detritus, microscopic animals, and dissolved organic material for food.

Reproduction: The life cycle of the rayed bean, like most freshwater mussels, is unusual and complex. The male releases sperm into the water column that is then siphoned by the female to fertilize her eggs. Fertilized eggs develop

into microscopic larvae, called glochidia, within special gill chambers. Female mussels expel mature glochidia, which must attach to the gills or fins of a specific host fish species to complete development into juvenile mussels. If successfully attached to a host fish, glochidia mature into juvenile mussels within a few weeks. They then drop from the fish and continue to grow, if they fall onto appropriate substrate. Using fish as a host species allows the rayed bean to move upstream and populate habitats it could not reach otherwise.

What threatens the rayed bean mussel?

Dams: Dams affect both upstream and downstream mussel populations by disrupting natural

river flow patterns, scouring river bottoms, changing water temperatures, and eliminating habitat.

The rayed bean also depends on host fish as a means to move upstream. Because dams block fish passage, mussels are also prevented from moving upstream, which isolates upstream mussel populations from downstream populations leading to small unstable populations more likely to die out.

Pollution: Adult mussels are easily harmed by toxins and degraded water quality from pollution because they are sedentary (they tend to stay in one place). Pollution may come from specific, identifiable sources such as accidental spills, factory discharges, sewage treatment plants and solid waste disposal sites or from diffuse sources like runoff from cultivated fields, pastures, feedlots, farms, mines, construction sites, private wastewater discharges, and roads. Contaminants may directly kill mussels, but they may also reduce water quality, affect the ability of surviving mussels to have young, or result in lower numbers or disappearance of host fish.

Sedimentation: Sedimentation can be accelerated by poor land use practices, dredging, impoundments, intensive timber harvesting, and heavy recreational use. Excessive sedimentation suffocates freshwater mussels because it is difficult for them to move away from the threat. Impacts from increased or heavy sedimentation also reduces feeding and respiratory ability for the rayed bean mussel, which can lead to

decreased growth, reproduction, and survival.

Nonnative Species: Nonnative zebra mussels have invaded U.S. waters, and pose a serious threat. Zebra mussels proliferate in such high numbers that they use up food resources and attach to native mussel shells in such large numbers that the native mussel cannot eat or breath.

Another invasive species, the round goby, is a nonnative fish that may displace native host fish species, thus reducing reproductive ability of the rayed bean reproduce.

What is being done to conserve and restore rayed bean mussels?

Listing: In 2004, the U.S. Fish and Wildlife Service designated the rayed bean mussel as a candidate species for listing as threatened or endangered under the Endangered Species Act. The Service is now proposing to list it as endangered. If listed, the rayed bean will receive the full protection of the Endangered Species Act (ESA). The ESA would provide protection against certain practices and would require planning for recovery and recovery actions.

Watershed Protection through Partnerships: The rayed bean cannot survive without help from watershed partnerships to restore habitat and improve surface lands. Causes of habitat degradation are numerous in streams throughout its range. In many cases, the threats are not from actions in or adjacent to the rivers where the species is found. Instead, threats are due to widespread problems on uplands at the highest elevations of

watersheds. Habitat restoration will require improvements across the entire watershed. The voluntary assistance of Federal and State agencies, conservation groups, local governments, private landowners, industries, businesses, and farming communities will be necessary to meet recovery goals.

What can you do?

Learn more about how the destruction of habitat leads to loss of endangered and threatened species and our nation's plant and animal diversity. Discuss with others what you have learned.

Help improve water quality locally in streams by minimizing use of lawn-care chemicals and properly disposing of or recycling hazardous materials found in your home, like batteries, paint, car oil, and pesticides.

When boating, please follow any rules established to prevent the spread of exotic pests like the zebra mussel.

Join a conservation group or volunteer at a local nature center, zoo, or wildlife refuge.

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