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Station

Zebra Mussel Research

Technical Notes

Section 3 — Control Strategies

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Environmentally Sound Zebra Mussel Control Strategies at Drainage Structures, Pumping Stations, and Water Intakes

Background Strategies for the environmentally sound control of zebra mussels at drainage structures, pumping stations, and water intakes were discussed at a meeting held at the Drawbridge Inn, Ft. Mitchell, Kentucky (near Cincinnati, Ohio), on January 22-24, 1992. The meeting was attended by 14 representatives from the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, private industry, a municipality, and academia.

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Variability in structures The number and type of public facilities along waterways that could be infested with zebra mussels vary greatly. Well-designed research will provide specific information on selected facilities; however, personnel at the site will have to adapt findings to their own situation. In order to assist in the development of the research objectives and conclusions, the workshop participants (hereafter referred to as working group members) first prepared a list of components associated with each facility, then suggested environmentally sound control strategies to eliminate or reduce problems caused by zebra mussels. This was done for drainage structures, pumping stations, and water intakes. Major findings of the workshop are discussed below:

Drainage structures

Drainage structures are found along a waterway and are used for recording water levels and the control of flow. Specific structures that were discussed included: gauging stations, flap gates, stop logs, pumping plants, and intake structures.

Gauging stations

Gauging stations that automatically record water levels in streams (also locks and other public facilities) are particularly susceptible to zebra mussel infestations. The infestations will primarily appear at the entrance of the intake pipe; the upper end of the pipe or well will be less likely to be infested. Feasible control strategies include: inspection and mechanical cleaning by divers, application of small doses of chlorine to the well, or the use of antifoulant inserts

placed inside the intake end of the pipe. Monitoring for the presence/absence of adults is another useful strategy.

Flap gates

Flap gates that are either partially or fully submerged in water are likely to be infested. These infestations could lead to improper sealing of a flap gate and could have disastrous results. Control strategies should include annual inspection, mechanical cleaning, or use of antifoulant coatings.

Stop logs

Stop logs used for water-level control or flood retardation are likely to be infested with zebra mussels if they are in contact most of the time with infested waters. Control strategies could include leaving one log in place permanently on the bottom (so grooves would not be fouled), a false or partial stop log kept in place to keep grooves clean, or the use of an elevated sill (by this latter measure, zebra mussels would be crushed and washed away when the bottom stop log is dropped in place). Antifoulant coatings along the sill could also have applicability.

Pumping plants

For the purposes of this meeting, pumping plants were subdivided into two types: drainage or storm, and utility or industrial. The former type was subdivided into those that remain dry most of the year (no problem with respect to zebra mussels) and those that remain wet most of the year. These were divided into gated and ungated. Utility and industrial plants were divided into those that are open (the pump is in very close proximity to the water surface) and those that require a conduit that carries water to the pump. The working group discussed strategies for early detection and control of zebra mussels at: trash racks or fixed screens, walls, deicing systems, traveling screens, stop logs, sluice gates, screen well, pump bell and sump, conduit, pump, and skimmer boom. Strategies consisted of any of the following: frequent use of valves or other movable devices, mechanical cleaning, artificial substrates, selective use of biocides, application of hot water, and coatings.

Intake structures

Intake structures (including cribs with trash bars and velocity capping) associated with pumping plants and other facilities were included in the discussions. Velocity at the intake for hydropower facilities and most municipal facilities (0.3 to 1.0 ft/sec) is much less than those associated with locks (10 to 20 ft/sec). Trash racks and fixed screens associated with the former facilities will probably be infested and should be monitored. Because of high water, those associated with locks probably will not be infested.

Major findings Suggested strategies for dealing with infestations at the above facilities included:

- Exercise gates and valves at least once every 6 months.
- Alternate flow paths in order to reduce the settlement potential.
- Chlorinate at the entrance of a pipe, especially in a water treatment facility where chlorination would be applied anyway.
- Monitoring for presence and absence of adults is extremely important.
- Problems associated with disposal of contaminated zebra mussels should be considered as part of cleaning operations.
- Maintenance funds must be appropriate for the likely level of infestation and required control.

- The importance of chlorination** The best strategy for dealing with an infestation at a pumping station is to chlorinate at the beginning or upstream end of the intake pipe. This would eliminate infestations at the beginning of the pipe (usually zebra mussels are more dense here than closer toward the plant). If the pipe is too long or if it is not possible to carry chlorine to the beginning of the pipe, other alternatives, such as chlorinating within the system or mechanical cleaning, have to be used. Approval from the U.S. Environmental Protection Agency will be needed before initiating chemical methods. Personnel should also be aware of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act), which was enacted to protect consumers from ineffective products. One problem dealt with by FIFRA, which could have application with zebra mussel infestations, is the use of a product inconsistent with its labeling, or contrary to an experimental use permit (see page 852, *Environmental Law*, by William H. Rogers, Jr., West Publishing Company, P.O. Box 3526, St. Paul, MN 55165).
- Monitoring** Operators should monitor for immature zebra mussels to determine when minimal chlorination should be initiated. There are usually two (although in some instances there has been one) high density peaks of immature zebra mussels each season. However, immature zebra mussels can be found in the water all year when temperatures are above 12° C. Monitoring for immature zebra mussels is more difficult than searching for adults. This type of monitoring should be considered at pumping plants, especially where potable water supplies or electricity generation could be threatened. It makes little sense to monitor for immature zebra mussels at locks, dams, or reservoirs in large rivers or at sites where there is not a need to develop a strategy for a specific pumping plant. Samplers constructed from PVC plates (6 in. by 6 in.) suspended horizontally about 1 in. apart should be considered if information on density, growth, or time of settlement is required. However, these are unnecessary if only presence/absence information is required.
- Presence/absence sampling for adults should be conducted if personnel desire to prepare for implementing strategies. Polyvinyl chloride (PVC) (plates or pipes) are preferred substrate because they are lightweight, easy to obtain, inexpensive, and zebra mussels are easily seen or felt on their smooth surface. However, if presence/absence information is required, little would be lost if concrete blocks, ceramic tiles, or nylon sponges were used. In some cases these might be more easily obtained and deployed than the PVC. If PVC is unavailable, other appropriate substrates should be used to collect presence/absence information.
- Cleaning and disposal** Many of the suggested cleaning procedures will provide additional work for maintenance personnel. Working groups members should investigate the success of suggested cleaning procedures and modify them if certain aspects are needless or burdensome.
- Disposal of zebra mussels** Working group members expressed concern over difficulties associated with disposing of zebra mussels in a safe manner. There are two possible problem areas: severe odor problems so landfill operators could refuse to accept material and problems with contamination of zebra mussels. Because zebra mussels feed by filtering particulate organic matter from the water column, they will likely ingest adsorbed toxic materials.
- Once zebra mussels are removed from a waterbody, they will have to be disposed of in a landfill. If mussels are dislodged from an underwater surface and not brought to the surface, they could be left to be removed by water currents.

This is an advantage of underwater cleaning, use of antifoulant coatings, and biocides.

Before consideration is given to zebra mussel disposal, a TCLP test should be conducted. This tests for heavy metals and polychlorinated biphenyls (PCBs). If the test is completed and results indicate low toxicity, zebra mussels could probably be safely deposited in a landfill. As part of the Corps' research, zebra mussels will be collected and analyzed for toxicants. This will provide baseline data on the existing contaminant levels that will guide site-specific strategies.

Maintenance funds Corps personnel have great concern over what appears to be a lack of additional maintenance funds to deal with zebra mussel infestations. It will be unfortunate if strategies exist, but there are no funds to implement them. If zebra mussel eradication procedures are not implemented early, costly repair or maintenance will be required. Searching for maintenance funds is not a function of this research program. However, development of pertinent control methods and rapid dissemination of this information can facilitate the appropriation of funds.

Future considerations Future considerations for this research include the involvement of natural resource personnel associated with a particular project on the control strategy team as well as those knowledgeable of macro-fouling strategies. A major need is to evaluate the success of various strategies such that an appropriate strategy will be recommended for a particular project. Recommended strategies will be published as technical notes.

Implementation of strategies In many cases environmental resource personnel will have to implement (or oversee) procedures suggested by working group members. They could be hesitant to use certain methods or be unaware of the reasons that working group members made specific recommendations. Working groups should communicate with these individuals to ensure that successful and safe zebra mussel control is implemented. Selected resource personnel could be invited to working group meetings.