Mississippi River Basin Panel on Aquatic Invasive Species

Panel Coordination Meeting at Barr Lake State Park in Brighton, Colorado

Compiled Member Reports

July 24, 2023

Table of Contents

State of Alabama

Submitted by Dave Armstrong

Invasive Carp (IC)

Efforts by Alabama Div. of Wildlife and Freshwater Fisheries (ADWFF) staff were expended on evaluation of potential sample sites, assistance to other cooperators, collection of monitoring data and eradication. Work within the IC project was performed within the four (4) Tennessee River impoundments in Alabama, including Pickwick, Wilson, Wheeler, and Guntersville Reservoirs. Field work on these management actions included:

- Thirty-one (31) field days were spent on fall and spring monitoring of invasive carp abundance/distribution (objective 1) data at 33 fixed-sites using an occupancy strategy developed fall 2022. Each site is comprised of gillnet and electrofishing reps (n=264 samples), repeated over four consecutive days. Four (4) additional field days were expended on six tailwater samples using the Early Detection protocol. Five Silver carp were either captured or sited during these efforts, ALL within the lowermost Alabama reservoir at Pickwick Lake.
- Forty (40) days were spent on telemetry receiver data retrieval at Guntersville Dam locks, assisting Tennessee Tech University with receivers, assisting USGS with collections of Silver carp for tagging and on-site assessment of sample sites for transect and depth data.
- Staff have finalized a "BOL sign" design for invasive carp to be placed at access sites in the lower Tennessee River during July-August 2023.

ANS State Grant Activities in Alabama, 2022-2023

The following summarizes "non-carp" invasive aquatic species control activities by ADWFF staff.

- With acceptance of the Alabama ANS plan, ADWFF staff secured an invasive species state funding grant to address "non-carp" issues.
- A new ANS biologist, Adrian Stanfill, was hired to assist carp collections and implement new ANS grant objectives. The Alabama ANS program now has a working staff comprised of three people.
- Staff have begun tracking a variety of snail and aquatic plant siting's for documentation to USGS; development of new ANS rack card and tri-fold pamphlets for general public; development of an aquaculture and pet store listing of acceptable commercial species.
- ADWFF staff assisted USFWS (Tupelo FWCO) staff with carp signage placement on the Tennessee-Tombigbee River.
- Longtime management activities and data on apple snails located in the Threemile Creek watershed (Mobile, AL) are being compiled/analyzed for a journal manuscript targeted for 2024.

State of Arkansas

Submitted by Matt Horton

Invasive Carp Removal Program

The Invasive Carp Removal Program continued removal efforts in the Arkansas and White River systems. Maintaining the program's five part-time staff positions who conduct removal efforts has been a significant challenge. The program utilizes two boat crews, but staff turnover has limited removal to one boat crew for several months during this timeframe. As of May 31, 2023, the program had removed 8,824 invasive carp totaling 147,248 pounds (128,091 lbs. Silver Carp, 10,732 lbs. Bighead Carp, 8,356 lbs. Grass Carp, and 70 lbs. Black Carp) since removal efforts began in October 2021.

The Invasive Carp Removal Program hosted two new staff from the Kansas Department of Wildlife and Parks on October 11th-13th. KDWP was starting in-house removal efforts, and sent their new staff to learn about equipment, sampling gear, and techniques our program utilizes to capture and remove invasive carp.

New ANS Regulations

On January 1, 2023, AGFC implemented several regulation changes to help prevent the spread of ANS. These include 1) addition of White Perch and Marbled Crayfish to the list of prohibited species; 2) addition of Code 19.20, which prohibits possession of 17 invasive aquatic plants, one algae species, and Didymo on properties owned, managed, or controlled by the AGFC; and 4) changed the definition of "game fish parts" that are illegal to use as bait to include gametes (including fresh or frozen eggs or milt).

ANS Funding Opportunities

The ANS Coordinator submitted applications for the FY2023 State and Interstate Aquatic Nuisance Species Management Plan and Aquatic Plant Control in the Southeast grants. These funding opportunities will help support implementation of the Arkansas ANS Management Plan and increase efforts to control/eradicate Giant Salvinia in Lakes Erling and Columbia.

Invasive Carp Control Funding Opportunities

The ANS Coordinator and Invasive Carp Biologist submitted an application for FY2023 federal invasive carp grant funds to support five invasive carp control projects in LMR and ARW sub-basins within Arkansas. Two projects are for the continuation of the AGFC Invasive Carp Removal Program in the ARW and LMR sub-basins. Two projects are for the implementation of an Arkansas Invasive Carp Market Stimulation Project in both the ARW and LMR sub-basins. The goal is to encourage market development and

incentivize commercial harvest to provide greater capacity for biomass removal in Arkansas waters and within the LMR and ARW sub-basins. Funding would support per pound subsidies to commercial fishers, start-up fishing supplies such as gill nets, and access to equipment such as ice machines to Arkansas commercial fishers that sign up for the program. The AGFC will also partner with the Arkansas Economic Development Commission to identify buyers for fishers to sell invasive carp to and provide assistance to individuals, businesses or other entities who seek to increase processing capacity or develop market products from invasive carp in the state. The other project is for a multi-year study to identify backwater habitat where juvenile Silver Carp are recruiting in the lower Arkansas and White Rivers, as well as identifying natal origin of any juvenile carp to determine if they originated from Arkansas waters.

ANS Reporting

The Arkansas ANS Task Force developed an iNaturalist collection project called "Arkansas Aquatic Nuisance Species" to help increase ANS early detection efforts by reaching audiences who may not be familiar with AGFC reporting options. The project is monitored by the AGFC ANS Coordinator and members of the Task Force. AGFC still maintains an online reporting form on the agencies ANS webpage.

In June, the ANS Coordinator submitted all verified aquatic invasive species reports from Arkansas to the USGS NAS Database. AGFC's reports were last updated in the NAS Database in 2018.

On November 15, 2022, a Black Carp was caught by a commercial fisherman in Pool 8 of the Arkansas River. This was the first observation of Black Carp above Pool 2 in the Arkansas River. The fish was sent to USGS for collection of biological data, and the report was updated in the NAS Database.

The ANS Coordinator developed and distributed new signs for public boat ramps at 20 water bodies in south Arkansas that are at greatest risk of Giant Salvinia introductions. The sign reads "Protect Our Water Bodies: Report Giant Salvinia", and provide images of the plant, ANS Coordinator phone number, and QR code to ANS webpage for reporting ANS.

Decontamination Equipment

The ANS Coordinator acquired heated pressure washers for 13 AGFC regional and field office and fish hatcheries throughout the state. The equipment ensures all staff have access to proper equipment for decontaminating boats, trailers, heavy equipment, and sampling supplies to prevent the spread of ANS and pathogens. Six of the pressure washers were purchased with Zoonotic Disease Initiative grant funds and seven were purchased by AGFC.

In January, the ANS Coordinator installed a CD3 Wayside Solar watercraft cleaning station at AGRED Park on Lake Erling. This was the first watercraft cleaning station installed on Arkansas public waters for ANS prevention. The cleaning station is free to the public and provides tools for boaters to clean, drain and

dry their boats, trailers, and fishing and hunting equipment to prevent the spread of giant salvinia from Lake Erling. The station's software system documented 72 tool use sessions in the first 5 months.

ANS Outreach Efforts

The following are ways the ANS Program increased public awareness of ANS management activities, regulations, reporting, species identification, and prevention behaviors from September 2022 – June 2023:

- AGFC Fishing & Trout Fishing Guidebooks
- Arkansas Boating Laws and Responsibilities Handbook
- AGFC Arkansas Wildlife Newsletter articles
- AGFC Arkansas Wildlife Magazine articles
- AGFC Wild Science Webinar
- AGFC Farm Pond Management Workshop
- AGFC Commission Presentations
- AGFC Fisheries Division Facebook posts
- AGFC Fisheries Division Constant Contact emails
- Targeted social media ads (Facebook & Instagram)
- Targeted radio spots (statewide)
- Presentations to Friends of Lake Ouachita & Central AR Auxiliary Coast Guard Unit
- Updated Arkansas AIS Fact Sheet for MICRA's annual Washington DC fly-in

Statewide Aquatic Invasive Plant Control

The AGFC continued efforts to monitor and control aquatic invasive plants across the state. From September 2022 – June 2023, AGFC spent over $150,000 on contracted chemical control of Giant Salvinia, Alligator Weed, Cuban Bulrush, Curly-leaf Pondweed, and Water Hyacinth. Curly-leaf Pondweed has become a problem in northwest Arkansas. Cuban Bulrush was identified in Lake Erling for the first time. Five acres were treated with herbicides prior to a five-foot drawdown in September. Treatments appear to be successful but staff continue to monitor the lake. Management drawdowns and herbicide treatments were conducted on Lakes Erling and Columbia to control Giant Salvinia. Control efforts along with subfreezing winter temperatures continue to keep Giant Salvinia densities minimized in both lakes.

Giant Salvinia was reported in Mercer Bayou for the first time on September 2, 2022. Rapid response efforts to determine distribution, contain, and eradicate Giant Salvinia were conducted. Luckily, it was reported early and isolated to a narrow canal that leads from the boat ramp to the bayou. Containment booms were installed to contain the plants in the canal. All visible plants were physically removed by hand. It appeared Giant Salvinia was introduced by someone's boat trailer. Mercer Bayou was closed to

the public during the initial response, to prevent spread and accidental transport of the plants. A contractor was hired to apply herbicides to denude the canal of all vegetation, to aid in inspections, and kill any remaining Giant Salvinia. After several lake-wide inspections, as well as inspections within the canal, eradication was determined to be successful and Mercer Bayou was opened to the public on September 21st. This was the fifth introduction in Arkansas since it was first reported in 2017.

To aid in control and prepare for new Giant Salvinia introductions, the ANS Coordinator purchased two 50-gallon high pressure spray rigs and 2,500 feet of containment boom with ANS Management Plan grant funds. Also, a trailered hydraulic boom reel was purchased, which houses the boom for rapid deployment anywhere in the state.

Hydrilla Genetics Study

The ANS Coordinator provided Hydrilla samples for a nationwide study, supported by the USACE, to determine the distribution of Hydrilla biotypes and identify introductions of new strains in the US. Samples were collected from seven water bodies (Lakes Maumelle, DeGray, Ouachita, Cane Creek, Felsenthal, Smith Park, and Millwood). The only results reported thus far is Lake Maumelle has both monoecious and dioecious biotypes.

Northern Snakehead eDNA Validation Study

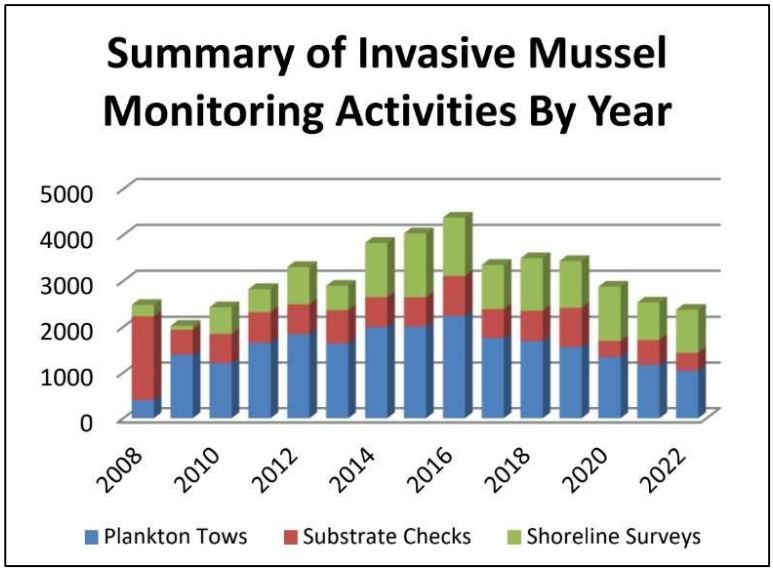
In October, AGFC and USGS staff collected water samples for eDNA analysis and validated presence/absence of Northern Snakeheads from five snakehead positive and two snakehead negative water bodies in southeast Arkansas. The USFWS led project includes representatives from USFWS, USGS, and AGFC. Once the eDNA samples are analyzed, the workgroup will begin development of an occupancy modeling study. The end result will be a Northern Snakehead eDNA sampling protocol for Arkansas and other states with similar habitats.

State of Colorado
Colorado Parks and Wildlife

Submitted by Robert Walters

Sampling/Monitoring

CPW has sampled 584 “at-risk” waters for aquatic invasive species since inception. While CPW ANS staff has historically monitored the state’s public waters for numerous invasive plants and animal species, and cataloging native species along the way, the focus of sampling is on the early detection of zebra and quagga mussels.



The state follows a three-tier sampling protocol targeting the three life cycles of the zebra or quagga mussel: (1) conducting plankton tows to find the veligers, (2) deploy and check substrates to find the juvenile “settlers” or attached adult mussels and (3) conduct surveys along the shoreline and existing structures for settled juveniles or attached adults.

The state requires three steps to identify, verify and confirm a detection of zebra or quagga mussel veligers: (1) visual analysis of plankton tows using a cross-polarized light microscope (2) DNA verification utilizing polymerase chain reaction [PCR] and (3) DNA confirmation utilizing gene sequencing.

In 2022, crews sampled 180 standing, and 14 flowing waters statewide. In addition to the sampling efforts performed by CPW, the National Park Service contributed 56 plankton samples.

The sampling teams conduct early detection sampling for zebra and quagga mussels on public lakes and reservoirs. CPW has met western regional minimum standards for zebra and quagga mussel monitoring.

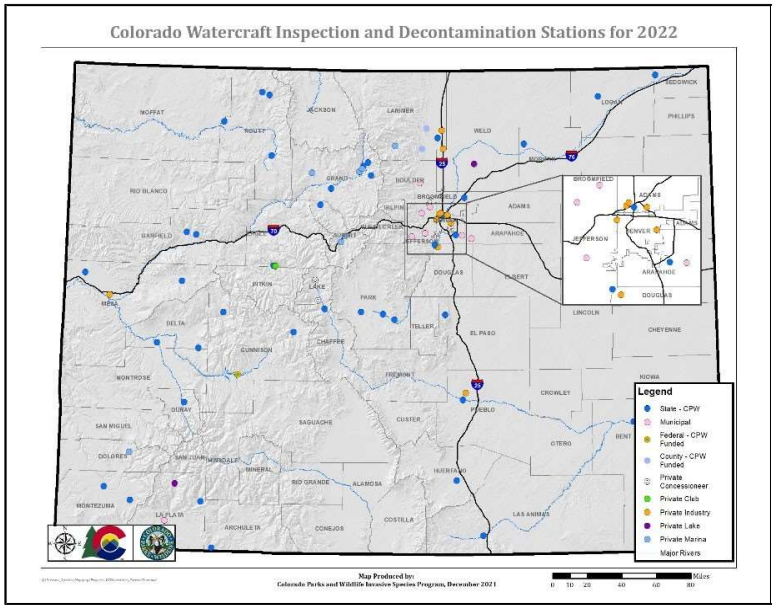
Zebra Mussels at Highline Lake

Zebra mussels detected at Highline Lake

In 2022 CPW's early detection monitoring program detected adult zebra mussels in Highline Lake near Mack, Colorado. This detection is the first time that adult invasive mussels have been detected in Colorado's waters. CPW's detection of this species in the early stages of invasion has allowed the implementation of a rapid response plan that is focused on stopping the spread of zebra mussels into additional waters of the state. While this new detection undoubtedly presents new challenges for the state, it highlights the effectiveness and necessity of the early detection monitoring program and the systems & resources CPW has in place to efficiently respond to a new detection.

Watercraft Inspection and Decontamination (WID)

CPW coordinates a vast network of WID stations operated by CPW, the National Park Service, Larimer County, several municipalities, and numerous private industry locations including businesses, concessioners, marinas, clubs and private lakes. In total, the state has collectively performed over **6.5 million inspections** and **199,465 decontaminations** since 2008.



Per the state ANS Regulations, trailered watercraft must submit to an inspection, and decontamination if needed, prior to entrance in Colorado's waters following boating out of state or boating on a positive or suspect water. Boaters are also required to submit to an inspection prior to launching into a water body where inspections are required by the managing agency. All persons performing inspections and/or decontaminations must be certified by CPW.

CPW taught 30 WID certification courses in 2022, in addition to maintaining an online re-certification program for experienced inspectors and decontaminators. There have been a total of 1003 training courses since the program's inception. In addition to the online course for experienced staff, the Invasive Species Program within CPW also provides two other specialized courses: (1) WID Trainer's certification and (2) Advanced Decontamination. CPW certified 705 individuals this year, for a total of 9,913 people certified or re-certified to perform WID since the implementation of statewide training and certification program in 2009.

In 2022, CPW authorized 74 locations to perform watercraft inspection and decontamination. Thirteen locations operated as containment for other ANS. The focus of the containment program is to inspect watercraft leaving the lakes/reservoirs to prevent boats from moving ANS overland into currently uninfested areas, while maintaining prevention activities upon entrance to the reservoir.

Sixty locations operated as prevention locations. Prevention locations are those that are negative for all ANS or are not located at a waterbody (e.g., offices or marine dealers).

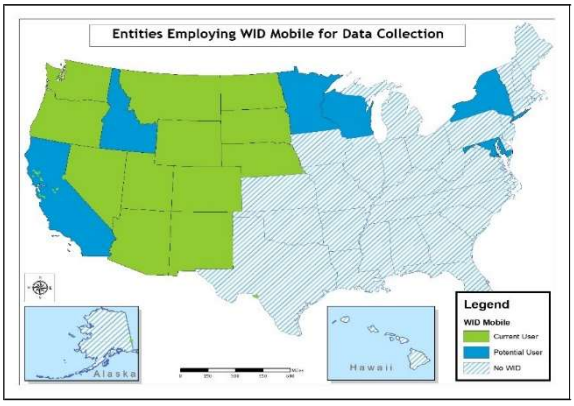
Colorado conducted a total of **446,663 inspections and 27,003 decontaminations** in 2022. There continues to be a large increase in the number of decontaminations performed as a direct result of CPW adapting to mitigate new threats. Increased invasions in the Colorado River Basin, from Lake Powell in Utah and Arizona downstream, continue to increase the need for diligent prevention at home in Colorado.

Regional WID Data Sharing System

The Regional WID Data Sharing System (System) is in use at more than 200 locations across the west, including 54 in Colorado. CPW developed the System and maintains ownership and oversight. The states of Arizona, Montana, Nebraska, Nevada, New Mexico, Oregon, South Dakota, North Dakota, Utah, Washington, and Wyoming as well as the National Park Service, Lake Tahoe Regional Planning Agency, Solano County Water Agency, County of Lake, Mussel Dogs, and TiGE are now employing the System as their primary form of data collection and management.

The purpose of the System is to record information related to WID electronically and to share information in a timely manner across jurisdictions to aid collaborative efforts to prevent the spread of zebra and quagga mussels and other ANS. The System consists of a mobile application, website, and shared database hosted on a private server. The mobile application is compatible on all iOS and Android devices. This reduces the operating costs for mobile data collection and data entry while increasing accuracy. It provides for improved reliability in data collected in the field at WID stations, in addition to rapid query capacity for on-demand reporting. Lead agencies are able to customize the user interface of the mobile application in alignment with both western regional standards and state or local laws, regulations, and priorities.

The System is used for data entry, viewing, editing, querying, and reporting. An included risk assessment tool shows where boats are moving after launching in mussel infested waters and sends an alert to the next known destination. With the benefits of data sharing proving to be abundant, the states of Arizona, Nevada and Utah have been using the System to send out timely electronic alerts of watercraft leaving infested waters. This increased timely communication has directly increased the number of infested watercraft being intercepted within the western region before launching in uninfested waters.



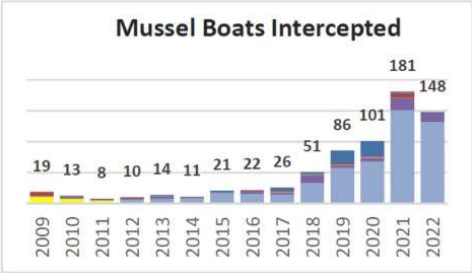
CPW manages and operates the System through a private industry contract utilizing federal grant dollars. The data itself is the property of the state agency that input the information. CPW leads a Governance Committee, consisting of user organizations that is charged with evaluating and prioritizing requests,

changes, and enhancements. The Governance Committee works collaboratively to determine the viability and usefulness of new technologies.

Implementing HB21-1226 – More Robust Aquatic Nuisance Species Check Stations

HB21-1226 authorized Colorado Parks & Wildlife to implement a roadside watercraft inspection & decontamination program. During the 2022 & 2023 field seasons, CPW is implementing a two-year pilot of this program. In 2022, CPW, in collaboration with CDOT & Port of Entry staff, implemented the first year of this pilot program at the eastbound Loma Port of Entry over the course of three days. This location was selected due to the high volume of boats traveling from Lake Powell towards Colorado. In total, 138 watercraft were inspected, 60 were decontaminated including 26 which were confirmed to have adult mussels. This initial effort has shown that the program can be effective at intercepting & decontaminating mussel fouled watercraft before they enter into the interior of the state. CPW is looking towards other ports of entry and border areas for year two of the pilot program to more broadly inform the potential long-term implementation of this program.

Mussel Boat Interceptions



In 2022, CPW intercepted 148 watercraft infested with zebra or quagga mussels coming from out of state. In 2021, the state intercepted 181, in 2020 the state intercepted 100, in 2019 the state intercepted 86, in 2018, the state intercepted 51 and in 2017 the state intercepted 26 infested watercraft. The average prior to that was 16 interceptions each year. This exponential growth in infested boat interceptions is directly related to the growing threat invasive mussels pose to Colorado's water infrastructure, natural resources, and outdoor recreation. All of these watercraft were fully decontaminated prior to being allowed into Colorado's waters. Since 2009, a total of 711 boats with adult zebra or quagga mussels have been intercepted coming into Colorado.

Information and Outreach

CPW and partner agencies have implemented a comprehensive, multi-faceted, public education campaign focused on boaters and anglers to prevent the spread of ANS utilizing a variety of mediums. The invasive species program within CPW has been conducting information, education and outreach efforts for terrestrial and aquatic plants (noxious weeds), animals, insects, and diseases. Accomplishments include distribution of tens of thousands of printed rack cards, brochures, handouts, DVDs, posters and signs at offices, boat ramps and water-access points.

In addition, staff have implemented an aggressive media relations campaign, using press releases and conducting web-based, radio, print and television interviews. CPW staff hosted numerous outreach seminars to boating and angling groups, marine dealers, HOAs, watershed groups, basin roundtables, ditch companies, municipal water managers and providers, schools and youth educational opportunities.

Colorado Aquatic Nuisance Species Management Plan

The State of Colorado Aquatic Nuisance Species Management Plan was approved by the National Aquatic Nuisance Species Task Force in 2020. This plan, which was originally conceptualized in 2006, has been collaboratively developed by CPW, the Colorado ANS Task Force, and the ANS program's diverse group of stakeholders. The approval of this plan makes Colorado eligible to receive federal funding to support the implementation of the plan and sets a clear path forward for preventing & managing ANS in Colorado.

State of Iowa, Department of Natural Resources

Submitted by Kim Bogenschutz

Final Iowa DNR Aquatic Invasive Species Program update for 2022

The Aquatic Invasive Species Program (DNR–AIS) staff in 2021 consisted of 1 full-time Coordinator/Natural Resources Biologist, 1 full-time Vegetation Management/Natural Resources Biologist, 1 full-time Natural Resources Technician, and 17 seasonal Natural Resources Aides (i.e., watercraft inspectors, survey crews).

Major accomplishments 2022 included the following:

- Conducted 2,671 watercraft inspections reaching 7,358 people on 79 waterbodies.
- Conducted 106 angler interviews on 22 trout streams.
- Completed 163 full-lake vegetation surveys.
- Surveyed vegetation at 467 access points on 53 lakes
- Chemically treated invasive aquatic plants in 29 waterbodies
- Continued a multi-year project testing the use of Sonar as an under-the-ice treatment for curlyleaf pondweed.
- Surveyed for adult zebra mussels in 4 lakes.
- Placed 76 zebra mussel veliger settlement samplers in 22 lakes and reservoirs.
- Collected 81 water samples from 47 lakes and reservoirs and analyzed them for zebra mussel veligers.
- Supported 28 partnerships and cooperative projects.
- Gave 22 live and virtual presentations at conferences, outdoor events, and trainings.
- Used geo-fencing to target 400,000 ads to visitors at 65 boat ramps.
- Ran 100,000 OTT commercials, videos and displays targeting registered boat owners.
- Served over 70,000 pre-roll video ads and over 400,000 digital impressions targeting boaters in Iowa .
- Ran 330 commercials on Des Moines television stations and Dickinson County radio stations.
- Displayed a digital billboard for 3 months in Dickinson County.
- Recorded a segment for the Iowa Live television program.
- Targeted water recreationists with AIS prevention messages using news station tickers, website takeovers and banner ads, boat ramp signs, news releases, social media and displays.
- Collaborated with Iowa State University and the U.S. Fish and Wildlife Service to acquire grants for 7 Bighead and Silver Carp projects in the Upper Mississippi and Missouri River Basins in Iowa.
- Initiated an online permit application system for lakeshore owners and commercial companies to transport harvested aquatic plants to local landfill green waste sites.
- Purchased supplies for DNR Fisheries management stations and hatcheries to prevent the spread of AIS during operations.
- Submitted Proposal and Paperwork for Grant F22AP02665 from the USFWS.

  Five new infestations of Eurasian watermilfoil (four are connected lakes) and five new infestations of brittle naiad were discovered in Iowa in 2022.

  No new infestations of zebra mussels were discovered in Iowa in 2022.

Preliminary Iowa DNR Aquatic Invasive Species Program update for 2023

The DNR-AIS Program is operating similar to 2022. For the 2023 field season, 3 seasonal survey staff are based out of the Boone Research Station (2 for Vegetation Management), 2 seasonal survey staff are based out of the Clear Lake Fisheries Office (Vegetation Management), and seasonal inspectors are based out of District Fisheries offices around the state.

Two new infestations of Eurasian watermilfoil and no new infestations of brittle naiad have been discovered in Iowa so far in 2023.

No new infestations of zebra mussels have been confirmed in Iowa in 2023.

State of Indiana

Submitted by Eric Fischer

The Indiana Department of Natural Resources continues its efforts to prevent the spread of AIS species throughout the state of Indiana but especially across the Watershed divide between the Mississippi River Basin watershed and the Great Lakes watershed.

Indiana Department of Natural Resources has continued to utilize state and Great Lakes Restoration Initiative funding along with state AIS management plan funding to provide for the implementation of the state AIS management plan implementation. Continuing the control and management work from past years we also have continued to fight the spread of Eurasian Watermilfoil and the growth of Starry Stonewort in northeast Indiana. Starry stonewort a macro algae especially, has proven very difficult to control but we continue to try different chemical prescriptions and are coordinating with universities and plant control companies with hopes of finding better tools that are effective at limiting the growth and success of this invasive aquatic plant. The aggressive and large-scale control and eradication efforts on over 350 acres of infestation were treated in 2022 and we are starting on the first half of 2023 treatments this month . We have been aggressive in our rapid response efforts and treatments through Great Lakes Restoration Initiative grant funding which has slowed the spread of this aggressive macro alga but has yet to provide the answers to the best path forward.

In the past year plus the Indiana DNR has put special emphasis and funding toward a dedicated Invasive Carp program to engage with neighboring states and region partnerships and committees to contribute to better understanding and implementation of control strategies across the drainages. Including working on a state Invasive Carp permit, working with regional partners on telemetry, early life history, otolith microchemistry and exploring the use of contract/commercial fishing.

Along with many other representatives of the AIS programs in the Midwest we continue to be engaged and participating in the following groups: Great Lakes Panel, Mississippi River Basin Panel, the Invasive Mussel Collaborative, Interstate ANS planning group, Indiana Invasive Species Council, regional hydrilla coordination and Invasive Carp Regional Coordinating Committee.

State of Kansas

Submitted by Chris Steffen

The Kansas Aquatic Nuisance Species Management Plan was approved by the ANSTF in May 2005. The goals of the plan are to prevent new introductions of ANS to Kansas, prevent dispersal of established populations of ANS, eradicate or control to minimize the adverse ecological, economic, social, and public health effects of ANS, educate all aquatic users of ANS risks, and to support ANS research in Kansas. The coordinated efforts contained within the plan are designed to protect residents of Kansas and the state's aquatic resources from the multitude of potential losses associated with ANS plants and animals.

- **Added 3 additional full-time staff to KDWP AIS program.** Three additional AIS FTEs were hired in September 2022. Two staff are focused on invasive carp management and removal. The other position is focused on organisms in trade concerns, AIS monitoring and detection, and AIS education and outreach.

- **Completed a research project to design a protocol for sampling invasive and native crayfish in Kansas lakes and streams -** This is a joint project between the Fisheries and Ecological Services divisions of Kansas Wildlife and Parks and New Mexico State University. Crayfish are the second most imperiled group of animals in North America (behind only native mussels). Negative interactions with invasive crayfish species and the diseases they carry threaten to further impact Kansas' crayfish populations. In 2019, the first introduced population of invasive Red Swamp Crayfish were found in Kansas and tested positive for crayfish plague There is very little existing data on Kansas' crayfish and most crayfish research that has taken place in North America has focused on stream populations, therefore no good protocols exist for sampling crayfish in lakes. This project looks to address these issues by:

    - Compared a suite of common sampling techniques to determine the best sampling methods for crayfish assemblages in Kansas lakes and streams.

    - Determined effort requirements needed to detect all species of crayfish inhabiting a lake or stream.

    - Evaluated habitat-species relationships for crayfish assemblages in lakes and streams.

    - Provided management recommendations to Kansas Department of Wildlife and Parks regarding long-term monitoring of crayfish in lakes and streams.

    Using this information, KDWP is planning to follow up with a university project to sample approximately 100 waterbodies in 2024 and 2025.

- **Continued bighead carp research project on Neosho River - Grand Lake system –** The project, funded in conjunction with FWS, aims to better understanding the small, isolated, but reproducing population of bighead carp in the Neosho River – Grand Lake system. The project objectives are to:

    - Identify locations of presence and upstream extent of bighead carp population within the Neosho River – Grand Lake system.
    - Collect baseline population demographic information including relative abundance, age and growth, and size structure.
    - Determine broadscale movements within the Neosho River system using otolith microchemistry.
    - Identify locations within the Neosho River – Grand Lake system for containment, removal, and/or eradication efforts.

  Two years of field sampling has been completed and the final report will be completed in the fall of 2023. As a natural outgrowth of this project, KDWP, OWDC, and MSU have been able to educate and build relationships with fishers - and fishing guides in particular – about the need to suppress bighead carp in the system. Fishing guides have begun using live-imaging sonar to target the bighead carp in the system and have removed more carp in spring of 2023 (approximately 40-50 fish) than have been documented in the system in the last 30 years (approximately 20-30 fish).

- **Continued removal of invasive carps from the Kansas River below the Bowersock dam –** In 2022, 24,000 pounds of invasive carp were removed from the Kansas River below the Bowersock Dam to prevent upstream range expansion and to benefit native species and river users below this barrier. So far in 2023, an additional approximately 20,000lbs. have been removed.

- **Conducted a survey to understand the impacts and perceptions of invasive carp by Kansas River users -** Until the creel survey conducted on the Kansas River in 2022, the Kansas Department of Wildlife and Parks (KDWP) was unaware of the breadth of the diversity of recreation and river users in the Kansas River. The Kansas River is one of three navigable rivers in Kansas and is a popular destination for public recreation such as kayaking and canoeing, fishing, hunting, and wildlife viewing. From March to October 2022, KDWP conducted in-person surveys of recreationists in the invasive carp-infested portion of the Kansas River to determine impacts and challenges river users experienced due to invasive carp. Results indicated carp did have negative impacts on KS River users but were not viewed as negatively as expected and that education and outreach (in multiple languages) and enforcement are needed to prevent users from unintentionally or intentionally spreading invasive carps from this location.

- **Collected eDNA samples to inform silver and bighead carp management efforts -** In collaboration with FWS, KDWP ANS program staff collected eDNA samples for silver and bighead carp in the upper Kansas River basin above the Bowersock Dam. Very few silver or bighead carp records occur above this barrier. Results from this sampling will inform efforts to prevent invasive carp from establishing breeding populations above this location.

- Inspections were conducted at 160 bait shops across the state in 2022. No invasive species were found at any of the bait shops. ANS literature was distributed to the bait shops during inspections.

- Education and outreach efforts were continued through a variety of media outlets including internet ads, press releases, and direct mailings. We recently contracted a marketing firm to revamp and greatly increase the reach of our education and outreach efforts, which will continue throughout 2023.

- ANS literature and outreach materials were distributed to all KDWPT offices, state parks, nature centers, bait shops, marinas and at educational events.
- ANS signage was maintained at ANS infested waters and prevention awareness signs were placed at uninfested lakes.
- Kansas continues to participate in the *Don't Let it Loose* campaign. The program has been well received and is very popular with pet shop owners. We are supplying additional bags as pet shops request them. We plan to continue purchasing bags in the future and revisiting the locations.
- Fish disease sampling was conducted at all four state fish hatchery facilities and two private fish farm locations. None of the fish tested showed signs of concerning disease.
- 110 waterbodies not known to contain zebra mussels were sampled for zebra mussel veligers in 2022 (all 110 will be sampled in 2023 as well).
- Zebra mussels were not detected in any new waterbodies in 2022.
    - Previously, zebra mussels were discovered in El Dorado Reservoir in 2003; Winfield City Lake in December 2006; Cheney Reservoir, and Perry Reservoir in 2007; Marion Reservoir and Lake Afton in 2008; Milford and Wilson Reservoirs in 2009; Council Grove City Lake and John Redmond Reservoir in 2010; Council Grove, Melvern, and Kanopolis Reservoirs and Jeffery Energy Center Lakes (2) in 2011; Coffey County-Wolf Creek Lake and Chase County State Fishing Lake in 2012; lakes Shawnee and Wabaunsee and Clinton and Glen Elder (Waconda Lake) Reservoirs in 2013; Pomona Reservoir in 2014; Paola City Lake (Miola Lake) in 2015; Wellington City Lake in 2015; Hillsdale and Cedar Bluff Reservoirs in 2016; Osage State Fishing Lake, Tuttle Creek Reservoir, and Geary State Fishing Lake in 2017; Lyon State Fishing Lake in 2019; Linn Valley Lakes - Main Lake and Emerald Bay in 2020; and Lebo City Lake in 2021.

State of Kentucky
Department of Fish and Wildlife Resources

Submitted by Josh Tompkins

Personnel

- KDFWR Invasive carp staff consists of 9 full time staff as of July 2023.
    - KDFWR recently hired a new program coordinator, Jeff Herod, for the Frankfort invasive carp branch. Jeff is also the new AIS coordinator for Kentucky. He will be reviewing Kentucky's ANS plan, updating and revising as needed.

General ANS

- 91 personnel hours, 5 gallons of liquid herbicide and 640 pound of dry herbicide have been documented to treat aquatic nuisance weeds such as Eurasian watermilfoil and hydrilla since September 2022.
- Eurasian watermilfoil has been identified at Cave Run Lake and Clear Creek Lake (USFS property).
- Central Fisheries District staff are working with malacologist Dr. McGregor to monitor zebra mussels in Williamstown Lake.
- Southeast Fisheries District staff are aware of a significant presence of Eurasian Milfoil in Cedar Creek reservoir. However, they are not taking any action currently, beyond stocking triploid grass carp.

Invasive Carp

- KDFWR completed YOY black carp sampling on the Lower Ohio river, in the fall of 2022. 23 sites were sampled. YOY black carp were collected at one site, near the City of Paducah.
- Three adult black carp were reported to KDFWR staff by commercial fishers on the Ohio river.
- KDFWR invasive carp staff continued to facilitate the contract fishing program on the Ohio river by Frankfort staff and to monitoring commercial fishing occurring through the Invasive Carp Harvest Program throughout the rest of the state.
- In 2022 statewide commercial harvest was ~9.5 million pounds. Most of the harvest occurred in Barkley and Kentucky reservoirs, where KDFWR facilitated this removal through our incentive program. In 2022 this program paid out $672,000 worth of subsidy monies.

State of Louisiana
Department of Wildlife and Fisheries

Submitted by Rob Bourgeois

New Reported ANS:

Mitten Crab

A Chinese Mitten Crab was reported near the mouth of the MS River. It was the first reported Mitten Crab since the 1990s. It was caught by a commercial crab fisherman. The Louisiana Department of Wildlife and Fisheries (LDWF) will monitor commercial crab catches for any additional occurrences.

Zebra Mussels

Zebra Mussels have been found to survive over the summer in areas where they were previously thought not to survive. The populations were found on telemetry receivers after being deployed underwater for two years. The Zebra Mussels have persisted since that first observation. The mussels were detected on the Atchafalaya River near Morgan City and in the Wax lake Outlet near Vermilion Bay. These areas will be monitored as the telemetry receivers are serviced. These sites also had more mussels in May 2023.

Northern Snakehead:

A video of 2 snakeheads guarding a school of fry was sent to the LDWF ANS coordinator in June 2023. The video was reported to be from the MS River near Ferriday, LA. Numerous press releases and newspaper articles have asked the public for reports of snakeheads. At this time, there have been no more reports. LDWF will continue to monitor the MS River backwaters for snakeheads during regular sampling tasks.

Update to recently reported ANS:

Peacock Bass:

A Peacock Bass was confirmed in the summer 2022. LDWF electro-fished the area but did not find the fish. This area is near a long-term sampling site so LDWF will be sampled in this area in the early summer and Fall 2023.

Murray Cod:

As previously reported during our Spring 2022 update, there have been no additional reports or sightings of Murray Cod. LDWF has sampled 3 times in the area and has not seen the fish or any native species that could be mistaken for it. LDWF will continue to monitor the area in the future. This will be the last time this fish will be reported on but LDWF will continue to monitor the area.

Status of Established ANS

Apple Snail:
Public reports for Apple Snails have slowed until the last week of March. The ANS coordinator went to three local areas where populations were previously present but found no snails. The disappearance of these populations may be due to a severe early freeze in Nov and/or a late freeze around the middle of March. LDWF will continue to monitor these three locations to see if the snails return.

Invasive Carp:
Since fiscal year 2020, LDWF has had projects funded through USFWS's Lower Mississippi River Invasive Carp Partnership and the Atchafalaya, Red, and White Rivers Invasive Carp Partnership.
LDWF collaborated with Nicholls State University to investigate the presence of invasive carp larvae on rivers in the LMR. The objective of the study was to determine the extent of invasive carp spawning activity Mississippi River, Atchafalaya River, Ouachita River, Red River and Tensas River Basins within Louisiana. Figure 1 below shows the results of that survey where carp were present. This data indicates that invasive carp are reproducing in the majority of the Lower Mississippi River (LMR) Basin sites sampled in LA. Reproduction is taking place on the Red, Mississippi, Atchafalaya, and the Ouachita Rivers. Invasive carp spawned in all three of the months sampled with a peak occurring in May. No larvae were collected west of the Atchafalaya River in 2022 despite large numbers of adults present in some of the areas sampled.

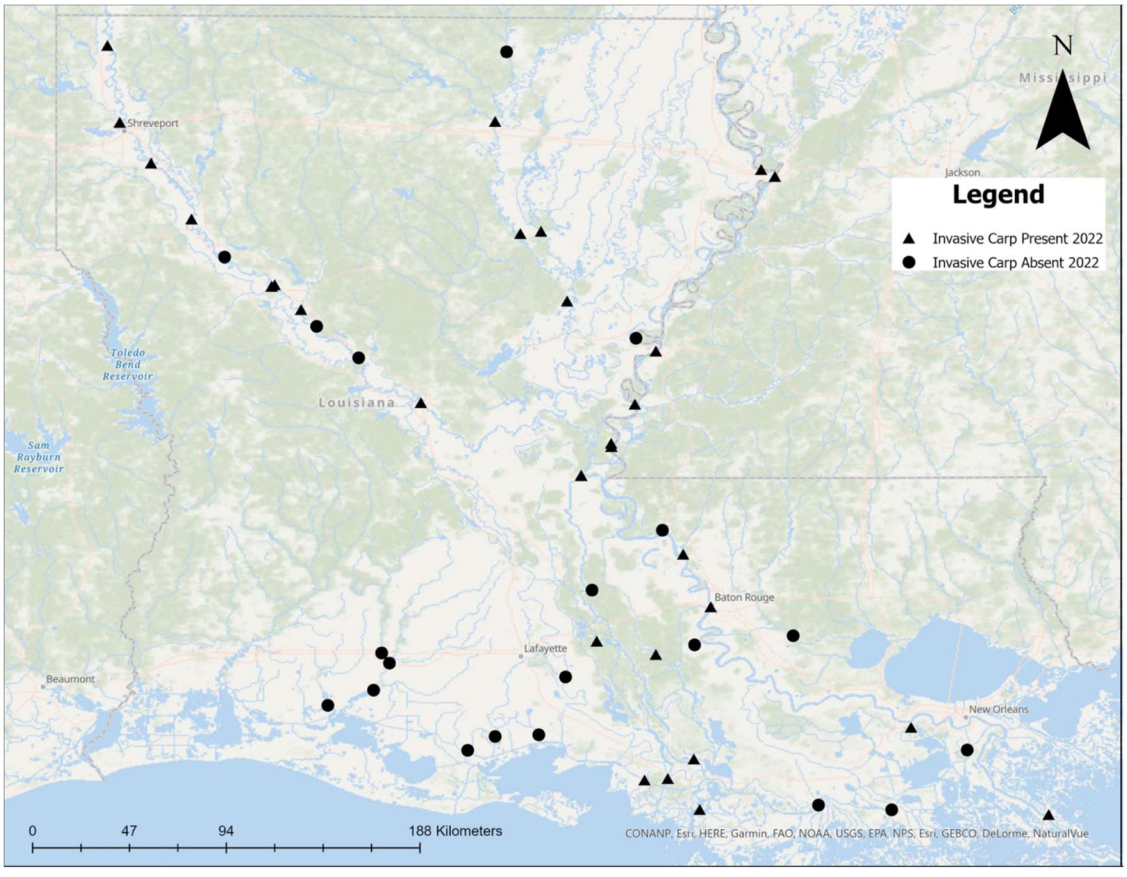


***Figure 1**. Ichthyoplankton sample locations where invasive carp have been identified (triangle) and where no invasive carp were identified (circles).*

LDWF has collaborated with Louisiana State University (LSU) since 2020 to tag 200 invasive carp and set up a receiver array. The object of the project was to determine intrabasin and interbasin movement to inform placement of potential deterrent technologies and removal efforts. Figure 2 shows the receiver array network and carp tagging locations. In 2022, there were nearly 158,000 detections from 79 unique carp across the array of 40 receivers. The maximum distance traveled and recorded by receivers was 572 km, and the mean distance traveled and recorded by receivers was 31 km.

A Silver Carp tagged in a backwater of the lower Atchafalaya River, south of Morgan City, LA has been detected in the Atchafalaya River Basin for over one year since its' initial capture and release in late 2021. Over the course of the year the fish has swam over 500 river kilometers, being detected on nine different receivers, utilizing the intercoastal waterway several times to transit between Wax Lake Outlet, and the Atchafalaya River, both north and south of Morgan City, LA.

Other fish appeared to make larger movements. Another Silver Carp was tagged in late 2021 in the North Prong of Schooner Bayou. This fish quickly transitioned into Vermilion Bay, at the mouth of the four mile-cutoff channel near Intracoastal City, LA. After being detected here continuously (~ 18,000 detections), the fish was next detected after a week of silence on another bay receiver – this time at the mouth of Avery Canal. Detections at Avery Canal appear in several day-long detection groupings spaced out over approximately one month. Total residence time in the bay for this fish was around three months. The next appearance occurred in the Lower Atchafalaya River followed by a rapid transit (~ 18 hours) north of Morgan City.

Other transmitters detected on our receiver array in southern Louisiana include a Grass Carp from the northern Mississippi River basin (Iowa), a Bull Shark, American Eels, and Red Drum. Additional orphan tags were detected but have not yet been identified.

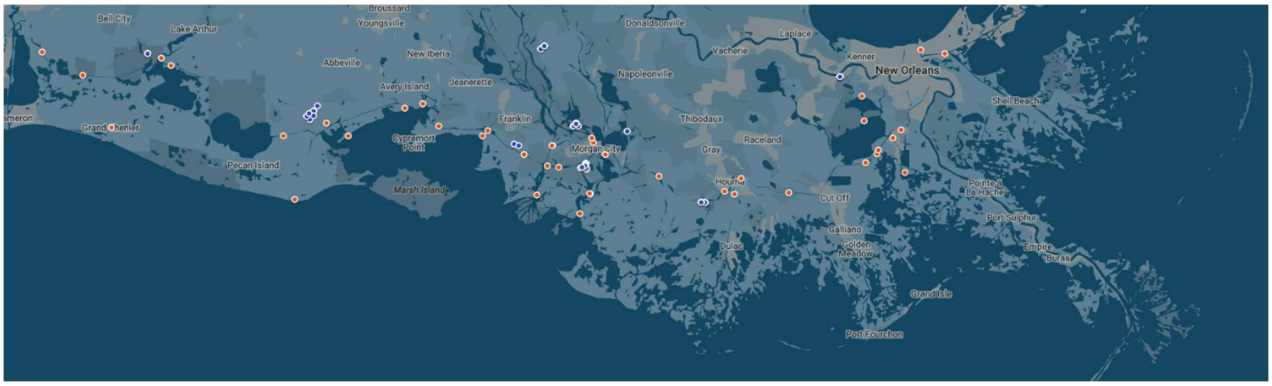


***Figure 2.** Map depicting receiver distribution (red points) and tagging locations (blue points) of invasive carp in coastal Louisiana.*

LDWF collaborated with Louisiana Universities marine Consortium (LUMCON) to perform feeding trials on catfish of food pellets made from invasive carp. The project will be completed during the first quarter of 2023. Figures 3 and Table 1 show that LA sourced invasive carp is bigger than invasive carp from Illinois. The LA invasive carp also had higher lipid content than the Illinois invasive carp.

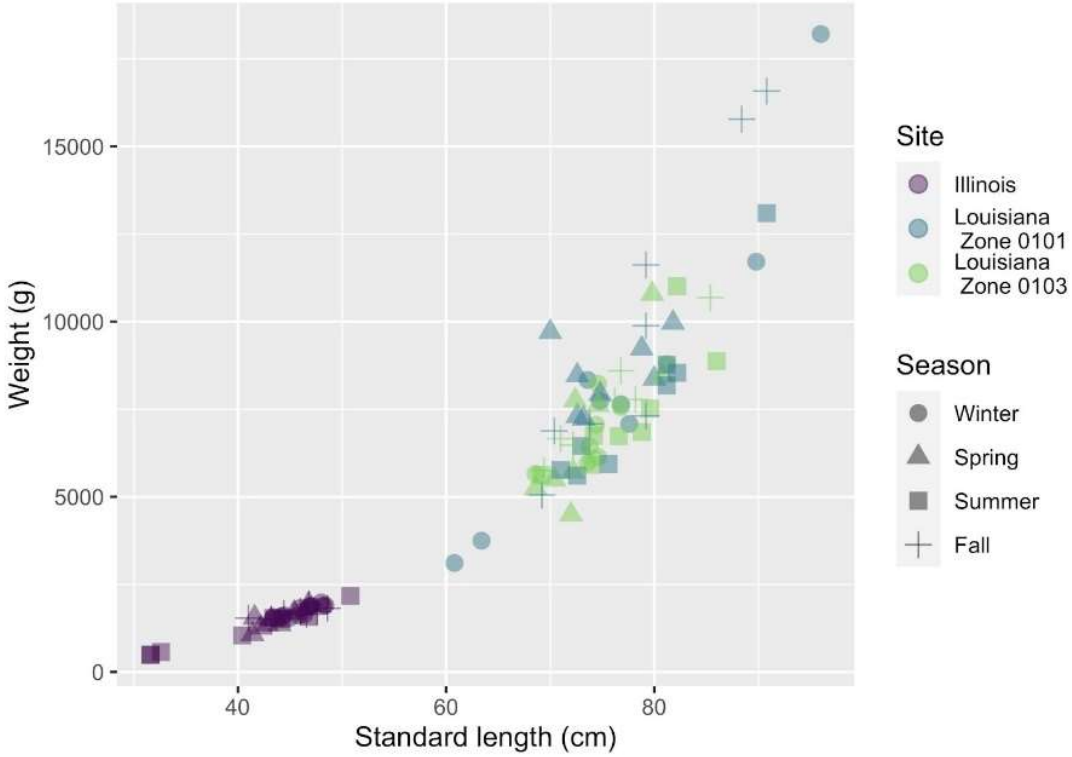


Figure 3. *Weight (g) vs standard length (cm) of whole invasive carp sourced from Illinois (Peoria Pools), Louisiana fishing area 0101, and Louisiana fishing area 0103 throughout Winter, Spring, Summer, and Fall, 2022.*

REGION	AVERAGE LENGTH (CM)	MINIMUM LENGTH (CM)	MAXIMUM LENGTH(CM)	AVERAGE WEIGHT (KG)
ILLINOIS (PEORIA POOLS)	52.1	38.8	59.6	1.6
LA FISHING AREA 0101	89.1	71.0	109.8	8.6
LA FISHING AREA 0103	87.0	77.8	97.0	7.2

Table 1. *Morphometric data from commercially caught invasive carp from Illinois (Peoria Pools), Louisiana fishing area 0101, and Louisiana fishing area 0103. Data includes the average, minimum and maximum length (cm) and average weight(g).*

Asian Swamp Eels:

Asian swamp eels (Monopterus cuchia) were found in Bayou St John, New Orleans in June 2019. LDWF and a local university professor continue to monitor and sample the population. LDWF electrofishing did not detect any swamp eels. The sampling by the university only resulted in three swamp eels being captured. All three of them were captured in one of the 82 samples taken in 2022. It is believed that this is a population with very low numbers at this time. So far, there have been no reports of swamp eels in 2023.

Aquatic Plant Control Program:

LDWF continued with our control of invasive aquatic weeds using a variety of techniques. Aquatic plant control plans were developed for approximately 70 different waterbodies during the reporting period. A total of 34,763 acres of nuisance vegetation were treated in 2022. Giant Salvinia continues to be the most problematic invasive plant in Louisiana, with herbicides being applied to over 20,207 acres during that time. Additionally, 9,993 acres of Water Hyacinth were treated across the state during the reporting period. LDWF uses an integrated approach to control aquatic plants consisting of chemical, physical (booms and drawdowns), and biological (insects and grass carp) methods in an effort to achieve a greater combined benefit. In 2022, LDWF had an Aquatic Plant Control Program budget of $6,500,000, of which a large portion was spent on the monitoring, treatment, and research of Giant Salvinia.

State of Minnesota

Submitted by Kelly Pennington

Watercraft Inspection and Enforcement

In 2022, Minnesota DNR and local government watercraft Inspectors completed 439,770 inspections of watercraft arriving at and leaving water accesses in Minnesota. DNR Conservation Officers completed 11,014 hours of invasive species education and enforcement.

Pledge to Protect Minnesota Waters

The Minnesota DNR started a campaign for individuals to "Take the Pledge" to take AIS prevention steps. Over 400 people made a public commitment to protect Minnesota waters in 2022 (Pledge).

Invasive Carp

The Minnesota DNR has begun a structured decision-making (SDM) process focused on carp management options in the Mississippi River basin to inform the update of the Minnesota Invasive Carp Action Plan in 2023. The Minnesota DNR invasive carp program takes an integrated approach to monitoring and management. We monitor for all life stages of invasive carp using a variety of fisheries gears, tag and track invasive carp, contract with commercial fishers to capture invasive carp, and develop new techniques to remove invasive carp in our low-density population (such as adapting the modified-unified method, or MUM, for our use). The DNR continues to build partnerships with the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service (USFWS), Wisconsin DNR, NPS, and Wild Rivers Conservancy with two MUM events on the Mississippi River in 2022. Additional upcoming projects include using attractant stations to concentrate invasive carp for capture, identifying watershed breaches that can be blocked to prevent invasive carp movement, and modeling invasive carp reproduction in the Upper Mississippi River to identify priority locations for management.

Regulation

The Minnesota DNR proposed rule changes that would add species to the state prohibited invasive species list. The rule was proposed to strengthen our ability to prevent the introduction and spread of priority species like jumping worms and nonnative Phragmites, align invasive species classifications with regional priority species lists, and fill critical gaps created by a 2015 legal decision that reinterpreted federal injurious species authorities. The public comment period for the proposed rule closed on December 9, 2022, and the comments are being reviewed by the agency.

County AIS Prevention Aid

The Minnesota DNR provides technical support to local government staff leading their county's AIS Prevention Aid programs by facilitating regional workshops. During winter-spring 2023, DNR AIS prevention planners hosted six workshops for staff and stakeholders involved in developing and implementing local AIS programs. Four workshops featured short presentations on topics of interest including: AIS Activities at Water Accesses, Public engagement, Strategic Planning and Evaluation, and Monitoring, Detection and Response. Two workshops, one online and another in-person, provided opportunities to network, share experiences, problem solve, gain knowledge, support inter-county collaboration, and leverage resources.

Early Detection

The Minnesota DNR partnered with the Minnesota Aquatic Invasive Species Research Center (MAISRC), the University of Minnesota Extension, and many counties and local partners on an annual statewide search for new populations of starry stonewort, called "Starry Trek." In 2022, 233 volunteers searched 248 Minnesota waterbodies. No new starry stonewort infestations were found during the 2022 Starry Trek.

Invasive Aquatic Plant Management Grants

In 2022, the Minnesota DNR Invasive Species Program issued 404 permits to control invasive aquatic plants and the DNR AIS Control Grant Program provided funding for 223 invasive aquatic plant treatments through 142 grants, totaling $1.25 million. In 2023, $400,000 in grants has been made available to local entities for DNR AIS Control Grants, funding 102 projects to treat Eurasian watermilfoil, curly-leaf pondweed, flowering rush and starry stonewort. Projects funded for two years of treatment in 2022 will be wrapping up work in 2023, which includes one-year of post-treatment monitoring to evaluate innovative control projects.

Nonnative Phragmites

The Minnesota DNR continued to fund nonnative Phragmites control throughout the state. Management efforts focused on "clearing counties" by targeting control in areas of the state with a limited number of small infestations. During the 2022 treatment season DNR contractors visited 423 nonnative Phragmites sites in 31 counties. At 100 sites no treatment was done because no live nonnative Phragmites was found, largely due to previous years' effective treatments. During the 2022-2023 winter, the DNR contracted to knock down dense standing dead nonnative Phragmites to facilitate treatment this coming summer at about 30 sites.

State of Missouri
Department of Conservation
Submitted by Joe McMullen

Project/Program: Invasive Species Management Program

MDC Contact Information
Name: Angela Sokolowski - Invasive Species Ecologist
Email: angela.sokolowski@mdc.mo.gov
Phone: 573-522-4115 x3641
Status: Ongoing

Description: Provides leadership to develop and implement a strategic approach for the Department and partners to address the threats and minimize impacts posed by terrestrial and aquatic invasive species, including identifying which species should be targeted and priority areas in which invasive species should be more aggressively controlled.
New Curly Leaf Pondweed infestations have been identified in a significant number of waterbodies in 2023. This species seems to be spreading faster/more widely than previously noticed.
Status of State ANS Grant: In 2023, MDC refrained from applying for the Federal ANS Grant primarily because the level of funding did not reach the minimum set by our Federal Aid staff. In the next year we will be updating our state ANS plans and re-evaluating needs and feasibility of applying for this funding again.

Prevention O&E: With the continued popularity and affordability of kayaks and paddleboards, MDC and partners have identified the need to develop Clean Drain Dry/ Stop AIS messaging for non-motorized boaters. The main "Stop Aquatic Hitchhikers" logos feature propellers and motorboats which may cause a disconnect with the paddling community. A member of the Hydrilla crew has begun designing CDD imagery and outreach materials to target this demographic.
Hydrilla Survey 123 App used by MDC and partners to map hydrilla presence/absence will be renewed and modified to include more AIS reporting. We intend to promote with our Stream Teams for greater AIS awareness, detection, and tracking.

Literature/Reports:
Invasive and Nuisance Species | Missouri Department of Conservation (mo.gov)

Project/Program: Hydrilla Eradication

MDC Contact Information
Name: Kara Tvedt - Fisheries Biologist
Email: kara.tvedt@mdc.mo.gov
Phone: 417-895-6881 x1626
Status: Ongoing

Description: Efforts to eradicate hydrilla still continue in southwest Missouri. As of today, 37 hydrilla sites have been detected in southwest Missouri with most being in private waters. These sites are in the James, Little Sac, Pomme de Terre, Niangua, and White River watersheds. Of the known sites, 36 of 37 are under a hydrilla eradication plan which includes an initial multi-year "treatment" phase followed by a multi-year "monitoring-only" phase. Going into 2023, 13 sites remain in the "treatment" phase, 21 sites are in the "monitoring-only" phase, and two sites have made it to "eradication" phase. Hydrilla has been reduced to non-detectable levels in over 50 percent of the sites and two of those sites have stayed hydrilla free for five consecutive years. The one remaining site made it to the "monitoring-only" phase before the site changed ownership in 2021. Since then, we have been unable to engage with the new owner. Efforts to reach that landowner and get the site back on track will continue in 2023. Similar efforts are also ongoing at a handful of sites in Kansas City Region, with several sites anticipated to move into the "monitoring-only" phase in 2024.

Literature/Reports: Hydrilla Control | Missouri Department of Conservation (mo.gov)

Project/Program: Round Goby Monitoring

MDC Contact Information:
Name: Sarah Peper - Fisheries Biologist
Email: sarah.peper@mdc.mo.gov
Phone: 636-441-4554 x4130
Status: Ongoing

Description: Monitor for range expansion of Round Goby population in the Mississippi River. In 2018, USWFS crews led by Jenna Bloomfield first discovered Round Gobies in the Mississippi River (Pool 26) near Grafton, IL. MDC joined USFWS' efforts to monitor for further expansion of this species into other areas of the UMR or into nearby tributaries: Missouri River and Meramec River. During 2019 - 2021, sampling revealed a slight range expansion into lower Pool 26 near Alton, IL. In 2022, we are pleased to report that the two agencies' combined sampling efforts on the MS and MO Rivers resulted in zero gobies captured. Hopefully this means the population remains low-density and localized.

Literature/Reports:

MDC asks anglers to help stop invasive round gobies | Missouri Department of Conservation (mo.gov)

Project/Program: Northern Snakehead Occurrence & Response

MDC Contact Information
Name: Dave Knuth - Fisheries Biologist
Email: dave.knuth@mdc.mo.gov
Phone: 573-290-5858 x4434
Status: Complete

Description: A second northern snakehead has been recorded in the state. The fish was captured by an angler May 19, 2023 while seining for bait at Duck Creek Conservation Area in Wayne County. The first northern snakehead recorded in Missouri was caught in a borrow ditch within the St. Francis River levees in Dunklin County in 2019. MDC staff spent two days looking for additional specimens on Duck Creek Conservation Area and Mingo National Wildlife Refuge. This effort found no additional fish.

Literature/Reports: Snakeheads | Missouri Department of Conservation (mo.gov)

MDC confirms second northern snakehead captured in Missouri | Missouri Department of Conservation (mo.gov)

Project/Program: Invasive Carp Telemetry

MDC Contact Information
Name: Josh Abner - Scientist
Email: joshua.abner@mdc.mo.gov
Phone: 573-290-5730 x4485
Status: Ongoing

Description: Document movement of invasive carp throughout the Mississippi River basin to inform management, control, and containment actions (e.g., location of potential deterrent technologies and removal efforts) and determine residence time and movement in association with season, environmental conditions, and barriers.

Literature/Reports:

Lower Mississippi River Sub-Basin Annual Summary Reports - Mississippi Interstate Cooperative Resource Association (micrarivers.org)

Upper Mississippi River Sub-Basin Annual Summary Reports - Mississippi Interstate Cooperative Resource Association (micrarivers.org)

Missouri River Sub-Basin Annual Summary Reports - Mississippi Interstate Cooperative Resource Association (micrarivers.org)

Project/Program: Invasive Carp Control & Removal

MDC Contact Information
Name: Joe McMullen - Scientist
Email: joe.mcmullen@mdc.mo.gov
Phone: 314-301-1506 x4215
Status: Ongoing

Description: Contract removal of invasive carp on the upper Mississippi River pools 22, 21, and 20 and lower Mississippi River (LMR) (MO-AR border to Ohio River confluence) are planned to begin fall 2023. MDC staff conducted fish assemblage sampling on the LMR during fall 2022 to collect baseline data to identify any potential effects that invasive carp removals may have on native fish. Sites were randomly selected, and sampling was standardized with Long Term Resource Monitoring sampling efforts on the upper Mississippi River. Sampling sites were located within a relatively small section of river due to accessibility issues associated with record low water levels. All fish captured were identified and measured, and a subset were weighed before being released. Water quality and habitat data were collected and recorded at each site and included Secchi disk measurement, dissolved oxygen, water conductivity, surface water velocity, water temperature, water depth, and substrate type.

Literature/Reports:

Lower Mississippi River Sub-Basin Annual Summary Reports - Mississippi Interstate Cooperative Resource Association (micrarivers.org)

Upper Mississippi River Sub-Basin Annual Summary Reports - Mississippi Interstate Cooperative Resource Association (micrarivers.org)

Project/Program: Invasive Carp Population Demographics

MDC Contact Information:
Name: Adam McDaniel - Scientist
Email: adam.mcdaniel@mdc.mo.gov
Phone: 660-646-3140 x1381
Status: Ongoing

Description: Early fall of 2022 marked the 3rd year for invasive carp population demographic sampling in the lower 40rkm of 4 tributaries to the Missouri River and their associated Missouri River bends. The four tributaries were the Nodaway, Platte, Lamine, and Grand. Objectives were: 1) Evaluate a suite of gears and sampling logistics to determine an effective and efficient method to sample all sizes of invasive carp; 2) Determine the size distribution, relative abundance, and other population characteristics of invasive carp to help identify areas where population control measures can be implemented; and 3) Characterize the historic and current fish community to assess impacts of invasive carp removal. Low water over the past several years has only allowed for the sampling to occur in the lower 20rkm of the tributaries. Silver carp was the most abundant invasive carp (n=1,687), followed by Grass carp (n=10), and Bighead carp (n=3). Silver carp catch per unit effort varied between sites using two electrofishing settings (60Hz/40% duty cycle and 40Hz/20% duty cycle) but usually produced similar catch rates at the same sites. Both settings are probably suitable options for sampling of Silver carp. Sampling in all tributaries collected few fish below 400mm and low numbers of fish in the 500-550mm range. Silver carp >600mm were more frequently collected in the Missouri River bends associated with the Lamine and Grand River than in those tributaries. Silver carp sex ratios of male:female were close to 1:1 in all sites except for the Grand River, and the

Missouri River bend at the Platte River where there were a higher ratio of males. Most native fish communities were dominated by a few species such as Gizzard shad, Shortnose gar, and Green sunfish. A small amount of Paddlefish and Bigmouth buffalo were sampled as well.

Literature/Reports:

Missouri River Sub-Basin Annual Summary Reports - Mississippi Interstate Cooperative Resource Association (micrarivers.org)

Project/Program: Grand River Invasive Carp Removal

MDC Contact Information:
Name: Adam McDaniel - Scientist
Email: adam.mcdaniel@mdc.mo.gov
Phone: 660-646-3140 x1381
Status: Complete (additional removal testing planned fall 2023)

Description: In September of 2022, the Missouri Department of Conservation working in conjunction with the U.S. Fish and Wildlife Service piloted an intensive short-term Invasive carp removal on the lower Grand River in Northwest Missouri. Objectives were: 1) Assess the feasibility of reaching >30% exploitation of the local invasive carp population using standard and experimental gears; 2) Assess the ability to remove a minimum of 15,000lbs of invasive carp to satisfy commercial fishing partner's requirements; and 3) Assess the short-term emigration of invasive carp back into the local population. Block nets were used to provide a closed population for 5 consecutive days, with daily hydroacoustic surveys to quantify invasive carp abundance. Removal gear included boat electrofishing, paupier boat, dozer trawl, and gill nets. Efforts resulted in the removal of 6,663 Silver carp, 52 Bighead carp, and 178 grass carp weighing 11,294kg (24,900lbs) from 6 miles of the lower Grand River. Hydroacoustic data analyzed using Leslie depletion models indicated and initial population estimate of 8,736 (+/- 3,430) Silver Carp and a mortality rate of 0.62. Pre-removal hydroacoustic data estimated Silver carp density at 3.2 fish/1000m^3 and 3 week post removal density at 2.25 fish/1000m^3.

Literature/Reports:

Missouri River Sub-Basin Annual Summary Reports - Mississippi Interstate Cooperative Resource Association (micrarivers.org)

State of Mississippi
Mississippi Department of Wildlife, Fisheries, & Parks
Submitted by Dennis Riecke

Aquatic Plant Control Activities

Treated filamentous algae and southern naiad at the Lamar Bruce pond with Cutrine Plus and fluridone.

Treated southern naiad and pondweed at Trace State Park lake with diquat.

Treated hydrilla at J.P. Coleman State Park lake with granular Cutrine

An additional containment boom was set to restrict water hyacinth movement, and to keep the boat ramp access open. MDWFP biologists chemically treated water hyacinth at Horseshoe Lake, and Belzoni Cutoff. MDWFP hired contractors who used airboats and helicopters to apply herbicides to treat water hyacinth and alligator weed.

Aquatic weed control continues at the 33,000 acres Ross Barnett Reservoir under an agency contract between MDWFP and the Pearl River Valley Water Supply District. Statewide aquatic plant management team treated alligator weed, water hyacinth, parrotfeather, and hydrilla at Ross Barnett. Alligator weed was treated with a tank mix of imazapyr, flumioxazin, surfactant. Water hyacinth was treated with 2,4-D amine and surfactant. Submerged vegetation was treated with several tank mixes including copper and flumioxazin, flumioxazin, and endothall. In addition, in areas with little water exchange fluridone was used.

Fisheries biologists conducted an annual littoral zone vegetation survey on Ross Barnett for long-term monitoring. Giant Salvinia management in Ross Barnett included boat surveys with no giant salvinia being noted.

Common salvinia was discovered in Eagle Lake during a vegetation survey in August 2022. The common salvinia was located in a backwater area called Buck Chute and was observed dispersing into the main lake. Treatments were conducted initially using a tank mix of glyphosate, flumioxazin, and surfactant. A scheduled drawdown occurred and placed a large amount of common salvinia on exposed mud. Follow up treatments in November were made using flumioxazin. A survey conducted in February 2023 did not observe the presence of common salvinia. Follow-up surveys will continue.

Statewide aquatic plant management team and fisheries biologist treated water hyacinth with 2,4-D and surfactant at Crystal Lake.

Fisheries biologists treated alligator weed with imazapyr, flumioxazin, and surfactant at Simpson County Lake.

Federal FY22 and FY23 ANS state grant fund projects were approved to treat and hopefully eradicate water hyacinth at Horseshoe Lake.

Invasive Carp Control Activities

Contracts to reimburse fish processors for invasive carp purchase from the Mississippi River and from the Yazoo River Basin were signed with three firms but only 1 firm purchased 1,469 pounds from January – June 2023. The federal grant was amended and extended to focus on hiring two temporary employees to harvest invasive carp but we will also continue the fish processor reimbursement program. The program reimburses fish processors 18 cents per pound if they pay fishermen at least 25 cents per pound.

Coordination Activities

Ongoing activities:

Coordinated and administered federal ANS grant to implement activities specified in the *Mississippi State Management Plan for Aquatic Invasive Species.*

Coordinated and administered 9 invasive carp USFWS research and management grants.

Participated in conference calls of the Mississippi Aquatic Invasive Species Council to guide implementation of the activities specified in the *Mississippi State Management Plan for Aquatic Invasive Species.*

Assisted the MS Dept. of Environmental Quality in applying for FY23 federal funds for State ANS plans.

Attended (in-person or virtually) Gulf and South Atlantic Panel on Aquatic Invasive Species meetings.

Participated in multiple Invasive Carp conference calls for Lower Mississippi River and Tennessee-Cumberland River Basin projects funded in FY19-22.

Continued to participate in the Mississippi Aquatic Invasive Species Council to guide implementation of the activities specified in the *Mississippi State Management Plan for Aquatic Invasive Species*.

New activities:

Participating in a decision analysis process to determine invasive carp barrier/deterrent placement along the Tennessee-Tombigbee Waterway.

Information & Education Activities

New activities:

MDWFP marketing group designed a fish measuring ruler sticker with the Stop Aquatic Hitchhikers message on it. Fifteen hundred (1,500) stickers where printed at $2.05 each.

MDWFP aquatic educators are working with the Gulf and South Atlantic Regional Panel on AIS Coordinator to select items relevant to Mississippi for inclusion in an ANS traveling trunk which will be loaned out to teachers.

The Mississippi Museum of Natural Science is finally updating their "exotic species" museum display to focus on the most common ANS species in Mississippi.

Ongoing activities:

Continued distributing "Stop Aquatic Hitchhiker" cards along with all initial boat registrations and boat renewal registration cards that are mailed out.

Continued printing The Stop Aquatic Hitchhiker logo and bullet list in the annual regulation guides --- *Mississippi Outdoor Digest*, (375,000 copies printed each year) and the *Digest of Mississippi Freshwater Commercial Fishing Laws and Regulations* (8,000 copies printed each year).

Links to the Mississippi River Basin Panel on Aquatic Nuisance Species and the Gulf and South Atlantic Panel on Aquatic Invasive Species, Stop Aquatic Hitchhiker and Habitattitude websites are on the department website.

The Mississippi Museum of Natural Science has a permanent exhibit on exotic species.

A project with Mississippi State University to develop 40 aquatic plant identification and control sheets for landowner use is nearing completion. The sheets provide herbicide options to mix with 1 gallon of water. Only herbicides that are rated as "excellent" are being listed. The sheets are being compiled into a booklet and are being placed on a website.

Monitoring & Reporting Activities

Continued Invasive Carp Telemetry Project on Pickwick Lake and Tennessee -Tombigbee Waterway (TTW).

Assisted USFWS personnel with early detection sampling for Invasive Carp in pools E and D on the TTW . No carp were detected.

Continued to work with state and federal entities to conduct sampling and tagging of Invasive Carp on Pickwick Lake and the TTW.

A FY23 state plan ANS project will expand the receiver array and tracking of invasive carp in the TTW.

Research Activities

Mississippi State Univ. Research Project:

FY 2020 Lower Mississippi River -Moon Lake Invasive Carp Tracking Research

Mississippi State Univ. Research Project:

FY2021Tennessee – Cumberland Rivers Data Management Application – Project 2 – a literature review of the effects of invasive carp on native fish species-

Mississippi State Univ. Research Project:

*FY 2021 Developing an adaptive framework based on connectivity for evaluating management actions that limit bigheaded carps access to floodplain lakes. (Oxbow Lake topology)_*

Mississippi State Univ. Research Project:

FY2021 Asian Carp Movement and Assessment to Inform Management and Removal Efforts in the Lower Mississippi River (LMR) Basin (Eagle Lake)

Mississippi State Univ. Research Project

FY2022 Distribution patterns of invasive carps in lakes of the Mississippi Alluvial Valley. Project will document the distribution of invasive carp in lakes of the Mississippi Alluvial Valley through surveys with biologists, fisherman and landowners and through field sampling.

New Detections

Another Northern Snakehead was reported from an oxbow lake on the river side of the Mississippi River mainline levee. This is the twelfth Northern Snakehead documented from MS waters.

None.

Future Activities

Compose freshwater fishing bait regulations to specify what bait can be legally, sold, possessed, transported, and used in Mississippi.

Adopt a list of approved, restricted and prohibited species under the authority specified in MS Code 49-7-80 and as specified in the *Mississippi State Management Plan for Aquatic Invasive Species* Amend list of approved, restricted and prohibited species as specified in the public notice that regulates aquaculture activities in Mississippi.

Establish an EDRR monitoring program comprised of state and federal personnel who sample aquatic species in Mississippi public waterways on a routine basis.

Submit backlog of reported nonnative species occurrences to ANS database.

Work on revisions to the *Mississippi State Management Plan for Aquatic Invasive Species.*

State of Montana

Submitted by Tom Woolf

AIS Program Activities:

- 17 roadside watercraft inspection station operating during daylight hours.
    - As of the end of June 2023:
        - 34,000 watercraft inspected this year.
        - 1,300 decontaminations conducted for organisms or standing water.
        - 28 mussel fouled vessels intercepted.
- AIS early detection survey ongoing state-wide.
    - No new AIS detections in 2023.
- Expanding community science involvement with AIS early detection survey.
- Pactola Lake in South Dakota remains a significant concern for the movement of zebra mussels due to the limited exit inspection and decontamination presence for containment at the lake.

State of North Carolina

Compiled and Submitted by Rob Emens

This report is a compilation of AIS updates from the following NC State Agencies: NC Department of Environmental Quality (NCDEQ), NC Wildlife Resources Commission (NCWRC), NC Department of Agriculture and Consumer Services (NCDA&CS), and the NC Department of Cultural and Natural Resources (NCDNCR).

NCDA&CS – Plant Industry Division

The State Noxious Weed Regulations, adopted under authority of the N. C. Plant Pest Law, were established to prevent the widespread establishment of harmful non-native plants that are placed on the Noxious Weed List. Any plant on the Noxious Weed List is prohibited entry into the state without a permit. Noxious Weeds already present in the state are contained by prohibiting movement of the plant outside of regulated areas. In addition to the plant itself, articles that could contain Noxious Weed propagules such as soil or hay, are also regulated. In addition, the sale of Noxious Weeds is prohibited unless exempted by provisions of the Noxious Weed Regulations. In addition to the State Noxious Weed Regulations, the General Assembly of North Carolina has adopted the Aquatic Weed Control Act providing the Department of Agriculture with the authority to regulate the importation, sale, use, and distribution of noxious aquatic weeds.

The NCDA&CS Plant Industry Division's Plant Protection Section monitors aquatic nurseries through annual inspections to ensure regulated plants are not being sold online or at retail locations and nurseries.

Yellow Floating Heart (*Nymphoides peltata*) – State of NC Class A Noxious Weed

NCDA&CS coordinated herbicide applications to 10 distinct Yellow Floating Heart sites in 2021. These sites were re-visited in 2022. Herbicide applications were conducted as needed. Several of the sites were "no detect" for at least part of the season. Sites will be declared eradicated after three consecutive years of "no detect". No new infestations were observed or reported in 2022. All sites will continue to be monitored (and treated as necessary) in 2023.

Giant Salvinia (*Salvinia molesta*) – Federal Noxious Weed

A major infestation of *Salvinia molesta* occurs in Columbus County, very close to the SC border. NCDA&CS is providing assistance to NCDEQ's efforts in the removal of this plant.

Wooly Frogsmouth (*Philydrum lanuginosum*) First find in U.S.

NCDA&CS took regulatory action to prevent further spread in August 2016. This Guam native served as a "first find" in the U.S. and was initially treated in late 2016 and 2017. No treatment was done in 2018 because the plant could not be found. In 2019 Wooly Frogsmouth was observed in its original location plus in a nearby pond. Treatments began again in 2019 and 2020. The 2020 survey revealed very good control

for plants above the waterline, however, plants below the waterline were not effectively treated. To increase efficacy, in 2021, water was pumped out to lower the water level. Drawing down the water level by approximately 2 ft allowed much greater access to the weed for treatment. A population of Gopher Frogs (*Rana capito*) inhabits this site. These frogs are classified as a rare species. Efforts were made to mitigate the potential impacts to the resident Gopher Frogs (i.e., potential impacts from herbicide applications) by conducting applications during a 1-month window. The 2022 season found this borrow pit already low with very few plants present, potentially indicating that the previous season's treatment was successful. The nearby infestation found a slight increase in plant population. Overall, these sites continue to show progress towards the goal of eradication.

Aquatic Dealer Inspections

Aquatic dealer inspections are an important activity as they help filter out unwanted invasive plants from entering the trade through aquariums and water gardens and are accomplished as a supplement to the aquatic nursery inspections NCDA&CS conducts. The aquatic dealers database is updated annually, and inspection sheets given to Plant Pest Specialists for completion each year. For the 2022 season, 108 aquatic dealers were inspected across the state, with one stop sale issued for ambulia (*Limnophila sessiliflora*).

NCDEQ – Division of Water Resources (Aquatic Weed Control Program)

The program website:
https://deq.nc.gov/about/divisions/water-resources/water-planning/water-supply-planning/aquatic-weed-control-program

2022 Summary: The program was staffed by 2 permanent FTEs. Additionally, two seasonal employees are hired each year (typically May-June). In 2022 recruitment and retention was a major challenge and it wasn't until our hire in September and a second hire in October before being fully staffed.
The program develops annual work plans (calendar year). $691,000 was budgeted for aquatic weed management activities planned for 2022. Management activities are supported by a special fund, called the Aquatic Weed Fund. Money spent from the Aquatic Weed Fund requires a 1:1 non-state dollar match.

The following shows actual expenditures:

Alternanthera philoxeroides "Alligatorweed"	$4,240.17
Egeria densa	$0
Hydrilla verticillata	$195,210.76
Ludwigia grandiflora "Creeping Water Primrose"	$0
Myriophyllum aquaticum "Parrotfeather"	$2,099.85
Myriophyllum spicatum "Eurasian milfoil"	$9,392.41
Phragmites australis	$9,984.15
Salvinia molesta	$138,607.59
Research	$44,771.33
Total	**$404,306.26**

Gapway Swamp Giant Salvinia project (Columbus County)

This site is a rural setting, near the NC/SC State line. This infestation of Giant Salvinia was brought to our attention during the summer of 2020. To our knowledge this is an isolated event and the only site in NC. Giant Salvinia was likely introduced to this system between 2012-2015. Spread/movement of Giant Salvinia within this site would have been limited due to 1) the heavily vegetated conditions (extensive floating tussocks and stands of hardwoods) and 2) low flows (average discharge at Richardson Pond is estimated to be 5 CFS). The infested area is ~250 acres.

Gapway Swamp is currently impounded. The impoundment is called Richardson Pond and it incorporates multiple private properties. Immediately upstream of Richardson Pond is Buffkin Pond; an impoundment with a breached dam, also on private properties. Columbus County Cooperative Extension has assisted with this project by acting as a liaison (between NCDEQ and property owners).
Herbicide treatments began in 2021. The primary target area was ~40 acres in the lower end of Richardson Pond. That treatment successfully halted the downstream spread. In 2022 the treatment was expanded to target ~90 acres. The objective of this project is to eradicate Giant Salvinia from the site. Planning is underway to further expand the herbicide treatment to target ~110 acres in 2023.

NCDEQ – Division of Marine Fisheries

No updates since December 2021 report.

NCDNCR – Aquariums

Lionfish Mitigation - North Carolina Aquarium on Roanoke Island

A team of scientific divers from the North Carolina Aquarium on Roanoke Island removes Lionfish from four shipwrecks along the NC coast (USS Tarpon, Proteus, British Splendor, and C.M. Monahan). Funding for this project has been inconsistent and in 2022 funding did not become available until the dive season was close to over; however, funding for this work has been re-awarded and our scientific dive team will resume lionfish removals on the same four shipwrecks in the early summer and again in the Fall of 2023.

NCDNCR – State Parks

No report

NCWRC – Inland Fisheries Division

Lyngbya

NC Wildlife Resources Commission staff has continued to work with NC State to minimize impacts of Lyngbya treatments in Lake Gaston on native mussels. There are ongoing efforts to develop new techniques to identify areas of high mussel abundance and time treatments to have minimal impacts mussel beds.

Red Swamp Crayfish

Recent crayfish surveys in eastern North Carolina by biologists with the NC Museum of Natural Sciences, NC Wildlife Resources Commission, and SC Department of Natural Resources have indicated a decline in several native crayfish species including the Sandhills Crayfish (*Procambarus pearsei*) and the Waccamaw

Crayfish (*Procambarus braswelli*). Coincident with this decline is a rapid increase in the abundance of the invasive Red Swamp Crayfish (*Procambarus clarkii*) throughout much of eastern North Carolina. The NC Wildlife Resources Commission is partnering with researchers at Appalachian State University and initiated a study in 2021 to try to determine if the Red Swamp Crayfish is the cause of the decline in the native crayfish. The study will consist of both field and laboratory components.

Pee Dee River Catfish Survey

Since the 1960s, invasive and non-native catfish have spread throughout North Carolina and have had major impacts on native aquatic species in both riverine and reservoir systems. While these catfish can have negative effects on ecosystems, catfish fisheries have developed in many locations, including the Pee Dee River, North Carolina. In 2019, following overexploitation concerns from anglers, a regulation limiting the daily harvest to five catfish, in aggregate, was established in the Pee Dee River, below Blewett Falls Dam to the South Carolina border. In fall of 2018, the North Carolina Wildlife Resources Commission began surveys to evaluate catfish populations in the Pee Dee River. These surveys focused on Blue Catfish *Ictalurus furcatus* and Flathead Catfish *Pylodictis olivaris*, which are considered invasive to the Atlantic slope river basins, as well as non-native Channel Catfish *I. punctatus*. Electrofishing surveys were conducted during fall 2018, spring 2019, fall 2019, and spring 2020. All catfish were targeted, but no native catfish were observed. Blue Catfish (n = 251), Flathead Catfish (n = 178), and Channel Catfish (n = 254) were collected. Catch-per-unit-effort for Blue, Flathead, and Channel Catfish was 10.0, 7.1, and 10.1 fish/h, respectively. Otoliths were removed from a subsample of Blue (n = 154) and Flathead Catfish (n = 38), and aging was completed. Blue Catfish ranged from 3–25 years old, with a mean age of 10.35 (SE = 0.23) years old. Flathead Catfish ranged from 0–15 years old, with a mean age of 3.57 (SE = 0.25) years old. Blue Catfish reached an average length of 544 mm (SE = 24.55) by age 5 and Flathead Catfish reached an average length of 638 mm (SE = 19.21) by age 5. Relative weights (*Wr*) were calculated for all fish collected and very few had a *Wr* below 80, indicating most fish were in good condition. Total annual mortality rates were calculated for Blue (*A* = 23.0%) and Flathead (*A* = 26.1%) catfish and these rates were often lower than those determined for the same species in other, nearby rivers. Results indicate an abundance of invasive catfish in the Pee Dee River suggesting restrictive harvest regulations may not be biologically warranted.

Cape Fear River Catfish Study

In 2020, the University of North Carolina at Wilmington, in partnership with the NC Wildlife Resources Commission, completed the first phase of a study looking at the trophic ecology of non-native catfishes in the Lower Cape Fear River ecosystem. This first phase was a 23-year study in the Cape Fear, Northeast Cape Fear, and Black rivers. Diet analysis indicated that Flathead Catfish (*Pylodictis olivaris*) consumed large amounts of fish, crayfish, freshwater prawns, and aquatic insects with fish becoming more important as fish age. Blue Catfish (*Ictalurus furcatus*) consumed mostly Corbicula spp. along with a mix of fish and aquatic insects with fish becoming more prominent as the fish ages. Primary fishes consumed by both Flathead and Blue Catfish were in the families Centrarchidae (sunfishes and black basses) and Ictaluridae (catfishes). Flathead Catfish also consumed anadromous species. A second phase of the study is evaluating the effects of hurricane-induced fish kills, especially pre- and post-hurricane analysis of potential impacts on the invasive catfish biomass.

Blue Catfish in Lake Gaston

Blue Catfish *Ictalurus furcatus* directed sampling was initiated on Lake Gaston in 2016. Sampling consisted of electrofishing, juglines, and gill netting. A total of 664 Blue Catfish were sampled between 16 November 2016 and 21 January 2021, with 643 sampled with gill nets. No Blue Catfish were collected with electrofishing and gill nets were determined to be the superior sampling gear for Blue Catfish at Lake Gaston. Proportional size distribution was high (PSD = 76) reflecting a high abundance of small to medium size Blue Catfish. Overall relative weight was 89. Blue Catfish ages ranged from 3 to 25 and fish reached a mean length of 534 mm by age 5. Instantaneous natural mortality (M = 0.11), fishing mortality (F = 0.05), and total mortality (Z= 0.16) were low resulting in an estimated annual mortality (A) of 14.8%. Of the 189 Blue Catfish stomachs examined, approximately 40% were empty and 40% contained fish. Due to crowding and poor body conditions of small to medium size Blue Catfish, harvest is recommended and encouraged. This Blue Catfish study provided critical baseline information to gauge future changes in their population at Lake Gaston.

Lake Mattamuskeet Common Carp Removal

An integrated pest management plan to control Common Carp at Lake Mattamuskeet is currently underway as part of a cooperative effort between NC Wildlife Resources Commission and USFWS to enhance aquatic habitat and water quality associated with the Lake Mattamuskeet Watershed Restoration Plan. The current overpopulation of Common Carp (2018 estimate of 900,000 Common Carp weighing 4 million pounds) has devasted the Submerged Aquatic Vegetation (SAV) of the 40,000-acre Lake Mattamuskeet that is integral to migratory waterfowl of the Atlantic Flyway and fish and wildlife resources present at Lake Mattamuskeet. Common Carp may be considered the “feral hog of shallow water ecosystems” through their behavior to feed upon aquatic bugs in the sediment that uproots the existing vegetation (USFWS reports 0% SAV coverage in last 7 years) and increases the turbidity of the shallow lake, exacerbating the inability for light to penetrate the water column for SAV growth.
Primary carp barrier installation at each of the four water control structures by USFWS refuge staff in May 2021 will continue to be instrumental in the defense of keeping these Common Carp out of the lake. Coupled with preventative barriers to keep adult Common Carp out and future biomass removal of adult Common Carp from within the lake, advanced Bluegill stockings are intended to limit the recruitment of Common Carp by eating the Common Carp eggs and larvae as early as possible in the Common Carp life cycle. Stocking advanced-sized Bluegill (2-4 inches) during whole-lake experiments has been found to be an effective biocontrol mechanism during early life stages of Common Carp where the Common Carp eggs and larvae are a preferred food for Bluegill.

On March 6 and 8, 2023, NC Wildlife Resources Commission led scatter-stocking efforts with assistance from USFWS technician. The team stocked 102,028 advanced sized Bluegills (average size of 3 inches) prior to Common Carp spawning and with the intent for these Bluegills to prey on carp eggs. This effort marks the third year of this applied research approach with the Watha State Fish Hatchery providing more than 350,000 Bluegill towards biocontrol of Common Carp during that time. The advanced Bluegill may also contribute to spawning of more Bluegills when they spawn and continue the predation on Common Carp eggs and larvae hopefully to further limit Common Carp recruitment. This multi-prong approach is intended to benefit the growth of SAV and improve water quality at Lake Mattamuskeet.

NC Aquatic Nuisance Species Management Plan (NC-ANS Plan)

A copy of this plan is posted here: https://deq.nc.gov/conservation/natural-resource-conservation
The NC-ANS Plan was drafted in 2014-2015. In 2016, the NC-ANS Plan was adopted by NC Department of Environment and Natural Resources (now NC Department of Environmental Quality), NC Wildlife Resources Commission, and NC Department of Agriculture and Consumer Services. The NC-ANS Plan is a working document that provides a framework for implementing state-level collaboration on NC's ANS challenges.

Staff within state agencies continue to pursue the goal of submitting the NC-ANS Plan to the ANS Task Force. Rob Emens (NCDEQ – Division of Water Resources) and Tim Ellis (NCDEQ - Albemarle-Pamlico National Estuary Partnership) are the primary contact for questions about the NC-ANS Plan.

Rob Emens – (919) 707-9012 rob.emens@ncdenr.gov

Tim Ellis – (919) 707-8106 tim.ellis@ncdenr.gov

State of North Dakota

Submitted by Ben Holen

Aquatic nuisance species efforts continue to grow in North Dakota. In 2023, the North Dakota legislature approved an increase of approximately 1.4 million dollars a biennium to our ANS program's spending authority. The North Dakota Game and Fish Department (NDGFD) plans to use federal APC-WID cost- share dollars to expand its program, which includes increasing prevention, education, and monitoring efforts.

Outreach

NDGFD continues to implement a comprehensive ANS education/outreach program. NDGFD utilizes print materials, radio, television, social media, digital marketing, and personal contacts to raise ANS awareness at a regional level. We continue to partner with Midco, a regional TV/internet provider, to develop and disseminate ANS commercials. These new commercials play during prominent sporting events throughout the summer. In 2023, Midco plans to shoot an ANS watersports commercial. Since the last report, NDGFD has updated its ANS homepage, check it out!

Monitoring

Zebra mussel

North Dakota currently has four lakes and three rivers designated as zebra mussel infested waters. There were no new detections of zebra mussels in 2022. NDGFD samples 150+ waters using plankton tow nets for the early detection of zebra mussels every year. Substrate deployment and snorkeling surveys are conducted at select waters.

Invasive carp

Silver carp continued to be documented in the James River in low abundance. Captured fish otoliths are sent to South Dakota Game Fish and Parks, where they will be part of an otolith microchemistry project to determine natal origin.

Nuisance vegetation

No new documentation of invasive vegetation has occurred during the reporting period. Other than a handful of large waterbodies, most of North Dakota's waters remain free of invasive vegetation.

Prevention/Inspection

NDGFD hires 12-15 seasonal employees that conduct watercraft inspections at 20 different waterbodies. So far, more than 3,500 watercraft have been inspected in 2023. Boater compliance with ANS regulations remains relatively high. Large commercial equipment, including barges and tugboats, remains one of the highest risk vectors for spreading zebra mussels. NDGFD recently add a new administrative rule that requires all docks/lifts and water-based equipment to sit out of water for three weeks before they can be moved to a new waterbody. NDGFD continues to inspect private wholesale bait vendors, pet stores, and federal fish hatcheries in the state.

State of Ohio

Submitted by John Navarro

ANS Program Activities

- Continue control efforts of *Hydrilla* at several inland impoundments in the Ohio River basins, including Mosquito Creek Lake and Alum Creek.
- Continue to monitor for Bighead Carp and Silver Carp in the Ohio and Muskingum Rivers using telemetry and eDNA.
- Continue to work on closing the GLMRIS connections at Little Killbuck Creek.
- Continue the surveillance of Ohio's bait and Grass Carp supply chain to determine if AIS, including Bighead and Silver Carp, are being transported through the bait trade.
- Working with Butler County Metro Parks to control a Red swamp Crayfish infestation on their property.
- Continue an AIS outreach campaign through Wildlife Forever to target anglers moving AIS in bait. This outreach program includes billboards, print media, and items for distribution at events with the slogan "Trash Unused Bait".
- Continue to distribute the *Ohio Aquatic Invasive Species* guide.
- Participated in the following groups: Great Lakes Panel, Mississippi River Basin Panel, Ohio Aquatic Invasive Species Committee, and Asian Carp Regional Coordinating Committee.

State of Oklahoma

Submitted by Elaine Gainer

The Oklahoma Department of Wildlife Conservation (ODWC) hired Morgan Winstead as the new ANS Technician starting January 3, 2023. Oklahoma's ANS activities have recently included invasive carp sampling and specimen collections, zebra mussel veliger sampling, triploid grass carp certification documentation from the US Fish and Wildlife Service, approval or denial of aquatic import/export permits, participating in the Don't Let It Loose program, working with our Communication and Education division for outreach efforts, and other miscellaneous activities.

Invasive Carp

At least 70 bighead carp have been captured out of the Grand Lake O' the Cherokees system so far in 2023. Last year, only six were captured out of the system. With the ever-advancing electronics and the help of paddlefish guides, this totals over 5,600 pounds of invasive carp biomass removed from this system. Missouri State University is continuing research on the Grand Lake system (including Neosho and Spring rivers) in cooperation with Kansas Department of Wildlife and Parks, collaborating with ODWC and US Fish and Wildlife Service.

Auburn University has an ongoing invasive carp project on the Red River, working with ODWC, Arkansas Game and Fish Commission and Texas Parks and Wildlife. US Fish and Wildlife Service in Tishomingo are also working on invasive carp research in the Red River and cooperating with ODWC and Auburn University.

The ODWC has been awarded additional funds to put towards invasive carp research, monitoring and removal efforts in the Grand Lake O' the Cherokees system as well as the Arkansas River below Robert S. Kerr Reservoir to the Arkansas border. ODWC intends to hire on one full time and one hourly position with these additional funds in the future.

Zebra Mussels

Zebra Mussel veliger sampling efforts were completed in the months of May and June on 36 lakes throughout the state. Samples were sent to the ECOLAB in Denver, Colorado and final results are pending. In the 2022 sampling season, only one new lake tested positive for zebra mussel veliger presence.

Future Directions

Plans for the future include assisting universities in the field with ongoing and upcoming invasive carp projects, starting our internal upcoming invasive carp projects on the Grand Lake system and Arkansas River, cooperating and collaborating with various agencies and municipalities on other statewide ANS issues, updating and performing ANS signage checks around public waters, performing shoreline observations, hiring a full time and an hourly position, attending annual meetings, when feasible, and writing interim/final reports for grants.

State of Pennsylvania
Pennsylvania Fish and Boat Commission

Compiled and Submitted by Sean *Hartzell*

- AIS DISPOSAL STATIONS: The Pennsylvania Fish and Boat Commission (PFBC) is installing several Aquatic Invasive Species Disposal Stations at some of the state agency's boat launches. This project is supported by grant funding through the federal AIS Management Plan Grant program. Stations are similar to those used in New York (https://www.dec.ny.gov/docs/fish_marine_pdf/isdsplanssign.pdf). Sites are primarily based in Western Pennsylvania.

- AIS CONTROL PLANS: The PFBC has recently updated or created new statewide control plans for various AIS of concern (e.g., Northern Snakehead, Rusty Crayfish, Invasive Carp, etc.). These plans can be vied online at the following webpage: https://www.fishandboat.com/Conservation/AIS/Pages/default.aspx

- AIS COMMUNICATIONS Plan: The PFBC has recently completed a statewide "Aquatic Invasive Species Communications and Outreach Plan" to guide the agency in this important role. The completed plan can be viewed online at the following link: https://www.fishandboat.com/Conservation/AIS/Documents/AISCommOutreachPlan.pdf

- ROUND GOBY: This invasive species was likely introduced by "bait buckets" into the French Creek Watershed (Allegheny/Ohio basin) from Lake Erie. It was first detected in Leboeuf Lake in 2014, which flows into Leboeuf Creek and then into French Creek. Recent and surveys in 2022 indicated the Round Goby is has spread significantly downstream from Leboeuf Lake, approximately 10 miles downstream French Creek in the vicinity of Cambridge Springs. It is thought that spread has been primarily due to larval drift. Pennsylvania Sean Grant is currently working with the PFBC and other partners to draft control and monitoring plans for the Round Goby in the French Creek watershed.

- AIS SURVEYS IN Lakes: With support from Great Lakes Restoration Initiative grant funding, the PFBC is surveying select agency owned lakes for AIS, particularly species that may be a treat to the Great Lakes basin. Surveys are occurring at select lakes statewide. The project is ongoing and started in Spring 2023.

- AIS REGULATIONS: The PFBC is working on proposed revisions of 58 PA Code Chapters 71 and 73 regulations focused on aquatic invasive species prevention, fish health, and stocking fish in waters of the Commonwealth.

State of South Dakota
Department of Game, Fish and Parks

Submitted by Tanner Davis

2022 Overview of AIS Management Efforts

In 2022, SDGFP conducted 18,582 watercraft inspection, up roughly 28% from 2021. In 2023, there has been 6,558 inspections conducted as of June 20th, which is up roughly 15% from last year at this time. Thirteen inspections stations are in operation across South Dakota on any given week during the summer months. A new roving watercraft inspection crew was implemented this year to show a presence at high trafficked lakes in eastern SD. GFP was able to hire 63 inspectors, which include two seasonal supervisors. The seasonal supervisors oversee operations in western and eastern SD. Additionally, GFP law enforcement officers are assisting with compliance during inspections, when available, and fewer law enforcement vacancies are helping with added presence compared to 2022. Law enforcement has also conducted their own AIS compliance checks when time allows.

SDGFP continues education and outreach efforts to educate boaters and water users on best management practices, specifically focusing on 'clean, drain, dry' messaging. For a fourth year in a row, utilizing Lawrence and Schiller for our marketing campaign, GFP is conducting gas station television at 43 gas stations across South Dakota. Individuals who encountered these gas stations or utilized infested waterbodies received digital and/or social media advertisements following up on these messages as well. GFP built upon their outreach and education aspect of the AIS Program by also incorporating an AIS Awareness week this year which occurred the week of May 22nd.

Outside of watercraft inspections, SDGFP continues to pursue invasive carp funding to better understand invasive carp distribution and habitat use, hydrological risk assessment, site suitability risk assessment, otolith microchemistry to better understand natal origins, and eDNA work related to bait trade and presence/absence of invasive carp in areas where risk was associated during the flooding in 2019.

Watercraft Inspection Stations

Maximize boater engagement to increase adoption of best practices to clean, drain, and dry watercraft between uses. Three roadside stations were operated in central and eastern South Dakota to maximize boater contacts, as well as implementing a new entrance based roving WID station.

Inspection stations are occurring at nine boat launch areas at the six largest western South Dakota reservoirs. In 2023, there is a secondary WID station at Sheridan Reservoir due to the recent infestation at Pactola Reservoir in 2022.

The USFWS is helping fund stations through the QZAP grant at Angostura, Belle Fourche, Deerfield, Sheridan, Pactola and Shadehill Reservoirs with Western Dakota Water Development District also contributing funds for Pennington County reservoirs.

To date, 6,558 watercrafts have been inspected compared to 5595 watercraft as of June 20, 2022. Therefore, SDGFP are up 15% in boat inspections compared to last year, which was our highest inspection year to date.

Sixty-three inspectors were hired between GFP and local County Conservation Districts. GFP added a new position, East River Watercraft Inspection and Decontamination Supervisor to oversee WID operations primarily in the NE part of state where we have seen the largest spread of zebra mussels. This position was created after seeing the utility in our West River Watercraft Inspection and Decontamination Supervisor, which was put into place in 2022.

Minimize transport of water, vegetation, and aquatic animals among waters by:

Increasing awareness of AIS and impacts to water users

Engaging boaters at inspection stations to help them develop best practices to slow the spread

Utilizing law enforcement to engage boaters and help increase regulation compliance

93%-100% Boat plug compliance at all locations in 2022.

Enforcement Increases Compliance

Issuance of warnings and citations for violations of AIS statutes and administrative rules helps increase compliance with boat plug, vegetation, and fish and bait transport rules. So far in 2023, approximately 64 warnings and 71 citations have been written, which is up from last year due to less vacancies for law enforcement.

State Agency Partnerships

Transportation- use of DOT field locations for watercraft inspections and include a provision in construction contracts stating contractors must obey AIS regulations.

Also helped install Zebra Mussel Infested Water signs and Preventative AIS signage as part of SDGFP rapid response plan.

Public Safety use of motor vehicle carrier weigh station locations for watercraft inspections.

Agriculture and Natural Resources - distribution of information to irrigators, municipalities, and businesses with surface water withdrawals.

Revenue - distribution of rack cards on “clean, drain, dry” to county treasurers for inclusion in registration renewal mailings.

Sioux Wahpeton Oyate Tribe – Partnering with SD Parks on placement of CD3 units placed at Pickerel and Enemy Swim Lake.

Federal Agency Partnerships

Bureau of Reclamation - Coordination with prevention efforts and mussel veliger sampling at BOR reservoirs.

US Forest Service - Use of USFS boat ramps for watercraft inspection locations and storage of equipment as well as placement of education signage at water access point.

US Corp of Engineers - Allowed signage at their public boat ramps.

NGO Partnerships

Wildlife Forever - GFP purchased hats from Wildlife Forever.

The Invasive Species Action Network - Received Don't Let It Loose signage for urban fisheries and purchased Don't Let It Loose pet store bags.

Glacial Lakes and Prairies Tourism Association - Placed rack cards at Bramble Park Zoo in Watertown for more public outreach.

SD Lakes and Streams – Partnering with SDGFP and SDSU extension on community-based monitoring inspection workshop.

Education and Outreach

Reinforce key messages of "Clean, Drain, Dry", leave boat plugs out except when launching, loading, and on the water, do not move water when transporting bait and fish, and be aware of current AIS infestations.

Tools include organic and paid social media messages, YouTube videos including AIS Biology and Inspection/Decontamination training videos, gas station TV, targeted emails, news releases, rack cards, AIS posters at Welcome Centers across the state, digital advertisements, lake association meetings, AIS training for volunteer inspectors and youth at SDGFP Outdoor Campus's, *sdleastwanted.sd.gov* website, Citizen Monitoring Program, and enhanced AIS signage and equipment at boat ramps to mitigate the spread of AIS.

GFP partnered with SDDOT to use interstate DOT signs for AIS messaging and partnered on installation of zebra mussel infested water signs in the central and eastern portions of SD.

GFP reached out to 32 lake associations for partnership and through that effort several lake associations have partnered to some degree on AIS prevention through signage and deploying monitoring devices for early detection of dreissenid mussels.

New Zebra Mussel Infested Waters in 2022

- Pactola Reservoir
- Enemy Swim Lake
- Clear Lake (Marshall Co.)
- Blue Dog
- South Rush

No new infestations have occurred in 2023 to date.

State of Tennessee
Tennessee Wildlife Resources Agency

***S**ubmitted by Cole Harty*

- Participated in and developed numerous ANS outreach actions including webinars, press releases, expos, news interviews, radio interviews, newspaper interviews, pamphlets, signs, etc.
- Placed boat ramp signage informing resource users of the threat of Alabama bass in Middle and East Tennessee.
- Actively participated in invasive carp sub-basin partnerships (Tennessee/Cumberland and Lower Mississippi River sub-basins), Invasive Carp Advisory Committee of MICRA, AIS Committee of MICRA, and MRBP (serving as second-term co-chair beginning July 2023).
- Hired three interns from University of Tennessee – Knoxville to do statewide ANS outreach during summer 2023. Interns assisted with regional ANS sampling, improved and replaced signage at access points, and developed draft ANS outreach material and media posts.
- Continued research on the use of freshwater prawns as a control for red swamp crayfish.
- Hired interns from University of Tennessee – Martin to assist with invasive carp study evaluating reproductive success, establishing leading edges and abundance of age-0 carp in Kentucky and Barkley Lakes using larval light traps, larval tows, and mini-fyke nets.
- Continued assessment of spatial variation in relative abundance of invasive carp in Kentucky, Pickwick, Barkley, Cheatham, and Old Hickory reservoirs.
- Monitored invasive carp movement and lock and dam passage in the Tennessee and Cumberland rivers. Assisted efforts by USGS and Tennessee Tech to implant acoustic tags in over 300 Silver Carp.
- Documented harvest at licensed wholesale fish dealers and collected biological information from Silver and Bighead Carp.
- TWRA has continued surveillance and outreach for invasive carp in response an angler reported Silver Carp in Chickamauga Lake from January 2020. Extensive search efforts in East Tennessee reservoirs and tailwaters have found no additional Silver Carp.
- TWRA Tennessee Carp Harvest Incentive Program (TCHIP) supports commercial fishers and wholesale buyers with monetary incentives applied to harvested invasive carp. As of 7/01/2023, the program has resulted in the harvest of more than 25 million lbs. of invasive carp from Kentucky, Barkley, Pickwick, Cheatham, and Old Hickory lakes since its inception in September 2018.
- TWRA has been actively engaged in discussions and structured decision-making processes with partners regarding the implementation of barriers on lock and dam sites on the Tennessee and Cumberland rivers.

State of Texas
Texas Parks and Wildlife

Submitted by Monica McGarrity

Zebra/Quagga Mussels

Since the last MRBP meeting, zebra mussels have been detected in two new water bodies in Texas, Hords Creek Lake and Lake Amistad.

In April, the US. Army Corps of Engineers found a single zebra mussel attached to dam infrastructure at Hords Creek Lake. Subsequent surveys by Texas Parks and Wildlife Department (TPWD) discovered the presence of multiple size classes of zebra mussels at multiple sites, indicating the lake is fully infested. This is a small lake with low water levels and only a single ramp currently in operation and no marinas are present.

The invasive mussel situation at Lake Amistad on the Rio Grande on the Texas-Mexico border continues to be monitored by the NPS in collaboration with TPWD. Since the 2021/2022 detection of quagga mussel larvae and eDNA by labs used by NPS, there have been no additional quagga mussel eDNA/larvae detections and settled mussels have not been found. However, the TPWD Analytical Services Lab has begun analyzing some plankton samples and detected zebra mussel larvae and eDNA in April/May 2023 samples but found no evidence of quagga mussels.

Invasive Carp

TPWD is continuing to work with Oklahoma Department of Wildlife Conservation, Arkansas Game and Fish Commission, Auburn University, and Texas Tech University to assess the population status of invasive bigheaded carp (bighead and silver) in the Lower Red River Basin across the tri-state area. The project is nearing the end of the population assessment phase and

the end of the first year of a two-year telemetry study. To date, bigheaded carps have been found in the Red River upstream to Denison Dam below Lake Texoma and in all monitored tributaries. However, thus far, successful reproduction has not been documented and more carp have been caught in Arkansas waters than upstream. Future project directions will move toward implementation of invasive carp removal efforts.

Aquatic Invasive Plants

Giant salvinia continues to be the most problematic aquatic invasive plant in Texas, and is present in 25 reservoirs and 7 river systems. Early detection and rapid response efforts continue, but no new recent infestations have been found. Biological control using giant salvinia weevils continues to show success and the weevils are being used as part of our IPM strategy on 15 water bodies with a total of 353,638 weevils released in fiscal year 2022. Self-sustaining weevil populations are now present at J.D. Murphree WMA lakes, Toledo Bend Reservoir, Sheldon Lake, Lake Naconiche, Lake Nacogdoches, and Lake Raven. Herbicide

treatments using penoxsulam/flumioxazin are also used to control giant salvinia on 31 water bodies, with nearly 15,000 acres treated in fiscal year 2022.

Water hyacinth also continues to be problematic and is present in 58 reservoirs and all major rivers across the state. In fiscal year 2022, nearly 3,500 acres of water hyacinth were treated with herbicides on 30 water bodies, primarily using 2,4-D.

Crested floating heart is currently found in 4 water bodies and yellow floating heart in 2 water bodies, as well as the latter being present on the Louisiana side of Toledo Bend Reservoir on the state border. Treatment using ProcellaCOR has been highly effective, and infestations have been significantly reduced on most water bodies.

Because hydrilla in many cases provides much needed fish habitat in those aging reservoirs in Texas with minimal littoral zones, treatments of this species are limited to addressing access issues at swimming areas, campsites, along shorelines where it has become problematic for lakefront landowners for access, boat ramps, and boat lanes unless coverage exceeds 40%. Control strategies include herbicides and triploid grass carp. In fiscal year 2022, 170 acres of hydrilla were treated across 9 water bodies.

Fiscal year 2023 information will be available by the next MRBP meeting.

Riparian Invasive Plants

Giant reed (*Arundo donax*) control is ongoing in Central Texas and has expanded to include the Pedernales, Blanco, Guadalupe, Medina, Nueces, and Llano rivers and San Felipe Creek. Control is implemented on nearly 400 private and public properties across these basins in collaboration with the landowners.

Saltcedar control on the Upper Brazos River in critical habitat for smalleye and sharpnose shiners in collaboration with the USFWS continues to be a priority. To date, over 20,000 acres have been treated across approximately 150 primarily private properties.

Watershed-scale elephant ear control on the Llano River continues, with over 50 river miles in monitoring or active management status. In 2022, survey and treatment efforts were hindered by severe drought, with only one treatment event conducted. One treatment has been completed thus far in 2023 with another anticipated in the fall.

Aquatic Invasive Species Research

TPWD is currently supporting four AIS research projects, described below, through our biennial AIS grant program; projects will be completed by the end of August. The FY24-25 Request for Proposals has closed with nine proposals received; we anticipate funding three new projects for the coming biennium based on funding availability.

Near real-time detection and monitoring of invasive mussel species in Texas waterways – Baylor University, Dr. Greg Hamerly & Dr. Ryan McManamay

Early detection of zebra mussel veliger larvae requires microscopic analysis of plankton samples that can be time consuming and delay results. This project seeks to test a novel and efficient AI process to more quickly detect and enumerate zebra mussel veligers, refine the technology, and explore spatiotemporal variability of veliger presence and density over time in the study areas. The study will also implement this technology to augment early detection monitoring in Texas.

Assessing the Population Dynamics and Body Condition of Zebra Mussels Within and Between Two Texas Water Bodies with Different Population Trajectories: Lakes Belton and Stillhouse Hollow – Temple College, Dr. Jason Locklin

Long-term studies have indicated that some zebra mussel populations in Texas decline in density and growth rates over time, whereas others do not. This study seeks to better understand population dynamics in two lakes with different population trends in conjunction with food availability and water quality parameters. This study will evaluate potential explanations for population declines that will have implications for predicting ecological and economic impacts of zebra mussels in infested waters and aid in guiding mitigation strategies.

Using remote sensing to map Arundo donax populations in Native Fish Conservation Areas throughout Texas to better understand causal factors of invasion and set management priorities.
– Texas State University, Dr. Jason Martina & Dr. Jennifer Jensen

Giant reed (Arundo donax) is a highly problematic invader of rivers and creeksides with significant impacts on both riparian and aquatic habitats and efforts to manage this species are ongoing in the Hill Country. This study will test and develop the use of remote sensing technology to identify infested areas and areas where infestation is increasing as well as examining landscape factors influencing infestations and identify areas at high risk of impacts. This technology will be applied to Native Fish Conservation Areas across the state to aid in prioritizing areas for future control efforts.

Assessing abundance, sex ratio, and space use by suckermouth armored catfish to enhance control efforts – Texas A&M University, Dr. Joshuah Perkin

Non-native suckermouth armored catfish compete with native species, alter food webs, and cause habitat degradation through burrowing into banks, and efforts to remove these invasive fish are underway in the San Marcos River to protect imperiled species. This study seeks to assess seasonal abundance of this species in the San Marcos River as well as assess movement and population sex ratios and test potential new control augmentation techniques. Results of this study will aid in guiding and enhancing the efforts of ongoing removal efforts.

State of West Virginia
Division of Natural Resources

Submitted by Katie Zipfel

Invasive Carp Monitoring

WVDNR currently collaborates with numerous state and federal partners on invasive carp related issues within the Ohio River basin. WVDNR is a participating agency on the Early Detection and Monitoring, Control and Containment, Telemetry and Early Life Stages Projects within the Ohio River Basin Framework.

Monitoring & Early Detection

WVDNR conducted annual monitoring boat electrofishing surveys on the R.C. Byrd (25 Sites, 6 hrs.) and Greenup (14 Sites, 3.5 hrs.) pools of the Ohio River in Spring 2023. No invasive carps were collected. Throughout April 2023, WVDNR deployed gill nets in the R.C. Byrd (1800 feet) and Greenup pools (900 feet) of the Ohio River. One Bighead Carp was removed from Greenup; one Silver Carp was removed from Tenmile Creek in the R.C. Byrd. In Fall 2022, the WVDNR deployed gillnets in the R.C. Byrd (2550 ft.) and Greenup (1350 ft.) pools. One Silver and two Bighead Carp were removed during this sampling period.

Early Life Stages

To date in 2023, WVDNR has conducted two sets of ichthyoplankton tows for invasive carp eggs and larvae in Raccoon Creek and the Kanawha River, both tributaries of the Ohio River in the R.C. Byrd Pool. All larval fishes that are collected will be sent to Indiana DNR for identification. No suspect eggs or larvae have been collected to date. WVDNR is collaborating with INDNR, KDFWR and WVU on increasing juvenile fish sampling further upstream in the Ohio River sub-basin.

Telemetry

In Fall 2022, the new USFWS-Region 5 invasive species group out of Williamstown, WV took over the maintenance of the USFWS telemetry array from WIllow Island L& D to R.C. Byrd L & D. The WVDNR continues to maintain an array in the R.C. Byrd pool that was previously installed for a catfish movement study. Receivers are offloaded every two months and data is shared with

USFWS and Kentucky DFWR. Data shows one tagged bighead and three silver carp are currently inhabiting the R.C. Byrd Pool of the Ohio River.

Control and Containment

In September 2022, WVDNR and USFWS employees engaged in a three-day removal effort in Raccoon Creek on the R.C. Byrd Pool. Using an electrofishing boat to drive carp into the gill nets (WVDNR - 2100 ft.), six invasive carp were removed. These included 3 Bighead Carp, 2 Silver Carp and a Grass Carp. Another two-day collaborative removal effort was conducted in July 2023 (900ft of net) in the same pool; one bighead carp was removed.

Hydrilla

WVDNR continues to communicate with ORSANCO in monitoring the advancement of Hydrilla downstream in the mainstem Ohio River. With reports of hydrilla in small impoundments increasing, the WVDNR will collect samples for New York DEC for another genetic survey of hydrilla in the Mid-Atlantic.

Northern Snakehead

Despite proximity, WVDNR has yet to receive any reports of sightings or catches of Northern snakehead in the WV portion of the Potomac River drainage.

Regulatory Actions

No new regulations have been put into place.

State of Wyoming
Game and Fish Department

Submitted by Josh Leonard

AIS Program Activities

- The WGFD responded to the mussel infestation detected in Pactola Lake, South Dakota mid-July, 2022. This infested water is only 27 miles from the Wyoming border, significantly increasing the threat to Wyoming. As a result, Wyoming closed all watercraft access to LAK Reservoir in northeastern Wyoming starting Aug 1st, 2022. In 2023, only hand-launched non-motorized watercraft will be allowed. Additionally, Wyoming closed all but one boat ramp on both Keyhole and Glendo Reservoirs, and limited launching/retrieving hours starting October 5, 2022. These closures remained in effect until ice on (Nov 30 for Keyhole and Dec 19 for Keyhole) in an effort to inspect 100% of watercraft launching at these locations, as they are the most popular next destination in WY for Pactola watercraft.
- In 2023, WGFD constructed two new AIS check stations in the towns of Lusk and Newcastle in response to the Pactola infestation. Operations at these locations began March 1, 2023 and will be open until Nov 30, 2023.
- In 2022, watercraft check stations began operation in late March and in select locations, stayed open into the winter, at fifteen permanent check stations at port of entry, rest area, and other locations to intercept watercraft entering the state. Roving crews focused on inspections at major waters throughout the state to contact resident boaters. In 2022, a total of 66,163 inspections were conducted. Of these, 4,789 were high risk watercraft and 699 were decontaminated for water onboard or suspect AIS. A total of fifty-eight boats were intercepted with mussels attached or in compartments, one of which was harboring live mussels. So far in 2023, over 21,000 inspections have been conducted, of which 2,033 have been high risk, 360 decontaminated and 8 mussel fouled boats intercepted.
- The WGFD increased seasonal personnel hiring in 2023 by over 20% to combat the increased workload and to staff the new check stations with the added risk from Pactola Reservoir. Additionally, our technician hourly wages were increased from $16.11 to $18.71 to address recruitment and retention issues from previous years. The program now operates with 75 personnel during peak season; 5 FTE personnel, four 10-12 month contract Specialists, four crew leads and 62 seasonal inspectors.
- In 2022, Wyoming initiated the roll out of tablets and wireless printers for all AIS inspections at our permanent check stations, in an effort to cut back on data entry and interact with surrounding states real-time. Additionally, this has allowed Wyoming to intercept high risk boats that may have been overlooked in years pasting trusting watercrafts users in where they said they boated last. In 2023, more units were purchased to so we can be 100% live at all locations and regional offices.
- The WGFD completed multiple rigorous regulation changes to further protect our state from AIS in regards to Private Hatchery fish importation, which was implemented Jan 1, 2023. All hatcheries requesting to import fish to Wyoming will now be required to have a valid AIS Hatchery Inspection following to rules set in Chapter 51. Additionally, the AIS program adopted the AIS Hatchery

Inspection obligations in 2021 and will continue their annual monitoring of hatcheries in the coming months.

- The WGFD recently purchased a 10 acre lot on the east side of the Flaming Gorge Reservoir to construct a new check station in preparation to possibly implement rapid response efforts. The project is currently in the design phase and will hopefully be constructed the winter of 2024.
- The WGFD is upgrading utilities at check station around the state in an effort to provide power and water to locations historically operated using generators and water hauling. In 2022, a well was drilled at our Cheyenne I80 Port of Entry location and on-demand decontamination units will be installed this fall. Additionally, the Cheyenne I25 check station will undergo a move and remodel this fall with over $250,000 in upgrades, including power, water, on-demand decontamination units and cement pads for inspections and decons.

Priorities for the Upcoming Year

1. The WGFD will continue to upgrade utilities at check stations while transitioning mobile decontamination units to on-demand units, to help deliver more reliable temperatures when preforming decontaminations.
2. The WGFD is in the process of constructing a new check stations at Keyhole Reservoir and the upgrading the Beulah AIS Check Station to more efficiently and effectively decontaminate watercraft coming from South Dakota and other eastern states, since our attention toward the northeast has shifted in the last year.
3. The WGFD will undergo revisions to their water specific rapid response plans as cost estimates have significantly changed since the initial drafting of these plans in 2020.
4. The WGFD will be pursuing the possibility of implementing a local/frequent boater program to reduce the workload of staffing so they can concentrate on higher risk watercraft.

U.S. Army Corps of Engineers

Submitted by Mark Cornish

Through its primary Civil Works missions, the U.S Army Corps of Engineers (USACE) has constructed and/or operates infrastructure in most major river systems and coastlines throughout the nation, with significant impacts on aquatic ecosystems and the species that depend on them. This infrastructure has taken the form of large dams to support its flood risk management, hydropower, and water supply missions; locks, dams, and canals to support navigation, levee systems, diversions, and coastal storm protection features. In the area covered by the Mississippi River Basin Panel, the USACEs has five Divisions that generally fall along watershed boundaries, including the Mississippi Valley Division (Mississippi River), Great Lakes & Ohio River Division (Ohio River), Northwest Division (Missouri River), Southwest Division (Red River), and the South Atlantic Division. Within each Division are Districts that oversee the management of USACE activities within their respective areas of responsibility. These include activities include both terrestrial and aquatic nuisance species management on USACE managed lands through both authorized projects, Ecosystem Restoration programs and the Environmental Stewardship programs for each USACE project office. USACE also has a research facility based in Vicksburg, MS that oversees the Aquatic Plant Control Research Program and the Aquatic Nuisance Species Research Program. This summary highlights both authorized projects and research activities relating to invasive carp and is not intended to be comprehensive. There are numerous other aquatic nuisance species activities that involve plant, insect, and animal control that are not included in this summary.

Electric Dispersal Barrier System (EDBS) – Operation, Maintenance and Construction – Chicago Sanitary and Ship Canal, Romeoville, Illinois

The EDBS is located in the Chicago Sanitary and Ship Canal, which is a man-made waterway creating the only continuous connection between Lake Michigan and the Mississippi River Basin. The dispersal barrier system was developed to prevent the spread of invasive fish species between these watersheds. 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. USACE is continuing to operate and maintain the barriers and continue construction on the Barrier I southern array. FY23 cost was estimated at approximately $14,129,000.

Figure 1 Electric Dispersal Barrier 1 Control Building, Romeoville, IL

In support of barrier efforts USACE tracks and monitors fish throughout the Chicago area waterway system. The goal is to monitor the EDBS for upstream passage of large fishes, assessing the risk of Bighead Carp and Silver Carp presence, identifying lock operations and vessel characteristics that may contribute to the passage of fish through navigation locks in the Chicago area waterway system, and evaluating temporal and spatial patterns of habitat use at the leading edge of the invasion front.

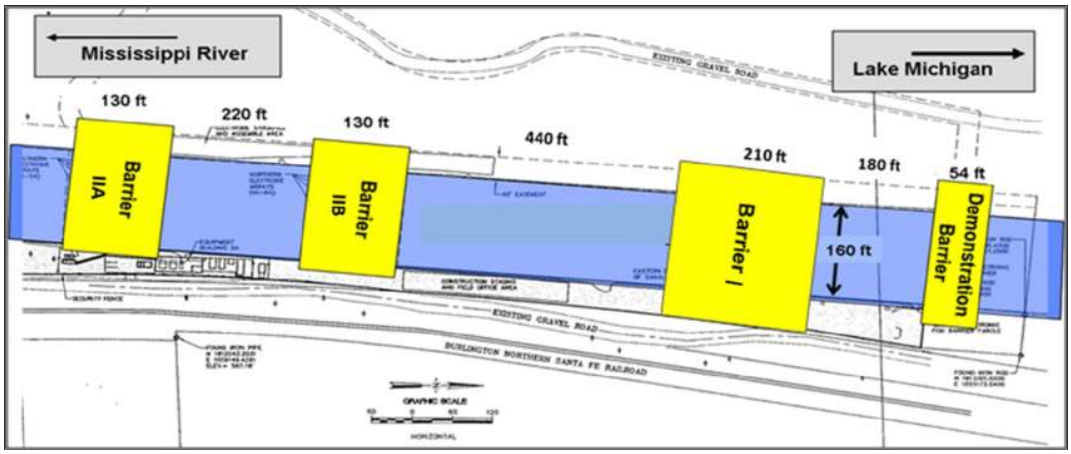


Figure 2 Location of electrodes in the Romeoville Electric Dispersal Barrier System

Brandon Road Lock and Dam Aquatic Nuisance Species Barrier Project – Design phase – Des Plaines River, Joliet, Illinois

The project includes a layered system of structural controls and non-structural measures. The structural plan includes a new control point on the Des Plaines River at Brandon Road Lock and Dam in addition to the control point that is already provided by the Chicago Sanitary and Ship Canal EDBS in Romeoville, Illinois. The new structural control point would include an acoustic fish deterrent, a bubble deterrent, an engineered channel, an electric deterrent, a flushing lock, and an automated barge clearing (barge entrainment) deterrent. The project includes managing the waterway below Brandon Road Lock and Dam as a "population reduction zone" where monitoring and overfishing would occur. Non-structural measures that may be implemented primarily by other federal and state agencies include public education and outreach, nonstructural monitoring, integrated pest management, piscicides, manual or mechanical removal of fish, research, and development and two boat launches.

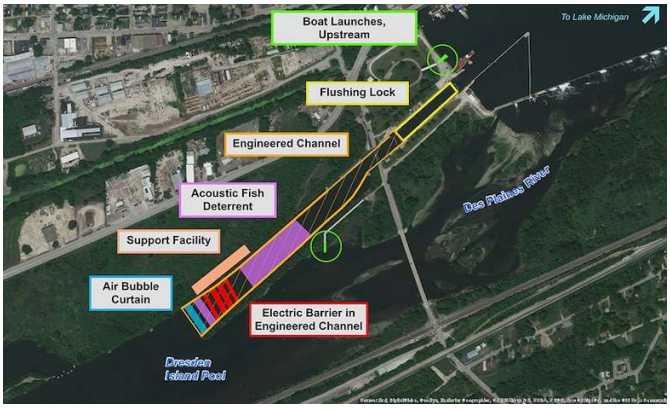


Figure 3 Project features of the Brandon Road Interbasin Project, Joliet, Illinois

The project is anticipated to be constructed in three increments:

- Increment I-A: bubble deterrent, acoustic deterrent, automated barge clearing (entrainment) deterrent, support facilities, and upstream boat launch.
- Increment I-B: site prep, and channel rock excavation.
- Increment II: electric deterrent, large acoustic deterrent, engineered channel floor & wall for electric & large acoustic deterrent, flushing lock, downstream boat launch, and support facilities.
- Increment III: the completion of the engineered channel floor and walls.

The project delivery team has completed the 95% design of Increment I-A and is working with the State of Illinois to sign the Project Partnering Agreement to begin contracting for construction.

Pilot study of underwater Acoustic Deterrent System (uADS) (Year 3)- Lock and Dam 19 – Mississippi River, Keokuk, IA

USACE and USGS are working on a multi-year effort to investigate underwater sound as a potential management technology, including piloting the use the underwater Acoustic Deterrent System (uADS) to deter invasive carp at Lock and Dam 19 on the Mississippi River. Deploying large-scale experimental acoustic structures at critical passage points in the Ohio River and Upper Mississippi River basins will help managers understand the effectiveness of acoustic deterrents in natural settings where invasive carp populations are already established and allow for the evaluation of the technology prior to deployment in other locations where it might help prevent upstream migration to the Great Lakes.

Figure 4 uADS installation at Lock 19, Keokuk, Iowa

For this large-scale deployment, underwater sound equipment will be installed at “pinch points” in the river system where carp are only able to swim upstream through a lock chamber because the head height of the dam structure is impassable. Migration of fish is then confined to a single passage point and can be monitored with the use of telemetry and hydroacoustic equipment. In addition to field-testing uADS, research efforts in the lab will continue to refine and optimize sound frequencies, sound pressure levels, and speaker designs to repel invasive carp while limiting or eliminating undesirable effects on native species. FY23 activities include maintenance of the uADS and its continued evaluation of the uADS at Lock 19.

Automated Barge Clearing Deterrent Experimental Testing – Illinois River, Peoria Lock and Dam, Creve Coeur, IL

Removing larvae and small fish from the near hull areas of barges has been the focus of research effort for almost a decade. Work in 2023 is a continuation of previous studies that investigated small fish entrainment, retainment, and upstream transport by commercial barge tows. An interagency team including USFWS, USGS, and USACE working with the Illinois DNR, have conducted several years of barge entrainment studies that demonstrate that small fish can become entrained and retained in the box to rake junction of commercial tows. The research team used the physical model to design and construct a compressed air-based system, called the Automated Brage Clearing (ABC) Deterrent.

A full-scale prototype ABC Deterrent was installed at Peoria Lock and Dam on the Illinois Waterway in August and September 2022. The interagency team ran six loaded barges over the study area 101 times (51 control and 50 test) and collected positioning and fluid velocity data and conducted hydrographic surveys. Each run consisted of the insertion of 550 small, marked fish into the rake/box junction of moving barges and recorded fish behavior with a sonar camera. A specially designed net was used to recapture fish to determine how many remained after the barges passed over the study area to quantify the effectiveness of the deterrent. The tow captain was interviewed after each run to determine the effect that the ABC Deterrent had on barge handling. Interested parties participated in an Open House to observe field testing. All field tests have been completed and the data will be analyzed and published in an ERDC Technical Report in late 2023.

Figure 5 Automated Barge Clearing Deterrent at Peoria Lock, Creve Coeur, Illinois

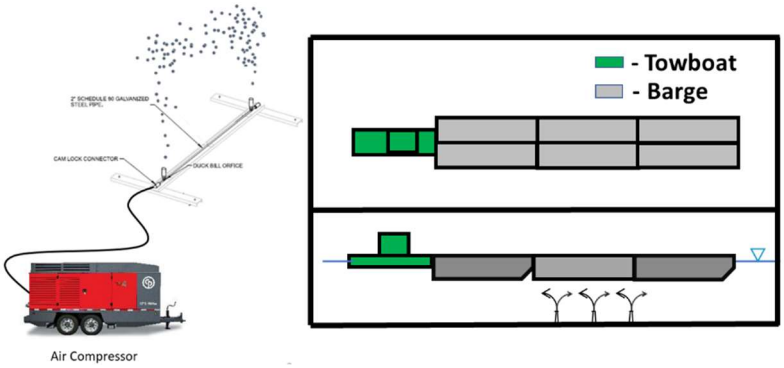


Figure 6 ABC Deterrent uses air bubbles to remove organisms from the near hull areas of passing barges.

USDA Forest Service Southern Research Station

Submitted by Zanethia Barnett

Crayfish

We are continuing to work with Montana Fish, Wildlife and Parks, the US Forest Region 1, and other partners on crayfish issues in Montana.

- We published a paper (Schmidt et al. 2023, attached) on a new nonnative crayfish found at Montana state fish hatchery.
- We are preparing another manuscript on a novel control method being tested for burrowing crayfish.
- We continue with genetic assessments to try to understand where virile crayfish (*Faxonius virilis*) are native versus invasive east of the divide in Montana.
- I have hired an ORISE intern, Mr. Hampton Kennedy, to search primary historical documents in search of early mentions of crayfish throughout the state, as well as in neighboring states.
- We, along with colleagues in Spain, are preparing a manuscript documenting crayfish plague in the state.
- I am seeking funding to continue our research on crayfish plague in Montana and throughout the country. One of the questions to be addressed is if plague expression occurs due in part to introduction of novel pathogen strains or to introduced crayfish being exposed to native strains to which they are not adapted.

Plants

We treated 3 acres of Japanese knotweed (*Reynoutria japonica*) on Whiteoak Creek, a headwaters tributary to the Nantahala River, which is part of the Little Tennessee River drainage and eventually reaches the mighty Mississippi River. As part of the treatment, we were enhancing suitable habitat for a federally threatened species, Virginia Spiraea (*Spiraea virginiana*). The Japanese knotweed had crowded out and actually extirpated some individuals. This area includes a project with the Atlanta Botanical Garden. We will be augmenting the existing very small Virginia Spiraea population with newly propagated individuals at this site following the control of the aquatic invasive plant. We also treated another 1.5 acres of Japanese Knotweed along Little Buck Creek, which flows to Buck Creek, a tributary to the Cullasaja River, which flows to the Little Tennessee River.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The MISSISSIPPI RIVER BASIN PANEL
On AQUATIC INVASIVE SPECIES
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