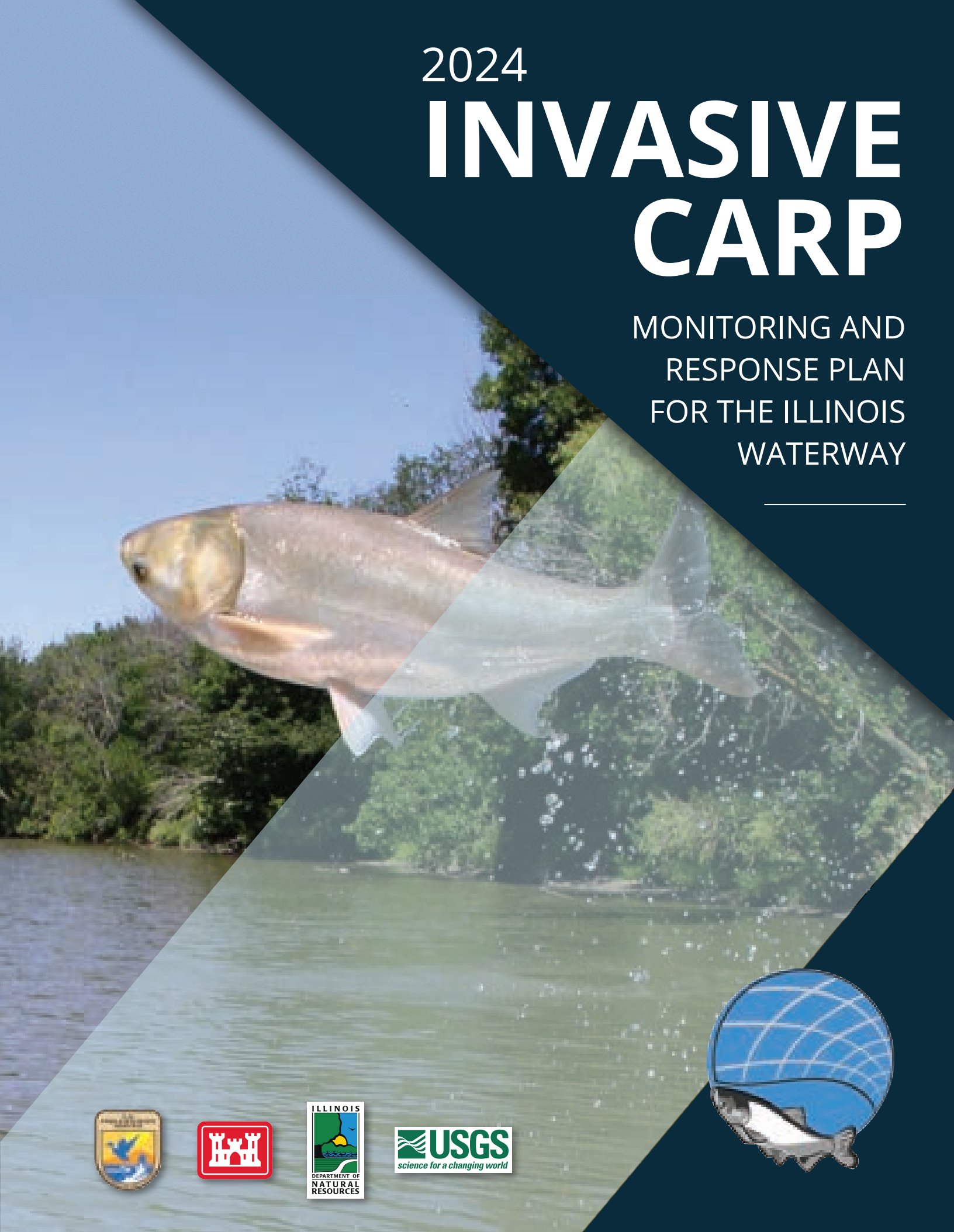
2024

INVASIVE CARP

MONITORING AND RESPONSE PLAN FOR THE ILLINOIS WATERWAY



ILLINOIS DEPARTMENT OF NATURAL RESOURCES

USGS science for a changing world

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List of Acronyms

Acronym	Definition
CarpDAT	Invasive Carp Database
CAWS	Chicago Area Waterway System
CO2	Carbon Dioxide
CRP	Contingency Response Plan
CSSC	Chicago Sanitary and Ship Canal
EDBS	Electric Dispersal Barrier System
EDM	Early Detection Monitoring
eDNA	Environmental Deoxyribonucleic Acid
FY	Fiscal Year
ICRCC	Invasive Carp Regional Coordinating Committee
ILDNR	Illinois Department of Natural Resources
ISR	Interim Summary Report
IWW	Illinois Waterway
LTRM	Long-term Resource Monitoring
MAM	Multi-Agency Monitoring
MRP	Monitoring and Response Plan
MRWG	Monitoring and Response Work Group
SCAA	Statistical Catch-at-Age
SEICarP	Spatially Explicit Invasive Carp Population
SIM	Seasonal Intensive Monitoring
SIU	Southern Illinois University
UADS	Underwater Acoustic Deterrent System
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

Note: in this document, "invasive carp" refers to four species of carps: Bighead Carp, Silver Carp, Grass Carp, and Black Carp

This Fiscal Year (FY) 2024 Invasive Carp Monitoring Response Plan (MRP) presents up-to-date information on this year's set of 25 large-scale projects dedicated to preventing invasive carp from establishing populations in the Chicago Area Waterway System (CAWS) and Lake Michigan. The MRP was developed by the Monitoring and Response Work Group (MRWG), co-chaired by the Illinois Department of Natural Resources and the Great Lakes Fishery Commission. This plan also describes how these projects will be coordinated and implemented through the nine work groups established under the MRWG. The current work groups include the following: Contingency Response, Detection, Monitoring, Hydroacoustics, Telemetry, Removal, Modeling, Behavioral Deterrence, and Black Carp.

The MRWG has been implementing invasive carp activities in the Illinois Waterway (IWW) – which includes both the Illinois River and the CAWS – since 2010. Through the efforts of the MRWG member agencies, the presence and reproductive fronts of invasive Silver and Bighead carp have not advanced.

This year's set of projects fulfill three main objectives, consistent with the MRWG Strategic Vision: 2023 – 2027:

- **Detection:** Determine the distribution and abundance of invasive carp to guide response and control actions.
- **Management and Control:** Prevent upstream passage of invasive carp toward Lake Michigan via use of barriers, mass removal, and understanding best methods for preventing passage.
- **Response:** Establish comprehensive procedures for responding to changes in invasive carp population status, test these procedures through exercises, and implement if necessary.

In FY 2024, MRWG member agencies will implement a suite of actions designed to prevent the upstream movement of invasive carp and other aquatic nuisance species into the Great Lakes from the Illinois Waterway, including spring and fall seasonal intensive monitoring within the CAWS, eDNA sampling above the electric dispersal barrier, assessments of reproduction within the IWW, strategic removal through contract and commercial fishing, as well as population monitoring, modeling, and telemetry work. These non-structural measures will complement the Brandon Road Interbasin Project as construction begins with the recent signing of a project partnership agreement between USACE and the states of Illinois and Michigan.

The activities in this MRP build upon considerable work completed in previous years. A detailed accounting of the results and findings of previously completed work can be found at Invasive Carp Resource Documents.

INTRODUCTION AND STRATEGY

Note: in this document, "invasive carp" refers to four species of carps: Bighead Carp, Silver Carp, Grass Carp, and Black Carp

This Fiscal Year (FY) 2024 Invasive Carp Monitoring Response Plan (MRP) presents up-to-date information on this year's set of 25 large-scale projects dedicated to preventing invasive carp from establishing populations in the Chicago Area Waterway System (CAWS) and Lake Michigan. The MRP was developed by the Monitoring and Response Work Group (MRWG), co-chaired by the Illinois Department of Natural Resources and the Great Lakes Fishery Commission. This plan also describes how these projects will be coordinated and implemented through the nine workgroups established under the MRWG. The current work groups include the following: Contingency Response, Detection, Monitoring, Hydroacoustics, Telemetry, Removal, Modeling, Behavioral Deterrence, and Black Carp.

The MRWG has implemented invasive carp activities in the Illinois Waterway (IWW) – which includes both the Illinois River and the CAWS – since 2010. The work of the MRWG is clearly focused on Bighead Carp and Silver Carp in the IWW. Through the efforts of the MRWG member agencies utilizing a variety of gear types, including electrofishing, netting, and telemetry, the leading edge of the Bighead Carp and Silver Carp populations remains around river mile 281 (north of I-55 Bridge within the Dresden Island Pool near the Rock Run Rookery) or approximately 55 miles from Lake Michigan. No appreciable advancement of Bighead Carp or Silver Carp populations has been documented since the implementation of these actions.

This year's set of projects fulfill three main objectives, consistent with the MRWG Strategic Vision: 2023 – 2027 (Attachment 1):

- **Detection:** Determine the distribution and abundance of invasive carp to guide response and control actions.
- **Management and Control:** Prevent upstream passage of invasive carp toward Lake Michigan via use of barriers, mass removal, and understanding best methods for preventing passage.
- **Response:** Establish comprehensive procedures for responding to changes in invasive carp population status, test these procedures through exercises, and implement if necessary.

In FY 2024, MRWG member agencies will continue actions focused on these three main objectives, including spring and fall seasonal intensive monitoring within the CAWS, eDNA sampling above the electric dispersal barrier, assessments of reproduction within the IWW, strategic removal through contract and commercial fishing, as well as population monitoring, modeling, and telemetry work. These non-structural measures are designed to complement the Brandon Road Interbasin Project and will continue to support the structural components identified within the recently signed project partnership agreement between the USACE and the states of Illinois and Michigan.

The MRWG prepared this FY 2024 Invasive Carp MRP, released by the Invasive Carp Regional Coordination Committee (ICRCC). It acts as an update to previous MRPs and presents up-to-date information and plans for a host of projects dedicated to preventing invasive carp from establishing populations in the CAWS and Lake Michigan. Specifically, this document is a compilation of 25

individual project plans, each of which plays an important role in preventing the expansion of the range of invasive carp and furthering the understanding of invasive carp location, population dynamics, behavior, and the efficacy of control and capture methods.

This document outlines actions planned for FY 2024. The actions and activities in this MRP continue to build upon the considerable work completed since 2010. A detailed accounting of the results and findings of previously completed work can be found at Invasive Carp Resource Documents. A summary of activities anticipated to be completed in FY 2024 is provided and grouped by MRWG work groups. Two or more work groups collaborate on many of the activities.

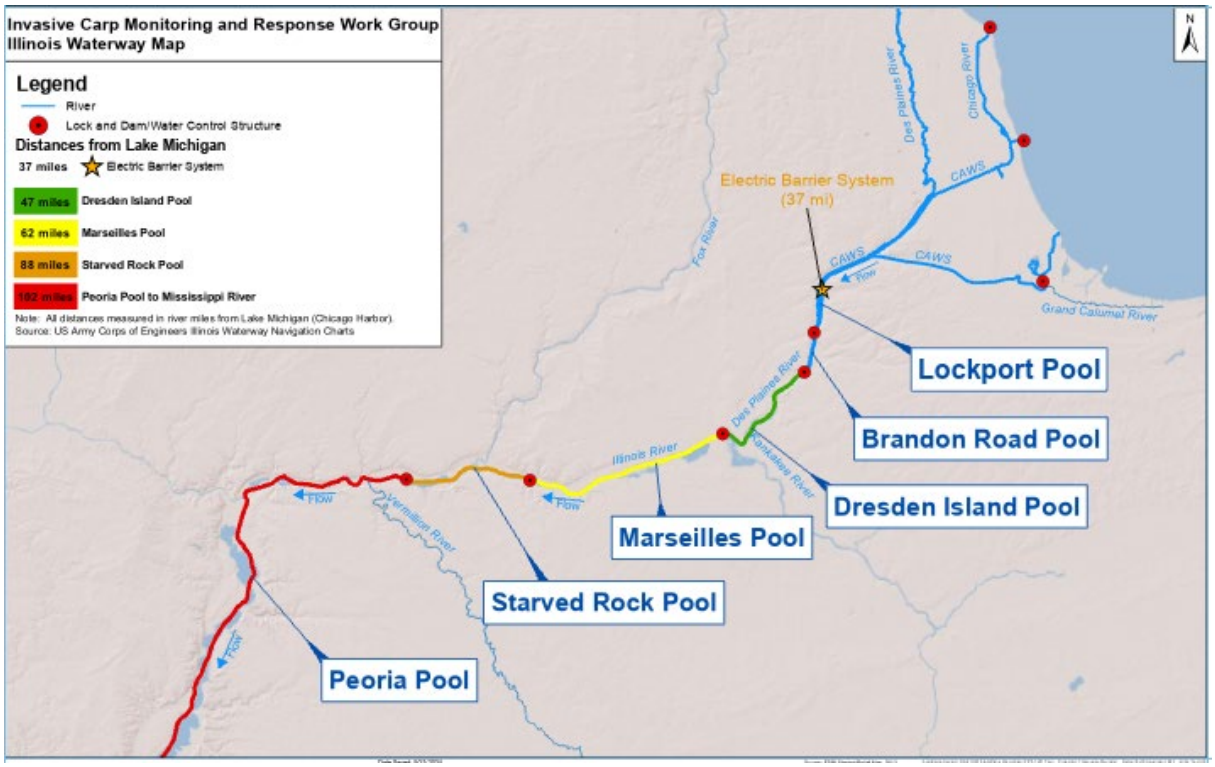
All MRPs to date, including the FY 2024 MRP, have benefitted from the review of technical experts and MRWG members, including, but not limited to, Great Lakes states' natural resource agencies and non-governmental organizations. Contributions to this document have been made by several state and federal agencies.

This FY 2024 MRP provides information about project activities, which incorporate new information, technologies, and methods as they have been discovered, field-tested, and implemented. The MRWG is also completing a companion document, the FY 2023 Invasive Carp Interim Summary Report (ISR), which summarizes each project's activities, results, findings, and recommendations for future actions. Collectively, the FY 2024 MRP and FY 2023 ISR present a comprehensive accounting of the activities and projects being conducted to prevent the establishment of invasive carp in the CAWS and Lake Michigan. Through these documents, the reader can obtain a thorough understanding of the most current project results and findings, as well as how these findings will be used to guide future activities.

This MRP provides is the operational direction regarding IWW-related projects described in the ICRCC FY 2024 Invasive Carp Action Plan. The ICRCC is convened by the U.S. Fish and Wildlife Service (USFWS) and the U.S. Environmental Protection Agency (USEPA) to assist ICRCC members in implementing their authorities to reduce and/or eliminate the threats to the Great Lakes posed by invasive carp. The ICRCC membership includes 26 U.S. and Canadian federal, state, provincial, tribal, regional, and local agencies.

This MRP is a natural extension of the Illinois State Comprehensive Management Plan for Aquatic Nuisance Species and further builds upon the Management and Control Plan for Bighead, Black, Grass, and Silver Carps in the United States. Figure 1 depicts the six pools, CAWS, and the Electric Dispersal Barrier System (EDBS) in the IWW, with their distances from Lake Michigan.

Figure 1 – MRWG IWW Map



MRWG Work Groups

Discipline-specific work groups assist in developing the most informed MRPs. Work groups may also be useful to focus expertise for further evaluation, assist in decision-making, or otherwise provide MRWG co-chairs, agencies, and the ICRCC with insights as technical experts on a range of subjects. Expected work groups for FY 2024 are listed below, with leads identified to assist in communication and structure. Co-leads may also be identified to assist with managing these work groups as appropriate and helpful. Work groups may be added or deleted to serve MRWG and ICRCC needs.

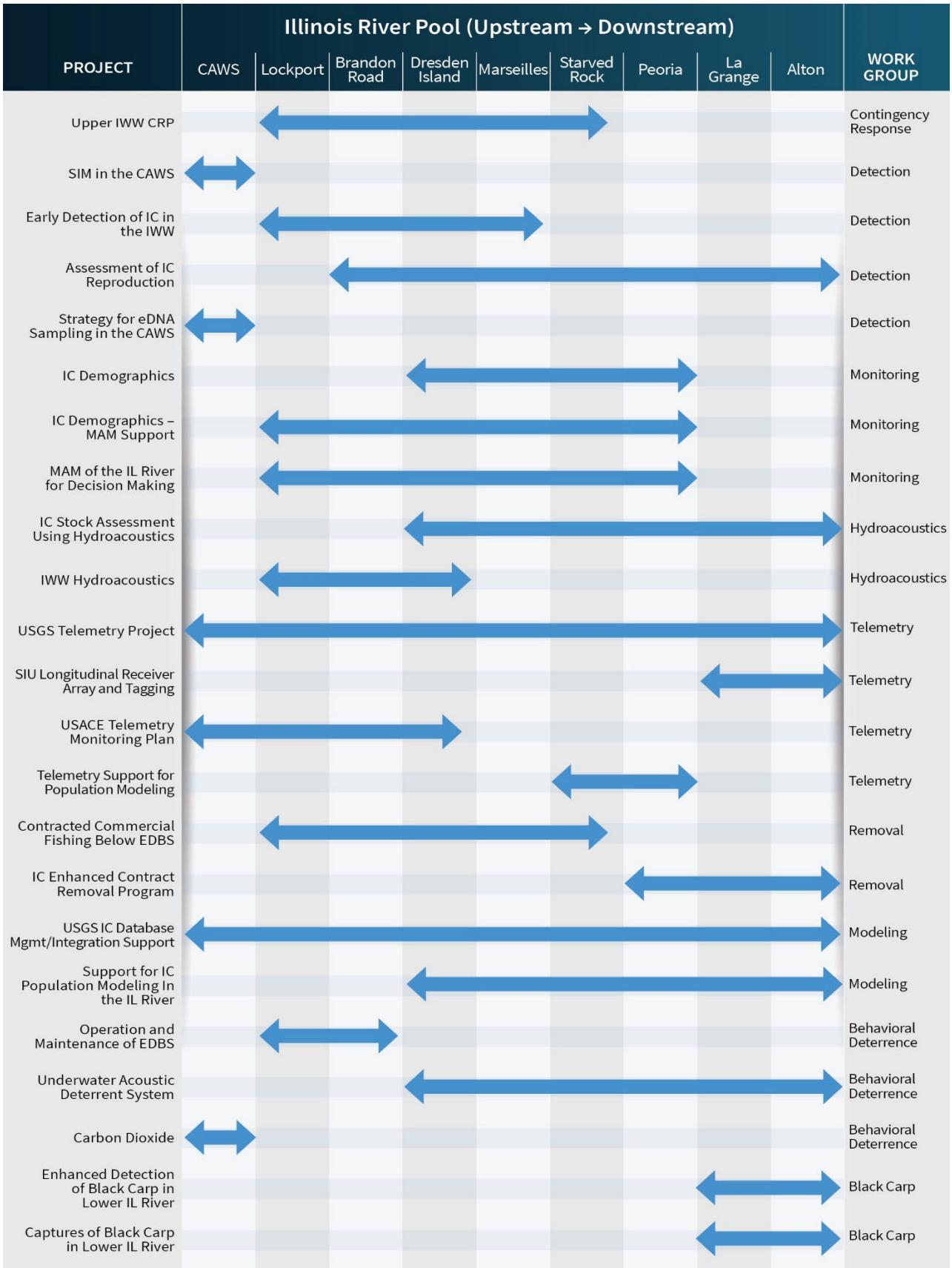
Table 1. MRWG Work Group Leads

2024 Work Group	Lead	Agency	Co-Lead	Agency
Contingency Response	Nick Barkowski	USACE	Mindy Barnett	ILDNR
Detection	Steve Butler	INHS	Mindy Barnett	ILDNR
Monitoring	Jim Lamer	INHS	Eli Lampo	ILDNR
Hydroacoustics	Jim Garvey	SIU	Mike Malon	USFWS
Telemetry	Marybeth Brey	USGS	-	-
Removal	Justin Widloe	ILDNR	Allie Lenaerts	ILDNR
Modeling	Richie Erickson	USGS	Ben Marcek	USFWS
Behavioral Deterrence	Aaron Cupp	USGS	-	-
Black Carp	Rob Simmonds	USFWS	-	-

Project Crosswalk

To clearly depict the geospatial scale and focus of projects by work groups included in the MRP, the MRWG has prepared a project location crosswalk (Figure 2 on the next page). This crosswalk tool allows readers to understand where a specific work group focuses its efforts and quickly discern all projects that are operating in a specific portion of the IWW and CAWS.

Figure 2 – Project Crosswalk



PROJECT FOCUS IN FY 2024

The below sections summarize the MRWG work group projects for FY 2024. A brief description of the mission or purpose of each work group is provided to give the reader an understanding of the work groups' top priorities and main focuses.

CONTINGENCY RESPONSE WORK GROUP

The Contingency Response Work Group is responsible for maintaining and updating the Contingency Response Plan (CRP). The purpose of the CRP is to outline the process and procedures the MRWG and ICRCC member agencies will follow in response to detected changes in invasive carp distribution or abundances of particular life stages in any given pool of the Upper IWW.

Upper Illinois Waterway Contingency Response Plan

This project has established a set protocol for determining whether detection results merit a direct response action and laid out a framework for taking response actions, including steps for coordinating between agencies and communicating with the general public. In FY 2024, relevant agencies will continue developing and refining the CRP, including conducting a tabletop exercise to identify any needed improvements to the plan and participating in Incident Command System training. NOTE: make sure name of Contingency Response Plan is consistent.

DETECTION WORK GROUP

The Detection Work Group works to ensure thorough surveillance for the presence of invasive carp in each of the pools upstream of Starved Rock Lock & Dam and in the Des Plaines and Kankakee rivers to enable an effective response to any detection before invaders challenge the EDBS, CAWS, or further threaten the Great Lakes.

Seasonal Intensive Monitoring in the CAWS

Seasonal Intensive Monitoring (SIM) is a planned intensive surveillance of the CAWS upstream of the EDBS conducted twice annually. These events are planned for the spring season (weeks of May 13th and 20th) and the fall season (weeks of September 30th and October 7th). The SIM deploys fixed and random site monitoring. This project includes standardized monitoring with pulsed-DC electrofishing gear and contracted commercial fishers. Along with maintaining the spatial coverage upstream of the EDBS, each SIM event will provide extra sampling focus on a unique location in the CAWS. SIM provides a spatially and temporally adequate assessment of the relative abundance and distribution of invasive carp in the CAWS upstream of the EDBS.

Early Detection of Invasive Carp in the Upper Illinois Waterway

The purpose of USFWS Wilmington Substation early detection monitoring (EDM) is to detect juvenile and adult invasive carp (Bighead Carp, Silver Carp, Black Carp, and Grass Carp) at the invasion front. A combination of traditional boat electrofishing, electrified dozer trawling, mini-fyke netting, and gill netting are used in main-channel border, side-channel, and backwater habitats in the Marseilles, Dresden Island, Brandon Road, and Lockport pools of the Upper IWW, and in the lower Kankakee River. Rarefaction analysis is performed annually to ensure an extremely high probability that sampling efforts are detecting any changes in invasive carp population status. The application

of fishing gears across pools and habitats, utilizing fixed and random sites, is assessed annually based on the results of this analysis.

Assessment of Invasive Carp Reproduction and Ecosystem Response in the Illinois Waterway

This project monitors for changes in the leading edge of invasive carp reproductive fronts, assesses the impacts of harvest efforts on the reproductive potential of invasive carp populations, monitors for Black Carp reproduction in the IWW, and quantifies relationships between invasive carp adult abundance, reproductive output, and recruitment. This project will monitor for invasive carp reproduction in the IWW and select tributaries (Fox, Kankakee, Vermilion, Sangamon, Mackinaw, and Spoon rivers) and quantify relationships between zooplankton abundance and invasive carp density in a sub-set of navigation pools in the Illinois River. In FY 2024, ichthyoplankton sampling will be conducted to monitor for the presence of invasive carp eggs and larvae to assess the extent, location, timing, and magnitude of reproduction in the IWW. Samples will be collected from late April through October, with more frequent sampling efforts during periods when temperature and flow conditions are thought to be optimal for invasive carp spawning (e.g., May to June, during periods of rising water levels, or shortly after peak flows). Observation of invasive carp eggs or larvae will help to inform the likelihood of capturing young-of-year invasive carp. Analyses of the spatial and temporal distribution and abundance of invasive carp eggs and larvae will aid in identifying spawning locations, environmental factors associated with successful reproduction, and factors contributing to invasive carp recruitment.

Strategy for eDNA Sampling in the CAWS

In FY 2024, the CAWS will be sampled for Bighead Carp and Silver Carp environmental deoxyribonucleic acid (eDNA) in Lake Calumet and Marine Services Marina on the Little Calumet River. One sampling event will be conducted prior to the late-spring SIM event, and the second will be conducted just before the fall SIM event. In 2022, a control site, Powderhorn Lake, was added to the sampling regime; however, based on no eDNA detections in the 2023 field season, Powderhorn Lake may be eliminated from the FY 2024 sampling regime.

Alternative Pathway Surveillance – Urban Pond Monitoring

This project provides monitoring and removal efforts for invasive carp that may have been unintentionally stocked in urban fishing ponds in the Chicago Metropolitan Area. Monitoring with eDNA and conventional gears (i.e., electrofishing and netting) has previously occurred in local fishing ponds and has detected and removed invasive carp that were possibly introduced as contaminants in shipments of stocked sport fish. During FY 2024, urban pond sampling will be based on photographic evidence of invasive carp or reports from credible sources. The Illinois Department of Natural Resources (ILDNR) also plans to sample all previously sampled urban ponds in FY 2024 as part of the monitoring response effort.

Alternative Pathway Surveillance in Illinois – Law Enforcement

This project created a more robust and effective enforcement component of ILDNR's invasive species program by increasing education and enforcement activities at bait shops, bait and sportfish

production/distribution facilities, fish processors, and fish markets or other food establishments known to prefer live fish for release or food preparation. Inspection and surveillance efforts will take place in the Chicago Metropolitan Area, including Cook County and the collar counties, with eventual expansion statewide and potentially across state boundaries. In FY 2024, this project will produce a minimum of ten organisms-in-trade-industry inspections, a minimum of five intelligence-based enforcement operations, and responses to all aquatic invasive species law enforcement-related threats throughout the year. Additionally, training of up to 120 statewide conservation officers in 2024 will further improve AIS surveillance.

MONITORING WORK GROUP

The Monitoring Work Group supports the MRWG in maintaining a portfolio of projects throughout the IWW that assist in developing, evaluating, and monitoring management actions that prevent Bighead, Black, Grass, and Silver Carp from establishing in Lake Michigan.

Invasive Carp Demographics

Detection and monitoring of invasive carp populations in the Illinois River are critical for achieving management goals. To address this important information need, natural resource agencies collaborate to implement a standardized multiple-gear sampling approach. This project will provide additional fisheries monitoring capacity for an existing standardized interagency sampling effort utilized by MRWG in the Illinois River and support the collection of key demographic data (e.g., total length, weight, age, sex, and maturity) for invasive carp captured in the lower six pools of the river. This project provides an additional sampling technique (the electrified dozer trawl) within the existing MAM and supports the acquisition of fishery population information for conducting statistically robust analyses of Silver Carp in the Illinois River. Results from the project will inform the development of a Statistical Catch-at-Age (SCAA) model for assessing Silver Carp abundance and response to management actions in the Illinois River. Data will be provided to the MRWG Modeling Work Group to inform the development and use of invasive carp population models, including the SCAA model, and evaluations of the relative importance of fishing mortality, fish movement, and natural mortality to observed changes in Silver Carp abundance.

Invasive Carp Demographics – Multiple Agency Monitoring Support

This project provides invasive carp catch data and age structure results in Illinois River pools to inform MRWG-supported models to prevent invasive carp establishment in the Great Lakes. This project has produced a comprehensive demographic dataset that includes a 6-year time series (2018 to 2023) spanning eight pools. In FY 2024, the project will continue to collect and process fisheries dependent and independent age structure data, quantify demographic rates, and inform modeling and management efforts (i.e., SCAA models and Spatially Explicit Invasive Carp Population [SEICarP] model).

Multiple Agency Monitoring of the Illinois River for Decision-Making

This project began in 2019 and utilizes a standardized, multi-gear sampling approach to (1) effectively monitor invasive carp population demographics (i.e., presence/absence, distribution, and abundance) and (2) assess native fish communities throughout pools of the Illinois River below the EDBS that may be adversely impacted by invasive carp. This project will utilize the Long-Term

Resource Monitoring (LTRM) sampling design to provide a more robust and statistically powerful fish population dataset than past monitoring efforts have produced.

HYDROACOUSTICS WORK GROUP

The Hydroacoustics Work Group provides information on trends in invasive carp abundance, size distributions, and habitat use through space and time in the IWW that inform and assess management actions.

Invasive Carp Stock Assessment in the Illinois River Using Hydroacoustics

This project continues previous work by Southern Illinois University (SIU) that has intensively monitored the movement and density of invasive carp in the Illinois River since 2012. A combination of hydroacoustic and telemetry tracking, and associated sampling surveys will yield information on trends in density, biomass, and population information, such as size structure, catch per unit effort, and length-weight relationships of invasive carp in the Illinois River. These surveys have been ongoing since 2012 and provide valuable long-term trends. SIU's contribution to continued model support will include maintenance of the Illinois River stationary telemetry array to document inter-pool movements, deployment of additional acoustic telemetry tags in bigheaded carp, and continued hydroacoustic monitoring of bigheaded carp densities throughout the Illinois River. Work comparing surrogate fish movements to bigheaded carps' movements will continue through FY 2024. In FY 2024, invasive carp density maps will be produced every other month in Marseilles and Dresden Island pools.

Illinois Waterway Hydroacoustics

Since 2016, hydroacoustic surveys have been completed biweekly-to-monthly to gain greater temporal resolution on fish abundance and distribution dynamics near the EDBS. This project continues to monitor fish abundance and distribution at the EDBS on a fine spatial and temporal scale to evaluate risk and inform contingency response and barrier maintenance scheduling. Information will be disseminated on changes in abundance and distribution near the EDBS and in downstream reaches to guide detection, response, and control efforts for invasive carp. In FY 2024, split-beam hydroacoustic surveys will be conducted immediately downstream of the EDBS to assess abundance and distribution patterns. Hydroacoustic scan results will be paired with U.S. Geological Survey (USGS) real-time telemetry summaries from the vicinity for the same dates. A pool scan of Dresden Island, Brandon Road, and Lockport will be conducted in the fall of 2024. Additional barrier and pool scans will be conducted at partners' requests to aid in barrier maintenance and contracted removal efforts.

TELEMETRY WORK GROUP

The Telemetry Work Group's purpose is to ensure the multi-agency telemetry efforts are coordinated to efficiently and effectively meet the MRWG goals of detection, management and control, and response. The objectives of the work group are to measure movement and distribution to inform management though (1) modeling efforts (e.g., SEICarP), (2) barrier evaluations, and (3) contingency and response efforts.

USGS Telemetry Project

Real-time telemetry receivers are deployed at strategic locations in channel and off-channel areas in the Upper Illinois and Des Plaines River systems and in the CAWS. The acoustic telemetry data supports modeling efforts and provides real-time telemetry data in support of barrier evaluations and contingency planning. The automated email distribution network alerts key MRWG and ICRCC members of detections of invasive carp in strategic locations. An updated model for estimating transition probabilities from telemetry data coming from a multi-agency network of acoustic receivers in the Illinois River was published in 2023. Transition probability estimates and their associated uncertainty will be updated through 2025 and used to parameterize population models such as SEICarP. In FY 2024, additional receivers and transmitters will be added to the Alton Pool and Pool 26, at the confluence of the Illinois and Mississippi rivers, to better estimate fishing or natural mortality and immigration or emigration to and from the Illinois River.

SIU Longitudinal Receiver Array and Tagging

This project detects patterns in the longitudinal movement of invasive carp within the Illinois River and contributes to the number of active transmitters for real-time receiver detections. In 2023, receivers were added to Alton and LaGrange pools. This project maintains adult invasive carp surveillance throughout the Illinois River to detect upstream movements. In FY 2024, SIU will tag 250 additional fish in Alton and LaGrange pools and maintain the receiver network throughout the Illinois River.

USACE Telemetry Monitoring Plan

Placement and maintenance of acoustic receivers will continue immediately above and below the EDBS to determine any tagged fish movement through the EDBS. Common carp will continue to be tagged as surrogates for bigheaded carp in Brandon Road and Lockport pools to further evaluate movement around the EDBS as well as pool-to-pool movements. Invasive carp tagging in Dresden Island Pool will continue to inform removal at the invasion front. Additional receivers will be placed in areas where invasive carp are typically collected, such as backwaters and marinas, to further inform removals. Collaboration with Constellation Energy Dresden Island Nuclear Power Plant is in progress to determine invasive carp use of the plant's waterways.

Telemetry Support for Population Modeling

This project provides support for the inter-agency telemetry array deployed in the Illinois River basin. The USFWS FY 2024 plan of work includes placing 150 acoustic transmitters in Silver Carp and Bighead Carp in the Peoria and Starved Rock pools, as well as the operation and maintenance of the telemetry array in these pools. The data gained from the additional tagged fish will improve the accuracy of MRWG modeling work, allowing improved estimates of current levels of exploitation and bolstering estimates of large-scale pool-to-pool movement.

REMOVAL WORK GROUP

The Removal Work Group's primary objective is to capture and remove invasive carp in the Upper Illinois River via contracted commercial fishing efforts to reduce the risk of upstream migration and minimize propagule pressure on the EDBS. This data will be used to help refine population models to inform future removal efforts.

Contracted Commercial Fishing Below the Electric Dispersal Barrier

Contracted commercial fishing below the EDBS uses contracted commercial fishers to reduce Bighead Carp, Black Carp, Grass Carp, and Silver Carp numbers and monitor for their expansion in the upper Illinois River and lower Des Plaines River downstream of the EDBS. The project aims to decrease invasive carp numbers, resulting in anticipated reduction of migration pressure toward the barrier, lessening the chances of invasive carp gaining access to upstream waters in the CAWS and Lake Michigan. Contracted commercial fishers assisted by agency biologists will fish four days per week during each week of the field season, except for two weeks in June and two weeks in September. In FY 2024, the goal is to remove approximately 1 million pounds of invasive carp from this portion of the IWW. Monitoring for upstream expansion of invasive carp should help identify changes in the leading edge, distribution, and relative abundance of invasive carp in the IWW.

Invasive Carp Enhanced Contract Removal Program

This program reduces the abundance of invasive carp in Peoria, LaGrange, and Alton pools through controlled and contracted fishing efforts. This program issues fishing contracts to commercial fishers willing to target invasive carp in these three pools and fulfill contractual obligations of selling, reporting, transporting, and fishing in the identified area. This project also provides critical information about population densities of invasive carp through time in the lower three pools of the Illinois River to guide management efforts. This project works to identify and employ mechanisms for the use of harvested fish by private industry, including human consumption. A cooperative relationship of agencies, fishers, markets, and end users will provide advice and support to further inform fishers on the quality and quantity of fish in demand. In FY 2024, the project goal is to remove approximately 6 million pounds of invasive carp in the lower Illinois River, subject to market forces, and thus reduce the number of fish reaching the upper Illinois River.

MODELING WORK GROUP

The Modeling Work Group focuses on providing quantitative support and guidance for bigheaded carp monitoring and removal in the Illinois River.

USGS Invasive Carp Database Management and Integration Support

This project uses data compilation and analysis to inform ongoing management and control actions. Continued maintenance and data compilation of the FishTracks Telemetry Database, Invasive Carp Database (CarpDAT), and Illinois River Catch Database of monitoring and removal effort data into a centralized database facilitates data standardization, quality, accessibility, sharing, and analysis to aid in invasive carp removal efforts, evaluations of management actions, and modeling efforts (e.g., SEICarP model). Data summarization, visualization, and modeling support a better understanding of bigheaded carp life history, behavior, and habitat use. Integrating invasive carp-related data and analyses into decision support tools and products aids in applying control and containment methods

in an informed and transparent manner. In FY 2024, FishTracks will be updated, and CarpDAT will be deployed and used to improve the efficiency of invasive carp management and research.

Support for Invasive Carp Population Modeling in the Illinois River

This project will develop objective, data-driven models to inform decisions concerning invasive carp control efforts in the Illinois River. This project will result in population status estimates and identify management recommendations that, when implemented, should minimize the number of invasive carp challenging the EDBS. Initial management recommendations can be provided from the SEICarP model, which is entering the production phase. To estimate the population size and harvest mortality of Bighead Carp and Silver Carp in the Illinois River, the MRWG Modeling Work Group is using catch statistics, age and growth data, and telemetry-based movement data (e.g., data received from the Removal, Monitoring, and Telemetry Work Groups and the enhanced contract harvest program) to begin developing an SCAA model. Once operational, these models can be used iteratively to set management targets, estimate the effectiveness of management actions, and recalibrate management targets based on this new information.

BEHAVIORAL DETERRENCE WORK GROUP

The goal of the Behavioral Deterrents Work Group is to provide current information to the MRWG co-chairs on the deployment, operation, and evaluation of behavioral deterrents for invasive carp.

Operation and Maintenance of the Electric Dispersal Barrier System

The U.S. Army Corps of Engineers (USACE) operates three electric dispersal barriers (Barrier 1, Barrier 2A, and Barrier 2B) for aquatic invasive species in the Chicago Sanitary Ship Canal (CSSC), collectively referred to as the EDBS. The USACE has operated electric barriers in the CSSC since 2002. Over the years, several operational and procedural improvements have been implemented to improve the effectiveness, and continuously deliver an uninterrupted flow of, electricity to the water to deter fish. In FY 2024, USACE will continue to operate and maintain the barriers and complete currently underway construction efforts.

Underwater Acoustic Deterrent System

The underwater acoustic deterrent system (UADS) is comprised of 16 speakers playing engineered signals in the lock approach channel of Lock 19 in Keokuk, Iowa. The UADS at Lock No 19 will operate for one more year through FY 2024. This fourth year of operation in FY 2024 will focus on increasing tagged Silver Carp and native species of concern. Additional data from the UADS study will be presented in summer 2024.

Additionally, this project will produce analyses of the UADS deployment on the Illinois River at Morris, Illinois. A series of 18 speakers was deployed in the Heidelberg Materials gravel pits in Morris, IL, and experimentally operated for 3 years during the spring through fall. Results of the study will be presented in mid-2024.

Carbon Dioxide

This project will complete the planning for implementation of a carbon dioxide (CO2) injection system in the CAWS as an added invasive carp deterrent technology at the EDBS. This project will assess the feasibility of using CO2 as a deterrent to prevent invasive carp from moving into and

becoming established in the Great Lakes by clearing fish from the EDBS after maintenance shutdowns. Activities in FY 2024 include work by the project team to coordinate with regulatory authorities to identify, complete, and acquire all necessary permits for field testing; validate fluid dynamic models; identify locations and specifications for structural modifications to allow installation of invasive carp deterrents (e.g., identify locations where the canal wall could be modified or notched to allow installation of invasive carp deterrents without risk for interference with vessels); and develop needed contract documents for field testing.

BLACK CARP WORK GROUP

The Black Carp Work Group works within the Illinois River and many other parts of the Mississippi River Basin to better understand the biology, distribution, and abundance of Black Carp in the U.S. The Black Carp Work Group identifies management actions, monitoring, and research that help limit the distribution and abundance of Black Carp, prevent their spread into the Great Lakes, and minimize their effect on native mollusks.

Enhanced Detection of Black Carp in the Lower Illinois River

This project will monitor for invasive Black Carp and determine their abundance in the Illinois River. This project will result in relative abundance estimates that can be used to assess the impacts of management activities. In FY 2024, the ILDNR will continue sampling for Black Carp using hoop nets augmented with experimental baits to assess the Black Carp population in the lower Illinois River and the efficacy of different baits used for collection. Expanded hoop netting efforts will be conducted in main- and side-channel habitats during three sampling periods conducted between June 15 and October 31, similar to ongoing standardized LTRM hoop netting efforts. Relative abundance estimates will be used to detect Black Carp population status changes and to help inform and assess management actions.

Data Collection from Commercial Fishers and Recreational Angler Captures of Black Carp in the Lower Illinois River

The ILDNR will continue monitoring the occurrence and potential range expansion of Black Carp within the upper Mississippi River basin (including the Illinois River) through incentive payments to recreational anglers and commercial fishers who submit harvested Black Carp for data collection and analysis. The geographic scope of the Black Carp reward program will include all waters in the upper Mississippi River basin. A payment of $100 will be provided to anglers and commercial fishers for each wild-caught Black Carp that they report and submit. There is a maximum of $1,000 in reward payments to any individual for Black Carp collected in a given location during a one-week period. This project will continue through September 2024. In October 2024, the program will be modified to include length, weight, and age structure information.

ATTACHMENT 1
MRWG Strategic Vision: 2023 -2027

MRWG Strategic Vision: 2023 -2027

The Monitoring and Response Work Group (MRWG) is the action arm of the Invasive Carp Regional Coordination Committee (ICRCC) working to monitor the Upper Illinois Waterway (IWW) and the Chicago Area Waterway System (CAWS) for invasive carp to manage invasive carp populations (Bighead Carp, Silver Carp, Grass Carp, and Black Carp) and to respond to any changes in the status of invasive carp in the upper IWW.

The projects undertaken by the MRWG are designed to address three primary objectives for preventing the spread of invasive carp to Lake Michigan. These objectives are:

- **Detection:** Determine the distribution and abundance of invasive carp to guide response and control actions.
- **Management and Control:** Prevent the upstream passage of invasive carp upstream of Brandon Road Lock and Dam toward Lake Michigan using barriers and mass removal, and understanding the best methods for preventing passage.
- **Response:** Establish comprehensive procedures for responding to changes in invasive carp population status, test these procedures through exercises, and implement if necessary.

The short-term strategic vision laid out below is dependent on continued funding at levels consistent with previous years to sustain aggressive removal efforts that reduce the risk of range expansion, as well as to continue focused surveillance to ensure that management agencies have an accurate understanding of changes to invasive carp range, population dynamics, and behavior.

Purpose

This strategic vision is intended to provide foundational guidance for detection, management, control, and response activities in the annual Monitoring and Response Plan (MRP) for 2023 to 2027. The overarching purpose of this strategic vision is the prevention of expansion of invasive carp populations within the Illinois waterway system and the protection of the Great Lakes from invasion by Bighead, Silver, Grass, and Black Carp. It reflects the collective input of the MRWG agency leads and MRWG co-chairs.

Detection

Determine the distribution and abundance of invasive carp to guide response and control actions.

- Maintain a comprehensive and complementary suite of detection activities (physical detection, telemetry, eDNA, etc.) that efficiently and effectively informs ongoing adaptive management and control or response needs.
    - Ensure sufficient detection effort is deployed through standardized multi-agency monitoring throughout upper IWW, Des Plaines, and Kankakee rivers to maintain ICRCC and MRWG leadership confidence that invasive carp are not present, including:

        - Detection for invasive carp upstream of the Electric Dispersal Barrier System (EDBS) in Romeoville, Illinois, through bi-annual eDNA and Seasonal Intensive Monitoring.
        - Annual assessment and status of adult fish, small fish, larvae, and eggs, as outlined in the Monitoring and Response Plan for each pool between Starved Rock Lock and Dam and the EDBS.
    - Adapt actions as appropriate to guide decisions and response planning through annual work group communication and coordination via the annual MRWG meetings.
    - Evaluate the amount and types of effort needed to most effectively characterize the risk of invasive carp upstream of Brandon Road Lock and Dam.
- Maintain alternative pathway surveillance.
    - Conduct invasive carp surveillance in Chicago area ponds using trammel nets and electrofishing every 5 years or when a verifiable invasive carp record is received.
    - Coordinate, train, and support law enforcement staff in intelligence gathering, commercial inspections, and enforcement actions related to invasive carps.

Management and Control

Prevent the upstream passage of invasive carp toward Lake Michigan using barriers and mass removal, and understanding the best methods for preventing passage.

- Support the development, testing, and/or operation of behavioral deterrents aimed at reducing or eliminating upstream movement of invasive carp.
    - Support optimal operation and maintenance of a state-of-the-art EDBS in the CAWS with ongoing effectiveness evaluation.
    - Support the design, installation, and evaluation of an effective carbon dioxide (CO2) deterrent system to function as a clearing mechanism in support of the EDBS.
    - Support the design, installation, or evaluation needs of the multi-deterrent system to be installed at Brandon Road Lock and Dam.
- Remove invasive carp from between Starved Rock Lock and Dam and Brandon Road Lock and Dam to reduce upstream propagule pressure at the leading edge of the population. This work will complement efforts further downstream to reduce invasive carp biomass.
    - Conduct annual contract fishing to suppress invasive carp to reduce densities to 2015 levels or lower.
        - Target: Reduce the estimated biomass of invasive carp in the Dresden Island Pool by an additional 25 percent from the biomass observed in 2020.
        - Target: Reduce the estimated biomass of invasive carp in the Marseilles Pool by an additional 25 percent from the biomass observed in 2020.
        - Target: Reduce the estimated biomass of invasive carp in the Starved Rock Pool by an additional 25 percent from the biomass observed in 2020.
    - Maintain or increase annual removal of 1.1 million pounds of invasive carp between Starved Rock Lock and Dam and Brandon Road Lock and Dam.
- Evaluate attractant, deterrent, and repellent technologies in combination with contracted fishing to increase harvest.

- Enhance existing commercial fishing downstream of Starved Rock Lock and Dam to increase harvest of invasive carp in source areas of the IWW.
  - Implement branding and marketing strategy to support commercial utilization.
  - Expand commercial fishing incentives downstream of Peoria Pool.
  - Increase removal/harvest in this part of the river to 20 million pounds annually by 2027.
- Evaluate and adaptively improve effectiveness/efficiency of all ongoing management and control actions.
  - Refine survey techniques to provide reliable estimates of invasive carp biomass per unit area in the IWW downstream of the Brandon Road Lock and Dam.
  - Improve the Spatially Explicit Invasive Carp Population (SEIcarP) model predictions through integration of telemetry results and revised population vital rates to evaluate effectiveness of removal efforts.
  - Develop additional population and movement models to assist MRWG and ICRCC leadership with resource allocation decisions.
  - Adaptively refine removal strategies based on lessons learned and new technologies identified to continually improve efficiency and effectiveness.
  - Integrate effective technologies to enhance control activities to herd or attract carp, such as modular electric barriers, algal attractants, acoustic deterrents and attractants, and use of CO_2.
- Leverage MRWG experience and expertise to support the development of invasive carp management and control strategies in other waterways, as requested.

Response

Establish procedures for responding to changes in invasive carp population status, test these procedures through exercises, and implement if necessary.

- Maintain effective response capability within 48 hours or less of detected population changes deemed actionable per the Contingency Response Plan.
  - Develop appropriate tabletop exercises annually and incorporate lessons learned into the Contingency Response Plan.
    - Recommend training when agency personnel change to maintain operational familiarity with Incident Command System structures and principles.
    - Identify, evaluate, and integrate potential new technologies for use in responses.
  - By 2023, evaluate the population status metrics for each pool and the suite of available response tools available for use within the Contingency Response Plan for future years.
- Review barrier operations and operational changes in close collaboration with U.S. Army Corps of Engineers and MRWG members during the annual MRWG meeting to ensure effectiveness at preventing upstream movement of carp.