

Invasive Mussel Detection and Monitoring Program for Reclamation Reservoirs

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The Threat: Invasive quagga and zebra mussels pose a significant threat to the costs of operation of Reclamation dams, power plants, pumping plants, and other water infrastructure. In January 2007, adult quagga mussels appeared at Lake Mead, AZ/NV, and since fully infested the lower Colorado River and Reclamation's Hoover, Parker, and Davis Dams and associated power plants. This necessitated significant installation of protective technology and increased the maintenance activities needed to keep mussels from clogging critical piped systems including the systems that cool generator bearings for hydroelectric turbines.

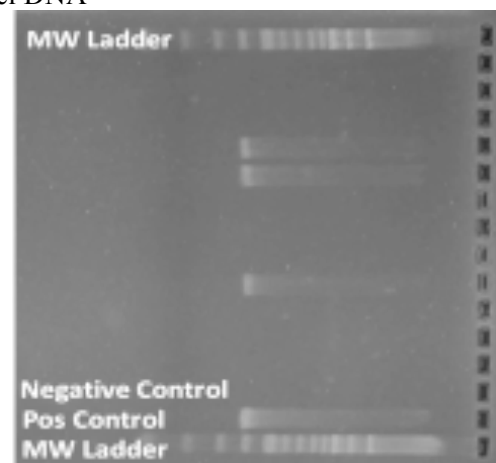
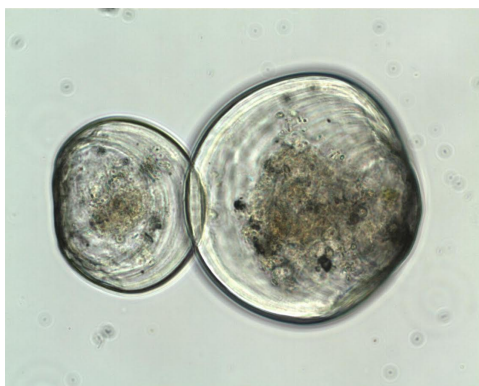
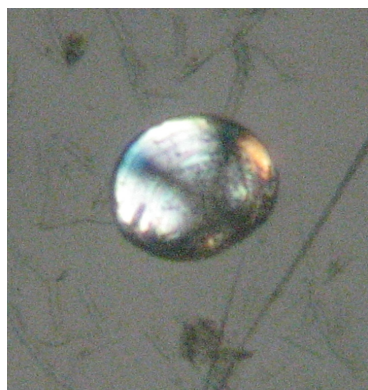
The Goal: Reclamation began an intensive monitoring and detection program in 2009 to determine the reservoirs most at risk of mussel exposure and infestation. The goal of this program is to detect the earliest stages of mussel exposure or infestation at Reclamation reservoirs, so that response planning and budgeting for protective measures can be initiated. Early detection of microscopic mussel larvae can potentially afford managers several years to implement response actions prior to full infestation of facilities. Early action may also be taken to prevent the spread of mussels to other water bodies.

The Program: Reclamation, in partnership with western states and other agencies, is monitoring close to 200 water bodies, including approximately 160 Reclamation reservoirs. Reclamation regional and area offices have selected target reservoirs based on:

1. The potential for a mussel infestation to impact or significantly increase the cost to provide critical Reclamation mission activities, known as facility vulnerability.
2. The annual number of boats and other crafts or equipment that are moved into a reservoir from other locations.

Water samples from each water body are analyzed using multiple test methods to determine invasive mussel presence. This testing includes:

- Cross-polarized light microscopy, to detect microscopic mussel shells.
- Brightfield microscopy for detailed magnification images for taxonomic identification.
- Polymerase Chain Reaction (PCR) and gene sequencing tests on the microscopic organism and the bulk water sample, to confirm the presence of mussel DNA



Left and Middle: Quagga larva photographed using cross-polarized light microscopy and Brightfield microscopy imaging of a quagga mussel veliger". Right: Standard PCR gel demonstrating positive sample DNA match.

Test results are shared with Reclamation facility managers and State Invasive Species Coordinators through the Reclamation Mussel Share Point Database. Currently, prevention of mussel introduction is the only known defense, therefore, the Research and Development Office is supporting intensive research in technologies for detection and control.