

Introducing ZEQUANOX™



A Natural Solution for the Control of Invasive Mussels

Marrone Bio Innovations® is pleased to introduce the first and only invasive mussel control solution that is naturally sourced and environmentally compatible: ZEQUANOX™.

- Highly selective for invasive zebra and quagga mussels (*Dreissena* species) with no impact on other tested aquatic organisms
- Compatible with existing chemical application equipment used for invasive mussel control
- Effective at both controlling adult mussels and preventing juvenile planktonic form of mussels from settling
- Low exposure risk for workers during applications



Zequanox is a highly effective, microbial-based product that selectively controls both of the invasive *Dreissena* mussel species, zebra and quagga, which continue to invade freshwater ecosystems throughout North America. Marrone Bio Innovations is finalizing product formulation and perfecting treatment protocols for industrial and power facilities, open water and irrigation systems. Zequanox will be the first and only naturally-sourced and environmentally compatible method for invasive mussel control in open water. US EPA registration is expected in 2010.

The United States Bureau of Reclamation (Reclamation) is anticipating approval of a Section 18 Emergency Use Exemption in early 2010. This would allow Reclamation to use the product at specified facilities within the lower Colorado Region prior to full regulatory approval.

Product Discovery

Although phytoplankton is the preferred food of zebra and quagga mussels, they can filter out and consume bacteria as a food source. After screening more than 700 bacterial strains, researchers at The New York State Museum identified a North American isolate of *Pseudomonas fluorescens* CL145A that is lethal to these mussels. All sizes of zebra and quagga mussels are equally susceptible to this particular strain, which is the active ingredient in Zequanox. Recent trials demonstrate that veligers can be controlled with lower doses than the adult mussel stages. Additional trials are underway to demonstrate the product's effectiveness in settlement prevention. (continued)



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For more information, contact Dennis Bitter: dbitter@marronebio.com 714-305-6111.

Pseudomonas fluorescens is found worldwide in the soil and is present in all North American water bodies. In nature, it is a harmless bacterial species that is found protecting the roots of terrestrial plants from plant diseases. These bacteria, however, produce specific compounds that destroy zebra and quagga mussels' digestive systems when ingested. Dead bacterial cells are equally as lethal as live cells, providing clear evidence that the mussels die from natural compounds, not from infection. Zequanox contains only dead bacteria cells.

Simple and Safe Application

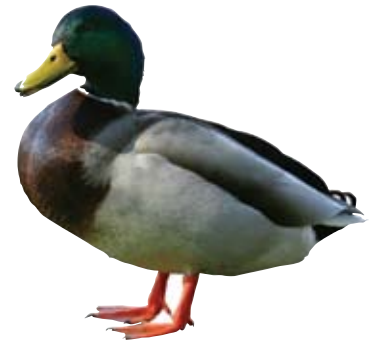
Zequanox has been developed as a direct operational replacement for the chemicals that are currently used by many industrial facilities to control invasive mussels. Toxicity studies required for product registration by the US EPA demonstrate that it has a low risk for exposure. This means that Zequanox does not present a risk to operators during application like many other chemicals and requires minimal personal protective equipment.

Also, the product shows no impact on other aquatic species that have been tested. Therefore, Marrone Bio Innovations anticipates that users of Zequanox will benefit from fewer restrictions and greater ease in permitting. Currently, for open water environments, there is no environmentally friendly product available to treat invasive mussels. In addition, many of the products currently on the market have numerous use restrictions because they are general biocides rather than specifically targeting only zebra and quagga mussels.

Non-Target Organism Trials: Outstanding Selectivity

Research trials have found Zequanox is safe for important aquatic species, including, but not limited to:

- water fleas, *Daphnia*
- brown trout
- sunfish
- mallard ducks
- fathead minnows
- freshwater shrimp, *Hyaella*
- native blue mussel, *Mytilus*
- native freshwater clams



Partners and Demonstration Projects

Marrone Bio Innovations is currently working with the United States Bureau of Reclamation and Ontario Power Generation to conduct both pilot (biobox) and demonstration (full facility) trials at selected facilities. The Niagara Plant Group of Ontario Power Generation received an Environmental Stewardship Award from the Ministry of Environment Ontario for their efforts to assist in the development of Zequanox.

