CDOT Research Area of Emphasis:

Mitigating Wildlife Vehicle Collisions and Improving Safe Wildlife Passage

Among Colorado's greatest assets is its natural environment of snow-covered mountains, wide open grasslands, canyons, plains, and deserts that support a diverse array of native wildlife species. These habitats and the diverse wildlife they support, particularly big game, contribute significantly to the state's economy and enhance Coloradans' quality of life. As stated in Governor Polis' 2019 Executive Order *Conserving Colorado's Big Game Winter Range and Migration Corridors:*

> *"Sportsmen, outdoor enthusiasts, and tourists from across the world visit Colorado to experience our State's outdoor landscapes and abundant wildlife. Colorado boasts the largest Rocky Mountain elk herd in the world, which contains over 250,000 animals. The State is also home to significant populations of other iconic big game species like mule deer, bighorn sheep, pronghorn, moose, and numerous other endemic wildlife species. Simply put, wildlife is essential to Colorado's outdoor recreation economy and landscape heritage."*

But Colorado's large herds, particularly species like mule deer and elk which migrate annually between seasonal habitats, face impacts and threats from Colorado's growing population, expanding development, habitat fragmentation, and potential barrier effects of highways, resulting in increasing pressure on wildlife populations and an increasing safety concern to the traveling public. Wildlife-vehicle collisions (WVCs) are the fourth most common type of crash in Colorado and a serious safety concern in many parts of the state. In an era when overall highway safety has generally improved, WVCs have continued to increase. According to State Farm (2018), 1 out of every 167 drivers submitted a claim from hitting a deer, elk, moose, or caribou during 2018. These trends are readily apparent in Colorado, where nearly 4,000 vehicle crashes involving wildlife are reported to law enforcement each year, resulting in injuries and fatalities to drivers and costing an estimated $80 million annually, not including the value of the wildlife that is killed and the impacts to wildlife populations. Reported accidents are known to represent only a fraction of the true number of WVCs, with underreporting rates of up to 80 percent or more, so the actual costs and impacts are greater.

In recent years, a mutual commitment to increased collaboration between CDOT and Colorado Parks and Wildlife (CPW) emerged to address wildlife-highway conflicts such as these. The partnership is evident in CDOT's environmental planning, and several research projects that include CPW as partners This collaboration predated Executive Order D 2019 011, quoted above, but as a result of the EO it has expanded and grown in importance because the EO directs CDOT and CPW to (among other things) work both individually and collaboratively on the issue of conserving big game populations and Identifying "priority areas for the implementation of big game crossings over and under roadways in Colorado… using the best available science."

CDOT has improved and continues to improve several corridors with a focus on driver safety and providing permeability for wildlife. Meanwhile ARIB has engaged in numerous studies intended to assist in this process through a scientific approach to identifying priority wildlife highway conflict areas; determining successful targeted wildlife mitigation measures to reduce WVCs; and measuring the success of these mitigation measures. As a result, several research teams in CO have gained considerable experience and expertise in this field, and their work is well respected in the research community such as national TRB committees. The continued interest from CDOT, the available

researchers, the partnership with CPW and the subject matter crossover - serving both driver safety and environmental concerns - suggest this topic will continue to be useful and productive for continued study.

We invite research Problem Statements to further address this important topic, reducing the occurrence and impact of WVC in Colorado.

Recent CDOT research projects that fall within this Area of Emphasis are:

- Research Report 2021-XX (*In progress*) US 160 Dry Creek Wildlife Study
  Authors: Patricia Cramer, Robert Hamlin

- Research Report 2021-XX (*In progress*) State Highway 9 Wildlife Mitigation Monitoring
  Authors: Julia Kintsch, Patricia Cramer, Paige Singer, Michelle Cowardin

- Research Report 2019-01 Western Slope Wildlife Prioritization Study
  Authors: Julia Kintsch, Pat Basting, Meredith McClure and Jim O. Clarke. Keywords:

- CDOT funded research 2016-08. Using Environmental Features to Model Highway Crossing Behavior of Canada lynx in the Southern Rocky Mountains
  Landscape and Urban Planning 157 (2017) 200–213. Authors: Phillip E. Baigasa, John R. Squiresa, Lucretia E. Olsona, Jacob S. Ivanb, Elizabeth. K. Roberts

- Research Report 2015-05 Monitoring Wildlife-Vehicle Collisions: Analysis and Cost-Benefit of Escape Ramps for Deer and Elk on U.S. Highway 550
  Authors: Jeremy L. Siemers, Kenneth R. Wilson, and Sharon Baruch-Mordo.

- Research Report 2012-2. The Reliability and Effectiveness of an Electromagnetic Animal Detection and Driver Warning System
  Authors: Marcel Huijser, Chris Haas, Kevin Crooks

- Research Report 2008-4 Roads and Connectivity in Colorado: Animal-Vehicle Collisions, Wildlife Mitigation Structures, and Lynx-Roadway Interactions
  Authors: Kevin Crooks, Chris Haas, Sharon Baruch-Mordo, Kris Middledorf, Seth Magle, Tanya Shenk, Ken Wilson, Dave Theobald

- Research Report 2007-9 Effectiveness of Ledges in Culverts for Small Mammal Passage
  Authors: Carron Meaney, Mark Bakeman, Melissa Reed-Eckert, Eli Wostl

- Research Report 2003-9 Identifying the Best Locations Along Highways to Provide Safe Crossing Opportunities for Wildlife
  Authors: Sarah Barnum

- Research Report 1991-11 Evaluation of Swareflex Wildlife Warning Reflectors
  Authors: David Woodham