

## **Freshwater Mussels of the Mill River**

### **The Big Picture**

North America boasts the world's greatest diversity of freshwater mussels. Yet a quick survey reveals that mussels are in deep trouble. Three centuries of dams, pollution, sedimentation and exploitation have led to an unprecedented level of rarity. Of the nearly 300 species in the US, over 70% are either endangered, threatened, of special concern, or already extinct. Here in Massachusetts', 7 of the 12 freshwater mussel species are protected by the Massachusetts' Endangered Species Act.

### **The Local Scene**

When it comes to freshwater mussels, the Mill River that flows through Whately, Hatfield, Deerfield and Conway has the greatest diversity in Massachusetts, with nine of the state's 12 species found in its waters. Of these, four—the eastern pond mussel (*Ligumia nasuta*), Squawfoot (*Strophitus undulatus*), triangle floater (*Alasmidonta undulata*) and dwarf wedge mussel (*Alasmidonta heterodon*)--are listed by the Massachusetts Natural Heritage and Endangered Species Program as endangered, threatened, or of special concern. The dwarf wedge mussel is further protected as a Federally Endangered species.

### **Mussel Biology**

In order to successfully reproduce, freshwater mussels have evolved a unique relationship with fish. And not just any fish. Most mussels rely on only a few (or less) fish species; for instance, the freshwater mussel known as the alewife floater (*Anodonta implicata*) relies on only three kinds of anadromous fish—shad, alewives and blue-backed herring—to complete its life cycle. It goes like this:

Once a female mussel is fertilized, she broods the larval mussels, known as glochidia, inside the shell. Depending on the species, this brooding period can last from a few weeks to a several months. At the end of this time, the female relies on a combination of water temperature and water flow cues to release the larval mussels. In Massachusetts, the larval mussels are broadcast into the water column. As a fish swims, water passes through its gills. When the microscopic glochidia are ingested by the appropriate fish, the glochidia clamp on, either to the fish's gills or fins. At this point, they begin the parasitic phase of their lives, and draw nutrients from the host's bloodstream. After a few weeks, the larval mussels drop off, burrow into the bottom of the river, and begin their independent lives. And for some species that can last up to 50 years!

Once mussels are living on their own, they feed by filtering algae from the water column. As they strain the water, they inadvertently ingest suspended solids and pollutants. As a result, these long-lived species are excellent indicators of a river's environmental health.

### **Why Are Freshwater Mussels in So Much Trouble?**

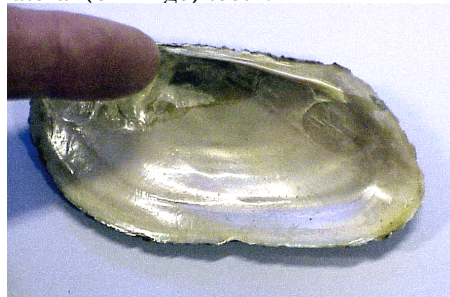
Over the last 300 years, human-induced changes have precipitated the decline of freshwater mussels around the globe. The construction of dams changed the way rivers flowed, altered how and when they flooded, and affected how much silt and sand they carried. As silt was trapped behind dams, mussels and fish-spawning grounds got buried. What's more, the dams blocked the upstream passage of the mussels' host fish.

Logging, farming and development activities have also caused problems by increasing surface runoff and erosion and altering water chemistry and water temperatures. In urban and rural landscapes, runoff carries not only sediments, but also pesticides, lawn fertilizers, road salt, oil and other pollutants. Although water quality in Massachusetts has significantly improved since the passage of the Clean Water Act in 1972, nearly half of our state's rivers are still not meeting their expected water quality standards.

In other parts of the country, freshwater mussel populations were also significantly impacted by overharvesting. But not for food. Although freshwater mussels taste like mud and have the consistency of the bottom of an old sneaker, their shells were used extensively during the 19<sup>th</sup> century to make buttons, especially in the Ohio and Tennessee River Valleys. (The species found in New England's are too thin for the button industry). Today, mussel shells are still being harvested in some areas of the US; these are being cut up and sent to the Orient as the "seeds" for the pearl industry.

### **Identifying Freshwater Mussels**

Several characters are used to correctly identify freshwater mussels: the outer shape, color of the outer shell, thickness of the shell, size (but variable with younger individuals), and with dead specimens, the color of the interior of the shell and shape and presence of the interior teeth. There are two kinds of teeth: pseudocardinal and lateral (or hinge) teeth.



Useful guides include the *Mussels of Vermont*, available from the Vermont Chapter of The Nature Conservancy and *Guide to the Freshwater Mussels of Maine*, available from the State of Maine. But, nothing substitutes for going out with an expert and sorting shells into piles to begin to see subtle differences.

## Mussels in the Mill River

### **Eastern Elliptio** (*Elliptio complanata*)

The most common and widely distributed species in New England, the Eastern Elliptio occurs in a wide range of habitats, from quiet lakes to fast-flowing rivers, from silty clays to squeezed between large boulders. It is easily recognized by its trapezoidal shape, pinkish-purple inner shell and prominent pseudocardinal and lateral hinge teeth.



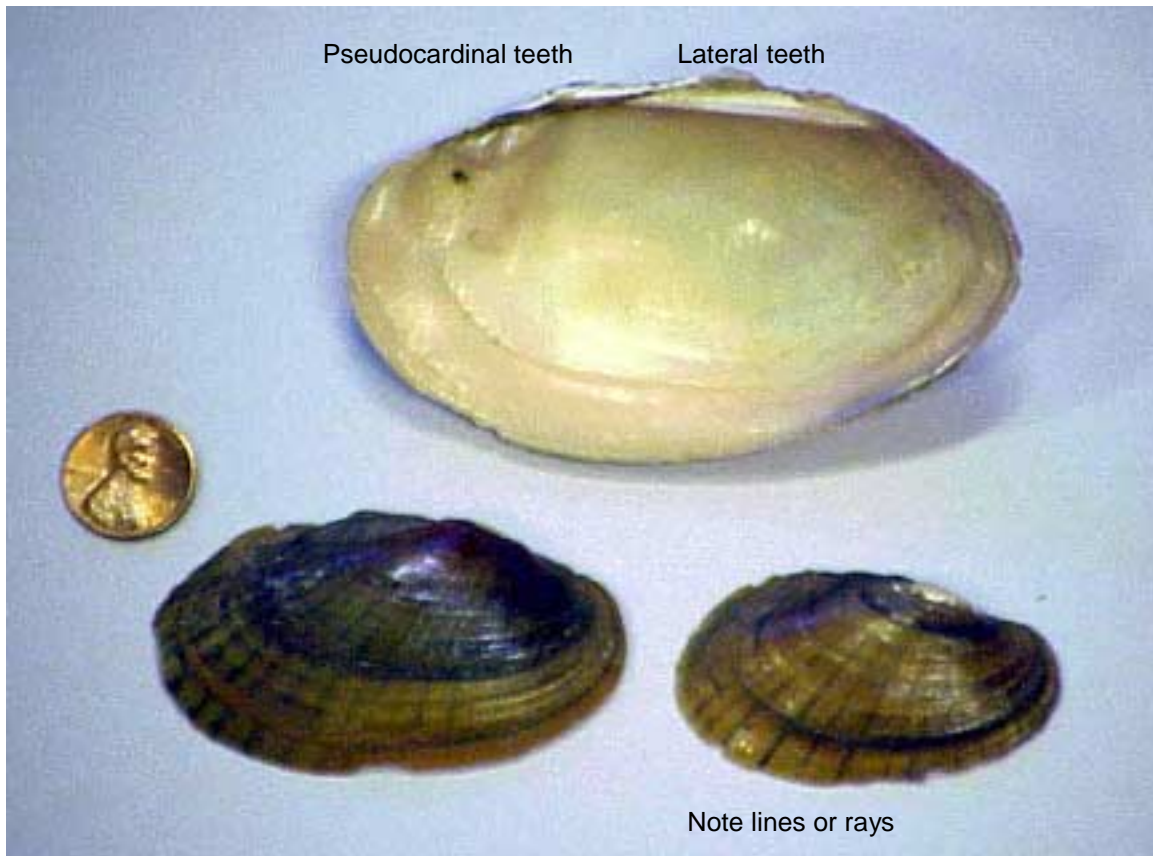
**Eastern Pearlshell** (*Margaritifera margaritifera*)

The largest species in the Mill River, the Eastern Pearlshell has an elongate, undulating form and well-developed pseudocardinal teeth, but no lateral teeth. Trout serve as its host fish.



**Eastern Lampmussel (*Lampsilis radiata*)**

Common in the Mill River, this species is readily identified by its rounded shape and prominent greenish rays. Both pseudocardinal and lateral teeth are present.



**Eastern Floater** (*Pyganodon cataracta*)

This common thin-shelled species is found in ponds, lakes and rivers. It has a large, translucent, yellowish shell; there are no teeth. Host fish include white suckers, carp and pumpkinseeds.



**Alewife Floater** (*Anodonta implicata*)

Found only below the Hatfield Dam, this species relies on anadromous fish (in the Mill River = shad and blue-backed herring) as its host for its larval stage. As its scientific name reveals (ano—“no”; donta—“teeth”), it has no teeth. It is distinguished from the preceding species by its shape, darker color and a slight thickening on one side of the shell.



**Squawfoot** (*Strophitus undulatus*)

Small but fat, this thin-shelled mussel is recognized by the presence of pseudocardinal teeth and absence of lateral teeth. Its host fish are the creek chub and largemouth bass. It is protected in Massachusetts.



**Eastern Pond Mussel (*Ligumia nasuta*)**

The long-pointed snout of this state-listed species distinguishes it from all others. As is seen here, the inner shell (nacre) is often purplish-pink. Its host fish is presently unknown. It prefers the silty, debris-laden shallows along quiet riverbanks.



**Triangle Floater** (*Alasmidonta undulata*)

Protected in Massachusetts, this close relative of the dwarfwedge mussel is squat and broadly-ovate to triangular. The outer shell ranges from yellowish-green to black, and bears prominent rays. The pseudocardinal teeth are well developed, but the lateral teeth are absent. It occurs in rocky to gravelly streams. Blacknose dace serve as the host fish for this uncommon species.



**Dwarf wedge Mussel** (*Alasmidonta heterodon*)

At only 2-4 cm in length, this is the smallest freshwater mussel in the Mill River. It's also the most endangered, and until 1995, biologists believed it no longer existed in Massachusetts. The Mill River population is presently the largest in Massachusetts, and one of only two known sites in the state.

