STAGE 2: RESEARCH TOPIC STATEMENT

Submit completed form to All fields are required, except the last field: XVIII, Sponsor(s). Incomplete forms will not be accepted.

I. TITLE: Testing ‘wildlife friendly’ fence modifications to manage wildlife and livestock movements

II. TOPIC STATEMENT: Generally, fences along roadways serve as safety measures to humans from vehicular collisions with wildlife and livestock by containing animals in appropriate pastures and keeping them off roadways. However, fences can act as semi-permeable or complete barriers to wildlife movement. As a consequence, through landscape fragmentation, fences reduce landscape connectivity, impede resource selection, and in addition, are a direct cause of mortality in ungulates (e.g. pronghorn, elk, deer) and other species (e.g. sage-grouse). To combat these effects on wildlife, multiple fence modifications have been recommended by management agencies to either facilitate or deter wildlife and/or livestock from crossing fences. However, none of these ‘wildlife friendly’ fence modifications have ever critically been tested for effectiveness. Further, there is not a clear understanding on the effects of fence densities on wildlife movements and on large scale connectivity. Agencies need effective approaches and tools to identify and prioritize locations to install ‘wildlife friendly’ fencing when considering mitigation measures for wildlife movement at both small and large scales, all while keeping livestock in proper pastures.

III. RELATED RESEARCH SUMMARY FROM STAGE 1: During a preliminary literature search, fourteen studies were identified evaluating structures to facilitate wildlife (mainly ungulates) movements across roadways. Structures include underpasses & overpasses (including fencing associated with these structures), wildlife-friendly fencing and cattleguards. The majority of these identified studies investigated the effectiveness of overpass and underpass structures on wildlife movements. These structures are used to reduce vehicle collision, keep livestock off roadways and improve functional connectivity for targeted wildlife species by facilitating wildlife movement across roads. However, underpass and overpass structures can be expensive to build, can be an unwarranted mitigation measure for wildlife within specific ecological systems and in many cases, may be an unwelcome measure in varying socioeconomic regions. For example, an overpass structure may not be the most effective mitigation measure within a flat, prairie landscape and may be unwelcome by local communities. Importantly, none of these fourteen studies reported on the effectiveness of these various mitigation measures in keeping livestock in desired pastures. Therefore, there is a gap in the literature for both analytically assessing and understanding the effects of various ‘wildlife friendly’ fencing modifications on wildlife and livestock movements.

IV. RESEARCH PROPOSED: We will evaluate various ‘wildlife friendly’ fence modifications that have previously been recommended by multiple management agencies over two broad study sites that are designed to either allow for continued wildlife movements or deter wildlife and/or livestock from striking or crossing common barbed wire fencing. Wildlife and livestock-fence interactions will be tested by conducting field tests at TNC’s Matador Ranch in North-Central Mt and CFB Suffield in AB, using a Before-After-Control-Impact (BACI) experimental design. We have deployed 40 remote cameras in MT and ~50 cameras in AB to capture and process images of wildlife interacting with fencing. Standardized procedures across study sites allow us to collect uniform data on wildlife-fence interactions and assess wildlife and livestock use based on statistical procedures. Previously, we have evaluated the effects of three modifications types to barbed wire fencing on pronghorn, deer and livestock movements. These included modifying the lowest barbed wire using either smooth wire, PVC pipe (i.e. goat bars), or with a carabineer clip. Currently, we are finalizing results and writing recommendations on this evaluation for scientific publication. In addition, we currently have deployed other commonly used fence modifications for wildlife and will assess fence interactions by both wildlife (i.e. pronghorn, deer and elk) and livestock. These additional common fence modifications/deterrents include Sage-grouse markers, PVC pipe on top wires only and the use of electric fencing. Furthermore, we will use previously developed and published fence density map

Note: All research topics submitted become public property and submitters are not guaranteed to receive a contract for any work that may result from this topic statement.
outputs to model varying fence density scenarios (current, reduced, increased) effects on pronghorn migratory pathway selection. Model results will be used to produce a large-scale connectivity map output for pronghorn, including across roadways, throughout the Hi-Line region of MT. This map output can be a tool, using a reproducible approach, to target specific roadside locations to mitigate barrier effects by installing validated ‘wildlife friendly’ fence modifications, thus increasing landscape connectivity for wildlife.

V. RESEARCH PERIOD (Time to complete research project.): Current to December 31, 2018

VI. IT COMPONENT: Identify if the project includes an IT component (purchasing of IT hardware, development of databases, acquisition of existing applications, etc.). If so, describe IT component in as much detail as possible. Database development has been completed and source data has been created/acquired or have use agreements in place.

VII. FEASIBILITY, PROBABILITY OF SUCCESS, AND RISK: Feasibility of successfully completing the project is very high. Strong partnerships have been established, field sites have been identified, remote cameras have been deployed, important data layers have been created, modeling techniques have been vetted and, the mechanism of downloading, categorizing and processing images is in place. With regards to evaluating additional ‘wildlife friendly’ fence modifications, our analytical approaches for interpreting data have proved to address our initial questions. We currently are in the process of finalizing these initial results and writing a manuscript for publication which expedite writing the next peer-reviewed publication. We foresee success looking like when varying landowners (i.e. public, private, etc.) are using multi-species wildlife-friendly fence modifications in targeted, high priority areas to sustain and enhance wildlife movements along barbed wire fences. Potential risks to successfully completing the project may include incomplete stakeholder buy-in and insufficient time to complete analysis.

VIII. URGENCY, IMPORTANCE, AND EXPECTED BENEFITS/PAY-OFF: Address urgency, timeliness, and importance of the research. Identify if the research is required for any federal or state initiative or compliance. This section must include a description of how this research will help to meet MDT’s mission (i.e., serve the public by providing a transportation system and services that emphasize quality, safety, cost effectiveness, economic vitality and/or sensitivity to the environment).

Fences are ubiquitous across the landscape, yet there is little understanding on their effects on wildlife. Fences pose both indirect (i.e. access to habitat, energetic costs) and direct (i.e. mortality) consequences to wildlife and thus, their effects are important. Wildlife and land managers must explore mitigation options to allow for wildlife connectivity, while at the same time, addressing human concerns (i.e. keeping vehicular travelers safe, keeping cattle in desired pastures). With increased wildlife movement data being collected, this is an ideal time to study wildlife-fence interactions. Results will provide scientifically based recommendations and can be used to inform both agencies and the public of a more holistic multi-species ‘wildlife friendly’ fence design, including those that continue to keep livestock in desired pastures. These designs can be implemented in targeted multi-species seasonal ranges and migratory pathways and can be an effective and economic tool to both agencies and landowners by limiting both the time and money required to fix fencing. Because these ‘wildlife friendly’ fence modifications are tested over large areas, we believe results can be implemented in a number of areas across wildlife range, not just the Hi-Line region of MT. Additionally, the techniques used to identify and prioritize important locations for fence modification along roadways can be used as a model in other systems, using a number of species. As far as we know, this research is not required for any federal or state initiative or compliance. However, to address MDT’s mission specifically in serving the citizens of MT, this research provides a cost-effective approach in decreasing both time and money for mitigating road impacts on wildlife by using vigorous scientific approaches, and tests fence modifications that keep cattle off roadways, thereby addressing safety needs. Furthermore, this work aims to increase function connectivity for wildlife across the landscape, thereby addressing sensitivity to the environment.

IX. IMPLEMENTABILITY, IMPLEMENTATION PLAN, AND RESPONSIBILITY: Address the implementability of the expected results from the proposed project. Identify products that will enhance implementation. Identify any known implementation barriers and how these barriers might be eliminated or reduced. Identify MDT office or entity outside of MDT responsible for implementation. Describe initial implementation plan, include timeframe for implementation.

Results from this research have high implementability opportunities for modifying barbed wire fencing along roadsides and within pastures that can specifically target implementation at specific locations. Our products are two-fold. First, a scientifically tested ‘wildlife-friendly’ multi-species fence design that allows for continued wildlife movement while concurrently keeps cattle in desired areas. Second, an approach to identify and prioritize fence mitigation efforts for along roadways. Here, we use fence effects on pronghorn as an example to retain and potentially enhance connectivity.
throughout a landscape. Results from these modelling approaches are valuable for private and public stakeholders alike. Potential barriers to implementation may include initial stakeholder skepticism of ‘wildlife-friendly’ fence designs. However, with strong and trusted partnerships in place, we foresee landowners and communities being willing to consider these innovative and cost-effective approaches. We believe that MDT staff members within environmental services and right-of-way bureaus being involved with implementation. Other implementation stakeholders may include specific landowners, state wildlife agencies, NGO’s that manage conservation easements on specific properties and, organizations that educate and increase engagement with communities (e.g. Western Transportation Institute in MT, Miistakis Institute in AB). An initial implantation plan would use the targeted locations along highways for implementation personnel (MDT staff, FWP biologists, etc.) to approach landowners (private and public) and gauge interest in modifying existing fencing using tested wildlife-friendly designs. Once initial designs are installed and neighbors observe the effectiveness and cost-reducing applications, they too would employ ‘wildlife-friendly’ designs. Successful interactions could be increased by holding educational meetings and engaging in citizen-science volunteer opportunities. The initial timeframe could take a number of months to two years. However, because of the cost-effectiveness in time and money of these modifications and the targeting approaches to apply fence modifications, ‘wildlife friendly’ modifications could be implemented rapidly across the landscape.

X. MDT PRIORITY FOCUS AREAS: MDT may, as often as annually, identify priority research focus areas. These focus areas will be listed on [http://www.mdt.mt.gov/research/unique/solicit.shtml](http://www.mdt.mt.gov/research/unique/solicit.shtml).

XI. TOTAL COST ESTIMATE (If the project proposal comes in at a higher cost, it may require further approval and may be delayed.): $55,000

XII. MDT FUNDING SOURCE (If MDT Research, enter SPR): SPR

XIII. FUNDING MATCH SOURCE AND AMOUNT: National Fish & Wildlife Foundation (NFWF): $119,000, Sage-grouse Initiative: $20,000

XIV. FUNDING PARTNER(S): The University of Montana, The Nature Conservancy – MT Chapter, Alberta Conservation Association

XV. POTENTIAL TECHNICAL PANEL MEMBERS (At this time, individuals do not necessarily need to be identified; rather, MDT offices and outside entities can be named. However, if known, individuals may be named): MDT Environmental, MDT Road Design, MDT ROW Staff Member, MDT Maintenance Staff Member, FWP Biologist

XVI. SUBMITTED BY:
NAME: Andrew Jakes
TITLE: Post-Doctoral Researcher
AFFILIATION: University of Montana
ADDRESS: Wildlife Biology Program, College of Forestry & Conservation, 32 Campus Drive, Missoula, MT 59812
PHONE NO.: 406-439-7583
E-MAIL: andrew.jakes@mso.umt.edu

XVII. CHAMPION: Must be internal to MDT, feel strongly that the research will benefit the Department, and is willing to chair the technical panel. Note: If a champion is not identified by you or Research staff, this topic statement will not move forward.
NAME: Larry Sickerson
TITLE: Glendive District Project Biologist
AFFILIATION: Montana Department of Transportation
ADDRESS: Rail, Transit and Planning, Environmental Services Bureau, 2701 Prospect Avenue, Helena, MT 59620
PHONE NO.: 406-444-0462
E-MAIL: lsickerson@mt.gov

XVIII. SPONSOR(S) (optional): Must be internal to MDT (Division Administrator or higher) and willing to ensure implementation occurs, as appropriate. If a sponsor is not identified, this topic statement will not move forward.
NAME: Lynn Zanto
TITLE: Rail, Transit and Planning Division Administrator
AFFILIATION: Montana Department of Transportation
ADDRESS: 2701 Prospect Avenue, Helena, MT 59620
PHONE NO.: 406-444-3445