



# Environment and Natural Resources Trust Fund

M.L. 2020 Approved Work Plan

## General Information

**ID Number:** 2020-033

**Staff Lead:** Michael Varien

**Date this document submitted to LCCMR:** August 13, 2021

**Project Title:** Increase Golden Shiner Production To Protect Aquatic Communities

**Project Budget:** \$188,000

## Project Manager Information

**Name:** Amy Schrank

**Organization:** U of MN - Duluth - Sea Grant

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## Project Reporting

**Date Work Plan Approved by LCCMR:** August 13, 2021

**Reporting Schedule:** April 1 / October 1 of each year.

**Project Completion:** June 30, 2024

**Final Report Due Date:** August 14, 2024

## Legal Information

**Legal Citation:** M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 08k

**Appropriation Language:** \$188,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota for the Minnesota Sea Grant in Duluth to identify and demonstrate best methods for in-state production of golden shiners to address angler demand while reducing the risk of introducing and spreading invasive species and to communicate findings through reports, manuals, and workshops. Production of shiners in this project must not take place in wetlands.

**Appropriation End Date:** June 30, 2024



## Narrative

**Project Summary:** We propose four strategies to increase in-state Golden Shiner (bait) production because angler demand exceeds production. Out-of-state importation creates a high risk of introducing aquatic invasive species and disease.

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

In Minnesota, demand for Golden Shiners (*Notemigonus crysoleucas*) used as bait exceeds in-state production. Recent projections by bait dealers estimate a deficit of approximately 10,000 gallons of Golden Shiners annually. There is pressure from anglers, bait dealers, and legislators to import them from Arkansas and other states. However, importation can introduce aquatic invasive species such as invasive carps and fish diseases, which can negatively impact state waters and jeopardize valuable native fish species.

Present laws prohibit the importation of baitfish for resale in Minnesota to prevent importation of invasive species and fish diseases. The recent report to the Minnesota Legislature titled “Minnow Importation Risk Report: assessing the risk of importing Golden Shiners into Minnesota from Arkansas” (Gunderson 2018) identified several key vulnerabilities and risks associated with importing Golden Shiner. The report recommends increasing production of Golden Shiner in Minnesota as a preferred alternative to importation (Gunderson 2018 pg. 57). This conclusion was endorsed by Minnesota Department of Natural Resources Commissioner Tom Landwehr in a February 2018 letter to legislators (included in Gunderson 2018).

**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.**

This proposal will explore strategies to provide a sustainable in-state supply of Golden Shiners that would negate the need for importation. A dependable in-state supply of Golden Shiner will reduce the risk of introducing invasive species and fish pathogens through importation and the inadvertent activity of anglers who illegally bring Golden Shiner into Minnesota. Expansion of in-state Golden Shiner production could increase jobs and commerce in rural Minnesota communities.

Our proposal will examine four in-state strategies to increase production of Golden Shiners using exclusively indoor production or indoor production in combination with dug grow-out ponds. The goal of moving production or partial production of Golden Shiner to indoor facilities is to extend the growing period and enable Golden Shiners to reach marketable size in 9 months or less. Indoor production prevents Golden Shiners from having to over-winter in natural ponds where mortality is high and growth very slow. Successful indoor production could provide Golden Shiners for bait year-round and be used to develop disease-free fish for dug grow-out ponds.

**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?**

Project outcomes: 1) Identify and demonstrate best methods for in-state production of Golden Shiner that will address angler demand and reduce importation and 2) Communicate findings and recommendations to commercial producers by publishing a project report, a production (how-to) manual, and holding three workshops to transfer results of this project.

## 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

## Activities and Milestones

### Activity 1: Indoor spawning and culture of Golden Shiner

**Activity Budget:** \$48,406

**Activity Description:**

Golden Shiners are an excellent candidate for indoor production because they are a hardy fish, spawn multiple times a year, and their spawning times can be manipulated by adjusting water temperature and lighting conditions. We propose to begin spawning Golden Shiners indoors and raising the juvenile fish to various sizes which will then be transferred to other facilities for grow-out with the goal of reaching marketable size in 9 months or less. To accomplish indoor production, we will start with mature Golden Shiners from Minnesota ponds. We will bring them into the hatchery, hatch the eggs, transition the newly hatched fry from yolk-sac stage to external feeding using small zooplankton and once the fry are eating the zooplankton, transition them to feed on a commercially available diet of dry food. This process has been researched and successfully implemented by Marc Tye (Tye 2012), a partner on this proposal. Activity Outcome: Provide year-round indoor production of Golden Shiner that will be transferred to aquaponics facilities or dug ponds for grow-out (see Activity 2).

**Activity Milestones:**

Description	Completion Date
1. Collect Golden Shiners from Minnesota ponds	October 31, 2021
2. Hatch eggs	May 31, 2022
3. Transition fry to commercial feed	May 31, 2022

### Activity 2: Four grow-out strategies for Golden Shiner

**Activity Budget:** \$132,386

**Activity Description:**

Strategy 1. Grow fish indoors using a recirculating aquaculture system (RAS) and commercial feed. This system could provide disease free, market-size Golden Shiners to the bait industry year-round. Strategy 2. Feed-trained fry derived from Minnesota Golden Shiners will be taken from the indoor hatchery and introduced into aquaponics systems (i.e., growing fish and plants together). This would also supply a year-round source not presently available. Strategy 3. Obtain fry (~ 1/4 inch) from the indoor hatchery and stock them into outdoor dug ponds. This is similar to what MNDNR uses for Walleye fingerling production. This method may increase grow-out season length in ponds by 1– 2 months, allowing fish to reach market size in one summer. Strategy 4. Rear fish indoors to fryling size (~ 3/4 - 2 inches), stock the dug grow-out ponds in early spring, and harvest before freeze up. This could increase the length of the growing season by up to three months allowing harvest of market-size fish in one summer, without over wintering in ponds. Activity Outcomes: Indoor, year-round production of market-size Golden Shiner within nine months or less using RAS and aquaponics. Outdoor (dug pond) production of market-size Golden Shiner over one summer growing season.

**Activity Milestones:**

Description	Completion Date
1. Stock hatchery fry and fryling into different sets of outdoor dug ponds (2 years)	June 30, 2023
2. Grow Golden shiners over the summer to market size and harvest in late fall (2 years)	October 31, 2023
3. Golden Shiner production in RAS and aquaponics systems (Tye Fish solutions).	June 30, 2024

### Activity 3: Monitor results and develop recommendations based on which strategies may best increase commercial production of Golden Shiner in Minnesota

**Activity Budget:** \$7,208

**Activity Description:**

Monitor results by sampling Golden Shiners, water quality, disease, and environmental conditions in tanks and/or dug ponds for each strategy. Develop recommendations based on growth rates, food availability, survival of Golden Shiner, and estimated costs for each strategy. Activity Outcomes: Summarize project results in a final report, publish a production (how-to) manual, and host three workshops for growers, bait dealers, and legislators.

**Activity Milestones:**

Description	Completion Date
1. Summarize project results in a final report.	June 30, 2024
2. Publish a production (how-to) manual.	June 30, 2024
3. Host three workshops for growers, bait dealers, and legislators	June 30, 2024

## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Donald Schreiner	Minnesota Sea Grant	Schreiner will help oversee the project, communicate with project partners, analyze results, and develop outreach workshops.	Yes
Marc Tye	Tye Fish Solutions	Tye is a Golden Shiner indoor production specialist, he will supply and grow Golden Shiner for this project.	Yes
Barry Thoele	Lincoln Bait	Thoele will grow-out Golden Shiners in his dug ponds and tank facilities.	Yes
Aquaponics Grower (TBD)	TBD	This person/business will grow-out Golden Shiner in his/her aquaponics facility.	Yes
Sean Sisler	Minnesota DNR	Sisler will assist with required permits, regulation compliance and act as MNDNR liaison.	No

## Dissemination

**Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENTRF Acknowledgement Requirements and Guidelines.**

We will summarize project results in a final report that will be shared among managers, bait growers, legislators and the public. We will also develop a production (how-to) manual to be made available to bait producers to allow them to repeat our results at their own farms. Both our project report material and the production manual will be made available through the Minnesota Sea Grant Golden Shiner project website. In addition to these outreach methods, we will host three workshops for growers, bait dealers, and legislators describing the results of our study and the implications for the MN bait industry in the future. In all of our materials, we will acknowledge the Environment and Natural Resources Trust Fund through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENTRF Acknowledgment Guidelines.

## 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?**

We anticipate that Golden Shiner growers and bait dealers will implement and fine-tune the results of this project. We predict growers will be better positioned to fund their businesses based on the profit gained through the increased production and sale of Golden Shiners to anglers. We expect increased in-state production to significantly reduce demand for Golden Shiner importation and increase the annual supply to appreciative anglers.

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Project Co-manager		Help oversee the project, communicate with project partners, analyze results, and develop outreach workshops.			27%	0.45		\$35,847
Project Manager		Oversee project components, coordinate with partners, oversee student workers, contribute to analysis and written reports and outreach products.			27%	0.45		\$47,322
Undergraduate student worker		Assist with field and lab work			0%	0.76		\$18,700
							<b>Sub Total</b>	<b>\$101,869</b>
<b>Contracts and Services</b>								
Tye Fish Solutions	Professional or Technical Service Contract	Produce Golden shiners for grow-out and grow fish indoors for entire life-cycle. Tye Fish Solutions is the only business in Minnesota that produces Golden Shiner indoors with the capacity to produce different life stages. We compared pricing with Dr. Chris Hartleb at University of Wisconsin facility and pricing was competitive.		X		0.6		\$30,000
Lincoln Bait	Professional or Technical Service Contract	Provide grow-out facilities, both indoor tanks and outdoor ponds. Lincoln Bait has the required variety of pond sizes, has previous experience working with researchers, and a demonstrated ability to follow data collection and reporting protocols. Pricing was compared to University of Wisconsin lab and found to be competitive.		X		0.38		\$25,000
Aquaponics grower	Professional or Technical Service Contract	Grow out Golden Shiners in their aquaponics facilities.				0		\$4,000
Univeristy of Minnesota	Internal services or	The lab will provide disease testing for Golden Shiner as needed throughout the project. 8 comprehensive aquatic necropsies @ \$120 each,				0		\$2,000



Veterinary Diagnostic Lab	fees (uncommon)	40 H&E histological slide preps @ \$16 each, 16 special stain preps @ \$25 each.							
								<b>Sub Total</b>	<b>\$61,000</b>
<b>Equipment, Tools, and Supplies</b>									
	Tools and Supplies	Miscellaneous field supplies: measuring board, scale, sample containers, sample preservatives, water temperature loggers, dissolved oxygen measurement, etc.	These items will be used for field or lab work to measure/weigh/assess health of fish during growing periods.						\$5,168
								<b>Sub Total</b>	<b>\$5,168</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	Mileage to sample fish from ponds (Lincoln Bait in Staples area), hatchery (Tye Fish Solutions near Mankato) and aquaponics (Twin Cities area and TBD): 8 trips/yr for three years @ 300 miles/trip = 7200 miles @ 0.575/mile = \$4140	Travel to sample fish and assess fish health at all field and lab sites.						\$4,140
	Miles/ Meals/ Lodging	Mileage to outreach meetings: travel to outreach groups (likely Twin Cities and Alexandria areas) for 7 trips @ 300 miles/trip = 2100 miles @ \$0.575 per mile = \$1208	Travel to provide outreach to stakeholders						\$1,208
	Miles/ Meals/ Lodging	Lodging for travel for field/lab work and outreach: 30 overnights @ \$100 per night = \$3000	Lodging for travel for field, lab, and outreach work						\$3,000
	Miles/ Meals/ Lodging	Meals for 124 days @ \$45 per day	Meals for trips to complete field, lab, and outreach work.						\$5,580
	Miles/ Meals/ Lodging	Mileage for initial planning meetings and facility preparation (likely in Twin Cities area) 2 trips, 3 groups @ 300 miles/trip = 1800 miles @0.575/mi = 1035	Mileage for initial planning meetings and facility preparation						\$1,035

							<b>Sub Total</b>	<b>\$14,963</b>
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	<b>-</b>
<b>Printing and Publication</b>								
	Printing	Printing of outreach materials and final growers manual	We will take outreach materials (handouts, growers manual) to distribute to groups.					\$3,000
	Publication	Design cost for final growers manual	Layout and design costs for publishing the final growers manual.					\$2,000
							<b>Sub Total</b>	<b>\$5,000</b>
<b>Other Expenses</b>								
							<b>Sub Total</b>	<b>-</b>
							<b>Grand Total</b>	<b>\$188,000</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
<b>Contracts and Services</b> - Tye Fish Solutions	Professional or Technical Service Contract	Produce Golden shiners for grow-out and grow fish indoors for entire life-cycle. Tye Fish Solutions is the only business in Minnesota that produces Golden Shiner indoors with the capacity to produce different life stages. We compared pricing with Dr. Chris Hartleb at University of Wisconsin facility and pricing was competitive.	Tye Fish Solutions is the only business in Minnesota that produces Golden Shiner indoors with the capacity to produce different life stages. We compared pricing with Dr. Chris Hartleb at University of Wisconsin facility and pricing was competitive. <b>This is a single source contract.</b>
<b>Contracts and Services</b> - Lincoln Bait	Professional or Technical Service Contract	Provide grow-out facilities, both indoor tanks and outdoor ponds. Lincoln Bait has the required variety of pond sizes, has previous experience working with researchers, and a demonstrated ability to follow data collection and reporting protocols. Pricing was compared to University of Wisconsin lab and found to be competitive.	Lincoln Bait has the required variety of pond sizes, has previous experience working with researchers, and a demonstrated ability to follow data collection and reporting protocols. Pricing was compared to University of Wisconsin lab and found to be competitive. <b>This is a single source contract.</b>

## Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
<b>State</b>				
In-Kind	Minnesota DNR	Minnesota DNR will support Aquaculture Specialist Sean Sisler at 40 hrs/yr for 3 years @ \$50 per hour.	Secured	\$6,000
In-Kind	University of Minnesota	Unrecovered indirect cost @ 55% MTDC	Secured	\$106,700
			<b>State Sub Total</b>	<b>\$112,700</b>
<b>Non-State</b>				
			<b>Non State Sub Total</b>	-
			<b>Funds Total</b>	<b>\$112,700</b>

## Attachments

### Required Attachments

#### *Visual Component*

File: [24de5ceb-7c0.pdf](#)

#### *Alternate Text for Visual Component*

Visual shows four strategies to increase in-state Golden Shiner production so importation is not required to meet angler demand. Importation has high risk of introducing aquatic invasive species and disease....

### Optional Attachments

#### *Support Letter or Other*

Title	File
Minnesota DNR letter of support (2019)	<a href="#">94363749-720.pdf</a>
University of Minnesota Letter of Support	<a href="#">07d83dce-982.pdf</a>
Minnesota DNR letter (updated - 2021)	<a href="#">8ec6bc1d-520.pdf</a>
Background Check Certification	<a href="#">a599251d-a04.pdf</a>

## Difference between Proposal and Work Plan

### *Describe changes from Proposal to Work Plan Stage*

The changes from proposal to workplan stage include: 1) a change a principal investigator from John Downing to Amy Schrank (she was hired as a Fisheries and Aquaculture Extension Educator in March 2020), and 2) the addition of Golden Shiner disease testing as needed throughout the project through the University of Minnesota Veterinary Diagnostic Lab.

## Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

**Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?**

N/A

**Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?**

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

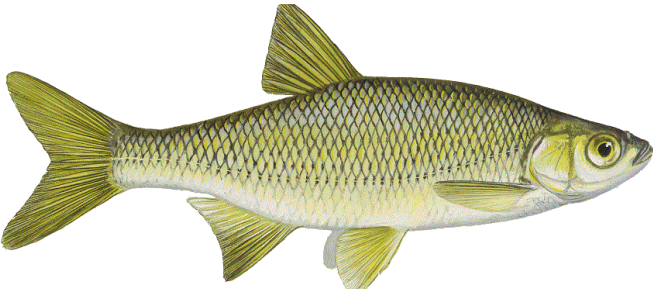
**Does your project include original, hypothesis-driven research?**

Yes

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

No

# Increase Golden Shiner Production to Protect Aquatic Communities



Demand for Golden Shiners used as bait exceeds in-state production and there is pressure from anglers to import them.



However, importation can introduce aquatic invasive species and carry disease, which can negatively impact our state waters and jeopardize valuable native fish species.

## 4 Strategies to Increase In-State Golden Shiner Production

Raise indoors for their entire lifecycle



Couple production with aquaponics



Grow indoors to fry size (1"), then transfer to dug ponds



Grow indoors to fryling size (2"), then transfer to dug ponds



## Outcomes and Products

Increase in-state production of Golden Shiner to meet angler demand and eliminate need to import

Document results, determine best strategies, and produce a report. Develop systems for commercial production

Host 3 workshops for growers, bait dealers and legislators to transfer project information

