

# TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Nevada Department of Transportation

## INSTRUCTIONS:

Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

<b>Transportation Pooled Fund Program Project #</b> <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> TPF-5(358)	<b>Transportation Pooled Fund Program - Report Period:</b> <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 3) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input checked="" type="checkbox"/> Quarter 4 (October 1 – December 31)	
<b>Project Title:</b> <i>The Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity Transportation Pooled-Fund Project Strategic Integration of Wildlife Mitigation into Transportation Procedures</i>		
<b>Name of Project Manager(s):</b> Nova Simpson for Nevada DOT Patricia Cramer, PI	<b>Phone Number:</b> Nova Simpson: 775-888-7035 Patricia Cramer: 435-764-1995	<b>E-Mail</b> <a href="mailto:nsimpson@dot.nv.gov">nsimpson@dot.nv.gov</a> <a href="mailto:cramerwildlife@gmail.com">cramerwildlife@gmail.com</a>
<b>Lead Agency Project ID:</b> Nevada Dept. of Transportation	<b>Other Project ID (i.e., contract #):</b> Agreement #: P700-18-803	<b>Project Start Date:</b> 12/13/2018
<b>Original Project End Date:</b> 12/31/2021	<b>Current Project End Date:</b> 12/31/2021	<b>Number of Extensions:</b> 0

Project schedule status:

☒ On schedule
 ☐ On revised schedule
 ☐ Ahead of schedule
 ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$146,000.00	\$85,823.23	58 %

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
2.50%	2.4%	67 %

**Project Description:**

The *Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity* pooled fund study is a collaborative research project through the Transportation Pooled Fund Program. Partners from both the United States and Canada have come together with a common interest in reducing WVC's for the safety of humans and wildlife, as well as restoring habitat connectivity in landscapes fragmented by roadways. Contributing partners currently include Alaska DOT, Arizona DOT, California DOT, Iowa DOT, Minnesota DOT, Nevada DOT, Ontario Ministry of Transportation, Oregon DOT, and Washington DOT.

This pooled fund study (PFS) will seek to identify solutions that integrate highway safety and mobility with wildlife conservation and habitat connectivity. The Project: Strategic Integration of Wildlife Mitigation into Transportation Procedures is conducted under Principal Investigator Patricia Cramer and is reported on in this progress report.

Within U.S. states and Canadian provinces, there are few standardized planning processes for considering wildlife in transportation planning, or Best Management Practices (BMP) manuals to instruct personnel at every level how to consider, plan, design, construct, and maintain transportation infrastructure that permits connectivity for wild and domestic animals that could become involved in WVC. This study investigates and makes recommendations on successful procedures that consider and create mitigation solutions to reduce WVC and provide connectivity for wildlife to assist transportation agencies in developing standards at every level.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

The Task 1 Final report was edited to incorporate Advisory Panel edits and comments.

The 2020 Annual meeting for this project was held on October 20 with the Advisory Panel. Progress to date was reviewed, several new panel members were fully updated to the project. Questions were asked. Notes were taken A path forward with report writing and time lines was agreed upon.

**Anticipated work next quarter:**

The team will complete Task 1 by bringing together all the chapters of Task 1 into a final report for this task. The national census on crash costs will be completed and a formal paper will be prepared. The Task 2 manual will begin to be developed.

**Significant Results:**

The Task 1 draft final report was completed, edits received, and it is being revised; the national census of all U.S. state DOT's crashes with animals and wildlife was completed, and crash costs were 99% completed. The advisory panel met with the PI in October for the annual partners meeting.

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

The budget is very constrained for the tasks in this work. The team will strive to complete all deliverables within the budget and time frame set forth in the contract. The Covid-19 pandemic will continue to affect this project. All activities that entailed meeting with people in 2020 are curtailed, including the annual meeting for this pooled fund study. It may be prudent to extend the project for an additional year to accommodate opportunities to present at conferences that will be

canceled or pushed back, such as the Transportation Research Board meeting in Washington DC, the Northeastern Wildlife Conference, and possibly ICOET.

**Potential Implementation:**

The information generated from this work will be available for U.S. DOT's and Canadian MoT's for assistance in incorporating wildlife concerns into transportation processes.  
It may also be used in the development of the forthcoming U.S. Transportation Act.

# TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Nevada Department of Transportation

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<b>Transportation Pooled Fund Program Project #</b> <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i>  <b>P200-20-803</b>	<b>Transportation Pooled Fund Program - Report Period:</b> <input type="checkbox"/> Quarter 1 (January 1 – March 31) 2020 <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input checked="" type="checkbox"/> Quarter 4 (October 1 – December 31)	
<b>Project Title:</b> <b>Permeability of large underpasses to wildlife: Effects of ledges and addition of structure for facilitating movement of small mammals and herpetofauna.</b>		
<b>Name of Project Manager(s):</b> Cheryl Brehme, Jeff Tracey, Robert Fisher <b>Budget:</b> Curtis Hettich	<b>Phone Number:</b> 619-225-6427 619-225-6457 619-225-6422 916-278-9479	<b>E-Mail (preferred contact method)</b> <a href="mailto:cbrehme@usgs.gov">cbrehme@usgs.gov</a> , <a href="mailto:jatracey@usgs.gov">jatracey@usgs.gov</a> , <a href="mailto:rfisher@usgs.gov">rfisher@usgs.gov</a> <a href="mailto:chettich@usgs.gov">chettich@usgs.gov</a>
<b>Lead Agency Project ID:</b> GR21ZC00TPMFA00	<b>Other Project ID (i.e., contract #):</b>	<b>Project Start Date:</b> 18 May 2020
<b>Original Project End Date:</b> 31 May 2022	<b>Current Project End Date:</b> 31 May 2022	<b>Number of Extensions:</b>

Project schedule status:

☒ On schedule
 ☐ On revised schedule
 ☐ Ahead of schedule
 ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$83,127.56	\$41,756.85	Approximately 50%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$19,418.86 – Approx. 23%	\$19,418.86	Approximately 50%

**Project Description:**

The Department of Transportation (DOT) currently recommends that structure be added to large underpasses to increase wildlife use and movement, but there are a lack of scientific studies to show the efficacy of this mitigation for small mammals and herpetofauna or potential effects on use by larger species. The USGS has completed two years of Before-After Control-Impact field studies on 8 large upland wildlife underpasses in San Diego County. The objectives of this study are to determine; 1) if small vertebrate species are using these underpasses, 2) if ledges and the addition of structure (rock piles 5m apart along one side of structure) within underpasses facilitate small animal movement and 3) if the addition of structure (rock piles) affect the use rates of medium and large mammals. Using highly sensitive cameras over two years resulted in over 3 million images of which ~200,000 have been reviewed (less than 10% of total). Preliminary analysis indicates that responses to structure and ledges are specific to animal species and groups. This provides substantial training and test data sets to create a machine learning algorithm to classify images by the presence or absence of animals, and a possible second stage of classification to the species level. In order to process all photos, USGS will program a convolutional deep network (DN) to perform supervised species/group classification. Existing classified photos will be used to train the network to predict classes for the remaining ~2.8 million photos. Explanatory models will then be run to compare the relative permeability of underpasses to animal movement and effects of structure on animal activity. The results will inform the design of large underpasses for use by wildlife communities and target species.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

Using the Python TensorFlow API, we constructed an image data pipeline for efficiently storage and loading of the image data from disk, functions for preprocessing the image data, and a convolutional neural network (CNN; specifically, a ResNet50 architecture) model for supervised image classification.

For the sake of testing the code and training algorithms, we created a subset of the human-labeled image dataset that consisted of 1000 images with no animals, 500 images with bobcats, and 500 images with deer. The images and their associated labels were stored in a format that allows efficient loading and preprocessing, which is necessary because the dataset is too large to be stored in main memory as the model is being trained. These records were divided into a training dataset of 1600 records and a validation dataset of 400 records.

We conducted numerous tests during which we trained the CNN on the subset of 1600 records and used the remaining 400 records for validation.

**Anticipated work next quarter:**

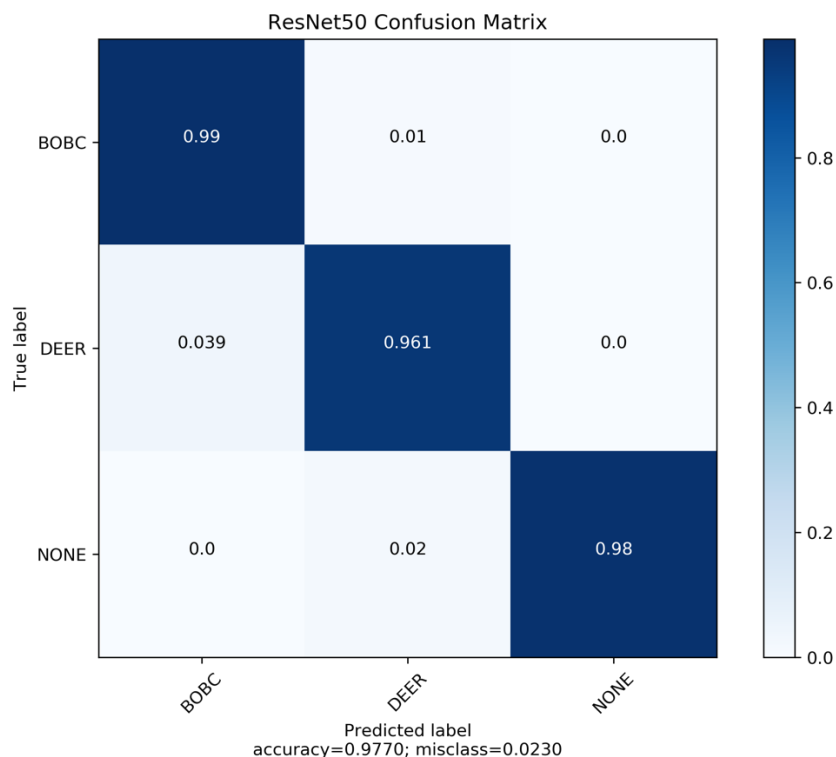
We plan to continue development and testing the current model. We will also experiment with image augmentation and other regularization techniques to improve model training and generalization.

We will train and test the model on increasingly larger datasets containing more classes of images. Further we plan to train a model to perform a binary classification to identify images with no animals versus those with animals of any species.

We will also make a determination about whether or not we need to acquire additional images from existing sources for under-represented taxonomic groups and, if necessary, identify sources of these images.

### Significant Results:

We achieved 97.7% accuracy in classifying the validation dataset (see figure). While further testing on an independent test dataset is a necessary next step, this result on the validation dataset is very promising.



**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

Note that total percentages of time and budget completed does not directly compare to project expenses due to use of matching funds for portions of this project.

**Potential Implementation:**

TBD

# TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Nevada Department of Transportation \_\_\_\_\_

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<b>Transportation Pooled Fund Program Project #</b>  <i>Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity</i> Task 1 – Cost Effective Solutions Transportation Pooled-Fund Project TPF-5(358)		<b>Transportation Pooled Fund Program - Report Period:</b>  <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input checked="" type="checkbox"/> Quarter 4 (October 1 – December 31) <span style="float: right;">2020</span>	
<b>Project Title:</b>  WVC Reduction & Habitat Connectivity NVDOT			
<b>Name of Project Manager(s):</b> Dr. Marcel Huijser	<b>Phone Number:</b> 406-543-2377	<b>E-Mail</b> mhuijser@montana.edu	
<b>Lead Agency Project ID:</b> 4W7576	<b>Other Project ID (i.e., contract #):</b> 4W7576	<b>Project Start Date:</b> 18 Dec 2018	
<b>Original Project End Date:</b> 30 Sep 2022	<b>Current Project End Date:</b> 30 Sep 2022	<b>Number of Extensions:</b> 0	

Project schedule status:

☒ On schedule
 ☐ On revised schedule
 ☐ Ahead of schedule
 ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$354,001.00	\$135,054.06 (thru Nov)	40%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$5,176.56 0.015%	\$5,176.56	35%



**Project Description:**

All research modules have been submitted, have been processed, and are active.

Topic	Title	Proposed Budget		PI	Submitted?	Approved by NV?	Active account?
C	Design of Fiber-Reinforced Polymer (FRP) Wildlife Overpass Structures	\$70,000		Rob Ament and Matt Bell	yes	yes	yes
F	Identification of the patterns and processes that result in highway accidents involving elk: Informing the design of effective mitigation strategies in areas where elk is a dominant species	\$20,000		Tony Clevenger	yes	yes	yes
G	Wildlife community and species factors affecting crossing structure use: A continental meta-analysis and a 16-year perspective	\$65,000		Tony Clevenger, Marcel Huijser	yes	yes	yes
H	Jump-out design and measures at fence ends and at access roads	\$115,000		Marcel Huijser	yes	yes	yes
I	Efficacy and cost-savings of fencing and wildlife crossings to reduce wildlife-vehicle collisions in the Bow River Valley, Alberta	\$30,000		Tony Clevenger	yes	yes	yes
X	Economic value select species based on biological conservation	\$90,181.20		Chris Neher and John Duffield (as subcontractors from Bioeconomics)	yes	yes	Yes Subcontract (WTI-Bioeconomics) is also active

On 19 Oct 2020 the annual meeting with the funders and researchers took place.  
This was a virtual meeting over the internet as travel was not possible / not advisable because of COVID-19.  
After each presentation a Q&A session took place.  
The PDFs of the presentations have been made available to NVDOT.

Time (MTN)	Time (Pacific)	Title	Presenter(s)
10:00-10:15	9:00-9:15	Intro, Welcome	Nova Simpson
10:15-10:30	9:15-9:30	Update literature review and Update Cost-Benefit data	Marcel Huijser
10:30-11:00	9:30-10:00	Innovative Fiber-Reinforced Polymer Structures for Wildlife Crossings	Rob Ament (Matt Bell, Damon Fick)
11:00-11:05	10:00-10:05	Wildlife community and species factors affecting crossing structure use: meta-analysis	Marcel Huijser (PI Tony Clevenger)
		Efficacy and cost-savings of fencing and crossings to reduce WVCs in the Bow River Valley	Marcel Huijser (PI Tony Clevenger)
11:05-11:30	10:05-10:30	Patterns and processes that result in highway accidents involving elk	Kari Gunson (PI Tony Clevenger)
11:30-12:00	10:30-11:00	Break	
12:00-12:30	11:00-11:30	Jump-out design and measures at fence ends and at access roads	Marcel Huijser
12:30-13:00	11:30-12:00	Economic value select species based on biological conservation	Chris Neher and John Duffield (Bioeconomics)
13:00-13:30	12:00-12:30	Permeability of large underpasses to wildlife: Effects of ledges and addition of structure facilitating movement of small mammals and herpetofauna	Cheryl Brehme, Jeff Tracey, (Robert Fisher)
13:30-14:00	12:30-13:00	Break	
14:00-16:00	13:00-15:00	Business meeting	Funders only, no researchers

**Anticipated work next quarter:**

General:

1. Finish literature review.
2. Finish the update for the costs and benefits of mitigation measures

**Significant Results:**

None yet

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

Positive:

Funding from MDT for 2 electrified barriers and permission to lower selected jump-outs along Hwy 93N has been tentatively approved. Contracting process has not been finalized yet though. This will supplement the effort of the pooled fund study related to electrified barriers and jump-outs.

Negative:

- Covid-19 increased expenses related to transportation.

**Potential Implementation:**

None

# TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT):     Nevada DOT    

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<b>Transportation Pooled Fund Program Project #</b> <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i>  TPF-5(358) Transportation Pooled Fund Study	<b>Transportation Pooled Fund Program - Report Period:</b> <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input checked="" type="checkbox"/> Quarter 4 (October 1 – December 31)	
<b>Project Title:</b> Innovative Fiber-Reinforced Polymer Structures for Wildlife Crossings (Adaptable for Bicyclists/Pedestrians)		
<b>Name of Project Manager(s):</b> Damon Fick Rob Ament	<b>Phone Number:</b> 406-994-6123 406.600.6348	<b>E-Mail</b> damon.fick@montana.edu rament@montana.edu
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b> 4W8317	<b>Project Start Date:</b> April 27, 2020
<b>Original Project End Date:</b> October 31, 2021	<b>Current Project End Date:</b> N/A	<b>Number of Extensions:</b> N/A

Project schedule status:

☒ On schedule
 ☐ On revised schedule
 ☐ Ahead of schedule
 ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$70,001	\$42,010.82	45%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
2%	\$1,142.61	30%

**Project Description:**

There are no known FRP wildlife overpasses in North America at this time. The overall objectives of this research project are to identify cost sensitive and environmentally friendly FRP materials and use them in the design of the continent's first FRP wildlife crossing. This structure can then be adapted for use in other locations across North America and will lead to innovation for bicycle and pedestrian crossings over roads. The development and deployment of a structural prototype by this project will help provide technical information that is sorely lacking for such a promising technology.

The project is organized into four tasks: 1) identify and select FRP manufacturers and materials that will contribute to efficient and cost-effective bridge structures; 2) investigate and perform a preliminary design of up to three different wildlife overpass structures using different FRP applications and assure they can meet Caltrans' structural specifications and address wildlife's needs; 3) evaluate the implementation of the selected FRP wildlife overpass structure via cost-benefit, construction and life-cycle metrics; and, 4) disseminate the results, recommendations and conclusions of the investigation.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

Task 7. Due to the COVID pandemic, the in-person design workshop with ARC has been cancelled. Instead, ARC is developing its first virtual design co-laboratory. Originally envisioned as a 2-day in-person workshop format, the co-lab will now take 5 months via online meetings. ARC Solutions has assigned a team of experts to help Caltrans and the WTI Team develop site-specific context-sensitive design elements so that the FRP superstructure has appropriate fencing, jump-outs, and sound barriers. The co-lab will develop a FRP guidebook for wildlife crossing structures that consists of two sections. One section will cover all wildlife crossing elements and those that can be made from FRP materials, and the second will consist of design features specific to the US-97 site location. ARC and WTI hosted the first kickoff meeting to introduce all the Technical Advisory Team (TAT) to the project and goals. Our working team has started to compile the TAT opinions and develop a strategy to have smaller working groups

Task 8. The WTI Team has investigated all the manufacturers that are capable of building an FRP wildlife overpass and have decided, along with the support of Caltrans, to work with Advanced Infrastructure Technologies (AIT) to develop designs of an FRP wildlife crossing structure. AIT is an engineering and manufacturing company that supplies advanced composite materials for bridges, while providing low cost solutions to the aging and deteriorating transportation infrastructure industry. Working alongside AIT will ensure a smooth transition from design to construction if Caltrans decides to build the FRP wildlife overpass. AIT is sharing details with the WTI Team so designs developed in the co-lab will be realistic and ensure that the structural design of the overpass will be able to support the loads required.

**Anticipated work next quarter:**

Task 7. Continue to make progress on the ARC co-lab design process.  
Task 8. Continue to develop an FRP designs using AIT designs.

**Significant Results:**

Made joint decision to work with AIT in the design of an FRP wildlife overpass.

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

No conflicts.

**Potential Implementation:**

Yes! Caltrans is committed to building the FRP wildlife overpass and has secured funding to support the design and planning elements of this research project. The result will be an efficient continuation of the final design, resulting in Caltrans putting the US97 FRP overpass crossing out for competitive bid for its eventual construction.

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Lead Agency (FHWA or State DOT): Nevada Department of Transportation

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<b>Transportation Pooled Fund Program Project #</b>  TPF-5(538)	<b>Transportation Pooled Fund Program - Report Period:</b>  Quarter 4 (Oct to Dec) 2020   <div style="text-align: right;">2020</div>	
<b>Project Title:</b> Efficacy and cost-savings of fencing and wildlife crossings to reduce wildlife-vehicle collisions in the Bow River Valley, Alberta		
<b>Name of Project Manager(s):</b> AP Clevenger	<b>Phone Number:</b> 4036881138	<b>E-Mail</b> apclevenger@gmail.com
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b>	<b>Project Start Date:</b> Jan 2020
<b>Original Project End Date:</b> Mar 2021	<b>Current Project End Date:</b> Mar 2021	<b>Number of Extensions:</b> 0

## Project schedule status:

Behind schedule

## Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$30,000	\$0	25%

## Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$0	\$0	10%

**Project Description:**

Currently there is an array of mitigation measures to meet reduce impacts of roads on wildlife. Of paramount importance is that measures need to be effective at meeting their intended objective or management role in the project. While there is general agreement that wildlife fencing in combination with wildlife crossing structures benefits human safety as well as nature conservation goals, there is the opinion that these mitigation measures may be too costly or have little cost-benefits. To obtain a better understanding of the actual costs and benefits of road mitigation measures cost-benefit analyses recently identified threshold dollar values above which individual mitigation measures start generating benefits in excess of costs. The Bow River Valley is one of the most critical habitats for wildlife in the Canadian Rockies. Wildlife research in the area highlights the complexity and limitations of wildlife movement through the Bow Valley due to human activity and natural barriers. We use WVC data previously collected on two mitigated sections of the Trans-Canada Highway (TCH) in the province of Alberta: 1) a 5-km section in Dead Man's Flats, Alberta and 2) an 18-km section in Banff National Park. This work will determine whether highway mitigation effectively reduced the occurrence of WVCs and quantify the cost-benefits of the measures in place. Our objective is to evaluate changes in the number of WVCs after each mitigation phase was completed. We will assess cost-effectiveness of the mitigation measures by using the Huijser economic model, comparing the annual cost of the mitigation infrastructure against the cost of WVCs occurring prior to and after mitigation treatment. We believe the results from our mitigation evaluation and cost-benefit model can be a valuable decision support tool for determining mitigation measures to reduce WVCs and demonstrate the utility and cost-effectiveness of highway mitigation in protected and non-protected landscapes.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

- Little progress on this project given the effort in finishing the elk-vehicle collision project.
- Review of background literature.
- Data compilation and organization for reviewing previous analysis on this project as part of other work.
- Data analysis assessing sampling effort (time and distance) at 2 study sites.
- We will be requesting an extension to this project.

**Anticipated work next quarter:**

- Continue with some data analysis.
- Continue review and edits of drafted text for report.
- We will be requesting an extension to this project.

**Significant Results:**

None to date



**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

Project has had significant delays due to: 1) getting the approvals from the PFS Committee regarding Project objectives, administrative delays due to approvals required at NV DOT and MSU/WTI and work slowdowns during the Covid 19 pandemic.

This project is in line after the elk-vehicle collision project, so once that is completed we will have more time to work on this project.

We will be requesting an extension to this project.

**Potential Implementation:**

None to date

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<b>Transportation Pooled Fund Program Project #</b>  TPF-5(538)	<b>Transportation Pooled Fund Program - Report Period:</b>  Quarter 4 (October to December 30) 2020  <div style="text-align: right;">2020</div>	
<b>Project Title:</b> Identification of the Patterns and Processes that Result in Highway Accidents Involving Elk: Informing the Design of Effective Mitigation Strategies in Areas Where Elk is a Dominant Species		
<b>Name of Project Manager(s):</b> AP Clevenger	<b>Phone Number:</b> 4036881138	<b>E-Mail</b> apclevenger@gmail.com
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b>	<b>Project Start Date:</b> Jan 2020
<b>Original Project End Date:</b> Dec 2020	<b>Current Project End Date:</b> Dec 2020	<b>Number of Extensions:</b> 0

## Project schedule status:

Behind schedule

## Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$20,000	\$0	30%

## Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$0	\$0	20%

**Project Description:**

Road networks are extensive in many western North American landscapes and vehicle use has sharply increased with population growth and development in rural and suburban areas. Roads alter important habitat components, such as forage, water, and cover for large herbivores, and often intersect migration and daily movements. In addition, landscapes inundated with roads may cause shifts in ungulate distribution and reduce carrying capacity. By far, the greatest and most direct effect of roads on ungulate populations comes from collisions with motor vehicles. Currently ungulate-vehicle collisions are a significant problem worldwide particularly in rural or suburban areas where they are a major safety problem for motorists. This project will describe the patterns and processes that result in highway accidents involving elk in order to provide transportation planners with the design of effective mitigation strategies in areas where elk is a dominant species. We use selected primary and secondary road segments within Banff, Yoho and Kootenay National Parks and within the adjacent Alberta provincial lands. Records of elk vehicle collisions (EVCs) were collected year-round by Parks Canada in the three national parks and Alberta Environment and Parks from 1986-2000. We tested for independence of the following: 1) sex and age (adult, subadult) classes in EVCs; 2) Demography and condition of elk killed on highways, railways and by predators; 3) differences in sex, age and condition of elk killed on highways, railways and by predators; 4) possible seasonal effects on EVC frequencies; 5) determine the relative risk of EVC occurrence on each highway we calculated the EVC rate per km per year; and 6) how traffic volumes and elk abundance influence EVC rates. We propose to identify and describe the patterns and processes that result in highway accidents involving elk in order to provide transportation planners with the design of effective mitigation strategies in areas where elk is a dominant species.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

- The project End Date is Dec 2020. We will request an extension for this project (1<sup>st</sup> quarter 2021)
- Reviewed of background literature on subject that will help form basis for results interpretation.
- Reviewed and editing of Results Interpretation for the Discussion and Mgt Implications of report.
- We have a near final draft completed and will complete final report for this project by March 2021.
-

**Anticipated work next quarter:**

- Complete any last minute data analysis.
- Complete report writing and finalize.

**Significant Results:**

- None to date

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

Project has had significant delays due to: 1) getting the approvals from the PFS Committee regarding Project objectives, administrative delays due to approvals required at NV DOT and MSU/WTI and work slowdowns during the Covid 19 pandemic.

**Potential Implementation:**

None to date

# TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Nevada Department of Transportation

## INSTRUCTIONS:

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

<b>Transportation Pooled Fund Program Project #</b> <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i>		<b>Transportation Pooled Fund Program - Report Period:</b> <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input checked="" type="checkbox"/> Quarter 4 (October 1 – December 31)	
<b>Project Title:</b> <b>Pilot Study: Incorporating Large Ungulate and Small Reptile Total Value in Collision Mitigation Benefit-Cost Calculations</b>			
<b>Name of Project Manager(s):</b> John Duffield	<b>Phone Number:</b> 406-721-2265	<b>E-Mail</b> bioecon@montana.com	
<b>Lead Agency Project ID:</b> P701-18-803 TASK 05	<b>Other Project ID (i.e., contract #):</b> G105-21-W8409	<b>Project Start Date:</b> 06/01/2020	
<b>Original Project End Date:</b> 12/31/2020	<b>Current Project End Date:</b> 12/31/2021	<b>Number of Extensions:</b> 1	

Project schedule status:

☐ On schedule     
 ☒ On revised schedule     
 ☐ Ahead of schedule     
 ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
69,974.00	None invoiced	20%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
None Invoiced	0	20

**Project Description:**

Funding decisions on specific wildlife collision mitigation measures are based largely on cost-benefit analysis and answering the question; do the benefits to humans and wildlife outweigh the direct fiscal costs of the mitigation measures? To date, one potentially significant component of the benefits of wildlife mortality and injury avoidance has been largely ignored in these calculations--passive use values to humans associated with species protection. This project will develop total value estimates for deer and turtles in Minnesota in a collision mitigation context. Total values include not only direct use such as hunting and viewing but also passive use values (biological conservation values).

The study will utilize an industry-standard repeat contact random household mail survey of Minnesota households to elicit preferences and valuations for avoiding deer and turtle collisions through use of collision mitigation structures incorporated into road design.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

Work in the current quarter was delayed until early August due to delays on contracting. Following initiating the work in August, preliminary background research and early drafting of survey instruments has progressed. We have requested And received a change in end date for the work from 12/31/2020 to 12/31/2021 due to the combined effects of delays in contracting and the difficulty in conducting survey research in a Covid-19 environment.

In the current quarter, work has continued to be slowed by the Covid outbreak. However, the draft survey instrument is complete and has been circulated to agency and peer reviewers. Cognitive interviews with the public are under way. Following finalization of the survey, we will commence with printing and administration.

**Anticipated work next quarter:**

When the survey package is finalized it will be printed and assembled for mailing. This survey administration process will Occur during the quarter.

**Significant Results:**

ngoing



**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

As noted above, work in the current quarter was delayed until early August due to delays on contracting. Following initiating the work in August, preliminary background research and early drafting of survey instruments has progressed. We have requested and received a change in end date for the work from 12/31/2020 to 12/31/2021 due to the combined effects of delays in contracting and the difficulty in conducting survey research in a Covid-19 environment.

**Potential Implementation:**

Ongoing

# TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Nevada Department of Transportation \_\_\_\_\_

## INSTRUCTIONS:

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<b>Transportation Pooled Fund Program Project #</b>  <i>Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity</i> Task 1 – Cost Effective Solutions Transportation Pooled-Fund Project TPF-5(358)	<b>Transportation Pooled Fund Program - Report Period:</b>  <input type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input checked="" type="checkbox"/> Quarter 4 (October 1 – December 31) <div style="text-align: right; margin-top: -20px;">2020</div>	
<b>Project Title:</b> Jump-out design and measures at fence ends and at access roads		
<b>Name of Project Manager(s):</b> Dr. Marcel Huijser	<b>Phone Number:</b> 406-543-2377	<b>E-Mail</b> mhuijser@montana.edu
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b>	<b>Project Start Date:</b>
<b>Original Project End Date:</b> 30 Nov 2022	<b>Current Project End Date:</b> 30 Nov 2022	<b>Number of Extensions:</b> 0

Project schedule status:

☒ On schedule
 ☐ On revised schedule
 ☐ Ahead of schedule
 ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
115,000	51,269.02 (thru Nov)	30%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$13,259.40 (11.5%) (thru Nov)	\$13,259.40	40%

**Project Description:**

- A. Investigate measures aimed at reducing intrusions of large wild mammals, especially carnivores, at gaps in wildlife fences through a literature review and field experiments.
- B. Investigate measures aimed at increasing the use of wildlife jump-outs by deer species (white-tailed deer and mule deer) through a literature review and field experiments.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

A1 Literature review  
Not Started yet

B1 Literature review  
Not Started yet

**Field experiments**

A2a. Electrified cattle guards at access roads, Parks Canada.

Sunshine and Compound road:

1. The WTI cameras have been installed at Sunshine and Compound road (12 Aug 2020).
2. The cameras were not installed in front of guards, but behind, looking to the area in front.
3. Animals entering the zone 2 m before the electrified area will trigger the cameras.
4. From 2 Sep onwards the cameras have restricted hours because traffic volume was too high to allow 24/7 operation, so now it is 17:00-8:00 (daylight saving time) for both locations.
5. Camera settings 5 images per trigger, no quiet time (rapidfire), high sensitivity
6. 8 Oct 2020: steel plates were installed in front of electrified barriers (completes installation).
7. The grounding plate for Compound Road was damaged and was removed on or before 20 Oct. Re-installation will likely be in spring. The Sunshine grounding plate will also be deferred. They both need metal strips installed to protect them from snow plows. These strips have not yet arrived, and so the grounding plates were unprotected when there was the 1<sup>st</sup> major snow fall (October 14) when it got damaged. So, even though, the wildlife guards are turned on they will not work as well without the grounding plate, not were they intended to nearly as effective during the winter (i.e. snow covered).

Lake O'Hara

Images reviewed 1-6 Oct : No animals

Lake Louise

Camera post not installed yet, will be spring 2021

A2b. Electrified mats at fence ends, Thompson Falls.

Camera at west fence end was installed 30 Sep 2020

No animals observed till mid Dec

Camera at east fence end required a new post in the clear zone.

A right-of-way encroachment permit was obtained from MDT on 8 Oct 2020.

Post and camera were installed on 27 Oct 2020.

2 wt-deer left the fenced road section, walking/running over guard.

1 of them appeared to have been shocked



the other not.



I am figuring out how to test operation/ voltage with the manufacturer.

Note: 1 w-t deer crossed road in front of guard outside fenced area, did not touch guard.



A2d. Different types of gates at gaps in electric wildlife fence, Dixon Melon Farm.

The images have been interpreted and the data have been entered in a database (through Nov 2020).  
Data analyses with start in 1<sup>st</sup> quarter 2021.

B2. Modifications to 10 Jump-outs, US93N Montana.

- Candidate jump-outs have been identified along US93N. 4 are known to receive relatively high use by mule deer, 6 are known to receive relatively high use by white-tailed deer.

The current height of the ten jump-outs selected for this project. EV=Evaro, HH= Ravalli Hill.

Area	#	Height	
		ft	cm
EV	14	6' 8.5"	204
EV	17	6' 0"	183
EV	19	6' 8"	203
EV	20	6' 0"	183
EV	21	6' 1.5"	187
EV	23	5' 6"	168
RH	26	5' 11"	180
RH	27	6' 0"	183
RH	28	5' 9"	175
RH	29	5' 11"	180

- Permission has been obtained for the modifications (from MDT) and research (from CSKT).
- MDT will assist with equipment in lowering (after agreement between MDT and WTI-MSU) is signed.
- MDT – WTI agreement was signed in Dec 2020.
- MDT – CSKT agreement was signed early January 2021.

#### **Anticipated work next quarter:**

##### General:

3. Install camera Lake Louise
4. Modify / repair guards Compound and Sunshine.
5. Modify jump-outs
6. Install cameras at Jump-outs
7. Analyze data Dixon Melon Farm

#### **Significant Results:**

The low-cost electrified barriers at the Dixon melon farm seem promising as (after modifications) they seem to be a very substantial barrier to black bears.

#### **Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

##### Positive:

Funding from MDT for 2 electrified barriers and permission to lower selected jump-outs along Hwy 93N has been obtained. This will supplement the effort of the pooled fund study related to electrified barriers and jump-outs.

##### Negative:

- Covid-19 increased expenses related to transportation.

#### **Potential Implementation:**

The low-cost electrified barriers at the Dixon melon farm seem promising as (after modifications) they seem to be a very substantial barrier to black bears. Two sites along a real highway are now considered for implementation of these types of barriers (see above).



# TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Nevada Department of Transportation

## INSTRUCTIONS:

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

<b>Transportation Pooled Fund Program Project #</b>  TPF-5(538)	<b>Transportation Pooled Fund Program - Report Period:</b>  Quarter 4 (Oct - Dec) 2020   <div style="text-align: right;">2020</div>	
<b>Project Title:</b> Long-term Responses of an Ecological Community to Highway Mitigation Measures		
<b>Name of Project Manager(s):</b> AP Clevenger	<b>Phone Number:</b> 4036881138	<b>E-Mail</b> apclevenger@gmail.com
<b>Lead Agency Project ID:</b>	<b>Other Project ID (i.e., contract #):</b>	<b>Project Start Date:</b> July 2020
<b>Original Project End Date:</b> Mar 2021	<b>Current Project End Date:</b> Mar 2021	<b>Number of Extensions:</b> 0

## Project schedule status:

Behind schedule

## Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$65,000	\$0	10%

## Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$0	\$0	10%

**Project Description:**

Crossing structures (CS) in Banff National Park and along US Hwy 93 North in Montana, have been monitored for many years, starting as early as 1996, forming the richest database on CS monitoring in the world. These data provide a unique opportunity to assess long-term changes in CS use by a large mammal community. Such a long-term and data-rich perspective is important to understand how slow-reproducing species interact with CS over time. These datasets come from areas with an intact community of large mammals ranging from rare carnivores like wolverine to more common ungulates like white-tailed deer. It is also characterized by mixed landscapes with agriculture and dispersed houses and roads with high traffic volumes. This combination of a relatively intact wildlife community in an area with substantive variation in human disturbance (Banff relatively low human presence and disturbance; Montana relatively high human presence and disturbance) creates a unique 'reference' condition to understand how highways and large mammals interact. Developing a statistical model to describe the relationship between population size and passage rates at CS has a number of important benefits to management. First, structural attributes of CS that contribute to a greater-than-expected passage rate by wildlife enable planners to more rigorously design species-specific mitigation measures. Second, if a strong association between population size and passage rate at particular sites can be found, then management can use monitoring of these limited areas to infer population trends in the broader study area. Third, detection rates of animals using CS are relatively high given the constricted nature of the passage, so monitoring CS use may be a more economical means of population monitoring than other index-type measures. Thus, the various crossing structures along the TCH can serve as a multi-species "super-transect" if appropriate population size and passage rate associations can be demonstrated. Specifically we are interested in understanding the following questions and will use data sets shown in bold to address each one: 1) What is the effect of different covariates on species use over time? Banff & Montana; 2) What are the effects of design and function of CS on community level metrics? Banff & Montana; 3) Can CS monitoring (counts) be used as an indicator of population abundance? Banff.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

- Review and summary of background literature to help form basis for results interpretation.
- We will be requesting an extension for this project. It is the 3<sup>rd</sup> project.
- 

**Anticipated work next quarter:**

- Continue with some data analysis and report writing.
- Requesting an extension to this project.

**Significant Results:**

None to date.

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

Project has had significant delays due to: 1) getting the approvals from the PFS Committee regarding Project objectives, administrative delays due to approvals required at NV DOT and MSU/WTI and work slowdowns during the Covid 19 pandemic.  
We will be requesting an extension to this project.

**Potential Implementation:**

None to date