Year 2007 *Paper Gunson*2007*a*

Limited Applications of Wildlife-Vehicle Collision Analyses for Transportation Planning and Mitigation Efforts Due to Spatial Inaccuracy

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Gunson, Kari, and Anthony Clevenger. "Limited Applications of Wildlife-Vehicle Collision Analyses for Transportation Planning and Mitigation Efforts Due to Spatial Inaccuracy". In Proceedings of the 2007 International Conference on Ecology and Transportation, edited by C. Leroy Irwin, Debra Nelson, and K.P. McDermott. Raleigh, NC: Center for Transportation and the Environment, North Carolina State University, 2007. pp. 602.

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Abstract

To properly mitigate road impacts for wildlife and increase motorist safety, transportation departments need to be able to identify where particular individuals, or species are susceptible to high road-kill rates along roads. Researchers have relied on a variety of statistical methods to determine the specific explanatory factors associated with wildlife-vehicle collisions (WVC). Of particular importance in these analyses is the underlying spatial data used to describe the locations of WVCs. In this study we investigate the importance of the same WVC factors on two different datasets: one with highly accurate location data (<3 m error) representing an ideal situation and another dataset with high spatial error (+0.5 mile or 800 m), which is likely more characteristic of the average transportation agency dataset where collision locations are recorded to the closest mile marker. We used spatially accurate locations of ungulate vehicle collisions (UVC) in the Central Canadian Rocky Mountains from 1999 to 2004 to create a low accuracy dataset by shifting each location to the nearest hypothetical mile-marker on the road. We measured the same attribute at each spatially ac¬curate UVC location and at each mile-marker location along five highways in the study area. We categorized each mile marker segment and its corresponding kills as a "high-kill" or "low-kill" zone by comparing the total number of UVCs associated with a single mile-marker segment to the average number of UVCs per mile for the same stretch of road. We measured three types of spatial variables for each high and low kill location: field measured point-specific and GIS generated proximity and proportional variables. We used univariate tests and logistic regression analyses to identify which of the attributes best predicted the likelihood of UVC occurrence for both datasets. Within the spatially accurate dataset, six of the point specific habitat and terrain variables were significant while only two of the field variables (road width and terrain) were significant for the mile-marker dataset. No proximity and one proportional measurement was significant for the mile-marker dataset. The spatially accurate regression model was significant and had more predictive ability than the low accuracy data since the majority of the variables measured were site-specific. This analysis demonstrates that WVC data collection accuracy will determine the scale and type of variables which should be measured. The application of models generated from low accuracy data is limited to a coarse landscape scale while

spatially accurate models are needed to determine the fine-scale factors associated with WVCs. The particular objectives of these predictive analyses i.e. pinpointing exact locations for mitigation structures, will ultimately determine whether an agency should invest in collecting spatially accurate data as opposed to opportunistically collecting low accuracy data.

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Abstract

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