



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2017 LCCMR Work Plan

Date of Submission: September 14, 2016
Date of Next Status Update Report: January 1, 2018
Date of Work Plan Approval: 06/07/2017
Project Completion Date: June 30, 2020
Does this submission include an amendment request?

PROJECT TITLE: Invasive Bighead and Silver Carp and Native Fish Evaluation – Phase II

Project Manager: Bradford G. Parsons
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Location: Mississippi, St. Croix, and Minnesota Rivers and their tributaries, other bodies of water if needed

Total ENRTF Project Budget:	ENRTF Appropriation:	\$500,000
	Amount Spent:	\$0
	Balance:	\$500,000

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 06c

Appropriation Language:
\$500,000 the first year is from the trust fund to the commissioner of natural resources to continue invasive bighead and silver carp monitoring in the Mississippi River and tributaries through advanced acoustic telemetry and assess food chains to determine how native species might prevent invasive bighead and silver carp establishment. This appropriation is available until June 30, 2020, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Continuation of Invasive Carp and Native Fish Evaluation

II. PROJECT STATEMENT: Invasive Carp, especially Bighead Carp and Silver Carp, pose an imminent and serious threat to Minnesota’s aquatic ecosystems. The Minnesota Department of Natural Resources (MN DNR) will continue monitoring Invasive Carp in the Mississippi River and tributaries employing complex sampling protocols using traditional fisheries techniques and targeted commercial fishing. These efforts are used to determine the distribution and abundance of Invasive Carp in Minnesota waters, including the leading edge of Invasive Carp reproductive success, and this information will be used to inform rapid response efforts. Advanced acoustic telemetry will be used to determine habitat use and movement patterns of native species, and potentially Invasive Carp, including how they approach and pass locks and dams and occupy key locations in Minnesota rivers in three-dimensions. Diet and stable isotope samples will also be taken from native species to determine their position in the food chain and provide baseline data prior to Invasive Carp establishment to better inform managers regarding native species’ resiliency and determine how native fish populations can be managed to prevent Invasive Carp establishment.

Invasive Carp have caused severe ecological damage to the Illinois, Missouri, and lower Mississippi River ecosystems. With increased monitoring, the MN DNR has found an increase in numbers and distribution of Invasive Carp in Minnesota. During 2014, two Silver Carp and one Bighead Carp were captured in Pool 2 of the Mississippi River, at that time that was the furthest upstream both species had been captured in Minnesota. In 2015, six Bighead Carp were captured further upstream in the St. Croix River than ever recorded. Most recently, during 2015 and 2016 the first Grass Carp and Bighead Carp ever were captured in the Minnesota River near New Ulm. Many of these fish were mature females carrying large numbers of eggs.

In the last three years, most of the Invasive Carp caught in Minnesota have been the direct result of work previously funded by the ENRTF (Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 06b; and M.L. 2015, Chp. 76, Sec. 2, Subd. 19). The Minnesota DNR Division of Fish and Wildlife, Section of Fisheries continues to conduct surveys and sampling of our major rivers. However, enhancing this effort to detect Invasive Carp is impossible at current staffing and funding levels.

This continuation project will support the maintenance of the state’s Invasive Carp monitoring, detection, and removal program including funding one full-time specialist and two student interns, funding standard fisheries monitoring and contracted commercial fishing, expert larval fish identification, and fleet and travel costs. The project will also expand an existing acoustic receiver array to determine how tagged fish approach and occupy critical locations in three-dimensions, including upstream and downstream of Lock and Dam 2 on the Mississippi River and Point Douglas on the St. Croix River where several Bighead Carp have been captured. Finally, the project will include a two year study to determine native species trophic niches to be compared with similar studies in areas where Invasive Carp are abundant to better understand the effects of Invasive Carp on native species and assess native species resiliency to Invasive Carp establishment. Outcomes will include increased numbers of Invasive Carp removed from Minnesota waters along with an increased understanding of their biology and populations, a better understanding of how fish occupy key locations and interact with locks and dams, and stable isotope data on Invasive Carp caught along with some of the Mississippi River’s most abundant predatory fish, the prey they feed on, and the planktivorous fish whose diets are most likely to overlap with Invasive Carp.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 1, 2018:

Project Status as of July 1, 2018:

Project Status as of January 1, 2019:

Project Status as of July 1, 2019:

Project Status as of January 1, 2020:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Enhanced Invasive Carp Monitoring to Evaluate Abundance and Removal Efforts

Minnesota DNR will enhance monitoring efforts to estimate abundance and distribution, determine preferred habitats, and inform removal efforts in all Minnesota waters to minimize the risk of populations becoming established. MN DNR has established an extensive Invasive Carp sampling protocol including standard fisheries sampling and deployment of directed commercial fishing. Using these techniques, the MN DNR has increased efficiency of monitoring and removal efforts and is better able to inform managers regarding their distribution and spread. In addition, it is critical that we determine if and where Invasive Carp are spawning and successfully reproducing in Minnesota waters. Prior MN DNR research and information from other states has provided vital information regarding what gears and habitats are most likely to confirm the presence of viable eggs, larvae, and juveniles. Larval samples will be sent to an expert on larval fish identification for analysis. MN DNR experience collecting larval native fishes has informed the best timing and locations for sampling. This efficiency will allow this method to expand from current sampling locations to the Mississippi River from Minneapolis to the Iowa border and in the Minnesota River.

Experiences in Minnesota waters and other states indicate that commercial fishing gears are an effective means of capturing adult Invasive Carp. Nearly all Invasive Carp caught to date in Minnesota waters have been collected by commercial fishermen. Commercial fishermen possess the necessary gear and have the local knowledge to deploy it in an effective manner. Contracting with commercial fishermen is a cost effective method of collecting adult Invasive Carp if they are present. An existing commercial fishing operation will be selected through a competitive bid process to provide approximately 22 days of gill net fishing and 10 days of seine fishing over a 2 year period. Seining is only feasible in certain locations within the rivers that are free of obstruction, while gill nets can be deployed in other locations. Additionally, the personnel in this project will accompany and monitor the catch of other, non-contracted, commercial fishing operations to detect fishing patterns and trends in fish caught which will greatly inform future Invasive Carp directed sampling efforts.

Standard fisheries gears, including electrofishing, trap nets, gill nets, trammel nets, trawls, drift nets, and hoop nets will also be used to capture Invasive Carp in habitats not accessible to commercial gears. This directed effort would be above and beyond MN DNR normal fisheries management efforts. Normal efforts by DNR staff are effective in monitoring population trends of our native sportfish and panfish species. However, detection of Invasive Carp requires specialized, targeted sampling gears deployed in different manners at intense levels in all habitat types. Annual reports will be prepared summarizing sites sampled, effort expended with various gears, and biological data on fish captured.

This continuation project will support the maintenance of the state’s Invasive Carp monitoring, detection, and removal program including funding one full-time specialist and two student interns, funding standard fisheries monitoring and contracted commercial fishing, expert larval fish identification, and fleet and travel costs. Outcomes will include increased numbers of Invasive Carp removed from Minnesota waters along with an increased understanding of Invasive Carp and native species’ biology and populations.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 394,074
Amount Spent: \$ 0
Balance: \$ 394,074

Outcome	Completion Date
1. Direct and monitor commercial fishermen in likely Invasive Carp habitats	June 30, 2020
2. Employ traditional fisheries sampling targeted to monitor Invasive Carp	June 30, 2020
3. Collect larval fish samples identified by larval fish experts	June 30, 2020

Project Status as of January 1, 2018:

Project Status as of July 1, 2018:

Project Status as of January 1, 2019:

Project Status as of July 1, 2019:

Project Status as of January 1, 2020:

Final Report Summary:

ACTIVITY 2: 2D/3D Acoustic Monitoring of Lock and Dam Passage and Critical Locations

Description: Funding will supplement an existing VEMCO fish telemetry project, adding a three-dimensional component to better understand how tagged fish occupy important locations in the Mississippi River and tributaries. MN DNR currently maintains a network of 70 acoustic receivers, tracking a total of 201 tagged fish representing eleven species. Numerous fish have been observed passing locks and dams in the Mississippi River. Upgrading the acoustic receiver network to provide 2D and 3D location data will greatly enhance our knowledge of fish passage at locks and dams, how fish respond to commercial fishing, movement between the Mississippi and St. Croix rivers (a popular commercial fishing site where several Bighead Carp have been captured), and how the warmwater discharge attracts fish at the Allen S. King Plant in Bayport, MN (a location where six Bighead Carp were captured in 2015). Data will be sent to VEMCO for processing, as they are the only company able to analyze these complex results. Silver Carp and Bighead Carp are already being implanted with transmitters outside of the state of Minnesota by other agencies and universities. Should a tagged Invasive Carp travel into Minnesota waters, it will be tracked and targeted to remove larger numbers of individuals.

Along with adding additional traditional acoustic receivers to the existing acoustic receiver array to fill in locations where fish may not be detected, MN DNR staff will install four networks of VEMCO VPS receivers to triangulate tagged fish locations to provide locations in three-dimensions. The VPS systems require the use of synch tags to synchronize receivers when receiving tag transmissions allowing for triangulation, along with batteries, and a permanent platform to hold the receivers in place. The first VPS network will be installed upstream of Lock and Dam 2, with five receivers added. The second VPS network will be installed downstream of Lock and Dam 2, with six receivers added. The third VPS network will be installed at Point Douglas on the St. Croix River near the confluence of Pool 3 of the Mississippi River, with eight receivers added. The fourth VPS network will be installed at the Allen S. King Plant on the St. Croix River in Bayport, MN, with four receivers added. Lastly, a VR100 and hydrophones will be purchased to assist researchers active track tagged fish to determine locations in real time. Acoustic receivers, including the VPS networks, will be downloaded to attain fish passage records twice per year and batteries will be changed once per year.

This Activity will expand an existing acoustic receiver array to determine how tagged fish approach and occupy critical locations in three-dimensions. Outcomes will include a better understanding of how fish occupy key locations and interact with locks and dams and the movement patterns of native riverine species. Results will be provided in high resolution locations of tagged fish and movement patterns that will be detailed in an annual MN DNR report.

Summary Budget Information for Activity 2:

ENRTF Budget: \$ 94,686
Amount Spent: \$ 0
Balance: \$ 94,686

Outcome	Completion Date
1. Deploy acoustic receivers around locks and dams and retrieve data	June 30, 2019
2. Contract VEMCO to analyze the 3D acoustic telemetry data	December 1, 2019
3. Analyze 2D and 3D data to determine how fish occupy these areas	June 30, 2020

Project Status as of January 1, 2018:

Project Status as of July 1, 2018:

Project Status as of January 1, 2019:

Project Status as of July 1, 2019:

Project Status as of January 1, 2020:

Final Report Summary:

ACTIVITY 3: Native Fish Diet and Food Web Analysis

Description: One of the best options to prevent the expansion of Invasive Carp populations in the Mississippi River and its tributaries is to support healthy native fish communities. This project will collect stable isotope samples from native fish

species collected using standard fish sampling techniques. Three native predators (Flathead Catfish, *Pylodictis olivaris*; Channel Catfish, *Ictalurus punctatus*; and Walleye, *Sander vitreus*), their main prey species, the Mississippi River’s most important planktivores (Bigmouth Buffalo, *Ictiobus cyprinellus*; Paddlefish, *Polyodon spathula*), and Silver (*Hypophthalmichthys molitrix*) and Bighead Carp (*Hypophthalmichthys nobilis*) will be sampled for isotope analysis. Stable isotope signatures will be used to determine their position in the food chain and provide baseline data on our native species prior to Invasive Carp establishment to better understand native species resiliency. Non-lethal fin clips from these species will be collected, with thirty individuals of each species sampled per year for 2 years. Fin clip samples will be dehydrated and vacuum sealed until the samples can be ground and sent for analysis. Stable isotope samples will be sent to an experienced stable isotope analysis laboratory at the end of each field season. From this project, MN DNR can better evaluate and make recommendations on how native aquatic communities can be used to slow the expansion and growth of Invasive Carp populations in Minnesota’s unique riverine habitats. Data will be reported in a MN DNR annual report with analyses of isotope overlap among species and which species exhibit the greatest overlap with Invasive Carp.

This Activity will be a two year study to determine native species feeding habits and niche to be compared with similar studies in areas where Invasive Carp are abundant to better understand the effects of Invasive Carp on native species and assess native species resiliency to Invasive Carp establishment in Minnesota. Outcomes will include stable isotope data on Invasive Carp caught in monitoring efforts along with some of the Mississippi River’s most abundant predatory fish, the prey they feed on, and the planktivorous fish whose diets are most likely to overlap with Invasive Carp. This information will provide a first look at how diverse our native species are ecologically and also the ecological effects of Invasive Carp establishment on native species.

Summary Budget Information for Activity 3:

ENRTF Budget: \$ 11,240
Amount Spent: \$ 0
Balance: \$ 11,240

Outcome	Completion Date
1. Collect stable isotope samples of native fish species	October 31, 2017
2. Contract to analyze stable isotope data	January 1, 2018
3. Compile results and analyze stable isotope data	June 30, 2018

Project Status as of January 1, 2018:

Project Status as of July 1, 2018:

Project Status as of January 1, 2019:

Project Status as of July 1, 2019:

Project Status as of January 1, 2020:

Final Report Summary:

V. DISSEMINATION:

Description: Information regarding sites sampled, effort expended, Invasive Carp caught, and native species associated with sampling sites will be compiled. This information will also be shared with other state and federal agencies including the University of Minnesota, U.S. Fish and Wildlife Service, National Park Service, U.S. Geological Survey, U.S. Army Corps of Engineers, Upper Mississippi River Conservation Committee, and others. Results will be presented at appropriate conferences, and, if appropriate, compiled and written for publication in peer reviewed journals. In addition, MN DNR annual reports will be written synthesizing the year’s sampling activities and results and updates will be provided on the MN DNR website’s Invasive Carp webpage. Invasive Carp collected will be processed by MN DNR staff, information will be relayed to the U.S. Geological Survey’s Nonindigenous Aquatic Species online database (<http://nas.er.usgs.gov/>) and representatives from

other state and federal agencies. Samples from Invasive Carp will be sent to collaborating agencies for age validation, determination of sex and reproductive maturity, microchemistry, genetics, and other purposes as they arise following established protocols.

Status as of January 1, 2018:

Status as of July 1, 2018:

Status as of January 1, 2019:

Status as of July 1, 2019:

Status as of January 1, 2020:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview:

***This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$225,000	NR Monitoring Fisheries Specialist (1 Unclassified position) (70% salary 30% benefits); 100% FTE for 3 years. Student Interns (2 positions) (100% salary) 25% FTE for 2 years.
Professional/Technical/Service Contracts:	\$129,241	Commercial Fishing: Contract 10 commercial seines and 22 large mesh gill nets over 2 years. Larval Fish Identification: Expert identification of larval fish samples for 2 years. Stable Isotope Analysis: Dual 13C and 15N natural abundance sample processing. Acoustic 3D Analysis: VEMCO Data Processing Fee for 2 years.
Equipment/Tools/Supplies:	\$91,555	Monitoring equipment to catch and process native species and Invasive Carp. Stable Isotope Analysis processing and tags to mark sampled fish. Acoustic Telemetry equipment including receivers, batteries, cages, and necessary equipment.
Travel Expenses in MN:	\$28,600	Fleet transportation expenses for 2 years and in-state travel expenses for distance and overnight status.
Other: Direct and Necessary Costs	\$ 25,604	*Direct and Necessary expenses: HR Support (~\$6,620), Safety Support (~\$1,854), Financial Support (~\$5,795), Communication Support (~\$1,316), IT Support (~\$8,910), Planning Support (~\$912), and Procurement Support

		(~\$197) necessary to accomplishing funded programs/projects.
TOTAL ENRTF BUDGET:	\$500,000	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Total Number of Full-time Equivalent (FTE) Directly Funded with this ENRTF Appropriation: 4.5 FTE

Total Number of Full-time Equivalent (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 2.0 FTE

*Direct and Necessary expenses include both Department Support Services (Human Resources, IT Support, Safety, Financial Support, Communications Support, Planning Support, and Procurement Support) and Division Support Services. Department Support Services are described in the agency Service Level Agreement, and billed internally to divisions based on rates 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. Division Support Services include costs associated with Division business offices and clerical support. 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-thru to other entities are not assessed Direct and Necessary costs for those activities.

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
United States Fish and Wildlife Service grant	\$200,696	\$200,696	Funding to support and maintain field work for detection and monitoring of Invasive Carp populations July 1, 2016- June 30, 2017.
State			
DNR Division of Fish and Wildlife in-kind match	\$132,000	\$132,000	Funding Fisheries Section employees assisting with field work and project oversight (\$40,000). Existing DNR equipment: trucks, boats, sampling equipment (fyke nets, gill nets, trawls, seines), acoustic receivers, microscopes, lab supplies, etc. (\$12,000). DNR facilities & services (office space, office overhead, technical & field support), existing DNR equipment (boats, sampling equipment, lab supplies, etc.), DNR fisheries staff (70% salary, 30% fringe) for John Waters (Invasive Carp Fisheries Specialist) and Joel Stiras (Fisheries Specialist).
TOTAL OTHER FUNDS:	\$332,696	\$332,696	

VII. PROJECT STRATEGY:

A. Project Partners: Minnesota Department of Natural Resources, Division of Fish and Wildlife, Section of Fisheries – Program administration, fisheries technical and field support, data management, and equipment. Several federal agencies, including the National Park Service, U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Army Corps of Engineers will provide assistance including sharing research findings, access to sampling areas, and logistical support.

Partners receiving ENRTF funding

- TBD, Invasive Carp Fisheries Specialist, Minnesota Department of Natural Resources, \$201,000, Field Biologist.
- TBD, 2 student interns, TBD, \$24,000, Field Interns.

Partners NOT receiving ENRTF funding

- John D. Waters, Invasive Carp Fisheries Specialist, Minnesota Department of Natural Resources, Project Leader.
- Joel Stiras, Fisheries Specialist, Minnesota Department of Natural Resources, assist in field sampling.
- Bradford Parsons, Region 3 Fisheries Manager, Minnesota Department of Natural Resources, Project Manager.

B. Project Impact and Long-term Strategy: The Minnesota DNR Division of Fish and Wildlife, Section of Fisheries continues to do surveys and sampling of our major rivers. However, enhancing this effort to detect Invasive Carp is impossible at current staffing levels. Furthermore Invasive Carp appear to be surprisingly hard to catch when they are at low numbers, apparently caused by better gear avoidance than many of our native fishes. This means that our traditional fisheries management and research activities on the rivers, although they are many, varied, and very effective for monitoring our native fish populations, are likely insufficient to understand what stage in the invasion we are facing. This project will determine the distribution and abundance of Invasive Carp in Minnesota waters and use this information to inform rapid response efforts. It will also delineate the leading edge of Invasive Carp reproductive success. Locating the areas and habitats these fish are using when they appear to be in very low numbers and have not yet established spawning populations is vital to targeting removal or other control efforts.

This proposal will enhance Minnesota waters by removing highly invasive species and will further the state’s knowledge of native fish populations. Through sampling, MN DNR is increasing effectiveness to successfully capture these species and is providing vital information regarding these species’ invasion and populations. This proposal will coordinate and enhance all current efforts that are available to monitor the invasion front and inform the state’s response to it into the future to ensure populations do not become established. From this project, MN DNR staff will be able to increase sampling efficiencies for Invasive Carp by better understanding associations with native species and increased captures of Invasive Carp and associated biological information from captured individuals. By increasing efficiencies and removing more Invasive Carp, the state will be better able to combat the spread and establishment of these species and protect that state’s natural resources and aquatic recreational opportunities. While operating under this grant and after completion, MN DNR will continue to seek additional funds to sustain efforts from the state’s Game and Fish Fund and general operating budget as well as federal grants, including grants from the U.S. Fish and Wildlife Service. This program is an evolving management strategy and as such will adapt as needed to best protect the state’s resources.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
M.L. 2013, Chp. 52, Sec. 2, Subd. 06b M.L. 2015, Chp. 76, Sec. 2, Subd. 19 Detection and Monitoring of Asian Carp Populations and Movements	July 1, 2013 – June 30, 2016	\$540,000
U.S. Fish and Wildlife Service	July 1, 2015 – June 30, 2016	\$60,000
U.S. Fish and Wildlife Service	July 1, 2016 – June 30, 2017	\$140,696
MN Game and Fish Funds	January 1, 2014 – April 30, 2016	\$29,694
MN DNR Invasive Species funds	June 1, 2015 – July 1, 2017	\$20,000

VIII. REPORTING REQUIREMENTS:

- The project is for 3 years, will begin on July 1, 2017, and end on June 30, 2020.
- Periodic project status update reports will be submitted *January 1* and *July 1* of each year.
- A final report and associated products will be submitted between June 30 and August 15, 2020.

IX. VISUAL COMPONENT or MAP(S): See attached visual.

**Environment and Natural Resources Trust Fund
M.L. 2017 Project Budget**



Project Title: Invasive Bighead and Silver Carp and Native Fish Evaluation – Phase II

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 06c

Project Manager: Bradford G. Parsons

Organization: Minnesota Department of Natural Resources

M.L. 2017 ENRTF Appropriation: \$500,000.00

Project Length and Completion Date: 3 years, June 2020

Date of Report: January 1, 2018

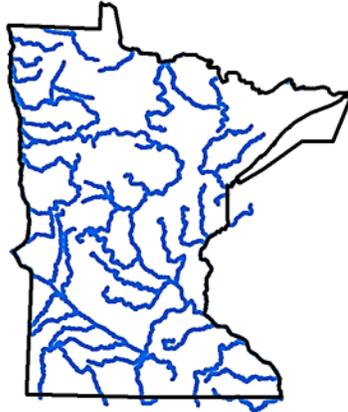
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	<i>Enhanced Invasive Carp Monitoring to Evaluate Abundance and Removal Efforts</i>			<i>2D/3D Acoustic Monitoring of Lock and Dam Passage and Critical</i>			<i>Native Fish Diet and Food Web Analysis</i>				
Personnel (Wages and Benefits)											
<i>NR Monitoring Fisheries Specialist (1 Unclassified position) - to conduct at least 200 field sampling days annually, oversee commercial fishing operations, and compile, analyze, and report findings (70% salary 30% benefits); 100% FTE for 3 years.</i>	\$201,000	\$0	\$201,000							\$201,000	\$201,000
<i>Student Interns (2 positions) - field data collection activities in support of project objectives 25% FTE for 2 years.</i>	\$24,000	\$0	\$24,000							\$24,000	\$24,000
Professional/Technical/Service Contracts											
<i>Commercial Fishing: Contracted directed commercial seines and large mesh gill nets. Licensed commercial fishermen will be hired to set 11 gill net days and 5 seine days per year or 22 gill net days total and 10 seine days total over 2 years.</i>	\$58,800	\$0	\$58,800							\$58,800	\$58,800
<i>Larval Fish Identification: Technical contract to provide expert identification of up to 200 larval fish samples per year for 2 years by an expert in the field.</i>	\$35,000	\$0	\$35,000							\$35,000	\$35,000
<i>Stable Isotope Analysis: Dual 13C and 15N natural abundance sample processing. 15 species will be sampled with a total of 900 samples analyzed over 2 years at approximately \$11 per sample.</i>							\$10,000	\$0	\$10,000	\$10,000	\$10,000
<i>Acoustic 3D Analysis: VEMCO Data Processing Fee for 4 locations for 2 years. VEMCO is the only company able to analyze this data due to the VEMCO acoustic array already in place. No other company is able to analyze this data.</i>				\$25,441	\$0	\$25,441				\$25,441	\$25,441
Equipment/Tools/Supplies											

Monitoring: Replacement nets, preservatives, sample bottles to support capture and collection of fishes, tags to track fish movement. Specialized nets including large mesh gill nets (4 @ \$300 = \$1,200), trammel nets (4 @ \$400 = \$1,600), and mini-lyke nets (6 @ \$600 = \$3,600), necessary to capture Invasive Carp at various life stages and in various habitats; associated supplies to deploy nets such as rope, anchors, floats (\$2,500); 500 mL bottles (120 bottles @ \$1.75 each = \$210) and preservative for larval samples (alcohol 48 L @ \$150 per 4 L = \$1,800; formalin 35 gallons @ \$110 per 5 gallons = \$770); external tags to track fish movements (6,000 @ \$0.70 each = \$4,200); tagging needles (8 @ \$10 each = \$80); tagging guns (2 @ \$55 each = \$110); miscellaneous supplies such as personal protective equipment, repairs, replacements, etc. (\$5,000). Costs are based on expected bids and may vary.	\$21,070	\$0	\$21,070							\$21,070	\$21,070
Stable Isotope Analysis: external anchor tags (900 @ \$0.70 each = \$630), dehydrator (\$250), vaccum pack bags (900 @ \$0.40 each = \$360).						\$1,240	\$0	\$1,240		\$1,240	\$1,240
Acoustic Telemetry: 23 VPS receivers (23 @ \$2,070 each = \$47,610), 25 deployment cages (25 @ \$50 each = \$1,250), 4 sync tags (4 @ \$380 each = \$1,520), 160 batteries (160 @ \$30 each = \$4,800), 1 VR100 (\$5,870), 1 Omnidirectional hydrophone (\$2,165), 1 Directional hydrophone (\$1,575), sales tax (\$4,455).				\$69,245	\$0	\$69,245				\$69,245	\$69,245
Travel expenses in Minnesota											
Fleet transportation expenses for 2 years; base of operation will be the Warner Road, St. Paul Fisheries office.	\$21,000	\$0	\$21,000							\$21,000	\$21,000
In-state Travel Expenses: Meals (\$3,100) and lodging (\$4,500) for distant and overnight status up to 25 nights per year for 2 years.	\$7,600	\$0	\$7,600							\$7,600	\$7,600
Other											
*Direct and Necessary expenses: HR Support (~\$6,620), Safety Support (~\$1,854), Financial Support (~\$5,795), Communication Support (~\$1,316), IT Support (~\$8,910), Planning Support (~\$912), and Procurement Support (~\$197) necessary to accomplishing funded programs/projects.	\$25,604	\$0	\$25,604							\$25,604	\$25,604
COLUMN TOTAL	\$394,074	\$0	\$394,074	\$94,686	\$0	\$94,686	\$11,240	\$0	\$11,240	\$500,000	\$500,000

Invasive Carp (a.k.a. Asian Carp) are coming!



They are moving further upstream and are found more frequently.



The state of Minnesota will:



continue monitoring and removal efforts;



better understand how fish pass locks and dams and occupy key locations;



and analyze native fish species' ecology before we start to lose them.