

**Statement of Mr. Mark Gaikowski**

**Center Director, Upper Midwest Environmental Sciences Center, U.S. Geological Survey**

**Department of the Interior**

**Before the House Committee on Oversight and Government Reform**

**War on Carp Field Hearing, Eddyville, Kentucky**

**July 27, 2018**

Congressman Comer, members of the Committee, I am Mark Gaikowski, Center Director of the U.S. Geological Survey (USGS) Upper Midwest Environmental Sciences Center. Thank you for the opportunity to testify on research conducted by the USGS to support management agencies in their continued fight against invasive Asian carp in the United States.

The USGS, as the science arm of the Department of the Interior, conducts research to understand the interrelationships among earth surface processes, ecological and biological systems, and human activities. The USGS partners with other federal and state agencies, tribal governments, and non-governmental organizations to provide the science needed to help resource managers address critical and complex natural resource issues.

**Background**

The USGS has been the primary federal agency conducting ecological research on bighead, silver, black, and grass carps – four species collectively referred to as ‘Asian carp’ - for more than a decade. USGS participates in the Asian Carp Regional Coordinating Committee (ACRCC) to protect the Great Lakes from the spread of Asian carp and in interagency working groups established for other watersheds including the Mississippi and Ohio River Basins. USGS research activities are conducted with a management action or objective as a guide post – seeking to answer gaps in understanding or inform the activities resource managers are working on to contain and manage populations. USGS Asian carp research is funded by USGS appropriations and the Great Lakes Restoration Initiative.

Most USGS research on Asian carp has focused on preventing their establishment in the Great Lakes. USGS scientists strive to ensure that the methods and tools developed are transferable to other locations. An example is the application of the model developed to predict potential Asian carp spawning areas in the Illinois River to the Muskingum River. USGS scientists are currently working with state and federal partners in Tennessee, Kentucky, Mississippi, and Alabama to manage Asian carp populations. USGS is part of a multi-state effort to determine extent, abundance, and ecosystem effects of Asian carp, and is partnering with the state of Kentucky to

improve catch of Asian carp using algal attractants and limiting their movement by testing an underwater acoustic deterrent. USGS scientists work with management agency partners and develop research projects that provide key information needed to improve resource management

## **Research and Investigations**

### Detection and monitoring

Effective detection tools are essential for determining the absence or abundance of Asian carps. Like other invasive species, early detection is key to mounting successful efforts to block population establishment. USGS research seeks to improve detection of Asian carps primarily through the detection of genetic material in water or other environmental samples (termed ‘eDNA’). The eDNA research focuses on detecting and surveilling Asian carp and other new Aquatic Invasive Species (AIS) and pathogens, understanding the eDNA ‘signal’ in the sample, and determining what these signals mean for Asian carp populations. Monitoring efforts are typically focused on determining the relative abundance and spatial distribution of Asian carp. Examples of USGS research are described below.

- USGS scientists helped to improve, refine and reduce costs associated with eDNA methodology to detect Asian carp through collaboration on a study with the U.S. Army Corps of Engineers (USACE) called ECALS or the eDNA Calibration Study, completed in 2016.
- In collaboration with the U.S. Fish and Wildlife Service (USFWS), USGS is developing methods using next-generation sequencing, a technique that identifies DNA from all known species found in a sample, to detect eggs and larvae of Asian carp and other AIS from samples collected using ichthyoplankton nets.
- USGS researchers are improving the interpretation of eDNA analyses by putting positive eDNA results into ecological and management context (e.g., correlating eDNA detection with Asian carp population density, correlating probability of detection with population expansion).
- USGS worked with industry to develop a portable eDNA detection system that is in use to detect Asian carp in the baitfish trade by several state and federal natural resource agencies; USGS provided DNA analysis units to management agencies in 2017.
- USGS, USFWS, and other partners are improving hydroacoustic survey methods to ensure accuracy of Asian carp monitoring to assess response to management actions.

### Information for decision making

USGS research activities are providing a foundation for risk assessment and decision making for adaptive management to control and contain Asian carp populations. The cornerstone of this management approach is understanding the life history, habitat use and population dynamics of Asian carps in invaded and at-risk systems. This information helps agencies decide on management actions. For example, telemetry studies provide information on habitats and movements to help guide removal efforts and placement of deterrents. Age, growth and

movement studies inform spatially-explicit population models to evaluate the effectiveness of alternative management actions. Reproduction and early life history studies, combined with hydraulic modeling help identify important habitat that could be targeted by new and existing control and containment technologies. Some examples of this research are:

*Life history, habitat, and feeding of Asian carp*

- With partners, identifying proximal spawning cues, sampling rivers for eggs and larval fish, estimating spawning population size to inform partner management programs.
- Developed FluEgg, a hydrodynamic particle transport model incorporating embryo and early life stage development, to evaluate the potential for Asian carp to spawn in rivers and to identify locations critical for the development of Asian carp. Transferring the FluEgg model, developed for the Illinois River, to the Muskingum River and other systems in the Ohio and Upper Mississippi River basins.
- Working with partners across the Tennessee and Cumberland river basins to assess distribution, movement, and extent of Asian carp in those systems.
- Using 2-D telemetry to track Asian carp during removal efforts to improve existing methods; assessing habitat use by larval Asian carp to inform detection and management efforts; and evaluating the use of infertile Asian carp as ‘Judas’ fish to detect and monitor wild fish.

*Developing spatially-explicit population models to inform management actions*

- Partnering with state partners and USFWS to develop spatially-explicit population models in each basin to evaluate a suite of management alternatives
- Integrating combined effects of deterring upstream movement (e.g., through deterrents at pinch-point dams) with increasing mortality rates (e.g., through harvest) to help managers decide on combinations of tools to be applied in the right place at the right time.

Actions - controls and deterrents

A fundamental understanding of Asian carp biology in U.S. waters underpins USGS research to manage and control these species. USGS research on Asian carp focused on the Illinois River and Great Lakes has application beyond these watersheds. USEPA registration of tools for use in the Great Lakes basin can be expanded to support applications wherever managers need to control Asian carp.

*Optimizing mass harvest as a removal tool* – Managers in states where Asian carp are established have taken steps to increase harvest by commercial fishing. USGS is partnering with states and universities on research projects to enhance harvest.

- A major 2018 effort was the mass removal of Asian carp from Creve Couer Lake, a 300-acre off-channel lake in Maryland Heights, Missouri. USGS partnered with USFWS, and the state

of Missouri to remove more than 240,000 pounds of silver carp and bighead carp (estimated 85% of the population) in a 3-week removal effort that integrated traditional Chinese fishing methods adapted to U.S. waters, new trap net designs, and new ‘herding’ techniques using underwater sound and electrofishing combined with multiple net sets to ‘push’ fish into a removal location. USGS is working with the state to deploy barriers and deterrents to capitalize on this removal and stop Asian carp from moving back into the lake.

- Testing, with the Illinois Natural History Survey and the Illinois Department of Natural Resources, improved methods of attracting bighead carp and silver carp by placing algae-based attractant ‘bait bricks’ in conjunction with commercial fishing to increase harvest.

*Carbon dioxide* – USGS researchers have demonstrated that carbon dioxide is an effective non-selective deterrent and toxicant for many fish species, including bighead carp and silver carp, and could be used to deter range expansion into new areas. USGS designed carbon dioxide infusion systems and delivery manifolds that could be installed in navigational locks and plans to conduct a navigational lock chamber-scale engineering assessment to determine infusion efficiency and evaluate operational conditions associated with operating a carbon dioxide deterrent. USGS is working with USEPA to register carbon dioxide as a deterrent to fish movement or passage and with partners to identify field sites to conduct the engineering assessment in 2019.

*Microparticles* – USGS has completed formulation of lethal microparticles for bighead carp and silver carp that incorporates Antimycin A, a general use piscicide previously registered with USEPA, that maximizes toxicity to targeted species while minimizing exposure to native fishes. An initial field trial was completed in the Wabash River (Indiana) in 2017 and killed primarily silver carp (but also killed some nontarget species). A larger field trial is currently in preparation for Iowa in August 2018. USGS is working with USEPA to determine registration requirements to register antimycin. Microparticle formulations can be modified to incorporate control agents other than Antimycin and USGS is seeking alternatives to Antimycin. USGS developed a toxic bait for grass carp that is presently in laboratory trials.

*Underwater acoustic deterrents and herding* – Underwater sounds that deter or ‘herd’ Asian carps while minimizing impacts to native fishes have been identified with additional stimuli refinements in progress to minimize habituation. USGS in collaboration with the USACE, will test (fall 2018) the most effective stimuli identified to date in the Wabash River (Indiana). USGS deployed an underwater acoustic deterrent system (UADS) in the Chicago Area Waterway System (CAWS) in 2018 during scheduled maintenance of a portion of the Electric Dispersal Barrier System (EDBS) near Romeoville, Illinois; partners asked USGS to deploy the UADS again later this calendar year during scheduled EDBS maintenance. USGS is also working with the state of Kentucky and USFWS to develop an evaluation plan for a largescale UADS for Barkley Lock and other locations.

## **Management agency technical support**

### Technical support and direct response to management agency actions

USGS provides technical assistance and direct responses to management agency requests. For example, USGS responded to a request of the ACRCC Monitoring and Response Work Group and the State of Illinois and deployed a UADS in the Chicago Area Waterway Ship Canal during electric fish dispersal barrier maintenance, the first deployment of an UADS in a management action, from February 1 through May 7, 2018. Scientists collected data on sound levels on operating tows transiting the barrier site. A UADS may be deployed again in Fall 2018 during scheduled maintenance of the barrier. USGS also evaluated the underwater soundscape at Brandon Road Lock and Dam in coordination with USACE, to inform evaluations of potential underwater acoustic deterrents; mapped hydraulic conditions and recorded water chemistry within the CAWS to inform potential management actions under evaluation by USACE; and assessed, in coordination with USACE and USFWS, the potential for upstream transport of juvenile Asian carp through navigation locks and across the EDBS during passage of commercial tows and tested possible mitigation methods – which is directly transferrable to locks at Barkley Dam on the Cumberland River in Kentucky and Kentucky Dam on the Tennessee River in Kentucky.

### Technology transfer

Successful implementation of USGS science requires successful transfer of data and tools to managers for field use. In addition to presenting results at scientific conferences, to the ACRCC, and other scientific outlets, as new tools have become ready for use, USGS works with partners to optimize the tool for their use and has provided training to partners ready for implementation. USGS also is pursuing registrations for tools requiring regulation. Examples include transferring approaches for sampling and processing eDNA to USFWS; training state and federal partners on use of a portable eDNA detection unit; and working with federal and state partners in the Upper Mississippi River to track Asian carp aggregations that were targeted for removal by commercial fishers using telemetry and habitat use data.

### **Conclusion**

USGS remains committed to working with our State and Federal partners on Asian carp prevention and management. When this fight began, it was acknowledged that it would not be easy and that all partners would have to commit to the long-haul to attain success. Although much USGS research on tools, technologies, and understanding of life history and behavior has been primarily in support of preventing establishment Asian carp in the Great Lakes, the approaches we have taken are transferable to other basins and areas. Challenges posed by Asian carp are great, but there also are other AIS of concern in U.S. waters; much of our work on Asian carp can be adapted to better detect, contain, and control other AIS, thereby increasing national benefit of dollars invested.

Thank you, Congressman Comer, for the opportunity to submit this testimony on USGS research to address the expansion of Asian carps in U.S. waters. I will be pleased to answer questions from you and other Members of the Committee.