Oregon Department of Transportation

Number: *25-38*

Proposed Title: **Effective Updates to Road Signs for Reducing Wildlife Vehicle Collisions**

1. Concisely describe the **transportation issue** (including problems, improvements, or untested solutions) that Oregon needs to research.

Wildlife presence is increasing in urban areas and climate change has added complexity in detecting their migration behaviors.   Various departments of transportation have reported an increasing trend of wildlife vehicle collisions (WVC) and a need to make the road signs more effective.   There are results indicating that regular signs are not as effective as large and custom designed signs and that some drivers ignore the signs after becoming insensitive to them. Nowadays, drivers can access on-board messages inside the vehicles in addition to the road signs.   It is challenging to balance the volume of warning signals to keep the drivers alert and to control the cost of liability when accidents happen. Effective road signs are continuously sought by DOTs to provide the alert at the right time to all drivers.

2. Document how this **transportation issue** is important to Oregon and will meet the [Oregon Research Advisory Committee Priorities](#)

WVC ranges from ~10K to ~40K per accident nationwide. Even though human fatality is still low, the animal fatality is very high. Furthermore, not all drivers report WVC and not all animal carcasses are found. ODOT has been investing in building wildlife corridors to benefit the ecological, environmental and transportation sectors of the Pacific Northwest. Road signs are proven to be effective in providing warning messages. According to a recent report by Utah DOT, the rate of WVC is higher for roads with a lesser number of warning signs for wildlife. However, further quantification on the effectiveness of these signs needs to be done to enable updates that meet the wildlife behavior change from season to season.

Multiple mitigation methods need to co-exist to minimize WVC as animals forage and chase/trail one another in the shared areas with human drivers. Overpasses, underpasses and fencing structures that guide the animals can achieve maximal outcome when drivers watch out for these animals. To know when to watch out for what animal is not trivial for all drivers. Road signs can prepare the drivers and help them leave sufficient reaction time to wildlife coming onto the roads.   Analyzing and evaluating road signs in regions that have high WVC can lead to a ranking that promotes effective designs and eliminates unnecessary warnings.

3. What **final product or information** needs to be produced to enable this research to be implemented?

The final product is a measurement of the effectiveness of the updated road signs in high WVC regions. The ultimate goal is to prove reduction of WVC from updating the road signs and recommending this update to ODOT. There are seven stages to this project and each stage has its own tasks. The first stage is to develop correlation between high WVC and the type of road signs, the second is to document the usage of this type of road signs on different roads, the third is to extensively describe the components of the signs in terms of its geometry, reflectivity, color, height and location, the fourth is to conduct eye-tracking measurements so that fixations and saccades are compared over different signs for different volunteers, the fifth is data analysis and decision matrix creation, the sixth is proposing updates to existing signs and conducting more eye-tracking measurements and the seventh is to test these updated signs on the different roads identified at stage two.

There will be monthly communication with ODOT committee members on the literature survey of road signs and their use with regard to WVC, on the eye-tracking experiment set-up and result analysis, and on the proposals for

updates to the existing road signs. The final testing of the updates will be coordinated with ODOT. In particular, for the experiments using the eye-tracking devices, there will be different categories for road signs, road types, lighting conditions, traffic flow, and drivers' sensitivity to road signs. Road signs will be sorted over text-only, animal-shape and vehicle-animal-drawing along with the sign surface material, geometry and location descriptions. We will investigate parking lots near natural parks, fenced-in mile markers on highways, 2-lane rural roads and ramps to multi-lane highways. The actual eye-tracking experiments will be done with volunteers who pass our survey questionnaire and are willing to look at the signs and their updates repeatedly. Obtaining permission from OSU to work with the volunteers will be finished before the start of the project. Data analysis from the eye-tracking experiments will employ statistical methods and visual analytics that can differentiate the performances of sensitive and insensitive volunteers. Lastly, evaluation on real roads will be carried out using animal carcass data measured over a period of time as a preliminary approach. The findings will be documented to enable more comprehensive evaluations over several seasons. All results and software tools will be delivered to ODOT.

4. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.

Name	Title	Email	Phone
Kira M. Glover-Cutter	Research Analyst and Coordinator	kira.m.glover-cutter@odot.oregon.gov	971-701-0051

5. Other comments:

6. Corresponding Submitter's Contact Information: [1 individual]

Name:	Yué Zhang
Title:	Associate Professor
Affiliation:	Oregon State University
Telephone:	541 737 0478
Email:	zhangyue@oregonstate.edu