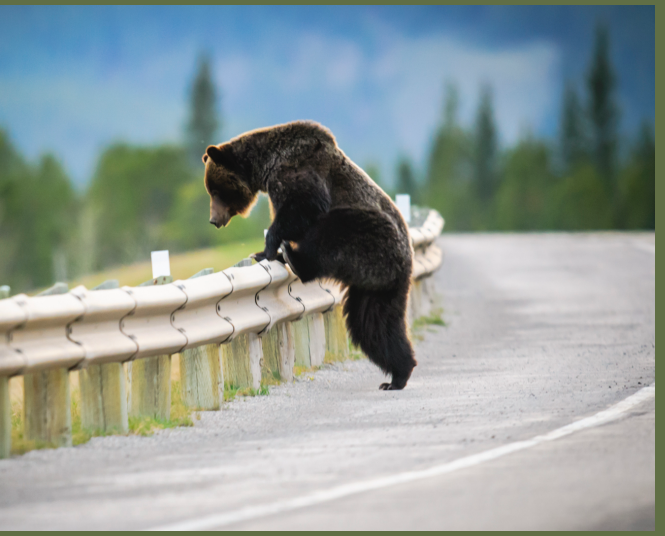
Animal-Vehicle Collisions

Mitigation Measures: Their Effectiveness and Ability to Reduce the Barrier Effect of Roads



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Presentation

1. Overview and Mitigation Strategies

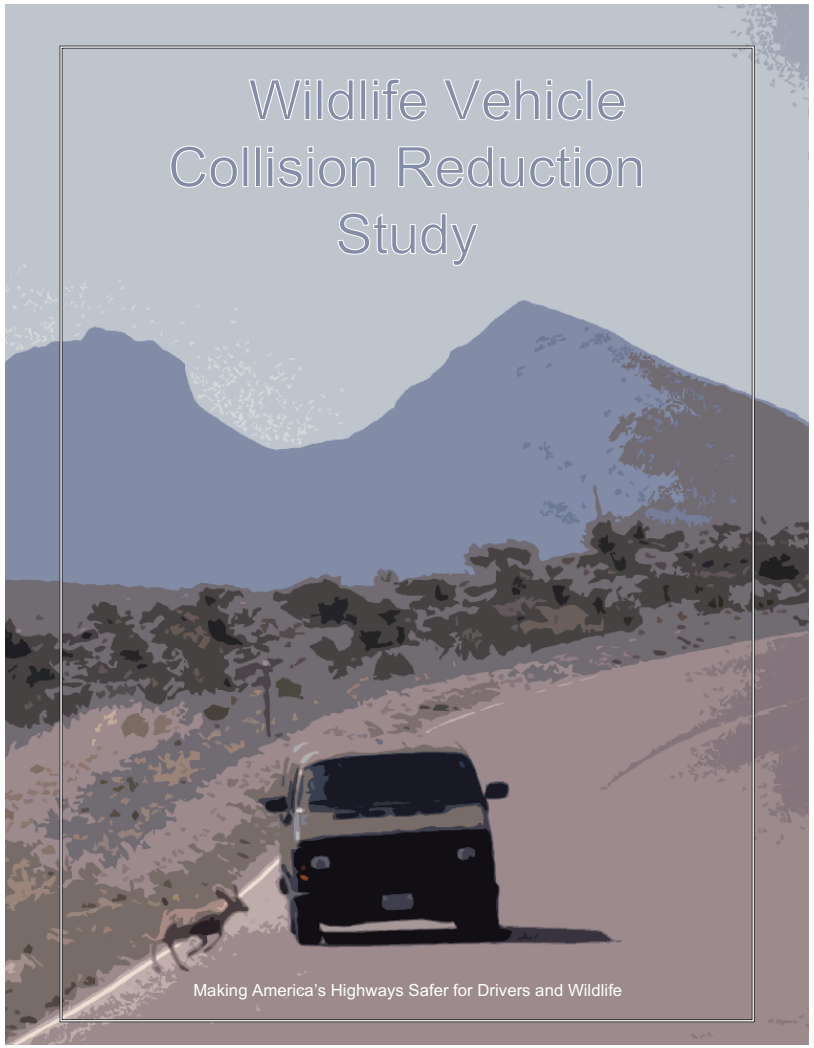
2. Effectiveness of AVC Mitigation Measures to Reduce Crashes

3. Effectiveness of AVC Measures to Provide for Ecological Connectivity

4. Large wildlife, domestic animals, small animals

OVERVIEW: AVC National Statistics

- There are an estimated 1-2 million collisions with large mammals in the U.S each year.
- ~29,000 human injuries and ~200 fatalities each year
- WVCs have estimated direct costs to society of $8 billion each year in the U.S.
- Direct road mortality is a major threat to the survival of 22 threatened or endangered species in the U.S. or certain populations of that species



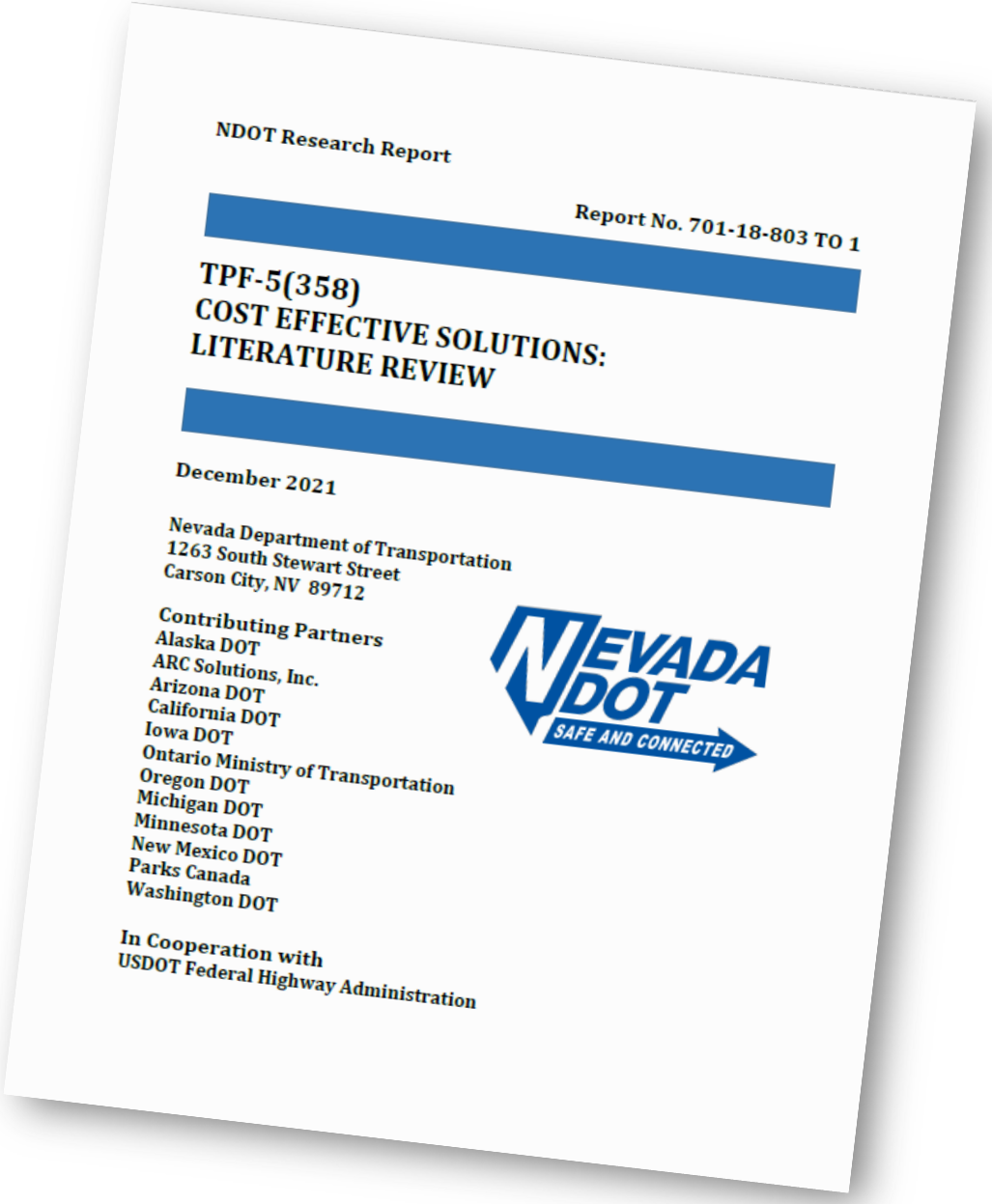
Huijser et al. 2007

OVERVIEW: Under-reporting Continues to be a Problem

- **2016:** British Columbia: >3X (BCMOT data) >2.2X (insurance data)
  - based on all WVC records captured in 4 databases
- **2017:** Virginia DOT DVCs >8.5X; DVC Costs >6X; $0.5 Billion/Year
  - based on VA law enforcement data base
- **2018:** United Kingdom >6X Small WVCs
  - based on road surveys of small carcasses


Marcel Huijser

CITATIONS:
- Hesse, G, Rea, RV. 2016. Quantifying wildlife vehicle collision underreporting on northern British Columbia highways (2004 to 2013). Prepared for the BC Ministry of Transportation and Infrastructure, Northern Region, Prince George, BC, 53 pp.
- Donaldson, BM. 2017. Improving Animal-Vehicle Collision Data for the Strategic Application of Mitigation. Report No. FHWA/VTRC 18-R16. Virginia Transportation Research Council, Charlottesville, VA, 24 pp
- Schwartz, AL, Williams, HF, Chadwick, E, Thomas, RJ, Perkins, SE. 2018. Roadkill scavenging behavior in an urban environment. Journal of Urban Ecology, 2018, 1-7, doi: 10.1093/jue/juy006



NDOT Research Report

Report No. 701-18-803 TO 1

TPF-5(358) COST EFFECTIVE SOLUTIONS: LITERATURE REVIEW

December 2021

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westerntransportationinstitute.org/wp-content/uploads/2021/12/4w7576_Huijser_etal_WVC_ConnectivityLiteratureReview_PooledFundStudyFinalReport_2021.pdf

Mitigation Measure Strategies

A. Influence Driver Behavior (15)

B. Influence Animal Behavior or Population Size (12)

C. Separate Animals from the Road and Traffic (3)

A. Influence Driver Behavior?

Influence Driver Behavior

Measure	Effectiveness in reducing collisions with large mammals	Effectiveness in reducing the barrier effect of roads and traffic
Mitigation measures aimed at influencing driver behavior		
Public information and education	None	None
Standard wildlife warning signs	None	None
Large and other nonstandard wildlife warning signs (VMS)	None	None
Seasonal wildlife warning signs	9-50%	None
Roadside animal detection systems (RADS)	33-97%	None
On-Board Vehicle Warning Systems	?	None
Increase visibility: roadway lighting	57-68%	None. May increase barrier effect for some species.
Increase visibility: vegetation removal/brushing	≤50%	None, May increase barrier effect for some species.
Increase visibility: wider road striping	?	None
Reflective ear tags, collars, and/or ankle bracelets	? (≤48% for bicyclists)	None
Reduce traffic volume on road network	Dependent on traffic volume and its level of reduction?	Potential to reduce barrier effect
Seasonal closure	100% during closure	Reduces barrier effect of traffic but not the road itself (during closure only)
Reduce speed by reducing posted speed limit	(Almost) none (for through roads, given their design speed)	None
Reduce speed by reducing night-time posted speed limit	None	None
Reduce speed with traffic calming measures	≤50%	None

Influence Driver Behavior: Enhanced and Seasonal Warning Signs

- Standard and Dynamic Messaging Signs generally not effective at reducing AVCs

- Seasonal warnings signs **reduce AVCs 9-50%**

Rob Ament

Influence Driver Behavior: Increase Visibility - Vegetation Reduction/Removal

- Allows more time for drivers to see/react to animals on or near the roadway
- Mixed results on reducing AVCs, ≤ 50%
- May cause barrier effects to certain species

Influence Driver Behavior: Traffic Calming Measures

- Physical alterations of the roadway: speed bumps, rumble strips, or adding curves
- Can provide protection for large and small animals
- Potential to reduce barrier effect
- Reduce AVCs up to 50%

Marcel Huijser

Influence Driver Behavior: Increase Visibility - Roadway Lighting

- Improve driver safety by increasing sight-distance beyond headlights
- Can attract small animals and insects and increase collision rates
- Reduce AVCs 57-68%

Influence Driver Behavior: Animal Detection – Driver Warning Systems

- Signs activate when animals are on/near the roadway
- Specific to time and place
- Technologically advanced and well-maintained systems have the most success at reducing AVCs 33-97%

Marcel Huijser

Influence Driver Behavior: On-board Vehicle Animal Detection Systems

- Lidar, infra-red and other sensors used to identify moving wildlife
- Development is ongoing
- Lacking scientific studies on the effectiveness of reducing AVCs

Currently available active or passive systems: Mercedes, BMW, Volvo, Audi, Toyota, Cadillac, Lexus

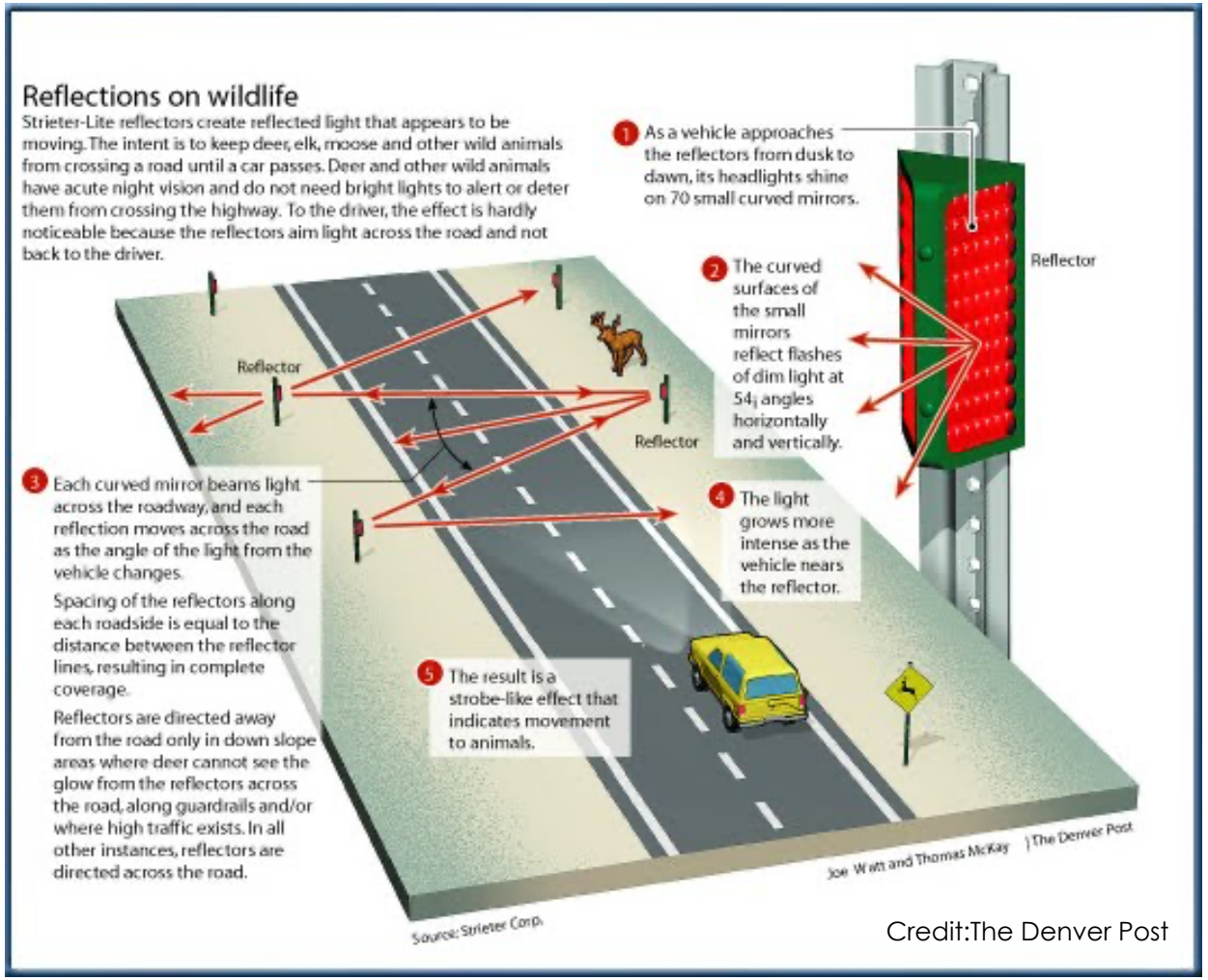
B.Influence Animal Behavior?

Influence Animal Behavior or Population

Measure	Effectiveness in reducing collisions with large mammals	Effectiveness in reducing the barrier effect of roads and traffic
Mitigation measures aimed at influencing animal behavior or population size		
Lines of visual or audio signals along roadside	None	None
Deer whistles installed on vehicles	None	None
Olfactory repellants	26-43% for target species only	None. Would increase the barrier effect for target species.
Hazing	?	None. Hazing would increase the barrier effect.
Wildlife crossing personnel	for large mammals	None
Deicing- alternatives to salt	?	None
Influence species via nutritional value of Right-of-Way vegetation	?	None, May increase barrier effect for some species
Habitat alteration outside ROW, Intercept Feeding	?	None
Expanded median	?	None. Increased width of road corridor may increase barrier effect.
Wildlife culling	49-84%	None
Wildlife relocation	9-22%	None
Anti-fertility treatment	Reduction proportional to reduction in population size	None

Influence Animal Behavior: Visual or Audio Signals Along Roadside

- Used to warn animals of oncoming traffic by visual or audio cues
- Mixed results for visual reflectors along ROW for reducing AVCs
- Whistles tested on trains but no research along roadside ROWs



Credit:The Denver Post

Influence Animal Behavior: Olfactory Repellants

- Designed to deter animals away from the places they are applied
- Can slightly reduce AVCs 26-43% for target species
- May act as a barrier to the areas where scents are applied

credit: www.deerout.com

Influence Animal Population: Wildlife Culling

- Trapping, euthanizing animals to reduce population size
- Reduction in population densities can decrease AVCs 49-84%
- No evidence of a barrier effect

Joe Riis

Separate Animals from the Road

Measure	Effectiveness in reducing collisions with large mammals	Effectiveness in reducing the barrier effect of roads and traffic
Mitigation measures that attempt to separate animals from the road		
Wildlife barriers (fencing/walls/boulders)	80-100% (83% on average)	None. Fences alone make the road into more of a barrier than without fences
Underpasses and overpasses	Varies greatly depending on structure/location	Barrier effect can be reduced
Underpasses/overpasses and fencing	80-100% (83% on average)	Barrier effect can be reduced

Separate Animals from the Road:
Wildlife Barriers - Fences, Boulders, and Walls

- Reduction in AVCs varies based on the type and length of the fence
- 80-100% reduction in AVCs
- Fences alone create a barrier to animals

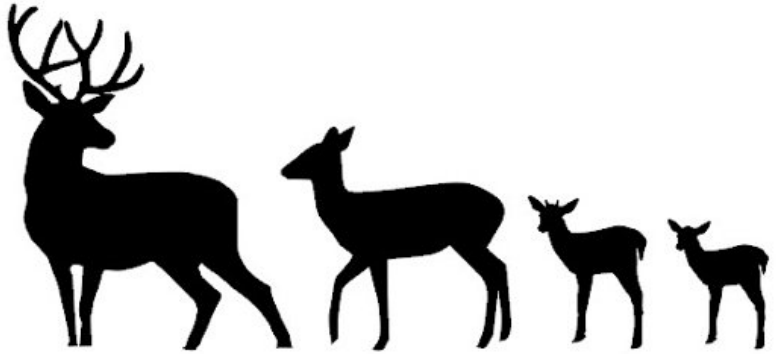

Terry McGuire

Separate Animals from the Road:
Underpass and Overpass Structures

- Can significantly reduce AVCs 80-100% when used with exclusion fencing
- Promote safe passages across roadways

Overview of Mitigation Measures

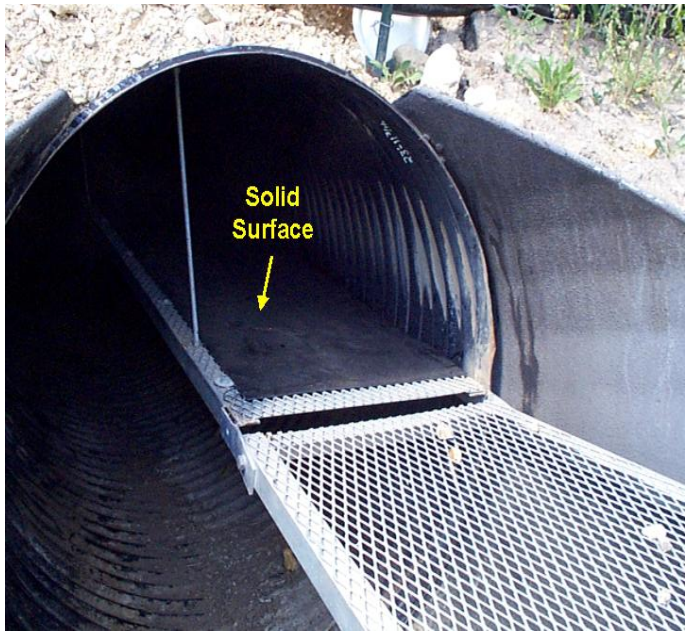
- Many types of AVC reduction techniques with varying degrees of success
- Mitigation measures are often species and/or locale dependent
- Need more evaluation of some measures - both older, as yet unproven ones, and those relying on new technologies
- Wildlife crossings with fencing is proven to greatly reduce AVCs and provide for connectivitv



Summary: Small Animal Species

Measure	Effectiveness in reducing collisions with small animal species	Effectiveness in reducing the barrier effect of roads and traffic for large mammals
Mitigation measures aimed at influencing driver behavior		
Public information and education	Unknown-None	None
Warning signs	None	None
Temporary or permanent road closure	100%	Unknown: Traffic is no longer present, but open area with unnatural substrate remains
Road removal	100%	100% if soil, hydrology, and vegetation is restored
Mitigation measures aimed at influencing animal behavior or population size		
Passage friendly curbs	Unknown, but it can reduce the time spent on road by the animals	Unknown, but the barrier effect of the road and traffic remain
Mitigation measures that attempt to separate animals from the road		
Assisted road crossings	Unknown, but a reduction in likely	Unknown
Wildlife barriers (fencing/walls/boulders)	65% (range 16-100%)	None: barrier effect increases
Underpasses and overpasses	Not necessarily	Likely effective
Underpasses/overpasses and fencing	65% (range 16-100%)	Likely effective

CROSSINGS FOR SMALL ANIMALS



Summary: Large Domestic Animals – horses, cattle, donkeys

Measure	Effectiveness in reducing collisions with cattle, horses, and donkeys	Effectiveness in reducing the barrier effect of roads and traffic for large mammals
Mitigation measures aimed at influencing driver behavior		
Public information and education	Unknown-None	None
Standard livestock warning signs	None	None
Large and other nonstandard livestock warning signs (VMS)	None	None
Seasonal livestock warning signs	9-50% (unknown for cattle/horses/donkeys)	None
Roadside animal detection systems (RADS)	33-97%	None
On-Board Vehicle Warning Systems	Unknown	None
Increase visibility: roadway lighting	57-68% (unknown for cattle/horses/donkeys)	None. May increase barrier effect for some species
Increase visibility: vegetation removal/brushing	≤50% (unknown for cattle/horses/donkeys)	None, May increase barrier effect for some species
Increase visibility: reflectors	Unknown (potentially 38-47%)	None
Increase visibility: wider road striping	Unknown	None
Reduce traffic volume on road network	Unknown	Likely effective (mostly relevant for feral species)
Reduce speed by reducing posted speed limit	(Almost) none for through roads	None
Reduce speed by reducing night-time posted speed limit	None	None
Reduce speed with traffic calming measures	Unknown - 59%	Unknown
Mitigation measures aimed at influencing animal behavior or population size		
Lines of visual or audio signals along roadside	None	None - Potential increase barrier effect
Deer whistles installed on vehicles	None	None - Potential increase barrier effect
Olfactory repellants	26-43% (unknown for cattle/horses/donkeys)	None - Potential increase barrier effect
Hazing	Unknown	None - Potential increase barrier effect
Wildlife crossing personnel	Unknown - Likely	None – Potential decrease barrier effect
Deicing- alternatives to salt	Unknown	None
Influence nutritional value of Right-of-Way vegetation	Unknown - ≤50%	None - Potential increase barrier effect
Habitat alteration outside ROW, Intercept Feeding	Unknown	None - Potential increase barrier effect
Vegetated median	Unknown	Unknown
Wildlife culling	30-94% (feral species only, not livestock)	None
Wildlife relocation	30-94%	None
Anti-fertility treatment	Reduction proportional to reduction in population size (feral species only)	None
Mitigation measures that attempt to separate animals from the road		
Wildlife barriers (fencing/walls/boulders)	80-100% (higher for domestic species?)	None
Underpasses and overpasses	Not necessarily	Likely effective (mostly relevant for feral species)
Underpasses/overpasses and fencing	80-100% (higher for domestic species?)	Likely effective (mostly relevant for feral species)

Influence Driver Behavior: Reflective Materials for Domestic Livestock

- Increase visibility of domestic animals at night
- Not scientifically studied for animals, but reduce collisions with pedestrians and bicyclists up to 48%
- No improvement on barrier effects

Credit: https://reflective-tape.com/reflective-tape-for-cow-cattle-and-livestock-ear-tags/

THANK YOU

Banff Underpass: Credit: PCA-WTI