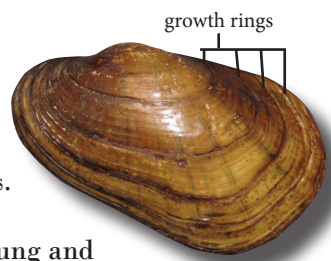


## How old is that freshwater mussel?

Shell growth shows as concentric growth rings that can be counted to estimate the age of the mussel. The growth rings (black lines or ridges on the shell) are believed to represent winter rest periods. Mussels are long-lived. Some species live more than ten years while others are reported to live for more than 100 years. Thin shelled species grow much faster than thicker shelled mussels.



Finding a mix of young and old live mussels indicates a healthy stream.

## What are those mussels doing?

Mussels spend their lives buried in the sediments on the bottom of bodies of water. The vast majority of species are found in streams and rivers. They are usually not present in shifting sands or deep silt. Many also do well in the shallows of large, natural lakes. They prefer slow to moderate current rather than swift current or still water. Densities of mussels in good habitat with no pollution can be as high as 50 per square meter.

A mussel moves by extending a fleshy muscular "foot" outside the shell to pull itself around. As adults, mussels are not highly mobile. Movement is slow and often obstructed by large rocks. Some mussels seem content to remain in one spot throughout their lives while others are known to move about. Most travel only in response to an ecological event such as a drop in water level.

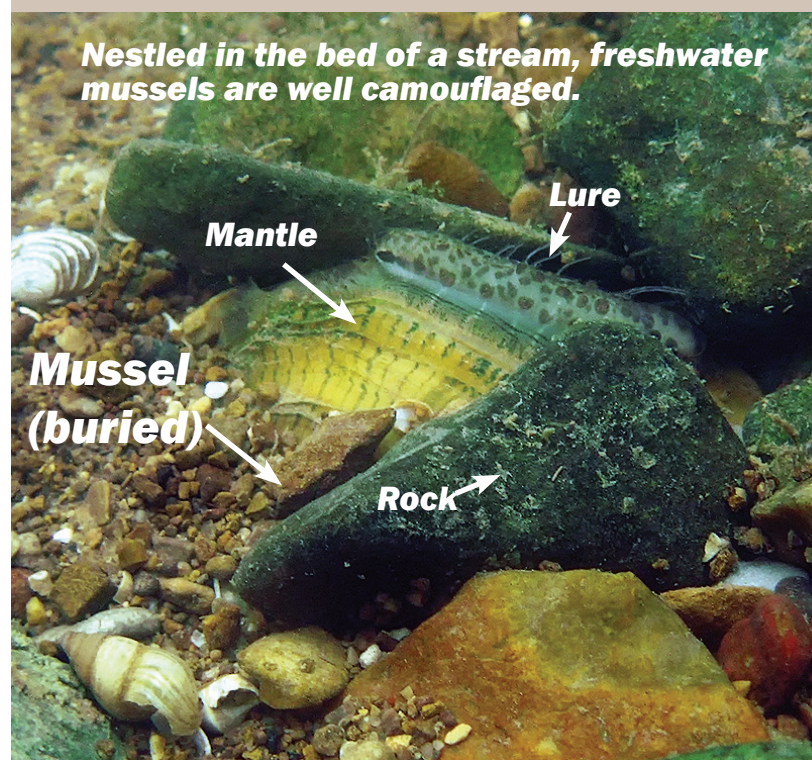
As detritivores (eaters of dead organic matter) mussels play an important role in aquatic ecosystems. Their filtering action removes not only detritus (dead organic matter) but also bacteria and parasites. Waste from mussels is used by aquatic insects and other small animals. Mussels are food for fish, raccoons, muskrats, river otters and other animals.

## What is a Mussel?

People often refer to mussels as clams. Both mussels and clams are bivalved mollusks - soft bodied organisms covered by two shells joined by a hinge. Mussels and clams are very similar in shape and structure, but they have different reproductive strategies. Many mussel species use a live host to assist in the development of their larva. For most kinds of freshwater mussels it takes 1-8 years to become an adult capable of reproducing.

Mussel shell is made of calcium carbonate extracted from the water. The soft body of the mussel includes the mantle which surrounds all other bodily organs. The mantle secretes the shell building it slowly over time. At first glance many mussel shells appear drab and unremarkable; but irregular shapes and surfaces and surprising colors have generated a long list of interesting common names including Pistolgrip, Monkeyface, Catspaw, and Purple Wartyback. Shell size varies with species and some can grow quite large like the Giant floater (up to 10 inches).

Mussels feed and breathe by pumping (or moving) water constantly through their bodies via muscular siphons extended from their shells. Water enters through the incurrent siphon and exits through the excurrent siphon. As the water moves through its body the mussel filters food in the form of detritus (organic matter), and plankton (microscopic plants and animals in the water). An individual mussel may clean or filter up to eight gallons of water per day, making mussels a great barometer of stream health.



Nestled in the bed of a stream, freshwater mussels are well camouflaged.

## Introduction

The waters of the White River are home to many animals that are relatively unknown to most people. Beneath the water surface live the fish that we expect to find in an aquatic environment. We also find a wide assortment of insects, crustaceans and mollusks. The variety of life in the stream ecosystem is very rich indeed; but these animals and their well being are often overlooked simply because we don't see them in a casual glance at the creek. We must look below the water surface, under the rocks and on the bottom to get the complete picture of life in the creek.

One inhabitant you might find on the river bottom is the freshwater mussel. Although freshwater mussels are distributed all over the world, the greatest abundance and variety are found in North America. Freshwater mussels are fascinating creatures with surprising life histories including intriguing adaptations for survival. Mussels are also indicators of environmental quality for aquatic ecosystems. Studying aquatic organisms is important for assessing the health of our water resources.

Freshwater mussels live on the bottom of streams, rivers, ponds and lakes. Mussels of different species develop different shell shapes and sizes. Clean streams in Indiana have freshwater mussels of all ages while polluted waters can be devoid of mussels and represent an imbalance in the waterway. Mussels are sensitive to pollution and their presence in a water body is a positive indicator of overall water quality and health.

A freshwater mussel displays a "lure" to attract potential host for its larval offspring.



## Resources

- Cummings, K.S. and C.A. Mayer. 1992. *Field Guide to Freshwater Mussels of the Midwest*. Illinois Natural History Survey Manual 5. 194 pp.
- Grabarkiewicz, J.D. and W.S. Davis. 2008. *An Introduction to Freshwater Mussels as Biological Indicators: Including Accounts of Interior Basin, Cumberlandian, and Atlantic Slope Species*. U.S. Environmental Protection Agency, Washington, DC. EPA-260-R-08-015.
- Freshwater Mussels of the Maumee River Drainage.** Online guide by Todd Crail. Maumee, Ohio. [www.farmertodd.com/musselguide/](http://www.farmertodd.com/musselguide/)
- Freshwater Mussels of the Upper Mississippi River System.** US Fish and Wildlife Service. [www.fws.gov/midwest/mussel/index.html](http://www.fws.gov/midwest/mussel/index.html)
- Freshwater Mussel (Unionoida) Genera of the World.** Online guide by K.S. Cummings, Illinois Natural History Survey, Center for Biodiversity, Champaign, IL. [www.inhs.uiuc.edu/~ksc/MusselGeneraMP.html](http://www.inhs.uiuc.edu/~ksc/MusselGeneraMP.html)
- Watters, G.T., M.A. Hoggarth, and D.H. Stansbery. 2009. *The Freshwater Mussels of Ohio*. The Ohio State University Press, Columbus, Ohio. 421 pp.
- Unio Gallery at Missouri State University** [unionid.missouristate.edu/](http://unionid.missouristate.edu/)

**Text contributed by:** David Inskeep, Biology teacher at Northwestern High School, Kokomo, Indiana, Sarah Brichford, Field Technician Howard County Stormwater District, and Laura A. Bowley, Aquatic Biologist at the Muncie Sanitary District's Bureau of Water Quality.

**Picture credit (Creeper, Elktoe, Fluted-shell, Mucket):** Muncie Sanitary District's Bureau of Water Quality.

**Graphic Design:** Steven Christensen, Marketing & Education Howard County Stormwater District, Jason Donati, Stormwater Educator for the Stormwater Management Department.

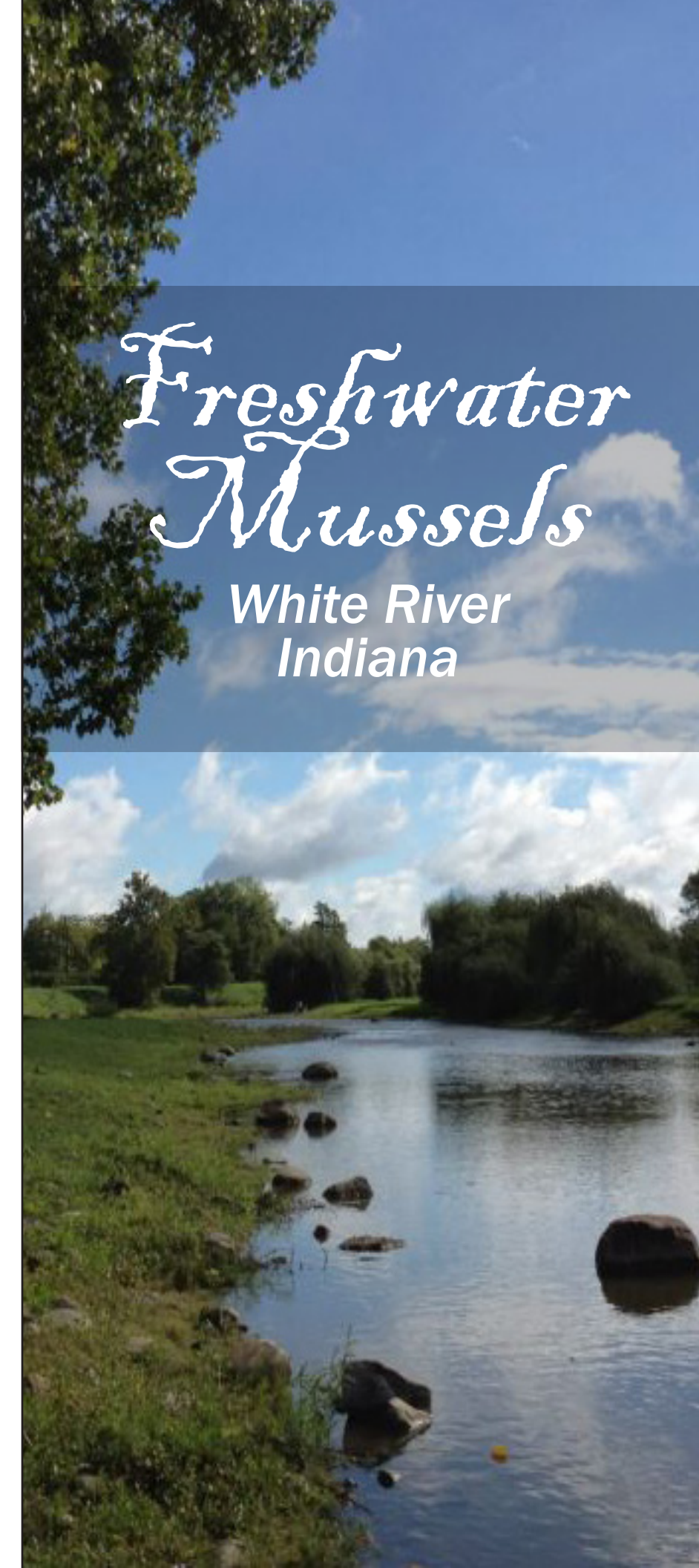
**Reviewers:** Brant Fisher of Indiana Fish & Wildlife, and Cassie Hauswald of The Nature Conservancy.



100 W. Main St. Room 205 Muncie, IN. 47305  
Phone: 765.747.2660 Fax: 765.747.7711  
[www.wishthefish.com](http://www.wishthefish.com)

# Freshwater Mussels

## White River Indiana



# Mussels of White River

Six common mussels in the White River\*



*Mucket*

*Actinonaias ligamentina*

Grows up to 7"



*Elktoe*

*Alasmidonta marginata*

Grows up to 4"



*Creeper*

*Strophitus undulatus*

Grows up to 4"



*Fluted-shell*

*Lasmigona costata*

Grows up to 7"



*Wabash Pigtoe*

*Fusconaia flava*

Grows up to 3"



*Asian Clam* *Corbicula fluminea* (most commonly seen)

The Asian clam was introduced to North America in 1938 as a food source and has since spread throughout the United States. These small clams grow to about 1.5 inches and have an average life span of less than 10 years. Their native range is Southeast Asia and Africa. The Asian clam is an example of an "invasive" species, an organism that does not naturally occur here and disrupts the native ecosystem.

\*Not to scale

## Hitching a ride to survive and thrive

Reproduction is a tricky process for the freshwater mussel. Males release sperm into the water relying on the current to fertilize the females. Fertilization occurs inside the female where the eggs develop into a larval stage called glochidia (glow-kid'-ee-ah). In the spring or summer the glochidia are ready to start life on their own. They begin this stage as parasites hitching a ride on a host fish!

To increase the rate of successful transmission of the parasitic glochidia to the fish host, female freshwater mussels have developed some astonishing adaptations and strategies. Known adaptations include fish lures and mucus webs. In some instances the mussel will actually clasp a host fish. Some mussels are host specific meaning that only certain fish species are appropriate for glochidia development. Other mussels are generalists and use several species of fish as hosts.

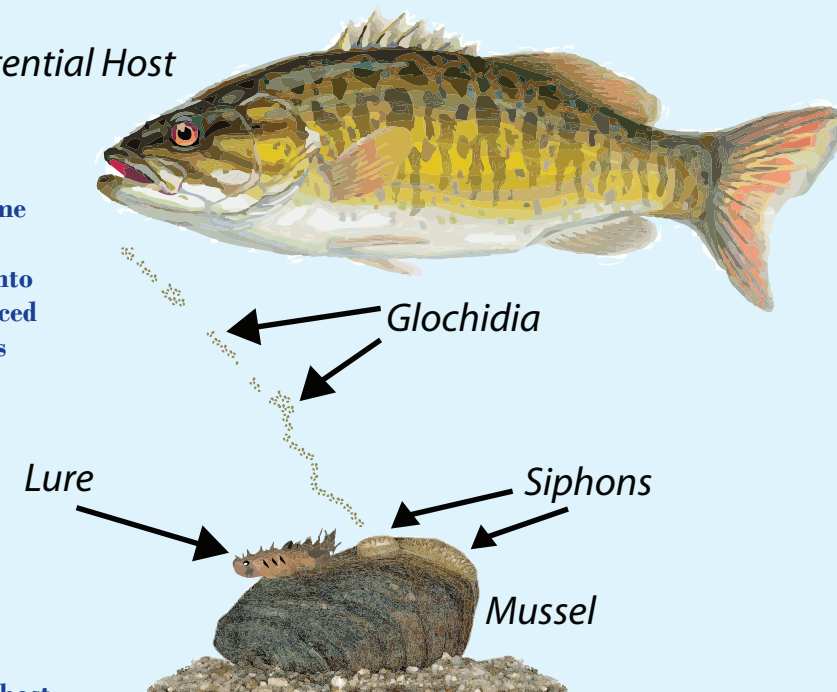
Mussels that are host specific often display lures that are remarkably realistic mimics of the preferred prey of the host fish. The fleshy mantle of the females of some mussel species is modified into a moving lure that resembles small fish, crayfish, or aquatic insects that will attract a host fish. The female manipulates the lure inducing the host fish to attack and come into contact with the glochidia. The female mussel may even rapidly close its shell to capture and hold the host fish during transmission of the glochidia.

In other host specific mussel species, the female produces and releases conglomerates, containers of glochidia that resemble insects or small fish. When a host fish attacks, the conglomerate breaks open releasing and transmitting the glochidia. As with the mantle lures, conglomerates increase the chances of direct contact with a host fish.

A more generalist approach adopted by some mussel species involves releasing the glochidia into large mucus webs produced by the female. Fish hosts come into contact with the glochidia when they become entangled in the web. After a brief struggle the host fish, now carrying glochidia, can easily escape and swim free.

While attached to the host fish, the glochidia continue to grow and develop into a form that looks like a mature adult mussel. After several weeks of development on the host fish, the young mussels detach and drift to the stream bottom, now fully independent.

Potential Host



This is a critical time for the young mussels as they will only settle in ideal streams and river habitats.

## Present status

Eastern North America has an abundance of clean, shallow, moderately flowing streams and rivers, and is home to the greatest mussel diversity in the world. A total of 44 genera encompassing nearly 300 species and subspecies have been documented in North America. Many mussel species are restricted to a particular geographic area or location (endemic). There are 77 native species known in Indiana. In the White River 25 native mussel species have been documented, but only 18 are known to exist today.

Although they are widespread, mussels are sensitive to pollution and significant declines in mussel populations throughout North America have been documented. Freshwater mussels are considered one of the most endangered groups of animals in North America. Currently, 42 species are listed as federally endangered, and another 70 have been proposed for listing. Contributing factors include: over-harvest (button and cultured pearl industries), water pollution (sediment, chemicals), habitat alteration/destruction (streambed excavation, dams), and competition from exotic species (zebra mussel, Asian clam).

**Since 1991 it is illegal to take or possess native freshwater mussels in Indiana. Live mussels must be left undisturbed and old shells cannot be collected except with a special permit from the Indiana Department of Natural Resources. These protections will help Indiana mussel populations to recover and sustain their important role in healthy aquatic ecosystems.**



*Fatmucket*

*Lampsilis siliquoidea*

Grows up to 5"