



Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-017

Proposal Title: Starch Allocation Patterns Of Starry Stonewort (*Nitellopsis Obtusa*) Harvested From Lake Koronis, Mn

Project Manager Information

Name: Ryan Wersal

Organization: Minnesota State Colleges and Universities - Minnesota State University Mankato - Department of Biological Sciences

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Project Basic Information

Project Summary: Starry stonewort is a macro-algae that has invaded Minnesota lakes, though nothing is known about its starch allocation. These data can identify weak points in allocation strategy to enhance management.

Funds Requested: \$101,000

Proposed Project Completion: 2023-07-31

LCCMR Funding Category: Small Projects (H)

Secondary 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

Narrative

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

Starry stonewort is a non-native macro-algae from Europe and western Asia that was introduced into Lake Koronis, MN in 2015, and has since spread to 14 other waterbodies. Unlike many of the native green macro-algae, starry stonewort can elongate into the water column, and in some cases reach plant lengths of 2 meters. Dense growth of starry stonewort can alter the community structure of aquatic habitats by extirpating native vegetation, thereby changing macro-invertebrate assemblages and ultimately fish assemblages. Starry stonewort interferes with boating and other recreational activities. Aquatic invasive species like starry stonewort have also resulted in declines in property values. Starry stonewort is anchored to bottom sediments by rhizoids. These rhizoids are important as they often contain bulbils, or are the point of bulbil production. Bulbils are starch-containing tissues used for overwintering and perennation. When conditions are conducive for growth, bulbils will sprout and grow a new plant. Although there are data on its impact as a non-native species, and how to manage it; to date, there are few studies on its life history characteristics, and no studies on phenology and resource (starch) allocation patterns for this species.

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.

The proposed project will utilize laboratory techniques to quantify seasonal starch allocation patterns in starry stonewort from samples previously collected from two growing seasons on Lake Koronis, MN. The commercially available starch assay kit (Sigma Aldrich) will be used to separate starch from aboveground, rhizoid, and bulbil biomass. Data will elucidate seasonal patterns in starch allocation for starry stonewort and identify which structures are important for storage. This approach has been utilized by the principle investigator on other aquatic species such as parrotfeather, phragmites, Eurasian watermilfoil, and Cuban bulrush. Funding is being sought to support a graduate student for two summers to conduct the tissue analysis of starry stonewort harvested from Lake Koronis from two growing seasons. Funding will also support undergraduate wages in order to involve undergraduate students in the research process. Funds are being sought by the principle investigator for summer salary to manage the project and mentor both the graduate and undergraduate students. Funds will be needed to purchase the necessary starch kits, reagents, and supplies to conduct the analyses.

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?

Having an understanding of starch allocation patterns in starry stonewort will allow for better management of this species. Knowing when starry stonewort begins growth and when it achieves maximum starch reserve is crucial in developing targeted management approaches. Management then occur during the times when starch reserves are at their lowest points making the plant more vulnerable to management techniques. Targeting starry stonewort during low points in its starch allocation curve will make managing this species easier and potentially more cost effective resulting in fewer impacts to Minnesota lakes and non-target species; and ultimately restore and conserve our water resources.

Activities and Milestones

Activity 1: Starch Allocation Analysis

Activity Budget: \$101,000

Activity Description:

Starry stonewort is a macro-algae that has invaded Minnesota lakes, though nothing is known about its starch allocation. These data can identify weak points in allocation strategy to enhance management. Having an understanding of starch allocation patterns in starry stonewort will allow for better management of this species. Knowing when starry stonewort begins growth and when it achieves maximum starch reserve is crucial in developing targeted management approaches. Management then occur during the times when starch reserves are at their lowest points making the plant more vulnerable to management techniques. Targeting starry stonewort during low points in its starch allocation curve will make managing this species easier and potentially more cost effective resulting in fewer impacts to Minnesota lakes and non-target species; and ultimately restore and conserve our water resources. The milestones listed below reference the activity/timeline that will be in place during the project.

Activity Milestones:

Description	Completion Date
Analyzing the First Season of Tissues	2022-06-30
Present Preliminary Findings	2022-07-31
Analyzing the Second Season of Tissues	2023-06-30
Prepare and Submit Journal Article	2023-07-31
Present Final Findings	2023-07-31

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?

Results from this project will have direct implications for how starry stonewort is managed nationwide. Presentations and journal publications will be developed and made available to the resource managers, lake associations, and the public. Stakeholder meetings with state agencies, such as the Minnesota Department of Natural Resources (MN DNR), lake associations, watershed districts, and federal agencies will continue in order to redefine management strategies for this species. Future in-field management projects will be developed based on results from this project with funds sought from the MN DNR, aquatic invasive species prevention program, Federal grants, and private companies.

Project Manager and Organization Qualifications

Project Manager Name: Ryan Wersal

Job Title: Assistant Professor

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

Dr. Wersal has 18 years of experience working with aquatic plants all over the country. He has designed and constructed research facilities to conduct controlled research in Mississippi, Georgia, and now in Minnesota. Dr. Wersal's labs have operated under both state and federal noxious weed permits in order to conduct research on the worst aquatic plants. His work has resulted in 45 journal articles, 5 book chapters, over 200 presentations, and 3 patents on aquatic plant related products. Dr. Wersal was invited to write the article on aquatic plant phenology for the Journal of Aquatic Plant Management's Research Methods special issue. He currently has a graduate student working on a starch allocation project with the plant Cuban bulrush. Relevant journal articles are offered below.

Wersal, R.M. and J.D. Madsen. 2018. Designing and using phenological studies to define management strategies for aquatic plants. In Compendium: Journal of Aquatic Plant Management Research Methods. Journal of Aquatic Plant Management 56s:83-89. Invited Paper.

Turnage, G., J.D. Madsen, and R.M. Wersal. 2018. Phenology of curlyleaf pondweed (*Potamogeton crispus* L.) in the southeastern US: a two-year mesocosm study. Journal of Aquatic Plant Management 56:35-38.

Madsen, J.D., R.M. Wersal, and M.D. Marko. 2016. Distribution and biomass allocation in relation to depth of flowering rush (*Butomus umbellatus*) in the Detroit Lakes, Minnesota. Invasive Plant Science and Management 9:161-170.

Wersal, R.M., J.D. Madsen, and J.C. Cheshier. 2013. Seasonal biomass and starch allocation of *Phragmites australis* (Haplotype I) in Southern Alabama, USA. Invasive Plant Science and Management 6:140-146.

Wersal, R.M., J.C. Cheshier, J.D. Madsen, and P.D. Gerard. 2011. Phenology, starch allocation, and environmental effects on *Myriophyllum aquaticum*. Aquatic Botany 95:194-199.

Wersal, R.M., J.D. Madsen, B.R.

Organization: Minnesota State Colleges and Universities - Minnesota State University Mankato - Department of Biological Sciences

Organization Description:

The Department of Biological Sciences offers programs for students preparing for careers in education, laboratory and field research, agricultural sciences, ecology, biotechnology, environmental sciences, medical laboratory sciences, cytotechnology, food science technology and pre-professional programs. The Aquatic Weed Science Laboratory offers research opportunities in the biology and ecology of both native and invasive aquatic plants, the management of invasive aquatic plants, and the quantitative assessment of aquatic plant communities. Research in the is conducted across multiple scales including laboratory, small scale aquaria studies, mesocosm evaluations, and field studies; and includes both vascular aquatic plants and harmful algae/cyanobacteria.

Focus areas include:

1. Understanding the seasonal life history characteristics of aquatic plants and how to exploit weak points in the life histories of invasive aquatic plants to improve management of these problematic species. Basic research is conducted to understand biomass, carbohydrate, and nutrient resource allocation patterns.
2. Conducting controlled growth studies whereby different techniques are evaluated to control aquatic plants in order to develop better use patterns for existing methods and to develop new products for use in aquatic plant management.
3. Utilizing spatial technologies to design and implement large-scale quantitative lake assessment programs.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Dr. Ryan Wersal		Project Director			19%	0.3		\$42,631
Graduate Student		Graduate Student Summer			7.65%	0.3		\$13,456
Student Personnel		Student Personnel Summer			7.65%	0.3		\$17,294
							Sub Total	\$73,381
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
	Equipment	Udy Cyclone Sample Mill	Plant samples will be ground using a Cyclone Sample Mill. Approximately 50 mg of the ground sample will be transferred into plastic centrifuge tubes for storage and preparation for the starch analysis					\$5,127
							Sub Total	\$5,127
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								

							Sub Total	-
Travel Outside Minnesota								
	Conference Registration Miles/ Meals/ Lodging	Aquatic Plant Management Society meeting in New Orleans, LA	The meeting attendees include academic researchers, state and federal agency personal, local and state resource managers, watershed district personnel, and pesticide applicators. These data would be applicable to all individuals currently managing starry stonewort in their respect regions					\$3,500
							Sub Total	\$3,500
Printing and Publication								
	Publication	Publication costs	Publication of results					\$600
							Sub Total	\$600
Other Expenses								
		Cost per item # of item \$206.00 50 STA20 Starch Assay Kits 3 Sulfuric Acid Reagent \$475.00 3 Reagent Alcohol \$149.00 3 Demethyl Sufoxide \$810.00 3 Pipette Tips \$150.00 9 Test Tubes \$494.00 4 Test Tube Racks \$56.00 5 Centrifuge Tubes \$85.60 5 Centrifuge Tube Caps \$12.50 3	Materials and supplies to complete project					\$18,392
							Sub Total	\$18,392
							Grand Total	\$101,000

Classified Staff or Generally Ineligible Expenses

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

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	-
Non-State				
			Non State Sub Total	-
			Funds Total	-

Attachments

Required Attachments

Visual Component

File: [598386ad-1e7.pdf](#)

Alternate Text for Visual Component

The attached visual is a map of the locations on Lake Koronis where seasonal biomass was harvested from a previous project. The seasonal biomass samples are the ones to be analyzed for starch content during the proposed study.

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



