

# Aquatic Invasive Species Research Capabilities at the Upper Midwest Environmental Sciences Center

Aquatic invasive species such as the sea lamprey, zebra mussel, and Asian carps reshape aquatic communities, cost millions annually to manage and control, and threaten the biodiversity of freshwaters. The rate at which invasive species are moved and spread is increasing and detrimental economic and ecological effects continue to mount. Further, natural resource managers have identified invasive species as one of the most serious problems they face in the United States. To better address this problem, scientists at the U.S. Geological Survey Upper Midwest Environmental Sciences Center (UMESC) are refocusing their research efforts on aquatic invasive species based on UMESC personnel, facility assets, and resource management needs.

Parasitic aquatic invasive species have been studied at UMESC since the 1950s. Early Center efforts to develop chemical controls for common carp expanded in the 1960s to include developing chemical controls for sea lamprey—primitive parasitic fish that attach to other fishes with a suction disc to live on their host’s blood and body fluids. This research, conducted in cooperation with the Great



The USGS Upper Midwest Environmental Sciences Center in La Crosse, Wisconsin, showing a variety of ponds used for culture and experimentation.

## Selected Projects

### *Technical assistance to Great Lakes sea lamprey control program*

As part of our commitment to provide technical assistance to the Great Lakes Fishery Commission’s Sea Lamprey Control Program, we conduct risk assessments of lampricide treatments on nontarget species of concern. Scheduled sea lamprey stream treatments were allowed based on our recent findings demonstrating minimal risk of lampricides to three species of native mussels classified as threatened, endangered, or of special concern by the State of Vermont. We are currently studying the effect of lampricides on the Hungerford’s crawling water beetle, a federally endangered species living in two rivers typically treated to control sea lamprey.

### *Integrated pest management of nonnative fishes in the southwestern United States*

The Bureau of Reclamation identified the need to control invasive fishes in the southwestern United States to protect native species. The UMESC reviewed taxon-specific piscicides and other management options for controlling nonnative fish. The report focuses on the feasibility of developing piscicides (chemicals to control unwanted fish) selective for specific groups of fishes and suggests developing an integrated management program that combines the use of chemicals with other control techniques such as barriers, selective removal, and habitat alteration.

## UMESC Strategic Plan for Research on Aquatic Invasive Species (AIS) Highlights

### (1) Preventing the Introduction of AIS

*Develop tools for managers to prevent the introduction of AIS in the United States*

### (2) Early Detection, Rapid Response, and Spread of AIS

*Provide science support for resource managers to eradicate newly reported AIS and to predict their potential spread*

### (3) Science Support for Monitoring AIS

*Improve and refine methods used by managers to monitor expanding populations of AIS in the Upper Mississippi River*

### (4) Ecology and Effects of AIS

*Study the ecology of and identify and quantify the effects of harmful AIS on native ecosystems and their components*

### (5) Control and Management of Existing AIS

*Work with managers to develop and improve alternatives for controlling AIS to restore native species and ecosystem function*

Lakes Fishery Commission, helped greatly reduce populations of sea lamprey in the Great Lakes. Since the 1990s, UMESC scientists have extended their expertise in chemical control to newly established nonnative species in the Great Lakes, conducted ecological research on the effects of zebra mussels, and worked toward better early detection and monitoring of invasive species in the Upper Mississippi River System.

## Containment and Experiment Complex for Aquatic Invasive Species

UMESC is combining wet lab space to develop a containment and experimental complex for aquatic invasive species for more efficient and secure research on aquatic invasive species. The facility is fully operational and features the following:

- Simultaneous culture and experimentation on various life stages and species
- Recirculating technology to save water and reduce risk of organism escape
- Separate culture and study areas with flow-through or recirculation
- Efficient effluent treatment
- Water temperature and light control, reconstituted water capabilities



- Expertise with historic and ongoing ecological studies in aquatic ecosystems
- Monitoring expertise from 20 years experience with the Long Term Resource Monitoring Program
- Close and continued association with the Great Lakes Fishery Commission Sea Lamprey Control Program
- Strong quantitative focus and strengths in geospatial applications and risk assessments
- Innovative decision support systems
- Located on the Mississippi River and close to the Great Lakes
- Unique facilities, including onsite culture and analytical laboratories and experimental ponds

### Dedicated Research Staff

Terrance Hubert, Ph.D. Chemist: Pheromones, analytical chemistry, chemical control, integrated pest management, regulatory affairs

Mark P. Gaikowski, M.A. Research Physiologist: Toxicity studies, environmental assessments, delivery technologies

Michael Boogaard, M.S. Biologist: Toxicity studies, chemical control, rapid response and integrated pest management of aquatic invasive species

Jane Rivera, B.S. Biologist: Regulatory affairs, toxicity studies

### Biological synopsis and risk assessment of Asian carp in the United States

In response to a petition to list bighead and silver carp as injurious wildlife under the Lacey Act, which would prohibit their importation and interstate transportation, UMESC is collaborating with the USGS Center for Aquatic Resource Studies, USGS Columbia Environmental Research Center, and the U.S. Fish and Wildlife Service to evaluate the risk these species pose to aquatic ecosystems of the United States.

### UMESC Assets and Capabilities for Research on Aquatic Invasive Species

- New containment and experimental complex for aquatic invasive species with recirculating and flow-through capabilities
- Extensive history of research on the chemical control and integrated management of aquatic species
- Capabilities in predicting the identity, pathways, and effects of invading species

Learn more about the UMESC Invasive Species Initiative at <http://www.umesc.usgs.gov/invasives>.

Visit the UMESC website at <http://www.umesc.usgs.gov> for information on UMESC projects, scientific publications and other products, staff profiles, and other useful information.

For more information, contact

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