Environment and Natural Resources Trust Fund

2022 Request for Proposal

General Information

Proposal ID: 2022-237

Proposal Title: Evaluating Bowfishing for Invasive Carp Control

Project Manager Information

Name: Mark Clark

Organization: U of MN - Duluth

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Email: meclark@d.umn.edu

Project Basic Information

Project Summary: Invasive fish degrade freshwater ecosystems. Recreational bowfishing has the potential to reduce carp populations. We will evaluate whether educational workshops combined with regulated bowfishing can effectively reduce carp numbers.

Funds Requested: $519,000

Proposed Project Completion: June 30 2024

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?

During the Project and In the Future

Narrative

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

Common carp Cyprinus carpio is established throughout Minnesota (Eddy and Underhill 1974), where it continues to degrade aquatic ecosystems (Bajer and Sorensen 2010; Vilizzi 2018). Many control measures (e.g., constructed barriers) prevent carp from dispersing into waters where they have not yet established (Bajer and Sorensen 2010; Dauphinais et al. 2018). Methods to remove carp from infested waters are expensive, not species-specific and therefore not often effective. For example, in 2021 at Lake Ocheda (on the impaired waters list for high turbidity) a planned drawdown to winterkill common carp caused mortality in at least six native fish species, including bigmouth buffalo Ictiobus cyprinellus, a species likely declining in Minnesota (Eddy and Underhill 1974; Lackmann et al. 2019). In fact, bigmouth buffalo mortality due to the drawdown exceeded the mortality of all other species combined, including common carp (Fig. 1A; MPR 2021). Recreational bowfishing, promoted as a sport that targets invasive carp, has exponentially increased in popularity, and bowfishing tournaments in Midwestern lakes result in harvests comparable to commercial fishing harvests (Scarnecchia and Schooley 2020). However the use of recreational angling to reduce carp populations has not been evaluated.

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.

We will assess the effectiveness of bowfishing as a targeted removal strategy of invasive carp by organizing workshop-centered, bowfishing carp-removal events in cooperation with watershed managers, Minnesota Department of Natural Resources, and local stakeholders. Unfortunately unregulated bowfishing tournaments can result in significant mortality of native species (Scarnecchia 1992). At the 2018 U.S. Open Bowfishing tournament, over 80% of fish harvested were native species (approximately 55% Ictiobus spp.) (Scarnecchia and Schooley 2020). Therefore training bowfishers to selectively target invasive species is critical for this to be a useful management tool. We will conduct workshop-centered, controlled removal events, in which anglers must attend an on-site training session designed to educate bowfishers on key identification features that distinguish invasive carp from native species. We will also collect data to quantify angling effort, catch (both target and non-target) and unharvested mortality. For comparison, we will collect the same information from standard bowfishing tournaments (See Fig. 1B for examples of bowfishing tournaments held in MN) that happen throughout the state to determine the potential effectiveness of recreational bowfishing and the education workshops in removing carp from Minnesota lakes.

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?

Outcome 1: Estimates of invasive carp removal, effort, native fish removal, unharvested mortality and carcass discard from directed bowfishing carp-removal events (June 2024).
Outcome 2 Educational workshops designed to improve bowfishing anglers' ability to distinguish carp from native species, and identify ecosystem services provided by native species (June 2024).
Outcome 3: Estimates of invasive carp removal, effort, native fish removal, unharvested mortality and carcass discard from standard bowfishing tournaments (June 2024).

Activities and Milestones

Activity 1: Regulated Bowfishing Carp-Removal Events

Activity Budget: $192,078

Activity Description:
We will assess the effectiveness of carp removal through regulated bowfishing removal events. We will organize approximately five bowfishing carp-removal events each year for a 3-year period (15 total) in lakes selected in collaboration with the MN DNR, local watershed districts, lake property owners and local stakeholders. Participants will be required to register, attend an educational workshop (see Activity 2), return their catch prior to departure, and report their start & end times to personnel monitoring the event following established guidelines (Fig. 1C). From this information we will quantify the number of anglers, boats and hours fished, and the number and species of fish removed. We will also collect a subsample of the catch to quantify demographic characteristics (e.g., age & size structure) of some species affected to compare with any historical information on populations from the specific lakes. Finally, we will contract with local businesses to dispose of the catch, then survey the nearby area to estimate the quantity of catch discarded (e.g., carcasses left near lake access points). Within 48 hours of the completion of the removal event, we will survey the lakeshore to estimate mortality due to unharvested catch (see Fig. 1D), and remove any carcasses encountered.

Activity Milestones:

Description	Completion Date
Complete 15 workshop-regulated, carp-removal bow fishing events	June 30 2024
Analyze bow fishing catch & survey data from workshop regulated, carp removal events	June 30 2024
Estimate unharvested mortality associated with workshop-regulated, carp-removal events	June 30 2024

Activity 2: Workshops for Improving Angler Differentiation of Carp from Native Fishes and Bowfishing Impacts on Native Fishes

Activity Budget: $196,645

Activity Description:
We will conduct educational workshops at each bowfishing carp-removal event so that shooters are exposed to the native species that are legal to shoot in MN waters vs. those that are invasive species. Workshops will include video and live demonstrations, along with pamphlets, to highlight identifiable characteristics that distinguish carp from native fishes following recommendations from Scarnecchia and Schooley (2020) for managing bowfishing tournaments. Workshops will also include demonstrations of appropriate landing technique using a net, because other methods (e.g., use of a gaff, by hand) can result in unharvested mortalities (a common complaint from landowners or other lake users) (Fig. 1D). We anticipate workshop demonstrations will require no more than 30 minutes, and all anglers will be required to complete the workshop to participate in the carp-removal event.

Activity Milestones:

Description	Completion Date
Conduct 15 Workshops associated with Regulated Bowfishing Events	June 30 2024
Compile Totals on Angler Workshop Attendance	June 30 2024

Activity 3: Monitoring Unregulated Bowfishing Tournaments at Minnesota Lakes

Activity Budget: $130,277

Activity Description:

In collaboration with the MN DNR and local stakeholders, we will monitor approximately five unregulated bowfishing tournaments (Fig. 1B) each year to collect comparative data to our carp-removal events. We will collect information on the number of participants and boats from the tournament organizers. We will collect catch, as well as information on participant start & end times and approximate locations where fish were taken following standard MNDNR fishing tournament guidelines (https://www.dnr.state.mn.us/fishing/tournaments/index.html, Fig. 1C). Data collected from these tournaments will then be used to estimate the number of anglers, boats and hours fished, and the number and species of fish removed. We will also collect a subsample of the catch to quantify demographic characteristics of species affected to compare with any historical information on populations from the specific lakes. Finally, we will contract with local businesses to dispose of the catch, then survey the nearby area to estimate the quantity of catch discarded (e.g., carcasses left near lake access points). Within 48 hours of the completion of the tournament, we will survey the lakeshore to estimate mortality due to unharvested bowfishing catch (Fig. 1D), and remove any carcasses encountered.

Activity Milestones:

Description	Completion Date
Monitor 15 unregulated bow fishing tournaments in Minnesota	June 30 2024
Analyze catch, effort & survey data collected from unregulated bowfishing tournaments	June 30 2024
Estimate unharvested mortality from unregulated bow fishing tournaments	June 30 2024

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dan Livdahl	Okabena-Ocheda Watershed District	Dan Livdahl is Administrator of the Okabena-Ocheda Watershed District, and will help coordinate areas in need of carp removal, communication with local stakeholders and outreach to other watershed districts interested in hosting a workshop, carp-removal event.	No

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?

Our findings will be disseminated to managers and the scientific community through peer-reviewed publications. We will also prepare reports for cooperating partners (Minnesota DNR, Minnesota Watershed Districts, regional angler associations) detailing the efficacy of workshops to train bowfishers for invasive carp removal as well as best practices for conducting bowfishing events designed to reduce invasive species numbers. If this proves to be an effective mechanism for reducing carp population size, our designs will offer a blueprint for local stakeholders to coordinate with MN DNR in using recreational bowfishing as a carp management tool.

Project Manager and Organization Qualifications

Project Manager Name: Mark Clark

Job Title: Professor

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

Mark Clark is a Professor in the Department of Biology at UMD, with research expertise in population biology. He has been a faculty member for over 18 years, advising 13 graduate students (3 Ph.D., 10 M.S.) and 1 postdoctoral fellow. His research projects have spanned a diverse array of vertebrates, including effects of timing of nesting on colonial waterbirds, life history variation in several fish species and waterborne parasite dynamics in small mammals. His work especially emphasizes the development of population models incorporating individual physiology and behavior (see https://sites.google.com/site/clarkreedecologylab/). Recent work from his lab highlights longevity in Bigmouth Buffalo, including changes in the immune function with age.

Organization: U of MN - Duluth

Organization Description:

The University of Minnesota Duluth is a highly-ranked regional research and liberal arts university with a global reputation for freshwater research. UMD students can choose from more than 93 undergraduate and post-baccalaureate degrees, and from graduate programs in more than 20 different fields. The Department of Biology lies within the Swenson College of Science and Engineering (SCSE), the largest college at UMD and the third largest in the University of Minnesota System. It currently has an enrollment of over 3,200 undergraduate and 200 graduate students. This research fits in with one of the grand challenges of the college, i.e. developing an international reputation in the nascent areas of materials science, water, sustainable energy and mining innovation.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Alec Lackmann		Co-PI			20.2%	3		$199,126
Undergraduate Research Assistants		Lab & Field Assistants			0%	2.61		$71,612
Mark Clark		PI			26.7%	0.24		$22,626
							Sub Total	**$293,364**
Contracts and Services								
TBD	Professional or Technical Service Contract	A subset of 10 otoliths will be prepared for bomb radiocarbon analysis for validation of age estimates (for age structure assessment). Preparation includes slide mount, micro milling and final radiocarbon analysis at Woods Hole Oceanographic Institute. Based on previous analysis we estimate the total cost of $812 per sample.				-		$8,120
							Sub Total	**$8,120**
Equipment, Tools, and Supplies								
	Tools and Supplies	Miscellaneous field supplies (e.g., waders, nets, scales, coolers, ice, projector, screen)	Various field supplies needed for surveys, collecting fish, dissection & transport, presentations at workshops.					$6,610
	Tools and Supplies	Miscellaneous lab supplies (e.g., storage vials, microscope slides, isomet blades, image analysis computer software)	Expendable items used to store samples in the lab, prepare samples for analysis and analyze otolith images for age determination.					$4,045
							Sub Total	**$10,655**
Capital Expenditures								
							Sub Total	**-**

Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Trip to field sites (30 total). We assume 400 miles per trip @ $0.56 per mile, 3 hotel rooms per trip @ $98 per room, $82.5 per diem overnight per person and 3 persons per trip. Thirty trips are estimated (10 per year), to conduct workshop & carp removal events and to survey standard Bowfishing tournaments.	Trips to organize/collect/survey workshops, fishing effort, etc. (Activities 1-3)					$23,861
							Sub Total	**$23,861**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	Publication	At least 2 manuscripts for scientific journals are anticipated from the study	Dissemination of findings through peer-reviewed scientific journals					$3,000
							Sub Total	**$3,000**
Other Expenses								
		Workshop Participant Travel Defrayment	We will provide $200 to defray travel costs to attract participants for the workshop & carp-removal events. We anticipate 40-50 participants, per event, with approximately 5 events per year for 3 years (total of 15 events and 750 participants)					$150,000
		Harvested fish disposal & cleanup	We have budgeted $30000 to pay for clean up & disposal of harvested fish after carp-removal events and standard Bowfishing tournaments (anticipating 10 events per year, $1,000 per event).					$30,000

							Sub Total	**$180,000**
							Grand Total	**$519,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	**-**
Non-State				
In-Kind	Unrecovered F & A at federally negotiated 55%		Pending	$285,450
			Non State Sub Total	**$285,450**
			Funds Total	**$285,450**

Attachments

Required Attachments

Visual Component

File: 7b5148ee-a2e.pdf

Alternate Text for Visual Component

Species-specific bowfishing could be a cost-effective, efficient, and widespread means of removing invasive carp from MN waters, which would enhance aquatic ecosystems statewide. A) Winterkill at Lake Ocheda, MN in March 2021 resulting from a planned water drawdown. Native bigmouth buffalo was the primary species affected despite the intended target being invasive carp. Catfish, bullhead, crappie, walleye, and freshwater drum were also significantly affected. B) Examples of bowfishing tournam...

Optional Attachments

Support Letter or Other

Title	File
UMD SPA Proposal Approval Letter	5093ecc5-e21.pdf
Literature Cited	5f4d90de-6f8.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have potential for royalties, copyrights, patents, or sale of products and assets?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

The Frazee Sportsman's Club Presents:

Lakes Area Night Carp Tourney

May 18th at 8:00 pm - May 19th at 6:30 am

GENE'S SPORTSHOP

9th Annual Lakes Area Night Carp Tourney

B

*Max of 4 Person Teams
*$100.00 Entry Fee Per Team - 90% Payout
*Payout for 1st 2nd 3rd place of Big 6 Common Carp
*Numbers contest is optional. $20 per team to get into this contest.
(Any rough fish qualifies for numbers.)
Winning team takes 100% of pot in numbers contest.
*Allowed to fish any lakes **with a public access** in Becker or Ottertail County
*All fish will be weighed with the tournament scale
*Fish Disposal will be onsite at Weigh In

Registration: Billy's Corner Bar in Vergas
From 8:00 – 8:45 pm on Saturday May 18th
Blast off from Billy's at 9:00 pm on Saturday May 18th

***Weigh in at 6:30 am on Sunday May 19th at Eagle Lake Access by Frazee**
*Door prizes will be drawn at weigh in.
Must be back by 6:30 am or you will be disqualified
There will be a boat check. Must follow the DNR bow fishing regulations. No netting of fish.

For Questions Please Text or Call:
Travis Perrine 218-234-3617
Heather Perrine 218-234-4450

LAST CHANCE ARCHERY
ONE CHANCE | ONE MOMENT
ONE SHOT
LAKES AREA POWER SOLUTIONS, LLC
FeraDyne OUTDOORS LLC
POWERMAX
GUN HOLDER

Join us May 23th at the 2nd

Henning Rod & Gun Club Bow Fishing Tournament

- The tournament will be taking place in Ottertail county
- Buy in is $100 per boat and a max 3 shooters per boat
- There will be 1st,2nd and 3rd place for Big 6
- Numbers side pot (All legal fish qualify)
- Other categories will be dicused during meeting
- Also $100 to biggest and smallest carp
- 100% pay out
- We'll have a meeting at the Henning Fairgrounds 8pm
- Take off will be 8:30 pm and meet back at 6am
- Take off as you show up
- Fish disposal and Breakfast is provided in the morning

BOWFISHING

2020 LLBA State Tournament

Where: Registration & Weigh-in at Jake Wolford Field in Dent, MN
Fergus Ave. Dent, MN 56528
Can shoot any public water in Ottertail County. Must use a public boat launch.

When: Registration 6:30pm—7:45pm on Saturday June, 27th.
Launch at 8pm
Weigh-ins 7am on Sunday June, 28th

Format: Big 20 & Numbers
All legal species

Entry: $50/person, must be LLBA member. 1-4 man teams
One year membership is $20
$10 big fish pot per team

If you have any questions please contact Justin Klages at 320-282-8940 or Austin Linder at 952-288-4588

Land of Lakes Bowfishing Association

Lakes Area Night Rough Fish Shoot

June 25th at 8:00 pm - June 26th at 6:00am

Lakes Area Night Rough Fish Shoot

*Max of 4 Person Teams—One boat per team
*$100 per boat Payout 1st place 45% 2nd place 30% 3rd place 20%
*Payout for 1st/2nd/3rd place of total numbers of rough fish.
*Optional side pot for biggest Common carp. $10 per boat.
*Optional side pot for biggest Dogfish (Bowfin) $10 per boat.
*Allowed to fish any lakes in Becker, Ottertail, Douglas or Grant County

Any rough fish will be counted in this numbers event!

Registration: Meeting place will be at Dent, MN ball fields
From 8:00 – 8:45 pm on Saturday June 25th
Blast off From Dent at 9:00 pm on Saturday June 25th
***Weigh in at 6:00 am on Sunday June 26th at Dent, MN ball fields**
Must be back by 6:00 am or you will be disqualified
Must follow the DNR bow fishing regulations. No netting of fish.

For Questions Please Text or Call:
Travis Perrine 218-234-3617

DEPARTMENT OF NATURAL RESOURCES

APPLICATION TO CONDUCT A FISHING TOURNAMENT

INSTRUCTIONS: **C**

1. Complete all information requested below and sign.
2. **Submit the permit fee and a copy of the Tournament Rules with this application.**
3. Permit applications will be accepted from August 1 for contests being held the following year. Applications received before the last Friday in September will be eligible for a drawing if more applications are received for a given water-body than available permits. Other applications will be handled on a first-come, first-serve basis.
4. Permit Fees are $70 for small contests (50 or fewer boats or shore-based tournaments, $225 for large contests (more than 50 boats), or $135 for ice contests (more than 150 participants). Off-site weigh-in fees are $280 for small contests or $560 for large contests. Submit fee with this application. See DNR website for details.

DEPARTMENT OF NATURAL RESOURCES

Revised September 2020

FISHING TOURNAMENT REPORT

This report must be returned to the Regional Fisheries Office within 30 days after completion of the contest

Species-specific bowfishing could be a cost-effective, efficient, and widespread means of removing invasive carp from MN waters, which would enhance aquatic ecosystems statewide. **A)** Winterkill at Lake Ocheda, MN in March 2021 resulting from a planned water drawdown. Native bigmouth buffalo was the primary species affected despite the intended target being invasive carp. Catfish, bullhead, crappie, walleye, and freshwater drum were also significantly affected. **B)** Examples of bowfishing tournaments that have occurred in MN in recent years. **C)** All fishing tournaments in MN must follow established rules according to the MNDNR including the Application and Report forms. These will be used for data collection from bowfishing tournaments. **D)** Unharvested mortality (in these examples, of native bigmouth buffalo) due to bowfishing (see arrow wound), found near the shoreline following a bowfishing tournament, could be minimized with education.