Environment and Natural Resources Trust Fund

M.L. 2024 Approved Work Plan

General Information

ID Number: 2024-071

Staff Lead: Mike Campana

Date this document submitted to LCCMR: June 10, 2024

Project Title: Investigating Life History Characteristics of Minnesota Elk

Project Budget: $933,000

Project Manager Information

Name: Eric Michel

Organization: MN DNR - Fish and Wildlife Division

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Project Reporting

Date Work Plan Approved by LCCMR: June 20, 2024

Reporting Schedule: June 1 / December 1 of each year.

Project Completion: December 31, 2027

Final Report Due Date: February 14, 2028

Legal Information

Legal Citation: M.L. 2024, Chp. 83, Sec. 2, Subd. 03h

Appropriation Language: $933,000 the second year is from the trust fund to the commissioner of natural resources to assess Minnesota elk herd health and genetic diversity, movements, survival, and causes of mortality and to develop a noninvasive, safer, and more accurate method to estimate population size. This appropriation is available until June 30, 2028, by which time the project must be completed and final products delivered.

Appropriation End Date: June 30, 2028

Narrative

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.

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 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, and they are weather dependent and dangerous to conduct. We propose exploring alternative survey techniques to improve population estimates.

There was one prior elk study conducted in Minnesota (funded by LCCMR in ML2015) where adult female elk home range size and resource use was estimated. Adult male movement patterns, resource use, and survival estimates 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 and DNR. Herd size will decrease 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 affects chronic 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.

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

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 up to 25 adult females and up to 15 adult males with tracking collars from January to February 2025 and will capture and affix additional tracking collars on up to 25 adult females and up to 15 adult males from January to February 2026. We will also capture and fit tracking collars on up to 25 calves from May to June 2025 and up to an additional 25 calves from May to June 2026. We will monitor movement patterns to assess dispersal and migration events as well as potential immigration and emigration among subpopulations. The same tracking collars we will use to monitor movements will allow us to estimate survival and fecundity rates to establish baseline vital rates, which will be used to manage the herd towards the established goal via population modeling. We will 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
Obtain IACUC Approval	December 31, 2024
Capture adult female and male elk (January to February 2025)	February 28, 2025
Capture elk calves (May to June 2025)	June 30, 2025
Capture adult female and male elk (January to February 2026)	February 28, 2026
Ship biological samples to lab for genetic analysis and health evaluation	June 30, 2026
Capture elk calves (May to June 2026)	June 30, 2026
Monitor elk movement and survival	June 30, 2027
Analyze data	September 30, 2027
Submit internal MNDNR final report	September 30, 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 current year abundance and could serve as an alternate to MNDNR's current aerial surveys used to monitor the population. Current year abundance would also be used in a population model to monitor the elk population. 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
Compare aerial count data to genetic capture-mark-recapture abundance estimates	July 31, 2027
Submit internal MNDNR final report	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
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

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.
The target audience for results from this research will be professionals in the fields of wildlife ecology and wildlife management. We will publish the results of this research internally with the Minnesota Department of Natural Resources via progress reports and research summaries and will send those reports directly to Tribal Biologists to disseminate. We will also publish these results in international peer-reviewed journals such as the Journal of Wildlife Management and the Journal of Applied Ecology. We will present the results from this research at state conferences such as the Minnesota State Wildlife Society Conference, regional conferences such as the Midwest Fish and Wildlife Conference, and national conferences such as the National Wildlife Society Conference. We will also engage with the media via radio and television interviews. The information gained from this research will ultimately improve elk management in Minnesota. We will acknowledge the Environment and Natural Resources Trust Fund through the use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENTRF 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 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.

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

TBD	Professional or Technical Service Contract	Adult data subscription and transmission fees ($342/collar for 80 collars) for GPS collars				-		$27,360
TBD	Professional or Technical Service Contract	Calf data subscription and transmission fees ($173/collar for 50 collars across two years)				-		$8,650
							Sub Total	**$384,170**
Equipment, Tools, and Supplies								
	Equipment	Adult GPS collars ($2281/collar for 80 elk over 2 years)	Monitor adult male and female movements and survival.					$182,480
	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
	Equipment	Calf GPS collars ($640/collar for 50 elk across two years).	Used to monitor movement and survival.					$32,000
	Equipment	UHF ID calf collar transmitter ($247/transmitter for 50 calves across two years).	Used for assessing interactions between the calf and mother.					$12,350
	Tools and Supplies	USB to Vertex Interface	Used to change data collection schedule remotely.					$65
	Equipment	Vaginal Implant Transmitters ($243/VIT for 50 females across two years).	Inserted into pregnant females to aid in calf captures.					$12,150
	Tools and Supplies	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.					$10,000
							Sub Total	**$250,725**
Capital Expenditures								
							Sub Total	**-**
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
		Shipping Costs	Shipping costs for mailing fecal and biological samples to the labs.					$1,800
							Sub Total	**$56,843**
							Grand Total	**$933,000**

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				
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....

Supplemental Attachments

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

Title	File
accepted revised Research Addendum	f4328ac1-338.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Dr. Benjamin Sacks and Dr. Corinne Kozlowksi were originally listed as Project Partners and Collaborators. I received quotes to run lab analyses from them, and they are some of the few individuals capable of these analyses in the country, which is why I originally listed them in my work plan. However, we will likely need to submit an RFP for these services so it is more appropriate to not list them as collaborators at this point, though they may become collaborators at a later time. We also updated the revised budget to request an additional $14,000 to evaluate a new plane with thermal camera technology the Department of Natural Resources has obtained. We will evaluate the thermal cameras capabilities to identify newborn elk calves from aerial flights.

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 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?

Yes, I agree to the Commissioner's Plan.

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?

No

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