Research Need Statement 608

I. Need Statement Champions and Information

    I.A. Need Statement Champion Information

        I.A.1. First and Last Name of Research Champion: **Chris Smith**

        I.A.2. Research Champion's Office: **MnDOT Office of Environmental Stewardship**

        I.A.3. Research Champion's Phone Number:

        I.A.4. Research Champion's Email: **Christopher.E.Smith@state.mn.us**

    I.B. Research Co-Champion

        I.A.1. First and Last Name of Research Co-Champion:

        I.A.2. Research Co-Champion's Office:

        I.A.3. Research Co-Champion's Phone Number:

        I.A.4. Research Co-Champion's Email:

    I.C. Research Needs Title (115 Characters): **Identifying Deer-Vehicle Collision Concentrations in Minnesota**

    I.D. Project Sponsor: **Joint MnDOT and Local Road Research Board**

II. Research Need Background and Description

    II.A. Research Need Background

        II.A.1. Describe the problem or opportunity.

Transportation agencies face many challenges constructing and maintaining safe, accessible, efficient, and reliable transportation systems. Though transportation infrastructure must meet multiple demands, safety permeates every part of a transportation agency's actions. In Minnesota, deer-vehicle collisions are a significant safety issue and Minnesota regularly ranks in the Top 10 riskiest states for deer-vehicle collisions.

Thousands of deer-vehicle collisions occur on Minnesota roads each year, with dozens resulting in serious injury or death. Approximately 10% of all traffic fatalities and serious injuries are caused by deer-vehicle collisions – though this is likely an underestimate given uncertainties surrounding the cause of many accidents. Despite the serious safety risk posed by deer-vehicle collisions, transportation and public safety agencies in Minnesota lack the information needed to prioritize and implement safety measures in a way that ensures cost-effective solutions.

White-tailed deer (*Odocoileus virginianus*) are a common, medium-sized mammal occurring throughout Minnesota. Common across the state and able to thrive in human-dominated landscapes, predicting deer road-crossing concentrations is challenging in a state like Minnesota, where terrain is relatively

homogenous and deer appear to remain scattered across the landscape year round. This is in sharp contrast to western states where deer often form large herds and migrate across the landscape via well-defined corridors (e.g., intermountain valleys). In addition, Minnesota's deer-vehicle collision data are incomplete and underestimate the total number of deer-vehicle collisions across the state. Currently, only deer-vehicle collisions resulting in significant vehicle damage, serious injury, and/or death are recorded in the State's crash database. Minor incidents often go unreported to law enforcement. These data gaps make the use of relatively simple hotspot analyses inadequate. More comprehensive and powerful analysis is needed to address this significant challenge for transportation and public safety agencies.

The analytical methods necessary to spatially predict deer-vehicle collisions continue to improve, and methods to reduce deer-vehicle collisions are now fairly well understood. However, due to the substantial costs associated with mitigating deer-vehicle collisions, it is necessary to prioritize focal areas for mitigation to ensure fiscal responsibility. This research seeks to develop an increased understanding of collisions in Minnesota and develop tools to prioritize mitigation in order to reduce the threat to motorists and the costs to society imposed by this safety challenge.

II.A.2. If applicable, describe how this project will build on previous research.

This project would build on previous research conducted in North America and Europe recognizing that the deer population in Minnesota is present year-round and scattered across the state year round.

II.A.3. If applicable, include the title/s or previous research.

Current Research

Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity. TPF-5(538) administered by the Nevada Department of Transportation

Completed Research

Stapleton, Steven York; Ingle, Anthony; Gates, Timothy J. Factors Contributing to Deer-Vehicle Crashes on Rural Two-Lane Roadways in Michigan. Transportation Research Record: Journal of the Transportation Research Board, Volume 2673, Issue 10, 2019, pp 214-224

SPAHN, V. Identification of road sections with a striking large number of deer-vehicle collisions, Volume 63, Issue 1, 2019, pp 16-24 (abstract available in English)

Donaldson, Bridget M. Improving Animal-Vehicle Collision Data for the Strategic Application of Mitigation. Virginia Transportation Research Council; Virginia Department of Transportation; Federal Highway Administration, 2017, 29p

Cramer, Patricia, et al. Reducing WVC in South Dakota. South Dakota Department of Transportation, 2016, 185p

Steiner, Wolfgang; Leisch, Friedrich; Hackländer, Klaus. A review on the temporal pattern of deer-vehicle accidents: Impact of seasonal, diurnal and lunar effects in cervids. Accident Analysis & Prevention, Volume 66, Issue 0, 2014, pp 168-181

II.A.4. What is the **objective** of the proposed research?

Assemble appropriate information to create a data-driven model of deer-vehicle interactions.

The data collected includes, but is not limited to:
- Collect deer-carcass data across a variety of roadways and geographies in Minnesota.
- Compare existing crash data with collected deer-carcass counts to quantify disparities between datasets.
- Identify biotic and abiotic factors associated with deer-vehicle collisions.

The project would develop a state-wide predictive model to identify deer-vehicle collision risk spatially and temporally.

In addition, the project would develop tools (i.e., GIS) for transportation and public safety agencies to use in decisions aimed at increasing motorist safety.

III. Strategic Priorities, Benefits, and Expected Outcomes

Section III. is for MnDOT sponsored and co-sponsored projects only; all LRRB projects proceed to section IV.

III.A. MnDOT Strategic Priorities
Instructions: Briefly describe how the project aligns with the following MnDOT Research Strategic Priorities. Complete all that apply.

III.A.1. Innovation & Future Needs:

IIIA.2. Advancing Equity:

III.A.3. Asset Management: **Being able to target mitigation efforts will allow limited funding to be used to the greatest effect.**

III.A.4. Safety: **Understanding deer-vehicle collision distribution could allow for effective of targeting collision reduction efforts to maximize the benefits.**

III.A.5 Climate Change & Environment:

III.B. Expected Outcomes
Instructions: Check all expected direct outcomes of this research.
- ☐ New or improved technical standard, plan, or specification
- ☐ New or improved manual, handbook, guidelines, or training
- ☒ New or improved policy, rules, or regulations
- ☐ New or improved business practices, procedure, or process
- ☐ New or improved tool or equipment
- ☒ New or improved decision support tool, simulation, or model/algorithm (software)
- ☐ Evaluation of a new commercial product
- ☐ New or improved technical standard, plan, or specification
- ☐ Other. Please specify below:

III.C. Expected Benefits

Instructions: Select all expected benefits that may be realized if the findings and recommendations from this research is adopted or implemented

III.C.1. Construction Savings   Other Construction Savings
Construction saving due to prioritization of deer-vehicle collision mitigation, and avoidance of construction costs in areas that are low priority for mitigation measures.

III.C.2.Decrease Engineering/Administrative Costs   Choose an item.

III.C.3. Environmental Aspects Other environmental impact.
 Reduced deer collision impacts

III.C.4. MnDOT Policy Changed or inform a policy

III.C.5. Lifecycle Choose an item.

III.C.6. Operations and Maintenance Savings Other operation and maintenance savings
Reduced costs associated with carcass removal and disposal as a result of fewer deer-vehicle collisions.

III.C.7. Reduce Risk Choose an item.

III.C.8. Reduce Road User Cost Other reduced road user cost
 Reduced deer-vehicle collisions and associated costs (i.e. property damage)

III.C.9. Safety Reduction of crash frequency

III.C.10. Technology Choose an item.

III.C.11. Other, please describe below:

IV. Technical Advisory Panel

Instructions: Please list the name and affiliation of individuals to consider for the Technical Advisory Panel.

Chris Smith, MnDOT OES

MnDOT Traffic / Safety

MnDNR

MN State Patrol

County Sheriff

County Engineers

Your assigned Project Advisor is available to answer questions and provide guidance (assigned by the Office of Research & Innovation).
Your Project Advisor is: Beth Klemann Email:beth.klemann@state.mn.us