



Engineering, Operations, & Technology Committee

# Update on Golden Mussels in the State Water Project

Item 6b

August 18, 2025

## Item 6b Update on Golden Mussels in SWP

### Subject

Golden mussels in the State Water Project

### Purpose

Provide an update on invasive golden mussels in the State Water Project, potential impact on operations, and Metropolitan's response

### Next Steps

Continue monitoring invasive mussels in SWP, coordinate with member and state agencies, and implement control measures

## Quagga Mussels in CRA

# Invasion of the Colorado River Aqueduct

- First discovered in Lake Mead in January 2007
- Spread quickly through the CRA by July 2008
- Colonized intakes and raw water conveyance facilities
- Safety of treated drinking water not affected



Yorba Linda Feeder, 2011



Colonized Intake Trash Rack



Multi-Generation Cluster  
of Quagga Mussels



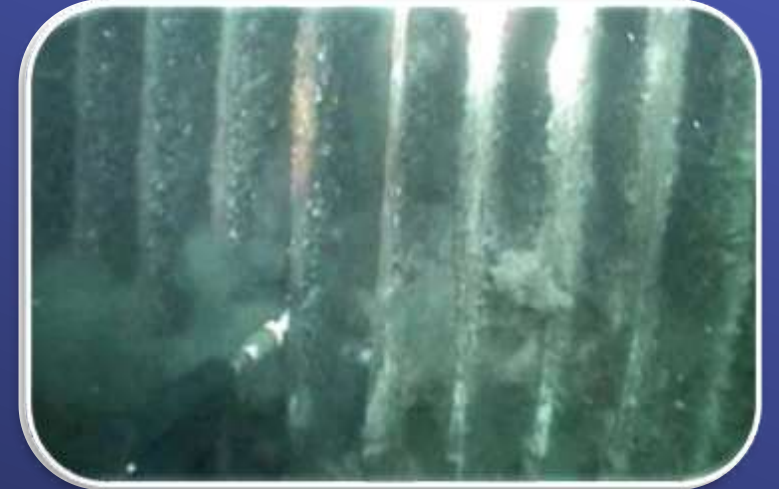
# Quagga Mussel Control in the CRA System



Continuous Chlorination at Copper Basin,  
Lake Mathews, Lake Skinner



Periodic Tower Chlorination at  
Lake Mathews and Lake Skinner



Periodic Cleaning of Trash Racks and  
Fish Screens



Desiccation, Cleaning and Inspections  
during CRA Shutdowns



Extensive Veliger Monitoring



Control Measures (e.g., Filtration) during  
Raw Water Discharges

## A New Invasive Mussel



Photo credit: DWR

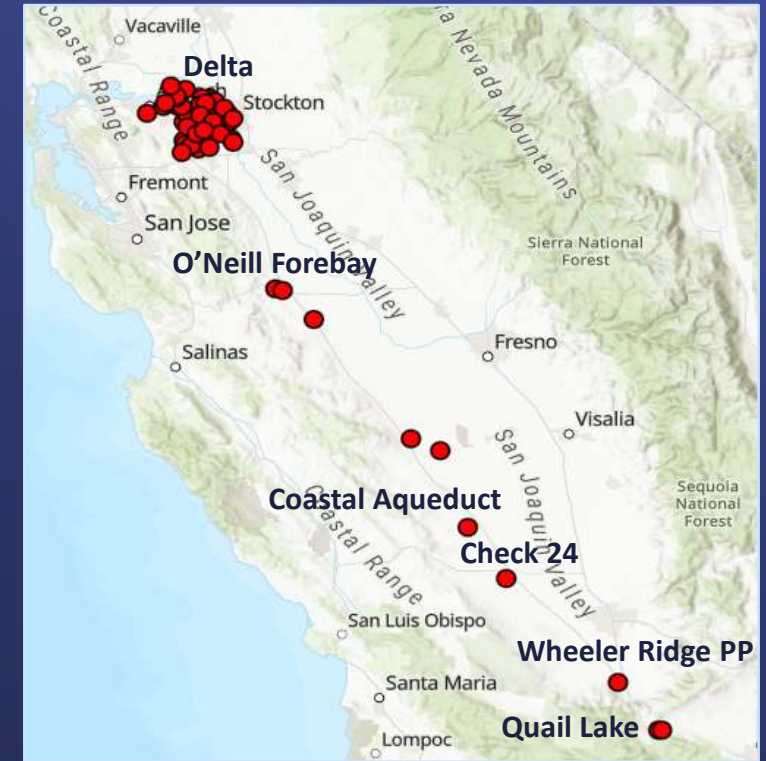
## Golden Mussels (*Limnoperna fortunei*)

- Native to China and southeast Asia
- Similar to quagga mussels with impacts on infrastructure and operations
  - Veligers are free-swimming and migrate through water
  - Adults attach to solid surfaces
- Spread to at least nine countries in last 50 years
  - South America in 1990s
- Adapt to a wide range of freshwater environments
  - Not limited by low calcium
  - Most California freshwater lakes and brackish areas are vulnerable to invasion



# Golden Mussels in California Delta and SWP

- Adult mussels found in Port of Stockton and O'Neill Forebay at San Luis Reservoir in October 2024
  - First discovery in North America
  - Mussels subsequently found throughout Delta and upper SWP
- California Fish & Game Commission added golden mussels to list of restricted species
- State task force formed to determine extent of invasion and assess control measures
  - Golden Mussel Response Framework - April 2025
- Quagga mussels established in Castaic Lake (WB-SWP) since 2023



Golden Mussel Detection Locations

## Invasive Mussels in the Delta



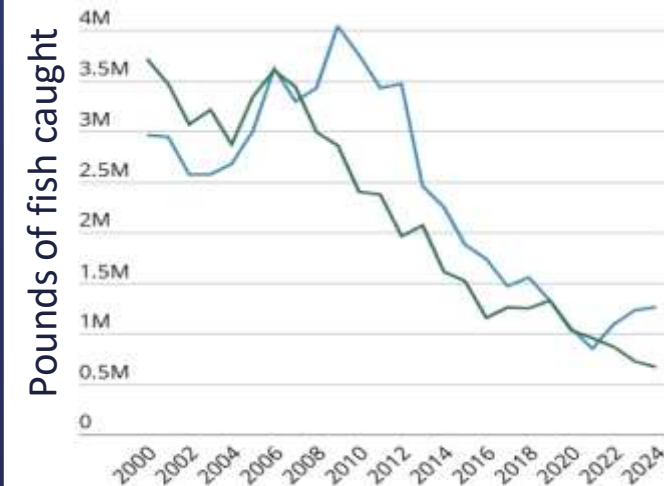
Image credit: DWR

## Potential Ecosystem Impacts

- Water quality changes
  - Increase water clarity and sunlight penetration
  - Potentially promote blooms of toxic cyanobacteria
- Ecosystem disruption
  - Alter food webs and nutrient cycles
  - Deplete primary producers
  - Affect the availability of resources to other organisms
  - Outcompete native species
  - Impact fisheries
  - Transfer of contaminants up the food chain

### Disappearing fish

As whitefish stocks dwindle in lakes Michigan and Huron, commercial fishing boats are pulling up emptier nets.



Michigan Dept. Natural Resources, 2024

# DWR Response to Golden Mussels

- Prevention and containment
  - Watercraft inspections at Lake Oroville, Thermalito Forebay and Afterbay, San Luis Reservoir, O'Neill Forebay
- Protective measures for cooling, service, and fire water lines at facilities adjacent to significant mussel populations
  - UV and chemical injection
- Chemical treatment research
  - Copper and chlorine
  - Testing concentration and exposure rates
- Expanded monitoring program
- Outreach and education
  - Website, social media, videos, workshops, signage, presentations





# Metropolitan's Invasive Mussels Monitoring Program

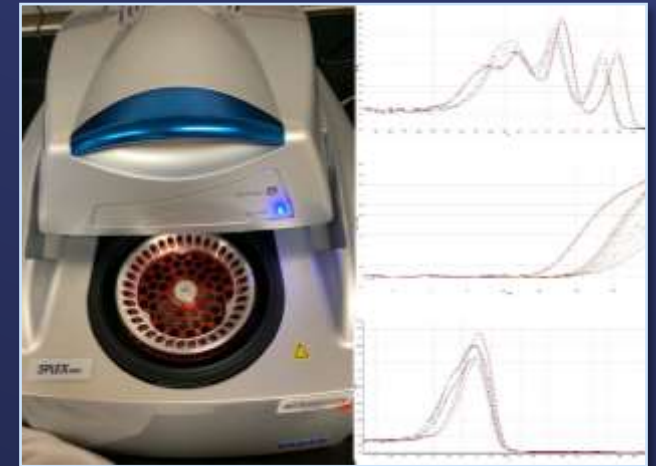
- Routine monitoring throughout Metropolitan's system since 2007, and additional SWP sites in collaboration with DWR
- Detection methods
  - Adult mussels – visual inspections, including ROVs
  - Veligers (larval stages) – microscopy
  - eDNA – molecular detection
  - DNA sequencing to confirm identification of veligers and eDNA signals



Veliger Sampling at Castaic Lake



Veliger Monitoring by Microscopy



Instrument for Detecting eDNA

# Recent Metropolitan and CDFW/DWR Monitoring Results





# Metropolitan's Operational Response to Golden Mussels

- Enhanced monitoring and inspections for golden mussels in SWP and Metropolitan reservoirs
- Multi-disciplinary taskforce evaluating and implementing mussel control strategies and plans
  - Groundwater replenishment deliveries (e.g., USG-3, B-06)
  - Treatment plants, reservoirs, and shutdowns
  - Updating and developing control plans
  - Research on control approaches
  - Advance legislation
- Quagga mussel control measures are expected to be effective for golden mussels



USG-3 Water Delivery



Jensen Plant Ozone Cooling  
System Strainer



# Invasive Mussel Control Measures

Remove/inactivate veligers to prevent infrastructure damage and downstream spread

- Ultraviolet light (UV), Filtration, Mobile chlorinators
- Assessing appropriate locations for equipment installation
- Equipment vendor RFQs posted early August
- Upcoming Board action for CIP and O&M funding
  - Phase I – monitoring, vulnerability assessments, near-term mitigation, rapidly deployable equipment
  - Phase II – infrastructure upgrades identified in Phase I
  - Phase III – long-term mitigation strategies
- Coordination with DWR and Member Agencies



Quagga mussel filtration for pipeline dewatering

# Invasive Mussels in State Water Project



## Summary and Next Steps

- Continue monitoring for invasive mussels
- Assess, design, and implement management and control options
- Develop draft invasive mussel control plans
- Manage raw water releases when necessary
- Coordinate with CDFW, DWR, and other agencies
- Work with partner agencies to advance protective legislation
- Provide updates to Board and Member Agencies as needed

