THE RELIABILITY OF TWO NEW ANIMAL DETECTION SYSTEMS AND RECOMMENDED REQUIREMENTS FOR SYSTEM RELIABILITY

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Animal–vehicle collisions affect human safety, property, and wildlife, and the number of animal–vehicle collisions has increased in many regions across North America. Animal detection systems can help reduce the number of wildlife-vehicle collisions and allow for safe crossing opportunities for wildlife. These systems detect large animals when they approach the road and once a large animal has been detected, warning signs are activated. Drivers can then respond by becoming more alert, reducing the speed of their vehicle, or both. For animal detection systems to be effective in reducing collisions, reliable systems are essential. For a previous project we investigated the reliability of nine systems from five manufacturers. The current study reports on the reliability of two new systems: 1. a buried cable that detects changes in an electromagnetic field when large animals walk over the cable and 2. a third generation break-the-beam system that uses microwave radio signals. The systems were investigated for their reliability in a controlled access test facility near Lewistown, Montana. The two new systems were also installed along real roadsides; the buried cable system was installed along Hwy 160 near Durango, Colorado, and the microwave radio signal break-the-beam system was installed along Hwy 3 near Fort Jones, California. At the test facility near Lewistown, Montana, we used horses, llamas, and sheep as a model for wild ungulates. The animals roamed in an enclosure and data loggers recorded the date and time of each detection for both systems. Animal movements were also recorded by six infrared cameras with a date and time stamp. By analyzing the images and the detection data in different seasons, researchers were able to investigate the reliability for each system. The percentage of false positives (i.e., a detection is reported by a system but there is no large animal present in the detection zone) was relatively low for both systems (≤0.5%). However the percentage of false negatives (i.e., an animal is present in the detection zone but a system failed to detect it) differed substantially (1.9–16.8%). The percentage of intrusions (i.e., animal intrusions in the detection area) that were detected also varied substantially (88.6-99.5%). The results suggest that one of the two detection systems was quite reliable in detecting large mammals with few false positives and false negatives, whereas the other system had relatively many false negatives, mostly because of downtime. When we compared the reliability data to the recommended performance requirements that were obtained through interviews with three stakeholder groups we found that one of the two systems tested met the recommended requirements, while the other did not. Based on the results we know that some systems are quite reliable and may be considered for implementation along a roadside where they can be investigated for their effectiveness in reducing collisions with large wild mammals. However, experiences with installation, operation and maintenance suggest that the robustness of animal detection systems may have to be improved before the systems can be deployed on a large scale.