

## Research Update

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### Bottom Line

This research study genotyped individual quagga mussels at 10 microsatellite DNA loci to analyze patterns of genetic diversity and population structure among six populations from different lower Colorado River reservoirs in the Southwestern United States.

### Better, Faster, Cheaper

A greater understanding of quagga mussel genetic variation may provide insight into genetic weaknesses or genes that can be targeted for control purposes. Without a clear understanding of a population's genetic diversity, control measures may fail to target the entire population.

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## Examining Genetic Structure of Quagga Mussel Populations in the Lower Colorado River

*Microsatellite analysis of quagga mussels*

### Problem

Large populations of invasive quagga mussels (*Dreissena rostriformis bugensis*; Andrusov, 1897) are present in reservoirs along the lower Colorado River. These reservoirs have unique water quality characteristics, which raise questions about the extent of gene flow and genetic divergence among these populations. In comparison to populations in their native range, and in the Great Lakes and Mississippi River Basins, quagga mussel populations in the Western United States are only recently established and they are likely adapting to the unique habitat characteristics of highly managed waters with novel flow regimes and water quality. Without a clear understanding of a population's genetic diversity, it is possible that control measures will fail to target the entire population.

### Solution

In this Reclamation Science and Technology Program research study, the Hydraulic Investigations and Laboratory Services Group in Reclamation's Technical Service Center, in collaboration with the U.S. Army Corps of Engineers-Engineer Research and Development Center's Environmental Laboratory, examined the natural genetic structure of quagga mussel populations.

Quagga mussels examined were among six populations from different lower Colorado River reservoirs in the Southwestern United States. Individual quagga mussels were genotyped at 10 microsatellite DNA loci to analyze patterns of genetic diversity and population structure. Analyzing microsatellites (repeated DNA segments) can provide information about genetic diversity within a species, including gene flow, genetic variants, and population structure.



*Adult quagga mussels collected from a lower Colorado River reservoir.*

## Results

Adult quagga mussels were collected from lower Colorado River reservoirs spread over approximately 640 river miles, which included Lake Powell, Lake Mead, Lake Mojave, Lake Havasu, Senator Wash Reservoir, and Imperial Dam (Arizona/California/Nevada/Utah). Overall, genetic divergence among these populations was negligible and populations at a single reservoir were not significantly genetically differentiated from the group. Some population pairings did exhibit significant, if slight, genetic differentiation, and there was a moderate pattern of isolation-by-distance.

Observed morphological differences at some reservoirs are likely an environmental effect separate from heritable genetics. Water quality variability does not appear to have dramatically altered the quagga mussels' genetic structure in reservoirs along the lower Colorado River. If significant environmental selective pressures are present, they do not appear to have been strong enough to result in observable genetic bottlenecks over the relatively short time scale of the quagga mussel invasion of the lower Colorado River.

## Future Plans

Continued monitoring of quagga mussel population genetic structure in the Western United States and comparing it to established populations in the quagga mussels' native range, and in the Great Lakes and Mississippi River Basins, may uncover changes over time. Monitoring changes in western quagga mussel population genetic structure may be especially interesting due to the changing climate.

***“In comparison to populations in their native range, and in the Great Lakes and Mississippi River Basins, quagga mussel populations in the Western United States are only recently established and they are likely adapting to the unique habitat characteristics of highly managed waters with novel flow regimes and water quality.”***

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## Collaborators

- Reclamation
  - ◇ Technical Service Center
  - ◇ Lower Colorado Region
- U.S. Army Corps of Engineers-Engineer Research and Development Center's Environmental Laboratory

## More Information

[www.usbr.gov/research/projects/detail.cfm?id=6712](http://www.usbr.gov/research/projects/detail.cfm?id=6712)

[www.usbr.gov/research/projects/researcher.cfm?id=2511](http://www.usbr.gov/research/projects/researcher.cfm?id=2511)