Environment and Natural Resources Trust Fund

2027 Request for Proposal

General Information

Proposal ID: 2027-109

Proposal Title: Critical Information for Science-Based Management of Minnesota's Wolves

Project Manager Information

Name: Joseph Bump

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

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Project Basic Information

Project Summary: This 6-group, statewide collaboration integrates historic & current biological data, mortality & survival analyses, pack composition tracking, and community-engaged monitoring to establish science-supported management strategies, ensuring long-term Minnesota wolf population viability.

ENRTF Funds Requested: $2,550,000

Proposed Project Completion: June 30, 2030

LCCMR Funding Category: Fish and Wildlife (D)

Project Location

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

Region(s): NW, NE, 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

Narrative

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

There are renewed efforts by the federal government to return the management of gray wolves to the state. The U.S. Fish and Wildlife Service, under both Democrat and Republican Administrations, has attempted to delist wolves from the Endangered Species Act but these efforts were blocked in the courts. Recent legislation in Congress, which has already passed the House, aims to permanently delist wolves in Minnesota. Regardless of legal and legislative fights over wolf protections, Minnesota needs improved key biological data to develop strategies to effectively manage wolves. The recent MN DNR Roundtable highlighted the need to "follow the science" regarding wolf management. Assessing wolf range within the state, causes of mortality, survival, and pack and population structure is critical. Past efforts to gather this information are either outdated, controversial, not statewide, or suffered from low sample size, limited spatial coverage, and poor partner participation. To address the limitations and inadequacies of past efforts we have assembled a statewide collaboration among researchers, state and federal managers, four tribes, and the public that will work together to collect key data on wolf populations and analyze all available historic data to understand the past and future trajectory of Minnesota's wolf population.

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.

Some groups argue that wolves have recovered in the western Great Lakes region. Others argue the states with wolves in the western Great Lakes region are unprepared to manage wolves. Regardless of the validity of either claim, it is imperative to track changes in wolf packs and across the population for long-term viability. Each activity we propose serves the viability of an iconic Minnesota species.

To ensure Minnesota "follows the best available science" regarding wolf management, we'll: 1) collect information on causes of wolf mortality to understand how causes of death change across seasons and year to year; 2) assess pack and population demographics with the best available data to understand how changes in demographics drive statewide wolf population; 3) collect new annual wolf survival data from multiple locations and incorporate it with all available existing survival information to complete the most comprehensive assessment of the key determinant of population growth and persistence, and 4) establish a web-based platform where we leverage public observations to determine wolf range in Minnesota and understand changes in wolf range over time.

These four activities will provide the key information to best conserve wolf populations and facilitate effective, science-based wolf management in Minnesota.

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:
1) Generate cause-specific mortality information using all available statewide wolf data,
2) Estimate pack demographics, population structure, tenure/turnover rates of breeding wolves, and the prevalence of lone wolves,
3) Determine temporal trends, and age- and sex-specific survival rates of wolves in Minnesota, both historically and recent (~1960s-2030s), and
4) Create a system to track change in wolf range in Minnesota using observations collected by the public.

Collectively, with these four project outcomes, we have a unique opportunity to provide needed information for the best possible, science-supported wolf management statewide.

Activities and Milestones

Activity 1: Assessment of Cause-Specific Mortality Across Minnesota

Activity Budget: $714,651

Activity Description:
This activity's objective is to assess cause-specific mortality of gray wolves both historically and through the coming years—when management of wolves could possibly revert to state management—to develop a comprehensive, rigorous assessment of state-wide wolf mortality. The analysis identifies dominant mortality sources, evaluates spatial & temporal patterns, and assesses how human, environmental, and ecological factors influence wolf survival.

Tasks include fitting gray wolves across the state with GPS-collars the next 3 years to understand causes of mortality as well as compiling all available data on wolf mortality to date. Compiling data includes data verification, with standardization and classification, so that spatial and trend analyses can be conducted. Mortality data will be obtained from MN DNR, Tribal Nations, federal monitoring, necropsy reports, telemetry studies, and verified records. Databases will be cleaned/standardized using reproducible data workflows. Quality-control procedures will flag inconsistencies, missing values, and uncertain cause assignments. Mortality will be assessed by monitoring of collared wolves and standardized assessment of causes of death; temporal analyses will examine seasonal & multi-year trends.

Outputs/results will support evidence-based policy discussions by clarifying the relative importance of human-caused versus natural mortality, and provide a baseline for evaluating future changes under different legal/ecological conditions.

Activity Milestones:

Description	Approximate Completion Date
Statewide Wolf Mortality Dataset Completed and Validated	June 30, 2030
GPS-collaring, Active Monitoring, and Field Data Generation	June 30, 2030
Cause-Specific Mortality Analyses and Cumulative Incidence Function Visual Created	June 30, 2030
Archived Analytical Code and Documentation	June 30, 2030

Activity 2: Understanding how pack demographics and structure drive population change

Activity Budget: $714,651

Activity Description:
The objective of this activity is to bridge the gap between broad population-level metrics and the often-overlooked dynamics of individual wolf packs in northern Minnesota.

One of the key criticisms of wolf conservation and management by wildlife agencies is that such efforts focus on population-level metrics and ignore pack-level metrics, which are therefore poorly understood. By collecting high-resolution data using GPS-collars and remote cameras in northern Minnesota, we will provide the first comprehensive assessment of wolf pack demography in the state and how this relates to overall population structure. Further, we will assess how wolf pack demography is related to wolf population density and changes in population density. We will determine how often the breeding pair of wolf packs change, which provides key data on pack-level process and how mortality drives pack and population-level changes.

The activity will produce numerous metrics of wolf pack demography in northern Minnesota over a 10-year period (2020-2030) and how that is related to wolf population density. These metrics include: pack composition (percent of

adults, subordinates, and pups), pack-level recruitment, breeding pair tenure, breeding pair turnover rate, and the prevalence of lone wolves in the population. Tasks include using GPS-collared wolves and remote cameras.

Activity Milestones:

Description	Approximate Completion Date
GPS-collaring, Active Monitoring, and Field Data Generation	June 30, 2030
Pack demographic data are collected, compiled, and ready for analysis	June 30, 2030
Quantitative estimates of pack demography are calculated and analysis between pack demography and populations conducted	June 30, 2030

Activity 3: Estimating Wolf Survival Rates Across Minnesota

Activity Budget: $714,651

Activity Description:
The objective of this activity is to estimate annual survival rates of gray wolves (Canis lupus) across Minnesota wolf range. The assessment aims to quantify overall and demographic-specific survival, evaluate spatial and temporal variation in survival, and provide robust survival estimates that support population modeling, conservation planning, and management decision-making.

Key tasks include generation of survival data, synthesizing historic data, encounter history development, and comprehensive survival estimation. This activity will be completed by collaring wolves to generate new data and compilation of existing capture records, monitoring histories, and confirmed mortality records collected by state and partners. Analytical methods will include known-fate or mark–recapture survival models, depending on data structure. Annual survival probabilities will be estimated with associated confidence intervals. Stratified or covariate-based models will be applied to evaluate demographic, temporal, and regional variation.

The activity will produce a new dataset of individual wolf encounter histories, annual survival estimates with measures of uncertainty, survival estimates stratified by age class, sex, region, and year (as data allow), and tables and figures summarizing survival patterns and trends.

Survival estimates will directly inform statewide wolf population models and trend assessments. Results will aid in understanding demographic population drivers.

Activity Milestones:

Description	Approximate Completion Date
GPS-collaring, Active Monitoring, and Field Data Generation	June 30, 2030
Data Synthesis & Historic Encounter History Compilation	June 30, 2030
Stratified Survival Modeling & Population Impact Analysis	June 30, 2030

Activity 4: Leveraging the public to map annual changes in wolf range in Minnesota

Activity Budget: $406,047

Activity Description:
The objective of this activity is to develop and maintain a web-based platform where the public can submit photographic/videographic data of wolves statewide, allowing us to capitalize on the vast amount of data collected by the public. The platform will provide an independent assessment of the DNR's estimate of wolf range by greatly

expanding spatial coverage of wolf monitoring, improving detection of wolf occupancy & range limits, and engaging the public in scientifically-rigorous wildlife data collection.

Tasks include designing a user-friendly web interface for submitting images/videos and metadata; integrating verified observations into a centralized geospatial database; developing guidance materials and outreach to encourage high-quality participation. The platform will be developed using established web and app frameworks that support image upload, geolocation, and database integration.

The activity will produce: a publicly accessible, digital platform for photographic/videographic submission; a curated, georeferenced database of verified observations of wolves; spatial products showing wolf occupancy and distribution across Minnesota; documentation outlining submission guidelines, verification criteria, and data limitations; outreach nstructional materials for participants.

The platform will substantially increase statewide coverage of wolf monitoring, while also leveraging the vast amount of opportunistic data captured by members of the public on wolves in the state.

Activity Milestones:

Description	Approximate Completion Date
The web/app-based platform is designed, built, and deployed in a pilot form	June 30, 2030
A standardized workflow for evaluating and verifying camera trap submissions is implemented	June 30, 2030
Compiled and verified data are analyzed to produce occupancy and range products	June 30, 2030

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.
Dissemination and data-sharing for the four wolf research and monitoring activities (cause-specific mortality, pack demography, annual survival, and mapping wolf range via public observations) will be designed to maximize management relevance, transparency, longevity of products, and public accessibility. Together, these efforts will ensure that results benefit agencies, partners, and Minnesotans while supporting long-term conservation of the state's natural resources.

Results will be shared directly with Minnesota Department of Natural Resources staff and other relevant state, tribal, and federal partners through technical reports, management briefings, and presentations timed to align with planning and decision-making cycles. Data products—including curated mortality databases, survival encounter histories, pack demography data, and verified camera-based wolf records—will be documented with clear metadata and archived in secure, publicly-available repositories to ensure long-term usability beyond the funding period.

Scientific findings will be disseminated through peer-reviewed publications and conference presentations to ensure methodological rigor and broader scientific engagement. Management-focused summaries will translate results into actionable insights, supporting improved population modeling, conflict mitigation, monitoring design, and adaptive management across Minnesota's wolf range.

The participatory science platform will serve as a key vehicle for public engagement and awareness, allowing Minnesotans to contribute directly to wolf monitoring and to see how their observations inform statewide assessments. Public-facing maps, dashboards, and plain-language summaries will communicate results in accessible formats, emphasizing transparency and stewardship.

Outreach products—such as web content, presentations, and interpretive summaries—will highlight how Trust Fund support enables rigorous science and informed management. By clearly linking monitoring results to conservation outcomes, these dissemination efforts are intended to promote informed behaviors, foster shared responsibility for Minnesota's natural resources, and ensure that the products and collections generated remain valuable, accessible, and influential well into the future.

Dissemination efforts 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 and outreach.

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?
Since the late 1970's, the MN DNR has monitored its statewide wolf population using an approach that combines attributes of territory mapping and pack size with an ad hoc approach to determine the total area of the state occupied by wolf packs. This project will significantly improve this approach by creating an enduring system to receive and assess wolf observations from anyone. As a consequence, monitoring statewide populations can be implemented annually

rather than ad hoc. Upon completion, participants will continue to generate project outcomes in future years based on diverse funding, e.g. University, donors, grants.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
Offal Wildlife Watching: How Do Hunters Provision Scavengers?	M.L. 2022, , Chp. 94, Art. , Sec. 2, Subd. 03g	$473,000
Voyageurs Wolf Project - Phase III	M.L. 2024, , Chp. 83, Art. , Sec. 2, Subd. 03k	$996,000
Deer Survival Within Minnesota's Densest Wolf Population	M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 03c	$809,000
Small-Mammals and Hunter Participation: Expanded Offal Wildlife Watching	M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 03l	$563,000

Project Manager and Organization Qualifications

Project Manager Name: Joseph Bump

Job Title: Professor

Provide description of the project manager's qualifications to manage the proposed project.
As a Professor and the Gordon W. Gullion Endowed Chair in Forest Wildlife Research and Education at the University of Minnesota, Dr. Joseph Bump possesses the unique intersection of expertise in predator-prey dynamics, large-scale ecosystem science, and community-engaged research necessary to lead a statewide wolf management initiative. His qualifications are defined by three key pillars:

1. Leadership in Wolf Research and Population Monitoring
Dr. Bump serves as a co-leader of the Voyageurs Wolf Project. This project is a global benchmark for using modern technology—including GPS camera collars and remote sensing—to address knowledge gaps in wolf ecology and conservation.

2. Expertise in Mortality and Survival Dynamics
Dr. Bump's extensive publication record includes critical assessments of wolf survival and mortality. He has co-led studies examining how human-caused mortality triggers pack instability and how wolf-prey interactions shape entire forest trajectories. His ability to synthesize complex, often "controversial" biological data into management-relevant insights ensures the project will meet the mandate to "follow the science" regarding pack structure and population growth.

3. Community Engagement and Public Outreach
A distinguishing feature of Dr. Bump's career is his commitment to bridging the gap between science and the public. He has worked directly with diverse stakeholders—including state and federal managers, ranchers, and tribal partners—to reduce human-wolf conflict and promote coexistence. His leadership of the successful Offal Wildlife Watching project that involves hundreds of hunter participants demonstrates his capacity to manage the proposed public participation, effectively involving citizens in scientific observations.

By leveraging strong ties to the MN DNR, experience managing large, multi-partner federal and state grants, and a proven LCCMR record, Dr. Bump is uniquely positioned to coordinate this statewide collaboration. His leadership ensures that Minnesota's wolf management strategy will be supported by the most comprehensive, non-partisan, and technologically advanced wildlife science.

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

Organization Description:
The Department of Fisheries, Wildlife, and Conservation Biology (FWCB) at the University of Minnesota Twin Cities is uniquely positioned to lead this wolf management initiative due to its unparalleled access to long-term data, its culture of interdisciplinary research, and its deep institutional partnerships. Located at a premier land-grant university, FWCB serves as the primary scientific engine for Minnesota's natural resource management.

A hub for collaborative science, FWCB houses a high concentration of large-carnivore experts and spatial ecologists who maintain direct pipelines to the MN DNR, U.S. Fish and Wildlife Service, and Tribal nations. This existing infrastructure is critical for the statewide collaboration required to unify historic data sets, collect new information, and establish the proposed Wolf Watch system.

The department specializes in the human dimensions of wildlife management, a necessity for a species as controversial as the wolf. By housing the Minnesota Cooperative Fish and Wildlife Research Unit, FWCB can bridge the gap between rigorous biological tracking—using the latest GPS and remote camera technologies—and the community-engagement frameworks needed to incorporate citizen science. This ensures the project moves beyond performative data collection to produce science-supported strategies that both state and tribal managers can trust.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
Project Manager, Principle Investigator		Professor responsible for supervision, leadership and management of all project activities			36.6%	0.24		$62,908
Researcher 6 - Co-Principle Investigator		Co-Leadership of all project activities and primary leadership in the field.			36.6%	2.94		$349,473
Researcher 5 - Field Biologist		Co-Leadership of all activities in the field			36.6%	2.94		$277,021
Researcher 3 - Field Biologist		Assist project leaders with all aspects of the project, especially field work			36.6%	3		$239,186
Two full time field technicians for 3 years		Two field crew members completing tasks as directed to support all project activities for 3 years			32%	12		$344,651
							Sub Total	**$1,273,239**
Contracts and Services								
Vectronic Aerospace Data Fees for GPS Collars	Service Contract	Same source GPS-satellite collar data acquisition and service contract; 55 collars X $470/collar/year X 3 yrs for a total of $77,550.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		$77,550
Wolf captures	Service Contract	Cost ($120,000) to capture 60 wolves/year for 3 years				0		$360,000
Genetic analyses	Service Contract	Genetic samples to assess pack demography and breeding turnover ($70 per sample for 250 samples per year for 3 years).				0		$52,500
Survival & mortality analyses	Service Contract	Complete Bayesian shared frailty model to capture variation in annual survival of wolves and as a function of sex and estimated age at capture,				0		$25,000

		including partitioned the hazard rate from the frailty model into cause-specific mortality rates.						
Website design	Service Contract	Contract web-site design for Activity #4				-		$30,000
Website hosting fee	Service Contract	Costs to maintain website online at $3600 per year for 3 years				-		$10,800
Web site promotion	Service Contract	Costs to publicize project website in order to recruit and engage public participation; $5000 per year for 3 years				-		$15,000
Veterinary Diagnostic Laboratory	Service Contract	The UMN Veterinary Diagnostic Laboratory will perform necropsies on recovered wolves to help determine the cause of death for each mortality, to the extent possible ($6000 per year for 3 years).				-		$18,000
							Sub Total	**$588,850**
Equipment, Tools, and Supplies								
	Equipment	GPS-satellite wolf collars; 55 collars x $2900 x 3 years for a total of $478,500. Includes replacements for lost/damaged collars.	GPS-collars are required to obtain the location data necessary to asses survival, mortality, and pack demographics ensuing we meet project Activities and Milestones. Sole sourcing from Vectronic Aerospace is requested to 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.					$478,500
	Tools and Supplies	Remote Cameras (50 total at $190 ea. per year for 3 years)	Remote cameras are used to determine territories, pack counts, survival, and behavior. We maintain an array of ~400 cameras year-round and 13% need to be replaced each year.					$28,500
	Tools and Supplies	Batteries for remote cameras: 8AA lithium batteries per camera; 3200 needed per year at $2.50 each for 3 years.	Remote power supply for cameras in all types of weather to maintain remote camera array.					$24,000
	Tools and Supplies	Supplies need for remote camera operation: memory SD cards, camera locks & Cables, data storage hard drives, gimble mounts and screws, etc.($2000 per year for 3 years)	Ensures remote camera array is functional, efficient, and effective.					$6,000

	Tools and Supplies	Capture supplies, immobilization drugs, and field investigation biological sampling supplies ($5,000/year for 3 years)	Required supplies for safe and effective capture and collaring of study animals.					$15,000
	Tools and Supplies	Supplies (e.g. gloves, sample bags, disinfectant, notebooks, labeling, sharpies, envelopes) for fieldwork related to project activities at $2,500/year for 3 years	Covers miscellaneous supplies needed for data collection in the field.					$8,161
							Sub Total	**$560,161**
Capital Equipment								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	lodging for 4-8 field technicians year round	Short term lease to house field technicians: $25,250/year for housing field crew for 3 years					$75,750
	Miles/ Meals/ Lodging	2 used vehicles for field work from UMN Fleet Services	Transportation to complete fieldwork for 3 years					$52,000
							Sub Total	**$127,750**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$2,550,000**

Classified Staff or Generally Ineligible Expenses

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

Non ENRTF Funds

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

Total Project Cost: $2,550,000

This amount accurately reflects total project cost?

Yes

Attachments

Required Attachments

Visual Component

File: 7b6c3696-a64.pdf

Alternate Text for Visual Component

Visual presents a compelling case for the necessity of rigorous, science-based data to manage the state's wolf population. It juxtaposes the perspectives of animal advocacy groups and hunting organizations to show a rare moment of "common ground" regarding the need for critical data collection by 6 groups & 9 supporting letters....

Supplemental Attachments

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

Title	File
Osprey Wilds Environmental Learning Center - Letter of Support	fd1aa78a-987.pdf
Signed Letter of Approval from University of Minnesota	da8556ca-7a4.pdf
National Wolfwatcher Coalition - Letter of Support	b39b3fbb-d47.pdf
Izaak Walton League - Letter of Support	c31c4ce5-2fe.pdf
Voyageurs Conservancy - Letter of Support	12373350-c06.pdf
Wolf Ridge Environmental Learning Center - Letter of Support	9d588f81-fa6.pdf
Humane World for Animals - Letter of Support	ef282d9f-dbb.pdf
Minnesota Deer Hunters Association - Letter of Support	c9ae02ce-e17.pdf
Back Country Hunters & Anglers - Letter of Support	05abb64d-692.pdf
International Wolf Center - Letter of Support	1aabd25e-c48.pdf
Fond du Lac Band of Lake Superior Chippewa - Letter of Participation	cab67109-072.pdf
1854 Treaty Authority - Letter of Participation	897c1410-518.pdf
Red Lake Band of Chippewa - Letter of Participation	dffde13a-495.pdf
Leech Lake Band of Ojibwe - Letter of Participation	6c7c4b50-50e.pdf
Minnesota Department of Natural Resources - Letter of Participation	c9cc921a-471.pdf
United States Geological Survey - Letter of Participation	a48e9844-e75.pdf

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 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 proposal:

Dr. Thomas Gable, University of Minnesota; Patrick McDonald and Kelsey Grachek, both 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