

Final Abstract

Final Report Approved on October 8, 2026

M.L. 2023 Project Abstract

For the Period Ending June 30, 2026

Project Title: Efficacy of Urban Archery Hunting to Manage Deer

Project Manager: Jacob Haus

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Funding Source:

Fiscal Year:

Legal Citation: M.L. 2023, Chp. 60, Art. 2, Sec. 2, Subd. 03k

Appropriation Amount: \$393,000

Amount Spent: \$336,072

Amount Remaining: \$56,928

Sound bite of Project Outcomes and Results

Survival and habitat use of female deer were monitored during a controlled archery hunt in Bemidji, Minnesota. Deer in hunted areas moved less, but did not change their resource use or experience reduced rates of survival relative to unhunted deer. Harvest rates must be substantial to reduce urban deer populations.

Summary of Project and Outcomes

White-tailed deer occupy urban landscapes where abundant populations create management challenges. Controlled archery hunting programs are commonly implemented in these areas to reduce deer-human conflict, but their effectiveness remains uncertain. Understanding how deer within urban and suburban areas respond to hunting activities may improve outcomes for urban deer management. We measured survival and behavioral responses of 45 female deer to a controlled archery hunt in northern Minnesota across five relevant periods of approximately 35 days in length (pre-hunt, early-hunt, mid-hunt, late-hunt, and post-hunt). We measured the degree to which deer in hunted and unhunted areas selected for different habitats and how fast they moved. Deer were classified as hunted or unhunted based on the presence of hunted property within their home range in each season. We found no differences in space use between hunted and unhunted deer and no effects of hunting status in any of the 5 seasons. Overall, all deer avoided forested

and open habitats, and had no response to wetlands, roads, or houses. Movement speed declined throughout the study period and was lower in hunted than unhunted deer. Overall, deer showed no significant differences in space use or resource selection, while movement intensity was the only behavioral difference observed between hunted and unhunted individuals. Annual survival was 0.63 (95% CI: 0.52–0.76), but was lower in deer who lived near roads and greater among deer who lived near buildings. Survival did not differ between deer in hunted versus unhunted areas. Harvest rates on females in our study appear insufficient to alter behavior or decrease abundance in an urban population of moderate density. Urban deer in Minnesota may tolerate relatively greater rates of harvest before adopting behavioral responses that would be detrimental to harvest efficiency, and municipalities should therefore maximize hunter effort and distribution.

Project Results Use and Dissemination

The project received media coverage from outlets including MPR News, Outdoor News, and the Bemidji Pioneer. Management recommendation resulting from the research was compiled into a report presented to the Bemidji City Council, Parks Department, and the Airport Authority Board. Results were presented to the scientific community via poster presentations at 3 conferences and a master's thesis prepared by the graduate student. Two manuscripts are in early stages of peer-review for scholarly journals and will be added to the attachment page upon publication. Major management recommendations included increasing harvest density (1.5 deer/km²) and prioritizing areas experiencing population growth.



Environment and Natural Resources Trust Fund

M.L. 2023 Approved Final Report

General Information

Date: October 9, 2026

ID Number: 2023-169

Staff Lead: Erin Barton

Project Title: Efficacy of Urban Archery Hunting to Manage Deer

Project Budget: \$393,000

Project Manager Information

Name: Jacob Haus

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Project Reporting

Final Report Approved: October 8, 2026

Reporting Status: Project Completed

Date of Last Action: October 8, 2026

Project Completion: June 30, 2026

Legal Information

Legal Citation: M.L. 2023, Chp. 60, Art. 2, Sec. 2, Subd. 03k

Appropriation Language: \$393,000 the first year is from the trust fund to the Board of Trustees of the Minnesota State Colleges and Universities for Bemidji State University to conduct an analysis of deer survival, habitat use, and hunter data in the city of Bemidji to improve special archery hunt management practices in urban areas of the state.

Appropriation End Date: June 30, 2026

Narrative

Project Summary: Several municipalities across Minnesota conduct special deer hunts within city-limits, but the efficacy is unknown. An analysis of deer survival and habitat use will improve management practices in these regions.

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

Deer population within urbanized areas cause substantial socioeconomic burdens to municipalities. Overabundant deer populations result in greater rates of deer-vehicle collisions, landscape damage, and increased risk of disease transmission (e.g., Lyme Disease, CWD). Urban deer are difficult to manage as anthropogenic food sources can maintain artificially high population densities, and management practices such as a firearm hunting cannot be safely conducted. Many municipalities throughout Minnesota utilize 'special city archery hunts' that allow for more liberalized harvest regulations than during regular archery seasons. The Bemidji City Council formed the Deer Management Committee in 2005 to operate special archery hunts within 3 city districts to limit negative impacts from overabundant deer populations for city residents. The hunt has removed 478 deer from within city limits since implementation, with greater rates of harvest in more recent years. Annual spotlight surveys suggest deer populations are increasing within all 3 districts however. Deer may alter their behavior or movement in response to hunting pressure, or the number of deer harvested may simply be inadequate to prevent population growth. Special archery hunts may be able to manage urban deer populations, but more research is needed to evaluate the factors affecting their efficacy.

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.

During the winter (January – March) of 2024 and 2025, we will live-capture a total of 40-50 adult female deer within city limits and affix individuals with GPS collars. Collars will provide information on both deer behavioral response to the city hunt as well as mortality data. Annual mortality rate of adult females is the most influential driver of deer population growth, and deer abundance is best managed by adjusting harvest rates of adult females. We will estimate overall rate of mortality as well as mortality due to harvest inside city limits, harvest outside city limits, wounding loss, vehicle collision, and natural causes. We will track the number of special hunt permits issued, hunter effort, and spatial distribution of hunting pressure using both mandatory logs submitted by hunters at the end of the season as well as small GPS units with participating hunters.

Collars on deer will be programmed to record a GPS location fix on individual deer every 30 minutes from 1 August to 31 January each year. We will examine changes in deer behavior in response to the city hunt using resource selection functions before, during, and after the hunting season.

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?

Most research involving urban deer management evaluates human attitudes towards deer and options for non-lethal management. Minnesota is unique in that support of regulated lethal deer management is strong among suburban residents, but there is a paucity of guidelines for effective suburban archery hunting programs. This research will develop best management practices for special city archery hunts, including the spatial distribution of hunting pressure, harvest objectives, and the necessary number of issued permits to achieve management objectives. The guidelines established during this research can be implemented to improve harvest management the special archery hunts throughout the State.

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

Activities and Milestones

Activity 1: Capture, collar, and monitor adult female white-tailed deer within Bemidji city limits

Activity Budget: \$285,000

Activity Description:

We will capture deer using 25'x25' drop nets and netted Clover traps throughout Bemidji City limits between 1 January and 31 March in both 2024 and 2025. We will chemically immobilize deer before removing them from the trap and affixing GPS collars and uniquely identifiable ear tags. Capture locations will be representative of the available habitats within city limits, and we will select locations that prioritize animal safety during the capture process. Deer will be monitored for 2 years or until the conclusion of the study (12-31-2025), with collars recording a GPS location every 30 minutes. At the conclusion of the study, any remaining collars will be removed from the study animals via a remote break-off mechanism in the collar. We will inform participants of the special city hunt that all collared animals are available for harvest, and the presence of the collar should not influence their harvest decisions.

Outcome: Capture 40-50 study animals in total during 2 winter capture periods (2024 and 2025). Monitor deer through the 2025 hunting season to collect data for Activity 2.

Activity Milestones:

Description	Approximate Completion Date
Identify suitable areas for deer capture within city limits.	November 30, 2023
Conduct capture efforts during winter 2024, with the goal of 25 deployed collars.	March 31, 2024
Conduct capture efforts during winter 2025, with the goal of 25 deployed collars.	March 31, 2025
Collect movement and survival data from collared deer for 1 year or until project termination.	December 31, 2025

Activity 2: Estimate cause-specific mortality rates for monitored deer and determine shifts in habitat use in response to the city hunt

Activity Budget: \$82,000

Activity Description:

We will use survival data to determine the percentage of deer being removed from the population through harvest, wounding loss, vehicle collision, and disease, as well as the percentage of deer surviving to the next year. To examine habitat use during the hunt, we will model resource selection using landscape variables (e.g., distance to road, distance to building, percent wetland cover, percent forest cover, ect.) for both day and night time locations before, during, and after the hunting season.

The distribution of hunting pressure through time and space will also be quantified using small GPS location loggers provided to participating hunters. GPS loggers will be activated by pressing a single on/off button before and after each hunt, and will internally store location data. Information on hunting pressure will be included in the analysis of deer movement and survival.

Formal analysis will begin upon the completion of the first hunting season (12/31/24). Databases and statistical models will be updated through the completion of the second hunting season (12/31/25).

Outcome: Determine what percentage of adult females must be removed via harvest to control population growth, and how to most effectively achieve sufficient rates of harvest.

Activity Milestones:

Description	Approximate Completion Date
Analyze rates of deer harvest and mortality in relation to permits issued to hunters.	December 31, 2025
Quantify the habitat use of deer in response to hunting pressure.	December 31, 2025
Record hunter locations via GPS units to estimate the distribution of hunting pressure	December 31, 2025

Activity 3: Identify management practices that effectively control deer population within urban areas using special archery hunts

Activity Budget: \$26,000

Activity Description:

Findings from Activity 2 will be integrated with existing, separately collected data from hunter observation logs and harvest reports. We will use the results of this research to develop recommendation for cities planning to implement or continue suburban archery hunting programs. Guidelines will include minimum hunter density and distribution, numbers of allotted tags per hunter, and priority habitats to target during management efforts.

Outcome: Develop guidelines for effective urban deer archery hunts in Minnesota. Dissemination through professional conferences, student thesis, scientific publications, and a publicly available report to city council with management recommendation applicable to other cities and municipalities.

Activity Milestones:

Description	Approximate Completion Date
Provide report to Bemidji City Council with broadly applicable management recommendations.	February 28, 2026
Provide guidelines to regional and state wildlife managers through professional outlets (conferences, publications, etc.)	March 31, 2026
Draft and submit manuscripts of research findings to peer-reviewed scientific journals.	March 31, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Brian Hiller	Bemidji State University	Dr. Hiller has collected much of the preliminary data on deer density within Bemidji city limits and will continue to cooperate with Dr. Haus regarding the design and execution of the research project.	No
Deer Management Committee	Bemidji City Council	The Deer Management Committee has coordinated the special city archery hunt on behalf of the Bemidji City Council for 15 years. The committee will continue to issue permits, register harvested deer, and record information on hunter permits and hunting locations.	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.

To the professional audience, preliminary findings and recommendations from the project will be disseminated at several wildlife management conferences within the state, including oral and poster presentations. Final results will be prepared in a graduate student thesis at Bemidji State University and submitted to peer-reviewed science journals for publication. For a more general audience and local municipal administrators, project results will be disseminated via a written report to the Bemidji City Council including an executive summary, detailed description of the data and findings, and applicable management recommendations. The report will be made publicly available on the city website and will include general recommendations applicable to other municipalities managing similar controlled archery hunts. The project manager and graduate student will pursue and accept any invitations for media and outreach engagement both within and beyond the Bemidji area. The Environment and Natural Resources Trust Fund will be acknowledged on all communication material through use of the trust fund logo or attribution language on project print and electronic media, publications, and signage.

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?

There are 28 cities and municipalities throughout Minnesota conducting special archery hunts, including several cities attempting to manage CWD outbreaks. Many additional cities experience negative impacts of overabundant deer populations but do not have the infrastructure to design an effective management program from the ground up. Based on the results of this research, we will develop recommendations for urban archery hunting best management practices. Cities across the state will be able to utilize the results of this research to improve the efficacy of their deer management efforts. The project will require no additional work or funding beyond the proposed timeline.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount	\$ Amount Spent	\$ Amount Remaining
Personnel										
Graduate Research Assistant		Data collection, analysis, writing			13%	3		\$92,153	-	-
Haus Principle Investigator		Manage, analyze data, write, outreach			20%	0.24		\$19,673	-	-
Technician support		Seasonal employees to assist graduate student with winter field work			13%	2		\$51,415	-	-
Undergraduate Research Assistant		Assist graduate student with equipment aquasition, maintenance, and field work			0%	1		\$22,600	-	-
Hiller Co-Investigator		Manage, write, outreach			20%	0.1		\$9,600	-	-
							Sub Total	\$195,441	\$166,647	\$28,794
Contracts and Services										
Advanced Telemetry Systems, Inc	Service Contract	Deployed GPS collars require a monthly service fee with manufacturer in order to receive data. We are budgeting 30/month/deployed collar.				0		\$18,000	\$14,160	\$3,840
							Sub Total	\$18,000	\$14,160	\$3,840
Equipment, Tools, and Supplies										
	Equipment	GPS collars (35x) at \$3250 per unit	Collars to collect data on deer movement and survival					\$113,750	\$113,750	-
	Equipment	Telemetry receivers (3) and antennas (4)	Equipment used to track and relocate GPS collars					\$2,100	\$2,100	-
	Equipment	Equipment to capture deer	drop nets (4x) at \$4250 per; clover traps (5x) at \$1000 per, pharmaceuticals (55x doses) at \$75 per					\$31,625	\$25,150	\$6,475
	Tools and Supplies	Supplies to capture deer	Miscellaneous capture supplies (syringes, needles,					\$10,124	\$10,124	-

			ear tags, tag applicators, tool boxes, shelled corn, etc.)							
	Equipment	GPS loggers to track hunters	Small GPS units provided to hunters to carry on their person while hunting (Not purchased in 2nd year, see report)					\$2,500	\$84	\$2,416
							Sub Total	\$160,099	\$151,208	\$8,891
Capital Equipment										
							Sub Total	-	-	-
Acquisitions and Stewardship										
							Sub Total	-	-	-
Travel In Minnesota										
	Miles/ Meals/ Lodging	Field travel to, from, and within study sites; miles (17,000 miles at 0.58/mile)	Travel during field research activities; travel to check and set traps 2x/day; travel to obtain field equipment and supplies; travel to monitor collared deer. Based on an estimated distance of 45 miles/day total between grad student and technicians for the duration of the study period.					\$9,860	\$2,872	\$6,988
	Conference Registration Miles/ Meals/ Lodging	Registration, travel, lodging, and food for 2 people to attend 2 professional conferences	Travel for graduate student and undergraduate researcher to attend 2 conferences in Minnesota and present results of research	X				\$6,000	\$1,185	\$4,815
							Sub Total	\$15,860	\$4,057	\$11,803
Travel Outside Minnesota										

							Sub Total	-	-	-
Printing and Publication										
	Publication	Publication charges for 2 research manuscripts at \$1800 per	To publish results in peer- reviewed journals available to the scientific community					\$3,600	-	\$3,600
							Sub Total	\$3,600	-	\$3,600
Other Expenses										
							Sub Total	-	-	-
							Grand Total	\$393,000	\$336,072	\$56,928

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Travel In Minnesota	Conference Registration Miles/Meals/Lodging	Registration, travel, lodging, and food for 2 people to attend 2 professional conferences	Attendance to the conferences will involve student presentations and formal dissemination of the project results.

Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount	\$ Amount Spent	\$ Amount Remaining
State						
			State Sub Total	-	-	-
Non-State						
In-Kind	Bemidji State University	Bemidji State University will provide indirect cost (12%) as in-kind support.	Secured	\$47,160	\$47,160	-
In-Kind	Bemidji State University Wildlife Research Program	Dr. Haus will provide trail cameras (30), telemetry receivers (4), antennas (3), GPS units (2), and other miscellaneous field supplies as in-kind support.	Secured	\$20,000	\$20,000	-
			Non State Sub Total	\$67,160	\$67,160	-
			Funds Total	\$67,160	\$67,160	-

Attachments

Required Attachments

Visual Component

File: [2fe7be11-83a.docx](#)

Alternate Text for Visual Component

The document contains figures representing major conclusions from the research. The first figure shows the study's location within Minnesota. The second figure shows similar survival curves between hunted and unhunted deer within city limits. The third figure shows the difference in daytime/ nighttime movement velocities between hunted and unhunted deer....

Supplemental Attachments

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

Title	File
Background check certification	4b0358d0-5a3.pdf
Research Addendum	de851341-24a.pdf
Dissemination update (April 1 2024)	a6e0d3d1-6dd.docx
Research Poster 2026	46bc1ebc-f8e.pdf
Preliminary data results (4.7.26)	74426d87-77f.docx
Report to Bemidji City Council	16705cb7-6b4.pdf
Graduate Student Thesis Defense Powerpoint	acaa74df-d50.pptx
Research Poster 2024	5739ea0d-d15.pdf
Research Poster 2024_2	e03209fe-404.pdf
City of Bemidji Spotlight survey results (2016-2019)	3b7e7412-b1c.pdf

Media Links

Title	Link
Bemidji State University study seeks to discover the secrets of urban deer life	https://www.mprnews.org/story/2024/02/29/bemidji-state-university-study-seeks-to-discover-the-secrets-of-urban-deer-life
New city-wide deer research project to take place in Bemidji	https://www.bemidjipioneer.com/sports/northland-outdoors/new-city-wide-deer-research-project-to-take-place-in-bemidji
BSU's deer-surveying expertise will support Fond du Lac Band's elk restoration project	https://www.bemidjipioneer.com/news/local/bsus-deer-surveying-expertise-will-support-fond-du-lac-bands-elk-restoration-project
How did June's storm impact Bemidji's deer population?	https://www.bemidjipioneer.com/sports/northland-outdoors/how-did-junes-storm-impact-bemidjis-deer-population?utm_medium=social&utm_source=facebook_Bemidji_Pioneer&fbclid=IwQ0xDSwN-w8BleHRuA2FlbQlxMQBzcnRjBmFwcF9pZAo2NjI4NTY4Mzc5AAEe5Nf0CNt2VwVE7-b9ysemPJlLEwb8dpEv4szCfUPdSsdjs97oTgTzdD9Kh0E_aem_bWewcvZZgU25zb6YysDiCg
Bemidji's urban deer study findings offer useful data for rural cities	https://www.bemidjipioneer.com/sports/northland-outdoors/bemidjis-urban-deer-study-findings-offer-useful-data-for-rural-cities?fbclid=IwY2xjawKtMdtleHRuA2FlbQlxMQBicmlkETfpZ2pIYkVoOTZDc2pueGFFAR69_6S-9typWa-JbsmU9Nyzm5WH5QRq4fEviTj5yWlkpm5rl_VS7elAwWqtlA_aem_L-VGzg_kLqNncymRBq4AUA
BSU study looks at deer management in state cities	https://www.outdoornews.com/2023/08/03/bsu-study-looks-at-deer-management-in-state-cities/

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Approved research addendum added

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 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 Commissioner's Plan 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?

No

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

Work Plan Amendments

Amendment ID	Request Type	Changes made on the following pages	Justification For Amendment Request (word limit 75)	Date Submitted	Approved	Date of LCCMR Action
1	Amendment Request	• Other • Budget - Professional / Technical Contracts	I contracted with the GPS collar manufacturer Advanced Telemetry Systems, Inc (ATS). ATS provided the functionality in their fix programming allowing for 30-minute fix intervals throughout our study period. Additionally, I owned several receivers and antennas that were compatible with ATS transmitters and I provided the equipment as in-kind support for the project.	January 29, 2025	Yes	January 30, 2025
2	Amendment Request	• Budget - Personnel • Budget - Capital, Equipment, Tools, and Supplies • Budget - Travel and Conferences	Allow graduate student stipend to continue through Spring 2026 to complete data analysis/writing following an extended medical leave of absence. Funds are available from 'travel' budget as 'field work mileage' was under budget. Modification of remaining equipment budget to purchase or maintain equipment; specifically telemetry equipment requiring repair or replacement. Funds are available to be moved from the line item for GPS loggers, which we decided not to use following an initial pilot study.	December 8, 2025	Yes	December 9, 2025
3	Completion Date	Previous Completion Date: 03/31/2026 New Completion Date: 06/30/2026	Administrative change to align project end date with appropriation end date.	November 13, 2025	Yes	December 9, 2025

Status Update Reporting

Final Status Update August 14, 2026

Date Submitted: August 14, 2026

Date Approved: September 11, 2026

Overall Update

The project was completed successfully. As mentioned in a previous update, the only objective we changed was the 3rd milestone under Activity 2 which was shifted from a continuous measure of hunter effort via GPS loggers to a binary classification of hunting pressure using reported harvest logs. All other milestones were completed as described. We captured and collared 73 deer, of which 45 deer both survived to begin the monitoring period the following fall and provided full data sets. Reduction in sample size was due to deer who died prior to the study period, experienced collar failures, or the collars could not be recovered to download the full dataset.

The graduate student completed their analysis of the deer movement and survival data, which culminated in a completed thesis with 2 chapters. Both chapters examine different aspects of movement and survival in response to a controlled archery hunt, and include management recommendation relevant to each topic. In the update for Activity 2 below, I provide high-level results from data analysis, and in the Activity 3 update I provide a summary of the management recommendations resulting from the research. A more detailed summary can be found in the graduate student thesis (attached).

Activity 1

This activity was previously marked complete.

(This activity marked as complete as of this status update)

Activity 2

We have completed this activity. We monitored 45 GPS-collared adult female deer between 2024 and 2026. Estimated annual survival was 63%, meaning nearly two-thirds of adult females survived from one year to the next. Twenty-four mortalities were documented during the study. Vehicle collisions were the leading cause of death, accounting for approximately 42% of mortalities. Hunting and natural causes each accounted for approximately 29%. Rates of illegal harvest (43% of all harvest) were nearly equal to legal harvest that followed the regulations of the city hunt (57% of harvest). Survival was influenced more strongly by urban landscape characteristics than by hunting exposure. Deer occupying areas with greater road density experienced lower survival rates, while deer living in more residential portions of the city generally exhibited higher survival. Survival did not differ significantly between deer whose home ranges overlapped hunted properties and those occupying unhunted areas.

GPS data revealed that deer exposed to hunting activity behaved similarly to deer occupying unhunted areas. Home range size, overall space use, and habitat selection remained largely consistent throughout the hunting season regardless of hunting exposure. The primary behavioral response of hunted deer observed was reduced movement velocity (See figures in report to city).

(This activity marked as complete as of this status update)

Activity 3

Our results found there was no difference in mortality rate between hunted and unhunted deer, and current harvest levels were too low and unevenly distributed throughout the city to drive population reduction. Specific management recommendation outlined to the city (attached report) include;

1) A review of safety buffers that may allow for an expansion of participating properties. Harvest is currently limited as

much by hunter distributions as it is by permit numbers. Expansion of access may also alleviate rates of unreported harvest.

2) An increased number of permits. Harvest was correlated to number of permits issues, and we observed no modification of deer behaviors in response to hunting that would affect harvest efficiency. Our results show a target of 100 permits issues may increase harvest to levels (35% of adult females) that can overcome compensatory dynamics and drive population decline.

All dissemination material discussed in Activity 3 have been completed, submitted to the appropriate parties, and attached here. The timeline for review and publication of the scientific journal articles will extend beyond the project end date, and budget line item for publication charges is unused. I will use non-ENRTF funds to pay future journal publication fees.

(This activity marked as complete as of this status update)

Dissemination

The graduate student produced a thesis with two chapters; the first focused on the movement response of collared deer to the hunting pressure within the city, the second examined the factors driving deer survival during the hunt. The thesis document is attached. The first chapter has been submitted to a peer-reviewed journal, and I anticipate the second chapter to be ready for submission by the end of August 2026. Using results from the thesis, we prepared a report to the City of Bemidji with high-level results and a recommendations for future management (attached). We have been invited to share our findings with the Bemidji Airport Authority, which manages the largest hunted property within the city. We will attend their quarterly meeting this coming fall. I have updated the media reports attachment with all coverage the project has received. I have updated the attachments tab to also include all conference poster and PowerPoint files prepared by the graduate student.

Status Update Reporting

Status Update April 1, 2026

Date Submitted: May 15, 2026

Date Approved: May 26, 2026

Overall Update

Since the previous October update, we have completed the final monitoring of the second year study cohort. Over 2 years, we captured and collared 73 deer, of which 45 deer both survived to begin the monitoring period the following fall and provided full data sets. Reduction in sample size was due to deer who either died prior to the study period, had technical issues with the collar, or the collars could not be recovered to download the full dataset. We monitored 45 adult females throughout the controlled city hunt and observed the following mortality causes; 13 predation events, 7 hunter harvests, 10 vehicle collisions. Preliminary analysis of movement data showed little difference in behavior between hunted and unhunted deer, with hunted deer moving slightly more overall but selecting for similar habitats as unhunted deer. Hunted deer also appeared to demonstrate more variability in their use of wetlands and forested habitats as the hunting season progressed. The graduate student is nearing completion of their thesis and will present their results to the city of Bemidji as well as submit their thesis chapters for peer-reviewed publication. The project is on schedule to be completed by 30 June 2026.

Activity 1

Work related to activity one is complete. We recorded and recovered data from 25 of 30 collared deer throughout the hunting season in 2025, bringing our total sample size between 2 years to 45 deer. This sample size is near the stated goal of 50 deer and is sufficient for statistically valid conclusions. The second year monitoring period concluded on 31 January 2026 and all collars were remotely removed from remaining study animals. The full data sets have been downloaded from the collars and the graduate student is progressing through analysis and writing.

(This activity marked as complete as of this status update)

Activity 2

Preliminary data figures have been added as an attachment. The primary finding is that although we observed minor shifts in habitat use and movement between hunted and unhunted deer, the shifts were not likely to have implications for harvest susceptibility. Survival data is still being analyzed, although rough data shows harvest as a relatively small component of mortality; with rates of harvest below rates of predation and vehicle collision. We observed no statistical difference in annual mortality between hunted and unhunted populations of deer within the city.

Activity 3

The grad student has nearly completed a first draft of their thesis, which will undergo review from their graduate committee prior to their defense this summer. The thesis documents will serve as a foundation for recommendations to the City of Bemidji and subsequent peer-reviewed manuscripts to the broader scientific community. The report will be submitted to city council by 30 June. Manuscripts will be submitted to journals as early as feasible, but timelines are difficult to predict when working with a team of coauthors and editors. Within 6 months of the student's defense is a reasonable timeline for submission. Preliminary results suggest urban deer do not demonstrate the same substantial behavioral response to hunting pressure as seen in rural deer. Management recommendation may involve increasing permit availability and the distribution of hunter effort to as high as safely possible in urban areas, as deer do not appear to shift behavior or habitat use in response to hunting, and current harvest levels appear insufficient to reduce density.

Dissemination

The graduate student on the project presented a research poster at the the Minnesota Chapter of The Wildlife Society's annual meeting in Duluth on Feb 26th-28th. The poster is attached and provided summary data from Year 1; including

movement metrics, habitat use, and home range composition of both hunted and unhunted urban deer. MPR news has requested a follow-up story to their initial coverage at the beginning of the project (Feb 2024), and we are arranging schedules now.

Status Update Reporting

Status Update October 1, 2025

Date Submitted: October 7, 2025

Date Approved: October 13, 2025

Overall Update

The project remains on schedule. There is little to update since the previous April report as we are primarily only waiting for the data collected during the current hunting season. However, there has been progress on the modeling and analysis applications, which were refined following the data collection period in year 1 and are ready to be updated with data from year 2. The total sample size for both years of the project will be 52 deer monitored during hunting seasons within the city, which is a statistically robust sample. An unexpected update was the cancellation of the city hunt on public lands in 2025. The decision was made due to unsafe conditions following a major June windstorm that destroyed or damaged many trees, trails, and infrastructure within the city parks. While not originally our study design, the change in 2025 will make for a useful control/treatment study framework and should help examine the effects of urban hunting pressure.

Activity 1

Activity 1 involved the capture and GPS collaring of all deer on the project during the winters of 2024 and 2025. Capture was completed using netted cage traps and drop nets during the winter (Jan - March). As of April 1st, all capture and collaring activities are finished. We captured and collared 73 total deer over 2 years, and continue to monitor the animals captured in 2025. The cohort captured in 2024 has completed their annual monitoring period and all remaining collars were removed from the cohort by 1 May 2025. Data upload from the 2024 cohort is complete; 22 animals recorded location data during the 2024 hunting season. We are currently monitoring 30 deer from the 2025 cohort, and their collars will continue to collect data until February 2026. Progress towards this activity is on schedule.

Activity 2

The data collection period from animals in year 1 is complete, and we completed the initial analysis of deer habitat use and survival from that first cohort. The models built to estimate home ranges and model habitat selection will be used for the 2025 cohort once the full data set is available Feb 2026. The use of GPS loggers provided to hunters was not resulting in usable data. Hunter compliance was low (hunters mention forgetting to bring or activate/deactivate the GPS units), and the fix acquisition rate of the loggers was also low, resulting in large gaps within the available data. We suspended the use of the GPS loggers during 2025 hunting season and will instead use the existing hunter logs submitted to the city in order to quantify spatial and temporal hunting risk on the landscape at a broader scale. Furthermore, the city suspended hunting permits on public property due to safety concerns as a result of the ongoing clean-up efforts following a major summer storm in the Bemidji area. We expect a large decrease in the number of active hunters within city limits in 2025, which will serve as useful comparison to the 2024 data.

Activity 3

We have not begun work on Activity 3. Work in this activity will begin following the conclusion of the second study year (Jan 2026).

Dissemination

Bemidji Pioneer article on the transition from Bemidji Urban Project to Fond du Lac deer project-phase I (2025)

<https://www.bemidjipioneer.com/news/local/bsus-deer-surveying-expertise-will-support-fond-du-lac-bands-elk-restoration-project>

Status Update Reporting

Status Update April 1, 2025

Date Submitted: June 3, 2025

Date Approved: July 7, 2025

Overall Update

This is the 3rd update since initial funding. The project is on schedule for all stated outcomes. All budget items are within budget and remaining balances are appropriate for this stage of the project. Field work during the 1st and 2nd deer capture periods is complete and we have begun analyzing data from the 2024 period.

Activity 1

Activity 1 involved the capture and GPS collaring of all deer on the project during the winters of 2024 and 2025. Capture was completed using netted cage traps and drop nets during the winter (Jan - March). As of April 1st, all capture and collaring activities are finished. We captured and collared 73 total deer over 2 years, and continue to monitor the animals captured in 2025. The cohort captured in 2024 has completed their annual monitoring period and all remaining collars were removed from the cohort by 1 May 2025. Data upload from the 2024 cohort is complete; 22 animals recorded location data during the 2024 hunting season. We are currently monitoring 34 deer from the 2025 cohort, and their collars will continue to collect data until February 2026. Progress towards this activity is on schedule.

Activity 2

The data collection period from animals in year 1 is complete, and we are currently building datasets and beginning initial analysis of deer from that first cohort. We have built and refined analytical methods to estimate home ranges and model habitat selection. Obtaining reliable data from GPS loggers provided to hunters has proved challenging. Hunter compliance is low (hunters mention forgetting to bring or activate/deactivate the GPS units), and the fix acquisition rate of the loggers is low resulting in large gaps within the available data. The data may still provide useful information on hunter behaviors, but we are considering suspending use of the GPS loggers in fall 2025 to instead use the existing hunter logs to submitted to the city in order to quantify spatial and temporal hunting risk on the landscape at a broader scale.

Activity 3

We have not begun work on Activity 3. Work in this activity will begin following the conclusion of the second study year (Jan 2026).

Dissemination

No dissemination update since previous report

Status Update Reporting

Status Update October 1, 2024

Date Submitted: October 1, 2024

Date Approved: January 30, 2025

Overall Update

This is the second update since initial funding. The first year of deer capture on the project was completed March 31 2024. We initially collared 30 collared female deer, which exceeded our minimum goal of 25 during the first winter of the project. After 11 mortalities throughout the summer and fall, we are currently monitoring 19 adult females. All budget items are within budget and remaining balances are appropriate for this stage of the project. Data collection on the first cohort of collared deer began August 14 2024, and we have begun preliminary data formatting and database management.

Activity 1

No change since the previous update; project is still on track for Activity 1.

As of March 31st, we have completed Milestone 1 and 2 of Activity 1, which places the project on track with the proposed schedule. We captured and collared 30 female white-tailed deer within city limits of Bemidji. The second capture season will begin Jan 1 2025.

Activity 2

No change since the previous update; project is still on track for Activity 2.

The first year of data used for Activity 2 is now being collected, and data collection for year 1 will be completed in January 2025. We can begin work on Activity 2 following January 2025.

Activity 3

We have not begun work on Activity 3. Work in this activity will begin following the conclusion of the second study year (Jan 2026).

Dissemination

In addition to the dissemination covered during the last project update, the graduate student will present another poster at an academic conference on October 22 2024. Other dissemination efforts have been targeted at local deer hunters prior to the managed hunt in Bemidji - including the following website (<https://faculty.bemidjistate.edu/jhaus/research/bemidji-deer-project/>).

Status Update Reporting

Status Update April 1, 2024

Date Submitted: April 4, 2024

Date Approved: June 14, 2024

Overall Update

This is the first update since initial funding. The first year of deer capture on the project was completed March 31 2024. We have 30 collared female deer currently, which exceeded our minimum goal of 25 during the first winter of the project. All budget items are within budget and remaining balances are appropriate for this stage of the project. The first primary data collection period will begin August 15th 2024.

Activity 1

As of March 31st, we have completed Milestone 1 and 2 of Activity 1, which places the project on track with the proposed schedule. We captured and collared 30 female white-tailed deer within city limits of Bemidji.

Activity 2

The first year of data used for Activity 2 is now being collected, and data collection for year 1 will be completed in January 2025. We can begin work on Activity 2 following January 2025.

Activity 3

We have not begun work on Activity 3. Work in this activity will begin following the conclusion of the second study year (Jan 2026).

Dissemination

The graduate student presented an academic poster at the Minnesota chapter of The Wildlife Society Meeting in February 2024 (attached). The project was covered in several popular media outlets (Outdoor News, MPR News, and the Bemidji Pioneer (attached).