

Effectiveness of Animal Advisory Messages on Dynamic Message Signs as a Speed Reduction Tool: A Case Study in Rural Montana

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Presentation Purpose

- Background
- Study Objectives
- Methods
- Results
- Recommendations



Animal-Vehicle Collisions (AVCs)

- Annually in US:
 - ~1.5 million AVCs
 - >200 human fatalities & 29,000 injuries
 - \$1 billion (property damage alone)

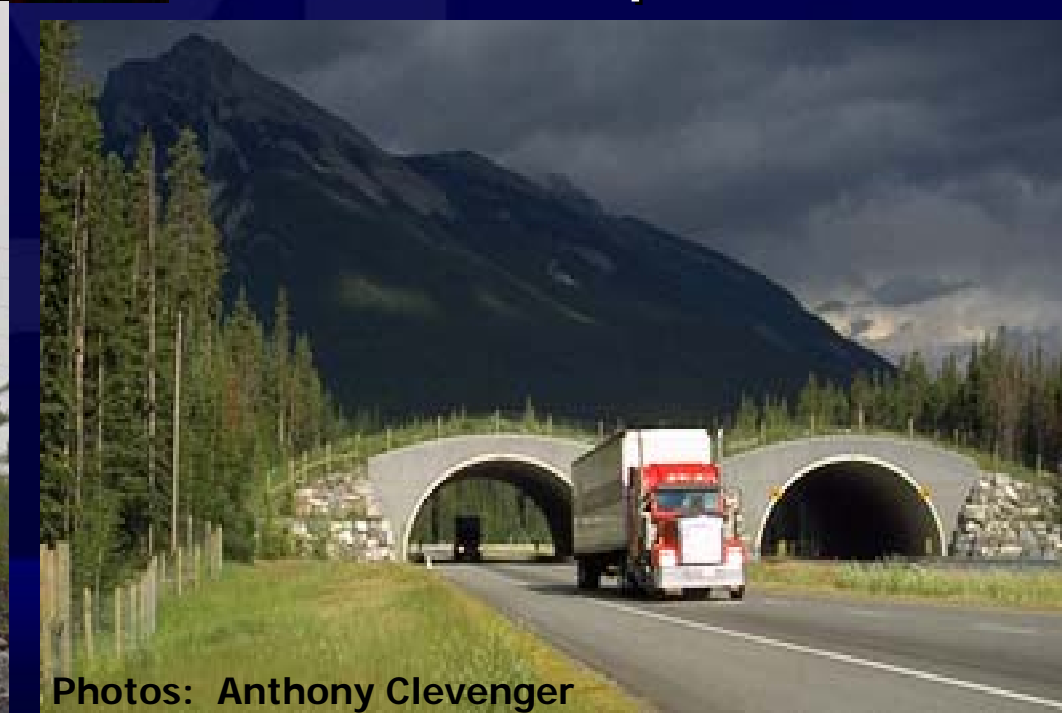
Mitigation approaches

- Reduce (over-) populations
- Modify
 - Animal behavior
 - Driver behavior



Modify Animal Behavior

- Sensory control
- Physical control
 - Fencing, under- & overpasses

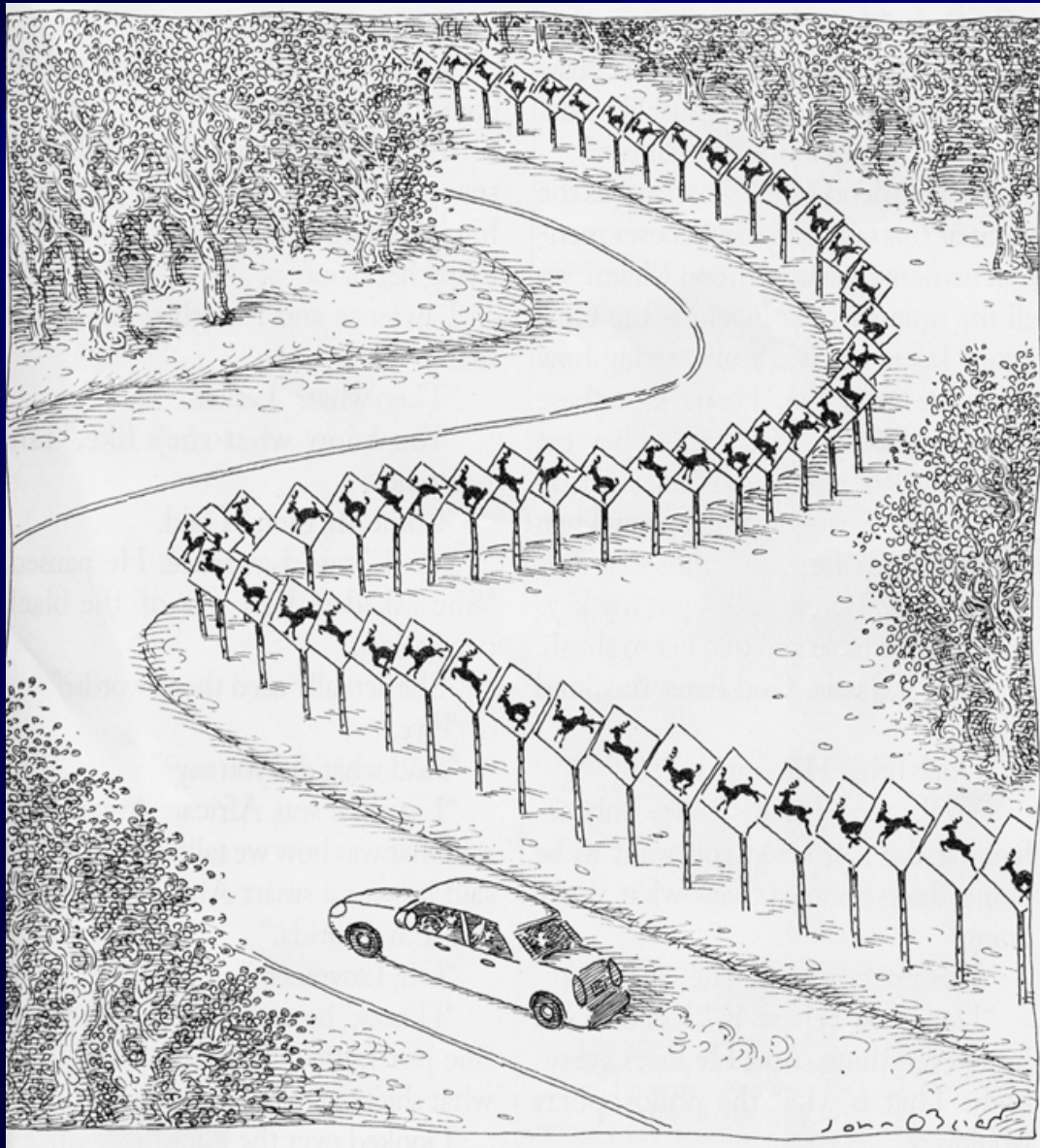


Photos: Anthony Clevenger



Modifying Driver Behavior

- Increased visibility
- Education
- Reduced speeds
- Signs



Traditional Warning Signs

- Common
- Static
- Effective?

Enhanced Signs

Drivers “see”, respond more readily to signs:

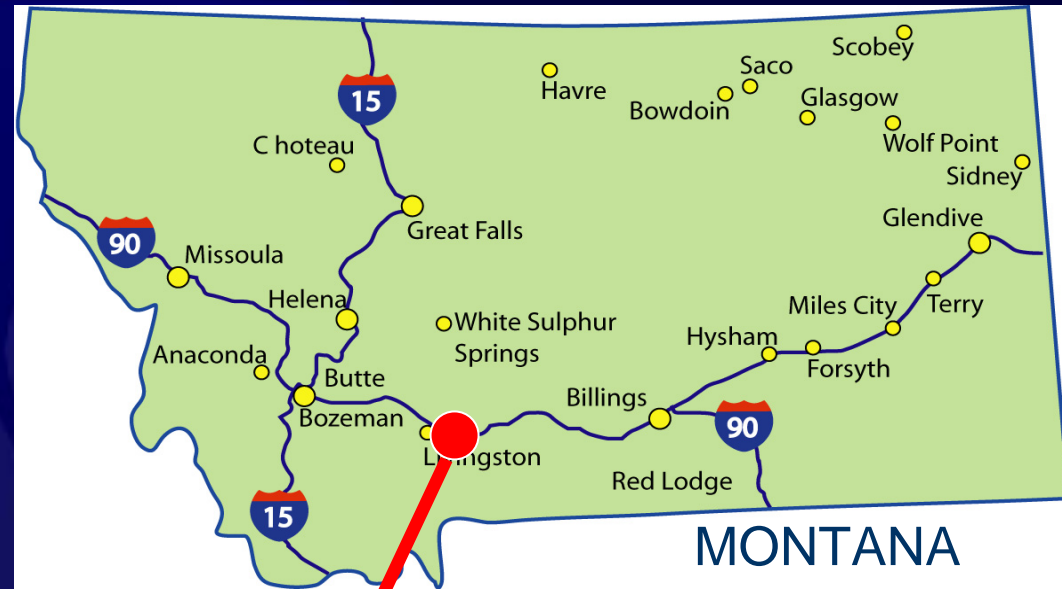
- Used sparingly, judiciously
 - Only when event of concern occurs
 - specific times of day, year
 - real-time, dynamically activated
 - Only where data show greatest need
- With unique, attention-getting features
 - Flashing beacons, extra flagging
 - Larger than typical, unique color

Study Objective

- *Quantify driver responses (speed) to animal advisory messages on dynamic message signs (DMS)*
 - Assumption: speed is + correlated to AVCs
 - Response = potential to reduce AVCs

Study Area

- 19 miles of I-90
- AADT ~13,000
- Speed limit 75 mph
- Wildlife corridor



Methods



- 2 permanent, 1 portable DMS
- 1 control (blank DMS), 3 treatment DMS messages
 - 5pm to 9am (overnight)
 - 16 consecutive calendar days in Sept./Oct. 2004
- Collected individual vehicle speeds at 5 locations

LIVINGSTON

Permanent DMS

WB1 Counter (2.8 miles past DMS)

**Top of
Bozeman Pass**

WB2 Counter (13.1 miles past DMS)

Portable DMS

WB3 Counter (0.8 mile past DMS)

**Greatest # of
roadkill/mile/year**

(mp 313-315)

I-90 Westbound



MP 330.5
MP 329
MP 327
MP 325
MP 323
MP 321
MP 319
MP 317
MP 315
MP 314
MP 313
MP 311

I-90 Eastbound



EB2 Counter (1 mile past DMS)

**Permanent
DMS**

**EB1 Counter
(at DMS)**

BOZEMAN

Permanent DMS (*one frame*)

- Control

[*blank DMS*]

- Treatment 1

TRAVEL INFO
CALL 511
BEFORE YOU DRIVE

- Treatment 2

ANIMAL CROSSING
NEXT 20 MILES
BE ALERT

- Treatment 3

[#] ANIMALS HIT
NEXT 20 MILES
THIS YEAR

Portable DMS (*frame 1 – frame 2*)

- Control

[*blank DMS*]

- Treatment 1

TRAVEL
INFO

CALL
511

- Treatment 2

WATCH
FOR
ANIMALS

NEXT 2
MILES

- Treatment 3

[#]
ANIMALS
HIT

NEXT 2 MI
THIS
YEAR

Eastbound Data Summary

		Passenger Vehicle Speed Data				Truck Speed Data			
		<i>n</i>	Mean Speed (mph)	<i>SD</i>	<i>Range</i>	<i>n</i>	Mean Speed (mph)	<i>SD</i>	<i>Range</i>
EB 1	Overall	23976	74.8	7.6	69.9	8284	70.2	7.0	62.2
	Control	5463	74.8	7.9	57.4	1468	70.8	6.9	51.8
	Treatment 1	10160	75.6	7.6	69.9	3617	71.1	7.1	58.9
	Treatment 2	2473	74.7	7.9	59.6	1079	68.8	6.6	42.2
	Treatment 3	5879	73.6	7.3	62.8	2120	69.0	6.8	58.7
EB 2	Overall	31431	78.3	8.5	76.1	12358	74.8	9.0	57.5
	Control	9753	78.5	8.3	76.1	3560	74.5	9.2	56.3
	Treatment 1	5658	81.5	9.1	58.5	2857	78.8	9.1	55.9
	Treatment 2	8968	77.3	8.1	76.1	3564	73.5	8.3	55.5
	Treatment 3	7052	76.8	8.1	62.2	2929	74.0	8.9	58.6

Westbound Data Summary

		Passenger Vehicle Speed Data				Truck Speed Data			
		<i>n</i>	<i>Mean Speed (mph)</i>	<i>SD</i>	<i>Range</i>	<i>n</i>	<i>Mean Speed (mph)</i>	<i>SD</i>	<i>Range</i>
WB 1	Overall	28698	72.4	6.3	73.5	7891	66.7	5.8	59.0
	<i>Control</i>	<i>10247</i>	<i>72.8</i>	<i>6.2</i>	<i>71.0</i>	<i>2184</i>	<i>67.0</i>	<i>6.1</i>	<i>46.0</i>
	Treatment 1	4391	73.5	7.2	61.1	1724	68.1	6.0	41.5
	Treatment 2	7837	71.5	6.0	65.7	2187	66.2	5.7	51.5
	Treatment 3	6222	71.8	6.2	56.7	1796	65.7	5.3	58.4
WB 2	Overall	25753	69.2	7.8	69.6	7898	64.4	7.7	52.2
	<i>Control</i>	<i>9207</i>	<i>70.4</i>	<i>7.7</i>	<i>69.6</i>	<i>2398</i>	<i>65.7</i>	<i>7.9</i>	<i>52.2</i>
	Treatment 1	4569	69.1	7.2	61.9	1754	64.0	7.6	48.1
	Treatment 2	7781	67.1	7.6	67.3	2333	63.0	7.1	49.7
	Treatment 3	4196	70.8	8.0	63.2	1413	66.0	8.1	48.8
WB 3	Overall	23320	71.6	7.9	69.3	6049	67.8	7.1	60.1
	<i>Control</i>	<i>4392</i>	<i>73.6</i>	<i>7.4</i>	<i>66.9</i>	<i>1361</i>	<i>69.9</i>	<i>6.4</i>	<i>57.1</i>
	Treatment 1	4949	72.6	7.6	59.8	1150	68.4	7.1	42.1
	Treatment 2	6075	70.5	7.6	63.0	1473	67.0	6.8	41.1
	Treatment 3	7901	70.5	8.3	68.6	2065	66.8	7.4	53.4

ANOVA Results

- No R^2 values $> 10\%$
- Speed (significance: $P = 0.05$)
 - weekdays $>$ weekends
 - dark $<$ dusk/dawn $<$ light
 - Animal advisories $<$ control, 511 message
- Interactions
 - Animal advisories + dark conditions = consistently slower speeds

Safe Stopping Distance (Dark)

		Passenger Vehicles				Trucks			
		Speed (mph)	SSD (ft)	Reduction		Speed (mph)	SSD (ft)	Reduction	
				feet	%			feet	%
EB 1	Control	73	771	-	-	70	719	-	-
	Treatment 1	75	822	none	none	71	746	none	none
	Treatment 2	72	765	6	1%	68	684	34	5%
	Treatment 3	71	749	22	3%	68	684	34	5%
EB 2	Control	77	853	-	-	73	780	-	-
	Treatment 1	80	898	none	none	77	850	none	none
	Treatment 2	75	820	33	4%	72	756	25	3%
	Treatment 3	75	807	46	5%	71	742	38	5%

Safe Stopping Distance (Dark)

		Passenger Vehicles				Trucks			
		Speed (mph)	SSD (ft)	Reduction		Speed (mph)	SSD (ft)	Reduction	
				feet	%			feet	%
WB 1	Control	72	757	-	-	66	661	-	-
	Treatment 1	72	763	none	none	67	680	none	none
	Treatment 2	70	733	24	3%	65	650	11	2%
	Treatment 3	70	730	27	4%	65	640	20	3%
WB 2	Control	69	702	-	-	64	627	-	-
	Treatment 1	68	688	15	2%	62	597	30	5%
	Treatment 2	65	642	61	9%	61	585	42	7%
	Treatment 3	68	693	10	1%	63	615	12	2%
WB 3	Control	72	758	-	-	68	696	-	-
	Treatment 1	71	743	15	2%	67	673	23	3%
	Treatment 2	68	696	62	8%	65	650	46	7%
	Treatment 3	68	686	72	9%	64	632	64	9%

Recommendations

- See Dudek for general DMS guidelines
- Post animal advisories when, where likelihood of AVCs is greatest
 - Short window in peak season
 - At night, twilight
 - Over short stretches (1-2 miles) with highest concentration of AVCs
 - Locally known “hotspots”
- Consider using DMS with other measures (e.g., at ends of wildlife fencing, HAR, public outreach campaign)

Recommendations

- Monitor over long-term to assess change in AVCs
- If applying in multiple locations over several years, consider meta-analysis of AVC data
- Control for covariates
 - changes in traffic, wildlife populations, landscape and habitats can influence AVC rates

Acknowledgements

- FHWA Intelligent Transportation System Deployment Program Project (ID # VIL.H.24)
- Montana Department of Transportation
- American Wildlands
- Craighead Environmental Research Institute
- WTI Graduate Fellowship Program



Questions?

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