

SOUTHERN NEVADA BRACES FOR QUAGGAS

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The discovery in January 2007 of a small striped mussel in Lake Mead was met with dread. Once the creature was positively identified by U.S. Fish and Wildlife Service experts as a quagga mussel (*Dreissena bugensis*), the event marked the first recorded occurrence of the mollusk in the western United States. Water and wildlife managers throughout the Southwest were well aware of the havoc the mussels have already created in the Great Lakes and Mississippi River Basin due to blocked water intake pipes and other physical and biological impacts. Now it was time for action.

Immediately, all affected local, state, and federal agencies began inspections of their infrastructure for quagga mussels. The extent of the infestation was evaluated visually through weeks of diver surveys and collection of water samples in search of veligers, the free-floating immature form of quaggas. Numerous meetings of expert scientists and resource managers were held to develop a response plan to this potentially disastrous invasion.

Southern Nevada Water Authority (SNWA) personnel are active participants in this effort due to the potential risk to drinking water intake facilities in Lake Mead. SNWA is the drinking water wholesaler for the Las Vegas Valley; 80 percent of the area's drinking water is withdrawn from Lake Mead at Saddle Island in Boulder Basin (see map). If the quaggas become as prolific as their Great Lakes counterparts, their abundance in untreated water facilities could significantly change SNWA's ability to pump water from Lake Mead.

Short-Term Response

Short-term responses by SNWA focused on determining the extent of infestation and gathering information about

biological features of quagga mussels. SNWA personnel worked with experts experienced with quagga mussels in the Great Lakes region to formulate an

Experts familiar with the Great Lakes invasion agree that this situation could be devastating to the ecology and infrastructure of the region.



Quagga mussels observed at Sentinel Island in the Boulder Basin on 2/23/07. Photo courtesy of the 100th Meridian Initiative.

efficient and practical response program, including developing strategies at the treatment plants that would disable veligers upon entering. This includes designing necessary alterations to the water intake infrastructure, including points where chlorine or other disinfectants can be injected in the intake tunnel out in Lake

Mead. The objective is to prevent live mussels from attaching or being transported throughout the treatment system.

SNWA's first activity following the discovery of quagga mussels was to inspect the two drinking water intake pipes in Lake Mead. The first intake was constructed in the 1970s. It exits the rock face of Saddle Island about 80 feet below the water surface and extends to a depth of 130 feet. The second intake was constructed in the 1990s and is also at a depth of 130 feet. At first, divers found quagga mussels on the steel pipe of the older intake from depths of 80 feet (where the pipe exits the rock wall) to 90 feet. No mussels were found below 90 feet. Later inspections of the older intake in July 2007 revealed that the density and extent of mussels had increased. Many were now found at depths of 30 to 60 feet, with very few on the bar screens of the intake pipes.

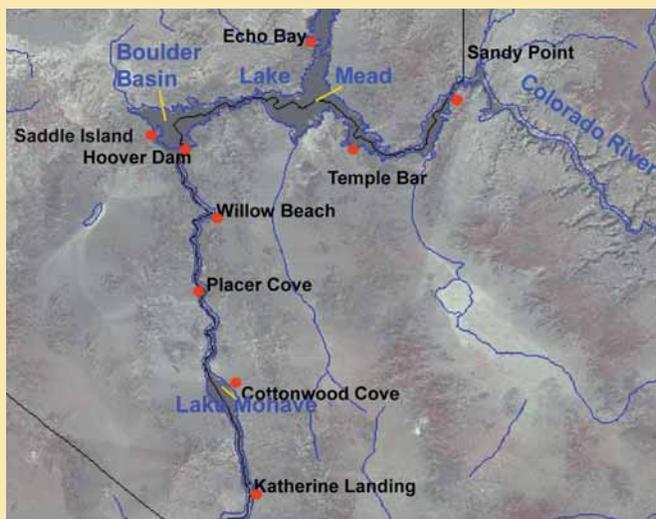
Scientists from SNWA and Metropolitan Water District of Southern California are conducting a joint investigation to determine veliger settling rates and adult growth rates. Last July, 24 concrete blocks were placed adjacent to the intake structures. Every other month, SNWA will remove two blocks and count and weigh the mussels. These investigations are being performed to determine the rate and magnitude of the infestation. This information will be used to help SNWA plan for future infrastructure construction in Lake Mead and to monitor water quality aspects associated with the invasion.

To determine the mussel growth potential from water entering the drinking water treatment plants, veligers were counted in a known quantity of water. Veligers were not detected in the January 2007

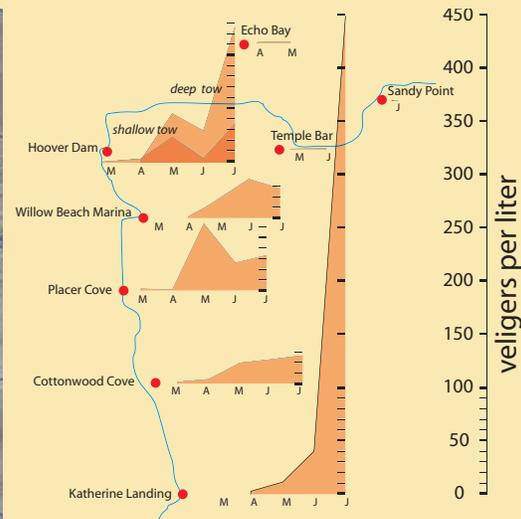
samples, but reached the greatest abundance so far (3.4 per liter) in May and were slightly less abundant in June.

Another study to determine veliger numbers in lakes Mead and Mohave was initiated in March 2007 by scientists from the U.S. Bureau of Reclamation, with funding from the National Park Service. Monthly samples are collected from four locations each in the two lakes. Results show that veligers are now found in every basin of Lake Mead and throughout Lake Mohave. To date, the greatest numbers in Lake Mead were observed in May 2007, but they have continued to increase at most locations in Lake Mohave.

In the continuing effort to find strategies to control impacts of quaggas to SNWA's intakes, engineering consultants are evaluating treatment options for controlling the mussels before they can



Locations of quagga mussel counts in the Las Vegas area (left), and their abundance as determined in monthly veliger counts from May through July 2007.



since very little sampling of it has ever been done. This deep portion of Lake Mead could be the most impacted by quagga mussels, since zebra and quagga mussels are suspected of accumulating organic materials in certain benthic regions of the Great Lakes. Biologists are also tracking changes in water quality, and have already noted that smaller zooplankton are disappearing from the water column as the veliger abundance increases.

Population growth in 2007 has so far been explosive (see plots above). Experts familiar with the zebra/quagga invasion of the Great Lakes agree that this situation could be devastating to the ecology and infrastructure of the region. SNWA is an active participant in eradication efforts in order to protect the drinking water infrastructure.

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Additional investigations will include process evaluations of chemical control measures that have been employed at other facilities and studies to determine how quagga mussels in Lake Mead respond to doses of various disinfecting chemicals. The objective is to eliminate any possibility of veligers or mussels being able to attach in the internal infrastructure. Many features of the treatment facilities use small-diameter pipes and untreated water to cool water for pumps and pump motors and for air conditioning units. The smooth functioning of pumps and valves within the treatment process would be negatively impacted by the attachment of large numbers of mussels. SNWA is developing permanent disinfection capabilities and modifying infrastructure to respond to this invasion.

Uncertain Future

Although quagga mussels were discovered in early January, they were likely introduced to Lake Mead in 2004 or 2005, based on the number of larger individuals versus the far greater number of small individuals.



Photo: SNWA

Quagga mussels beginning to attach and pile up on a pipe in Lake Mead.

infiltrate the water treatment plants. In July 2007, chlorine application in the intake tunnel of the newer intake began, and plans are underway to do the same in the older intake.

Long-Term Response

SNWA's long-term needs are in the areas of biological monitoring, research, and treatment/control.

One need is to investigate the benthic (lake bottom) environment of Lake Mead,

Hydrogeologists Needed

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