

**Environment and Natural Resources Trust Fund
2018 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 145-D

River Food Webs with and without Invasive Carp

Category: D. Aquatic and Terrestrial Invasive Species

Total Project Budget: \$ 495,000

Proposed Project Time Period for the Funding Requested: 3 years, July 2018 to June 2021

Summary:

This project will determine how Invasive Carp disrupt river food webs, effects of disruptions on important fishes and recommend best management practices to limit harm to over 500 river miles

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Sponsoring Organization: MN DNR

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Location

Region: Central, Metro, Southwest, Southeast

County Name: Blue Earth, Brown, Carver, Dakota, Goodhue, Le Sueur, Nicollet, Ramsey, Scott, Sibley, Wabasha, Washington

City / Township:

Alternate Text for Visual:

The visual shows food chains in rivers with Invasive Carp in South Dakota and Iowa and in rivers without Invasive Carp in Minnesota. The food chain with Invasive Carp poses the question, will Invasive Carp stop food chains resulting in less abundant fishes such as walleye. Conversely, food chains in rivers without Invasive Carp in Minnesota support important prey fish such as gizzard shad which lead to abundant sportfish such as walleye. The caption for the visual asks will Invasive Carp disrupt river food webs and what can we do about it?

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



PROJECT TITLE: River Food Webs with and without Invasive Carp

I. PROJECT STATEMENT

Effective river management in the face of expanding Invasive Carp populations in Minnesota necessitates an understanding of food webs in rivers with and without Invasive Carp. This information can help determine what native fishes will be competing with Invasive Carp, what fishes might be important predators of Invasive Carp or alternatively, what effects Invasive Carp may have upon top predator fishes if food webs are disrupted. Such information will dictate management efforts to facilitate resiliency of native fish competitors or perhaps suggest angling regulations to protect important predators of Invasive Carp. Previous investigations, funded in part by the Environment and Natural Resources Trust Fund, are monitoring the expansion of Invasive Carp into Minnesota so that rapid response efforts can be implemented. This food webs investigation will help determine what those rapid response efforts should be.

The goal of this project is to map and compare food webs in rivers with and without Invasive Carp to determine if and how Invasive Carp will effect native fishes. There are two common food chains in rivers:

- Sunlight-phytoplankton-zooplankton-prey fishes-predator sport fishes
- Decomposing leaves and sticks-bacteria-aquatic insects-prey fishes-predator sport fishes

We do not know where important native fishes such as lake sturgeon, commercially-valuable buffalo fish or recreational species such as walleye and flathead catfish fit in these food chains in the absence of Invasive Carp. Further, once Invasive Carp become established, do fishes switch positions between these food chains and if so what are their effects? Advances in food web studies using stable isotope analysis combined with diet studies can identify where different organisms fit in food chains. Isotopic signatures reflect where an organism is feeding in which food chain. Fish diets allow identification of food items with greater taxonomic precision. When the two methods are combined they can provide a food web map for rivers.

Invasive Carp are present but in low numbers in southern Minnesota rivers. Consequently, Minnesota rivers provide a reference point for unaltered river food webs. However, to determine if and how Invasive Carp will alter these systems in Minnesota it is critical that we repeat food web studies in similar rivers with abundant Invasive Carp populations for comparison. There are no such rivers in Minnesota. Some rivers in Iowa and South Dakota are very similar to Minnesota rivers, are infested with Invasive Carp and likely foreshadow the future for southern Minnesota rivers. Repeating food web analyses in those rivers will identify Invasive Carp effects on native fishes and indicate management strategies to limit Invasive Carp expansion across the 550 or more miles of rivers exposed to invasion in southern Minnesota.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Determine if Invasive Carp Alter River Food Webs

Budget: \$299,000

To determine if Invasive Carp will even alter food webs and if so, what those alterations will be, we will collect tissue samples from biota at each food chain level and stomach contents from native predator fishes at four Minnesota river locations without Invasive Carp (Minnesota River, Mississippi River Pools 2 and 4, and the lower St. Croix River) and in two similar rivers with carp populations, one each in Iowa and South Dakota. The MN DNR has extensive expertise and equipment to leverage for sampling Minnesota rivers but essentially no expertise or jurisdiction to sample in adjacent states. Drs. Mike Weber in Iowa and Steve Chipps in South Dakota represent the only leading experts in those states with combined expertise in sampling and studying Invasive Carp in their rivers and that also have extensive research programs using stable isotope analysis. As such, they represent the most efficient means of collecting comparable data. This information will identify which food chains support



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native fishes and Invasive Carp and which native fishes compete with or prey upon Invasive Carp. From this project, MN DNR can better evaluate the need for management actions and what potential actions to take to slow the expansion of Invasive Carp such as angling regulations to protect large predator fishes.

Outcome	Completion Date
1. A collection of fish diets and stable isotope samples from each food chain level	October 31, 2019
2. A lab analysis of stable isotope data	June 30, 2020
3. A map of food webs in rivers with and without Invasive Carp	June 30, 2021

Activity 2: Determine Effects of Altered Food Webs on Native Fishes

Budget: \$196,000

Once we know that food webs have been altered by Invasive Carp, we need to know if those alterations will cause harm to native fishes. Two indicators of fish population status are fish health and reproductive potential. We will measure body condition as an indicator of fish health and the number of eggs in females as an indicator of reproduction. We will then determine if different food chains result in differences in fish health or reproduction. Native fish populations in poor health or with poor reproduction can benefit from different angling regulations than populations with better health and reproduction. Consequently, this information will recommend management actions to maintain resiliency of native fishes that support important recreational and commercial fisheries in 550+ miles of southern Minnesota rivers.

Outcome	Completion Date
1. A collection of fish body condition and egg count data	October 31, 2019
2. A compilation and analysis of body condition and egg count data	January 1, 2021
3. Determination of differences in body condition and egg counts between food chains	June 30, 2021

III. PROJECT STRATEGY

A. Project Team/Partners

- Dr. Doug Dieterman (Research Scientist, MNDNR) and Dr. Heidi Rantala (freshwater ecologist, MNDNR) will oversee the project with assistance in project planning, field sampling, and interpretation of results provided by John Waters (Invasive Carp Specialist, MNDNR), John Hoxmeier (Research Scientist, MNDNR), Joel Stiras (Fisheries Specialist, MNDNR) and Tony Sindt (Minnesota River Specialist, MNDNR). All MNDNR staff are providing in-kind services but request ENRTF funds to support 2 interns for each of two years to assist with field sampling activities. ENRTF funds also requested for stable isotope lab analyses.
- Drs. Mike Weber (Iowa State University) and Steve Chipps (South Dakota State University) will oversee project implementation in Iowa and South Dakota respectively, with ENRTF funds to support one graduate student each (from Minnesota) for 2.5 years with associated funds to support field sampling, supplies, and stable isotope lab analyses.
- This project will also seek to leverage and enhance several ongoing programs including Invasive Carp management, sportfish restoration and non-game wildlife.

B. Project Impact and Long-Term Strategy

This project will enhance 550+ miles of southern Minnesota rivers by providing an understanding of river food webs supporting native fish populations and informing rapid response efforts in support of ongoing Invasive Carp monitoring programs.

C. Timeline Requirements

3 years, July 2018 through June 2021.

2018 Detailed Project Budget

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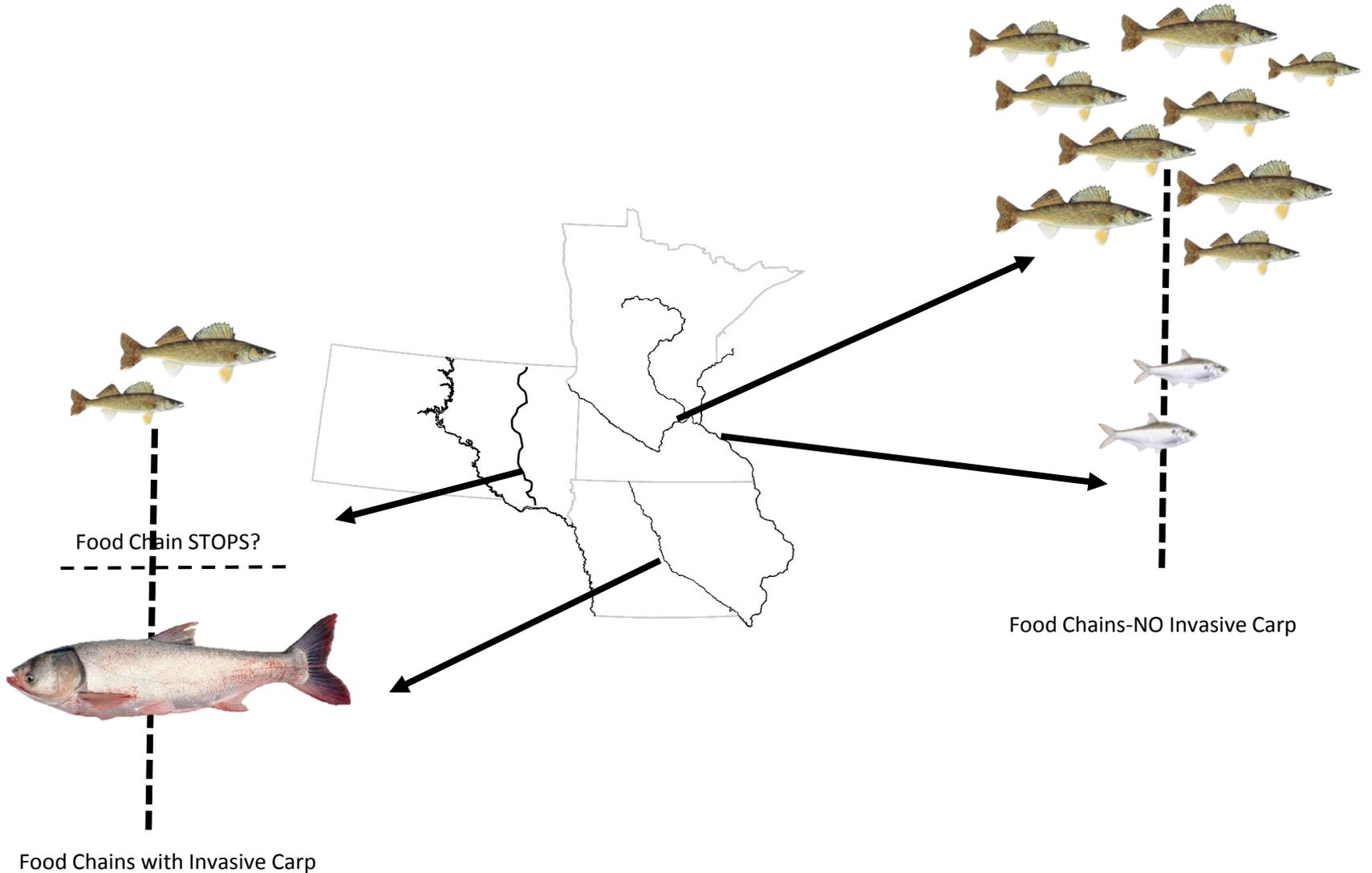
IV. TOTAL ENRTF REQUEST BUDGET for 3 years

BUDGET ITEM	AMOUNT
Personnel: Doug Dieterman, Heidi Rantala, John Hoxmeier, John Waters (MNDNR)-Non-ENRTF funds. Student Interns (2 positions) for field work assistance in support of Activities 1 and 2 at Mississippi River Pools 2 and 4, Minnesota River, and lower St. Croix, 25% FTE for 2 years.	\$ 31,000
Professional/Technical/Service Contracts: Sample the Des Moines River, Iowa with abundant Invasive Carp-contract to complete all field sampling, lab processing, lab analysis, and write up of stable isotope sampling for 2 years in support of Activities 1 and 2 by Dr. Mike Weber, Iowa State University. Dr. Weber is the leading expert on Invasive Carp in Iowa rivers and has extensive research experience with stable isotope analyses.	\$ 200,000
Professional/Technical/Service Contracts: Sample the James River, South Dakota with abundant Invasive Carp-contract to complete all field sampling, lab processing, lab analysis, and write up of stable isotope sampling for 2 years in support of Activities 1 and 2 by Dr. Steve Chipps, South Dakota State University. Dr. Chipps is the leading expert on Invasive Carp in South Dakota rivers and has extensive research experience with stable isotope analyses.	\$ 162,000
Professional/Technical/Service Contracts: Stable isotope analysis for Minnesota Rivers without Invasive Carp-Dual 13C and 15N natural abundance sample processing and analysis in support of Activity 1. 37 taxa groups with a total of 5,500 samples analyzed over 2 years at \$13/sample. Will select lab from list of state approved vendors.	\$ 72,000
Equipment/Tools/Supplies: Diet, egg count and isotope analysis in Minnesota: Alcohol and formalin preservative, approx. 5,500 sample bottles.	\$ 7,000
Travel: Fleet Transportation: DNR fleet charges (for operation of trucks, cars & special equipment) & instate travel costs (per state contracts) over 2 years for sampling Minnesota rivers by Doug Dieterman, John Hoxmeier, and interns. In-state Travel expenses: meals and lodging for distant and overnight status.	\$ 14,000
Additional Budget Items: *Direct and Necessary expenses: HR Support (~\$1,485), Safety Support (~\$341), Financial Support (~\$1,620), Communication Support (~\$1,271), IT Support (~\$3,074), and Planning Support (~\$1,072) necessary to accomplish funded programs/projects.	\$ 8,862
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 494,862
*Direct and Necessary expenses include Department Support Services (Human Resources, IT Support, Safety, Financial Support, Communications Support, and Planning Support). Department Support Services are described in the agency Service Level Agreement and billed internally to divisions based on rate that have been developed for each area of service. These services are directly related to and necessary for the appropriation. Department leadership services (Commissioner's Office and Regional Directors) are not assessed. Those elements of individual projects that put little or no demand on support services such as large single-source contracts, large land acquisitions, and funds that are passed through to other entities are not assessed Direct and Necessary costs for those activities.	

V. OTHER FUNDS

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period: United States Fish and Wildlife Service funding to support field monitoring of Invasive Carp will be requested (\$10,000) to support sampling in Iowa and under the Interstate Aquatic Nuisance Management Plan Grant Program (\$15,000) to support St. Croix River sampling.	\$ 25,000	<i>Pending</i>
Other State \$ To Be Applied To Project During Project Period: DNR Division of Fish and Wildlife in-kind match, funding Fisheries Section employees assisting with field work and project oversight (\$25,000). Existing DNR equipment: trucks, boats, sampling equipment (fyke nets, gill nets, trawls, seines), microscopes, lab supplies, etc. (\$5,000)	\$ 30,000	<i>Secured</i>
In-kind Services To Be Applied To Project During Project Period: DNR facilities & services (office space, office overhead, technical & field support (\$6,000)), existing DNR equipment (boats, sampling equipment, lab supplies etc. (\$5,000)), DNR Fisheries staff (70% salary, 30% fringe) for Doug Dieterman (Research Scientist II), John Hoxmeier (Research Scientist II) and Heidi Rantala (NR Program Consultant)(\$226,000).	\$ 237,000	<i>Secured</i>
Past and Current ENRTF Appropriation: M.L.2017-Invasive Bighead and Silver Carp and Native Fish Evaluation-Phase II.	\$ 11,240	<i>Pending</i>
Other Funding History:	N/A	

Will Invasive Carp disrupt river food chains and what can we do about it?



Food Chains with Invasive Carp

River Food Webs with and without Invasive Carp

Project Manager Qualifications

Project Manager: Doug Dieterman, Research Scientist II
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Doug Dieterman is a Fisheries Research Scientist II at the Lake City Fisheries Research Office. He has been working in the Fisheries Research Unit for 16 years and with the DNR for 17 years. He has statewide responsibilities and has worked on river and stream research projects from the Ottertail River in west-central Minnesota to the Kettle River in east-central Minnesota to the Driftless Area streams and Mississippi River of southeast Minnesota. His research has focused on fish-habitat interactions in cold water trout streams, medium-sized warm water rivers, and large floodplain rivers. Prior to his work with DNR, he received his PhD from the University of Missouri-Columbia in 2000, studying imperiled Missouri River fishes on a multi-state, multi-agency (five federal, seven state, and six universities) project. He received his MS degree from South Dakota State University in 1995 studying prairie river fish community responses to implementation of the Clean Water Act.

Project Responsibilities

Doug Dieterman will provide overall project direction and coordination. In his capacity as a Research Scientist, he has demonstrated his ability to coordinate and communicate with multiple project partners, manage budgets, adhere to timelines, hire and direct staff and prepare project work plans, updates, and reports.

Organization Description

The Minnesota Department of Natural Resources works with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and provide for commercial uses of natural resources in a way that creates a sustainable quality of life. This mission requires sharing stewardship with citizens and partners working together to address often competing interests.