



## Environment and Natural Resources Trust Fund

### 2021 Request for Proposal

#### General Information

**Proposal ID:** 2021-217

**Proposal Title:** Evaluating Minnesota's Last Best Chance to Stop Carp

#### Project Manager Information

**Name:** Peter Sorensen

**Organization:** U of MN - College of Food, Agricultural and Natural Resource Sciences

**Office Telephone:** (612) 624-4997

**Email:** soren003@umn.edu

#### Project Basic Information

**Project Summary:** Invasive carp have breached Minnesota's southern border. The last place they can be stopped is Lock&Dam 5 but time is of the essence. This proposal enables this solution.

**Funds Requested:** \$499,000

**Proposed Project Completion:** 2023-06-30

**LCCMR Funding Category:** Aquatic and Terrestrial Invasive Species (D)

#### Project Location

**What is the best scale for describing where your work will take place?**

Statewide

**What is the best scale to describe the area impacted by your work?**

Statewide

**When will the work impact occur?**

In the Future

## Narrative

### **Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

In November 1963, invasive carp were imported from China to Arkansas. Within a decade these fish had been moved to about 30 other states, and by the early 1990s they had escaped into the central region of the Mississippi River where they now dominate food webs while native fisheries have collapsed. Because adult carp in the Mississippi River must pass through locks and dams, these structures have become the focus of efforts to stop these species from moving upriver. While the University of Minnesota (with funding from the LCCMR) has been conducting a test of an experimental sound/light carp deterrent at Lock&Dam 8 (LD8) on Minnesota's southern border, flooding 5 times more than average has been allowing carp to swim through its spillway gates and two overflow submersible spillways (unpublished data). On March 13, 2020, 51 adult invasive carp, more than enough to permit reproduction, were captured by a commercial fisher just a few miles upstream of LD8 in Pool 8. It is now clear that carp can no longer be stopped at LD8 and Pool 8. Fortunately, one very good opportunity remains, Lock & Dam 5.

### **What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.**

Lock & Dam 5 (LD5) is an extremely promising place to stop carp and has long been Sorensen's focus. Located upstream of LD8, the likelihood of LD5 flooding is less than 10% that of LD8; LD5 does not have overflow spillways, and the pool above it is too short to allow reproduction and is suitable for carp removal. A deterrent here is uniquely able to stop carp advancing into Lake Pepin, sparing the Minnesota, St Croix and upper Mississippi rivers. Further, LD5's lock appears suited to installing the sound/light/air bubble system (a bio-acoustic fish fence or BAFF) that the University (LCCMR funding) has shown to be 97% effective in the laboratory, and which is now being installed in Kentucky. Based on invasive carp movement rates downstream, it is likely they will take 5-10 years to reach LD5, enough time to install a BAFF if planning starts immediately. Mr. Fronhauer, DNR Invasive Fish Coordinator, states that "as a technical expert, I believe this is a solid project" but the DNR is "neutral as an agency"; it is seemingly unable to act at this time. This proposal fills this void and is submitted here because MAISRC does not support construction.

### **What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?**

This project will critically assess the fundamental suitability of LD5 as a site to install a BAFF carp deterrent, so that work could be completed before carp reach this location. A deterrent system at LD5 could protect the northern two-thirds of Minnesota from these species, which have decimated river fisheries in other states. We will evaluate the promise of this location, the construction challenges and costs (by completing a 10% design), and institutional processes that need to be involved. We would make it possible for a full feasibility study and construction to occur in time to make a difference.

## Activities and Milestones

**Activity 1: Determine the feasibility and maximum cost of installing a state-of-the-art BAFF carp deterrent at Lock and Dam 5.**

**Activity Budget:** \$115,000

### Activity Description:

While effective, BAFF technology is sophisticated and relatively expensive. It entails installing a speaker, light and air bubbler system along the river bottom at an angle downstream of locks in a manner that is protected from shipping. A 2015 visit by Fish Guidance Systems Ltd (FGS), developer of the BAFF, suggested it is feasible at LD5 but that costs could range between 2-5 million dollars depending on many variables. To provide a reasonable estimate of possible costs and identify risks to help the Legislature make an informed decision, information must be obtained on the needs of a BAFF installation relative to existing lock and dam infrastructure (platforms, power supplies, conduit leads, etc.), as well as bottom bathymetry and water velocities. The permitting process must also be examined with the U.S. Army Corps of Engineers, MN DNR, and other key stakeholders. A review of what a BAFF is and the promise of this technology is needed. Accordingly, a 10% design (the amount needed to make critical decisions) will be completed by Barr Engineering Co. along with an AACE Class 5 cost estimate (the most basic). Barr has experience with BAFF systems (in KY with FGS) and LDs in Minnesota.

### Activity Milestones:

Description	Completion Date
Report on engineering requirements, feasibility, and 10% system design	2022-01-31
Report on probable costs (-15%/+100%), risks and suitability of a BAFF, and stakeholder needs	2022-06-30
Final engineering report with complete assessment of BAFF technology and suitability	2022-06-30

**Activity 2: Determine the biological feasibility of stopping carp at LD5 -- assessing the permeability of its spillway gates to invasive carp.**

**Activity Budget:** \$374,000

### Activity Description:

LD5 is 1612 feet long, of which only 110 feet is the lock (7%) and 1512 feet is spillway gates through which carp might also pass (it has only three small overflow culverts that can be blocked). There is no point in adding a BAFF to the lock if carp then pass through the adjacent spillway gates. Fortunately, the UMN's numeric models suggest that water velocities through spillway gates are far too high for carp to pass except in rare times of flood when the gates are out of the water, but empirical proof is lacking. The proposed study will collect this proof by acoustically-tagging and releasing adult common carp (a good proxy for invasive silver carp) and native fishes below LD5 for 1.5 seasons (the minimum needed) and tracking their movement using automated archival receivers and manual boat tracking, focused on key locations upstream (the lock, culverts and large spillway gates). This approach has been successfully deployed at LD8 by the UMN and now in Kentucky. The UMN will be responsible for this activity and will have a draft report completed by 2023.

### Activity Milestones:

Description	Completion Date
Identify locations to monitor carp passage and collect fall data	2022-01-31
Track carp passage through the spillway gates and lock at LD5	2022-06-30
Analyze data and then report on carp passage rates and spillway gate permeability	2023-01-31

**Activity 3: Produce a report with a recommendation to the state on installing a BAFF deterrent at Lock and Dam 5.**

**Activity Budget:** \$10,000

**Activity Description:**

Produce a report for the Legislature and others that summarizes both the engineering and biological assessment results as well as risks and costs of installing a BAFF at LD5. A recommendation will be included.

**Activity Milestones:**

Description	Completion Date
Draft data report on possible costs, risks and promise of a BAFF at LD5 for Legislature	2023-03-31
Comprehensive final report on possible costs, risks, feasibility and promise of a BAFF at LD5	2023-06-30

## Long-Term Implementation and Funding

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?**

By late 2022, a draft report will be completed on the feasibility and suitability of installing a BAFF at LD5, while a final report will be available by the 2023 legislative session so that rapid action could be taken by the Legislature to stop invasive carp from invading our state, if they think it warranted. It is reasonable the next step would be a 100% engineering assessment by the DNR (similar to LD1 in 2011). The 10% design completed as part of this study should be enabling.

## Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Install and Evaluate an Invasive Carp Deterrent for Mississippi River Locks and Dams	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 06e	\$998,000

## Project Manager and Organization Qualifications

**Project Manager Name:** Peter Sorensen

**Job Title:** Professor

**Provide description of the project manager's qualifications to manage the proposed project.**

Dr. Sorensen is a global expert on aquatic invasive species, carp in particular. Dr. Sorensen has been at the University of Minnesota since 1988 where he is a full professor. He and his team have spent the last decade studying carp movement through locks and dams and developed the use of sound and bio-acoustic fish fence (BAFF) concept for carp (with LCCMR support) now being deployed at Barkley Dam in Kentucky, for which Dr. Sorensen is a co-leader with the US Fish and Wildlife Service. He has also served on the Mississippi River Basin Panel of Aquatic Nuisance Species for over a decade. In 2012 he founded the Minnesota Aquatic Invasive Species Research Center. He and his team have close to 200 peer-reviewed publications including three books. Dr. Sorensen teaches fish physiology and behavior as well as marine biology and has had over two dozen graduate students and postdoctoral fellows, 8 of whom are now professors at other institutions, some working on invasive fish. He is passionate about fisheries conservation.

**Organization:** U of MN - College of Food, Agriculture and Natural Resource Sciences

**Organization Description:**

The Public Land Grant University

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Principle Investigator		To direct and manage the project while guiding the science			36%	0.2		\$40,800
Researcher 4		Field scientist			36.5%	2		\$163,200
Researcher 1		Field support staff for year 2 (key year)			36%	1		\$54,400
Undergraduate summer field assistant		support for both summers			0%	0.2		\$11,600
							<b>Sub Total</b>	<b>\$270,000</b>
<b>Contracts and Services</b>								
Barr Engineering Company	Professional or Technical Service Contract	We need an engineering company to assess the technical feasibility and costs of installing a fish deterrent in a large US Army Corps lock and dam. Barr has already done this at Lock&Dam 1 in Minnesota and is currently working with Fish Guidance Ltd to do so in Kentucky			0.5			\$115,000
							<b>Sub Total</b>	<b>\$115,000</b>
<b>Equipment, Tools, and Supplies</b>								
	Equipment	9 archival fish tag receivers, and one portable unit for boat	Receivers to record the presence of acoustically tagged fish, 8 autonomous units are needed to attach to buoys and 1 portable unit for a boat					\$33,000
	Tools and Supplies	125 implantable acoustic fish tags (@\$350), also Field supplies	we need acoustic tags to track carp as they attempt to swim through Lock and Dam 5, also supplies to assist this effort					\$49,000
							<b>Sub Total</b>	<b>\$82,000</b>
<b>Capital Expenditures</b>								

							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
	Miles/ Meals/ Lodging	travel to our field site, Lock and dam 5	need to get to field site from the university					\$24,000
	Conference Registration Miles/ Meals/ Lodging	1 DNR fisheries conference	report results to the DNR and other agencies					\$1,000
							<b>Sub Total</b>	\$25,000
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
	Publication	journal publication	disseminate information					\$1,000
							<b>Sub Total</b>	\$1,000
<b>Other Expenses</b>								
		Repairs	We will need to repair our field equipment (boat and truck)					\$5,000
		Professional services	We need the help of a technician to make hangers for fish tag receivers					\$1,000
							<b>Sub Total</b>	\$6,000
							<b>Grand Total</b>	\$499,000

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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## Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
<b>State</b>				
			<b>State Sub Total</b>	-
<b>Non-State</b>				
			<b>Non State Sub Total</b>	-
			<b>Funds Total</b>	-

## Attachments

### Required Attachments

#### *Visual Component*

File: [5d3d1473-02f.pdf](#)

#### *Alternate Text for Visual Component*

Lock and Dam 5 is shown. It is located just south of Lake Pepin and in a location that it would shield the lake as well as the St. Croix River, Minnesota River and upper Mississippi River - most of Minnesota- from invasive carp. Its design (no overflows, short upstream pool) also shows unique promise.

### Optional Attachments

#### *Support Letter or Other*

Title	File
Letter of support from the Stop Carp Coalition (11 signatories)	<a href="#">b2eb8b6f-d72.pdf</a>
Letter of support and partnership from U.S. Fish & Wildlife Service	<a href="#">d903eb54-cb2.pdf</a>
Approval letter U of Minnesota	<a href="#">f600c2f7-0a4.pdf</a>

## Administrative Use

### **Does your project include restoration or acquisition of land rights?**

No

### **Does your project have patent, royalties, or revenue potential?**

No

### **Does your project include research?**

Yes

### **Does the organization have a fiscal agent for this project?**

Yes, Sponsored Projects Administration

Lock & Dam 5 is located just south of Lake Pepin so would shield most of Minnesota from invasive carp including the St. Croix River, Minnesota River and upper Mississippi River. No other location offers this opportunity.

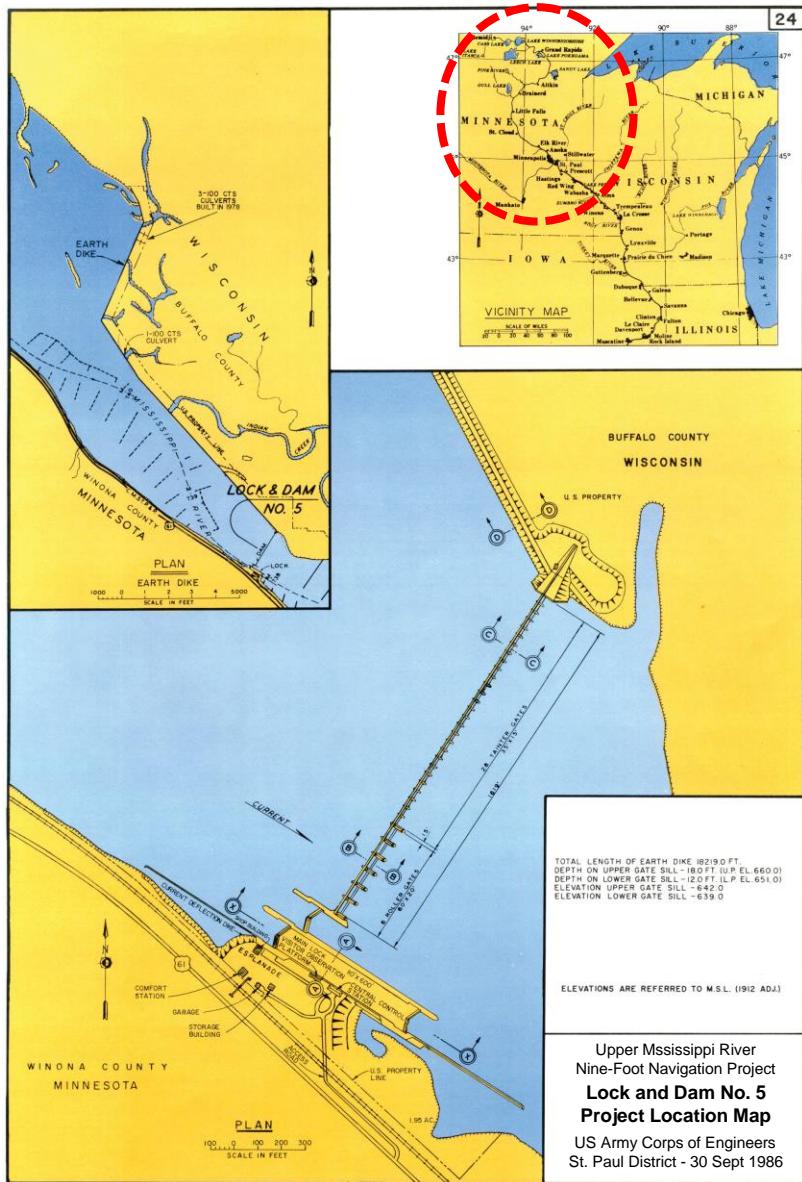


Plate 2-1

