



# Environment and Natural Resources Trust Fund

M.L. 2024 Approved Work Plan

## General Information

**ID Number:** 2024-083

**Staff Lead:** Lisa Bigaouette

**Date this document submitted to LCCMR:** June 10, 2024

**Project Title:** Voyageurs Wolf Project - Phase III

**Project Budget:** \$996,000

## Project Manager Information

**Name:** Joseph Bump

**Organization:** U of MN - College of Food, Agricultural and Natural Resource Sciences

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## Project Reporting

**Date Work Plan Approved by LCCMR:** June 20, 2024

**Reporting Schedule:** June 1 / December 1 of each year.

**Project Completion:** November 30, 2027

**Final Report Due Date:** January 14, 2028

## Legal Information

**Legal Citation:** M.L. 2024, Chp. 83, Sec. 2, Subd. 03k

**Appropriation Language:** \$996,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to continue to study summertime wolf predation on deer, moose, and other species in the greater Voyageurs ecosystem to inform wildlife management and to share natural history of this species with the public. This appropriation is available until June 30, 2028, by which time the project must be completed and final products delivered.

**Appropriation End Date:** June 30, 2028

## Narrative

**Project Summary:** Wolf survival and predation in summer are almost unknown but critical to deer, moose, and wolf management. We'll study wolf predator-prey ecology, share charismatic natural history, and promote Voyageurs' region.

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

Research need: Before the Voyageurs Wolf Project began, almost nothing was known of the details of summer wolf predation on deer, moose, or other species in Minnesota. Most of what we know about wolf predation is from studies in winter, which does not likely apply to spring, summer, and fall. Phases I and II of this project documented alternative food sources such as beavers, fish, berries, and laid the foundation for understanding summer wolf predation. Phase III will continue and build on this foundation, with an emphasis on gathering additional key data on landscape effects and wolf pup recruitment to address an important knowledge gap in wolf management.

Goal & proven success: We will study the ecology of wolves and specifically measure pup recruitment, wolf predation rates on key big games species in an area with abundant alternative food sources, especially beaver. We will evaluate the relationship between beaver abundance and wolf predation rates on moose and deer. We will use cutting edge audio-visual materials to broadly share the ecological story of Voyageurs wolves and Minnesota's Northwoods region. We have developed novel methods and strong partnerships to successfully document wolf ecology and demonstrated significant outreach success.

**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.**

Management of iconic and highly valued Minnesota wildlife: Deer and moose are iconic MN species, with huge economic, recreational, and cultural importance. We know that wherever deer, moose, and wolves coexist, knowledge and understanding of their interactions, and often complex, ecological relationships, are absolutely integral to the most effective and sound management of all three species. Because these species are intricately linked, they have strong influences on each other's population performance (i.e., survival rates and reproductive success), which directly affects annual variation in their numbers (MN DNR 2017).

Understanding wolf predation on deer is a key aspect of the Minnesota White-Tailed Deer Management Plan 2019-2028 and is critical to determining the best management for practices for sustainable ungulate populations. By intensively studying the predation behavior of wolves in the field, we will develop a long-term dataset of wolf predator-prey ecology. This field-based project provides foundational information so that species management is based on the best available science.

Additionally, major knowledge gap in the population biology of wolves is neonate survival, recruitment, and contribution to annual pack size. We will address this knowledge gap using a novel approach to measure survival and recruitment of wolf pups using remote cameras.

**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?**

Our specific, direct activities outcomes are to:

1. Determine wolf food sources, predation rates, and predation behavior for wolf packs in the Greater Voyageurs Ecosystem
2. Determine beaver populations within each wolf pack in Greater Voyageurs Ecosystem
3. Evaluate the relationship between beaver abundance and wolf predation rates on moose and deer.
4. Assess annual wolf pup survival and recruitment to address a major knowledge gap in wolf population biology.

5. Create educational material for outreach to the general public and promotion of Minnesota wildlife and the Greater Voyageurs Ecosystem.

## Project Location

**What is the best scale for describing where your work will take place?**

Region(s): NE

**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

## Activities and Milestones

### Activity 1: Determine wolf food sources, predation rates, and predation behavior for wolf packs in the Greater Voyageurs Ecosystem (GVE).

**Activity Budget:** \$232,000

#### Activity Description:

Within each of the wolf packs (the number varies each year) whose territory falls in the GVE, we aim to capture and GPS-collar 1-2 wolves/pack. GPS-collars will record wolf locations every 20 minutes and all locations will be uploaded and transmitted via satellite service and received by project personnel in near real time. Clusters of collar locations will be searched to identify wolf bed sites, ambush sites, kill sites, and prey items. Ground inspection by trained and experienced field crews will gather this information by searching thousands of locations each year and gathering evidence to determine wolf behavior. This information will provide the data that can be summarized and analyzed to assess key natural history metrics such as ambush rate and kill rates of various prey.

#### Activity Milestones:

Description	Approximate Completion Date
Capture and collar ~12 wolves annually for year one of study.	November 30, 2025
Estimate wolf predation rates on moose, deer, and beaver for year one of study.	November 30, 2025
Capture and collar ~12 wolves annually for year two of study.	November 30, 2026
Estimate wolf predation rates on moose, deer, and beaver for year two of study.	November 30, 2026
Capture and collar ~12 wolves annually for year three of study.	November 30, 2027
Estimate wolf predation rates on moose, deer, and beaver for year three of study.	November 30, 2027

### Activity 2: Determine beaver populations within each wolf pack in Greater Voyageurs Ecosystem

**Activity Budget:** \$68,000

#### Activity Description:

Annual fall beaver cache surveys will be completed using fixed-wing aircraft. Surveys are completed by a pilot and an experienced observer. Active beaver colonies are systematically located from the air and marked via GPS. Alternative methods will be assessed if possible. Each active beaver lodge will be identified and mapped using real-time GIS software. Beaver abundance data gathered for this project can be related to other beaver population work done in the GVE from the 1950s-present.

#### Activity Milestones:

Description	Approximate Completion Date
Estimates of beaver abundance in each wolf pack territory year one of study.	November 30, 2025
Estimates of beaver abundance in each wolf pack territory year two of study.	November 30, 2026
Estimates of beaver abundance in each wolf pack territory year three of study.	November 30, 2027

### Activity 3: Evaluate the relationship between beaver abundance and wolf predation rates on moose and deer.

**Activity Budget:** \$232,000

#### Activity Description:

Beaver abundance varies across the GVE landscape and therefore varies among wolf packs. We will evaluate how

differences in the abundance of beavers affects wolf predation rates on moose and deer of different sex and age classes (fawn/calves, yearlings, prime adults, old adults). This will directly assist deer and moose management in Minnesota and is a key metric identified in the Minnesota White-Tailed Deer Management Plan 2019-2028 and the newly (2023) Minnesota Wolf Management Plan 2023-2032.

**Activity Milestones:**

Description	Approximate Completion Date
Modeling/analysis of predation rates and prey abundance. This milestone requires long term data.	November 30, 2027

**Activity 4: Assess annual wolf pup survival and recruitment to address a major knowledge gap in wolf population biology.**

**Activity Budget:** \$232,000

**Activity Description:**

Active wolf dens will be identified using movements and locations of GPS-collared wolves and a remote camera array. Dens are visited once to count and sex pups, record morphometrics, collect a hair and/or blood sample, and tag each pup with integrated transponder. Remote cameras are deployed to count pups with an additional method and confirm litter size. Pack sizes will be recorded with remote cameras throughout the year. This novel approach will allow us to determine how many pups were in the initial litter of multiple packs and track water how many pups are the packs at the beginning of the next breeding season. This information will be used to assess annual wolf pup survival and recruitment to address a major knowledge gap in wolf population biology.

**Activity Milestones:**

Description	Approximate Completion Date
Estimate wolf pup survival and recruitment for year one of the study	November 30, 2025
Estimate wolf pup survival and recruitment for year two of the study	November 30, 2026
Estimate wolf pup survival and recruitment for year three of the study	November 30, 2027

**Activity 5: Create educational material for outreach to the general public and promotion of Minnesota wildlife and the Greater Voyageurs Ecosystem.**

**Activity Budget:** \$232,000

**Activity Description:**

On an ongoing basis, we will produce material such as captioned photos, videos, social media content, dynamic graphs, maps, illustrations, presentations, and press releases highlighting the natural history of Minnesota wildlife and the unique value of the Greater Voyageurs Ecosystem and Northwoods Minnesota. We will collaborate with partners to develop educational and outreach materials that can be exhibited.

**Activity Milestones:**

Description	Approximate Completion Date
Produce outreach and media materials on an ongoing basis throughout the project.	November 30, 2025
Produce outreach and media materials on an ongoing basis throughout the project.	May 31, 2026
Produce outreach and media materials on an ongoing basis throughout the project.	November 30, 2026
Produce outreach and media materials on an ongoing basis throughout the project.	May 31, 2027
Produce outreach and media materials on an ongoing basis throughout the project.	November 30, 2027



## Dissemination

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

Our dissemination efforts will include, but not be limited to, peer-reviewed publications, annual reports, newsletters, professional conference presentations (oral and poster), online webinars, popular presentations to interested groups, multiple social media platforms, working with photographers and film companies, and news & popular press.

## 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?**

Implementation: We will share wolf pack size and territory area information with the Minnesota DNR, which has recently been the largest dataset included in the statewide wolf population estimate. We will publish results in peer-reviewed papers and popular press. We will present results in professional meetings and popular webinars.

Ongoing Effort: Establishing a long-term Voyageurs Wolf Project is our goal. After the proposed phase is completed, we will to raise funds at the University of Minnesota and develop key partnerships with the International Wolf Center, the Voyageurs Conservancy, the Bell Museum, and the Minnesota Zoo to continue the project.

## Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Mapping Aquatic Habitats for Moose	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03l	\$199,000
Voyageurs Wolf Project – Phase II	M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 03e	\$575,000
Offal Wildlife Watching: How Do Hunters Provision Scavengers?	M.L. 2022, , Chp. 94, Art. , Sec. 2, Subd. 03g	\$473,000

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Principle Investigator		Leads overall project management. Participates in all aspects of the project.			36.8%	0.24		\$54,173
Field biologist - Researcher 2		Co-leads all aspects of field work. Manages all field equipment and supplies. Participates in all aspects of the project.			32%	3		\$190,080
Co-Principle Investigator - Researcher 5		Leads field work and social media. Co-mentors graduate students. Participates in all aspects of the project.			36.8%	3		\$266,760
Field technicians		Field work: cluster searching, camera maintenance, prey surveys			32%	6		\$247,104
							<b>Sub Total</b>	<b>\$758,117</b>
<b>Contracts and Services</b>								
Vectronic Aerospace, Inc.	Professional or Technical Service Contract	Same source GPS-satellite collar data acquisition and service contract; 10 collars/yr for 3 years; \$1000/yr/collar. This service is required in order to receive data from GPS-collared animals and maintain data continuity. This contract is compared to other industry estimates to ensure				0		\$30,000
Up North Aerials PO Box 114 Two Harbors, MN 55616	Professional or Technical Service Contract	The purpose of this expense is cover flight time necessary to complete the beaver census each year; necessary to estimate beaver populations. This pilot has specialized experience and continuity of data collection is needed. 40 hrs of flight service at \$400/hr each year for 3 years				0		\$48,000
							<b>Sub Total</b>	<b>\$78,000</b>
<b>Equipment, Tools, and Supplies</b>								
	Equipment	GPS-satellite wolf collars; \$3000/collar for 30 collars to maintain 2 collars/pack for 3 years. Includes replacements for lost/damaged collars.	GPS-collars are required to obtain the location data necessary to search clusters and meet project Activities and Milestones. Sole sourcing from Vectronic Aerospace is requested to					\$90,000



			maintain the same data collection, i.e. data continuity, product reliability, and battery life. We have compared cost estimates across other wildlife collar companies to ensure competitive pricing.					
	Tools and Supplies	Capture supplies, immobilization drugs, and field investigation biological sampling supplies (\$4,000/year for 3 years)	Required supplies for safe and effective capture and collaring of study animals.					\$12,000
	Tools and Supplies	Remote cameras (25 per year for 3 years at \$300 ea.)	Remote cameras are used to determine territories, pack counts, survival, and behavior. We maintain an array of ~250 cameras year-round and ~10% need to be replaced each year.	X				\$22,500
	Tools and Supplies	Batteries for 200 remote cameras: 8AA lithium batteries per camera per year at \$30 each for 3 years.	Remote power supply for cameras in all types of weather to maintain camera array.					\$18,000
							<b>Sub Total</b>	<b>\$142,500</b>
<b>Capital Expenditures</b>								
							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
							<b>Sub Total</b>	-
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
	Publication	Page charges for peer reviewed articles 3 per year for 3 years at a cost of \$1931.44 per article	Primary means of sharing scientific results of the project.					\$17,383

							<b>Sub Total</b>	<b>\$17,383</b>
<b>Other Expenses</b>								
							<b>Sub Total</b>	-
							<b>Grand Total</b>	<b>\$996,000</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
<b>Equipment, Tools, and Supplies</b>		Remote cameras (25 per year for 3 years at \$300 ea.)	<p>It may be that remote cameras for data collection classify as audio visual equipment. Data collection for this project would be impossible without remote cameras. We cannot observe wolves directly in this study system. Remote cameras are our 'eyes in the forest.'</p> <p><b>Additional Explanation :</b> Cameras will be used exclusively for the proposed project until failure.</p>

Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount
<b>State</b>				
			<b>State Sub Total</b>	-
<b>Non-State</b>				
Cash	Minnesota Zoo Foundation	Funds to support the Voyageurs Wolf Project Phase III	Pending	\$180,000
Cash	Unrecovered indirect cost is 55% MTDC, which is \$547,250	Not available for use.	Secured	\$547,250
			<b>Non State Sub Total</b>	<b>\$727,250</b>
			<b>Funds Total</b>	<b>\$727,250</b>

## Attachments

### Required Attachments

#### *Visual Component*

File: [99188135-bc6.pdf](#)

#### *Alternate Text for Visual Component*

Summer wolf biology and ecology is almost unknown but critical to deer, moose, wolf, and beaver management. With proven methods we'll study wolf biology and ecology in summer and promote Voyageurs' region wildlife. This projects promotes wildlife and wild places in Minnesota, reaching >25 million people via social media annually....

### Supplemental Attachments

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

Title	File
Support Letter from Minnesota Zoo	<a href="#">dba22306-da6.pdf</a>
Support Letter from Voyageurs Conservancy	<a href="#">44593e4d-f80.pdf</a>
Support Letter from International Wolf Center	<a href="#">20ea3804-4f7.pdf</a>
Letter of permission to submit from the University of Minnesota	<a href="#">aebbb41f-3ea.pdf</a>
Research Addendum revised 2024-083_final	<a href="#">db345324-fd3.pdf</a>

### Difference between Proposal and Work Plan

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

- 1) I corrected the Description in the Budget for the section Printing and Publication Details items. It was brought to my attention during the project presentation that I had a typo in the cost per publication description. No change to overall budget.
- 2) Cash support from MN Zoo Foundation in the section Non-ENRTF Funds Contributed to the Project in the Budget was updated from \$240K to \$180K and updated to a status of pending rather than potential.
- 3) I described dissemination efforts to include, but not be limited to, peer-reviewed publications, annual reports, newsletters, professional conference presentations (oral and poster), online webinars, popular presentations to interested groups, multiple social media platforms, working with photographers and film companies, and news & popular press.

## 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?**

N/A

**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?**

Yes

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

Yes, Sponsored Projects Administration

**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