HABITAT REPORT ON THE STATUS OF NEW INVASIVE MUSSELS ON THE WEST COAST

At the November 2024 Pacific Fishery Management Council (Council) meeting, the Council discussed the recent discovery of invasive golden mussels in the Sacramento-San Joaquin Delta (Delta). This discovery is the first known occurrence of golden mussels in North America. The Council asked the Habitat Committee (HC) to provide an update on this issue at the March 2025 Council meeting. This report summarizes what is currently known about golden mussels for each of the Council states, and steps being taken to address the infestation. In addition, we note a discovery of quagga mussels for the first time in 2023 in the Snake River near Twin Falls, and this was the first detection of quagga mussels in the Columbia-Snake River system.

Habitat and Ecology

The Golden mussel (*Limnoperna fortunei*) is an invasive, freshwater/brackish bivalve native to China and Southeastern Asia. Golden mussels inhabit shallow (<10 meters) aquatic environments. They are similar in appearance, biology, and impacts to quagga and zebra mussels, and tolerate similar wide ranges in temperature, pollution, salinity, pH and calcium, although golden mussels tolerate significantly higher temperatures and calcium levels (Table 1). Golden mussels are fast-growing filter-feeders with high reproductive potential. Juvenile mussels are free-swimming, planktonic larvae which then settle and attach to hard substrates, including buoys, rocks, rooted plants, boat hulls, and other mollusks. Colonies can reach densities around 5,000-250,000 individuals per square meter.

Impacts

Golden mussels pose a significant immediate threat to natural ecosystems, water conveyance systems, infrastructure and water quality. Golden mussels impact biodiversity by smothering native mollusks, consuming and competing with zooplankton which disrupts aquatic food chains. Mussel infestations impact water treatment plants and hydroelectric infrastructure by clogging water intakes and fish screens. They can impede water distribution for municipal water supplies, agricultural irrigation and native fish passage. Mussel infestation can also impact vessels by encrusting docks, colonizing hulls, engines, and steering components.

Status in California

Golden mussels were first discovered at the Port of Stockton and San Luis Reservoir in October 2024 (Figure 1). Increased monitoring in both intensity and geographic coverage has confirmed several new detections of golden mussels in the Delta, primarily in the eastern portion of the Delta (see Figure 2). Efforts to monitor and respond to golden mussel invasion in California include the following:

- The Golden Mussel Task force is working on a Response Plan.
- All water agencies in California participated in a statewide water agency summit, with plans to convene regional follow-up summits.
- In December 2024, golden mussels were included as an emergency addition to the Restricted Species List, which prohibits possession, import and transport of live golden mussels.

- The state is continuing statewide monitoring and reporting, and has completed a statewide habitat suitability assessment of waterbodies based on water quality parameters (calcium, salinity). The state is working on developing a map and database of all waters receiving delta and State Water Project (SWP)/Central Valley Project water and of waterbodies with public watercraft access.
- The State Lands Commission is tracking the movement of vessels in and out of the Port of Stockton and advising other ports about their expected arrival.
- The Aquatic Invasive Species coordinators of Western States have been convening.
- Numerous reservoirs around the state are temporarily closed and others have implemented quarantine programs for all vessels wishing to launch.
- The Department of Water Resources is developing and implementing mitigation measures to protect SWP pumping plants and water supply deliveries.
- At SWP reservoirs with established golden or quagga mussel populations, all watercraft must undergo an exit inspection to prevent the spread of mussels.
- California Department of Fish and Wildlife's golden mussel webpage has a public reporting form and a live map.
- The Division of Boating and Waterways, is currently working on an outreach plan

Status in Oregon

At present, there are no reported detections of golden mussels in Oregon waterways, however targeted monitoring surveys have not yet begun so it is too soon to know if golden mussels are present. Oregon's ballast water program is closely monitoring large commercial vessels (i.e., cargo, tankers) and the Oregon Department of Environmental Quality has reported numerous vessels transiting from the Delta to Oregon. While some of the intercepted vessels were found to be out of compliance with Oregon's Aquatic Invasive Species Prevention Program, no infestations of golden mussels have been detected. The Oregon Department of Fish and Wildlife (ODFW) is reviewing boater check station information to determine which Oregon waterbodies may be at risk of infestation, and where to prioritize monitoring efforts. ODFW is working to update Oregon Administrative Rules to list golden mussels as a Prohibited Species. Public outreach efforts are currently underway to inform the public and encourage boaters to comply with Oregon's Invasive Species Prevention Program.

Status in Washington

There have not been any reported detections of golden mussels in Washington, and the Washington Department of Fish and Wildlife (WDFW) recently conducted a risk assessment looking at port arrivals from Stockton, California. WDFW has a ballast water program that continues to closely monitor large commercial vessels, and boater check stations across the state are monitoring for invasives.

Status in Idaho

Golden mussels have not been detected in Idaho and points of entry are monitored by the Idaho Department of Agriculture. However, quagga mussels were discovered for the first time in 2023 in the Snake River near Twin Falls. This was the first detection of quagga mussels in the Columbia-Snake River system. In response, the Idaho Department of Agriculture led a treatment with liquid copper (Natrix) in October 2023. Quagga mussels were rediscovered in the same area in September 2024 and a similar treatment was completed in October. Additionally, the 2024 treatment has

included winter treatment of 46 ephemeral ponds that are a unique feature of the Snake River Canyon. Ponds are being treated with Potassium Chloride. Final applications and cleanup are scheduled to be completed by March 13, 2025, and sites will again be monitored throughout the year.

Federal and Regional Activities

On January 10, 2025, the U.S. Fish and Wildlife Service published a notice in the Federal Register to add the genus of golden mussels (*Limnoperna*) to the list of injurious wildlife in title 50 of the Code of Federal Regulations (CFR) at § 16.13 (50 CFR 16.13). This action would prohibit the entire genera from being imported into the United States and shipped within the United States or any territory. The proposed rule is open for public comments through March 11, 2025 docket # FWS-HQ-FAC-2024-0060. The Bureau of Reclamation is pursuing development of a more sensitive Environmental DNA primer for golden mussels to facilitate surveillance monitoring for new mussel infestations.

Multiple regional groups have been coordinating on the emerging golden mussel invasion, including the Department of the Interior Invasive Mussels Coordination Group, the Western Regional Panel, and the Columbia River Basin 100th Meridian Aquatic Invasive Species Working Group. The Aquatic Invasive Species coordinators of Western States will discuss the topic at the in-person Western Invasive Species Coordinating Effort meeting in Reno, Nevada the week of February 23, 2025.

Golden mussels are included in the Columbia River Basin Interagency Invasive Species Response Plan. The most recent plan and additional information about rapid response plans in the region is available online at https://www.westernais.org/rapid-response and Columbia River Basin Dreissenid Incident Response Toolkit (http://www.crbdirt.com/).

Habitat and Impact References

Alberta Invasive Species Council

California Department of Fish and Wildlife

Table 1: Environmental parameters for Quagga, Zebra and Golden mussels

Parameter	Numeric Value		References
	Q/Z mussels	Golden mussel	
Calcium	10-25 mg/L	1–50 mg/L	Mackie and Brinsmead 2017
Salinity	≤4 ppt	0–3 ppt; up to 23 ppt w/ FW pulses	Sylvester et al. 2013
Temperature (adult survival)	1-32 °C (34-90°F)	5–35 °C (41-95°F)	Oliveira et al. 2010
Temperature (spawning)	12-18 °C (54-64°F)	16–28 °C (61- 82°F)	Darrigran et al. 2003
Temperature (larval devel)	20-22 °C (68-72°F)	16– 28 °C (61- 82°F)	Ricciardi 1998
pH	7.4-8.4	5-10	Yang et al. 2023
DO	0.1–13.3 mg/L	3.7–11.2 mg/L	Mackie and Brinsmead 2017
Depth	≤ 50m (164 ft)	0.5 – 40m (1.5-131ft) , 10m* (33 ft)	Darrigran 2022
Sexual Maturity (shell size)	8–9 mm (~⅓ in)	6-8 mm (~¼ to ⅓ in)	Xu et al. 2013

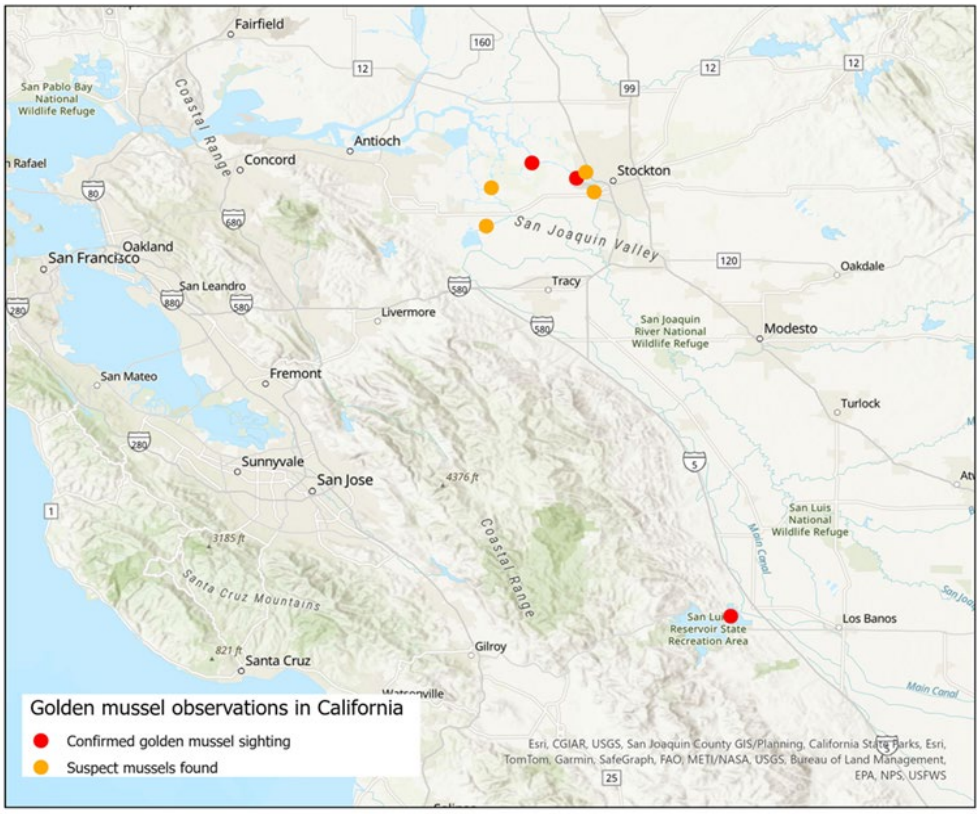

Figure 1: Golden mussel detections in CA reported as of November 2024

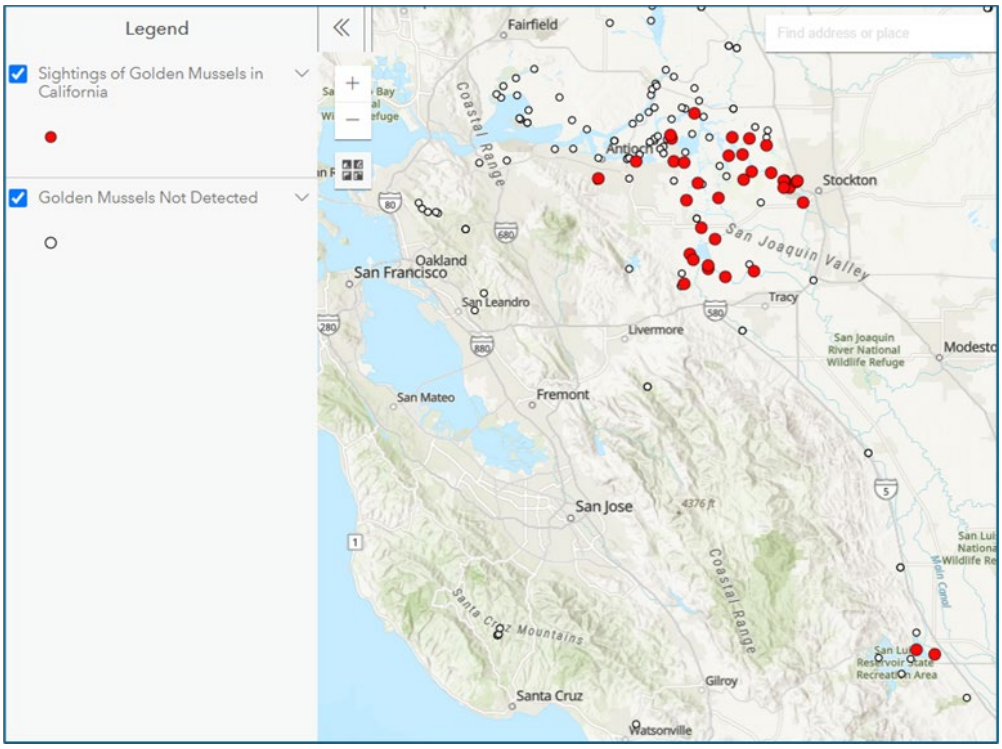

Figure 2: Golden mussel detections in CA reported as of February 2025

PFMC
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