

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.

Transportation Pooled Fund Program Project # <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> TPF-5(358)		Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31) 2020 <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input checked="" type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: <i>The Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity Transportation Pooled-Fund Project Strategic Integration of Wildlife Mitigation into Transportation Procedures</i>			
Name of Project Manager(s): Nova Simpson for Nevada DOT Patricia Cramer, PI	Phone Number: Nova Simpson: 775-888-7035 Patricia Cramer: 435-764-1995	E-Mail nsimpson@dot.nv.gov cramerwildlife@gmail.com	
Lead Agency Project ID: Nevada Dept. of Transportation	Other Project ID (i.e., contract #): Agreement #: P700-18-803	Project Start Date: 12/13/2018	
Original Project End Date: 12/31/2021	Current Project End Date: 12/31/2021	Number of Extensions: 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	\$82,303.23	55%

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%	2.5%	55%

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 case studies were reviewed by the project panel members, and edits and questions were sent to the research team, who began revising the case studies. Once these edits are incorporated, the case studies under partnerships will be complete.

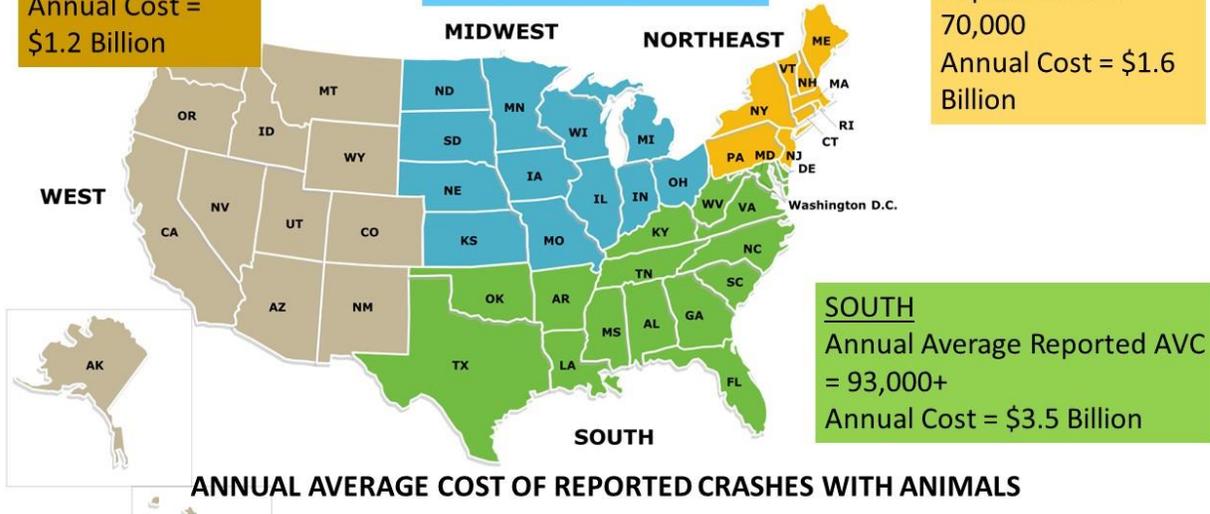
The Data Requirements chapter was completed and also sent to the panel members for input and review. Edits and potential changes were received and a revised Data Requirements chapter was being finalized.

The survey of all state traffic safety engineers to report crash data was completed with the exception of Florida's crash data. The Florida data were purchased on 5 CD's. Each year's crashes have to be calculated using multiple high volume databases. The PI on the project is working with Florida DOT analysts to finalize the crash data. The crash data for all other states were tallied per region of the US (without the Florida data), and the map below was created, as a temporary presentation of preliminary results. The crash costs were based on the 2018 FHWA crash costs estimates (Harmon et al. 2018). The U.S. average annual cost of reported crashes with animals is over \$10 billion. There are at least 200 reported fatal crashes with animals each year. Not all states report crashes that occur only with wildlife, thus, the "animal crashes" are reported here.

WEST
Annual Average
Reported AVC =
26,000+
Annual Cost =
\$1.2 Billion

MIDWEST
Annual Average Reported
AVC = 162,000+
Annual Cost = \$3.8 Billion

NORTHEAST
Average Annual
Reported AVC =
70,000
Annual Cost = \$1.6
Billion



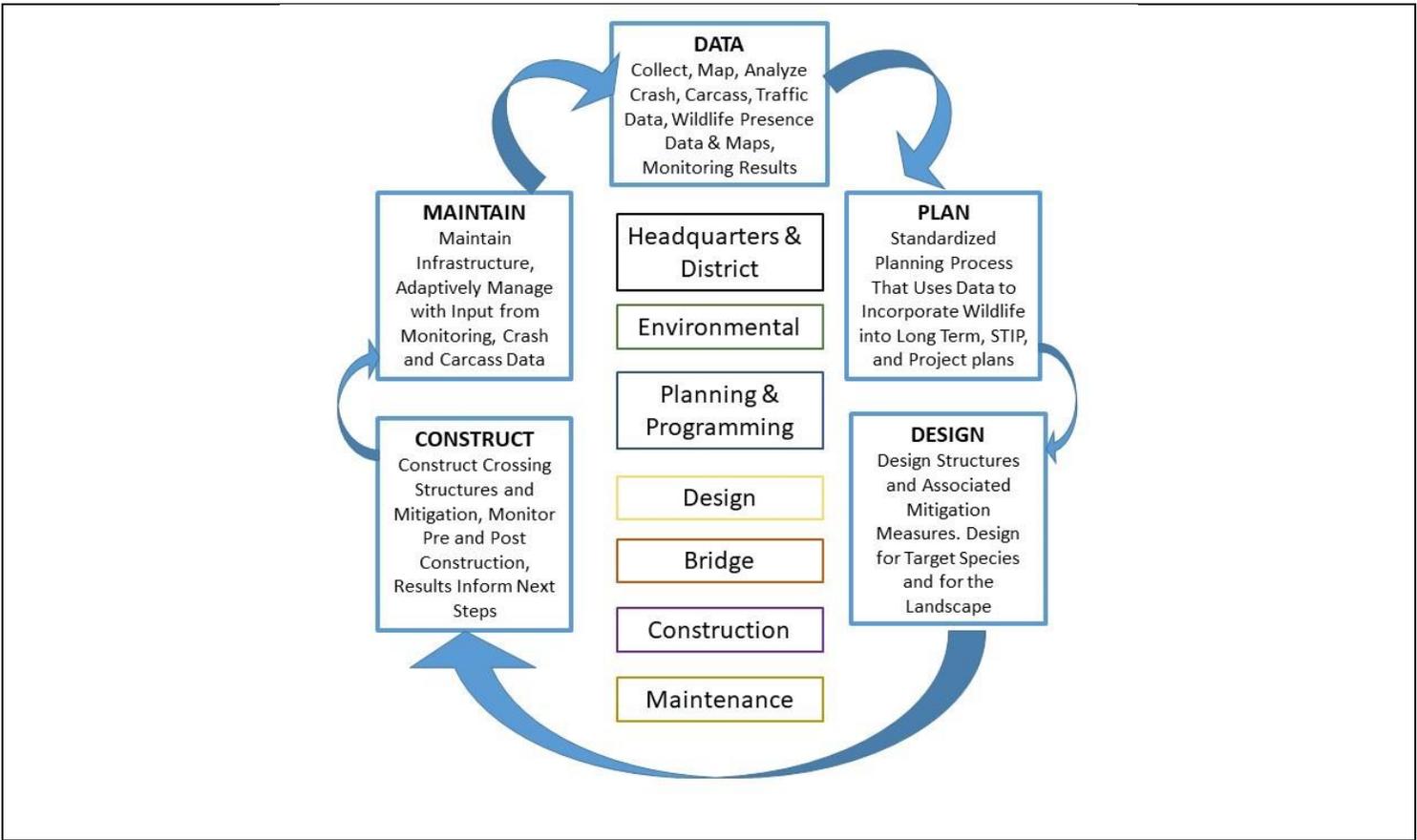
ANNUAL AVERAGE COST OF REPORTED CRASHES WITH ANIMALS

P. Cramer, the PI on the project was the Keynote speaker of the 2nd day of the on-line “virtual” Northeastern Transportation and Wildlife Conference (<https://www.netwc.org/>). She administered several survey questions to the conference participants that were similar to the 2019 on-line survey administered in this research. These results will be reported in the Task 1 report. Talks on how various northeastern states incorporate wildlife into transportation processes were informative for future case studies in the national manual.

Anticipated work next quarter:

The team 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, using the master figure (below) to guide the chapters.

The project panel will meet with Dr. Cramer on October 20, 2020 to review progress thus far and future work on the project, all virtually over the internet.



Significant Results:

The Partnerships chapter was completed; the Data Requirements chapter draft 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; Dr. Cramer presented the research’s survey results at the Northeastern Transportation and Wildlife conference, September 30th, 2020.

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

INSTRUCTIONS:

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

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		5%

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%

**Note that an estimated 40% of this project is to be supported by other funding sources. Therefore this estimate for % of work is based on the entire project from all funding sources.

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.):

- Meetings (primarily online due to covid-19).
- Project planning
- Image data management:
 - Image files we put on three separate external drives for processing
 - An index file containing image metadata we created so that images could be queried.
 - Results of human classification of $\approx 300,000$ images were added to the index file.
 - Properties of the image data set were summarized).
- Algorithm design
 - Literature research on image processing, computer vision, use of deep neural networks in image classification.
- Python coding and testing for image preprocessing
 - This is a very important step in the overall process because the convolutional deep neural networks (CDNNs) typically take images rescaled to a specific size (number of rows and columns).
 - If animals occupy only a small portion of the image, important detail need for classification might be lost when rescaling the image.
 - Further, some images may contain multiple animals, but CDNNs typically assign the probability assuming the image represents one class.
 - An option to resolve these issues is to identify the regions in the image that contain animals (i.e. foreground objects) and then clip out and rescale those parts of the image. Each part will then be classified separately by the CDNN. This is a challenging problem in field conditions because moving plants, changes in illumination, and bright spots and shadows all can create differences between focal and background images. Hence, a lot of work must be done to test algorithms to ensure they work for most cases.

Anticipated work next quarter:

- Transfer images to USGS supercomputers for processing
- Continue developing Python code for preprocessing.
- Begin developing and testing code for the convolutional deep neural networks that will be used for image classification

Significant Results:

We have organized and made copies of the image data set, and built an index that allows us to query the data set and load images we need for preprocessing and analysis.

Have develop basic Python code that includes all of the basic steps in image preprocessing and facilitates experimentation with various algorithms so that we can determine which will work best for the camera trap imagery that we have collected.

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).

NA

Potential Implementation:

NA

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Transportation Pooled Fund Program Project # <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> P342-20-803	Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31) 2020 <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input checked="" type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: Research to inform passage spacing for migratory amphibians and to evaluate the effectiveness of an elevated road segment to reduce road mortality and maintain connectivity between wetlands and uplands: Case study with the Yosemite toad.		
Name of Project Manager(s): Cheryl Brehme, Robert Fisher Budget: Curtis Hettich	Phone Number: 619-225-6427 619-225-6422 916-278-9479	E-Mail (preferred contact method) cbrehme@usgs.gov , rfisher@usgs.gov chettich@usgs.gov
Lead Agency Project ID: Not yet assigned	Other Project ID (i.e., contract #):	Project Start Date: 10 Sept 2020
Original Project End Date: 30 June 2022	Current Project End Date: 30 June 2022	Number of Extensions:

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
\$120,630.42	\$0	0%

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	0%

Project Description:

Many small animals, especially amphibian populations that must migrate between aquatic and terrestrial habitats, are susceptible to negative impacts from roads within their habitat. Narrow tunnels (<1m) under roads connected with barrier fencing are a standard mitigation solution. However, there is recent evidence that tunnel mitigation systems can act to filter migratory movements of species that disperse over large areas and unintentionally cause population decline. This project supports continued field study to determine; 1) the distances that Yosemite toads will move along barrier fencing before they “give up” and move back into the habitat and 2) the efficacy of a novel road crossing prototype for toads and other small wildlife species. The prototype is an 8” high elevated road segment on a US Forest Service road that provides a safe crossing nearly 100’ wide while allowing both light and rain to pass through. Although the prototype is 100’, it can be made to any length. The project includes an assessment by transportation engineers in collaboration with Caltrans to provide insight, guidance, and concept designs for similar crossing solutions that could be implemented on improved roads and highways. The results of this study will inform the minimum distances required between passages to provide permeability for migratory toads to make population level movements across roads. It will also provide a permeability analysis and concept plans for a new passage design that may provide greater connectivity and offer an alternative to below grade tunnels for sensitive amphibians, reptiles, and small mammals.

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

No work was performed this quarter

Anticipated work next quarter:

Work on purchase requisition and contracting for transportation engineering evaluation.

Significant Results:

NA

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).

NA

Potential Implementation:

NA

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Transportation Pooled Fund Program Project # Wildlife Vehicle Collision (WVC) Reduction and Habitat Connectivity Task 1 – Cost Effective Solutions Transportation Pooled-Fund Project TPF-5(358)		Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31) 2020 <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input checked="" type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: WVC Reduction & Habitat Connectivity NVDOT			
Name of Project Manager(s): Dr. Marcel Huijser	Phone Number: 406-543-2377	E-Mail mhuijser@montana.edu	
Lead Agency Project ID: 4W7576	Other Project ID (i.e., contract #): 4W7576	Project Start Date: 18 Dec 2018	
Original Project End Date: 30 Sep 2022	Current Project End Date: 30 Sep 2022	Number of Extensions: 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	\$129,877.5	35%

Commented [HM1]: Data from previous quarter. Financial data for this quarter are not available yet

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$547.34 0.0015%	\$547.34	33%

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

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

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Transportation Pooled Fund Program Project # <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> TPF-5(358) Transportation Pooled Fund Study	Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31) 2020 <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input checked="" type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: Innovative Fiber-Reinforced Polymer Structures for Wildlife Crossings (Adaptable for Bicyclists/Pedestrians)		
Name of Project Manager(s): Damon Fick Rob Ament	Phone Number: 406-994-6123 406.600.6348	E-Mail damon.fick@montana.edu rament@montana.edu
Lead Agency Project ID:	Other Project ID (i.e., contract #): 4W8317	Project Start Date: April 27, 2020
Original Project End Date: October 31, 2021	Current Project End Date: N/A	Number of Extensions: 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	\$40,868.21	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
30%	\$21,235.23	26%

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 also 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.):

Tasks 1-4 have been completed.

Task 5 was a report on Tasks 1 thru 4. It was finalized and published on the TPF-5(358) Transportation Pooled Fund Study website.

Task 6. The WTI Team conducted a site visit to US97 in Siskiyou County, CA with members of Caltrans, CA Fish and Wildlife Department, and the US Forest Service. There are 6 potential sites for the overpass and one has been selected as the result of the field review. The WTI Team awaits Caltrans to assure private landowners near the crossing site will provide wildlife friendly fencing and help address other wildlife needs for the approach areas to the overpass.

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. 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. Equally important, the co-lab seeks to help the crossing structure fit into the landscape aesthetically. Originally envisioned as a 2-day in-person workshop format, the co-lab will now take 5 months via online meetings. ARC has had a kickoff meeting with Caltrans and the WTI Team. It will result in a booklet of recommendations for various design elements that go with the FRP superstructure.

Task 8. The WTI Team is currently actively working on this task to create up to three different FRP structural prototype preliminary designs for a for the wildlife overpass at the selected US- 97 site.

Anticipated work next quarter:

Task 6. Caltrans will finalize the site selection so Task 7 and Task 8 can proceed.

Task 7. Continue to make progress on the ARC co-lab design process.

Task 8. Continue to develop 2-3 FRP designs using different FRP materials that are commercially available in North America.

Significant Results:

Caltrans has secured funding to have its staff work on this project and prepare the FRP overpass for eventual construction after the research project is concluded.

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 only problem has been settling on the final location for the overpass, because private lands adjacent to the site may be effected. Thus, Caltrans is consulting with, and seeking assurance from, adjacent landowners before the WTI Team can complete FRP designs and ARC co-lab design recommendations.

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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Transportation Pooled Fund Program Project # TPF-5(538)	Transportation Pooled Fund Program - Report Period: 2020 Quarter 3 (July 1 – September 30) 2020	
Project Title: Efficacy and cost-savings of fencing and wildlife crossings to reduce wildlife-vehicle collisions in the Bow River Valley, Alberta		
Name of Project Manager(s): AP Clevenger	Phone Number: 4036881138	E-Mail apclevenger@gmail.com
Lead Agency Project ID:	Other Project ID (i.e., contract #):	Project Start Date: Jan 2020
Original Project End Date: Mar 2021	Current Project End Date: Mar 2021	Number of Extensions: 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 WVC 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.):

- Review of project objectives and methods by PFS Committee
- Response to PFS Committee queries regarding project
- Project administration and mgt: Preparing Scopes of Work and Budgets for approval by NVDOT;
- Preparing Scope of Work and Budget for MSU/WTI and Contracted Services Agreement for project staff.
- Review of background literature on subject that will help form basis for results interpretation.
- Data analysis assessing sampling effort (time and distance) at 2 study sites.
-

Anticipated work next quarter:

- Continue with some data analysis and report writing.

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**

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Transportation Pooled Fund Program Project # TPF-5(538)		Transportation Pooled Fund Program - Report Period: Quarter 3 (July 1 – September 30) 2020 2020	
Project Title: 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			
Name of Project Manager(s): AP Clevenger	Phone Number: 4036881138	E-Mail apclevenger@gmail.com	
Lead Agency Project ID:	Other Project ID (i.e., contract #):	Project Start Date: Jan 2020	
Original Project End Date: Dec 2020	Current Project End Date: Dec 2020	Number of Extensions: 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.):

- Review of project objectives and methods by PFS Committee
- Response to PFS Committee queries regarding project
- Project administration and mgt: Preparing Scopes of Work and Budgets for approval by NVDOT;
- Preparing Scope of Work and Budget for MSU/WTI and Contracted Services Agreement for project staff.
- Review of background literature on subject that will help form basis for results interpretation.
- Review and editing of Results Interpretation for the Discussion and Mgt Implications of report.
-

Anticipated work next quarter:

- Continue with data analysis and report writing.

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.

Transportation Pooled Fund Program Project # <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i>		Transportation Pooled Fund Program - Report Period: <input type="checkbox"/> Quarter 1 (January 1 – March 31) 2020 <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input checked="" type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
Project Title: Pilot Study: Incorporating Large Ungulate and Small Reptile Total Value in Collision Mitigation Benefit-Cost Calculations			
Name of Project Manager(s): John Duffield	Phone Number: 406-721-2265	E-Mail bioecon@montana.com	
Lead Agency Project ID: P701-18-803 TASK 05	Other Project ID (i.e., contract #): G105-21-W8409	Project Start Date: 06/01/2020	
Original Project End Date: 12/31/2020	Current Project End Date: 4/30/2021	Number of Extensions: 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	0%

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	0

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 a change in end date for the work from 12/31/2020 to 4/30/2021 due to the combined effects of delays in contracting and the difficulty in conducting survey research in a Covid-19 environment. This new end date will allow us to mail surveys after January 1 when the volume of mail and overall distractions of the political season have (hopefully) passed.

Anticipated work next quarter:

In the next quarter drafting of survey materials will continue along with testing of survey questions through cognitive interviews and key-informant interviews. When the survey package is finalized it will be printed and assembled for mailing after the first of the year.

Significant Results:

ongoing

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 a change in end date for the work from 12/31/2020 to 4/30/2021 due to the combined effects of delays in contracting and the difficulty in conducting survey research in a Covid-19 environment. This new end date will allow us to mail surveys after January 1 when the volume of mail and overall distractions of the political season have (hopefully) passed.

Potential Implementation:

Ongoing

**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.

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

Commented [HM1]: Data from previous quarter. Financial data for this quarter are not available yet

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date

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).



One of the electrified guards and steel grounding plate (left) and the 2 m yellow line from the electrified barrier (middle) (Photo Parks Canada).



Black bear approaching the barrier at Sunshine road (Photo Parks Canada).

Lake O'Hara

Camera installed 3 Oct 2020



Lake O'Hara, red line indicates 2 m line from guard (Photo Parks Canada).

Lake Louise

Camera post not installed yet



Lake Louise, yellow tape indicates 2 m line from guard (Photo Parks Canada).

A2b. Electrified mats at fence ends, Thompson Falls.

Camera at west fence end was installed 30 Sep 2020



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

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

WTI now prepares for equipment and installation of this post.

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

3 different electrified gates types were installed.

- 1 swing gate



Zero bears out of about 15 bears have passed.

- 2 bump-gates



The commercially available design has electrified strands that hang down. This proved to be a poor barrier for black bears; about 30-50% (preliminary estimate) of dozens of bears went through. Walking or running through the wires appeared to easy or tempting for them.



A modification with added netting with metal wires seems to have resulted in a substantial barrier; zero out of about 15 bears went through. More difficult to just run through, better and longer contact with the electrified wires.

- 1 drive over wires



1 out of about 30 bears passed. However, after the wires were brought closer together and the sides were made less accessible, zero bears have passed.

Note:

The melon season has ended now.

The farmer estimates about 80% reduction in melon loss to bears.

The fence and gates will remain electrified till sometime in November (hibernation).

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. This is expected to start 1 Nov 2020.

Anticipated work next quarter:

General:

1. Install camera Thompson Falls east
2. Install camera Lake Louise
3. Modify jump-outs
4. Install cameras at Jump-outs

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 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:

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:

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Transportation Pooled Fund Program Project # TPF-5(538)	Transportation Pooled Fund Program - Report Period: Quarter 3 (July 1 – September 30) 2020 2020	
Project Title: Long-term Responses of an Ecological Community to Highway Mitigation Measures		
Name of Project Manager(s): AP Clevenger	Phone Number: 4036881138	E-Mail apclevenger@gmail.com
Lead Agency Project ID:	Other Project ID (i.e., contract #):	Project Start Date: July 2020
Original Project End Date: Mar 2021	Current Project End Date: Mar 2021	Number of Extensions: 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 of project objectives and methods by PFS Committee
- Response to PFS Committee queries regarding project
- Project administration and mgt: Preparing Scopes of Work and Budgets for approval by NVDOT;
- Preparing Scope of Work and Budget for MSU/WTI and Contracted Services Agreement for project staff.
- Review and summary of background literature to help form basis for results interpretation.

Anticipated work next quarter:

- Continue with some data analysis and report writing.

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