

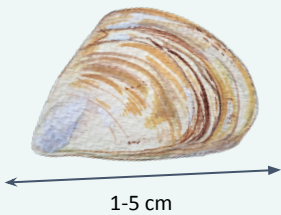
Don't Move a Mussel: Preventing and Managing the Spread of Invasive Mussels

Background

In September 2023, invasive **quagga mussel larvae** were detected in the South Fork of the Snake River through an early monitoring program, with adult mussels confirmed in September 2024.¹ This was the first known establishment of this species in the Columbia River Basin, the last major North American river basin to be without an invasive mussel population.^{2,4} Quagga mussels are one of three invasive species of concern in the Northwest, along with **zebra** and **golden** mussels.^{2,3} These species are primarily **transported by humans** and can rapidly take over waterways.¹ Their presence poses significant threats to climate impacts in the Northwest by directly impacting **energy production, critical ecosystems, and cultural resources.**^{2,3,4}

Invasive Mussel Identification:

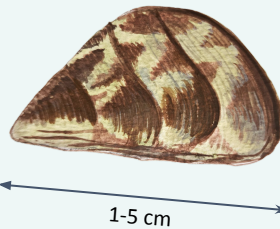
Quagga Mussel
(*Dreissena bugensis*)



Features: Fan shaped shell, rounder than zebra mussels. Tan to white in color, with brown concentric stripes.

Habitat: Settles on **hard and soft** surfaces, at depths up to 400 m.

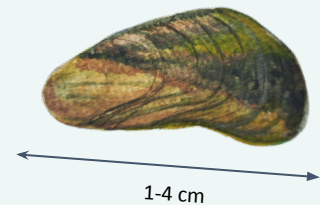
Zebra Mussel
(*Dreissena polymorpha*)



Features: Light colored with namesake jagged brown banding. More of a pointed shell than other mussels.

Habitat: Settles **only** on hard substrate at depths of up to 180 m.

Golden Mussel
(*Limnoperna fortunei*)



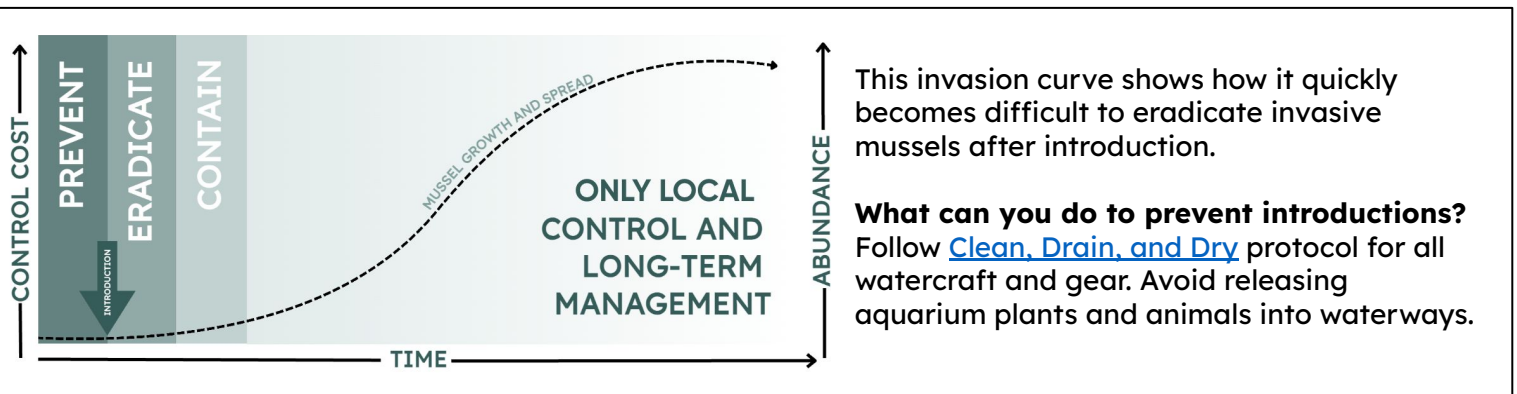
Features: Ranges from dark brown to gold to green. Longer shell than other mussels.

Habitat: Settles on **hard and soft** substrate at depths of up to 40 m. More **tolerant of temperature and salinity** compared to quagga and zebra mussels.

All Species:

- Females can release up to one million free-floating microscopic eggs per year.³
- They can attach to hard substrates by producing strong, thin strands called byssal threads.
- There are no native freshwater mussel species in North America that attach to hard surfaces; **if it is attached to a hard surface, it's an an invasive mussel.**¹²

Find a mussel? Photograph and report it! [AB](#), [AK](#), [BC](#), [CA](#), [ID](#), [MT](#), [NV](#), [OR](#), [UT](#), [WA](#), [WY](#)



Climate Connections

One of the most effective ways to protect freshwater resources and ensure regional climate adaptation is the management of invasive mussels. Changes to climate, especially warming waters, **expands the geographic range and reproductive window** of invasive mussels.^{4,15} In turn, established mussel populations may **intensify climate impacts** that the Pacific Northwest is already experiencing in several ways, including:

Impacts to native species: Critical species already at risk from warming water and reduced stream flow would be directly harmed by invasive mussels.^{9,10} High rates of filter feeding can remove prey for young salmonid species, while their razor-thin shells could injure fish moving through hatcheries.⁹ They smother native mussels and invertebrates, restricting movement and food availability.^{8,11}

Water quality and quantity: Mussels exacerbate climate-driven water quality issues and drought, resulting in severe consequences for both **agricultural and drinking water**. Free-floating larvae settle in pipes, bringing flow rates down to a trickle that requires costly annual removal.⁶ Large groups of mussels can alter the ecosystem in ways that prompt the growth of harmful algae blooms, posing risks for water use and consumption.^{13,14}

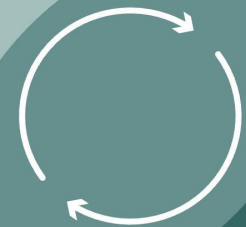
Energy Production: Hydroelectric power is the largest source of renewable energy in the Northwest. Mussel-fouled hydroelectric equipment would cost a projected **hundreds of millions annually** to clean.^{2,6} The establishment of invasive mussels could lead to higher renewable energy prices and increase the **risk of power outages** in the Columbia Basin.⁴

How Invasive Mussels Impact Climate Risks

Increased Hydroelectric Costs

Accelerates Freshwater Warming

Loss of Food and Habitat for Key Species



Range Expansion

Declining Competition from Native Species

Longer Reproductive Window

How Climate Change Impacts Invasive Mussels



Byssal threads

Byssal threads allow invasive mussels to attach to hard surfaces. (Credit: WDFW)

Management Strategies

Prevent: Engage in public outreach and conduct watercraft inspections in high-traffic areas, focusing on early detection and monitoring in emerging high-risk waterbodies.

Prepare: Identify response networks and consult with partnerships *before* detection to ensure a rapid response. Conduct spatial risk assessments, taking into account near-future climate scenarios.

Eradicate: Control methods vary from physical removal to chemical pesticides. Eradication using copper and potassium-based chemical treatments has been effective in Idaho.¹ Chemical treatments can cause fish and invertebrate mortality, and may not be suitable for regions with ESA-listed species.

Contain: If mussels establish, isolate the infested region and restrict any dispersal vectors.

