



Engineering, Operations, & Technology Committee

Reservoir Management Update

Item 6b

July 13, 2026

Presented by: Ying Wu

Item 6b Reservoir Management Update

Subject

Management of Metropolitan's reservoirs

Purpose

Provide an overview of Metropolitan's comprehensive reservoir monitoring and management practices to ensure operational flexibility and resilience

Next Steps

Continue to manage reservoirs to ensure reliable operations

Large Regional Source Water Reservoirs

Metropolitan

Dept. Water Resources

Bureau of Reclamation

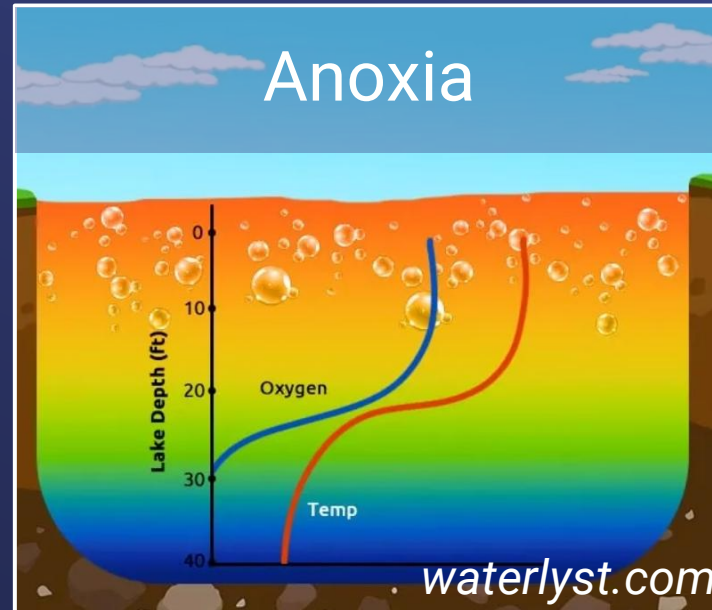


Common Reservoir Challenges and Water Quality Issues

Water quality issues can reduce operational flexibility



- Taste and odor production
- Toxin production



- Elevated manganese
- Hydrogen sulfide production



- Quagga mussels in CRA and WB-SWP
- Golden mussels in WB-SWP and EB-SWP

Comprehensive Reservoir Monitoring Program

- Routine field sampling and laboratory analyses
- SCUBA diving
- Remote water quality sensors/probes
- Satellite monitoring of lake conditions
- Remotely operated vehicles (ROVs)
- Water quality models



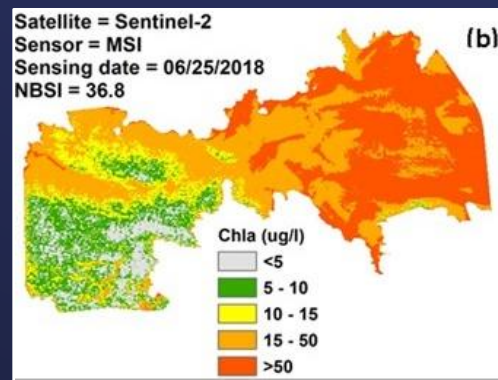
SCUBA diving



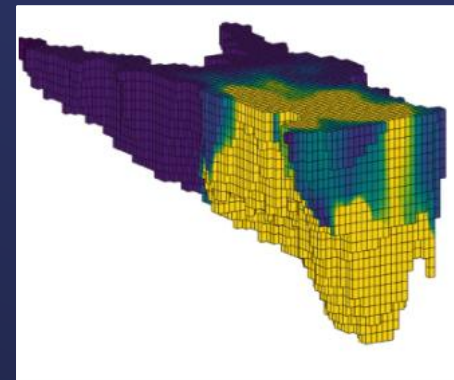
Field sampling



Microscopic analysis



Satellite imaging



Lake modeling

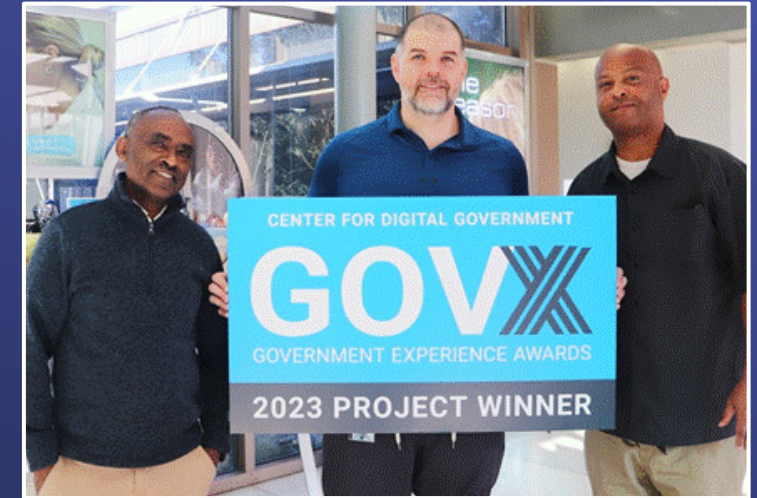


Remote monitoring

Lake Explorer Advanced Portal (LEAP)

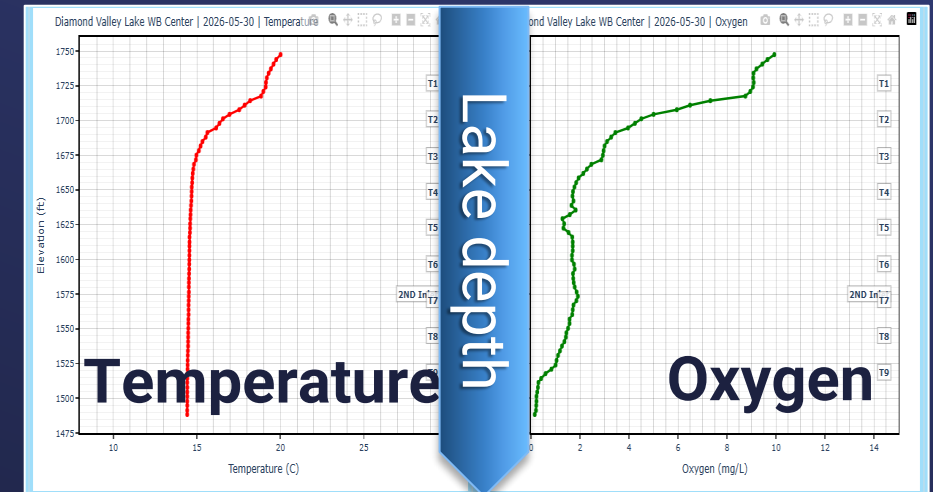
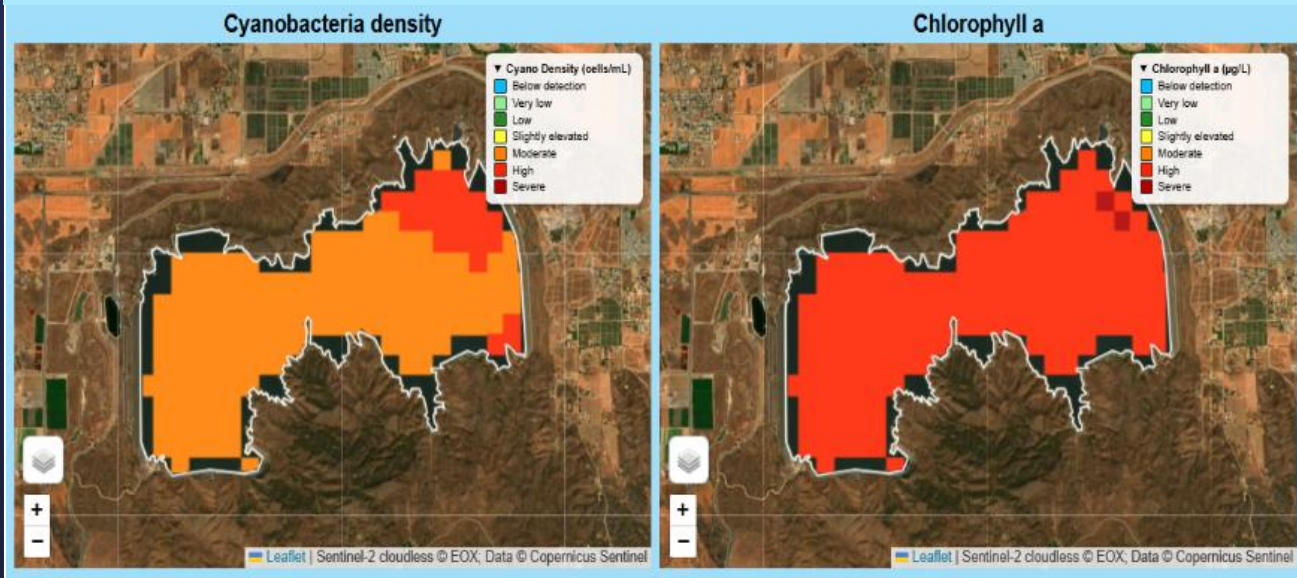
In-house application which combines:

- Near-real-time satellite imagery for tracking blooms
- Biological, chemical, and weather data
- Metropolitan's waterline network
- Source water quality forecasting



First Version of Lake Explorer Won
2023 Government Experience Award

Satellite Images of Cyanobacteria and Chlorophyll at DVL



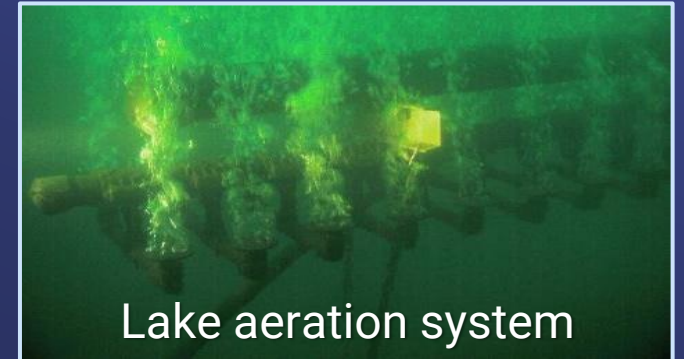
Reservoir Management Toolbox

Managing lakes to ensure reliable water supply

- Cyanobacterial blooms
 - Tier change for optimal lake withdrawal
 - Copper sulfate treatment of lakes
 - Ozone at treatment plants
- Low dissolved oxygen (anoxia)
 - Aeration to mix water column
 - Deep water oxygenation (future)
- Invasive mussels
 - Chemical control (chlorine, copper)
 - Infrastructure cleaning
 - Controlled discharges



Copper sulfate treatment of cyanobacterial bloom



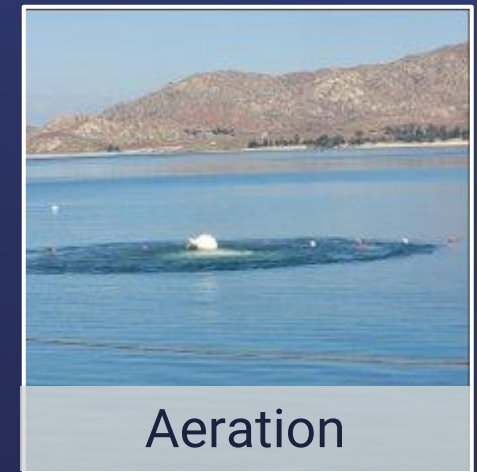
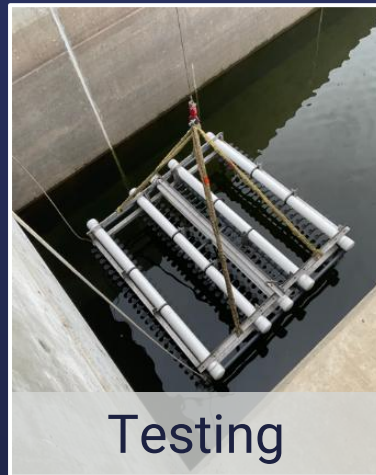
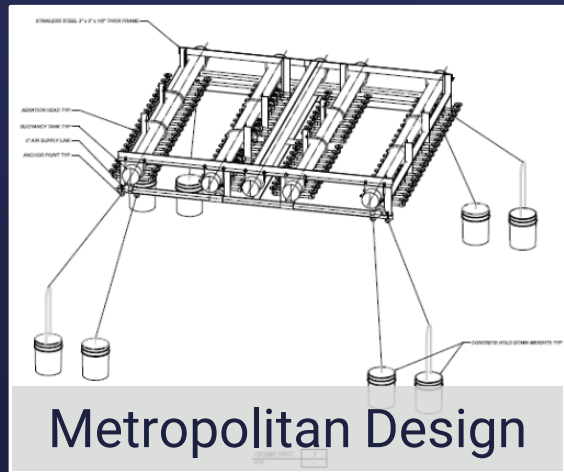
Lake aeration system



Lake chlorination equipment

Lake Perris Aeration System

Aged aeration system - replaced in 2026 through collaboration with DWR



AFTER - New aerator installed



Diamond Valley Lake

- Spring/Summer 2026 – Rapidly developing cyanobacterial bloom producing cyanotoxins and taste & odor
- A recreational water issue only
- Drinking water not impacted
 - Water currently not being withdrawn from DVL
- Following state's voluntary guidance for posting recreational advisories
 - No regulatory requirements
 - Advisory signs posted starting in May
- Blooms are becoming more frequent across all seasons

Cyanobacterial Bloom 2026

CAUTION

Harmful cyanobacteria or algae may be present in this water during the summer months. Green scum or mats floating on the lake surface may contain harmful cyanobacteria.

For your and your family's safety:



Body contact recreation such as swimming is not permitted in this lake at any time.



Keep children away from algae in the water or on the shore.



Do not wade or paddle in algae or green scum in the water.



Do not let pets and other animals go into or drink the water, or eat scum on the shore.

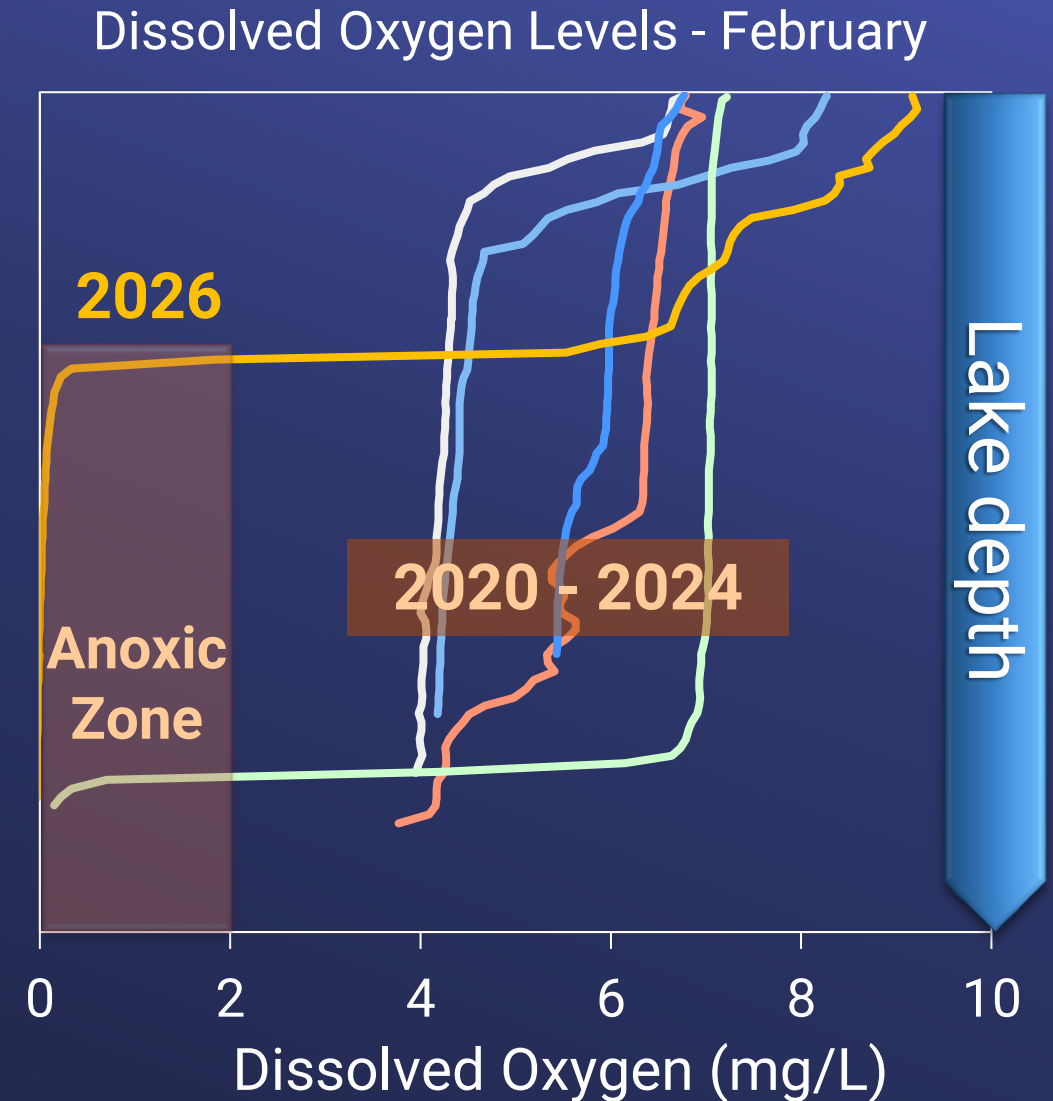


Do not touch algae or green scum in the water.

For information on harmful cyanobacteria and algae, go to mywaterquality.ca.gov/monitoring_council/cyanobab_network.
For local information, contact: The Metropolitan Water District of Southern California, 1-800-CALL-MWD

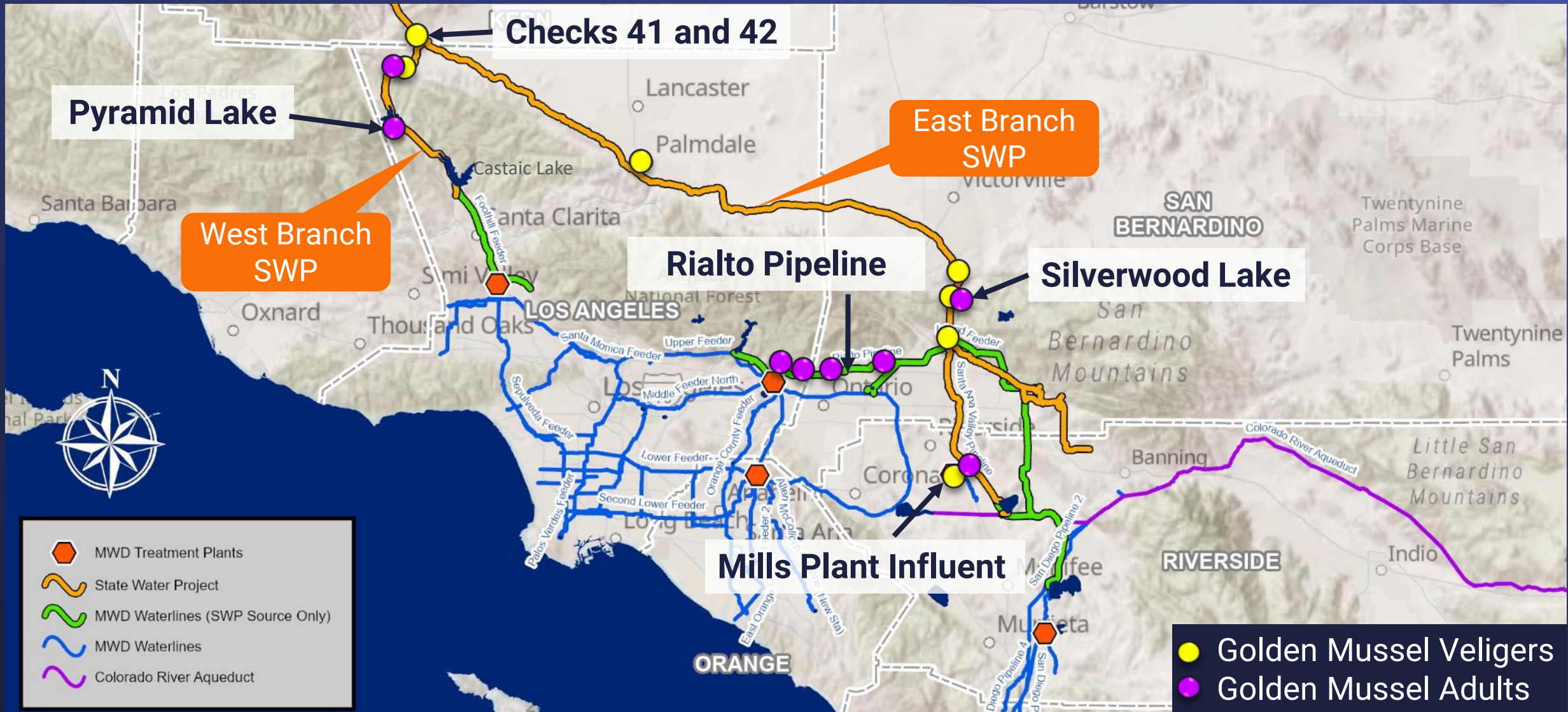
Depleted Oxygen (Anoxia) in Diamond Valley Lake

- Lake becoming progressively more anoxic
- Winter 2026 – lake failed to fully mix and reverse anoxia for the first time in its 24-year history
- Potential operations to mix lake and mitigate anoxia
 - Periodically increase flow through DVL (near-term)
 - Deep water oxygenation (long-term)



Golden Mussel Detections in Metropolitan's Local Waters

Adult mussels detected in Box Springs Feeder, Rialto Pipeline, and Live Oak Reservoir



Status of Mussels in Metropolitan's Lakes

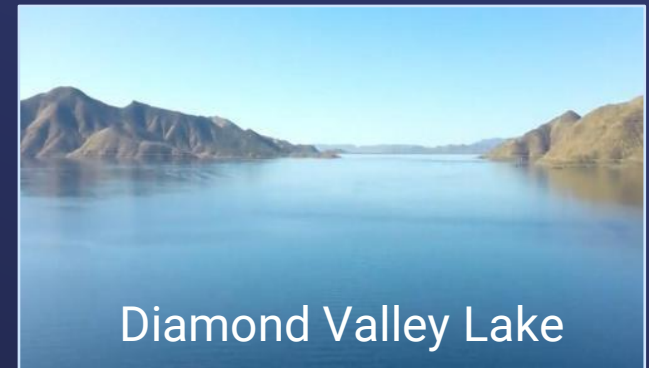
Lake Mathews and Lake Skinner

- Infested with quagga mussels since 2007
- No golden mussels detected
- Continue outlet chlorination for mussel control



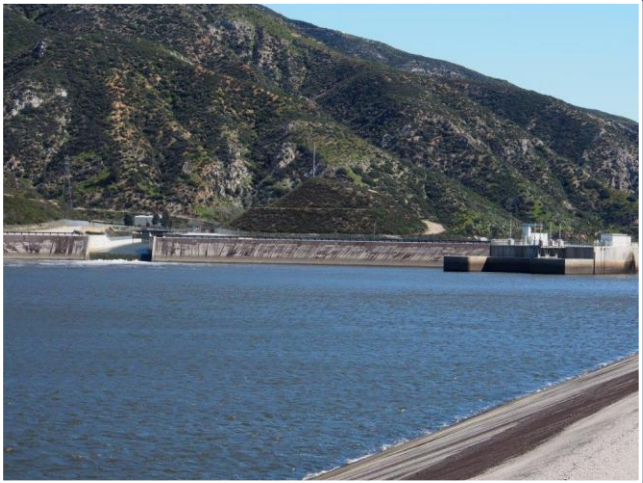
Diamond Valley Lake

- Not infested with quagga mussels
- No golden mussels detected
- Implement boat exit inspections if mussels detected
- Invasive mussel control plan submitted to CDFW





Silverwood Lake



Devil Canyon 2nd Afterbay
(downstream of Silverwood Lake)

Status of Mussels in DWR's Lakes

- Silverwood Lake
 - Golden mussels detected in 2025
 - Collaborating with DWR on:
 - Copper pilot test for Rialto Pipeline in August/September
 - Feasibility study for protection of Metropolitan's downstream supplies (East Branch)
- Castaic Lake
 - Infested with quagga mussels since 2016
 - Golden mussels not detected
 - Planning temporary chemical control at Foothill Feeder PCS downstream of lake
 - Collaborating with DWR on feasibility for protection of Metropolitan's downstream supplies (West Branch)

Metropolitan's Lakes Are Dynamic

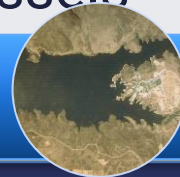
- 24 years old
- 800,000 AF
- SWP since 2006
- More blooms
- Prolonged stratification and anoxia
- No mussels yet

Diamond Valley Lake



- 53 years old
- 43,800 AF
- SWP and/or CRA
- Problematic bloom almost every year
- Quagga mussels since 2007
- No golden mussels

Lake Skinner



- 85 years old
- 182,000 AF
- CRA supply
- No significant blooms in the past 22 years
- Quagga mussels since 2007

Lake Mathews



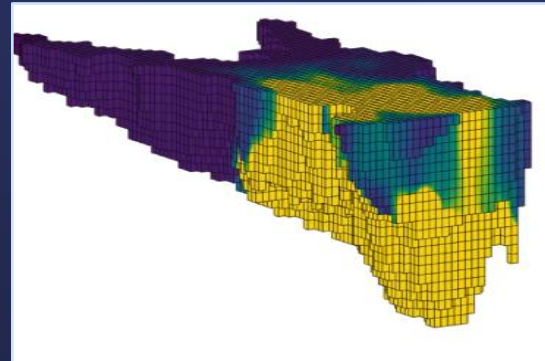
Potential contributing factors for lake changes

- Supply water characteristics
- Invasive mussels
- Climate change
- New cyanobacterial species

The Future of Reservoir Management

Vigilance, Adaptation, and Innovation

- Continue to monitor and manage impacts of invasive mussels
- Improve and expand remote sensing
- Increase modeling and forecasting capabilities with machine learning
- Plan for climate impacts on water quality
- Continue adapting lake operations to ensure reliable delivery and increased resiliency



Metropolitan's Reservoir Management Team



From left to right: Tommy Ly, Ying Wu, Steve Reynolds, Matthew Williams, Margaret Spoo-Chupka, Kelly Lorenz, Kenneth Hwang, and Seyoum Gebremariam

