

Latest Marrone biologics company goes after invasive golden mussel infestation

By Mark Anderson – Staff Writer, Sacramento Business Journal

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Story Highlights

Invasive Species Corp. to fine-tune Zequanox for golden mussels. Golden mussels discovered in California, threatening sensitive ecosystems. Zequanox selectively kills invasive mussels without harming native species.

Davis-based biological controls company Invasive Species Corp. is going to fine-tune its invasive mussel control product for golden mussels, which have been threatening the ecosystems of Central Valley waterways in recent months.

Invasive Species Corp. has an exclusive license to an issued patent on Zequanox for invasive mussels, said founder Pam Marrone, who previously started and built several other Sacramento area biotech companies.

The recent discovery of golden mussels in the region is "a total recipe for disaster," Marrone said. "These mussels are really bad. They outcompete all other flora and fauna for food, and they end up clarifying the water of all nutrients for other animals and plants. California's waterway are highly sensitive ecosystems."



The effect of golden mussels eventually leads to algal blooms in open waterways. The mussels are also a serious problem for dams, power generation plants, water treatment plants, piping and irrigation system, where the mussels can cluster tightly together until they block flow.

It was because of the threat of golden mussels that U.S. Bureau of Reclamation officials closed Folsom Lake and Lake Clementine for motorized boating effective April 14.

Since their first detection in October at the Port of Stockton, golden mussels have now been found in more than 40 sites all through the Sacramento Delta and including in the California Aqueduct of the State Water Project and canals as far South as Kern County, according to the California Department of Fish and Wildlife.

Zequanox was developed by Marrone's previous Davis-based company Marrone Bio Innovations Inc. The product was tested and proven over a decade ago in lakes and waterways in Minnesota and Lake Erie to control quagga and zebra mussels.

Invasive Species Corp. plans to perform testing at its labs in Davis of Zequanox on golden mussels to work out treatment dosages and best practices for treatment, which includes water temperature, time of day and other variables, Marrone said.

Zequanox is selective in killing invasive dreissena mussels without killing native mussels or harming most fish species. Dreissena is a genus of freshwater mussels that includes quagga, zebra and golden mussels. Dreissena attach to firm surfaces by threads from their shells, clustering in high densities.

"These things are terrible," Marrone said of golden mussels. "They have wrecked lakes and rivers in Brazil."

Zequanox is made from a killed bacteria pathogen of dreissena and then grown through fermentation before being dried into powder or tablets for sale and distribution.

Outside of Zequanox, other methods to control dreissena include chlorine, which operators can use to kill and clear the mussels in pipes and water systems. In open water, one of the primary treatments to kill mussels is copper, but that is harsh on the environment. Zequanox tends to dissipate and break down naturally after treatment.

Zequanox was approved by the U.S. Environmental Protection Agency in 2012 for mussel control in enclosed systems, such as intake pipes for dams, manufacturers and golf courses. The product was approved by the EPA in 2014 for open waterways. Zequanox worked well, but it was expensive, Marrone said. Her new company has worked with an outside manufacturer to increase yields and lower the cost.

Invasive Species is also focused on developing biological controls for invasive Asian carp, and for burrowing shrimp which are a problem for commercial oyster production.

Marrone is a pioneer in biological controls. She has started four biologics companies in Davis, three of which were sold to larger companies. Marrone Bio Innovations Inc. went to an initial public offering on the Nasdaq Stock Market and then was sold in 2022, after nearly a decade, for \$236 million to Bioceres Crop Solutions Corp. (Nasdaq: BIOX) of Rosario, Argentina.

Marrone, who retired as CEO of Marrone Bio in 2020, had a three-year non-compete agreement when she left the company. She started Invasive Species at the end of 2022. In December 2023, Invasive Species closed a \$2.5 million round of pre-seed funding from Singapore-based Silverstrand Capital.

Previously, in 1990, Marrone started a biotech subsidiary in Davis for Danish chemical company Novo Nordisk. Then, in 1995, she launched her own startup biologics company AgraQuest, which was sold to Bayer AG for \$500 million in 2012.