Chehalis Basin
Native Freshwater Mussels

Get to Know Your Neighbors!

Native freshwater mussels belong to the phylum Mollusca, the second largest and very diverse group of animals in the world. These native bivalves are very long living animals, and some species can live up to 100 years while helping to clean our waters!

Range

The United States has the richest diversity of mussels in the world with about 300 species. Unfortunately, it is believed that about 10% of the species are already extinct and 70% are at risk of disappearing. There are six species of freshwater mussels native to the Pacific Northwest. In western Washington, the main species are the Oregon floater (*Anodonta oregonensis*), Western Pearlshell (*Margaritifera falcata)* and the Western Ridge (*Gonidea angulata)*.

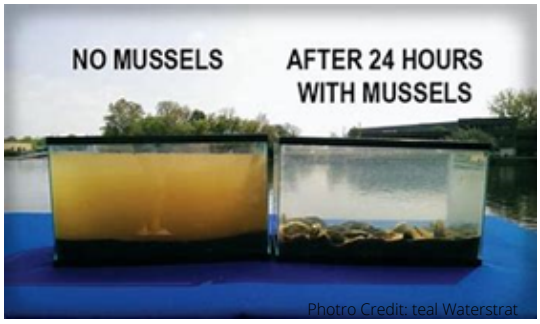
Cultural and Historical Significance

Native People have historically gathered native freshwater mussels as a food source. (Today, they are no longer considered edible; as filter feeders, their bodies concentrate chemicals and other pollutants from streams.) Their shells were valued and used for tools, utensils, and jewelry. Some freshwater mussels have very pearly insides, and in the late 1800s and early 1900s millions of pounds were harvested to make buttons. By 1921, the industry declined as plastic buttons were introduced.

Immense Ecological Significance of Native Freshwater Mussels

Freshwater mussels do not get the recognition that they deserve as they are intricately tied to the health of our watersheds.

Nature's Living Water Purifiers



Native freshwater mussels feed using siphon-like appendages to filter bacteria, algae, and detritus, out of the water column and into their gill chambers. These filter-feeding powerhouses substantially improve water quality and contribute to the overall health of our rivers and lakes -- for a variety of aquatic and terrestrial life. Mussels perform this water purification service as they filter suspended solids, nutrients and contaminants from the water column and collectively improve water quality by reducing turbidity and controlling nutrient levels.

Just one freshwater mussel can filter up to 18 gallons of water in one day!

Food Sources

Native freshwater mussels are a food source for many animals such as otters, raccoon, crayfish, turtles, frogs, salamanders, and water birds. Piles of cleaned mussels called middens, are sometimes found along stream banks. Mussel fecal pellets provide food for aquatic insects and other invertebrates at the heart of the aquatic food web.

Refugia

Mussels are often found in dense beds, making them a living part of the substrate, providing shelter and habitat for aquatic snails, caddisflies, midges, crayfish and for a variety of aquatic invertebrates that fish rely on for food. Water quality is often greater in the vicinity of mussel beds, as mussel beds are "rich spots" for nutrient cycling and aquatic invertebrate abundance and diversity.

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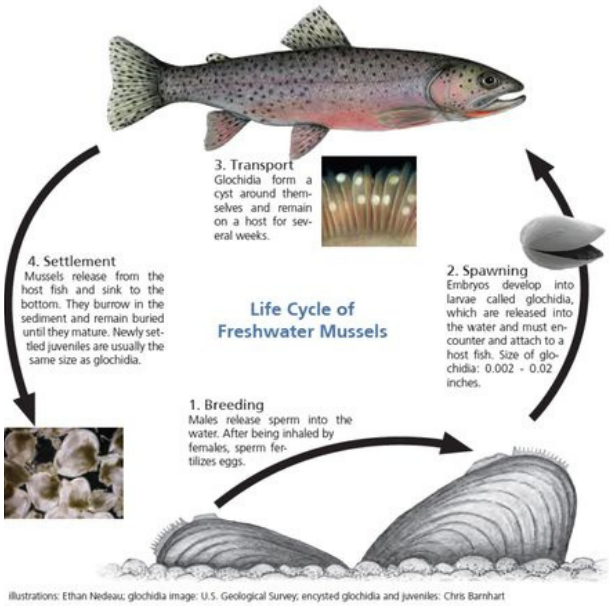
Life Cycle of Freshwater Mussels

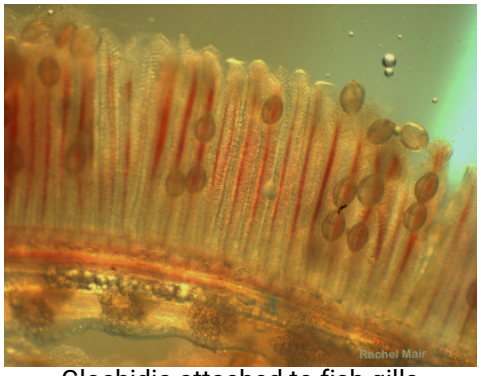
Native freshwater mussels such as Floaters, the Western Pearlshell, and Western Ridged mussels have very interesting, unusual and complex mode of reproduction, which includes a brief, required stage as a parasite on salmon or other species of fish.



Illustrations: Ethan Nedeau; glochidia image: U.S. Geological Survey; encysted glochidia and juveniles: Chris Barnhart

Adults: Adults stay in one spot, bury their anterior end in the soft river bottom, and leave the posterior end and two siphons exposed (like snorkels). They continuously pump water through their bodies and use its gills to filter oxygen and food from the water. Their food consists of plankton (microscopic plants and animals) and other organic matter suspended in the water.

Reproduction: During the breeding season, females lay eggs and brood them inside specialized chambers in their gills called a marsupium. The males broadcast sperm into the open water, which the females draw through their siphons, and the sperm fertilizes the eggs. The female can hold up to several thousand eggs at a time in her gills. Here there is plenty of oxygen to be obtained and a place to brood until eggs develop into microscopic larvae (as small as a grain of sand) known as glochidia (pronounced "glow-kid´-ee-ah"). Mussels can lead very long reproductive lives and can produce millions of eggs per year.



Glochidia attached to fish gills

Hitchhiking Larval Stage: In the late spring or early summer, the glochidia are released into the water and must encounter and attach to a fin or gill filaments of the 'right' host fish within a few days. Our Chehalis Basin Western Pearlshell favor salmon -- and without salmon as hosts -- these mussels cannot successfully reproduce.

Glochidia complete development and encyst on the host fish. The process of encystment on the fish host occurs as the tissue of the fish grows over the glochidia. Metamorphosis takes place within days or weeks, depending on mussel species and temperature. This 'fish' hitchhiking is the juvenile mussel's opportunity find suitable habitat to live. It's a challenge, and only one in a million larvae survive to the adult stage.

Juvenile Mussels Colonize: As freshwater mussels can not move far on their own, their association with fish allows them to colonize new areas, or repopulate areas where they have been wiped out. When the timing is right, the mussels release from their host fish and sink to the bottom, burrow in the sediment and remain buried as they fully mature. If by chance they settle into suitable habitat, a new mussel bed is created. Mussels may move less than a few yards from the spot where they first landed after dropping from their host fish.


Photo Credit: Marie Fernandez, USFWS

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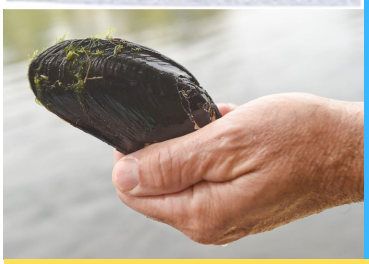
Habitat

Freshwater mussels are found in shallow habitats in permanent bodies of water, including creeks, rivers, and ponds generally at low elevations. Mussels tend to concentrate in rivers with consistent flows and stable substrate conditions.

Western Ridged Mussel: May live 20 - 60 years, and they inhabit bottoms of water bodies with cold water, constant water, and well-oxygenated including creeks, rivers, and lakes with substrates of sand, silt and gravel bars. May burrow deep with only siphons exposed. Their host fish are largely unknown, but includes sculpin.

Floaters: May live 10-15 years, and occur in warmer, slower waters of lakes, and downstream low-gradient reaches of rivers. As their thin shells are fragile, floaters favor habitats of sand and silt substrates. Found under vegetation or submerged logs. Host fish include trout, sculpin, and stickleback.



Western Pearlshell: May live 100 and more years. This species inhabits creeks and rivers with clear, cold water, and fast moving water. Prefer sand, gravel and cobble substrates with gravel and cobble substrates. This species appears to be intolerant of sedimentation. Host fish include salmon and trout.

Threats to the Survival of Native Freshwater Mussels

Mussels are very sensitive to the quality of their river habitat and act 'like a canary in the coal mine'. Their presence indicates the health of the river. However, as they filter the water where they first landed as juveniles, they ingest whatever is around them.

The main threats to mussel survival are:

Pollution: Mussels need the same clean, cool, consistent, clear and well-oxygenated water that our salmon need. Chemical and nutrient contaminants from land activities including construction can degrade water quality. Bank erosion and sediments can also smother stream bottoms and the mussels.

Barriers: Dams and impassable culverts prevent fish from reaching the mussel beds. With no host fish for the young glochidia, the mussels disappear. Flow and temperature can also become problematic for mussel survival.

Invasive Species: They compete with native freshwater mussels for space and resources. Non-native zebra mussels are outcompeting the native mussels in the east, and it may only be a matter of time before zebra mussels appear in the northwest.

Habitat loss: Channelizing, dredging and altering streams and buffer zones threaten, and remove, the homes of mussels. This also affects the presence of host fish and habitat connectivity.

Mussel bed die-offs: Freshwater mussels often occur in mussel beds. In the mainstem Chehalis River, biologists have documented an ongoing mussel die-off event. At these mussel beds, you may observe many empty (dead) shells of mussels, and this may occur very suddenly. The cause of these die-offs is unknown, but biologists are actively studying the causes.

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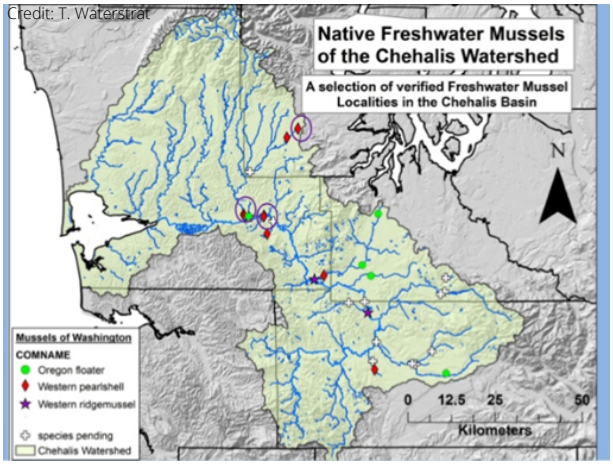
What Can You Do to Protect and Restore Native Freshwater Mussels?



Help Monitor and Map Their Distribution

The United States Fish and Wildlife Service (USFWS), the Washington State Department of Fish and Wildlife and the nonprofit Xerces Society are working together to collect information on mussel health and distribution in the Chehalis River and tributaries. Sampling will help look for relationship between water quality, population characteristics, and mussel condition. **For more information on ways you can help protect mussels,** please contact Emilie Blevins, Xerces Society for Invertebrate Conservation Biologist at Emilie Blevins@xerces.org or Marie Winkowski at elizabethmarie.winkowski@dfw.wa.gov.

USFWS Biologist, Teal Waterstrat monitoring for presence of mussels with local students

References and Resources

- **Pacific Northwest Native Freshwater Mussel Workgroup: https://pnwmussels.org**
- **Freshwater Mussels of the Pacific Northwest Field Guide: https://tinyurl.com/y8d45w2x**
- **Native Freshwater Mussels in the Pacific Northwest Field Guide: https://tinyurl.com/ybufp66**
- **Xerces Society's: Conserving the Gems of Our Waters Guide: https://tinyurl.com/y8cjuwtu**
- **Washington Fish and Wildlife Office, United States Fish and Wildlife Service: https://www.fws.gov/wafwo/**
- **Quick Reference Guide to Western Freshwater Mussels: https://tinyurl.com/ycbsbzsk**
- **The International Union for Conservation of Nature's Red List of Threatened Species (IUCN Red List) https://www.iucnredlist.org/**
- **Freshwater Mussels of the Pacific Northwest, PowerPoint; Xerces Society: https://tinyurl.com/y87d64h9els.pdf**

This publication was produced by the Chehalis Lead Entity. To learn how you can be involved in projects that support salmon recovery, visit the Chehalis Basin Lead Entity website: www.chehalisleadentity.org
Or contact Watershed Coordinator, Kirsten Harma: 360-488-3232.