REFERENCE

Hardy, A., S. Lee, and A.F. Al-Kaisy. Effectiveness of Animal Advisory Messages on Dynamic Message Signs as a Speed Reduction Tool: Case Study in Rural Montana. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 1973, Transportation Research Board of the National Academies, Washington, D.C., 2006, pp. 64-72.

INTRODUCTION

The study documented in this article measured the vehicle speed impacts of animal-related messages displayed on dynamic changeable message signs. The study area was a 19-mile segment of Interstate 90 through Bozeman Pass in Montana. This is a roadway segment that experiences frequent animal-vehicle collisions. The posted speed limit along the study site roadway segment was 75 miles per hour (mph) for passenger vehicles and 65 mph for trucks.

STUDY DESIGN

One portable and two existing permanent dynamic message signs were used as part of this research study. The two permanent signs served each direction of Interstate 90 and were approximately 19 miles apart. The portable dynamic message sign was located in the westbound direction of Interstate 90, within the study area, immediately before the two-mile segment with the highest annual number of recorded animal-vehicle collisions in the study area. It was located approximately 16 miles after the permanent dynamic message sign that served the Interstate 90 westbound direction.

Vehicle speed data were collected near the signs from 5 PM to 9 AM (animal-vehicle collisions are the most prevalent during dusk, night, and dawn) for 16 consecutive days (between September 17, 2004 and October 2, 2004). Light conditions were represented in the data (i.e., light, dusk, dawn, or dark), as well as day of the week (i.e., weekday or weekend). Pneumatic road tube devices were used to collect these vehicle speeds and classify the vehicles as either passenger cars or heavy vehicles. In the eastbound direction a data collection device (EB1) was placed at the permanent eastbound sign location and another was placed one mile downstream (EB2) so that the data collected in this direction corresponded to this sign alone. In the westbound direction a data collection device (WB1) was placed 2.8 miles downstream from the permanent westbound sign, another (WB2) was placed 2.6 miles before the portable sign, and a third (WB3) 0.8 miles after the portable sign. In this direction, WB1 measured the effects of the permanent westbound sign, while WB2 and WB3 measured the effects of the portable westbound sign. It was noted by the researchers that no counter was placed before the permanent sign in the westbound direction because the sign location near an interstate on-ramp would have prevented reliable speed data collection. The researchers stated that additional counters were originally deployed, but technical difficulties in the field prevented their use. These unusable counters were placed before the signs and would have served as controls. Overall, however, the data that was collected from each counter was not compared to other counters. Only the data at each counter were compared when different dynamic message sign treatments were active.

One control (no message displayed) and three messages were used on both the permanent and portable dynamic message signs during the study period. The following were displayed on the permanent dynamic message signs:

- Control: No message displayed;
- Message 1: "TRAVEL INFO CALL 511 BEFORE YOU DRIVE;"
- Message 2: "ANIMAL CROSSING NEXT 20 MILES BE ALERT;"
- Message 3: "'X' ANIMALS HIT NEXT 20 MILES THIS YEAR."

The portable dynamic message sign, however, required a smaller number of words to display the same type of information. The following were displayed on this sign:

- Control: No message displayed;
- Message 1: "TRAVEL INFO-CALL 511;"
- Message 2: "WATCH FOR ANIMALS-NEXT 2 MILES;"
- Message 3: "'X' ANIMALS HIT-NEXT 2 MI THIS YEAR."

In addition, the messages displayed on the permanent signs were on one frame, but the text used on the portable dynamic message signs, although shorter, was displayed in two frames. Each of the messages and the blank sign (i.e., the control) was used between 5 PM and 9 AM on four of the 16 nights within the study time period. The order of the messages (or the control) used during the time period was determined randomly. The message used on the two permanent signs, however, was always the same, and the portable sign was assigned a message separately.

STUDY RESULTS

Vehicle speed data were collected for 133,178 passenger cars and 42,480 heavy vehicles during the study time period. Speeds less than 30 miles per hour (mph), however, were considered outliers excluded from the analysis. Stopping distances were also calculated for the average vehicle speed for the control situation (i.e., no message) and when the messages were displayed. These calculations assumed a driver perception-reaction time of 2.5 seconds, level grade, and a 0.3478 pavement coefficient of friction. The average vehicle speed and standard deviation, along with a stopping distance (given the above assumptions), are shown in Table 1 for data collection location. Similar information for heavy vehicles can be found in the article.

The researchers statistically compared the average vehicle speeds during the control situation (i.e., no message displayed) to average vehicle speeds during each message treatment. Average vehicle speeds were only compared between the different sign displays at each traffic counter location. The range of the difference between the average vehicle speed with no treatment and those with messages was -3.0 mph (an increase in speed) to 3.3 mph. The standard deviation of the average speed ranged from 6.0 to 9.1 mph.

Overall, the researchers concluded that the correlations between the sign displays and the average vehicle speed were consistent for passenger vehicles and trucks. The fit of the models that defined these correlations, however, was weak. The researchers also concluded that the second and third message treatments (see above) appeared to

Table 1. Average Vehicle Speed, Standard Deviation, and Stopping Distance for Passenger Vehicles

Device Location[1]	Message[2]	Average Vehicle Speed (mph)	Standard Deviation (mph)	Stopping Distance (feet)
EB1	No Message	74.8	7.9	771
	Treatment 1	75.6	7.6	822
	Treatment 2	74.7	7.9	765
	Treatment 3	73.6	7.3	749
EB2	No Message	78.5	8.3	853
	Treatment 1	81.5	9.1	898
	Treatment 2	77.3	8.1	820
	Treatment 3	76.8	8.1	807
WB1	No Message	72.8	6.2	757
	Treatment 1	73.5	7.2	763
	Treatment 2	71.5	6.0	733
	Treatment 3	71.8	6.2	730
WB2	No Message	70.4	7.7	702
	Treatment 1	69.1	7.2	688
	Treatment 2	67.1	7.6	642
	Treatment 3	70.8	8.0	693
WB3	No Message	73.6	7.4	758
	Treatment 1	72.6	7.6	743
	Treatment 2	70.5	7.6	696
	Treatment 3	70.5	8.3	686

[1]Specific locations of these are noted in the previous text.
[2]The treatment messages are noted in the previous text. It is assumed that only the WB2 and WB3 locations were measures of the potential impact of the portable message sign information.

result in average vehicle speeds that were generally lower than those when no text was presented to the driver or a general warning (i.e., message 1) was displayed. At one counter location (i.e., WB2), however, the average speed was greatest during message 3. In addition, the researchers determined that average vehicle speeds during dark conditions (i.e., at night) were also lower during the second and third message treatments than during the control and message 1. Overall, the average speeds during dark conditions were lower than daytime for all sign displays. Vehicle speeds were also somewhat higher during weekdays when compared to weekends. The portable dynamic message sign also appeared to have a greater impact on vehicle speeds than the permanent dynamic message signs. The researchers believed that this might have been the result of the two-frame message approach used with the portable dynamic message sign. The general conclusion of the authors was that the messages related to wildlife-vehicle collisions on dynamic message signs could potentially reduce average speeds and safe stopping distances of passenger vehicles and trucks.

DVCIR CENTER FINDINGS

The content of this article may be of interest to jurisdictions considering the use of portable or permanent dynamic message signs to display wildlife-vehicle collision warnings. The project described attempts to evaluate the vehicle speed impact of different wildlife-related messages. Unfortunately, the results are somewhat limited due to what appears to be some malfunctioning data collection devices. Overall, the authors concluded that the average vehicle speeds appeared to be smaller when messages specific to wildlife-vehicle crashes were displayed (in comparison to the "no message" control situation and/or the general "dial 511 for travel info" message). The location of the vehicle speed data collection devices, however, limits the ability of the authors (based on our review of the article content) to make this conclusion with complete confidence. The data collection device locations, combined with the potential for an inconsistent message on the portable and permanent signs, may also introduce further limitations. Overall, however, the study conclusions generally agree with the idea that more detail in a message can result in a greater impact. In other words, sign messages can be more effective if they are specific and appear to indicate a hazard that the driver believes and understands. The completion of another more significant research project on this subject would be desirable.