



US Army Corps  
of Engineers  
Waterways Experiment  
Station

# Zebra Mussel Research

## Technical Notes

Section 1 — Environmental Testing

Technical Note ZMR-1-02

### Larval Monitoring in a Chlorine Treatment Program to Prevent Zebra Mussel Settlement in Hydropower Facilities

**Background** Chlorine can be used to kill or prevent planktonic veliger zebra mussel larvae from settling in raw water piping systems. Veligers are much more sensitive to chlorine than adults, and larval settlement in pipes can be prevented by sustained chlorine concentrations as low as 0.5 mg/L. Because there is chlorine demand in a raw water system, this concentration must be maintained at the most *downstream* point in the system. Chlorine is highly toxic to aquatic life other than zebra mussels, and its use must be minimized.

**Additional information** This technical note was written by Dr. Barry S. Payne, U.S. Army Engineer Waterways Experiment Station (WES), and Mr. Dave Lowther, Ontario Hydro. Contact Dr. Payne, (601) 634-3837, Mr. Lowther, (416) 592-8771, or Dr. Andrew C. Miller, WES, (601) 634-2141, for additional information. Dr. Ed A. Theriot, WES, (601) 634-2678, is Manager of the Zebra Mussel Research Program.

**Zebra mussel reproduction in relation to chlorine treatment** The potential reproductive season for zebra mussels is spring through fall when water temperature is greater than 12° C (54° F). There is no need to chlorinate during winter when the water temperature is too low for reproduction. However, even during the warm season, there may occur periods of a few weeks when no veligers are being released. Such periods without veligers offer an opportunity to cease chlorination without jeopardizing protection of the hydropower plant. Chlorination does not have to be resumed until 1 to 2 weeks after veligers reappear in samples.

**Monitoring requirements** Detection of periods without veligers requires a trustworthy program of daily veliger monitoring in the waters of the plant forebay. Ontario Hydro uses an automated sampling device to take water samples from the intake forebay six times daily; these are combined into a composite sample for each day. If veligers are not detected for 14 consecutive days, then chlorination is ceased and not restarted until 7 to 14 days after the reappearance of veligers. Monitoring should be done in the intake water, not as part of a general ecological survey in adjacent waterbodies.

**Cost savings** In addition to the obvious environmental benefits, this sophisticated system of veliger monitoring allowed savings of \$40,000 per year at a single plant. Additional savings are realized by reduced levels of chlorine-induced pipe corrosion.

March 1992