

# **Environment and Natural Resources Trust Fund**

# 2026 Request for Proposal

## **General Information**

Proposal ID: 2026-337

Proposal Title: Building Super-Cool Cryostorage Capacity for Minnesota Biodiversity

# **Project Manager Information**

Name: Dakota Rowsey Organization: Science Museum of Minnesota Office Telephone: (612) 314-3638 Email: drowsey@smm.org

# **Project Basic Information**

**Project Summary:** We seek to install freezers and develop standard procedures to archive genetic samples from biodiversity specimens. These samples will be made available for internal and external research use.

**ENRTF Funds Requested:** \$230,000

Proposed Project Completion: June 30, 2029

LCCMR Funding Category: Small Projects (G) Secondary Category: Fish and Wildlife (D)

# **Project Location**

What is the best scale for describing where your work will take place? Region(s): Metro

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.

Natural history specimens are irreplaceable time capsules of information about an organism's existence and condition at a time and place, making them critical resources for researchers. Through careful curation of specimens and data, collections like SMM maximize their utility by preserving specimens in ways that support new approaches to answering scientific questions. One new approach that has revolutionized biodiversity research in the last 20 years is genomic analysis, which relies on high quality tissue samples associated with specimens to understand an organism's entire genetic makeup, as well as that of associated microbes, pathogens, and diet items. These samples enable researchers to answer questions from a broad array of disciplines, from conservation biology, to forensic analysis, to population genomics, to public health, and many more besides.

The SMM handles a high volume of biological specimens from across the state, including through projects like the recently-funded Salvage Wildlife program (LCCMR Proposal 2023-146), which makes the museum a natural candidate for generating and disseminating tissue samples for research use. However, the museum, and Minnesota more broadly, currently has insufficient infrastructure for storing high-quality tissue samples, limiting the ability of researchers to conduct the aforementioned types of molecular research to understand Minnesota biodiversity.

# What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

With the requested funding, SMM will establish a repository of high quality tissue samples by developing protocols and purchasing equipment necessary for industry-standard tissue sampling and long-term archiving. We will tailor these protocols from the best practices of other leading institutions in accordance with SMM safety regulations. Protocols will cover where and how to obtain different tissue sample types, sample data recording, data publication and sharing with researchers statewide, and emergency response procedures. Dr. Rowsey will receive International Air Transport Association and Department of Transportation training to ship cold samples externally for borrowing researchers. We will then purchase and install a liquid nitrogen freezer and -80 ultracold freezer along with the equipment needed to safely work with liquid nitrogen in our facility. Finally, we will test and refine our tissue sampling protocols by preparing 150 SMM specimens that were collected from across the state of Minnesota and have awaited preparation in our freezers. To maximize the impact of this funding, we will share project results at an international conference and through data aggregators used by researchers statewide. This broad dissemination will ensure that a large audience can use these tissue samples to study and preserve Minnesota's natural resources.

# 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?

This project will create capacity to store tissues and genetic samples from organisms across the state. These samples will enable researchers to tackle high-priority natural resource concerns, including tracking prevalence of white-nose syndrome through time across bat hibernacula, elucidating dietary changes in deer populations pre- and post- buckthorn removal, and tracking genetic diversity of wood turtle populations across the state. Additionally, the cryocollection will help ensure reproducibility and extensibility of past ENRTF projects (e.g., 2020-070, 2024-036, 2023-237). We will also make this resource available for external institutions without cryostorage capacity to archive tissue samples they generate.

# Activities and Milestones

# Activity 1: Developing Standard Operating Procedures

Activity Budget: \$40,519

#### **Activity Description:**

Biological tissues stored under cryogenic conditions present several important considerations with respect to handling materials safely. For example, in order to ship frozen samples, safety training is needed to be in compliance with federal shipping regulations, so Dr. Rowsey will pursue this training to enable him to ship these resources to external users when the equipment is installed. In addition, it is important that we develop standardized protocols for tissue sampling so that specimens prepared at different times and by different people have similar tissues sampled, maximizing their utility. We will also develop sample use policies that are in alignment with broader SMM loan policies that prioritize sample uses that will have the greatest impact on conserving Minnesota's natural resources.

#### **Activity Milestones:**

Description	Approximate Completion Date
Information gathering and training (Department of Transportation and International Air Transport	August 31, 2026
Association)	
Draft Safety Procedures	September 30, 2026
Draft Genetic Sampling Procedures	January 31, 2027
Draft Sample Use Policies	September 30, 2027

# Activity 2: Installing Cryostorage Equipment

Activity Budget: \$136,712

#### **Activity Description:**

For this activity, we will first work with our facilities team to make minor modifications to the freezer room to improve air handling, ensure load stability of the facility for the liquid nitrogen equipment, and install hazard signage and oxygen monitoring equipment. We will then purchase and install the requested equipment and develop our procedures for preparing specimens while making sure genetic samples don't decompose, subsequent to developing our Safety Procedures and concurrent with drafting our Sampling Procedures documents (Activity 1). We will procure a liquid nitrogen freezer for storage of 2 mL sample vials (sufficient for most tissue samples) and a -80 ultracold freezer for sample holdup and samples larger than can fit in 2 mL vials. We will also purchase personal protective equipment, establish a freezer temperature monitoring and alert service, and procure materials used for collecting and working with tissue samples. We will monitor the equipment to ensure safe operations before Activity 3 begins.

#### **Activity Milestones:**

Description	Approximate Completion Date
Modify Freezer Room, as Necessary	December 31, 2026
Purchase Freezers and other Liquid Nitrogen Materials	January 31, 2027
Install Freezers and Other Liquid Nitrogen Equipment	February 28, 2027
Initial Equipment Monitoring	March 31, 2027

# Activity 3: Trial Specimen Prep and Project Results Dissemination

#### Activity Budget: \$52,769

#### **Activity Description:**

We will trial our sampling protocol using a series of approximately 150 specimens from various locations across the state. These specimens are prime candidates for trialing our procedures as they are data rich and exist as whole carcasses, meaning we can sample a breadth of different tissue types from each specimen and that the samples will be highly usable once generated. As we prepare the specimens, we will evaluate if any changes to our procedures documents need to be made to enhance personnel safety or integrity of samples and make edits accordingly. We will also trial and develop data-sharing pipelines from our internal database to aggregators like iDigBio and the Minnesota Biodiversity Atlas.

As the capstone for the project, we will use the policies and procedures we have generated to submit an application for genetic resources collection accreditation through the American Society of Mammalogists, which will serve as a step toward external visibility of the collection. Towards greater visibility of the resource, an SMM staff member will present project results at the Society for the Preservation of Natural History Collections, an annual gathering of professionals who promote preservation and research use of tissue samples and other natural history specimens.

#### **Activity Milestones:**

Description	Approximate Completion Date
Specimen Preparation Triage	February 28, 2027
First Round Procedures Evaluation	June 30, 2027
American Society of Mammalogists Genetic Resources Collection Application Submitted	June 30, 2028
Second Round Procedures Evaluation	June 30, 2028
Trial Specimens Prepared	June 30, 2029
Project results presented at conference	June 30, 2029

# 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 work be funded?

This project's results include the establishment of the cryocollection and publicizing this resource for other agencies. Each specimen from which we sample tissues will be digitized into our internal database, which is backed up daily as part of our institutional data management practices. The data will also be made publicly available to biodiversity data aggregators like iDigBio, the LCCMR-funded Minnesota Biodiversity Atlas (2023-248), and through applying for collection accreditation with the American Society of Mammalogists. Long-term funding for equipment maintenance will be funded by the museum's operating budget.

# Project Manager and Organization Qualifications

#### Project Manager Name: Dakota Rowsey

#### Job Title: Biology Collections Manager

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

Dr. Dakota Rowsey serves as the Biology Collections Manager for the Science Museum of Minnesota, where he is responsible for the care and maintenance of the SMMs collections of invertebrates, plants, amphibians, reptiles, fishes, birds, and mammals. Dr. Rowsey has over 4 years of experience of managing cryocollections, and a decade of experience as a user of and contributor to cryocollections (e.g., Rowsey et al. 2018 Evolution, Rowsey et al. 2022 Journal of Mammalogy). Dr. Rowsey also has over a decade of experience managing collections databases for archiving and sharing specimen data. Dr. Rowsey works with managers at other cryostorage facilities and the Systematic Collections Committee of the American Society of Mammalogists to share best practices and recommendations, as well as with researchers who use frozen samples. Because of this history, Dr. Rowsey is aware of the breadth of questions that these samples can be used for. He has worked with other Science Museum of Minnesota staff to identify appropriate facilities for the equipment from a safety and usability standpoint.

Organization: Science Museum of Minnesota

#### **Organization Description:**

The Science Museum of Minnesota (SMM) was founded as the St. Paul Academy of Arts and Letters in 1907. The Academy offered lectures on scientific issues relevant to the community; in its first year, the Academy sponsored over 100 lectures, attracting thousands of attendees. In the over one hundred years since, SMM has grown from an exclusive scientific literary society to an institution nationally and internationally recognized for its innovative programming, dynamic exhibits, research, and science learning resources, from professional development workshops for K--12 teachers and student programming to cutting-edge digital resources to share our assets internationally. Today, we are one of Minnesota's leading cultural attractions and educational resources, focused on equitable and impactful STEM learning opportunities for all. We specialize in interactive STEM (science, technology, engineering, and math) exhibits that emphasize hands-on learning while integrating our tradition as a natural history museum with interpretive exhibits, collections featuring two million artifacts and specimens, and scientific research that address issues vital to our collective future. Our stewardship of a world-class collection of artifacts and specimens, along with the ongoing active research in our Center for Research and Collections, plays a crucial role in informing policies, practices, and solutions.

# Budget Summary

Category /	Subcategory	Description	Purpose	Gen.	%	#	Class	\$ Amount
Name	or Type			Ineli	Bene	FTE	ified	
				gible	fits		Staff?	
Personnel								
Biology		Planning and Implementing Equipment Purchase and			24%	0.87		\$74,103
Collections		Procedure Development and Implementation						
Manager								
Barbara		Occasional support for managing equipment and			24%	0.18		\$21,916
Brown Chair		developing sample use procedures						
of								
Ornithology								
Registrar		Occasional support for specimen data management			24%	0.06		\$6,233
		and developing sample use procedures						
Project		Support for developing safety procedures			24%	0.01		\$1,349
Manager,								
Safety and								
Risk								
Management								
							Sub	\$103,601
							Total	
Contracts								
and Services								
							Sub	-
							Total	
Equipment,								
Tools, and								
Supplies								
	Equipment	Personal Protective Equipment; 3 each of the	Ultra-cold specimens require safety					\$2,466
		following to cover 3 users of the facility: Wearable	equipment to keep people safe and					
		O2 monitors (\$268.99 x 3), Liquid Nitrogen Cryogenic	samples uncontaminated.					
		Gloves (\$217.22 x 3), Lab Coats (\$18.05 x 3), Aprons						
		(\$229.62 x 3), and Face Shields (\$71.00 x 3), Plus one						
		pack of 12 -80 freezer gloves (\$68.99)						
	Tools and	Cryovials, boxes, and racks needed to prepare 2000	The storage media we have selected					\$1,484
	Supplies	tissue samples (\$0.74 per specimen)	are designed to function at -190 Celsius					
			for perpetuity.					
	Tools and	Matheson Gas Liquid Nitrogen Quote for renting and	The LN2 freezer and Cryopod require					\$4,452
	Supplies	refilling a 230L cylinder for 29 months (\$153.52 per	liquid nitrogen to keep samples cold.					
		month)	We will rent a cylinder and get periodic					

Acquisitions and Stewardship						
					Sub Total	\$110,996
		Engineering and HVAC costs associated with increasing airflow and ensuring load-bearing capacity of the Cryostorage facility	This funding will allow us to install freezers and safety equipment needed to comply with LN2 safety requirements	X		\$9,686
		Azenta Cryopod Sample Carrier and Automatic Refilling Station	Used for working with samples at liquid nitrogen temperatures. Also helps ensure specimens go into liquid nitrogen freezer cold, preventing other samples and the freezer from warming.	X		\$23,128
		TSX Series 19.4 cu ft freezer with 4 sample racks	The -80 C freezer will be used for temporary specimen holdup and for samples that do not fit in the standard freezer boxes used in the LN2 freezer.	X		\$27,812
Expenditures		MVE HEco 1536 Liquid Nitrogen Freezer	The liquid nitrogen freezer requested will hold approximately 30,000 tissue samples at -190 degrees Celsius, which is ideal temperature for storage for most fresh tissues.	X		\$50,370
Capital					Sub Total	\$12,380
	Equipment	3 metal signs indicating hazards present in room (\$18.99 x 3)	These signs provide a visible indicator of the nature of hazards inherent to cryogenic storage (cold storage, gas expansion risk)			\$57
	Equipment	Static Wall-mounted O2 Monitor including installation	This O2 Monitor will record gaseous oxygen levels and generate an alarm in the event that oxygen falls below a certain threshold			\$2,388
	Equipment	Freezer monitoring setup 36 month pre-paid package: CORIS CATS Gateway (\$225 + \$8.50 per month), Monitor for LN2 freezer (\$140 + \$10.65 per month), Monitor for -80 freezer (\$140 + \$9.40 per month)	The freezer monitoring service connects to a wireless gateway and notifies personnel by phone and email if a freezer dips below a temperature threshold			\$1,533
			refills from a local LN2 vendor			

						Sub Total	-
Travel In Minnesota							
						Sub Total	-
Travel Outside Minnesota							
	Conference Registration Miles/ Meals/ Lodging	Society for the Preservation of Natural History Collections (SPNHC) Conference Registration for 1 person	Travel to 2028 SPNHC Conference to present results of project	х			\$700
	Conference Registration Miles/ Meals/ Lodging	Roundtrip Flight from Minneapolis-Saint Paul to a NYC ariport	Travel to 2028 SPNHC Conference to present results of project	X			\$400
	Conference Registration Miles/ Meals/ Lodging	Lodging for 1 person for 5 nights at \$250/night	Travel to 2028 SPNHC Conference to present results of project	Х			\$1,250
	Conference Registration Miles/ Meals/ Lodging	Ground transportation during the conference	Travel to 2028 SPNHC Conference to present results of project	Х			\$150
	Conference Registration Miles/ Meals/ Lodging	Per diem for 6 days (\$11 breakfast, \$13 lunch, \$19 dinner) according to rate approved by Commissioner's Plan for 2025	Travel to 2028 SPNHC Conference to present results of project	Х			\$258
						Sub Total	\$2,758
Printing and Publication							
						Sub Total	-
Other Expenses							
		Department of Transportation and International Air Travel Association Training Costs	Cost of two online training courses to ensure compliance with federal transportation regulations of cryogenic materials				\$265

			Sub	\$265
			Total	
			Grand	\$230,000
			Total	

# Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Capital Expenditures		MVE HEco 1536 Liquid Nitrogen Freezer	The freezer requested is needed to preserve specimens at optimal temperatures for long term storage and use, which is the main focus of the project. <b>Additional Explanation :</b> This freezer can hold approximately 30,000 samples, which will allow us to build our genetic resources collection for years to come. The freezer will only be used for preserving genetic biodiversity samples.
Capital Expenditures		TSX Series 19.4 cu ft freezer with 4 sample racks	The freezer requested is needed for samples too large to fit in the standard 2mL cryovial most tissue samples are prepared in. This freezer will also allow us flexibility in how we cool samples before placing them in liquid nitrogen, and a place for short term storage with samples that are being actively used or generated. Additional Explanation : This freezer can hold approximately 20,000 samples, which will allow us to build our genetic resources collection for years to come. The freezer will only be used for preserving genetic biodiversity samples
Capital Expenditures		Azenta Cryopod Sample Carrier and Automatic Refilling Station	Since the laboratory where specimen prep occurs is in a different room than the freezer, this cryopod will allow us to prepare specimens and immediately freeze the samples at ideal cryogenic temperatures, preventing degradation of the samples. Additional Explanation : This sample carrier will allow us to work with samples in the laboratory. All samples we work with in the lab will be samples pursuant to growing or using the genetic resources collection.
Capital Expenditures		Engineering and HVAC costs associated with increasing airflow and ensuring load-bearing capacity of the Cryostorage facility	These funds are needed so that the facility where the freezer is able to accommodate the weight of the equipment and able to be vented properly in the event of an emergency liquid nitrogen leak. In other words, work cannot be conducted safely if the space is not retrofitted to handle liquid nitrogen storage. Additional Explanation : All of the adjustments needed for ensuring load bearing requirements for the liquid nitrogen equipment and air handling are for the sole purpose of ensuring the facility can safely accommodate liquid nitrogen storage.
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Society for the Preservation of Natural History Collections (SPNHC) Conference Registration for 1 person	These travel and registration costs are needed to attend the 2028 Society for the Preservation of Natural History Collections conference, where we will share the results from the project, spread awareness of the new resource, and solicit feedback on management of the facility with other cryocollection professionals. SPNHC was identified as the best conference at which to present this project as it is the largest gathering of professionals that include both administrators of cryocollections and researchers who will use our cryocollections to understand Minnesota's biodiversity.

Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Roundtrip Flight from Minneapolis- Saint Paul to a NYC ariport	These travel and registration costs are needed to attend the 2028 Society for the Preservation of Natural History Collections conference, where we will share the results from the project, spread awareness of the new resource, and solicit feedback on management of the facility with other cryocollection professionals. SPNHC was identified as the best conference at which to present this project as it is the largest gathering of professionals that include both administrators of cryocollections and researchers who will use our cryocollections to understand Minnesota's biodiversity.
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Lodging for 1 person for 5 nights at \$250/night	These travel and registration costs are needed to attend the 2028 Society for the Preservation of Natural History Collections conference, where we will share the results from the project, spread awareness of the new resource, and solicit feedback on management of the facility with other cryocollection professionals. SPNHC was identified as the best conference at which to present this project as it is the largest gathering of professionals that include both administrators of cryocollections and researchers who will use our cryocollections to understand Minnesota's biodiversity.
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Ground transportation during the conference	These travel and registration costs are needed to attend the 2028 Society for the Preservation of Natural History Collections conference, where we will share the results from the project, spread awareness of the new resource, and solicit feedback on management of the facility with other cryocollection professionals. SPNHC was identified as the best conference at which to present this project as it is the largest gathering of professionals that include both administrators of cryocollections and researchers who will use our cryocollections to understand Minnesota's biodiversity.
Travel Outside Minnesota	Conference Registration Miles/Meals/Lodging	Per diem for 6 days (\$11 breakfast, \$13 lunch, \$19 dinner) according to rate approved by Commissioner's Plan for 2025	These travel and registration costs are needed to attend the 2028 Society for the Preservation of Natural History Collections conference, where we will share the results from the project, spread awareness of the new resource, and solicit feedback on management of the facility with other cryocollection professionals. SPNHC was identified as the best conference at which to present this project as it is the largest gathering of professionals that include both administrators of cryocollections and researchers who will use our cryocollections to understand Minnesota's biodiversity.

# Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
			State Sub	-
			Total	
Non-State				
In-Kind	Contributed funds (unrecovered indirect costs)	Funds contributed by the Science Museum of Minnesota for operations in the absence of recovering indirect costs of the proposal	Secured	\$112,079
			Non State	\$112,079
			Sub Total	
			Funds	\$112,079
			Total	

Total Project Cost: \$342,079

This amount accurately reflects total project cost?

Yes

# Attachments

## **Required Attachments**

*Visual Component* File: <u>3a8c7013-0f1.pdf</u>

#### Alternate Text for Visual Component

This graphic depicts some of the different types of tissues that biological specimens can generate and describes ways that these tissues can be used to inform critical issues in natural resource conservation, including monitoring wildlife disease, understanding genetic diversity of populations, and more....

### Supplemental Attachments

#### Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
Independent Audit Report	bc8a7e50-76b.pdf
Evidence of Good Standing with Secretary of State	<u>5128917b-179.pdf</u>
IRS Form 990	<u>953e7ac5-77d.pdf</u>
Authorization of Proposal Submission from Non-state Entities -	e8977b8d-ef3.pdf
Alison Rempel Brown, Science Museum of Minnesota	
Letter of Support, Azhar Husain, Arizona State University	5afdcb08-638.pdf
Letter of Support, Jon Dunnum, Systematic Collections	<u>1b7022b1-dbd.pdf</u>
Committee, American Society of Mammalogists	
Letter of Support, Keith Barker, University of Minnesota	<u>144df114-395.pdf</u>

# Administrative Use

Does your project include restoration or acquisition of land rights?

No

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I understand the Commissioner's Plan applies.

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

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?

No

Does the organization have a fiscal agent for this project?

No

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing \$10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No

Provide the name(s) and organization(s) of additional individuals assisting in the completion of this proposal:

Science Museum of Minnesota: Catherine Early, Adele Porter

Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements

N/A