



## Environment and Natural Resources Trust Fund

M.L. 2025 Approved Work Plan

### General Information

**ID Number:** 2025-053

**Staff Lead:** Mike Campana

**Date this document submitted to LCCMR:** June 23, 2025

**Project Title:** Deer Survival Within Minnesota's Densest Wolf Population

**Project Budget:** \$809,000

### Project Manager Information

**Name:** Joseph Bump

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

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**Email:** bump@umn.edu

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### Project Reporting

**Date Work Plan Approved by LCCMR:** June 26, 2025

**Reporting Schedule:** March 1 / September 1 of each year.

**Project Completion:** June 30, 2028

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

### Legal Information

**Legal Citation:** M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 03c

**Appropriation Language:** \$809,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to evaluate how wolves, winter severity, and habitat affect deer mortality and survival across space and time within the Voyageurs region.

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

## Narrative

**Project Summary:** Deer are highly valued by Minnesotans, especially in the Northwoods. We'll assess causes of deer survival and habitat needs amidst high wolf density to inform the deer/wolf management debate.

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

White-tailed deer abundance in northern Minnesota has declined recently, leading to considerable public interest and debate regarding the influence that wolves, winter, and habitat have on deer populations.

Preliminary research by the Minnesota Department of Natural Resources documented higher deer mortality from wolf predation than prior studies, indicating wolves may be a greater source of mortality than previously thought (Smith and DelGuidice 2017).

Added to predation is the role that habitat plays in deer survival (Anderson, Star Tribune 2024). Coniferous forests are critical habitat for deer during winter, but conifer abundance is declining throughout Minnesota—in part due to practices like forest harvesting. On one hand, younger forests created by forest harvest provide abundant food for deer, but on the other hand these forests generally lack the dense conifer cover deer need in snowy winters.

Winters in northern Minnesota are snowier, with the past decade being the snowiest decade on record in much of Minnesota (MPR News 2022). Deep and prolonged snow are difficult conditions for deer survival.

Given the intense public interest and debate surrounding these deeply valued wildlife, there is a pressing need to better understand how deer populations are impacted by wolves, winter, and habitat.

**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.**

We'll study deer survival and habitat use in the Greater Voyageurs Ecosystem (GVE) in northern Minnesota. The GVE is an ideal place to understand the role of wolves, winter, and habitat on deer because:

- 1) The GVE has supported the densest wolf population in Minnesota for many years (Gable et al. 2022)
- 2) The GVE is a multiple-use landscape with substantial habitat variability —ranging from old, mature coniferous forests to forest lands that are intensively logged—that results from the patchwork of county, state, federal, and timber company lands, which all have different forest management regimes.
- 3) The GVE has long, cold, and snowy winters.

Thus, there is not a better place in Minnesota to try and disentangle "how wolves, habitat, and winters affect deer?" To answer this question, we will capture adult female deer—the most important to a healthy population—and fit them with GPS-collars that will allow us to estimate deer mortality/survival and what habitats deer prefer and depend upon across the landscape.

Further, we will leverage long-term datasets on wolves, wolf predation, and deer populations collected by the ENRTF-supported Voyageurs Wolf Project to understand and interpret patterns in deer survival documented in this study.

**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 project outcomes are:

- 1) Quantify causes of deer mortality and survival rates, and the proportion of the deer population killed by wolves annually.
- 2) Determine what habitats deer prefer and avoid during winter, summer, and fall in relation to forest regimes and

landscape availability.

- 3) Evaluate how deer survival and habitat use changes throughout the annual cycle, which will provide an assessment on how wolves, winter severity, and habitat cumulatively affect deer mortality and survival across space and time.
- 4) Present results at annual Minnesota meeting of the Wildlife Society. Share results via established social media platforms.

## 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?**

Region(s): NE, NW, Central,

**When will the work impact occur?**

During the Project and In the Future

## Activities and Milestones

### Activity 1: Quantify annual deer mortality and survival in a multiple-use northern Minnesota landscape

**Activity Budget:** \$202,250

#### Activity Description:

We will quantify deer mortality and survival in a multiple-use landscape, with the primary objectives of identifying survival rates and causes of mortality (predation, starvation, disease). A helicopter crew will capture 75 adult female white-tailed deer and fit them with GPS-tracking collars across two years. Adult females are most important to population growth. We will monitor deer survival and mortality throughout the study's duration using the GPS-collars (the collars send a mortality signal when the animal has died). Upon detection of a mortality signal, we will assess the cause of death with field-based investigations. If the mortality cause cannot be determined in the field, we will collect the carcass and collaborate with a veterinary diagnostic lab to assess the possible cause of death. Biological samples from the deer during captures will be used to assess health ( blood parasite load, body condition) to inform survival and mortality patterns. Hunting of females is currently prohibited in the study area, so harvest by humans should not impact this study. This activity will produce annual rates of survival and mortality, causes of mortality, and data regarding how wolves and winter severity relatively influence deer survival and mortality.

#### Activity Milestones:

Description	Approximate Completion Date
Obtain permits, order and acquire GPS collars, hire helicopter company	November 30, 2025
Capture 75 adult female white-tailed deer (Winters 2026, 2027); collect biological samples	March 31, 2027
Monitor deer survival, including field investigations to determine mortality causes	December 31, 2027
Ship deer carcasses to veterinary diagnostic laboratory for autopsies	December 31, 2027
Analyze data and write manuscripts	June 30, 2028

### Activity 2: Assessing patterns in deer habitat use in relation to forest regimes and winter severity

**Activity Budget:** \$202,250

#### Activity Description:

Using movement data obtained from the GPS-collars, we will assess female white-tailed deer habitat use across the landscape, in both natural and managed areas, during different seasons. We will assess these patterns in deer space use for three separate seasons (summer, fall [rut], and winter) to determine how deer movements change throughout the year and how they are potentially affected by land management practices (e.g. forestry).. Of particular interest is assessing how deer habitat selection varies during late winter when they are typically most vulnerable to starvation and predation, and assessing how deer respond to forest harvest regimes during different times of the year. The main product developed from this activity will be the creation of maps of seasonal deer habitat use, which provide information on specific areas preferred by deer during different seasons. Understanding how deer respond seasonally to forest management regimes will provide key information that can be used to guide management practices of deer populations and identify critical habitats.

#### Activity Milestones:

Description	Approximate Completion Date
Monitor deer movements using GPS-collars	November 30, 2027
Analyze data, assessing how deer space use relates to human landscape change	December 31, 2027
Create maps of deer habitat use	December 31, 2027
Interpret results and write manuscripts	June 30, 2028

### Activity 3: Quantify deer mortality risk in relation to habitat and seasonal conditions

**Activity Budget:** \$202,250

#### Activity Description:

The goal of this activity is to link the data obtained from Activities 1&2 to determine patterns of deer mortality risk in relation to their habitat use throughout the landscape. Specifically, we will determine spatial patterns of deer mortality risk, evaluate how these spatial patterns of mortality risk vary across seasons, with particular interest on mortality patterns during winter, and finally assess how forest management regimes influence these patterns of risk (or not). For instance, we will determine how deer use of certain habitats during winter influences the probability that they are killed by predators. This activity will provide valuable information on how the cumulative effects of wolves, seasonal conditions (winter severity), and habitat quality influence deer mortality risk across space and time.

#### Activity Milestones:

Description	Approximate Completion Date
Analyze data, assessing how deer space use patterns relate to mortality risk	December 31, 2027
Create maps of seasonal deer mortality risk	December 31, 2027
Interpret results and write manuscript	June 30, 2028

### Activity 4: Create educational material for outreach to the general public regarding deer ecology in northern Minnesota

**Activity Budget:** \$202,250

#### Activity Description:

On at least a monthly basis, we will produce material such as captioned photos, videos, social media content, dynamic graphs, illustrations, presentations, and press releases highlighting the ecology and natural history of white-tailed deer and their predators in northern Minnesota. We will post information at least monthly to at least two social media outlets. Deer hunting, and the effects that predators have on deer populations, are major topics of interest to the general public, yet they are also topics rife with misinformation and disinformation. We will collaborate with partners (e.g. International Wolf Center) to develop evidence-based educational and outreach materials that will collectively increase public awareness and knowledge of key aspects of white-tailed deer ecology. This includes presenting seminars and project results in public forums annually.

We will also present results at annual Minnesota meeting of the Wildlife Society. Share results via established social media platforms.

We expect to produce at least 12 social media posts and one professional seminar annually.

Results results will be disseminated to agencies and partners via emailing of annual population report and sharing summary metrics that inform management (e.g., survival estimates, cause specific mortality, habitat use, wolf pack size, number, and territory).

#### Activity Milestones:

Description	Approximate Completion Date
Produce outreach and media materials on an ongoing basis throughout the project.	June 30, 2028



## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Thomas Gable	University of Minnesota	Co-PI	Yes

## 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.**

Project results will be disseminated through popular press articles, peer-reviewed papers, professional presentations, and social media. Dissemination efforts for this project will be in collaboration with the Voyageurs Wolf Project.

Results results will be disseminated to agencies and partners via emailing of annual population report and sharing summary metrics that inform management (e.g., survival estimates, cause specific mortality, habitat use, wolf pack size, number, and territory).

This project 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 ENRTF 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 work be funded?**

This project establishes methods and data to assess key deer vital rates. Success will be leveraged to raise ongoing funding from state resources agencies, federal research grants, the University of Minnesota, NGOs, and donors.

Results will be implemented in multiple ways:

- 1) Publication of peer reviewed articles.
- 2) Development of annual reports to share with state and tribal resource agencies, and communities.
- 3) Creation of educational materials (social media, webinars) for outreach to the general public regarding deer ecology in northern Minnesota.
- 4) Presentation at professional conferences and association meetings.
- 5) Creation of university course content that incorporates project results.

## 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		1 faculty research to supervise, manage, and be responsible for all project aspects			37.1%	0.24		\$53,568
Researcher 5 - Field lead		1 PhD Researcher to lead all field and publication efforts			37.1%	3		\$225,536
Researcher 1 - Field technician		1 full-time, year round field technician to assist with all project efforts			33.5%	3		\$160,200
							<b>Sub Total</b>	<b>\$439,304</b>
<b>Contracts and Services</b>								
Vectronic-Aerospace	Service Contract	Satellite service to receive and send data from GPS collars; \$225/collar/year.				0		\$50,625
TBD	Service Contract	A helicopter capture company will be contracted to help capture and collar deer (75 deer at \$1250 per capture).				0		\$93,750
							<b>Sub Total</b>	<b>\$144,375</b>
<b>Equipment, Tools, and Supplies</b>								
	Equipment	GPS-collars	GPS collars to track deer survival and movement (75 collars at \$2,150 per collar)					\$161,250
	Tools and Supplies	Capture supplies, drugs, and equipment	Items to safely and successfully aid capture and collar of deer (e.g. immobilization drugs, gloves, eye-shields, hobbles, ground matts, scale, sling)					\$10,000
							<b>Sub Total</b>	<b>\$171,250</b>
<b>Capital Expenditures</b>								
							<b>Sub Total</b>	<b>-</b>

<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
	Miles/ Meals/ Lodging	10,000 miles/year for 3 years @ \$0.67/mile	Travel to field sites and field work track deer movements, understand habitat use, recover deer that have died, investigations of cause of death for collared deer.					\$20,100
	Miles/ Meals/ Lodging	Short term lease to house 6 field technicians: \$9,000/year for housing field crew for 3 years	Short term lease to house 6 field technicians for at least 8 months each year. Extended hotel stay for field crew personnel is cost prohibitive. Housing for field work at the project site is critical and very limited.	X				\$27,000
							<b>Sub Total</b>	<b>\$47,100</b>
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	-
<b>Printing and Publication</b>								
	Publication	1 peer-reviewed article per year at ~\$2,324/article	Page charges for scientific publications to help disseminate results.					\$6,971
							<b>Sub Total</b>	<b>\$6,971</b>
<b>Other Expenses</b>								
							<b>Sub Total</b>	-
							<b>Grand Total</b>	<b>\$809,000</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Travel In Minnesota	Miles/Meals/Lodging	Short term lease to house 6 field technicians: \$9,000/year for housing field crew for 3 years	Short term lease to house 6 field technicians for at least 8 months each year. Extended hotel stay for field crew personnel is cost prohibitive. No other housing options are available. Housing for field work at the project site is critical and very limited.

## Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount
<b>State</b>				
In-Kind	University of Minnesota	Unrecovered indirect costs to the University of Minnesota	Secured	\$430,100
In-Kind	Minnesota Department of Natural Resources	120 hours of in-kind support of this project for each of three years, for a value of \$4,859. Dr. Michel will advise on deer capture methods and radio collars to be used in this study, provide information on general deer ecology throughout the study, and assist in manuscript preparation.  Dr. Tyler Obermoller will replace Dr. Michel in this capacity since Dr. Michel has taken a new position outside of MN DNR.	Secured	\$4,859
			<b>State Sub Total</b>	<b>\$434,959</b>
<b>Non-State</b>				
Cash	Non-sponsored funds, i.e. donations to UMN/VWP	Professional conference travel, registration, and lodging	Pending	\$5,000
			<b>Non State Sub Total</b>	<b>\$5,000</b>
			<b>Funds Total</b>	<b>\$439,959</b>

**Total Project Cost: \$1,248,959**

**This amount accurately reflects total project cost?**

Yes

## Attachments

### Required Attachments

#### *Visual Component*

File: [9401f5a0-752.pdf](#)

#### *Alternate Text for Visual Component*

A Venn diagram with images of a deer, a wolf, a forest in summer, and winter forest scene are pictured. The words wolf, habitat, and winter are written with a question mark over the deer and the question below reads, "What drives deer survival within Minnesota's densest wolf population?..."

### Supplemental Attachments

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

Title	File
Support Letter from: Iron Range Partnership for Sustainability	<a href="#">5fe7a0b4-146.pdf</a>
Support Letter from: International Wolf Center	<a href="#">d9196b4a-38f.pdf</a>
Support Letter from: Izaak Walton League of America (Duluth)	<a href="#">58941dff-f00.pdf</a>
Support Letter from: Minnesota Deer Hunters Association	<a href="#">bcb37ed0-3d2.pdf</a>
Support Letter from: Voyageurs Conservancy	<a href="#">9877e11f-ce7.pdf</a>
Support Letter from: Wildlife Science Center	<a href="#">5ba1a028-03e.pdf</a>
UMN - LCCMR proposal approved for submission / PRF 1129202	<a href="#">41e40aaf-e9a.pdf</a>
Support letter from: Minnesota Department of Natural Resources	<a href="#">9404f0e0-4d7.pdf</a>
Support Letter from: Back Country Hunters and Angerls	<a href="#">6e0cba17-39b.pdf</a>
2025-053 Research Addendum original_no changes necessary	<a href="#">8262ad1c-0b2.pdf</a>

### Difference between Proposal and Work Plan

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

As directed we have revised our forth outcome on Narrative (4) page and the added text to the 4th Milestone (5). We have now made clear that in addition to regular planned outreach activities, we will present results at annual Minnesota meeting of the Wildlife Society and share results via established social media platforms. Combined, these activities and milestones will demonstrate that this outcome has been achieved.

Response to latest comments:

In both Dissemination and Activity 4, it is now indicated how results will be disseminated to management agencies and partners.

Regarding work by Dr. Michel, indeed he is no longer at DNR. He will continue as a project collaborator. MN DNR is still committed to this project and Dr. Tyler Obermoller (now in Dr. Michel's former position) will replace his effort on this project.

The generally ineligible justification for the field technician lodging now includes the following sentence from the original line-item: "Housing for field work at the project site is critical and very limited."



## 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 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 UMN Policy on travel 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?**

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

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

Dr. Thomas Gable (Researcher) Patrick McDonald (Financial Specialist); both employed by the University of Minnesota.

**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**

Yes, I understand