

Project Title: Prevention of Invasive Carp In the Missouri River Basin

(formerly submitted as Understanding invasion risk to more effectively allocate monitoring and management)

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Participating Agencies:

- South Dakota Game, Fish and Parks (SDGFP)
- South Dakota State University (SDSU)
- Iowa Department of Natural Resources (IADNR)
- Kansas Department of Wildlife and Parks (KDWP)
- North Dakota Game and Fish (NDGF) & University of North Dakota (UND)
- Minnesota Department of Natural Resources (MDNR)

Location of Activities:

The location includes the Missouri River mainstem, its tributaries, and adjacent waterbodies throughout all states in the Missouri River Basin.

Statement of Need:

Minimizing the risk of invasive carp from spreading to new areas in the Missouri River Basin requires an understanding of the human-mediated pathways by which introductions could occur and which sites are most vulnerable to invasion.

Though invasive carp are known to dramatically impact our aquatic resources, little is understood about how these species affect recreationists and anglers who use these resources. As invasive carp spread and impact waterways, users can be affected through several mechanisms. Invasive carp may prevent boating or impact the quality of a fishery. Therefore, it is critical to obtain information from these users to not only better understand how invasive carp affects them, but to gain insight into potential management techniques. Information obtained can also be used to direct specific outreach efforts for all AIS and allow for increased dialogue with aquatic users and managers. By surveying those that interact with water (i.e., anglers, boaters, other recreationists), we can develop and plan preventative actions to address the most likely pathways of invasive carp spread. Effective aquatic invasive species (AIS) management requires a knowledgeable and invested public. Achieving knowledge and investment requires diversified outreach programs that use different types of educational programming to reach unique groups (stakeholders, ages, etc.) and promote participation and compliance. Previous work has indicated that live bait could be one pathway for invasive carp spread in areas where natural spread is not possible due to dams or lack of connection. However, other regional pathways for human-mediated spread of invasive carps are not yet identified and cannot be targeted with outreach and education campaigns. Different types of aquatic recreationists (boaters, anglers, etc.) likely represent unique pathways for invasive carp spread that could be related to travel distance and sociodemographic characteristics. The recreationist type, residence (e.g., in-state vs. out-of-state), and associated sociodemographic characteristics are predicted to contribute to differences

in knowledge, information sources and sharing networks, and compliance with regulations, which all contribute to the risk of invasive carp spread. These factors are also likely to vary among waterbodies.

Movement of invasive carps from invaded to uninvaded habitats also represents a major pathway for population spread in the Missouri River Basin and an opportunity for targeting management actions. However, identifying uninvaded habitats that are hydrologically connected to invaded areas can be difficult in South Dakota and North Dakota portions of the Missouri River Basin where aquatic habitats are numerous and connections among waterways are not fully identified. Determining which uninvaded systems share a hydrological connection to invaded waters would allow sites to be prioritized for management actions, such as placing movement deterrents, tagging fish to better understand movement patterns, or targeted sampling effort. Identifying habitats at-risk of invasion due to physical connectivity among waterbodies is further complicated by annual water level fluctuations. Even brief connections between invaded and uninvaded habitats may allow for invasive carp introductions, and the cyclical water level fluctuations of the Dakotas could result in source-sink population dynamics to occur. Thus, risk assessments identifying invasive carp habitat connectivity are needed to efficiently and effectively direct management plans and must evaluate physical habitat connections under typical and extreme water levels.

Project Objectives:

- Assess human-mediated pathways for invasive carp spread to inform education and outreach activities and reduce further spread of invasive carp into and within the Missouri River Basin.
- Assess hydrologic connectivity in the Missouri River Basin to identify locations at risk of Silver and Bighead carp movement into new areas.

Project Highlights:

- Lack of understanding of what information water users know about invasive carp creates potential blind spots in prevention efforts.
- Aquatic invasive species coordinators and regional biologists from seven states in the Missouri River Basin identified 47 priority locations to assess floodwater connectivity.
- Floodwater data from Landsat imagery were obtained for these 47 locations and are being analyzed to quantify whether or how often flooding creates connections around existing movement barriers or between invaded river reaches and uninvaded habitats.

Projects:

- 1) Assess human-mediated pathways for invasive carp spread
- 2) Identifying areas of habitat connectivity for invasive carp throughout the MO River Basin

Project 1: Assess human-mediated pathways for invasive carp spread

Lead Author, Agency, and Contact Information: South Dakota Game, Fish & Parks (SDGFP), Tanner Davis (Tanner.Davis@sdstate.edu)

Participating Agencies: South Dakota Game, Fish and Parks (SDGFP), South Dakota State University (SDSU), Iowa Department of Natural Resources (IADNR), Kansas Department of Wildlife and Parks (KDWP), North Dakota Game and Fish (NDGF) & University of North Dakota (UND), Minnesota Department of Natural Resources (MDNR). All sub-basin members invited.

Location of Activities: All Missouri River Basin states.

Methods:

Multiple surveys are being developed to address this project objective. The first survey will have various water users self-identify with which water activities they participate. This survey will also ask respondents about their knowledge of invasive carps and specific regulations that relate to aquatic invasive species (AIS) spread (e.g., regulations about live bait release). It will also ask water users if they comply with regulations related to invasive carp spread and to identify where they obtain information about invasive carp. Survey questions are currently being finalized and will be submitted to the South Dakota State University IRB for review in early 2026. Questions will then be provided to Qualtrics, who will distribute the survey and secure responses.

The second survey will explore how previous invasive carp and AIS-related campaigns have influenced the behavior of water users and identify “best practices” regarding messaging and behavioral change. This survey is planned for 2027 and will be developed in fall 2026.

Results and Discussion:

The first survey is currently undergoing final review by collaborators before submission for review by the SDSU human-subjects research board. Results from this survey should be available in fall 2026.

Recommendation:

- There is a need to identify knowledge and perceptions across water users to create effective education and outreach programs that reduce risk.

Project 2: Identifying areas of habitat connectivity for invasive carp throughout the MO River Basin

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Participating Agencies South Dakota Game, Fish and Parks (SDGFP), South Dakota State University (SDSU), All Sub-basin states.

Location of Activities: All Missouri River Basin states.

Methods:

A prior project (FY22 and FY23 funding) with SDGFP and SDSU evaluated interconnectivity between Missouri River tributaries in the Dakotas and has developed an approach for quantifying hydrologic connectivity between invaded and uninvaded areas. SDGFP and SDSU, with assistance from partners in the Missouri River Basin, are using this approach to evaluate the potential for interconnectivity among invaded and uninvaded tributaries in high-priority Missouri River Basin watersheds.

We facilitated discussions with state Aquatic Invasive Species (AIS) Coordinators and with regional biologists to identify specific, prioritized tributaries to include in analyses. We obtained Landsat-derived observed surface water presence (e.g., Landsat Dynamic Surface Water Extent) at these priority locations for determining whether floodwater connections occur. We will also quantify the frequency at which these locations become connected and identify precipitation events that result in watershed connectivity. Deliverables from this work include maps and GIS layers identifying locations where hydrologic connectivity occurs during high-water events, as well as the timing (e.g., river discharge levels from nearby USGS gages) when these connections occur. This information can be used to identify priority areas for targeting future monitoring and preventative control actions.

Results and Discussion:

We contacted AIS Coordinators from each state in the Missouri River Basin to identify priority locations to include in this study. State coordinators identified 47 locations to include in this analysis. We began evaluation of the potential for flooding to temporarily create floodwater connections around existing barriers at these locations or with adjacent, currently uninvaded habitats. We obtained 40-years of river discharge data from USGS stream gage data closest to each location. We were then working to obtain Landsat-observed surface water data from flood dates at each location. These surface water data are being assessed to determine 1) whether flooding bypasses existing barriers or connects invaded and uninvaded areas, 2) how long these connections last if they occur, and 3) how commonly these flood connections occur.

Recommendation:

- Surveillance monitoring efforts should include locations where floodwaters create temporary connections around existing movement barriers or with adjacent, uninvaded waterbodies.