

Quagga and Zebra Mussels

Monitoring and Prevention Programs at LADWP

Presentation to the Bishop
Administrative Office

March 27, 2012

By

Douglas Ball, Water Quality Division

Outline

- What are Quagga and Zebra mussels?
- Why should we care?
- Regulatory status
- The DWP prevention and monitoring programs
- Potential control measures
- What can you do to help?

What are Quagga and Zebra Mussels?

- Small freshwater mussels
- Invasive nuisance aquatic species
- Native of the Ukraine
- Discovered in Great Lakes in 1988
- Brought into the U. S. in ship ballast water
- Filter feeders
- Ability to attach to hard substrates with byssal threads
- Prolific breeders

Mussel Comparisons

Quagga mussel



Asiatic clam (Corbicula)



Zebra mussel

Clams Vs Mussels

- Clams

- Fairly uniform dark color
- Heavy shell with ridges
- Roughly triangular shape
- Found only on soft substrates

- Mussels

- Light and dark colored bands
- Thin, smooth shell
- Mostly oval or “D” shape with pointy end
- Found attached to hard substrates

Where Are Mussels Most Likely to be Found?

- Raw water pipelines
- Turn outs
- Surge chambers
- Trash racks
- Docks
- Drain pipes
- Transitions
- Quiescent water
- Underside of rocks
- Moored Boats
- Sand Traps

*Mussels are less likely to settle in high laminar flowing water such as in pipelines and aqueducts

1986



Source: U.S. Geological Survey, Nonindigenous Aquatic Species Database, April 2011

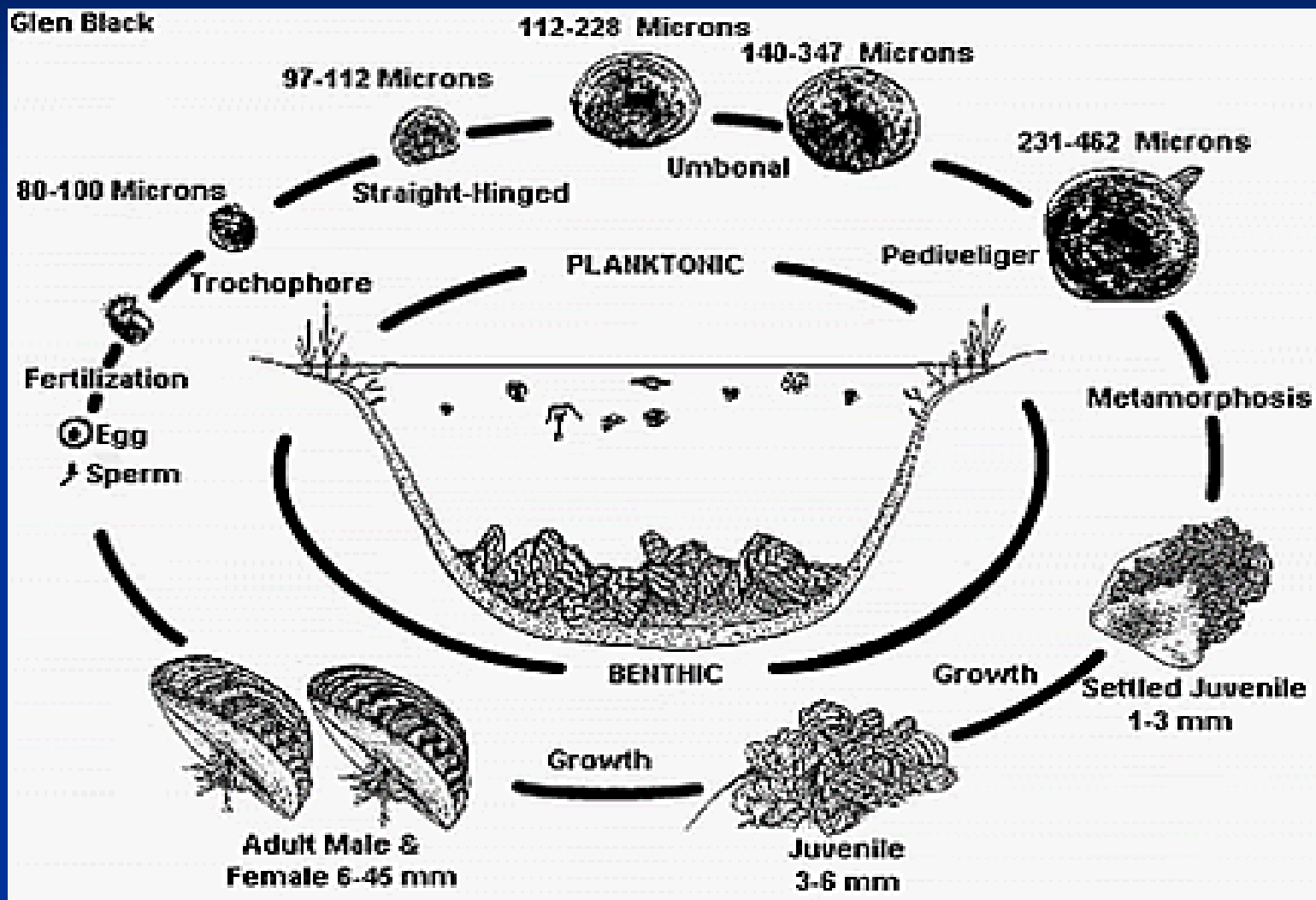


Zebra and Quagga Mussel Sightings Distribution *Dreissena polymorpha* and *D. rostriformis bugensis*

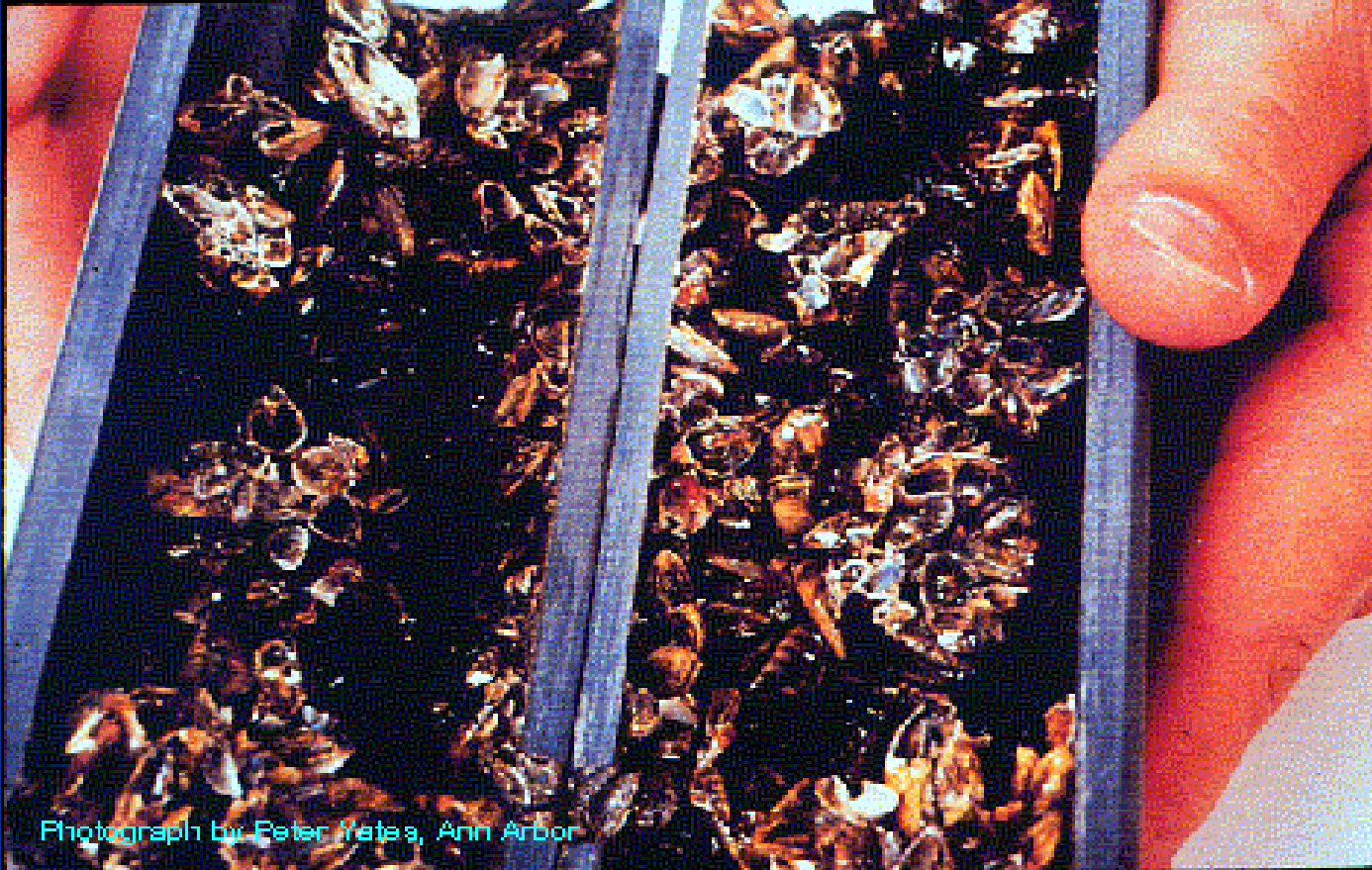


- Zebra mussel occurrences
- Quagga mussel occurrences
- Both species occurrences
- Zebra mussels eradicated

ZM-QM Lifecycle



Why Should We Care?



Photograph by Peter Hetsa, Ann Arbor

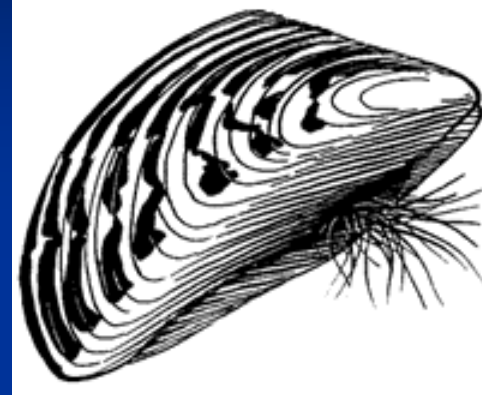
Why Should We Care?

- ZM/QM are extremely prolific
- Rapid growth rates
- QM Can grow on hard or sandy substrates
- Clog pipes, gates, trash racks, etc.
- Impossible to eradicate
- Utilities in the Northeast and East spend millions of dollars every year to try and control ZM/QM

Why Should We Care? II

- Negative environmental impacts
 - Consume the phytoplankton that is the base of the food web
 - Clear up water to allow greater photic zone for aquatic weeds
 - Beaches and banks become covered with mussel shells
 - Often result in increased blue-green algae growth
 - Taste and odor issues

Why should we care?



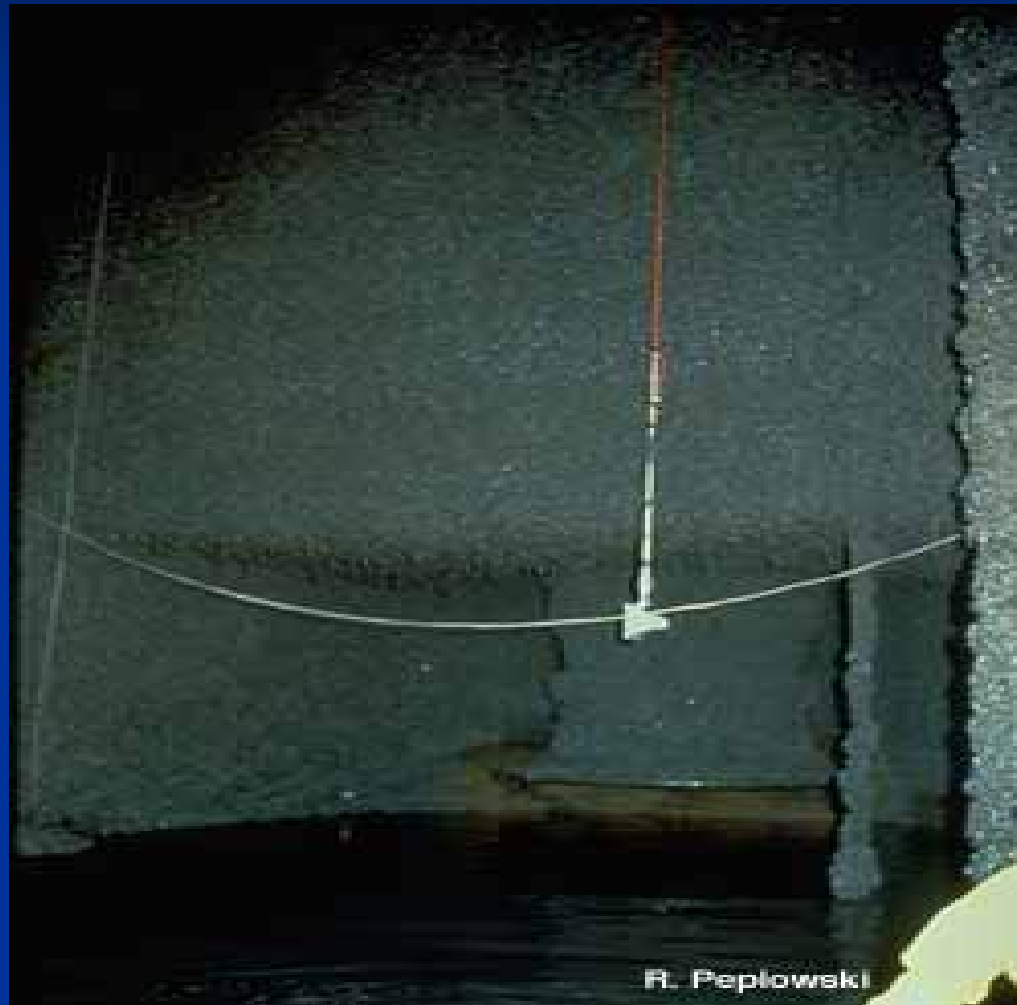


Mussels in a Kansas Reservoir



Mussels on Bait Bucket – 6 months in Lake Mead

Bell housing of a pumping well fouled with zebra mussels.



Ron Peplowski, Detroit Edison, Monroe Michigan Power Station

Worker removing zebra mussels from Detroit Edison water intake pipes.



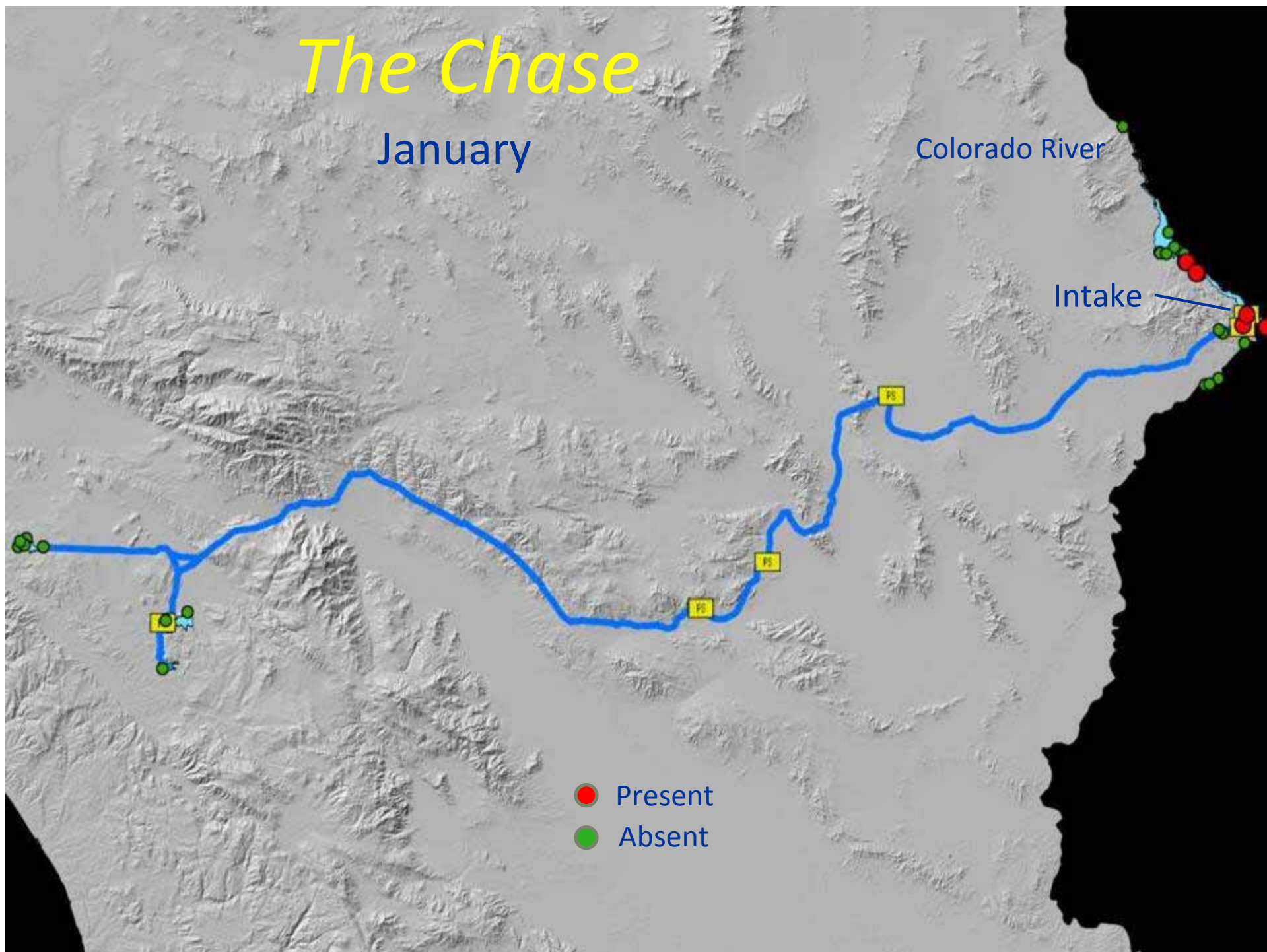
Ron Peplowski, Detroit Edison, Monroe Michigan Power Station

Colorado River and the MWD Experience

- QM discovered in Lake Mead January 7, 2007
- Divers sent in to inspect facilities – a few found at Lake Havasu
- Monitoring for veligers along the river began in April
- Chlorination at Copper Basin for veliger control went to 24/7 in June
- QM were present throughout the CRA by July
- Veliger numbers increased dramatically during summer 2007

The Chase

January



The Chase

March (Post-shutdown)

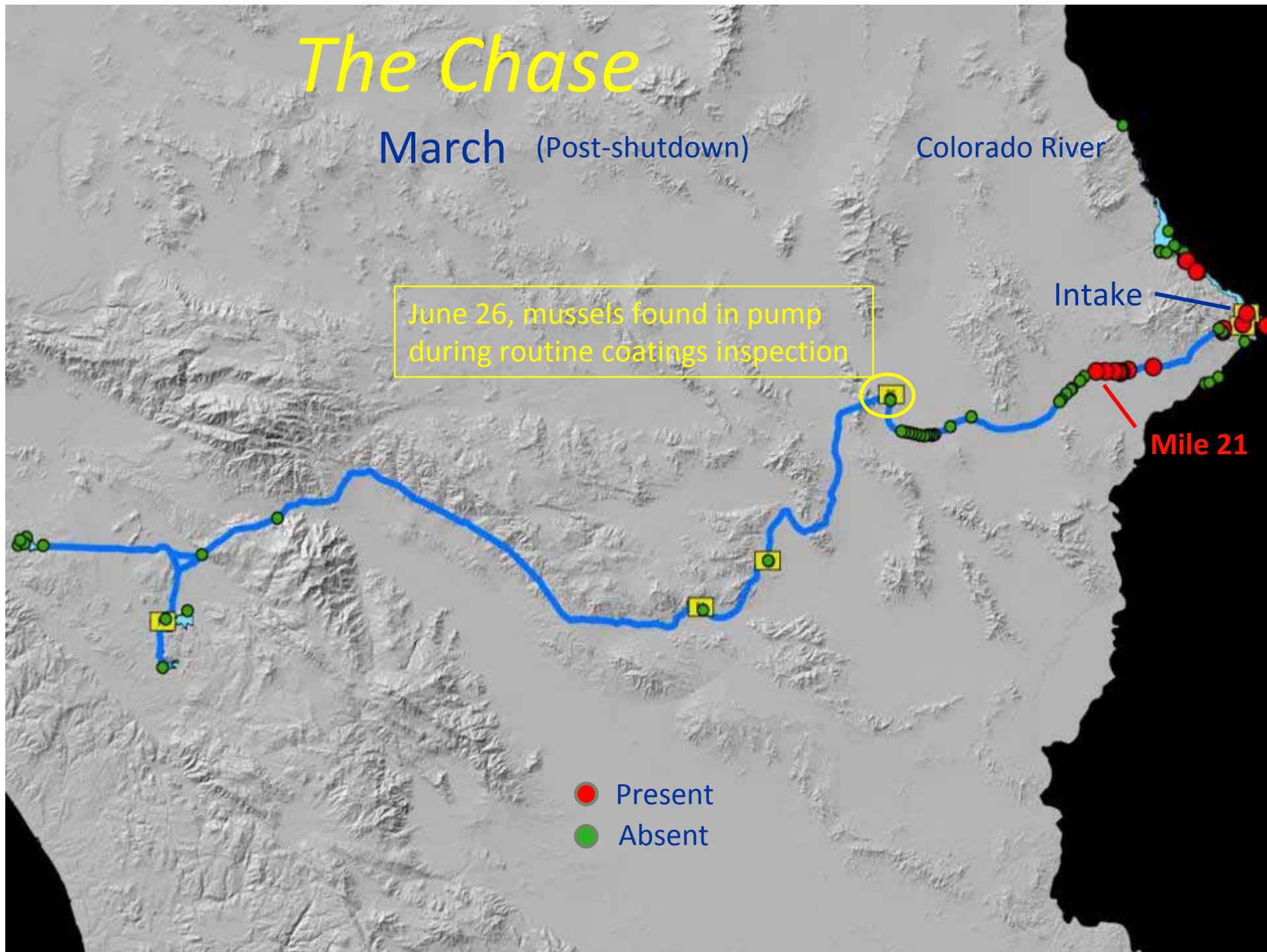
Colorado River

Intake

June 26, mussels found in pump
during routine coatings inspection

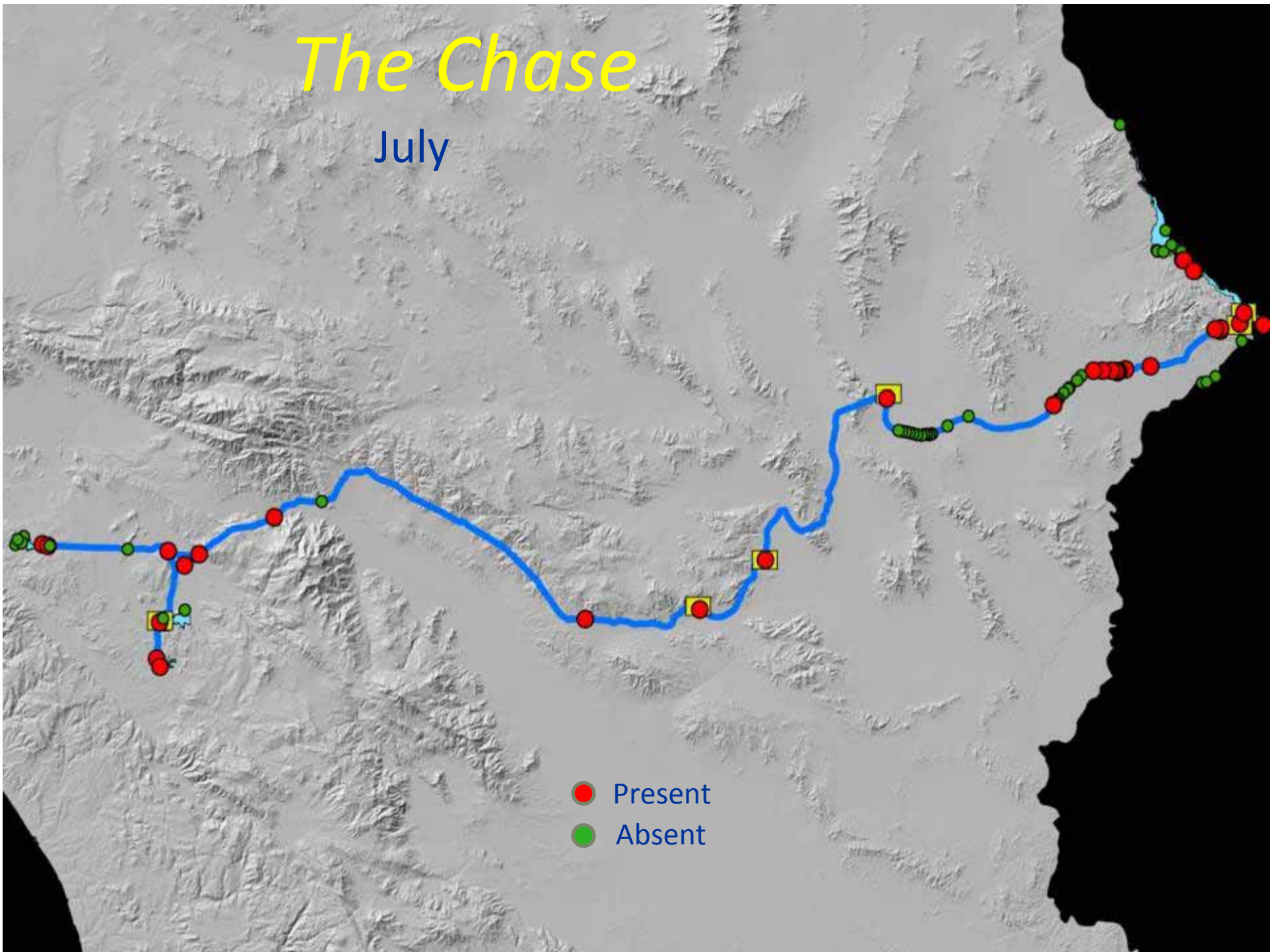
Mile 21

● Present
● Absent



The Chase

July





Mussels on Water Intake Screen – Lake Havasu

Chlorination at Copper Basin



Copper Basin Outlet



Regulatory Status

- Federally Listed Nuisance Species
- California Listed Invasive Species
- California Legislation

- AB1683 – October, 2007

- Prohibit possessing, importing, shipping, or planting Dreissenid Mussels

- Gave DFG authority:

- To inspect and quarantine “conveyances”
 - To restrict access to facilities found to be contaminated
 - To require agencies that were found to have mussels to file and implement a control plan

SB 215 – Extended this law to January, 2017

Regulatory Status

- California Legislation (cont.)
 - AB 2065 – September 30, 2008
 - Requires owners and operators of reservoirs that allow recreation:
 - To conduct vulnerability assessment
 - To develop and implement plan to prevent introduction of Dreissenid Mussels
 - To conduct monitoring
 - Monitoring requirement applies to owners of reservoirs closed to the public

What is being done?

- Risk assessment
 - Source water
 - Environmental conditions
- Prevention
 - Staff Training
 - Boater awareness programs
 - Boater questionnaires and inspections
 - Reservoir access control
- Monitoring

Environmental Conditions for Risk Assessment

- Temperature: <32 degrees C
- Calcium: >12 mg/l
- pH: 7.3 - 9.4
- Dissolved oxygen: >4mg/l
- Salinity: <4 ppt

“Potential Distribution of Zebra Mussels and Quagga Mussels in California – Phase 1 Report”, Andrew Cohen, San Francisco Estuary Institute (SFEI)

Prevention - Public Outreach

- Fliers in Sport and Boat Shops
- Letters to Prior Visitors
- Hosted Boat Inspection Classes

Have you checked your boat and trailer for zebra mussels? If you have used your fishing boat, outboard, or personal watercraft in infested waters (see map), you could spread zebra mussels. However, doing this takes time and effort. So please get your boat and trailer inspected before you head out.

YOUR HELP IS NEEDED TO ZAP THE ZEBRA!

Before launching ... Before leaving:

- Remove aquatic plants from boat, motor and trailer.
- Check all underwater things and equipment (see diagram below). Put plants in trash if possible.
- Drain into or out water from your equipment (including the motor, bilge, live wells, boat bottom, and cooler).
- Dispose of unwanted live bait on shore or in trash.
- Rinse boat and equipment with high pressure or hot water, separately if possible for more than a day, or dry completely for at least 5 days.

For personal watercraft: Impulse skis can contain zebra mussels and aquatic plants. Once upon the water, run the engine for 5-10 minutes to blow out excess water, then a nozzle, and pump. Before leaving, rinse skis, pump and nozzle, and put them in a plastic bag or plastic bag, drying 10 days, 100°F and 100% RH.

Protect Your Property and Our Water Resources

TRANSPORTING MUSSELS?

Zebra mussels are bad news for boaters. They can:

- Plug your engine by blocking the cooling water — causing overheating.
- Increase drag on the bottom of your boat, reducing speed and increasing fuel.
- Jam moving appliances on boats.
- Require scraping and repainting of boat bottoms.
- Overwhelm local waters and clog beaches with thousands of broken shells with sharp edges — making it unsafe to play and swim!

IF YOU SEE A ZEBRA MUSSEL, please call 1-800-437-2744

By taking the steps outlined in this brochure, you can help the spread of zebra mussels and other aquatic invaders that have been introduced into our waters and threaten the life and animals. Protect your property and resources.

FOR MORE INFORMATION:
CALL TOLL FREE 1-800-437-2744 (1-800-437-2744)
ONLINE: WWW.MUSSELFREEBOAT.COM

TO STOP THE SPREAD OF ZEBRA MUSSELS
please report any sightings by calling
1-800-437-2744

The 100th Meridian Initiative
to promote the widespread removal of zebra mussels
www.100thmeridian.org

ZAP THE ZEBRA

Prevention - Public Outreach

- Advertisements in:
 - Los Angeles Times
 - Inyo Register
 - Western Outdoor News
- Message Boards on Highway 395
- Signage at Launch Points

CROWLEY LAKE

MANDATORY BOAT INSPECTIONS FOR INVASIVE MUSSELS BEFORE LAUNCHING

To help prevent the spread of invasive mussels that can impact the fishery and damage boats and water systems, all boats entering Crowley Lake this year will be thoroughly inspected. Boats showing signs of contamination with invasive mussels, or found to contain any water or debris that could harbor mussels, will not be allowed to launch into Crowley Lake. Boat inspections will be done at Crowley Lake South Landing and in Bishop for fishing season opening.

Los Angeles Department of Water and Power

760-872-1104

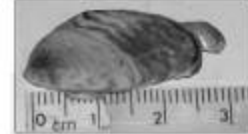
www.LADWP.com/mussels

<http://www.dfg.ca.gov/invasives/quaggamussel/>

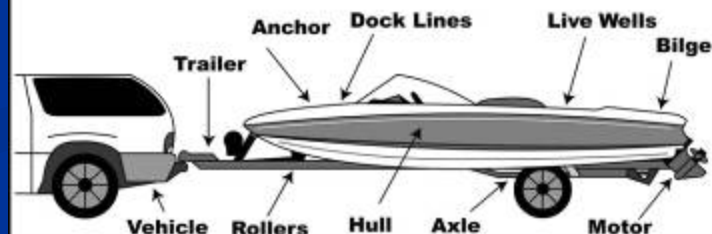
DON'T MOVE A MUSSEL!

Help stop the spread of invasive mussels!

- Inspect boats and trailers thoroughly, and remove any trash, mussels or aquatic weeds before leaving any water body.
- Mussels and other items removed should be properly disposed of in a trash container.
- Drain water from the motor, live-well, bilge and transom wells, and any other water from the boat and equipment before leaving any water body.
- Wash boats, trailers and equipment thoroughly with a pressurized power sprayer and hot water.
- Rinse live-wells, bilge and cooling systems with hot water.
- Dry boats, motors, trailers and equipment thoroughly in the hot sun for at least two weeks before using them again.



LOOK FOR MUSSELS HERE



CHECK YOUR BOAT, TRAILER AND VEHICLE

Prevention - Boat Inspections



Prevention - Restricting Access at Crowley Lake



Prevention - Restricted Access at Klondike Lake



Douglas Ball - LADWP

Prevention - Restricted Access at Lake Diaz



Douglas Ball - LADWP

Monitoring Activities

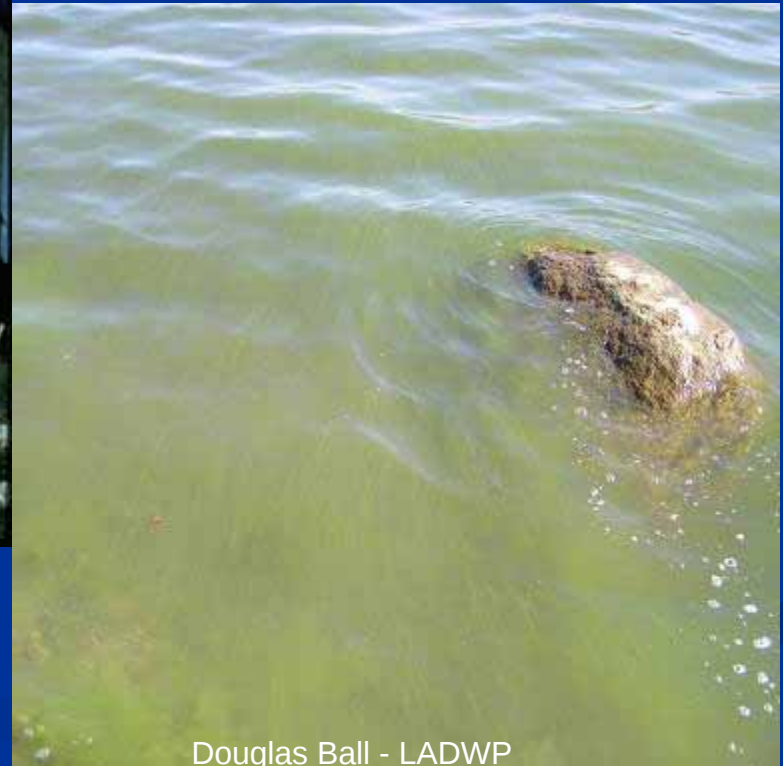
- Substrates





Monitoring Activities

Sampling
for
Veligers
at
Crowley
Lake



Monitoring Activities

- Coordinate with Operations to Inspect Facilities During Maintenance Activities



Douglas Ball - LADWP

Monitoring Activities

- Aqueduct Inspections

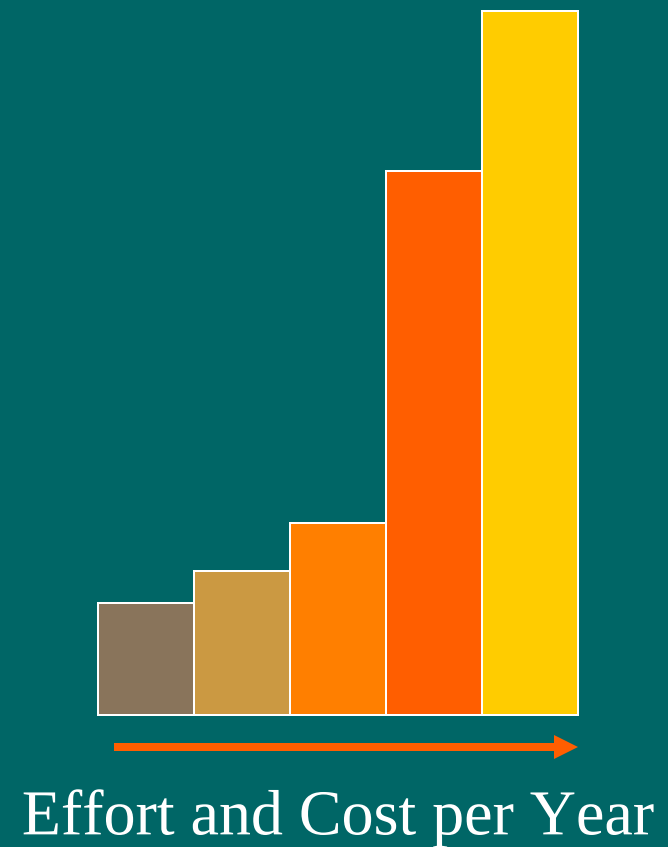
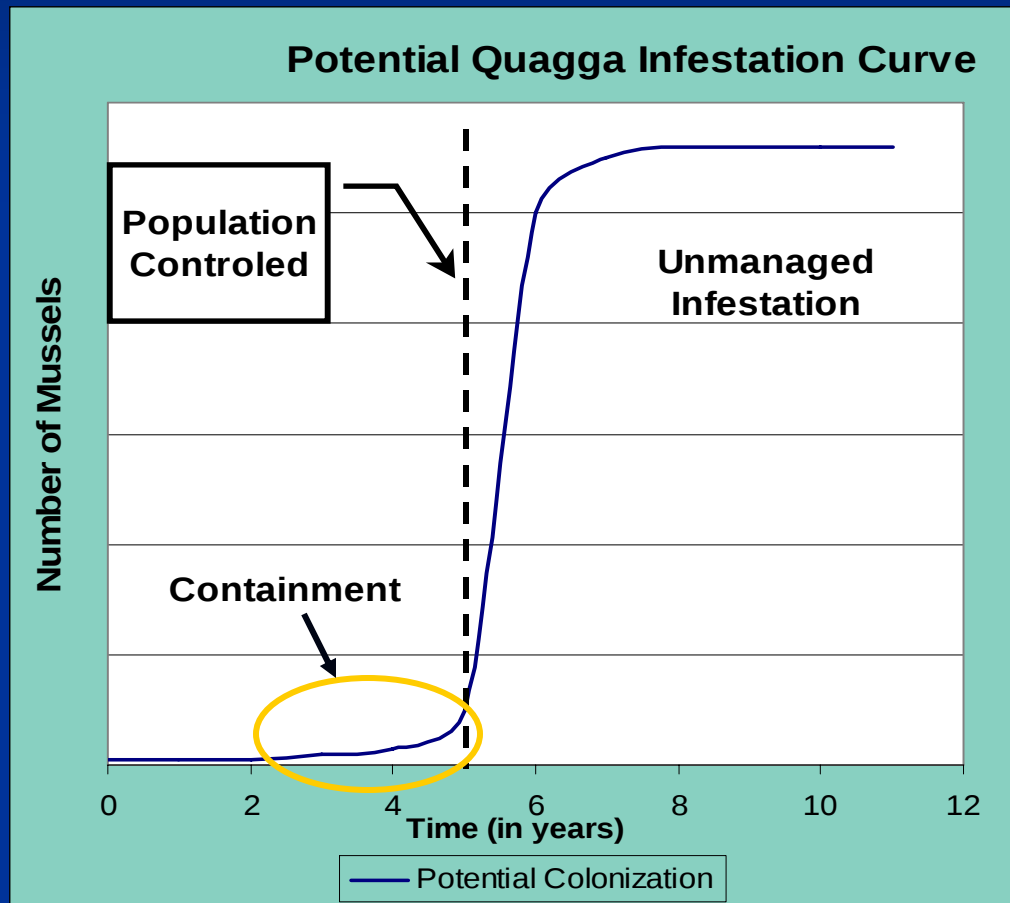


Douglas Ball - LADWP

What Remains to be Done?

- Identify potential control measures
- Coordination with other agencies?
- Budget for associated activities
- Training for monitoring activities
- In-house PCR?

Sizing the Problem



Potential Control Measures

- Identify appropriate site-specific control options
- Keep current on developments of potential new control options
 - Coatings
 - Molluscicides
 - Zequanox™ - Microbial based (*Pseudomonas fluorescens*)

Potential Control Measures

- Physical
 - Freeze/Desiccate
 - Drain and Scrape
 - Shell removal



■ Michael Martin – Cedar Eden

Potential Control Measures

- Chemical
 - Coagulants?
 - Oxidants
 - DBPs
- Few Choices for Potable water
- Expensive
- Limited Effectiveness



Potential Control Measures

- Physical/
Biological
- Summer
Anoxia in
deep lakes
- Manipulation
of reservoir
levels



■ Michael Martin – Cedar Eden

Potential Control Measures

- Facilities Design
 - Raise Awareness for Design Engineers
 - Provide Access for Cleaning
 - Encourage Laminar Flow
 - Ability to Dewater Piping
 - Robust Screens
 - Redundancy if Possible
 - Provide Space for Treatment Equipment

Potential Control Measures

- Operational Considerations
 - Dewater facilities or components that are out of service
 - Provide budget/personnel time for treatment or cleaning
 - Provide for shell disposal

What should you do?

- Be on the lookout for mussels
 - If you see something suspicious
 - Take a sample if possible (sandwich bag)
 - Notify supervisor
 - Contact Bio-Control
- Follow invasive species protocols
- Maintain clean boats and gear
- Tell your friends and neighbors about the threat

Guidelines for Boaters

- INSPECT EVERYTHING – Before launching and after pull-out
- REMOVE – Visible mud, plants, fish, or other animals before transporting
- ELIMINATE – All water from bilges, motors, cooling systems, bait wells, etc before transporting
- NEVER – Release plants, fish, or other animals into a water body unless they came from that water body
- ALLOW – 5 days in dry conditions for things to dry out

Questions?

- Contact Information:

- Douglas Ball
- (213) 367-3222
- Douglas.Ball@ladwp.com

- Lori Gillem
- (760) 873-0407
- Lori.Gillem@ladwp.com

- Additional Information:

- 100th Meridian Initiative:
- <http://100thmeridian.org>