



Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-071

Proposal Title: Investigating Life History Characteristics of Minnesota Elk

Project Manager Information

Name: Eric Michel

Organization: MN DNR - Fish and Wildlife Division

Office Telephone: (507) 621-8918

Email: eric.michel@state.mn.us

Project Basic Information

Project Summary: We will assess movements, survival, and causes of mortality of Minnesota elk while developing a non-invasive, safer method to estimate population size. This information is important for long-term management efforts.

Funds Requested: \$933,000

Proposed Project Completion: December 31, 2027

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?

In the Future

Narrative

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

Elk are a charismatic species that provide recreational opportunities for consumptive and non-consumptive users. Minnesota's elk herd is small (<200 animals) and separated into 3 subpopulations. Limited-entry hunts are conducted annually to keep herd size within population goals established by legislative mandate. Although winter aerial surveys provide minimum population counts and thus inform tag allocation, there is no estimate of visibility bias. We propose exploring alternative survey techniques to improve population estimates.

There was one prior elk study conducted in Minnesota (funded by LCCMR in ML2015, see here) where adult female elk home range size and resource use was estimated. Adult male movement patterns and resource use and survival estimates (adults and calves) are unknown parameters needed to understand population dynamics of this herd.

Genetic diversity is a concern for small animal populations. A proposal to relocate elk from northwest to northeast Minnesota was developed by the Fond du Lac Band of Lake Superior Chippewa (FDL) and DNR. Herd size will be decreased if animals are relocated. Therefore, genetic analysis of the existing herd is important to understand and identify potential genetic concerns. Establishing base line stress levels is also important to understand how relocating individuals will affect stress.

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 will capture adult male and female elk using a helicopter capture crew. We will insert vaginal implant transmitters into pregnant females to assist in subsequent capture of calves, a standard and reliable wildlife method. We will fit all captured animals with tracking collars to assess movement patterns and estimate survival rates. Using tracking collars improves our ability to determine causes of mortality (e.g., predation, disease, vehicle-collision, hunting), determine home range size and resource use, and identify migration and/or dispersal events.

We will collect hair and tissue samples at capture to assess overall health and the genetic structure of the population to determine if genetic concerns exist. We will collect fecal samples and extract DNA from each sample to identify individuals. We will then use that information in a capture-mark-recapture (CMR) framework to estimate population size. The CMR framework produces an error estimate associated with the abundance estimate, which is an improvement upon the minimum counts derived from aerial surveys. We will also use fecal samples to establish baseline stress levels prior to the potential relocation effort.

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?

Prior research on elk produced useful information on home range size and resource use. However, we are currently lacking information on basic vital rates, as well as an understanding of movements of adult males and the genetic composition of the herd. Understanding these basic life history traits is necessary to inform population management, particularly if FDL's relocation proposal is enacted. This project will therefore ensure the health and persistence of Minnesota's elk population for future generations, ultimately allowing for balanced management that will benefit both consumptive and non-consumptive users alike.

Activities and Milestones

Activity 1: Assessing vital rates, movement patterns, herd health, and genetic diversity of Minnesota elk

Activity Budget: \$896,200

Activity Description:

We will contract with a helicopter capture company to capture and fit 50 adult females and 30 adult males with tracking collars across two years. We will monitor movement patterns to assess dispersal and migration events as well as potential immigration and emigration among subpopulations. We will estimate survival and fecundity rates to establish baseline vital rates, which will be used to manage the herd towards the established goal. We will also collect biological samples at capture from both sexes to assess herd health and genetic diversity within the subpopulations, which will inform the proposed relocation effort of potential genetic concerns resulting from the movement of elk to northeastern Minnesota.

Activity Milestones:

Description	Approximate Completion Date
Capture adult female and male elk (Winters 2025 and 2026)	March 31, 2026
Capture elk calves (Springs 2025 and 2026)	June 30, 2026
Ship biological samples to lab for genetic analysis and health evaluation	June 30, 2026
Monitor elk movement and survival	June 30, 2027
Analyze data	September 30, 2027
Interpret results and begin manuscripts	December 31, 2027

Activity 2: Estimating abundance and assessing baseline stress levels of elk using fecal samples

Activity Budget: \$36,800

Activity Description:

We will use a non-invasive genetic capture-mark-recapture method to estimate elk abundance. Fresh elk fecal samples will be collected along transects in elk range and will be sent to a lab for DNA extraction and analysis. Based on the DNA results, a capture-mark-recapture method will be used to estimate abundance. Fecal samples will also be used to establish baseline stress levels of this population. Cortisol is a hormone associated with stress and can be extracted from fresh feces. For this objective, real-time location data from the GPS collars will be used to identify areas of use and subsequent fecal sample collection from collared elk. These fecal samples will undergo analysis to estimate the cortisol concentrations of elk in each subpopulation. We will store samples in freezer bags, label them with the date and analysis to be completed (e.g., genetic or cortisol extraction), and will store in a -80°C freezer until samples are ready to be shipped to laboratories.

Activity Milestones:

Description	Approximate Completion Date
Collect fecal samples	April 30, 2026
Ship fecal samples to lab for population estimation and stress analyses	June 30, 2026
Analyze Data	June 30, 2027
Interpret results and begin manuscripts	September 30, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Dr. Joseph Bump	University of Minnesota - Twin Cities	Administer graduate students for the project	Yes
Dr. Benjamin Sacks	University of California - Davis	Analyze biological samples for genetic analysis	Yes
Dr. Corinne Kozlowski	St. Louis Zoo	Analyze fecal samples for cortisol levels	Yes
Mike Schrage	Fond du Lac Band of Lake Superior Chippewa	Advise on project design and data collection	No
Steven Dobey	Rocky Mountain Elk Foundation	Provide consultation and verbal support of research	No

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 will produce the foundational information on life history traits of elk in Minnesota necessary for long-term, sustainable management. Elk management impacts a wide range of stakeholders including residents of northwestern Minnesota, indigenous communities, agricultural producers, consumptive users, and non-consumptive users. In turn, sustainable management of this elk herd may substantially impact the current and future economics for these stakeholders in addition to impacting current and future conservation of this charismatic species.

Project Manager and Organization Qualifications

Project Manager Name: Eric Michel

Job Title: Ungulate Research Scientist, Minnesota Department of Natural Resources

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

Dr. Eric Michel received his B. S. in Wildlife Ecology and Management from the University of Wisconsin – Stevens Point (Stevens Point, WI), his MSc in Wildlife, Fisheries, and Aquaculture, and a PhD in Forest Resources, both from Mississippi State University (Mississippi State, MS). He has been with DNR since 2019 and currently serves as the Ungulate Research Scientist for the Farmland Wildlife Populations and Research Group (Madelia, MN). Eric works with two other Research Biologists to develop research and monitoring projects designed to inform the deer population model and prairie/farmland habitat management efforts in relation to deer and elk. His current projects include assessing fawn survival, movements, and habitat use in the farmland region, using camera traps to monitor deer populations in the forest region, administering a statewide deer hunter observation survey, and assessing deer exposure to neonicotinoid pesticides.

Organization: MN DNR - Fish and Wildlife Division

Organization Description:

A state natural resource agency dedicated to protecting and managing land, water, fish and wildlife, and providing access to outdoor recreation opportunities. The mission of the Minnesota Department of Natural Resources (DNR) is to “work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities,

and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.” Our research will provide information needed to manage for healthy and sustainable elk populations in Minnesota for the benefit of hunters, non-consumptive resource users, and future generations.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Natural resource technicians		Full-time 6-month temporary hires to help capture calves, monitor survival, conduct mortality investigations, and collect fecal samples (2 technicians needed for each FY at \$37,216 each).			45%	2		\$148,862
							Sub Total	\$148,862
Contracts and Services								
TBD	Professional or Technical Service Contract	A helicopter capture company will be contracted to help capture adult elk (40 adult elk/year for 2 years @ \$1258/capture).				0.5		\$100,640
Minnesota Department of Natural Resources	Internal services or fees (uncommon)	The Minnesota Department of Natural Resources will be contracted with to provide a plane with staff to help spot elk for the helicopter capture company to capture (\$360/hr for 80 hrs).				0.2		\$57,600
TBD	Professional or Technical Service Contract	Will conduct a genetic structure analysis from biological samples to assess if there are any genetic concerns with the elk herd (80 samples @ \$369/sample) .				2		\$29,520
TBD	Professional or Technical Service Contract	Extract DNA from fecal samples to use in a population estimate analysis (400 samples @ \$80/sample).				2		\$32,000
TBD	Professional or Technical Service Contract	Extract cortisol from fecal samples to establish baseline stress levels (240 samples @ \$20/sample).				2		\$4,800
University of Minnesota - Twin Cities	Sub award	Housing a graduate student (1 PhD student) and covering the student's stipend and tuition fees (\$50,000/year for 2 years).				4		\$100,000
University of Minnesota - Twin Cities	Sub award	Screening biological samples for exposure to diseases and parasites (130 samples @ \$120/each), necropsies (10 necropsies @ \$400/necropsy), and blood chemistries (50 samples @ \$80/sample).				2		\$23,600

							Sub Total	\$348,160
Equipment, Tools, and Supplies								
	Equipment	Elastic belt option for males (\$56/belt for 30 males across two years).	Allows for increasing neck size during the breeding season.					\$1,680
	Tools and Supplies	USB to Vertex Interface	Used to change data collection schedule remotely.					\$65
	Tools and Supplies	Shipping costs	Shipping costs for mailing fecal and biological samples to the labs.					\$1,800
							Sub Total	\$3,545
Capital Expenditures								
		Adult GPS collars (\$2281/collar for 80 elk over 2 years)	Monitor adult male and female movements and survival.	X				\$182,480
		Adult data subscription and transmission fees (\$342/collar for 80 collars) for GPS collars	Allows for monitoring individuals using real time data.	X				\$27,360
		Calf GPS collars (\$640/collar for 50 elk across two years).	Used to monitor movement and survival.	X				\$32,000
		UHF ID calf collar transmitter (\$247/transmitter for 50 calves across two years).	Used for assessing interactions between the calf and mother.	X				\$12,350
		Calf data subscription and transmission fees (\$173/collar for 50 collars across two years)	Used to assess movements in real time.	X				\$8,650
		Vaginal Implant Transmitters (\$243/VIT for 50 females across two years).	Inserted into pregnant females to aid in calf captures.	X				\$12,150
		Capture supplies, immobilization drugs, and field investigation biological sampling supplies (\$5,000/year for two years)	Supplies needed to aid in capturing and immobilizing individuals during capture and for supplies used to collect biological samples at capture.	X				\$10,000
							Sub Total	\$284,990
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								

	Miles/ Meals/ Lodging	Travel to field sites (fleet @ 0.94/mi, estimated 30,000 miles/year for two years), food, and lodging (\$18,000/year for two years).	Travel to field sites to capture adult elk, capture calves, and investigate mortalities along with food and lodging for technicians and the PhD student.					\$92,400
							Sub Total	\$92,400
Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
		Direct and necessary costs cover HR Support (\$11,008), Safety Support (\$2,288), Financial Support (\$11,524), Communication Support (\$2,123), IT Support (\$28,639), and Planning Support (\$1,036)	Direct and necessary costs used to support MNDNR staff needed when hiring individuals and subsequently supporting those individuals during the duration of the study.					\$55,043
							Sub Total	\$55,043
							Grand Total	\$933,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Capital Expenditures		Adult GPS collars (\$2281/collar for 80 elk over 2 years)	These GPS collars collect data frequent enough to allow for questions regarding movement and survival to best be assessed. Without GPS collars, personnel costs would increase due to increased monitoring of individuals and the fine scale data associated with GPS collars would be lost. Additionally, GPS collars are standard equipment in movement and survival studies. Additional Explanation : The GPS collars will remain on the individual elk until the data is needed for analysis.
Capital Expenditures		Adult data subscription and transmission fees (\$342/collar for 80 collars) for GPS collars	These subscription fees are necessary to evaluate movements in real time for monitoring purposes. Additional Explanation : These subscription fees will discontinue after the collars are retrieved from the individual.
Capital Expenditures		Calf GPS collars (\$640/collar for 50 elk across two years).	These GPS collars collect data frequent enough to allow for questions regarding movement and survival to best be assessed. Without GPS collars, personnel costs would increase due to increased monitoring of individuals and the fine scale data associated with GPS collars would be lost. Additionally, GPS collars are standard equipment in movement and survival studies. Additional Explanation : The GPS collars will remain on the individual elk until the data is needed for analysis.
Capital Expenditures		UHF ID calf collar transmitter (\$247/transmitter for 50 calves across two years).	These transmitters are necessary to assess cow/calf interactions to gain a better understanding of how calf's interact with their mothers. Additional Explanation : These transmitters will allow us to continue to monitor interactions between the cow and calf for the life of each respective collar; that is, these transmitters will only last as long as either the cow collar or the calf collar.
Capital Expenditures		Calf data subscription and transmission fees (\$173/collar for 50 collars across two years)	These subscription fees are necessary to evaluate movements in real time for monitoring purposes. Additional Explanation : The subscription fees will discontinue once collars are retrieved from the individual.
Capital Expenditures		Vaginal Implant Transmitters (\$243/VIT for 50 females across two years).	Vaginal implant transmitters are commonly used in offspring survival studies as they allow for the timely detection of newborns. Marking newborn calves is important as it allows for a better understanding of how early in life a calf mortality might occur. Additional Explanation : Each vaginal implant transmitter will only be used for the current calving season. Once expelled, they will no longer have the battery life to support a

			subsequent use.
Capital Expenditures		Capture supplies, immobilization drugs, and field investigation biological sampling supplies (\$5,000/year for two years)	Additional supplies for capture and data collection during adult capture events are necessary to ensure the safe capture and handling of individuals as well as the successful collection of biological samples once adults are captured. Additional Explanation : These supplies generally only provide a single-use and as such, will not be kept for an extended period of time.

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
In-Kind	Minnesota Department of Natural Resources	MNDNR Farmland Research Group: Dr. Eric Michel, project management, fieldwork, data analysis, writing, outreach, supervising graduate student; 24 mos, 25% effort	Secured	\$39,750
In-Kind	Minnesota Department of Natural Resources	MNDNR Farmland Research Group: Tyler Obermoller, project management, fieldwork, data analysis; 24 mos, 15% effort	Secured	\$16,500
In-Kind	Minnesota Department of Natural Resources	MNDNR Farmland Research Group: Brian Haroldson, project management, fieldwork, outreach; 24 mos, 10% effort	Secured	\$6,000
In-Kind	Minnesota Department of Natural Resources	MNDNR Wildlife Health Program: Dr. Michelle Carstensen, project management, health screening and necropsy support, analyses; 24 mos, 10% effort	Secured	\$10,500
In-Kind	Minnesota Department of Natural Resources	MNDNR Big Game Program: Dr. Barb Keller, project management, outreach; 24 mos, 5% effort	Secured	\$10,020
In-Kind	University of Minnesota - Twin Cities	University of Minnesota Professor: Dr. Joseph K. Bump, research collaboration and graduate advising; 24 mos, 8.3% effort	Pending	\$18,134
			State Sub Total	\$100,904
Non-State				
In-Kind	Fond du Lac Band of Lake Superior Chippewa	Fond du Lac Band of Lake Superior Chippewa: Mike Schrage, project management, field work; 24 mos, <5% effort	Secured	\$2,240
			Non State Sub Total	\$2,240
			Funds Total	\$103,144

Attachments

Required Attachments

Visual Component

File: [7060328a-bf5.pdf](#)

Alternate Text for Visual Component

Map of northwestern Minnesota depicting the location of the three elk subpopulations. Lower left inset depicts a county map of Minnesota with a black box encapsulating the elk subpopulations in the northwestern portion of the state. Upper left inset shows a collared cow elk with her calf....

Administrative Use

Does your project include restoration or acquisition of land rights?

No

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?

No

Does your project include the design, construction, or renovation of a building, trail, campground, or other capital asset costing \$10,000 or more?

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?

No