Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-288

Proposal Title: Increase Golden Shiner Production to Protect Aquatic Communities

Project Manager Information

Name: Amy Schrank

Organization: U of MN - Duluth - Sea Grant

Office Telephone: (612) 301-1526

Email: aschrank@umn.edu

Project Basic Information

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.

Funds Requested: $194,000

Proposed Project Completion: 2024-06-30

LCCMR Funding Category: Small Projects (H)

Secondary Category: Methods to Protect, Restore, and Enhance Land, Water, and Habitat (F)

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 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.

Activities and Milestones

Activity 1: Indoor spawning and culture of Golden Shiner

Activity Budget: $46,406

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	2021-10-31
3.	Transition fry to commercial feed	2022-05-31
2.	Hatch eggs	2022-05-31

Activity 2: Four grow-out strategies for Golden Shiner

Activity Budget: $140,386

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 (~ ¾ - 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)	2023-06-30
2.	Grow Golden shiners over the summer to market size and harvest in late fall (2 years)	2023-10-31
3.	Golden Shiner production in RAS and aquaponics systems (Tye Fish solutions, MAISRC lab facilities).	2024-06-30

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
3.	Host three workshops for growers, bait dealers, and legislators	2024-06-30
2.	Publish a production (how-to) manual.	2024-06-30
1.	Summarize project results in a final report.	2024-06-30

Project Partners and Collaborators

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

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.

Project Manager and Organization Qualifications

Project Manager Name: Amy Schrank

Job Title: Assistant Extension Professor

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

Please note the Project Manager change in this re-submission from Dr. John Downing to Dr. Amy Schrank. Dr. Amy Schrank is a Fisheries and Aquaculture Extension Educator with Minnesota Sea Grant (MNSG) and an Adjunct Assistant Professor in the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota. Schrank's expertise is in fisheries and aquatic ecology, aquatic ecosystem management, and conservation. She has conducted field research in aquatic ecosystems over the last 23 years in both streams and lakes and with life stages of fishes ranging from larvae to adults. Her Master's degree focused on fish biomechanics and during this time period she gained experience in fish health and captive fish maintenance. Schrank has experience in project management both for large scale field projects and collaborative projects involving various stakeholders. For example, she oversees the Great Lakes Aquaculture Collaborative, a $1 million project with six other Sea Grant programs and eight Great Lakes states to understand the potential for a sustainable, environmentally responsible, and economically viable aquaculture industry in the Great Lakes region. In addition to Dr. Schrank's fisheries background, MNSG Fisheries/Aquaculture Specialist Don Schreiner has over 34 years of experience working for the Minnesota Department of Natural Resources and Minnesota anglers on a variety of fisheries management issues including Walleye production, invasive species, bait production and aquaculture.

Professional Preparation

University of Wyoming: Ph.D. Zoology and Physiology, Statistics minor, Research: Movement patterns of cutthroat trout in streams, 2002

University of Michigan: M.S. Resource Ecology and Management: Aquatic Ecosystems, Research: Fish maneuverability, 1997

University of Michigan: B.S. Biology and Spanish, 1995

Organization: U of MN - Duluth - Sea Grant

Organization Description:
Minnesota Sea Grant's (MNSG) mission is to facilitate interaction among the public and scientists to enhance communities, the environment and economies along Lake Superior and Minnesota's inland waters by identifying information needs, fostering research, and communicating results. MNSG program staff routinely administer grants, track funding, and develop outside contracts with relevant experts for various projects. Outreach, or the transfer of aquatic science information among researchers, targeted user groups, and the public is a key component of the MNSG program and will be instrumental in applying the results of the proposed project.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
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
							Sub Total	**$101,869**
Contracts and Services								
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.				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.				0.38		$25,000
Aquaponics grower	Professional or Technical Service Contract	Grow out Golden Shiners in their aquaponics facilities.				0		$4,000
Minnesota Aquatic Invasive	Internal services or	Provide space to grow Golden Shiners in an indoore RAS (recirculating aquaculture system):				0		$8,760

Species Research Center (MAISRC) Lab	fees (uncommon)	containment lab rental fee for biosecure lab space for 1 year ($2190/13 weeks x 4)						
Univeristy of Minnesota Veterinary Diagnostic Lab	Internal services or fees (uncommon)	The lab will provide disease testing for Golden Shiner as needed throughout the project. 4 comprehensive aquatic necropsies @ $120 each, 20 H&E histological slide preps @ $16 each, 8 special stain preps @ $25 each.				0		$1,000
							Sub Total	**$68,760**
Equipment, Tools, and Supplies								
	Tools and Supplies	Miscellaneous field supplies: measuring board, scale, sample containers, sample preservatives, etc.	These items will be used for field or lab work to measure/weigh/assess health of fish during growing periods and strategies.					$3,408
							Sub Total	**$3,408**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	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 are) 2 trips, 3 groups @ 300 miles/trip = 1800 miles @0.575/mi = 1035	Mileage for initial planning meetings and facility preparation					$1,035
							Sub Total	**$14,963**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
	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
							Sub Total	**$5,000**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$194,000**

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				
In-Kind	University of Minnesota	Unrecovered indirect cost @ 55% MTDC	Secured	$106,700
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
			State Sub Total	**$112,700**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**$112,700**

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
Michigan DNR letter of support	94363749-720.pdf
University of Minnesota Letter of Support	07d83dce-982.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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

No

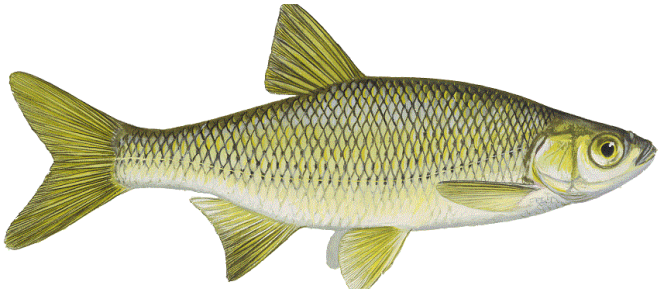
Does your project include research?

Yes

Does the organization have a fiscal agent for this project?

No

Increase Golden Shiner Production to Protect Aquatic Communities



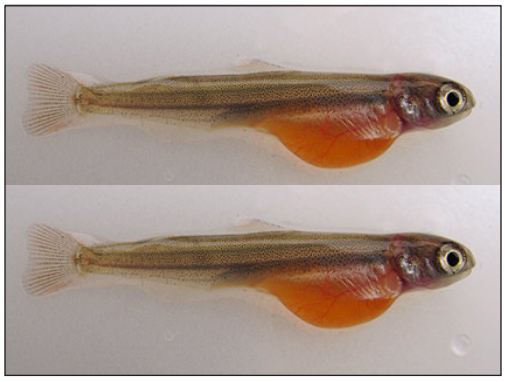
- Demand for Golden Shiners used as bait exceeds in-state production and there is pressure from anglers to import them.
- However, importation can introduce aquatic invasive species and carry disease, which can negatively impact our state waters and jeopardize valuable native fish species.

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

Proposal LCCMR 2021-2024. Increasing Golden Shiner Production in Minnesota to Avoid Importation of Aquatic Invasive Species and Pathogens. Don Schreiner. April 2020.