



Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-104

Proposal Title: Habitat Use and Recruitment Rates in Exurban Wolves

Project Manager Information

Name: Jacob Haus

Organization: Minnesota State Colleges and Universities - Bemidji State University

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Project Basic Information

Project Summary: This project will investigate wolf resource selection, home range size, pack interactions, and population dynamics within an agriculturally fragmented exurban landscape with high potential for human-wolf conflict.

Funds Requested: \$263,000

Proposed Project Completion: 2024-01-31

LCCMR Funding Category: Foundational Natural Resource Data and Information (A)

Project Location

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

Region(s): NW

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.

The presence and management of wolves in Minnesota has been divisive and controversial. Issues related to human-wolf conflict, including livestock depredation, a perceived reduction in hunting opportunities, and a perceived risk to humans and domestic pets all influence population management. Within Minnesota, research into wolf behavior, habitat use, and population dynamics has mostly occurred in the northeast and north-central regions of the state, which consist primarily of rural wilderness areas with limited human development. Expansions of the primary wolf range over the last several decades has increasingly included regions with agriculturally fragmented landscapes and exurban development, however a paucity of information exists concerning how wolves utilize resources on these landscapes. As part of a pilot study, we captured and placed a GPS collar on an adult male 5km outside the city limits of Bemidji, MN (Pop. 15,500) in July 2019. The home range extended from the edge of Bemidji city limits to include the entirety of Cass Lake, MN (Pop. 800; figure 1). Location data suggested the wolf regularly utilized anthropogenic resources, including residential yards. An understanding of wolf resource use and population dynamics within human dominated landscapes is necessary to minimize human-wolf conflict, but data are currently lacking.

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.

We plan to capture and place GPS collars on a minimum of 10 adult wolves, in 8 distinct packs, over 2 years. (1 July 2021 – 30 June 2023). Capture activities will occur within 25 km of Bemidji city limits. We will record a location fix on each individual every 4 hours for a minimum of 1 year. We will use mixed-effect resource selection functions to quantify how the use of agricultural and residential areas by wolves varies as a function of human development (e.g., road and housing density, land cover type). Additionally, we will use GPS location data to identify den sites and place expandable very-high frequency collars on 20 neonate wolves shortly after birth. We will estimate home range sizes and mortality rates on an annual and seasonal basis for both adult and juvenile wolves.

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 identify patterns in wolf selection or avoidance of resources associated with human activity, as well as examine population dynamics among both adult and juvenile age classes in more human dominated landscapes. Results of this study will be used to optimize state and federal wolf management practices, identify high-risk areas for wolf-human conflict, and to inform future harvest regulations and quotas. The Minnesota Department of Natural Resources will also use findings from this study related to wolf pack and territory size to update their estimate of statewide population abundance.

Activities and Milestones

Activity 1: Examine adult wolf resource selection in response to human development and agriculture

Activity Budget: \$140,950

Activity Description:

The amount of developed land cover is variable throughout the range of wolves in northern Minnesota, and wolf use of habitats and resources likely varies as a function of development. We will evaluate how wolves utilize their habitat in regions where human development is common and potential for wolf human conflict is high. Additionally, we will examine home range sizes and pack composition within a human dominated landscapes, which are important parameters used by the Minnesota DNR to estimate wolf density.

Activity Milestones:

Description	Completion Date
Complete first year of adult wolf capture and monitoring	2022-06-30
Complete second year of adult wolf capture and monitoring	2023-06-30
Analyze habitat selection and provide management recommendations	2024-01-31

Activity 2: Examine juvenile wolf survival, recruitment, and movement as a function of human development.

Activity Budget: \$122,050

Activity Description:

Pup survival and recruitment are the primary factors driving wolf population dynamics, but are poorly understood. Sources of mortality are likely variable across habitats and land cover types. We will examine the primary sources of mortality among juvenile wolves during the first year of their life, with a focus on the influence of human development on survival rates.

Activity Milestones:

Description	Completion Date
Initiate year 1 juvenile capture and monitoring activities	2022-04-30
Initiate year 2 juvenile capture and monitoring activities	2023-04-30
Analyze juvenile survival and movement and provide management recommendation	2024-01-31

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Brian Hiller	Bemidji State University	Dr. Brian Hiller is a professor of wildlife biology at Bemidji State University and will serve as co-principle investigator on the project. He has previously managed a state-funded research project in the greater Bemidji area involving wolf capture and monitoring.	Yes

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?

Although 2 years of funding are requested, this project is intended to initiate a comprehensive, long-term (5-7 year) study in the Bemidji region to further explore wolf ecology and management in the context of human development and habitat fragmentation. Data collection and analysis from animals included in this research will extend beyond 2.5 years, and future research objectives will be funded through additional external grant proposals. The data collected will add to the Minnesota Department of Natural Resources long-term dataset and knowledge of wolf ecology throughout the state.

Project Manager and Organization Qualifications

Project Manager Name: Jacob Haus

Job Title: Assistant Professor

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

Dr. Jacob Haus is a Certified Wildlife Biologist® and assistant professor at Bemidji State University specializing in large mammal ecology. He earned a B.S. in biology from Bemidji State University in 2010, an M.S. in wildlife ecology from the University of Delaware in 2013, and a Ph.D. in wildlife ecology with certificate in applied statistics from the University of Delaware in 2017. His 2 years of postdoctoral work examined survival and spatial ecology of white-tailed deer, wild turkeys, and bobcats. He has 10 years of experience capturing large mammals and analyzing movement and survival data. He has been the principle investigator or co-investigator on 5 previous externally-funded wildlife research projects totaling over \$750,000 in awarded grants. He regularly publishes in high-impact journals and presents research results at national and international wildlife conferences.

Organization: Minnesota State Colleges and Universities - Bemidji State University

Organization Description:

Nestled in Northern Minnesota's wooded region and located on the shore of Lake Bemidji, Bemidji State University serves over 5,100 students in undergraduate, graduate and online degree programs. The University's core philosophy is built upon a commitment to environmental stewardship, community service and global understanding. Bemidji is the cultural and commercial hub for north central Minnesota and is located within the state's primary wolf range. The Biology department awards both BS and MS degrees in the field of wildlife biology, making Bemidji State University an excellent location to conduct research focused on wolf ecology.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Haus; Co-investigator		Manage, analyze, write, outreach			20%	0.2		\$16,078
Hiller; Co-investigator		analyze, write, outreach			20%	0.2		\$16,966
Graduate Assistant		Coordinate field work, data management, analyze, write			13%	2		\$45,978
Graduate Assistant		Tuition and fees			0%	2		\$12,200
Technician support		Part time research technician			13%	1.5		\$38,620
Undergraduate Research Assistant		Undergraduate student worker			7%	1		\$20,600
							Sub Total	\$150,442
Contracts and Services								
TBD	Professional or Technical Service Contract	Contract with veterinary lab for wildlife necropsy/histology/pathology to determine sources of wolf mortality.				2		\$6,000
TBD	Professional or Technical Service Contract	GPS collar satellite monitoring service fee contract (10 collars @ \$540/year)				2		\$5,400
							Sub Total	\$11,400
Equipment, Tools, and Supplies								
	Equipment	10 GPS collars	GPS tracking collars for adult wolves					\$23,000
	Equipment	20 expandable VHF collars	Collars for wolf pups					\$6,000
	Equipment	Telemetry equipment	3 receivers and 4 Yagi antennas					\$2,100
	Equipment	10 Browning trail cameras	Monitor wolf dens and observe behaviors					\$2,500

5/18/2020

	Equipment	3 remote telemetry data logging towers	Monitor wolf pup survival remotely without disturbing den sites					\$12,000
	Tools and Supplies	Pharmaceuticals for wolf capture (10 captures)	Immobilizing drugs for safe wolf capture and handling					\$8,500
	Tools and Supplies	Miscellaneous trapping supplies (traps, GPS units, drug delivery systems, ect)	Tools and supplies required for safe wolf capture and handling (\$7,500/year)					\$14,958
							Sub Total	\$69,058
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Miles/ Meals/ Lodging	Field travel to/from study sites, miles (40,000 miles at 0.58/mile), food, lodging	Travel to support field research					\$27,000
	Conference Registration Miles/ Meals/ Lodging	Conference expenses for Minnesota Wildlife Society Conference	Funding for the graduate student to present research findings to local Minnesota wildlife biologists					\$1,500
							Sub Total	\$28,500
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
	Publication	Page charges for 3 peer-reviewed journal publications	Results from this project will be communicated to the broader scientific community through publication in peer-reviewed journal outlets.					\$3,600
							Sub Total	\$3,600

Other Expenses								
							Sub Total	-
							Grand Total	\$263,000

Classified Staff or Generally Ineligible Expenses

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

Category	Specific Source	Use	Status	Amount
State				
			State Sub Total	-
Non-State				
In-Kind	Bemidji State University	Bemidji State University will provide indirect costs (32.5%) as in-kind match	Secured	\$85,475
In-Kind	Bemidji State University	Drs. Haus and Hiller will provide additional trail cameras, telemetry receivers, antennas, and a data logging tower.	Secured	\$8,500
			Non State Sub Total	\$93,975
			Funds Total	\$93,975

Attachments

Required Attachments

Visual Component

File: [077ec179-e14.pdf](#)

Alternate Text for Visual Component

Kernel density estimate of the home range (95%) and core area (50%) for an adult male wolf captured 10-km east of Bemidji, MN (pop. 15,500) in July 2019. The southeast core area overlaps portions of Cass Lake, MN city limits (pop. 800) and includes a popular hotel location and a lakeside resort.

Optional Attachments

Support Letter or Other

Title	File
Map of wolf home range	ae064c0c-04c.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have patent, royalties, or revenue potential?

No

Does your project include research?

Yes

Does the organization have a fiscal agent for this project?

No

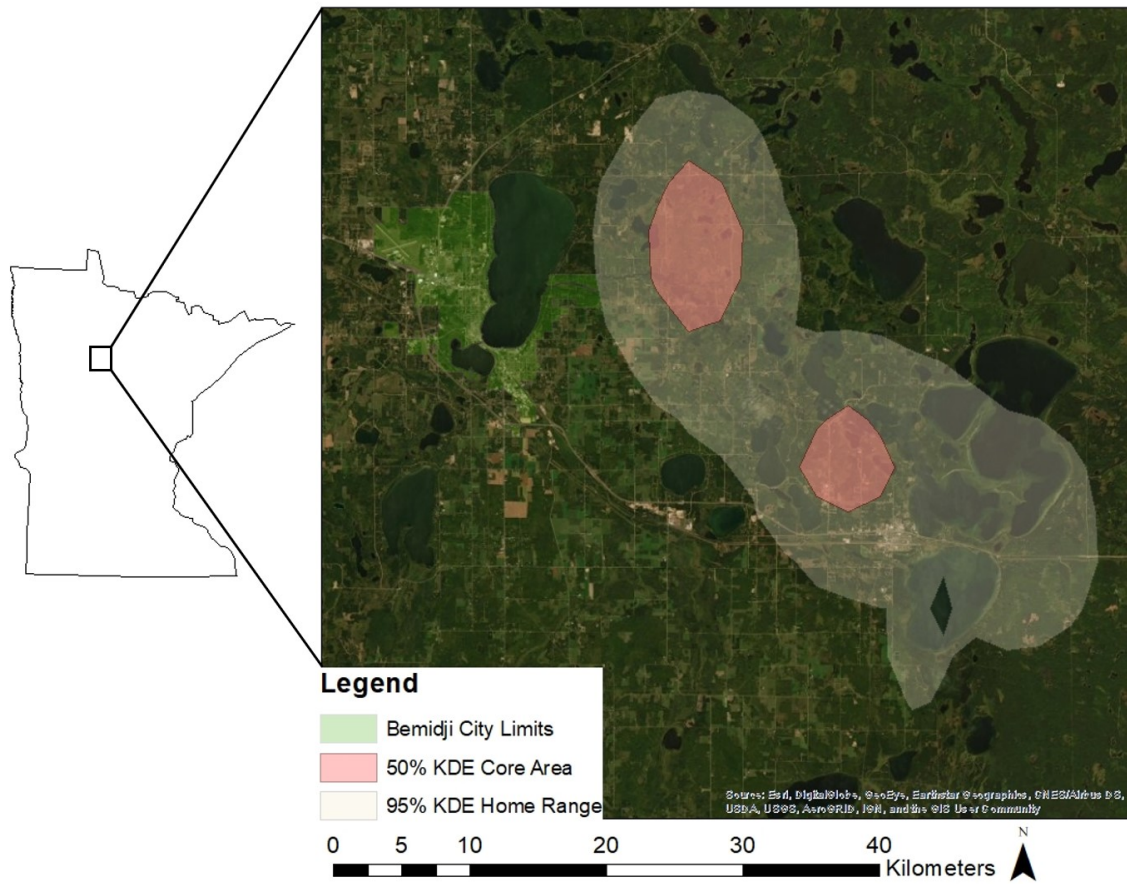


Figure 1. Kernel density estimate of the home range (95%) and core area (50%) for an adult male wolf captured 10-km east of Bemidji, MN (pop. 15,500) in July 2019. The southeast core area overlaps portions of Cass Lake, MN city limits (pop. 800) and includes a popular hotel location and a lakeside resort.

