POSTER PRESENTATION

EVALUATION OF THE RELIABILITY AND EFFECTIVENESS OF AN ANIMAL DETECTION SYSTEM ALONG STATE HWY 3 NEAR FT JONES, CALIFORNIA

Marcel P. Huijser (406-543-2377, mhuijser@coe.montana.edu) Research Ecologist, Western Transportation Institute, Montana State University, PO Box 174250, Bozeman MT 59717, United States

Mohammad (Ashkan) Sharafsaleh (510-665-6716, ashkan@path.berkeley.edu) , Senior R & D Engineer, California PATH Program, University of California at Berkeley, 1357 S.46th Street, Bldg. 452, Richmond, CA 94804-4648, United States

Christopher Nowakowski (510-665-3673, chrisn@path.berkeley.edu), Human Factors Research and Development Engineer, California PATH, University of California, Berkeley Richmond Field Station, Bldg. 452, 1357 South 46th Street, Richmond, CA 94804-4648, United States

Jonathan Felder (510-665-3668, felder@path.berkeley.edu), Systems Administrator, California PATH, University of California, Berkeley Richmond Field Station, Bldg. 452, 1357 South 46th Street, Richmond, CA 94804-4648, United States

ABSTRACT

We investigated the reliability and effectiveness of a microwave break-the-beam animal detection system (ICx Radar Systems), along State Hwy 3 (SR-3) near Ft Jones, northern California, USA. The first reliability test involved a human passing through the beam at about (20 m) intervals. The results indicated that the system was capable of detecting a human and was therefore likely to be able to detect large ungulates such as black-tailed deer. While the system did not have any blind spots, three of the beams did show evidence of desensitizing during testing. For a second reliability test, we compared the detection data from the animal detection system with the video images from infrared cameras along the section of SR-3 that is covered by the system. At least 74% of all detections could be considered “correct”. Because of the limited range of the cameras, especially during the night, it is likely that the percentage of correct detections is substantially higher. Most of the triggers that were not identified were in the late afternoon and during the night when the range of the cameras was very limited, except for triggers that carried lights (e.g. vehicles). There were some system errors but except for one system error they did not result in the activation of the warning signs. About 93% of the correct detections related to vehicles turning on and off SR-3, suggesting that it is worthwhile to implement additional vehicle detectors at the side roads that keep the warning lights from turning on when a vehicle turns on or off the highway. Only about 4% of the correct detections related to black-tailed deer. However, compared to vehicles the number of deer that triggered the beam is more likely to have been underestimated as deer cannot be identified on night images if they are further away than about 100 ft (30 m) from the cameras. Vehicles reduced speed by about 5.5% with activated warning signs (from 56.2 mi/hr to 53.1 mi/hr), with greatest effectiveness during the evening and night. Because of the relatively low number of large mammal carcasses, the relatively short road section with the system (2/3 mile), and the relatively short time period

during which the system was present with the warning signs uncovered (7 months), it was not possible to conclude whether the animal detection system may have also reduced the number of large mammal-vehicle collisions. Finally, the results of a survey among drivers of the road section with the system indicated that most respondents wanted the system to be removed. The most common concerns related to the cost of the system, the perception that the system was in the wrong location, the brightness of the warning signs at night, and the perception that the system is not reliable. We recommend improving the reliability of the system, reducing potential downtime and operation and maintenance costs, improving the warning signs, and to implement an extensive communication program with drivers and the general public.

BIOGRAPHICAL SKETCHES

Marcel Huijser received his M.S. in population ecology (1992) and his Ph.D. in road ecology (2000) at Wageningen University in Wageningen, The Netherlands. He studied plant-herbivore interactions in wetlands for the Dutch Ministry of Transport, Public Works and Water Management (1992-1995), hedgehog traffic victims and mitigation strategies in an anthropogenic landscape for the Dutch Society for the Study and Conservation of Mammals (1995-1999), and multifunctional land use issues on agricultural lands for the Research Institute for Animal Husbandry at Wageningen University and Research Centre (1999-2002). For more than a decade now Marcel has worked on wildlife-transportation issues at the Western Transportation Institute at Montana State University (2002-present).

Mohammad (Ashkan) Sharafsaleh is a Senior Research and Development Engineer with California PATH Program of UC Berkeley. He received his B.S. in Civil Engineering from University of Cincinnati (1991) and M. of Eng. in Structural Engineering (1993) and M.S. in Transportation Engineering (1994) from UC Berkeley. He has passed all the course requirements and exams for his PhD in Transportation Engineering from UC Berkeley except for his dissertation. He has worked as a consultant in private sector as well as the assistant City Traffic Engineer for the City of Berkeley prior to joining PATH (2002-present). At PATH, he has managed a variety of projects including Performance Measurement System (PeMS), ITS Decision Support Website, Construction of PATH's Intelligent Intersection Test-Bed, Hybrid Data Roadmap, and Evaluation of Animal Warning System Effectiveness. He is currently managing Silicon Valley Connected Vehicle Test Bed project. He has also contributed to a number of other internationally well-known PATH projects such as Intersection Decision Support, Vehicle-Infrastructure Integration, and Cooperative Intersection Collision Avoidance Systems. He has a vast experience dealing with cities, counties, and state institutions for deployment and field data collection efforts. Mr. Sharafsaleh is a registered Traffic Engineer in State of California.

Christopher Nowakowski is a Research and Development Engineer at the University of California, Berkeley, Partners for Advanced Transportation TecHnology (PATH) program. He has a background in Civil Engineering and a M.S. in Human Factors Engineering from the University of Michigan. His research interests include safety, usability, and transportation human factors issues such as driving behavior, transit behavior, technology use, and driver decision making in the context of transportation systems. At California PATH he has spent over 10 years conducting research on topics related to the design of in-vehicle controls and displays, navigation and traveler information systems, Advanced Driver Assistance Systems (ADAS) and Collision Avoidance Systems (CAS), connected vehicles, cooperative adaptive cruise control (CACC), and automated vehicles.

Jonathan Felder received his B.S. in computer science (1998) and did some graduate work in computer science with a focus on system administration (1998-2000) at Florida State University in Tallahassee, FL. He has been employed as a systems administrator at the University of California, Berkeley for over a decade. First he worked for the California PATH Program (2001-2009) where he supported researchers working on solving various problems in transportation. He now works for Educational Technology Services where he focuses on supporting the online publishing and distribution of lectures from all across the UC Berkeley campus to the public (2009-present).

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Evaluation of the Reliability and Effectiveness of an Animal Detection System, Hwy 3, Ft Jones, California

Marcel P. Huijser[1], Mohammad (Ashkan) Sharafsaleh[2], Christopher Nowakowski[2] & Jonathan Felder[2]

[1] Western Transportation Institute, Montana State University (406-543-2377, mhuijser@coe.montana.edu), [2] California PATH Program, University of California at Berkeley (c/o 510-665-6716, ashkan@path.berkeley.edu)

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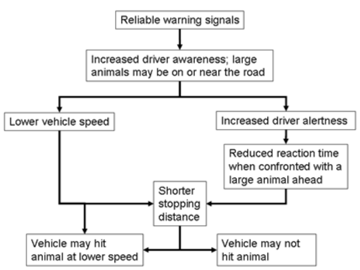
Introduction

We investigated the reliability and effectiveness of a microwave break-the-beam animal detection system (ICx Radar Systems), along State Hwy 3 (SR-3) near Ft Jones, northern California, USA.

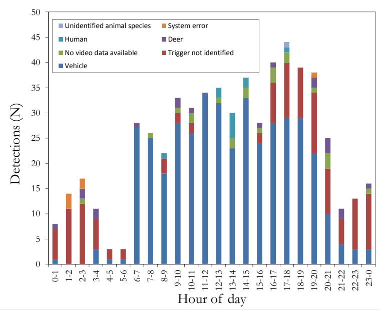
Animal detection systems use sensors to detect large animals when they approach the road. Once a large animal has been detected, warning signs are activated that urge drivers to reduce vehicle speed and become more alert. Reliability of the system is essential; appropriate driver response depends on it.



Reliability

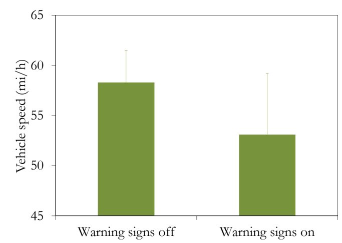
We matched the detection logs with video footage to identify what may have triggered the system. We analyzed 30 days in total.

We were able to identify the trigger for 74% of the 586 detections that were recorded. The trigger was not identified for 21% of the detections. The unidentified triggers occurred mostly during the dark hours and are a result of the limited range of the cameras at night. Over 92% of the identified triggers were vehicles turning on and off the highway. About 4% of the identified triggers were deer.

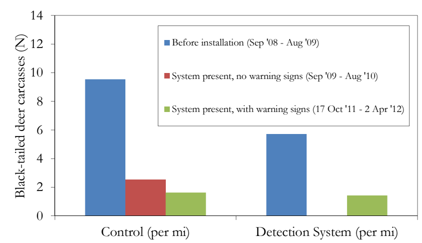


Effectiveness

Drivers reduced the speed of their vehicle by 5.1 mi/h (8.2 km/h) on average when the warning signs were activated.



The number of reported black-tailed deer carcasses per mile was higher in the control sections than in the section with the system, both before and after installation. There was only one black-tailed deer carcass reported in the road section with the system after the warning signs were attached, but at this location the system is only present on the north side of the road and not on the south side.



Conclusions

The system appeared reliable in detecting black-tailed deer. However, most detections were related to vehicles turning on and off the highway at access roads. Drivers reduced vehicle speed by 5.1 mi/h (8.2 km/h) on average in response to activated warning signs. There was only one black-tailed deer carcass reported in the road section with the system after the warning signs were attached, but the research period and the number of deer carcasses were too low for a meaningful analyses for a potential reduction in deer-vehicle collisions.

Recommendations

- Install detection loops at access roads that cancel triggers by vehicles turning on and off the main highway.
- Start and end road sections equipped with sensors on opposite sides of the road (not staggered).
- Adjust the brightness of the warning signs depended on the time of day.
- Allow for sufficient time to investigate a potential effect of activated warning signs on collision reduction.

Acknowledgements

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