

Operational Guideline for Manitoba Water Suppliers

Dealing With Zebra Mussels in Drinking Water Systems

PURPOSE

This guideline has been prepared to provide public and semi-public drinking water suppliers throughout Manitoba with information on how to mitigate, and control a potential zebra mussel infestation of water system intake structures and/or water treatment components or equipment within treatment plants.

Background

[Zebra mussels](#) are an emerging issue in Manitoba surface waters and were initially found in Lake Winnipeg in 2013. A map of the current zebra mussel distribution in Manitoba can be found [here](#).

Zebra mussels were first discovered in North America in 1988 in Lake St. Clair. They invaded all the Great Lakes and water bodies in eastern Canada and the US by natural water movement, or human-caused transport.

The overland transport of watercraft and water-related equipment are the primary means for spreading zebra mussels to new water bodies. Fortunately, the human-mediated spread of zebra mussels is preventable.

A single female adult zebra mussel can produce up to one million eggs in a spawning season, resulting in rapid colonisation of invaded waterbodies.

From experience from other North American jurisdictions, once zebra mussels establish, especially in larger water bodies, they are cost prohibitive to eradicate.

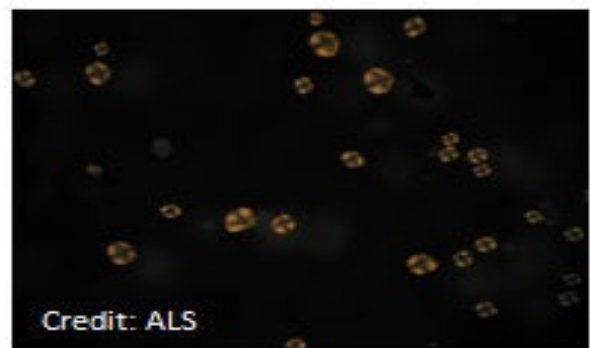
While preventing the spread of these invasive, macrofouling mussels is a key management priority, in places where they have already colonized, there are some adaptation strategies that can be applied to drinking water systems.

What to Look For

Zebra mussels are freshwater member of the mollusc family that includes clams and oysters.

Immature zebra mussels, called veligers, are free floating and invisible to the naked eye. In an invaded water body, they can enter water-based infrastructure unknowingly.

As zebra mussels grow a shell, they can start as small as a grain of sand and can attach to underwater surfaces such as watercraft hulls, docks or intakes.



Credit: ALS
Microscopic zebra mussel veligers in a sample of water

Adult zebra mussels can have dark shells with lighter-coloured stripes. They can be up to four centimetres long but most are smaller than two centimetres in length.



Credit: Amy Benson

Adult Zebra Mussel

Effect of Zebra Mussels on Drinking Water Utilities

Zebra mussels can clog surface water intake pipes of public and semi-public water systems, or even intake pipes serving private homes or cottages. This can cause a loss in pumping ability or obstructed valves, sometimes leading to plant shutdowns. Zebra mussels can also increase corrosion of cast iron pipes and are a safety hazard when hydrant systems are clogged and fail to deliver fire-fighting water.



A three-foot-diameter pipe clogged by zebra mussels in less than three months (U.S. Department of Energy)



Water intake pipe in Ohio (credit: City of Toledo)

Mitigation or Control of Zebra Mussel Infestations

There are several methods to control zebra mussels in public, semi-public and private home or cottage water system intake structures:

- **Zebra mussel resistant biostatic materials.** This includes high-copper alloy screens and zinc-based alloy screens. These control solutions use materials unattractive for

colonization, and do not require authorization. It is highly advisable to use these materials for new or upgrading intake screens to reduce future maintenance requirements.

- **Zebra mussel-resistant paints or coatings.** These are products such as Jacquelyn®, Prezi®, AMIAD®, ecological coatings®, or fluorinated silicone coatings, to name just a few. Products already authorized by the Pest Management Regulatory Agency (PMRA) of Health Canada should be used. Information on these products may be obtained from PMRA at the following location: <https://www.canada.ca/en/health-canada/corporate/about-health-canada/branches-agencies/pest-management-regulatory-agency.html>
- **Sand-bed filtration.** This involves the use of sand placed over an intake to prevent colonization on metallic intake components. While no chemical products are required, authorization may be required if the sand bed has a significant footprint and affects aquatic habitat. Questions on this method of intake protection may be referred to the Environmental Approvals Branch (see contact information at the end of this guideline).
- **Switching to a new source.** This may include a new infiltration gallery or shoreline, horizontal or directionally drilled well adjacent to the original water source. In most cases, the Office of Drinking Water’s minor alteration approval requirements would apply.
- **Prechlorination.** As discussed in more detail below, prechlorination is the most commonly-used control measure for zebra mussels in public and semi-public water intake structures. The Office of Drinking Water has received PMRA authorization to use chlorine as a pesticide to combat zebra mussels under certain conditions. **The PMRA authorization does not extend to private home or cottage water intakes.**
- Public or semi-public water systems interested in using chlorine under different conditions will have to obtain their own approval from PMRA before contacting the Office of Drinking Water.

- **Other oxidants and control products.** Authorization for other oxidants and control products has not been established by Manitoba or granted by PMRA for use on zebra mussels. Utilities interested in using other oxidants or control products will have to obtain their own approval from PMRA before contacting the Office of Drinking Water (see PMRA contact information at the end of this guideline).

Prechlorination – Manitoba Conditions for Use

On behalf of Manitoba public and semi-public water systems, the Office of Drinking Water has obtained authorization from PMRA to use chlorine as a pesticide to control zebra mussel colonization in water intake works that meet the following conditions (**this does not include private home or cottage water intakes**):

1. Chlorine dosing equipment is professionally designed and supplied by manufacturers with expertise in this application so that public and operator safety and environmental protection are not compromised;
2. Chlorine will be applied a short distance from the exterior of the screen to prevent colonization on the surface of the screen, within the intake structure, and in pipes connecting the intake structure with downstream raw water supply works;
3. Chlorine is applied only when flow into the intake is occurring, to prevent the loss of chlorine to the surrounding waterbody. Therefore, chlorine application occurs only when direct pumping through the intake or downstream pumping from a wet well is occurring;
4. Chlorine is applied as sodium hypochlorite at a dosage of free residual chlorine not exceeding 5.0 mg/L at the dosing location.
5. Chlorine is applied only at water temperatures of 10°C or more.

Public or semi-public water systems complying with these requirements must notify the Office of Drinking Water and receive approval as a minor alteration to their water system. The equipment can then be installed and used.

Water system owners are encouraged to use compliant equipment so that they can take advantage of the PMRA authorization obtained by the Office of Drinking Water.

Approval Requirements

PMRA: Water system owners must first obtain PMRA approval if they want to use:

- oxidants or control products other than chlorine;
- mussel-resistant paints or coatings other than those already approved by PMRA; or
- pre-chlorination in a manner that does not conform to Manitoba's conditions for use as outlined in this guideline.

Office of Drinking Water: Once PMRA approval is in place, water system owners should discuss approval requirements with their regional Drinking Water Officer or the Office of Drinking Water's Approval Unit (see contact information at the end of this guideline). In most cases, including a change in the water source, intake construction or alteration or pre-chlorination in a manner that conforms with Manitoba's conditions for use, a minor alteration approval will be sufficient. Some conditions, such as enhanced disinfection by-product monitoring may apply.

Manitoba government - Fisheries Branch

It is against the law to possess, transport, import and cause an aquatic invasive species such as zebra mussels to be released in Manitoba.

Thus, water system owners require prior approval and a permit from the Fisheries Branch to possess, transport and dispose of zebra mussels. A permit can be obtained by emailing: AIS@gov.mb.ca

Fisheries and Oceans Canada: Water system owners including private home or cottage owners doing work on an intake or in a fish-bearing water body should contact the federal department of Fisheries and Oceans to identify any additional approval requirements that may apply. Approval information is available on their website at: www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html

Additional Warnings/Cautions

Water system owners including private home or cottage owners should be aware that chlorine and other chemicals maybe toxic to fish and other aquatic species. In all cases, the water system owner is responsible for any safety or environmental issues arising from pre-chlorination at the water intake works or any other zebra control measures taken.

PMRA Information Officer

Mail: Pest Management Information Service
Pest Management Regulatory Agency
Health Canada
2720 Riverside Drive
Ottawa, ON K1A 0K9
Address Locator: 6606D2
E-mail: pmra.infoserv@hc-sc.gc.ca
Call 613-736-3799 (toll-free 1-800-267-6315)

Environmental Approvals Branch

Call 204-945-8321.

[Aquatic Invasive Species \(AIS\)](#)

For more information related to zebra mussels and the legal AIS requirements when using water bodies in Manitoba, visit: Manitoba.ca/StopAIS

Office of Drinking Water

Regional [Drinking Water Officers](#) are available for operational and monitoring advice, and to provide technical assistance.

After hours, please call 204-944-4888.

For more information related to Manitoba's drinking water and how it is regulated, visit: www.manitoba.ca/drinkingwater