

**Environment and Natural Resources Trust Fund**

# 2022 Request for Proposal

## **General Information**

**Proposal ID:** 2022-069

**Proposal Title:** Effects of Road Mortality on Minnesota Wildlife

## **Project Manager Information**

**Name:** Ron Moen

**Organization:** U of MN - Duluth - NRRI

**Office Telephone:** (218) 788-2610

**Email:** rmoen@d.umn.edu

## **Project Basic Information**

**Project Summary:** Study road mortality of wildlife species in Minnesota and identify ways to reduce frequency of animal-vehicle collisions to conserve wildlife and improve safety on Minnesota roads

**Funds Requested:** $183,000

**Proposed Project Completion:** June 30 2024

**LCCMR Funding Category:** Small Projects (H) **Secondary Category:** Foundational Natural Resource Data and Information (A)

## **Project Location**

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

**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.**

Deer-Vehicle Collisions (DVCs) pose a significant risk to public safety on Minnesota roads. In 2019, 1,263 DVCs were reported to the MN Department of Public Safety (MnDPS).   
  
DVCs with minor damage are not reported to MnDPS. State Farm estimated 42,207 DVCs in 2015 based on accident claims, about 20 times the number of DVCs reported to the MN DPS. An estimated 25,000 DVCs in 2019 had an economic cost of about $124 million (see Graphic). It is probably safe to assume that each of the 25,000 DVCs resulted in a dead deer.   
  
Thus, the wildlife cost of DVCs in 2019 was about 13% of the 189,637 deer harvested in Minnesota.   
  
Our current MnDOT project (“Identifying Deer-Vehicle Collision Concentrations in Minnesota”, $165,450) focuses on the human cost of DVCs, uses machine-learning to identify locations to reduce DVCs, and develops a small-scale pilot project to obtain field estimates of the number of unreported DVCs.   
  
With this proposal to the LCCMR, we hope to expand the MnDOT research project with a broader focus on the potential effect of road mortality on other wildlife.

**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.**

The proposed work builds on a funded MnDOT project to analyze safety implications of DVCs in Minnesota that also includes an analysis of DVCs near Duluth. Our proposed work applies this research methodology to study other wildlife species in Minnesota and expand the geographic scale of DVC surveys.  
  
ENRTF funding would (1) expand the geographic scope of the MnDOT research project, and (2) collect roadkill data on other wildlife species. The ultimate goals of the road mortality research project are:  
  
1. Use foundational data collected from road mortalities to estimate the potential effect of road mortality on wildlife species (including deer).  
  
2. Identify ways to reduce the number of Wildlife-Vehicle Collisions (WVCs), which will benefit both humans and wildlife populations.   
  
The MnDOT project is limited to DVCs and relies heavily on data collected in the area surrounding Duluth. With ENRTF funding we would expand the road survey for DVCs to include much of the area of reported DVCs (see graphic). We would also be able to record roadkill locations of other species to include in the DVC road mortality hotspot analysis framework. This would address both driver safety and wildlife conservation objectives for MnDOT and other highway departments.

**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?**

The project outcome is a greater understanding of the potential effect of road mortality on wildlife populations in Minnesota. Road mortality will always occur, and we believe a good approach is to understand the magnitude of road mortality in the context of populations of different wildlife species. Together, the MnDOT project and the proposed ENRTF roadkill project will help protect, conserve, preserve, and enhance the state’s natural resources.

## **Activities and Milestones**

### **Activity 1: Collect road mortality data for MN Wildlife to inform machine learning protocol and predict road mortality hotspots**

**Activity Budget:** $183,000

**Activity Description:**The activity has three parts:   
  
Part 1: Collect and analyze road mortality data for Minnesota Wildlife species  
Part 2: Use machine-learning to predict road mortality hotspots  
Part 3: Disseminate results of Part 1 and Part 2 to resource management agencies and to the public   
  
In Part 1, we use the road mortality protocol developed in the MnDOT DVC research project. Systematic surveys will be repeated on sections of roadways for an annual estimate of road mortalities for different species. Surveys will be stratified by road type and by Average Annual Daily Traffic data. We will also collect biotic and geographic features at each mortality site (e.g., vegetation, viewshed, road features).   
   
In Part 2, we will apply the machine learning model developed in the MnDOT project to data collected in Part 1. Machine learning techniques are able to identify statistical patterns in data sets that may not be apparent otherwise. This allows the research team to construct a model for crash risk that goes beyond a simple map-based analysis.   
  
In Part 3, we will disseminate results of Part 1 and Part 2 to agencies (MnDOT, MNDNR), to other scientists via peer-reviewed publications, and to the public via a roadkill website.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Completion Date** |
| Collect and analyze animal mortality data on Minnesota roads | December 31 2023 |
| Machine learning model applied to animal mortality data | March 31 2024 |
| Identify possible ways to reduce animal road mortality and increase human safety | June 30 2024 |
| Disseminate results to resource management agencies and to the public | June 30 2024 |

## **Project Partners and Collaborators**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Organization** | **Role** | **Receiving Funds** |
| Raphael Stern | University of Minnesota - Twin Cities | Co-PI. Dr. Stern is an Assistant Professor in the Dept. of Civil, Environmental, and Geo- Engineering. He and his lab have expertise in traffic data analysis via machine learning. Dr. Stern is the PI on the related funded MnDOT project: Identifying Deer-Vehicle Collision Concentrations in Minnesota | 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?**For wildlife, the systematic survey will provide an initial analysis of the effect of road mortality on wildlife populations. The effect may be larger than expected (DVC mortality equal to over 13% of the annual deer harvest), for other wildlife species the effect may be minimal at the population level.  
  
For people, the benefit will be identifying ways to reduce wildlife-vehicle collisions (WVCs), and in conjunction with the MnDOT DVC project, making Minnesota roads safer.   
  
This project could result in us, agency personnel, or a Citizen Science approach to continue monitoring AVCs using the protocol developed in the two projects.

## **Other ENRTF Appropriations Awarded in the Last Six Years**

|  |  |  |
| --- | --- | --- |
| **Name** | **Appropriation** | **Amount Awarded** |
| Endangered Bats, White-Nose Syndrome, and Forest Habitat | M.L. 2015, Chp. 76, Sec. 2, Subd. 03i | $1,250,000 |
| Genetic and Camera Techniques to Estimate Carnivore Populations | M.L. 2015, Chp. 76, Sec. 2, Subd. 03l | $200,000 |

## **Project Manager and Organization Qualifications**

**Project Manager Name:** Ron Moen

**Job Title:** Associate Professor / Senior Research Associate

**Provide description of the project manager’s qualifications to manage the proposed project.**Key Qualifications: Ron is a Wildlife Ecologist and Research Lab Manager at the Natural Resources Research Institute, University of Minnesota Duluth. He has over 25 years of research experience focusing on mammals, telemetry, and wildlife ecology.   
  
EDUCATION:   
  
 Ph.D., 1995. University of Minnesota, Wildlife Conservation.   
 M.S., 1988. University of Minnesota, Wildlife. Plant Physiology Minor.  
 B.S., 1984. Cornell University, Division of Biological Sciences.  
  
RELEVANT RESEARCH EXPERIENCE:   
  
Dr. Moen has worked on and managed research projects on many different species while at NRRI, with over $4 million of research projects on Minnesota mammals funded. In addition, Dr. Moen has taught Mammalogy at the University of Minnesota Duluth since 2003, and guided over 20 graduate students doing research on mammals in Minnesota to M.S. and Ph.D. degrees.   
  
PUBLICATIONS ON MAMMALS (Examples, > 50 peer-reviewed, > 60 Technical Reports):  
  
Moen, R.A., C.L. Burdett, and G.J. Niemi. 2008. Movement and Habitat use of Canada Lynx during denning in Minnesota.   
 Journal of Wildlife Management 72:1507-1513.  
  
Moen, R., G.J. Niemi, and C. Burdett. 2008. Canada lynx in the Great Lakes. NRRI Technical Report No. NRRI/TR-2008/14.  
  
McCann, N. and R.A. Moen. 2011. Mapping potential core areas for lynx (Lynx canadensis) using snowshoe hare   
 (Lepus americanus) pellet counts and satellite imagery. Canadian Journal of Zoology 89:509-516.  
  
Ditmer, M.A., J.R. Fieberg, R.A. Moen, S.K. Windels, S.P. Stapleton, and T.R. Harris. 2018. Moose movement rates   
 are altered by wolf presence in two ecosystems. Ecology and Evolution 8(17):9017-9033.   
  
Moen, R., and M. Swingen. (2018). Historical northern long-eared bat occurrence in Minnesota based on   
 acoustic surveys. NRRI Technical Report No. NRRI/TR-2018-40.

**Organization:** U of MN - Duluth - NRRI

**Organization Description:**The Natural Resources Research Institute (NRRI) is an applied research and economic development engine for the University of Minnesota research enterprise. NRRI employs over 130 scientists, engineers and technicians to deliver on its mission to deliver integrated research solutions that value our resources, environment and economy for a sustainable and resilient future. NRRI collaborates broadly across the University system, the state and the region to address the challenges of a natural resource based economy.   
  
NRRI researchers have extensive experience in managing large, interdisciplinary projects. NRRI’s role is as an impartial, science-based resource that develops and translates knowledge. Projects include characterizing and defining resource opportunities, minimizing waste and environmental impact, maximizing value from natural resources and maintaining/restoring ecosystem function.

## **Budget Summary**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Category / Name** | **Subcategory or Type** | **Description** | **Purpose** | **Gen. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified Staff?** | **$ Amount** |
| **Personnel** |  |  |  |  |  |  |  |  |
| Project Manager |  | Manage project, Experimental design, Data analysis, Writing results, Field work |  |  | 26.7% | 0.16 |  | $28,255 |
| Co-Investigator |  | Help manage project, Experimental design, Data analysis, Writing results |  |  | 26.7% | 0.16 |  | $28,960 |
| Scientist |  | Experimental design, Data analysis, Writing results, Field work |  |  | 26.7% | 0.2 |  | $17,343 |
| Researcher 2 / Web Development |  | Field work, data entry, web site creation |  |  | 24.1% | 0.52 |  | $41,246 |
| Grad Student - Summer |  | Field work, Data entry and analysis, writing results |  |  | 16.7% | 0.14 |  | $7,000 |
| Grad Student - Academic Year |  | Field work, Data entry and analysis (machine learning), writing results |  |  | 21.9% | 0.36 |  | $20,380 |
| Undergraduate Research Assistant |  | Field work, Data entry, Literature searches |  |  | 0% | 0.38 |  | $10,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$153,184** |
| **Contracts and Services** |  |  |  |  |  |  |  |  |
| University of Minnesota Duluth | Internal services or fees (uncommon) | NRRI GIS Lab fee @ $5.25 / hour. Standard user fee for access to NRRI GIS lab, estimated at 38 hours |  |  |  | 0 |  | $200 |
|  |  |  |  |  |  |  | **Sub Total** | **$200** |
| **Equipment, Tools, and Supplies** |  |  |  |  |  |  |  |  |
|  | Tools and Supplies | Dash cams (4), Cameras w/ GPS (4), Latex gloves (20 boxes), SD cards (8), Lithium AA batteries (2 boxes) | Dash cams record road mortalities while driving, cameras w/ GPS give site-specific data, SD cards for cameras/Dashcams, Latex gloves for touching dead animals, batteries for power cameras |  |  |  |  | $2,500 |
|  |  |  |  |  |  |  | **Sub Total** | **$2,500** |
| **Capital Expenditures** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Acquisitions and Stewardship** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Travel In Minnesota** |  |  |  |  |  |  |  |  |
|  | Miles/ Meals/ Lodging | Estimated 60 trips, 13,000 miles, 1 person / trip, some overnight | In state travel to search for wildlife mortalities on roads |  |  |  |  | $23,816 |
|  | Conference Registration Miles/ Meals/ Lodging | Conference attendance (e.g., The Wildlife Society meetings, DNR Roundtable). Estimated Costs include conference registration fee and GSA approved rates for mileage, hotel, per diem. | Presentations/Discussion on results of road mortality survey project |  |  |  |  | $1,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$24,816** |
| **Travel Outside Minnesota** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Printing and Publication** |  |  |  |  |  |  |  |  |
|  | Publication | Page charges for manuscripts on Road Mortality Project results | Peer-reviewed publications increase acceptance of research results |  |  |  |  | $2,300 |
|  |  |  |  |  |  |  | **Sub Total** | **$2,300** |
| **Other Expenses** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
|  |  |  |  |  |  |  | **Grand Total** | **$183,000** |

### **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 | MnDOT Project Number: 2020-063, Contract WO#: 1036342 WO#11 TITLE: Identifying Deer-Vehicle Collision Concentrations in Minnesota | The MnDOT project referenced in this proposal is funded from 7/1/2021 to 11/30/2023 with Raphael Stern as PI and Moen as CoPI. The focus of the MnDOT project is reducing Deer-Vehicle collisions. In this proposal to LCCMR we are expanding the work to other wildlife species (also of concern to MnDOT) and collecting data on deer from a broader area (the direct link between the two proposals). There will be 50% overlap in time in these projects if this proposal to LCCMR is funded. The MnDOT award is technically not matching funds for the LCCMR project, so the award amount is not specified here. However, the proposed LCCMR project will significantly benefit from the analyses and data developed under the MnDOT award, and the MnDOT project will significantly benefit from the geographic expansion of data collection. | Secured | - |
|  |  |  | **State Sub Total** | **-** |
| **Non-State** |  |  |  |  |
| In-Kind | UMN unrecovered indirect costs are calculated at the UMN negotiated rate for research of 55% modified total direct costs. | Indirect costs are those costs incurred for common or joint objectives that cannot be readily identified with a specific sponsored program or institutional activity. Examples include utilities, building maintenance, clerical salaries, and general supplies.  (https://research.umn.edu/units/oca/fa-costs/direct-indirect-costs) | Secured | $99,934 |
|  |  |  | **Non State Sub Total** | **$99,934** |
|  |  |  | **Funds Total** | **$99,934** |

## **Attachments**

### **Required Attachments**

#### ***Visual Component***

File: [b333cd45-56f.pdf](https://lccmrprojectmgmt.leg.mn/media/map/b333cd45-56f.pdf)

#### ***Alternate Text for Visual Component***

Figure showing the wildlife and human costs of deer-vehicle collisions (DVCs). The number of deer killed by cars equals about 13% of the number killed during the hunting season. Other wildlife species are rarely recorded in the MN DPS database, and our goal in this project is to increase understanding of the effect of road mortalities on wildlife populations....

### **Optional Attachments**

#### ***Support Letter or Other***

|  |  |
| --- | --- |
| **Title** | **File** |
| UMD Sponsored Projects Transmittal Letter | [944f58ba-7b0.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/944f58ba-7b0.pdf) |
| MnDOT Letter of Support | [5b429869-ac8.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/5b429869-ac8.pdf) |

## **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?**   
 Yes, Sponsored Projects Administration