



US Army Corps  
of Engineers  
Waterways Experiment  
Station

# Zebra Mussel Research

## Technical Notes

Section 3 — Control Strategies

Technical Note ZMR-3-02

### Controlling Zebra Mussel Infestations in Fire Prevention Systems in Locks that Use Raw Water

- Background and purpose** This technical note describes strategies for controlling zebra mussel infestations in fire prevention systems at locks and other public facilities that use raw water. Most locks on navigable waterways have raw water systems that are used for cleaning, cooling equipment, or fire prevention. Systems are particularly susceptible to zebra mussel infestations if they leak or are used periodically (once every several days or weeks) and, therefore, do not become truly stagnant.
- Additional information** Contact the authors of this technical note, Dr. Andrew C. Miller, U.S. Army Engineer Waterways Experiment Station (WES), (601) 634-2141, or Dr. Frank Neilson, WES, (601) 634-2615, for additional information. Dr. Ed A. Theriot, WES, (601) 634-2078, is Manager of the Zebra Mussel Research Program.
- Inspections** Structures near water intakes should be inspected for zebra mussels every week when water temperature is above 12° C (54° F). Check for zebra mussels just below the water level on concrete walls, metal or wood pilings, ladders, steel cable, or rope that is partially submersed. Zebra mussels will readily attach to concrete blocks, rope, and polyvinyl chloride (PVC) plates or pipe. Any of these objects can be suspended from a rope and deployed near a water intake or any structure where zebra mussel infestations are likely to be troublesome. Although more quantitative sampling equipment for zebra mussels is available, facility operators are encouraged to use any of the above substrates to check for infestations.
- Recommended strategies** The following strategies are recommended to eliminate or at least reduce problem levels of zebra mussels in raw water systems.
- Ensure that water in the system is stagnant**  
A leaky system may have a high enough flow and a continuous supply of oxygen and food to support a viable population of zebra mussels. Eliminating leakage is a preventative method since zebra mussels cannot survive in stagnant water.
- Install screens**  
Screens can be installed at the entrance to intake pipes or other easy-to-reach areas within the system. Screens should be checked periodically and cleaned or replaced. Zebra mussel veligers are very small, between 40 and 290 µm

(0.0016 to 0.1 in.) long, and cannot be removed by conventional screens. Veligers that pass through a screen have the potential to attach and mature in the piping with the most abundant populations being near the intake. The downstream side of a screen often provides a much more suitable habitat for zebra mussels than the anoxic pipe farther inside the system. Adult and juvenile zebra mussels can be restricted by screens. Screens will prevent adults from entering and fouling small-diameter downstream components, such as heat exchangers or fire protection systems.

**Periodic chemical treatment**

A suitable quantity of chlorine or other biocide can be injected into raw water systems. The system is then sealed for a specific period of time (24 to 48 hr). The water in the system may then have to be treated to remove toxicants. When no longer toxic, the water can be disposed of normally. Shells of dead mussels can foul downstream components; in-line strainers can keep these components from being clogged.

**Avoid the use of raw water**

Chlorinated city or well water from an isolated source will be free of zebra mussels.

**Backwash the system**

Many systems can be modified so that the piping and screens can be backwashed regularly. The backwash cycle can be designed to engage automatically for several minutes before the system is activated.

**Use of mechanical pigs**

Mechanical in-line scrapers, known as pigs, propelled by gas or fluid pressures within various sized pipes can be used to remove zebra mussel infestations from specific lines. These are useful for all but extreme infestations such as total occlusions of the pipes.

**Inject steam or hot water**

Steam or hot water can be injected into part or all of the raw water systems periodically to kill zebra mussels. Zebra mussels are only moderately tolerant of elevated water temperatures. Exposure to 32.5° C (90.5° F) for 5 hr is lethal. This temperature is low enough to be obtainable often with minor modification. As part of this process or as a separate control method, the system could be completely drained and exposed to the air for 7 to 10 days at temperatures above 15° C (59° F). Any of these methods will kill adult and larval zebra mussels. When the system is reactivated, the released shells of dead mussels could be carried downstream and become lodged in nozzles and valves. If this happens, selected sections of pipes would have to be removed, cleaned, and then replaced. In-line strainers could be used to prevent fouling of downstream components by dead shells.

**Replace existing pipe with galvanized or copper pipe**

Zinc and copper are toxic to zebra mussels and will eliminate infestations. All or selected sections of standard iron or PVC pipe should be replaced with galvanized or copper pipe.

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