

State of California
Fish and Game Commission
Finding of Emergency and Statement of Proposed Emergency Regulatory Action

Emergency Action to Amend Section 671
Title 14, California Code of Regulations
Re: Golden Mussel

Date of Statement: December 12, 2024

Throughout this document, CDFW refers to the California Department of Fish and Wildlife, and Commission refers to the California Fish and Game Commission. Unless otherwise specified, all section references in this document are to Title 14 of the California Code of Regulations (CCR).

I. Statement of Facts Constituting the Need for Emergency Regulatory Action

Background

Golden mussel (*Limnoperna fortunei*), an invasive, non-native freshwater bivalve, was discovered for the first time on October 17, 2024, in the Port of Stockton by California Department of Water Resources (DWR) staff while conducting routine operations. This is the first known occurrence of this highly invasive species in North America. Shortly after, golden mussels were detected at additional sites in the Sacramento-San Joaquin Delta (Delta), including Turner Cut downstream of the Port of Stockton (October 23), Middle River (October 31), Old River (November 7), and in the San Joaquin River upstream of the Port of Stockton (November 5). Golden mussels were also detected in O'Neill Forebay on October 25 and at the outlet of O'Neill Forebay to the California Aqueduct on October 31 (Figure 1). O'Neill Forebay is a forebay of San Luis Reservoir, which is a joint use facility of the California State Water Project and federal Central Valley Project located in Merced County.

Golden mussels in the Delta pose a significant immediate threat to the ecological health of the Delta and all waters of the state, the operations of water conveyance systems, agricultural interests, hydroelectric power generation, infrastructure, water quality, and the economy. Their presence in California is of statewide, national, and international concern. Without actions to prevent further spread, golden mussel have the potential to be moved overland on trailered watercraft and equipment out of the Delta and to nearby and distant fresh and brackish waters, including rivers, lakes, and reservoirs within California and the rest of North America.

Golden mussels are native to rivers and creeks of China and Southeast Asia. They are known to be established outside of their native range in Hong Kong, Japan, Taiwan, Brazil, Uruguay, Paraguay, and Argentina. The initial introductions to these countries were likely the result of ships with biofouling on the hulls and/or ballast water release. In most cases, the invaded range has expanded upstream from the point of introduction, and inland from ports through local, human-mediated pathways. Within the invaded range, significant impacts resulting from the dense colonization of golden mussels on hard surfaces are widely documented.

Golden mussels have similar appearance, biology, and impact as quagga and zebra (dreissenid) mussels. Golden mussels are small, typically under 1.5 inches in length with shell color that is light golden to darker yellowish-brown to brown color. They firmly attach to hard to semi-hard surfaces. Shortly after fertilization, the larvae become mobile, capable of coordinated swimming, and

disperse in the water column. Larva are microscopic and themselves cannot swim upstream, but can be carried by human-mediated pathways such as water within watercraft. Once a suitable substrate is found, juvenile mussels settle and attach themselves to the substrate by strong, silky fibers called byssal threads and develop into adults. Golden mussels can grow in dense colonies of hundreds of thousands of mussels per square meter.

Figure 1. Golden mussel detections as of November 14, 2024.



Golden mussels can tolerate a wider range of environmental conditions than dreissenid mussels, meaning they are able to establish in environments where dreissenid mussels are unable to invade. Because they require less calcium to survive and reproduce than dreissenid mussels, nearly every waterbody in California is at risk of becoming infested with golden mussels if they are introduced. Golden mussels tolerate higher salinity than dreissenid mussels, making the brackish parts of estuaries, such as Suisun Bay, suitable for golden mussel establishment. They also tolerate warmer water temperatures compared to dreissenid mussels.

Like dreissenid mussels, golden mussels pose an environmental threat to California since they are ecosystem engineers and can profoundly change the food web of an invaded ecosystem. They

can impact native species and sports fish by competing for food sources. They can also increase water clarity due to intense filter feeding, resulting in degraded water quality, algal blooms, and increased aquatic vegetation growth that requires control to maintain navigation.

Like dreissenid mussels, golden mussels pose an economic threat to California's infrastructure and recreation industries. Heavy encrustations of golden mussels form dense reef-like structures that block municipal and industrial water supplies, agricultural irrigation, and power plant operations, necessitating ongoing biofouling removal. Millions of dollars are spent annually to maintain infrastructure and efforts to prevent the further spread of dreissenid mussels in California.

Golden mussels can also impact recreation by limiting recreational opportunities, encrusting docks and beaches, and colonizing recreational equipment including watercraft hulls, engines, and steering components. Dreissenid mussel infestations resulted in the temporary and permanent closure of waterbodies to the public and have negatively impacted aquatic ecosystems.

Golden mussels were likely introduced to the Port of Stockton, San Joaquin County, by a ship traveling from an international port. Golden mussels are likely to spread throughout the interconnected Delta, upstream into Delta tributaries, as far west as the Suisun Bay, and southward via the State Water Project and Central Valley Project that draw from the Delta. Without containment, golden mussels are also likely to spread overland on trailered vessels and equipment to other fresh and brackish waterbodies throughout California, and to other ports and inland waters of North America, and potentially abroad.

CDFW, California Department of Parks and Recreation (California State Parks), California Department of Food and Agriculture (CDFA), DWR, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, and other state, federal, and local agencies regularly coordinate through the CDFW's Invasive Species Program. This partnership aims to limit the spread of invasive species in California's waterways, which cause harm to native species and the ecosystems they depend on to survive. These agencies are mobilizing to delineate the infestation and prevent the further spread of golden mussels. Currently there are no federal or state prohibitions for possessing or moving golden mussels.

Currently, it is unlikely that any person is intentionally in possession of golden mussel, as they are not known to be a species for human consumption, for aquaculture or in the aquarium trade. In the event someone were to be in possession, intentionally or unintentionally, those mussels should be euthanized upon enactment of this emergency regulation. Thereafter, pursuant to Section 671.1, golden mussels could be possessed under a permit issued by CDFW for purposes as defined in the regulations.

Emergency Regulations

In response to this emergency situation, the regulatory action amends Section 671 to add golden mussel to the list of restricted animals. This amendment adds subsection (B) to subsection (c)(10) Bivalves, where (A) currently covers all members of the genus *Dreissena* (zebra and quagga mussels). The new subsection (B) adds the golden mussel (*Limnoperna fortunei*) species. Adding golden mussel to the list of restricted animals will immediately prohibit importation, transportation, and possession of live golden mussels, thereby deterring people from moving them to other waters of the state and providing enforceability if golden mussels are found in someone's

possession. Adding golden mussel to the list of restricted species will also allow water managers operating mussel prevention programs grounds to refuse watercraft from launching into waterways. Additionally, it will allow law enforcement personnel to detain vessels or equipment until such time as they no longer pose a threat to the environment.

California Fish and Game Code sections 2118 and 2120 provide broad authority for the restricted species list implemented in Section 671. Cooperation with CDFA is required for consideration of the addition or removal of classes, families, genera, and species from the list of restricted species (subdivisions 2118(j) and (k)). Given the ramifications for spread of golden mussel, its presence is considered, "...undesirable, and a menace to native wildlife or the agricultural interests of the state."

II. Findings for the Existence of an Emergency

The Commission considered the following factors in determining that an emergency does exist at this time.

The magnitude of potential harm:

In waterways where golden mussels are present, heavy encrustations of golden mussels have blocked municipal and industrial water intakes compelling ongoing biofouling removal (Xu et al. 2015; Zhao et al. 2019), harmed native species in the ecosystem (Boltovskoy and Correa 2015; Cataldo et al. 2012), facilitated aquatic weed growth, and diminished water quality (Zhang et al. 2022). Spread of golden mussel out of the Delta into fresh and brackish waters would cause infrastructural damage across the state, and could threaten water delivery and electric power delivery from hydroelectric operations (for example, O'Neill Forebay). As ecosystem engineers, golden mussels can permanently change ecosystem function. As large encrustations of reef-like structures grow in a stream or river, the increase in organic matter shifts varied microhabitats and their diversity to monocultures of species, slowly eliminating aquatic species diversity (Mouthino, 2021).

Given the very real harms presented by golden mussels, individuals within and entering California should not be importing, transporting, or possessing them, and so making them a restricted species is appropriate.

The existence of a crisis situation:

These discoveries in the Delta are the first known occurrences of golden mussels in North America. The further spread of the species poses a significant immediate threat to the ecological health of the Delta and all waters of the state, water conveyance systems, infrastructure, electric power delivery from hydroelectric operations, and water quality.

Because of rapid mussel colonization of infrastructure and water conveyances, this new invasion is a significant threat to the Delta and waterbodies statewide, nationally, and internationally. Impacts are far-reaching, from water transfers inclusive of the Central Valley Project and State Water Project, to water agencies and distributors, to recreationists. Adverse impacts could be felt to recreation, transportation and shipping, agriculture, and municipal water supplies.

The immediacy of the need:

There is a significant immediate need to stop the spread of this invasive species to prevent the translocation of this species to other waterbodies in the state and beyond. There is an immediate need to conduct vessel inspections to reduce the spread of the aquatic invasive species. CDFW law enforcement needs to be able to inspect watercraft and quarantine any vessels that are infested with golden mussels. Water managers must be able to refuse vessels and equipment that are or suspected to be carrying golden mussels from launching into lakes, reservoirs, or other waterways where golden mussels are not known to be present.

Previous cases, such as in South America, have seen ultra-rapid expansion after the first infestation (e.g., Darrigran and Damborenea 2005), invading both natural areas and human infrastructure. Aside from natural mussel propagation, spread is assisted by human activities including commerce, fishing, and recreation. Any delay in facilitating vessel inspections could allow the mussel's range to spread to new areas and compromise efforts to control it.

CDFW is continuing to work with state, local, and federal agencies to enhance monitoring efforts, communicate additional detection and response information, and coordinate on potential next steps. If the spread of this species is not prevented, more waterways will be infested, further increasing the threat to uninfested waters.

Whether the anticipation of harm has a basis firmer than simple speculation:

Ecosystem degradation, infrastructure biofouling, and water quality decreases are all documented potential effects from golden mussel invasion. Costs for maintenance, control, and surveillance have skyrocketed following its spread in other invaded areas (Darrigran and Damborenea 2005). Golden mussel is also quite adaptable to a broad range of environmental conditions; it tolerates a wide range of temperatures, salinity, and other water quality factors, making its spread to disparate areas much more likely even than other bivalve invaders.

California's experience with dreissenid mussels over the last 17 years has demonstrated prevention and containment is effective to slowing the spread of mussels and avoiding widespread impacts resulting from invasive mussel establishment. This success would not have been achieved without the necessary authority.

III. Impact of Regulatory Action

The potential for significant statewide adverse economic impacts that might result from the proposed regulatory action has been assessed, and the following initial determinations relative to the required statutory categories have been made:

(a) Costs or Savings to State Agencies or Costs/Savings in Federal Funding to the State:

Adding golden mussels to the restricted species list does not necessarily compel a requirement to act upon state agencies, but rather enables existing programs to include the species in their enforcement actions for detection and prevention. As such, the Commission does not anticipate any direct costs or savings to CDFW or other state agencies as a result of this emergency action. There may be future complementary authorities or requirements for managing golden mussels that will come from elsewhere, such as legislation, compelling costs associated with preventing the spread of golden mussels.

(b) Nondiscretionary Costs/Savings to Local Agencies:

None. Adding golden mussel to the list of restricted animals will not have the potential for a fiscal effect on local governments, as the regulation only adds the species to the restricted animals list without prescribing specific enforcement actions to be taken by local government entities.

(c) Programs Mandated on Local Agencies or School Districts:

None. Adding golden mussel to the list of restricted animals will not have the potential for a fiscal effect on local governments, as the regulation only adds the species to the restricted animals list without mandating specific enforcement actions or programs to be taken by local government entities.

(d) Costs Imposed on Any Local Agency or School District that is Required to be Reimbursed Under Part 7 (commencing with Section 17500) of Division 4, Government Code: None.

(e) Effect on Housing Costs: None

IV. Technical, Theoretical, and/or Empirical Studies, Reports, or Documents Relied Upon:

California Department of Fish and Game. 2008. [California Aquatic Invasive Species Management Plan](https://wildlife.ca.gov/Conservation/Invasives/Plan); Draft Rapid Response Plan. State of California, Resources Agency. Available from: <https://wildlife.ca.gov/Conservation/Invasives/Plan>

Smith, R. and L. McMartin. 2011. [Bay Delta Rapid Response Plan For Dreissenid Mussels](#). U.S. Fish and Wildlife Service developed for the California Department of Fish and Game #P0685514. Stockton, CA.

V. Documents Providing Background Information

Boltovskoy, D., E. Paolucci, H. J. MacIsaac, A. Zhan, Z. Xia, and N. Correa. 2022. What we know and don't know about the invasive golden mussel *Limnoperna fortunei*. Hydrobiologia. <https://doi.org/10.1007/s10750-022-04988-5>.

Boltovskoy, D., and N. Correa. 2015. Ecosystem impacts of the invasive bivalve *Limnoperna fortunei* (golden mussel) in South America. Hydrobiologia 746:81–95.

Cataldo, D., I. O' Farrell, E. Paolucci, F. Sylvester, and D. Boltovskoy. 2012. Impact of the invasive golden mussel (*Limnoperna fortunei*) on phytoplankton and nutrient cycling. Aquatic Invasions 7:91–100.

Darrigran, G. A., and M. C. Damborenea. 2005. A South American bioinvasion case history: *Limnoperna fortunei* (Dunker, 1857), the golden mussel. American Malacological Bulletin 20:105–112.

- Moutinho, S. 2021. A Golden Menace. An invasive mussel is devastating ecosystems as it spreads through South American rivers, threatening the Amazon basin. *Science* 374: 390-393. Available from: <https://www.science.org/content/article/golden-mussels-devastating-south-american-rivers-amazon-may-be-next>
- Xu, M., Z. Wang, N. Zhao, and B. Pan. 2015. Growth, reproduction, and attachment of the golden mussel (*Limnoperna fortunei*) in water diversion projects. *Acta Ecologica Sinica* 35:70–75.
- Zhang, J., M. Xu, L. Sun, D. Reible, and X. Fu. 2022. Impact of golden mussel (*Limnoperna fortunei*) colonization on bacterial communities and potential risk to water quality. *Ecological Indicators* 144:109499.
- Zhao, N., M. Xu, K. Blanckaert, C. Qiao, H. Zhou, and X. Niu. 2019. Study of factors influencing the invasion of Golden Mussels (*Limnoperna fortunei*) in water transfer projects. *Aquatic Ecosystem Health & Management* 22:385–395.

VI. Authority and Reference

Authority: Sections 2118 and 2120, Fish and Game Code.

Reference: Sections 1002, 2116, 2118, 2118.2, 2118.4, 2119, 2120, 2122, 2123, 2124, 2125, 2126, 2127, 2150, 2190 and 2271, Fish and Game Code.

VII. Fish and Game Code Section 399 Finding

Pursuant to Section 399 of the Fish and Game Code, the Commission finds that the adoption of this regulation is necessary for the immediate preservation of the public peace, health and safety, or general welfare.

Informative Digest/Policy Statement Overview

Golden mussel (*Limnoperna fortunei*), an invasive, non-native freshwater bivalve, was discovered for the first time on October 17, 2024, in the Port of Stockton, San Joaquin County. This is the first known occurrence of this highly invasive species in North America. As of November 13, 2024 golden mussels were detected at 9 additional sites in the Sacramento-San Joaquin Delta and State Water Project.

Golden mussels were likely introduced to the Port of Stockton by a ship traveling from an international port. Golden mussels are likely to spread throughout the interconnected Delta, upstream into Delta tributaries, as far west as the Suisun Bay, and southward via the State Water Project and Central Valley Project that draw from the Delta. Without containment, golden mussels are likely to spread overland on trailered vessels and equipment to other fresh and brackish waterbodies throughout California, and to other ports and inland waters of North America, and potentially abroad.

Golden mussels are native to rivers and creeks of China and Southeast Asia. They are known to be established outside of their native range in Hong Kong, Japan, Taiwan, Brazil, Uruguay, Paraguay, and Argentina. Within the invaded range, significant impacts resulting from the dense colonization of golden mussels on hard surfaces are widely documented.

Golden mussels in the Delta pose a significant immediate threat to the ecological health of the Delta and all waters of the state, the operations of water conveyance systems, agricultural interests, hydroelectric power generation, infrastructure, water quality, and the economy. Their presence in California is of statewide, national, and international concern.

Golden mussels have similar appearance, biology, and impact as quagga and zebra (dreissenid) mussels. Golden mussels can tolerate a wider range of environmental conditions than dreissenid mussels, including less calcium, higher salinity, and warmer water temperatures. Nearly all waters of California are conducive to golden mussel establishment.

Golden mussels are ecosystem engineers and can profoundly change natural environments. They threaten California's infrastructure, recreation, municipal and industrial water supplies, the robust agricultural industry, and power plant operations. Millions of dollars are already spent annually to maintain infrastructure and prevent further spread of dreissenid mussels in California, and golden mussel are anticipated to increase these costs significantly.

Golden mussels can also impact recreation by limiting recreational opportunities, encrusting docks and beaches, and colonizing recreational equipment including watercraft hulls, engines, and steering components. Dreissenid mussel infestations resulted in the temporary and permanent closure of waterbodies to the public and have negatively impacted aquatic ecosystems.

The California Department of Fish and Wildlife (CDFW) and partners are in the beginning stage of mobilizing a statewide response, including delineation of the infestation and implementing containment to prevent the further spread of golden mussels. Currently there are no federal or state prohibitions for possessing or moving golden mussels. Addition of golden mussel to the list of restricted animals in Section 671 will equip CDFW and local water managers with authority to take action to prevent the overland spread of golden mussels.

In response to this emergency situation, the proposed regulatory action amends Section 671 to add golden mussel to the list of restricted animals. This amendment adds subsection (B) to subsection (c)(10) Bivalves, where (A) currently covers all members of the genus *Dreissena* (zebra and quagga mussels). The new subsection (B) adds the golden mussel (*Limnoperna fortunei*) species. Adding golden mussel to the list of restricted animals will immediately prohibit importation, transportation, and possession of live golden mussels, thereby deterring people from moving them to other waters of the state and providing enforceability if golden mussels are found in someone's possession. Adding golden mussel to the list of restricted species will also allow water managers operating mussel prevention programs grounds to refuse vessels and equipment that are or suspected to be carrying golden mussels from launching into lakes, reservoirs, or other waterways where golden mussels are not known to be present. Additionally, it will allow law enforcement personnel to inspect watercraft and quarantine any vessels that are infested with golden mussels and/or detain vessels or equipment until such time as they no longer pose a threat to the environment.

Benefits of the Regulation:

The California Legislature has declared that some wild animals are a threat to native wildlife or the agricultural interests of the state and that some wild animals are a threat to public health and safety. It is the Legislature's intention that the importation, transportation and possession of wild animals be regulated to protect the native wildlife and agricultural interests of the state against damage from the existence at large of certain wild animals and to protect the health and safety in this state. The proposed regulations will help to prevent the translocation of this golden mussel to other waterbodies in the state and beyond, thereby protecting native wildlife, the agricultural interests of the state and public health and safety.

Consistency and Compatibility with Existing Regulations

Article IV, Section 20 of the State Constitution specifies that the Legislature may delegate to Commission such powers relating to the protection and propagation of fish and game as the Legislature sees fit. The Legislature has delegated to the Commission the power to regulate the importation, transportation and possession of wild animals to protect the native wildlife, agricultural interests of the state, and the health and safety in this state. (Fish and Game Code Section 2118). The Commission has reviewed its own regulations and finds that the proposed regulations are consistent with other regulations in Title 14, CCR, and therefore finds that the proposed regulations are neither inconsistent nor incompatible with existing state regulations. The Commission has searched the California Code of Regulations and finds no other state agency regulations pertaining to adding golden mussel to the list of restricted animals.