Animal Warning Systems

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Photos: Courtesy of Marcel Huijser, WTI

Description: Animal Warning Systems are intended to warn motorists about the potential or actual presence of animals on the road. Animal Warning Systems utilize electronic sensors to detect animals. Once an animal is detected, signs are activated to warn drivers of the presence of an animal. These systems are different than:

1) Standard wildlife warning signs,
2) Enhanced wildlife warning signs, and
3) Temporal wildlife warning signs.

Animal Warning Systems are best used to *mitigate* large mammal/vehicle collisions; they are not intended to eliminate them.

Rural Transportation Critical Needs

- ☑ Crash Countermeasures
- ☐ Emergency Services
- ☐ Operations & Maintenance
- ☐ Rural Transit & Mobility
- ☐ Surface Transportation & Weather
- ☐ Tourism & Travel Information
- ☐ Traffic Management

Issues Addressed

- ☐ Road Geometry Warning
- ☐ Highway-Rail Crossing Warning
- ☐ Intersection Collision Warning
- ☐ Pedestrian Safety
- ☐ Bicycle Warning
- ☑ Animal Warning
- ☐ Collision Avoidance
- ☐ Collision Notification
- ☐ Weather Warning

Strategies Achieved

- ☑ Road User
- ☑ Road
- ☐ Vehicle
- ☐ Safety Culture
- ☑ Engineering
- ☐ Emergency Response
- ☐ Enforcement
- ☐ Education

Applicability	Partnerships	Key Components
•Animal warning systems are very applicable to rural areas, as these areas often have a lower population and consequently a larger presence of animals. Reducing animal/vehicle collisions can help to mitigate crashes, thereby improving safety.	•Applications benefit from collaboration among numerous agencies, which may include: •Federal land managers •Insurance companies •Private entities (i.e. those interested in reducing animal mortality)	•Sign(s), post(s), lights •Animal detection system •Electromagnetic •"Break-the-beam" (i.e. infrared) •Fencing (optional, but recommended)

Examples of Implementation

- **Minnesota's Experience with Deer Warning Systems**

Minnesota estimates that 35,000 deer/vehicle collisions occur every year. There are 3 to 11 human fatalities resulting from deer/vehicle collisions annually. The average cost of a collision is estimated to be $1,840. Minnesota Department of Transportation (MnDOT) enhanced a deer warning system installation in Marshall, Minnesota. The system reportedly used passive infrared devices for detection. The agency installed solar panels to generate power for the light and wireless communication. Challenges include retaining the wireless connectivity and maintenance of the system. However, across a year, MnDOT has documented an almost 60% reduction in deer/vehicle collisions.

- **Roadside Animal Detection System(Florida)**

The Roadside Animal Detection System (RADS) was installed on Highway 41 in Florida to help protect the Florida Panther, whose high mortality rate as a result of crashes with vehicles and low population, puts it on the endangered species list.

- **Wildlife Detection System (Colorado)**

The Colorado Department of Transportation (CDOT) installed sensors nine inches beneath the ground along Highway 160 to detect the presence of wildlife. When triggered, the signs along the roadway light up to warn motorists. CDOT selected sensors instead of lasers because of concerns that lasers would trigger false alarms.

- **Animal Detection & Driver Warning System; Durango and Bayfield, Colorado**

An animal detection and driver warning system was installed between Durango, Colorado and Bayfield, Colorado in 2008 on US Hwy 160. A buried cable generated an electromagnetic field, which is used for detecting the large animal (i.e. deer and elk). However, this type of system, installed at this site, did not prove to be reliable.

- **Smartphone Application Helps to Protect Reindeer (Finland)**

A smartphone application called "Reindeer Bell," uses crowdsourcing to activate warnings. When drivers observe a reindeer near the road, they tap on a one-button interface. It activates a one-mile warning zone, which lasts for an hour, to warn other application users who are approaching the area. They can then reduce their vehicle speeds while passing through the warning zone.

Implementation Considerations (General)

- Not effective when traffic volume ≥ 20,000 vehicles/day.
- Less effective on roadways with large amounts of commuter traffic.
- Less effective on roadways with many large vehicles (commercial trucks and recreational vehicles).
- Terrain must be considered when installing these systems. Snow may create problems with detection.

Implementation Considerations (Pro)

- Animal/vehicle collisions are costly, with drivers and passengers being injured or killed, numerous animals being injured and killed, and significant property damage costs.
- Animal detection systems have been found to reduce vehicle/large mammal wildlife collisions from 33 to 97%.
- Animal detection and warning systems bring more validity to wildlife crossing signs, as they are closely tied to a detection, not just a corridor where animal/vehicle collisions have been identified through historical crash data.

Implementation Considerations (Con)

- Does not work as well for small and medium-size animals.
- Does not address the barrier effect of roadways on animal migration.
- Findings to date suggest that Animal Warning Systems be installed at locations that are relatively near offices to facilitate maintenance needs.
- Vehicles entering from access roads and animals that may feed along roadway can generate false positives.

Opportunities for Future Expansion

- Evidence indicates that Animal Warning Systems are more effective with wildlife fencing or crossing structures, potentially increasing effectiveness from 80% to 100%.
- Automakers, like Volvo, are beginning to offer vehicles that will hit the brakes when a large animal is detected.

Additional Resources

- Huijser, M.P., Mosler-Berger, C., Olsson, M., and Strein, M. (2015). *Chapter 24: Wildlife Warning Signs and Animal Detection Systems Aimed at Reducing Wildlife-Vehicle Collisions* by Marcel P. van der Ree, R., Smith, D.J., and C. Grilo. (Eds). Handbook of Road Ecology, First Edition. John Wiley & Sons, Ltd.
- Huijser, M.P., Duffield, J.W., Clevenger, A.P., Ament, R.J., and McGowen, P. (2009). *Cost-Benefit Analyses of Mitigation Measures Aimed at Reducing Collisions with Large Ungulates in the United States and Canada: a Decision Support Tool*. Ecology and Society 14(2): 15. Found here: https://www.ecologyandsociety.org/vol14/iss2/art15/

Useful Tip

If a flashing beacon warning of the potential presence of wildlife is already deployed on a roadway, the notification could be improved by installing detection systems.

Cost Range

(Cost/financial information, where noted, is based on 2016 dollars (unless otherwise specified). Cost/financial information is estimated, and will vary based on size and scope of project, number of units, etc. In general, capital costs include initial purchase costs of hardware, software, and other required equipment. Maintenance and operations costs include staff time to operate, monitor and maintain systems; data collection; system upgrades; evaluation; etc.)

Capital Costs: The total capital cost for this tool range from low (Less than $50,000) to high ($100,000 to $250,000). As an example, seasonal wildlife warning signs, which includes equipment anticipated to last for 10 years, cost $1,228/km. In Marshall, Minnesota, a deer detections system was installed at a total cost of approximately $103,000, including equipment (about 80% of the cost) and installation and testing (about 20% of the cost). The equipment includes 2 sign nodes, 14 detector nodes, 1 remote terminal unit/programmable logic controller, 2 loop detectors and 1 passive infrared device[1]. As another example, an animal detection system with a 10-year life span cost $87,500 for purchasing, $58,300 for planning, $58,300 for installation, $17,300/km/year for maintenance and operations, and $11,700/km for system removal[2].

Operations Costs: The operations and maintenance costs for this tool are low (less than $50,000). One example reported $17,300/km/year[2]. Costs include problem identification and problem solving, parts, and vegetation management (i.e. cutting the grass).

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