Research Note

Identifying High Risk Locations of Animal-Vehicle Collision for Washington State Highways

From the WSDOT Research Office
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Animal-Vehicle Collisions claim lives, cause injuries and property damage

Animal –Vehicle Collisions (AVCs) claim the lives of hundreds of motorists each year and have caused of millions of dollars in injuries and property damage. Statistics indicate the rate at which AVCs occur is increasing. With limited resources available to install safety features, it is important to identify the high-risk locations for AVC on the state's freeways and highways. Unfortunately, the available data does not make identification of high-risk locations a simple or straightforward matter.

Washington State
Department of Transportation

Challenges in identifying high-risk AVC locations and causal factors

Identifying high-risk AVC locations and causal factors to AVCs is important for highway safety improvement. However, there are two major challenges to overcome to fulfill the task. The first challenge is the quality of available data. Existing AVC data consists of collision reports filed with the police and animal carcass removal data recorded by department of transportation maintenance workers. In an ideal world, the two datasets would agree exactly, with every collision reported and every removed carcass attributable to a collision report. Unfortunately, the two datasets do not align well, with only a fraction of the records matching between the datasets. This overlap is problematic because it represents a case where a model created with both datasets double counts some AVCs skewing the results. To accurately represent the true AVC risk requires identifying which records in the carcass removal data can be attributed to the collision report data so that a single dataset can be created for use in risk modeling.

The second challenge to identifying high AVC risk locations is choosing a model that can translate the AVC data into collision risk and identify AVC causal factors. Models vary in complexity and required data. One focus of this research involved selecting the best performing conventional accident model from those investigated for AVC risk assessment and causal factors identification.

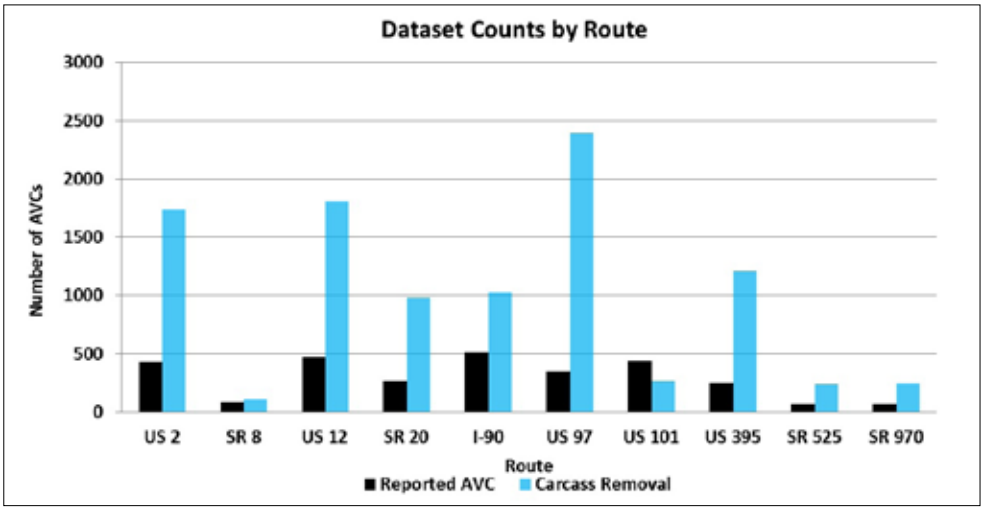

Figure 1: Comparison of the total AVC number between two datasets each study route (2002-2006)

Researchers reconciled collision reports and carcass removal datasets

The research team conducted a survey of WSDOT personnel regarding the data on carcass removal. The survey results were used to calibrate a fuzzy logic algorithm to match records between the data sets. After matching, approximately 30% of the collision report data was matched to the carcass removal data. Combining the two data sets resulted in a 20% increase in unique records over the carcass removal data alone.

High-risk locations

Ten routes were selected as study routes for close examination. The ten routes are US-2, US-12, US-97, US-101, US-395, I-90, SR-8, SR-20, SR-525, and SR-970. The measure by which AVC risk is quantified is important. After comparing several measures, AVCs per mile was used. In mitigating AVC risk, identifying specific high-risk locations where

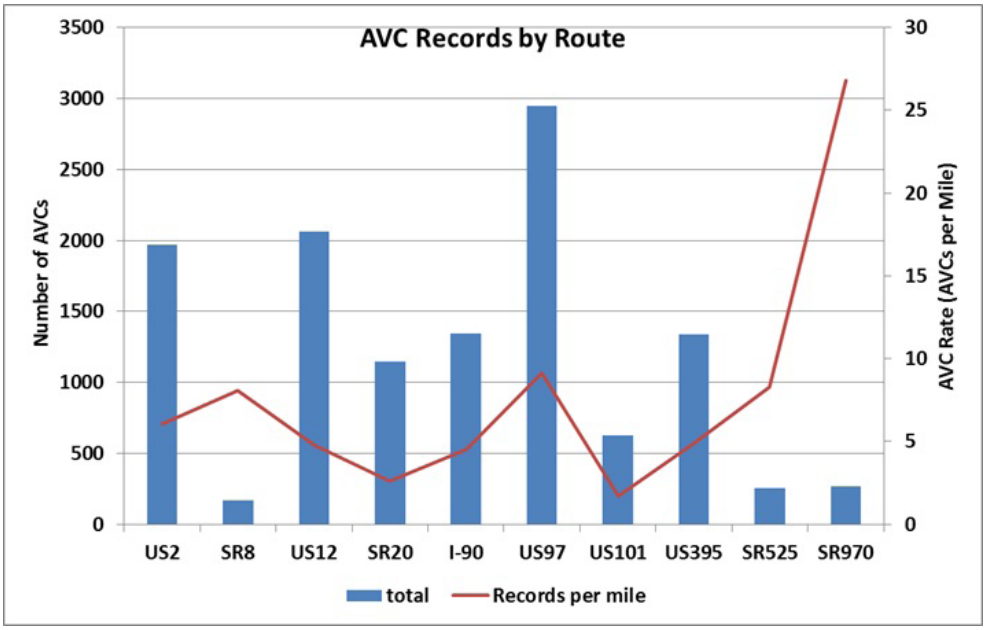

Figure 2: AVC Records by Route, Total and Per Mile

countermeasures can be effectively deployed is more useful than long stretches of elevated risk. Figure 1 shows the number of collision records and carcass removals on each study route. Figure 2 shows the total AVCs and per mile AVCs for each of the study routes. Figure 3 shows the AVC count density along the study routes using the reconciled datasets.

AVC modeling

The researchers ran the reconciled datasets through different statistical models and compared and analyzed the results. The team examined the double Poisson, bivariate Poisson, zero-inflated double Poisson and diagonal inflated bivariate Poisson models. An additional microscopic probability model was also developed and tested to examine how AVC causal factors impact the risk associated with driver, animal, and road.

Researchers identified the factors associated with AVC's

The microscopic probability and diagonal inflated bivariate Poisson models identified factors that may contribute to AVCs including:

- Animal habitat areas, particularly for white-tailed deer, increase collision risk
- Speed limits greater than 50 mph increase collision risk
- More lanes increase collision risk
- Limited access control relates to lower AVC
- Increased heavy truck traffic reduces AVC risk
- Wider medians decrease AVC risk

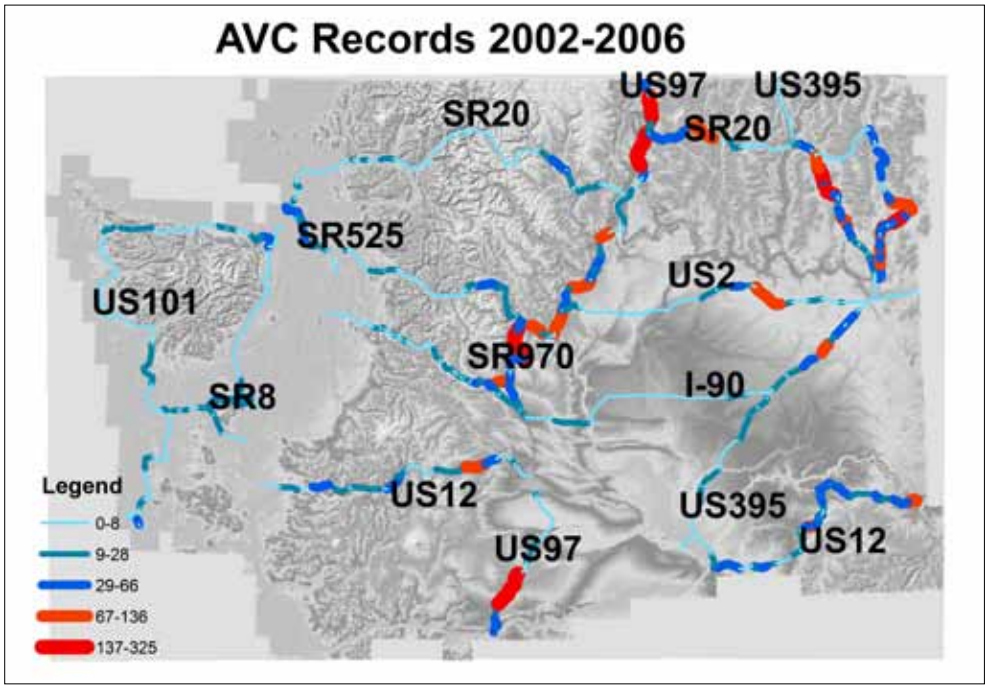

Figure 3: AVC location distribution for the ten study routes

Researchers recommend points to consider when designing road projects

The primary difficulties associated with this research include inferior data quality and availability. Improving data collection, particularly animal information such as species data, in the collision reports would be a great help. WSDOT started collecting species data in 2010. Lack of information also makes it difficult to determine how increasing heavy truck traffic and median width can lower AVC rates. Researchers can speculate on reasons such as drivers may be more cautious when driving close to trucks. Trucks have better sightlines allowing them to anticipate and avoid collisions. Trucks are also noisier which may drive animals away. But, better information is needed to design effective countermeasures.

A few key points need consideration when designing road projects:

- New routes should be planned to avoid dividing high density animal habitats. Otherwise, solutions are needed to mitigate animal vehicle interactions.
- Areas of localized AVCs may benefit from fences, animal crossings, and grade separated crossings.
- Driver warning systems may be beneficial in areas where driver reaction speeds are problematic.
- Lowering the speed limit in collision prone areas can reduce AVC risk.

Results used to identify low cost safety countermeasures

WSDOT will use this research to strategically identify low cost highway safety countermeasures, such as placing signage, fencing, and animal crossings in areas with a high probability and potential of animal vehicle collisions.

Contact Information

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