



INTELLIGENT TRANSPORTATION SYSTEM TECHNOLOGY PROTECTS DRIVERS AND WILDLIFE ON THE HIGHWAYS

Solar-powered ITS technologies such as sensors and programmable controllers — which detect when animals are near roadways and trigger warning lights — are being tested across the country.

Use of sensor technologies to track wildlife usage of critter crossings such as highway overpasses and underpasses for animals is being perfected. Years of experience with critter crossings is yielding clues as to how to make them more appealing to wildlife.

Critter crossings and other wildlife amenities are being embraced by Nevada and some other state DOTs as they strive to make highways more environmentally friendly. Many of these agencies feel that existing state wildlife warning signs are not enough.

Threat is real

As endearing as critter crossings may be, their need is founded on real threats to motorists and wildlife.

Analysis of nationwide highway crashes and fatalities data shows that human fatalities from wildlife-vehicle crashes increased 45 percent from 1994 to 2003. Out of 6.3 million crashes resulting in 2.9 million injuries and 42,884 fatalities, 315,000 crashes (5 percent of the total) involved wildlife and vehicles. These resulted in 10,000 injuries (1 percent of the total) and 200 fatalities (0.5 percent of the total).

And the problem is more than collisions, injuries and deaths. Despite the best efforts of designers, highways can be profoundly detrimental to the local ecology. Highways negatively affect wildlife through habitat fragmentation, on-pavement wildlife mortality, loss of habitat, and displacement of wildlife as they avoid the pavement and associated human activities.

Animal detection systems

Automatic photography of animals using crossings has been used to track usage, although the bright burst of flash may startle or spook the animal. Today the most modern facilities use invisible infrared radiation to paint the animal with energy that can make a photograph.

Video surveil-



This solar panel wildlife sensor helps to warn drivers of animals on the highway.

lance is proving the efficacy of wildlife underpasses. The process determines passage rates — the proportion of animals approaching and crossing



Wildlife underpasses and overpasses help make highways more environmentally friendly.

through underpasses — and categorizes their behavior.

Now that Intelligent Transportation System technologies have arrived, researchers are seeing how they may be applied to reducing animal-vehicle collisions via active animal detection.

Active animal detection systems use electronic equipment or sensors to detect large animal-vehicle collisions via active animal detec-

tion. Once a large animal is detected, warning signs are activated, urging drivers to reduce their vehicle speed, be more alert, or both, much like the speed limit sign that flashes at you when its built-in radar detects you are exceeding the speed limit.

Research demonstrates that drivers learn to trust the warning signal over time, reduce vehicle speed and be more alert.

Nevada in forefront

Nevada took part in a long-term pooled-fund project involving 14 state DOTs that continued through 2008. It investigated and helped develop the most promising roadway-based active animal detection/driver warning systems to mitigate animal-vehicle crashes.

The investigation has resulted in the development and installation of a prototype animal detection and driver warning system along Montana's Highway 191 in Yellowstone National Park.

The electronic system in Yellowstone has had mixed results. Nearly 87 percent of elk crossings recorded through snow tracking could be linked to a crossing event detected by the system. However, medium-sized animals such as coyotes and wolves were rarely detected. Furthermore, blind spots (potentially 11 percent of the total length covered by the sensors) were discovered.

Ultimately, a regional ITS detection system of an animal in or near the roadway could trigger a signal to slow a vehicle down, just as it would for slick road conditions or an accident ahead. The technology is available. It can be modified for animal detection. And that's exactly what will happen. But first, norms need to be established as to how reliable the system is and minimum standards developed so that DOTs can set specifications.



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RELIABLE CROSSINGS

Just because an animal overpass or underpass is available doesn't mean it will be used immediately. Predators may use the crossing even before it's completed, but game animals and small prey may take years to come to trust it in large numbers. To gauge use, wildlife biologists count tracks periodically until the number of animals reaches a peak and stabilizes there.

Effectiveness of critter crossings is dependent on a number of variables, which include:

◆ **Placement:** Travel distance to the crossing may be especially important for small animals. Generally, animals are capable of learning to use underpasses or overpasses and may transfer that knowledge to succeeding generations, but this is unlikely true for reptiles and amphibians.

◆ **Size:** It is difficult to determine critical size thresholds for passage structures because these thresholds vary from species to species. For some animals, openness — the size of underpasses relative to the width of the roadway — may be more important than absolute size. Tunnel layouts that allow animals to see the opposite end of the passage encourage use.

◆ **Light:** Some animals are hesitant to enter underpasses that lack sufficient ambient light, while at the same time animals that are sensitive to human disturbance — such as mountain lions — avoid areas that are artificially lit. Maintenance of natural light through the use of overpasses, large underpasses or grated underpasses may encourage use.

◆ **Moisture:** Maintenance of wet substrate is important for some amphibian species. Shrews are often more active on rainy nights and also may prefer wet substrates for traveling. Grated or slotted underpasses do provide sufficient moisture for crossings that lack flowing water. Alternatively, innovative storm water systems might be designed for closed-top underpasses that would provide enough water to maintain moist travel



Some species won't enter underpasses that lack sufficient ambient light, while others sensitive to humans (like mountain lions) avoid areas artificially lit.

conditions without creating flooded or stream-like conditions.

◆ **Temperature:** Small underpasses may create temperature disparities (inside vs. outside) that deter use by some amphibians. Larger underpasses or open-top systems that allow for more air flow may work better.

◆ **Noise:** Traffic noise can be a problem for some animals, especially those sensitive to human disturbance. Certain underpass designs (those with expansion joints and those with uncovered medians) can be quite noisy. Overpasses that incorporate tree and shrub buffers along the edges appear to be much quieter than underpasses.

◆ **Substrate:** Some small animals feel more secure using a crossing system if it provides sufficient cover. For example, rows of stumps in an underpass appear to facilitate use by small mammals. Maintaining or replicating stream bed conditions within oversized culverts may facilitate use by salamanders, frogs and aquatic invertebrates.

◆ **Approaches:** Characteristics of the approaches to underpasses or overpasses may affect their use by some animals. Forested animals, such as black bears, prefer well-vegetated approaches. Others, such as mountain goats, prefer approaches that provide good visibility. Vegetation at the entrance of an underpass may deter some animals that are wary of conditions that provide ambush opportunities for predators.

◆ **Fencing:** Fences help guide animals to passage systems and prevent wildlife from circumventing them. Mountain lions moving along stream corridors have been observed to leave stream valleys and cross over highways rather than utilize large culverts. Ungulates commonly seek to avoid underpasses and generally will use them only if other access across the highway is barred. Standard fencing is ineffective for small animals.