Environment and Natural Resources Trust Fund
2020 Request for Proposals (RFP)

Project Title: **ENRTF ID: 163-D**

Mississippi River Dams: Blocking Invasive Fish, Helping Natives

Category: D. Aquatic and Terrestrial Invasive Species

Sub-Category:

Total Project Budget: $ 324,282

Proposed Project Time Period for the Funding Requested: June 30, 2023 (3 yrs)

Summary:

Deter Bigheaded Carp establishment in Minnesota by adjusting gates at six Mississippi River navigation dams. Downstream dams block carp, while upstream dams open pathways for native fishes to resist invasion.

Name: Jay Hatch

Sponsoring Organization: U of MN

Job Title: Associate Professor

Department: CEHD DEANS OFFICE ADMIN

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Location:

Region: Central, Metro, Southeast

County Name: Carver, Chisago, Dakota, Dodge, Goodhue, Hennepin, Houston, Ramsey, Scott, Wabasha, Washington, Winona

City / Township:

Alternate Text for Visual:

Map of Upper Mississippi River navigation dams.

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____%

PROJECT TITLE: Mississippi River Dams: blocking invasive fish, helping natives.

I. PROJECT STATEMENT

a) *Overall goals of the project*—Our first goal is to prevent ≥94% of Bigheaded Carps in Iowa's Pool 16 from reaching Minnesota's Pool 8 (Fig. 1). Our second goal is to increase the passage of native fish species from Pool 5 to Pool 1 within Minnesota, which will contribute to the restoration of the Mississippi River ecosystem and improve its resistance to invasion by Bigheaded Carps.

b) How the project will achieve those goals—To achieve the first goal, we will recommend gate adjustments that can prevent ≥50% of the Bigheaded Carps from passing through each dam below Pools (LDs) 15, 14, and 11. With the adjustments that already have been implemented at LD8, the overall rate of passage from Pool 16 to Pool 8 will be reduced to ≤6% (= ≥94% prevention). We will use a previously developed and proven computational model that uses dam hydrodynamics, gate positioning, river discharge, fish swimming abilities, and navigational requirements to arrive at the recommended adjustments. The process for achieving the second goal at LD5, 4, and 2 will be similar, except we will look for increasing instead of decreasing passage, and we will be using swimming ability data for Lake Sturgeon, Paddlefish, Channel Catfish, and Walleye. These species exhibit a wide array of swimming abilities that will apply to many other native species. The dams we selected offer the greatest potential for changing passage rates because their gates spend the least amount of time out of the water.

c) Why this project needs to be done—Because the invasion fronts of Bigheaded Carps currently are downstream of Pool 16, we have the opportunity to greatly slow the advance of those fronts into Minnesota. The state has implemented several mechanisms to keep Bigheaded Carps below LD8. If we use the cumulative effect of four blockage dams, we greatly reduce the chances of Bigheaded Carps becoming established in Minnesota. If we can improve native fish movement in the reach above LD5, we can increase biological connectivity and potentially improve natural resistance to invasion by Bigheaded Carps. The proposed project directly contributes to action item 2.9 in *Minnesota's Invasive Carp Action Plan*. It also offers an alternative upstream deterrence strategy that is based on enhancing native fish movement and helps to offset the negative impacts of blockage strategies, an item identified in section 2 of the Action Plan.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Determination of gate operations at LD15, 14, and 11. **(July 2020–December 2021).**

Description: We obtain structural and operational data, and historic river discharges for each dam from USACE (Rock Island District). We use a supercomputer to run thousands of simulations for each dam and analyze for optimal gate adjustments. We conduct multiple interagency meetings to secure data and implementation agreements among the states and USACE.

ENRTF BUDGET: $162,141

Outcomes	Completion Date
1. Optimal gate adjustments for ≥50% Bigheaded Carps blockage for LD 15.	*December 2020*
2. Optimal gate adjustments for ≥50% Bigheaded Carps blockage for LD 14.	*June 2021*
3. Optimal gate adjustments for ≥50% Bigheaded Carps blockage for LD 11.	*December 2021*
4. Interagency (state and federal) agreement on implementation	*December 2021*

Activity 2: Determination of gate operations at LD5, 4, and 2. **(January 2022-June 2023).**

Description: We already have structural and operational data, and historic river discharges for each dam from USACE (St. Paul District). We use a supercomputer to run thousands of simulations for each dam and each

species and then analyze for optimal gate adjustments across all target species. We conduct meetings to negotiate implementation agreements among Minnesota, Wisconsin, and USACE.

ENRTF BUDGET: $162,141

Outcome	Completion Date
1. Optimal gate adjustments to improve native fish passage for LD 5.	*June 2022*
2. Optimal gate adjustments to improve native fish passage for LD 4.	*December 2022*
3. Optimal gate adjustments to improve native fish passage for LD 2.	*June 2023*
4. Interagency (state and federal) agreement on implementation	*June 2023*

III. PROJECT PARTNERS AND COLLABORATORS:

U of MN: Dr. Jay Hatch (Associate Professor): Project management, invasive and native fish behavior; Dr. Anvar Gilmanov (Research Associate): modeling, fish passage analysis, numerical simulations.

Project Partners: Minnesota Aquatic Invasive Species Research Center, Minnesota Department of Natural Resources (in negotiations with U. S. Army Corps of Engineers, Upper Mississippi River Conservation Committee, U. S. Fish and Wildlife Service, U. S. Geological Survey, and Wisconsin Department of Natural Resources)

IV. LONG-TERM IMPLEMENTATION AND FUNDING:

Implementation of gate adjustments is dependent upon agreement among the states and USACE's willingness to use them, which makes the negotiation portion of the project important. Once agreements are established, implementation can continue as long it is needed. Slowing the advance of Bigheaded Carps into Minnesota's reach of the Mississippi River also aids in the efforts to deter their advance into the St. Croix and Minnesota River systems. Similarly, improving connectivity in the upper reaches should increase invasion resistance in these other stream systems. Should monitoring indicate large increases in Bigheaded Carps at any navigation pool above LD8, gate adjustments to block advancement will have to be made at more upstream dams as suggested in Minnesota's Action Plan. Gate adjustment recommendations for blockage already have been made for LD5 and 4.

V. SEE ADDITIONAL PROPOSAL COMPONENTS:

A. Project Budget Spreadsheet

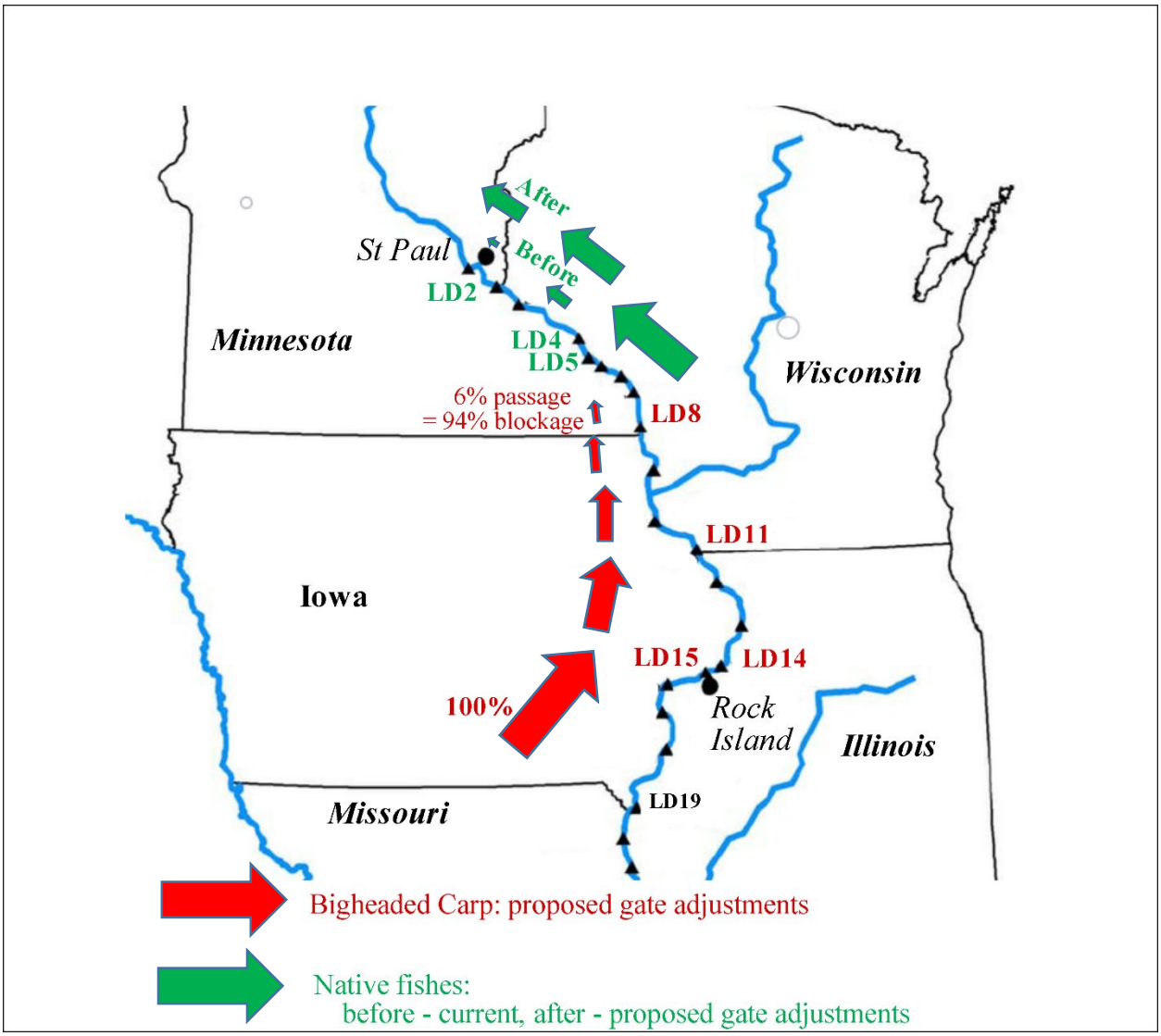
F. Project Manager Qualifications and Organization Description

Attachment A: Project Budget Spreadsheet
Environment and Natural Resources Trust Fund
M.L. 2020 Budget Spreadsheet
Legal Citation:
Project Manager: Dr. Jay Hatch, Associate Professor
Project Title: Using navigation dams to minimize Asian carp invasions while improving native fish passage in Minnesota
Organization: University of Minnesota
Project Budget: $342,282
Project Length and Completion Date: 3 years, June 2023
Today's Date: 15 March 2019

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	$ 322,782	$ -	$ 322,782
Jay Hatch/Professor: 5% academic year effort ($14,486 salary, $5,125 fringe). Dr. Hatch will manage			
Anvar Gilmanov/Research Associate: 100% calendar year effort ($222,854 salary, $80,227 fringe). Dr. Gilmanov will be responsible for 3-D modeling of dams and hydraulic conditions, conducting simulations for how different fish species would pass through the dams under different conditions, and determine how the dam gates can be adjusted to reduce the passage of invasive Asian carps. He will conduct data analaysis, write reports, and present results in collaboration with Dr. Hatch.			
Travel expenses in Minnesota			
Participate in 3 conferences in order to present project results (1/year=3) x 2	$ 1,500		$ 1,500
COLUMN TOTAL	$ 324,282	$ -	$ 324,282

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:		$ -	$ -	$ -
State:		$ -	$ -	$ -
In kind: The College of Education & Human Development will contribute 5% of Dr. Hatch's academic year effort to the project.	Secured	$ 19,700	$ -	$ 19,700

Other ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	Amount legally obligated but not yet spent	Budget	Spent	Balance
MAISRC Subproject 26: Updating an invasive and native fish passage model for locks and dams. M.L. 2013, Chp. 52, Sec. 2, Subd. 06a		$ 90,827	$ 90,827	$ -


After
Before
St Paul
LD2
Minnesota
LD4
LD5
6% passage
= 94% blockage
LD8
Wisconsin
LD11
Iowa
LD15
LD14
100%
Rock
Island
Illinois
Missouri
LD19
Bigheaded Carp: proposed gate adjustments
Native fishes:
before - current, after - proposed gate adjustments

Project Manager: Jay T. Hatch, Associate Professor, College of Education and Human Development Dean's Office, University of Minnesota

Qualifications

Dr. Jay Hatch has conducted research on fishes and aquatic ecosystems of the upper Midwest for the past 47 years. Studies have included impacts of power-generating facilities on fish and macroinvertebrate communities in major rivers and the Great Lakes; life history, habitat selection, resource utilization, behavior, and distribution studies of Minnesota native fishes; and more recently studies of fish passage through potential barriers. Fifty-seven of his 86 published works are based on this research. Dr. Hatch has been faculty at the University of Minnesota for 37 years, having been tenured since 1987. He joined the Graduate Faculty in 1990 and served as Associate Curator of Ichthyology (fishes) in the James Ford Bell Museum of Natural History from 1986 to 2006. He has been in the Dean's Office of the College of Education and Human Development for the past three years, and continues to conduct research and advise graduate students in the Department of Fisheries, Wildlife and Conservation Sciences. He has managed budgets and supervised personnel for 27 research and development projects. He served on the U.S. Fish and Wildlife Service National Recovery Team for the endangered Topeka Shiner, the National Park Service OMV Technical Assessment Team for the St. Croix River, and the Minnesota Comprehensive Wildlife Conservation Strategy Technical Team. Currently, he serves on Minnesota's Topeka Shiner Recovery Team, MNDOT's Technical Advisory Panel for fish passage research, and MNDNR's Minnesota Fish Species Technical Advisory Team.

Responsibilities

Dr. Hatch will manage the project budget, provide input and data regarding fish movement and behavior, review data and provide ecological input to data interpretation, write reports and manuscripts, and present results. He will rely on Dr. Anvar Gilmanov to carry out the extensive computer simulations required for this project. Dr. Gilmanov, Professor of Theory of Heat-and-Mass Transfer at Kazan Energy Power University (Russia) and currently Research Associate in the Minnesota Aquatic Invasive Species Research Center, has developed the fluid dynamics and agent-based computer codes upon which most of the proposed research will be based. He has made eight professional presentations and has published seven peer-reviewed journal articles stemming from work directly leading to this proposal.

Organization Description

"The University of Minnesota, founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation, and the world."

Founded at the University of Minnesota in 2012, the Minnesota Aquatic Invasive Species Research Center's mission is "to develop research-based solutions that can reduce the impacts of aquatic invasive species in Minnesota by preventing spread, controlling populations, and managing ecosystems; and to advance knowledge to inspire action by others."