



## What can you do to help freshwater mussels?

- 1 Learn about mussels and spread the word on their importance!
- 2 Reduce the use of fertilizers, chemicals, and pesticides in and around your home. They can wash away during rain events and pollute nearby streams.
- 3 Volunteer and support streamside plantings of trees, shrubs, and other plants. Healthy forests along streambanks help prevent erosion and provide shaded waterways that keep freshwater mussels cool during summer months.
- 4 Wade carefully in streams and creeks. **Observe mussels peacefully in their natural habitat!**
- 5 Help keep your local streams clean by participating in litter cleanups, including street cleanups because trash can wash into waterways and harm mussels.
- 6 Support efforts to manage stormwater, or water that comes from rain and snow events. Water that can not drain into the soil enters rivers and streams too quickly and can erode stream bottoms where mussels live.
- 7 Visit PDE's Freshwater Mussel page at [www.delawareestuary.org](http://www.delawareestuary.org) to view our guidebook and learn more about our volunteer survey program where you can help look for mussels and report your data to PDE!

Remember, everything we do on land impacts our streams and rivers including the plants and animals that live in these habitats. You can make a difference by protecting your local lands and waters!

## Restoring freshwater mussels in the Delaware Estuary

The Partnership for the Delaware Estuary (PDE) established the Freshwater Mussel Recovery Program in 2007. This program aims to conserve and restore all native mussel species through a combination of research, outreach, restocking and habitat improvements in Delaware, New Jersey and Pennsylvania. For more information on the FMRP, see freshwater mussel science pages at [www.delawareestuary.org](http://www.delawareestuary.org).

### What is a mussel bed?

In nature, freshwater mussels tend to live together in dense groups, called a mussel bed. Many rare species are only found in a dense mussel bed with large numbers of common species. A mussel bed is an important habitat that filters and cleans large amounts of water.

To expand the FMRP in urban areas of the Delaware Estuary such as Philadelphia, in 2018 seven cultural and environmental organizations in the Philadelphia region launched the Aquatic Research & Restoration Center (ARRC) and will work together to restore freshwater habitats and develop conservation and restoration programs.

The Mussels for Clean Water Initiative is another new facet of the FMRP. This initiative is focused on restoring large beds of mussels in the region's streams, rivers and lakes to help sustain and improve water quality. Most efforts to restore mussels have focused on the rarest species. A new mussel hatchery will produce both common and rare juvenile mussels to restore natural mussel populations, which together will promote cleaner water.

This new "production hatchery" will be supported by "The Mussel Hatchery," an interactive exhibit that opened in 2017 at the Fairmount Water Works. Here, PDE scientists actively work with other partners to show how mussels are reproduced in a hatchery and explain why this effort helps improve water and habitat conditions. Visit the Fairmount Water Works or [www.mightymussel.com](http://www.mightymussel.com) to learn more and see freshwater mussel research in action!



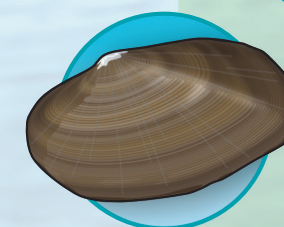
This project is funded through a Federal 319(h) grant awarded by the New Jersey Department of Environmental Protection



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The Partnership for the Delaware Estuary, a National Estuary Program, leads science-based and collaborative efforts to improve the tidal Delaware River and Bay, which spans Delaware, New Jersey, and Pennsylvania.

## Freshwater Mussels in the Delaware River and Bay



Connecting people, science, and nature for a healthy Delaware River and Bay





## What are freshwater mussels?

Freshwater mussels are animals that live in fresh water around the globe, from the smallest creeks and ponds to the largest rivers like the Amazon. They are bivalve mollusks, which means they have a soft body protected by two shells, just like saltwater mussels and clams. Freshwater mussels live partially buried in the bottom of streams and lakes where they can slowly crawl around with their "foot". There are nearly 300 species of mussels in North America and 13 species native to the Delaware Estuary. Unfortunately, mussel populations have declined both globally and locally. Where mussels can be found, their population numbers are low and many are listed as threatened or endangered by state and federal agencies.

## Why are mussels important?

Freshwater mussels provide natural benefits including stabilizing streambeds, providing food and homes for other animals and plants, and cleaning water for everyone. Yes, you read that right! Mussels are filter-feeders, which means they eat small particles in water. This includes phytoplankton, bacteria, and other microscopic organisms. When mussels eat, they also remove dirt and other pollutants from the water, which cleans the water for fish, plants, and people to enjoy!

## How do mussels clean water?

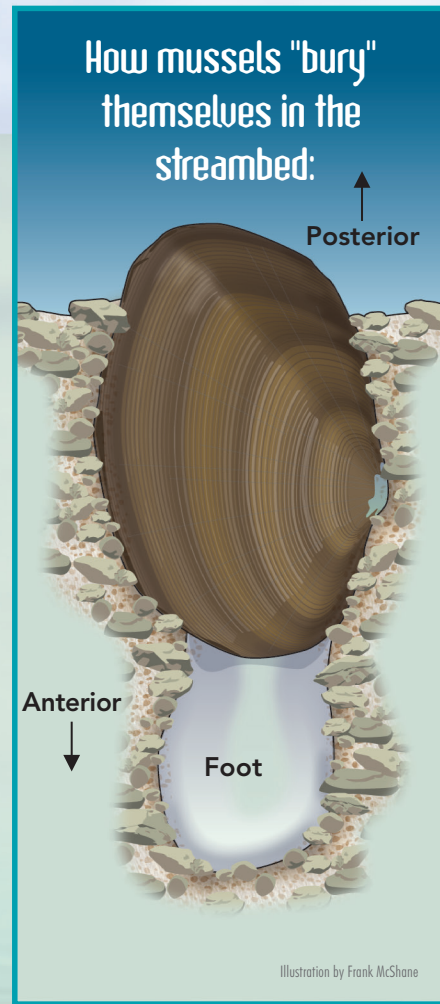
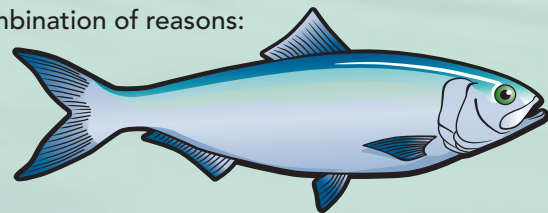
One adult freshwater mussel filters up to 10 gallons of water per day. This special ability means that mussels across the region clean our rivers, thousands of gallons at a time!

Phytoplankton are a group of aquatic microscopic organisms that use sunlight to grow, just like trees. They consume carbon dioxide and produce oxygen for fish to breathe. Phytoplankton are the bottom of the food chain and support aquatic life in both fresh and salty waters.

## Why have populations declined?

- Freshwater mussel populations may be declining due to a combination of reasons:
- Toxic spills and other pollution
  - Harvesting for bait or shells
  - Loss of forests
  - Dams that block fish from swimming upstream
  - Stormwater runoff



Remember, because mussels need fish to reproduce, anything that hurts fish can also hurt mussels.



## Mussel species in the Delaware Estuary

There are nearly 300 different species of freshwater mussels in North America, which is more than anywhere else in the world. Thirteen of these species live here in the Delaware Estuary. Below are just a few:



### Tidewater Mucket

	Scientific Name: <i>Leptodea ochracea</i>
	Size: Up to 5 inches
	Habitat: Silt, sand, gravel
	Fish Host: White Perch, Striped Bass
	Fun Fact: Primarily found in tidal freshwater, a unique habitat!



### Eastern Elliptio

	Scientific Name: <i>Elliptio complanata</i>
	Size: Up to 6 inches
	Habitat: Silt, sand, gravel, cobble
	Fish Host: American Eel
	Fun Fact: Most common mussel in the Delaware Estuary.

### Alewife Floater

	Scientific Name: <i>Utterbackiana implicata</i>
	Size: Up to 7 inches
	Habitat: Silt, sand, slow flowing water
	Fish Host: Alewife, Blueback Herring
	Fun Fact: Shells are thick on one end and thin on the other.

### Eastern Pondmussel

	Scientific Name: <i>Ligumia nasuta</i>
	Size: Up to 5 inches
	Habitat: Silt, sand, gravel
	Fish Host: Largemouth Bass
	Fun Fact: Like being together, rarely found alone.

## All mussels are not the same

### Fun Fact!

Mussels found on restaurant menus are saltwater mussels, like the blue mussel. Because they are grown in saltwater, they typically have a salty taste to them and are quite delicious. Freshwater mussels on the other hand lack this salty taste and aren't safe to eat.

You may be wondering if you have ever eaten a freshwater mussel. Unless you're an otter, the answer is no! Freshwater mollusks often contain pathogens and other pollutants that can harm people's health, and no one should ever try to eat one. If you like to eat bivalve shellfish, stick with saltwater species such as marine mussels, clams, scallops and oysters purchased through safe seafood suppliers. Since many species of freshwater mussels are threatened or endangered, they are also protected in many states where it is illegal to disturb or harvest them without a special permit.

Although we don't eat them, freshwater mussels are still useful for a variety of reasons besides cleaning our waterways. They are a natural source of food for some small mammals, like otters and raccoons. In the past, Native Americans used freshwater mussel shells to make tools and jewelry and before the use of plastics, freshwater mussel shells were also used to make buttons for clothing.

## Map of the Delaware Estuary



## Freshwater mussel life cycle

A unique characteristic of freshwater mussels is that mussel larvae need to hitch a ride on a fish in order to grow into baby mussels. Certain freshwater mussel species need specific fish species in order to reproduce. Some mussels use fish that stay in the Delaware Estuary year-round, like largemouth bass, while others time their reproduction with migratory patterns of fish like American eel and striped bass!

Female mussels fertilize eggs with sperm from a male to form larvae, also called glochidia ("glo-kid-ee-ya"). After a few months, these larvae are released in the water when a specific fish comes along. Some of the mussel larvae will attach onto the gills or fins of the host fish, and stay there until they grow into a juvenile (baby) mussel, which takes a few weeks. When they are ready, juvenile mussels drop off their fish host and settle to the stream bottom. They will stay there for the rest of their lives, sometimes as long as 100 years!

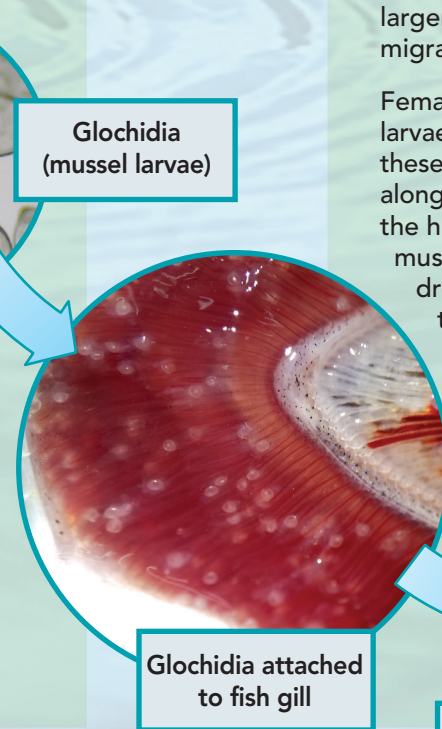
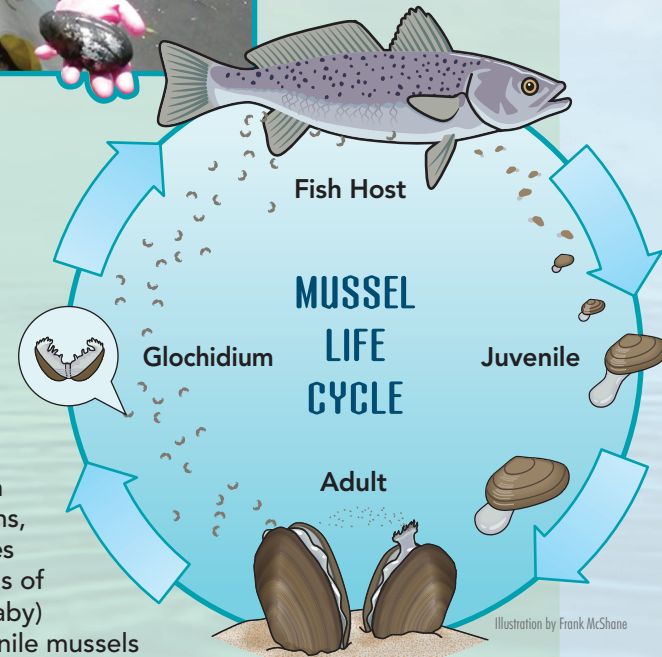
## What is the Delaware Estuary?

The Delaware Estuary is the area of the Delaware River where fresh water from the river mixes with salt water from the Atlantic Ocean. This area ranges from the mouth of Delaware Bay at the Atlantic Ocean up to Trenton, New Jersey. Therefore, all of the streams and rivers that drain to the Delaware River south of Trenton, New Jersey are part of the Delaware Estuary.

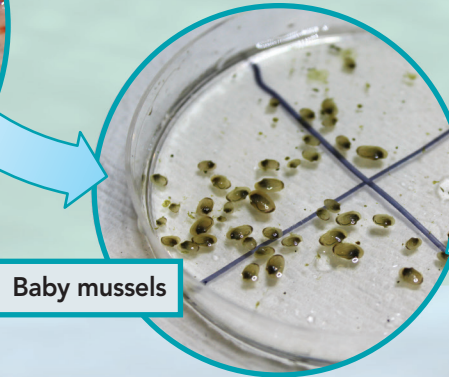


### Fun Fact!

One female mussel can produce more than 100,000 larvae! Only some of these will grow into adult mussels.



Glochidia attached to fish gill



Baby mussels



Juvenile mussels



Adult mussels