Environment and Natural Resources Trust Fund

M.L. 2020 Approved Work Plan

General Information

ID Number: 2020-067

Staff Lead: Corrie Layfield

Date this document submitted to LCCMR: August 13, 2021

Project Title: Voyageurs Wolf Project – Phase II

Project Budget: $575,000

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: August 13, 2021

Reporting Schedule: April 1 / October 1 of each year.

Project Completion: June 30, 2025

Final Report Due Date: August 14, 2025

Legal Information

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 03e

Appropriation Language: $575,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to study summertime wolf predation on deer, moose, and other species in the Voyageurs region to inform management of wildlife. This appropriation is available until June 30, 2025, by which time the project must be completed and final products delivered.

Appropriation End Date: June 30, 2025

Narrative

Project Summary: Wolf predation in summer is almost unknown but critical to deer, moose, wolf, and disease management. We'll measure wolf predation rates on these species and promote Voyageurs' region wildlife.

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 MN. Most of what we know about wolf predation is from studies in winter, which does not likely apply to spring, summer, and fall. Phase I of this project documented alternative food sources such as beavers, fish, berries, and laid the foundation for understanding summer wolf predation. Phase II will build on this foundation, with an emphasis on gathering key data on wolf predation that will assist deer and disease management.

Goal & proven success: We will study spring to fall feeding ecology of wolves and measure 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 to successfully document summer feeding ecology and demonstrated significant outreach success, e.g. NY Times., PBS Nature.

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.

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 mitigating deer related diseases.

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 predation rates on beavers, adult and calf moose, and adult and fawn deer for each of the wolf packs that in the Greater Voyageurs Ecosystem (GVE); applicable across forest regions of MN.
2. Determine beaver populations within each wolf pack in GVE annually.
3. Evaluate the relationship between beaver abundance and wolf predation rates on moose and deer.
4. 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, NW, Central,

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 and predation rates on beavers, adult and calf moose, and adult and fawn deer for each of the wolf packs that in the Greater Voyageurs Ecosystem (GVE).

Activity Budget: $300,000

Activity Description:
Packs are determined with remote camera surveys. Within each wolf pack (the number varies annually) whose territory fall in the GVE, we aim to capture and GPS-collar at 1-2 wolves/pack. Wolf kill sites will be identified from clusters of GPS-collar locations (uploaded daily by satellite) and extensive ground crew inspection with proven, novel methods. We will collect—depending on the prey species—samples from kills. Samples include: hair/skin, skull/lower mandible, antlers, castor gland, toe nails, claws, hooves, teeth, leg bones, bone marrow, pelvis, vertebrae, and other miscellaneous remains found at kills. We will extract and section teeth from wolf-killed prey to estimate the age of the prey. Bone marrow from wolf-killed deer and moose will be extracted and dried to determine the percent of fat in the marrow. Castor glands will be dried and weighed to estimate the age-class of wolf-killed beavers. Collectively, these samples will be used to determine diet (e.g. prey proportions), kill rates (i.e. prey items per unit time), prey selection (e.g. sex and/or age of prey compared to availability; poor condition vs good condition). When searching clusters of GPS-locations we will also record instances where wolves waited-in-ambush for beavers.

Activity Milestones:

Description	Completion Date
Capture and collar ~12 wolves annually for 3 years	June 30, 2025
Estimate wolf predation rates on moose, deer, and beaver.	June 30, 2025

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

Activity Budget: $15,000

Activity Description:
Annual fall beaver cache surveys will be completed using fixed-wing aircraft. 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. Aerial beaver surveys will be used to estimate beaver population density and the location of all active beaver lodges in each wolf pack territory of interest. These surveys will follow the same methods as described in numerous publications (e.g., Gable and Windels 2018, Gable et al. 2020) and internal Voyageurs National Park survey reports.

Data collected includes: 1) Aerial fall cache surveys, 2) Beaver feature (pond, dam, lodge) delineations from aerial photos, 3) Beaver dam and lodge measurements (height, width, volume).

Predation of beavers by wolves is highest during the ice-free period with beaver constituting up to 42% of wolf diet biomass during the ice-free period (Gable et al. 2017, Sidorovich et al. 2017). Despite this, wolf-beaver dynamics remain poorly understood (Romanski 2010, Gable et al. 2016). However, understanding this dynamic has implications, not only for the conservation and management of both wolves and beavers, but also for ungulate populations.

Activity Milestones:

Description	Completion Date
Estimates of beaver abundance in each wolf pack territory annually.	June 30, 2025

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

Activity Budget: $230,000

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.

Ultimately, dense beaver populations either 1) buffer ungulate populations from wolf predation, thus decreasing wolf predation on ungulate populations; 2) negatively affect ungulate populations by facilitating a numerical response by wolves, thus increasing wolf predation on ungulates (i.e., apparent competition); or 3) do not influence wolf predation on ungulates. To understand the effect of beaver and ungulate densities on wolf densities we will use linear and non-linear modelling strategies. We will first use simple linear regression to model the relationship between ungulate and wolf densities (wolf ~ ungulate), which is currently considered the best model explaining wolf densities. This model will serve as a baseline to compare other models that incorporate the effects of beaver density, i.e. as a linear and non-linear predictors (predictor (wolf ~ beaver + ungulate).

Activity Milestones:

Description	Completion Date
Modeling/analysis of predation rates and prey abundance.	June 30, 2025
Formulate management recommendations	June 30, 2025

Activity 4: Create educational material for outreach to the general public and promotion of Minnesota wildlife and the Greater Voyageurs Ecosystem.

Activity Budget: $30,000

Activity Description:
On an ongoing basis, PI, postdoc, & project biologists 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 also disseminate our research via peer-reviewed journals and presentations at regional, national, and international conferences. Additionally, projects members will write popular articles for conservation organizations (e.g., International Wolf Center, Voyageurs National Park Association) and disseminate information through the social media platforms (e.g. Facebook) of organizations such as Voyageurs National Park and Great Lakes Research and Education Center.

Educational material will be shared via project social media. The project started a Facebook page in November 2018 and as of July 30, 2021, over 127,000 people follow this page. We will also maintain a project website for which we create educational content (www.voyageurswolfproject.org). The project will also maintain an Instagram feed (currently has >10,300 followers), a Youtube Channel (currently has >1,860 subscribers), and a Twitter feed (currently has >3,850 followers).

We will continue to work with outlets such as Smithsonian, Scientific American, Washington Post, Associated Press.

Activity Milestones:

Description	Completion Date
Produce outreach and media materials	June 30, 2025

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.
Outreach Impact and Goals of the Voyageurs Wolf Project:
Our project has put an emphasis on disseminating our work to the public, especially since it's formal conception in 2017. In particular, we started actively sharing our work on social media. Doing so has allowed us to reach a large audience (we currently have >120,000 people following the project on Facebook alone). To date, our Facebook content has reached over 30 million people since November 2018. In 2021, our Facebook content reaches an average of ~100,000 people/day. The relatively quick, large following we have received on Facebook was unexpected but confirmed our suspicion that the public is extremely interested in wildlife, wildlife research, and wolf ecology. As a result, we have made it a priority to make outreach a fundamental part of our project. By maintaining our social media presence, we are able to provide information that entertains, engages, and educates the public. Projects such as ours are really the only way that the public can get the kind of information we share. People cannot go out in the forest and start putting GPS-collars on wolves and seeing where they go, and the public doesn't have the time to go purchase and deploy 40 remote video cameras across large expanses of wilderness. However, we have the resources and the abilities to do this. By sharing maps of the travels of GPS-collared wolves along with photos, videos, and other media from the project, we are able to provide the public with information on wolves and other wildlife that they simply could not get another way, and that is where the social value of this work is in our opinion.

In addition, by sharing this information and generating excitement for the work, we are ultimately fostering an appreciation for the habitat that wolves and their prey need. In our case, that habitat is northern Minnesota and specifically, Voyageurs National Park. By capturing and showing a side of Voyageurs that no one ever sees, we are connecting people to wild qualities that really make Voyageurs the national treasure that it is.

We have also been able to expand our outreach through >30 public presentations, >15 radio/tv interviews, and 5 popular articles written by project members since 2018. Further, our work has been covered in >120 newspaper/magazine articles and appeared on national television 5 times since 2018.

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?
This project will provide foundational data for wolf, deer, moose, beaver, and disease management. Although three years of support are requested, we view this funding as foundational. ENRTF support for this phase of the Voyageurs Wolf Project will increase the likelihood that the project can continue longer-term. ENRTF funding for this project will help ensure continued support the Department of Fisheries, Wildlife, and Conservation Biology at the University of Minnesota, Voyageurs National Park, Northern Michigan University, Van Sloun Foundation, The Bell Museum, and numerous small donors and volunteers.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Effects of Wolf Predation on Beaver, Moose, and Deer	M.L. 2017, Chp. 96, Sec. 2, Subd. 03l	$293,000

Mapping Aquatic Habitats for Moose	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03l	$199,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Joseph K. Bump		Principle Investigator responsible for responsible for overall project management, organizing all personnel across activities, as well as directly supervising and mentoring project post-doctoral researcher and graduate research assistant.			36.5%	0.24		$45,560
Full-time Postdoctoral Associate		Field Leader responsible for field work, data management, and analyses required to achieve project Activities. Thomas Gable has been critical to the success of the Voyageurs Wolf Project to date and is committed to continuing with the project under the advising of Bump.			25.4%	3		$223,740
Field Biologist		Experienced field technicians are required to complete field work safely and efficiently, e.g. most field activties require at least two individuals.			31.8%	2		$105,600
							Sub Total	**$374,900**
Contracts and Services								
Vectronic Aerospace, Inc.	Professional or Technical Service Contract	Same source GPS-satellite collar data acquisition and service contract; 12 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 fair pricing.		X		0		$36,000
							Sub Total	**$36,000**
Equipment, Tools, and Supplies								
	Equipment	GPS-satellite wolf collars; $3000/collar for 36 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 maintain the same data collection, i.e.					$108,000

			data continuity, product reliability, and battery life. We have compared cost estimates across other wildlife collar companies to ensure competitive pricing.					
							Sub Total	**$108,000**
Capital Expenditures								
		1 utility snowmobile and trailer	The purpose of the snowmobile and trailer is to enable early and late season field work, i.e. efficient movement among field sites across snow covered ground and lakes.	X				$15,000
		Purchase of vehicle ($26,100) if deemed to be more economical than mileage reimbursement for est 45,000 miles of travel.	The purpose of this expenditure is to provide dedicated transportation capacity to the project. Summer, vehicle rental, purchase, or mileage (whichever is most economical) for 3 years of fieldwork requiring 45,000 miles of travel for capturing and monitoring study animals @ $0.58 per mile = $26,100).	X				$26,100
							Sub Total	**$41,100**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
							Sub Total	**-**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								

							Sub Total	**-**
Other Expenses								
		Flight time for annual beaver census ($100/hr) 50 hours/yr for 3 years. Rate for NPS-owned aircraft per Federal govt. guidelines.	The purpose of this expense is cover flight time necessary to complete the beaver census each year.					$15,000
							Sub Total	**$15,000**
							Grand Total	**$575,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Contracts and Services - Vectronic Aerospace, Inc.	Professional or Technical Service Contract	Same source GPS-satellite collar data acquisition and service contract; 12 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 fair pricing.	Justification: It is necessary to continue with the same vendor and data contract so there is data continuity in wolf collars, i.e. we can be sure that collar manufacturing performance, and data received are consistent. This contract is compared to other industry estimates to ensure fair pricing. **This is a single source contract.**
Capital Expenditures		1 utility snowmobile and trailer	We that acknowledge ENRTF policy to return funds to the program if the capital equipment is sold. Justification: Snowmobile use is critical to project objectives (e.g. deploying cameras to monitor pack size) and there is no other efficient means of monitoring wolf packs during winter in remote areas. **Additional Explanation :** The Voyageurs Wolf Project is a long-term research and management project with the goal continuous operation. The snowmobile and trailer will be dedicated to the Voyageurs Wolf Project for the duration of their useful product life.
Capital Expenditures		Purchase of vehicle ($26,100) if deemed to be more economical than mileage reimbursement for est 45,000 miles of travel.	We that acknowledge ENRTF policy to return funds to the program if the capital equipment is sold. Justification: A field vehicle is necessary to complete all project objectives, e.g. cluster searches, transport field crew, capture wolves, towing. Currently there is not project vehicle. **Additional Explanation :** Cost amount is listed under travel, but this may fall under a capital expense if a it is a more prudent use of project funds. The Voyageurs Wolf Project is a long-term research and management project with the goal continuous operation. If a vehicle is purchased, it will be dedicated to the Voyageurs Wolf Project for the duration of their useful product life.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
In-Kind	Un-recovered indirect costs (54% MTDC) at the University of Minnesota	Foregone, Uun-recovered indirect costs.	Pending	$292,852
			State Sub Total	**$292,852**
Non-State				
Cash	Van Sloun Foundation, Bell Museum, Voyageurs National Park Association, Rainy Lake Conservancy, Sturgeon River Chapter of the Minnesota Deer Hunters Association and numerous small donors and hardworking volunteers.	Non-State: Donors to the Voyaguers Wolf Project have supported the purchase of boats, motors, and trailors; remote cameras, batteries, and mounting brackets; collars.	Secured	$48,500
Cash	1 National Science Foundation Graduate Research Fellow at the University of Minnesota Department of Fisheries, Wildlife and Conservation Biology 100% FTE for 3 years ($108,000 salary, $57,000 fringe and tuition)	Graduate Student Research Assistantship to support project Activities.	Secured	$165,000
In-Kind	National Park Service has supported project management; supplemental wolf monitoring and kill sites visits; field supplies and equipment; boat and vehicle use; housing for personnel; pilot salary and flight costs for winter moose and wolf suveys and fall beaver surveys.	Overall project support	Pending	$176,000
			Non State Sub Total	**$389,500**
			Funds Total	**$682,352**

Attachments

Required Attachments

Visual Component

File: cb42f5ba-589.pdf

Alternate Text for Visual Component

Summer wolf predation is almost unknown but critical to deer, moose, wolf, and CWD management. With novel, proven methods, we'll study wolf predation in summer and promote Voyageurs' region wildlife....

Optional Attachments

Support Letter or Other

Title	File
Bump et al. 2021 Voyageurs Wolf Project - Phase II Revised Graphic.pdf	98761bd4-dee.pdf
VNP_Letter of Support_Bump LCCMR_2021 updated.pdf	e48c3bb4-b2d.pdf
Bump - Background Check Certification Form for ENRTF Funding Recipients	d63bec08-569.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Apart from completing the required tasks in the 'Introduction' tab, an update was made to the "Non-ENRTF Funds Contributed" in the budget. Specifically, we were able to recruit and secure funding for a National Science Foundation Graduate Research Fellow at the University of Minnesota Department of Fisheries, Wildlife and Conservation Biology 100% FTE for 3 years. This project dedicated Fellowship adds $160,000 to the total project value.

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?

Yes

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, or sale of products and assets?

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

Voyageurs Wolf Project – Phase II

Management need: Deer and moose are iconic MN species, with huge economic, recreational, and cultural importance. Deer and moose management especially needs to understand wolf predation in summer, which is unknown compared to winter.

Deliverables: Key data on summer wolf diet, reproduction, and packs will be collected & shared with managers across northern MN where deer and moose overlap.

Proven methods: Summer wolf diets are hard to study, but we developed novel methods and preliminary results show that the summer diet of wolves is highly dynamic, especially with high beaver, fish, and berry availability. We'll use multiple approaches to inform deer, moose, and wolf management.

Proven productivity: So far, we've produced:

- 11 publications; 2 more submitted; 5 more in preparation.
- 27 presentations to professional and popular audiences.
- Data shared directly with MN DNR and Tribal natural resource agencies.
- >13,000 Facebook followers in only 5 months, >3 million people reached.

Promoting Minnesota Wildlife & Wild Places: We've attracted media attention from major newspapers (e.g. MN Star Tribune, NY Times) and large audience TV (PBS Nature, National Geographic) to promote Minnesota's wildlife, Minnesota's Northwoods, and the Greater Voyageurs Ecosystem. Promoting wildlife and wild places in Minnesota is a project activity.

VOYAGEURS WOLF PROJECT