

MERG

ING TRAFFIC

ARTICLE BY MARILYN STONE

PHOTOGRAPHY BY TIM CHRISTIE AND CHRIS MADSON

U.S. drivers traveled approximately 270 billion miles during just October 2007, according to U.S. Department of Transportation statistics. Drivers on Wyoming's rural state highways drove 14.3 million miles, according to 2005 data. As our population grows and expands into rural areas, we build more roads and commute longer distances. Energy development

transforms wild landscapes with new networks of roads and huge increases in traffic. Many highways cross big-game winter range, pass over wetlands, or intersect migration corridors. Big game and a host of other wild animals have little choice but to cross the pavement, dodging an increasing stream of passenger cars and eighteen-wheelers to reach habitat they need for survival.

The costs are high for all involved. Highway mortality can be significant for wildlife populations. Drivers are traumatized and killed in accidents as well. Although solid data remain elusive, Dr. Michael Conover of the Berryman Institute at Utah State University estimates 200 people per year are killed in deer-vehicle collisions; another 29,000 people are injured, and the collisions cause \$1.1 billion in property damage. Many accidents involving wildlife go

unreported, and no standard nationwide data collection system exists to either track numbers of incidents or costs. Except for State Farm Insurance, insurance companies have remained tight-lipped on wildlife-related accident claims.

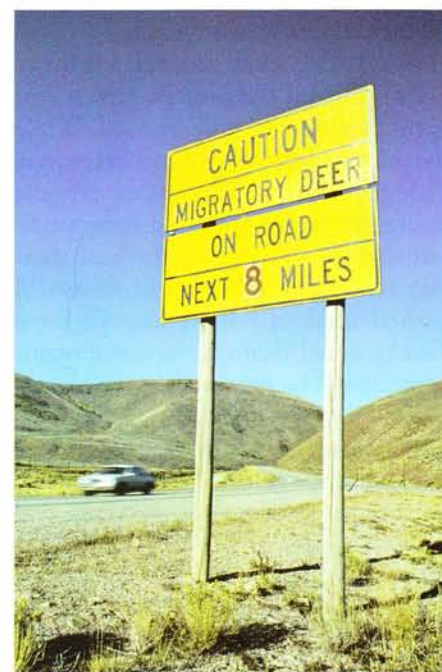
Advances in technology coupled with research into both human and wildlife behavior have resulted in new strategies to help wildlife from turtles to grizzly bears safely cross roads.

Nugget Canyon in southwest Wyoming has been notorious for road-killed deer. U.S. Highway 30 bisects mule deer winter range between Kemmerer and Cokeville. Wyoming Department of Transportation (WYDOT) and Wyoming Game and Fish Department have been attempting to mitigate wildlife mortality there since 1985, according to John Eddins, district engineer with WYDOT in Rock Springs.

In 2000, WYDOT built a wildlife passage under the highway. Fencing on both sides of the road funneled deer and the few elk in the area toward the openings of the underpass. Infrared digital cameras triggered by movements photographed big game as well as other species crossing under the road.

In October 2008, six new underpasses twenty feet wide and twelve feet high were completed in strategic locations through Nugget Canyon. Western EcoSystem Technology, Inc. (WEST) will monitor the wildlife behavior and mortality for three complete fall and

Deer and elk tend to be most active at dawn and dusk, which means that encounters between animals and traffic are most likely to occur at times when visibility is poor. Drivers learn to ignore warning signs if animals aren't usually present. (Mule deer by Tim Christie; sign by Chris Madson)



spring migrations cycles, but Eddins believes the deer carnage on U.S. 30 has ended.

"It'll be successful because we didn't shoot from the hip," says Eddins. "We spent ten years doing tracking studies and took every bit of information from collared movement studies. We put those boxes (underpasses) where deer usually cross. We put in one underpass in 2000 and watched it for three years. I expect we'll see a ninety-seven percent drop in deer mortality."

Eddins may be right. During a three-week period between December 16, 2008, and January 3, 2009, WEST documented an average of 800 deer per week moving under U.S. 30 through the structures with only three deer mortalities. If the trend continues, Eddins estimates the underpasses will save well over 100 deer per year.

When a group of deer approaches the entrance, some don't hesitate, but others sometimes hang back.

"I've watched a good-sized group of deer at the entrance," says Sam Lockwood, bio-technician for Wyoming Game and Fish Department. "One doe will walk under the underpass and then go back under like she's telling the other ones, 'This way; follow me.' Then they'll all go through." Lockwood monitors wildlife use of the underpass in Nugget Canyon.

Hall Sawyer, research biologist with WEST, says many small mammals, including pine martens, foxes, coyotes, skunks, and porcupines have been photographed using underpasses.

WYDOT and federal highway dollars funded the project, which cost approximately \$4 million total. While the price tag is hefty, underpasses require little maintenance. Eddins expects the structures to last thirty to forty years. Some deer will inevitably find their way onto the highway right-of-way. A basketball-sized hole is enough for a deer to crawl through, so fence maintenance will be needed.

On Togwotee Pass between Dubois and Moran Junction in northwest Wyoming, WYDOT is experimenting with more underpasses, culverts, and

open span bridges for wildlife. Although construction is ongoing and monitoring has just begun, Sawyer said cameras had documented a grizzly bear stumbling through the underpass in December 2008.

Historically, smaller species, including amphibians and reptiles, have used traditional culverts when accessible, but the design of the new structures on Togwotee Pass have been tweaked for the benefit of all wildlife, according to Tom Hart, WYDOT wildlife specialist in Cheyenne. For instance, the culverts are designed to allow sediment to collect and create an artificial stream bank for animal movement except during high-water periods when they may be submerged. Other designs incorporate a shelf running the length of the culvert for small mammals to use during high runoff periods.

Species such as grizzly bears prefer to go over a highway rather than under it, through dark tunnels. To accommodate this preference, engineers have installed overpasses in some locations, such as Banff National Park in Alberta and the Flathead Indian Reservation in northwest Montana.

Banff leads the world in wildlife-crossing structures with twenty-two wildlife underpasses and two overpasses along a twenty-seven-mile stretch of the Trans-Canada Highway from the east entrance of Banff to Castle Junction.

Year-round monitoring by Banff staff has revealed grizzly and black bears, wolves, coyotes, cougars, moose, elk, deer, bighorn sheep, and, more recently, wolverine and lynx using the structures, but not all of these species readily accepted the structures. Grizzly bears and wolves took as long as five years to adapt to the structures, while elk were using them even before construction had been completed.

Grizzly bears, wolves, and moose prefer underpasses that are high, wide, and short in length; they favor wide, short overpasses as well. Banff research indicates that deer and elk prefer wide, short structures as well, but there is extensive documentation of these ungulates using underpasses of various

designs. Black bears and cougars prefer underpasses and don't seem to mind narrower passages.

Dale Becker, biologist for the Confederated Salish and Kootenai Tribes in northwest Montana, says the tribes and Montana DOT are working on a reconstruction of U.S. Highway 93 with a variety of wildlife crossing structures. Traffic has increased between Missoula and Kalispell as both cities have grown. Deer splattered on the highway had become a common sight. Becker says "we're looking at laying the highway differently than just laying a ribbon of concrete from one point to another."

When the project is completed in a few years, there will be forty-two metal pipe culverts, seven bridges over streams and wetlands, an overpass spanning the highway, drift fencing to direct wildlife toward crossing structures, wildlife escape structures, and two types of signage for motorists.

Wildlife escape structures, like one-way valves, are openings in a section of fencing along the highway right-of-way where wildlife can jump down approximately seven feet to safety. The design and height discourage animals from jumping into the right-of-way, however. This strategy has been proven successful on projects elsewhere.

Pre-construction monitoring and research on U.S. Highway 93 have been conducted and will continue after construction to evaluate what works.

The area is habitat for white-tailed and some mule deer. Becker says that, although the mule deer were more skittish initially, deer were using the crossing structures even before the fencing was completed. Now, it's rare to see deer road kill on this stretch of road. Bears are also using the structures, but the system isn't bear-proof, and some are still getting hit.

In addition to signs warning motorists of the potential for wildlife on the highway, an educational sign informs motorists of the reasons for the structures. Becker said they've found motorists return to higher speeds after they've cleared the fencing, so the sign encourages them to continue to watch



for wildlife.

Biologists see both under- and overpasses as potentially effective solutions to the problem of vehicle-wildlife collisions. Highway engineers and accountants see a big difference between the two structures, however.

An underpass costs approximately \$300,000 to \$350,000 with little maintenance, but an overpass can cost \$4 million, according to Eddins. Clearance requirements and lengthy approaches are primarily responsible for the higher price tag— an eighteen-wheeler needs more clearance than a trophy bull elk. Bridges have higher maintenance cost, also.

Neither structure will work everywhere, however. Terrain and geography can determine whether an under- or overpass is most appropriate for a given location. Overpasses need more space for the sloped approaches, but underpasses require ten feet of vertical clearance between the road and the surrounding terrain. Eddins says Nugget Canyon worked well for underpass structures because many locations allowed for the necessary clearance.

While the familiar yellow sign with the bounding deer alerting motorists to big game crossing areas is low-cost, it's a dismal failure. Every time a motorist sees the sign and no deer, the sign loses credibility— finally, drivers are no longer even aware of the signs.

Technology has provided innovations to the old standard sign in an attempt to modify driver behavior instead of wildlife behavior. In late October of 2005, a wildlife detection system was installed at Trapper's Point on U.S. Highway 191 near Pinedale, Wyoming.

The situation on this stretch of road is becoming increasingly common in the West. Subdivisions impinge on historic migration routes, plus both additional traffic from local residents and increased energy-related vehicle traffic create more hazards for wildlife attempting to get through this chokepoint to their winter range. The Wyoming Game and Fish Department estimates 3,000 mule deer and 2,000 pronghorn migrate through this narrow corridor.

The Trapper's Point wildlife detection system relies on two types of sensors: geophones and infrared scopes,

The damage done to a deer when the deer meets a car or truck is obvious enough— the damage done to the vehicle and possible injury suffered by the driver aren't so public. However, it's clear that people reap benefits from a reduction in collisions with large ungulates. (Photo by Tim Christie)

In Wyoming, deer and pronghorns aren't the only hooved animals a driver is likely to hit. Elk and moose cross roads as well, and collisions with these animals is always dangerous to occupants of the vehicle. (Photo by Tim Christie)

installed along the shoulders of the highway. The geophones pick up animal footsteps and the infrared scopes detect heat. When big game activates both the geophones and infrared scopes, a warning light flashes along the highway to warn drivers. Unfortunately, the system alerts drivers to vehicle vibrations and sun glares as well. False positives when the lights flash even though there is no wildlife present don't encourage drivers to slow down or use caution.

Mike McVaugh, traffic engineer for Colorado DOT, says he hopes a new pilot system that detects changes in electro-magnetic fields will solve the problem of false positives often experienced with infrared detection systems. A buried cable system can sense the change in the earth's electro-magnetic field when a human or animal crosses the cable.

U.S. Highway 160 in southwest Colorado bisects mule deer and elk winter ranges between Durango and Bayfield. In some stretches of the highway, seventy percent of the reported accidents are wildlife-related. CDOT completed installation of the \$1.2 million detection system on a one-mile section in October 2008. To help motorists see approaching wildlife, CDOT workers also cleared underbrush for thirty feet beyond the highway shoulder. A second one-mile stretch has no detection system, but was cleared of underbrush for thirty feet, also. The third mile was the control section with no detection system and no clearance of the underbrush. All three miles have nearly identical accident history.

Goals for the system are two-fold—reduce animal-vehicle collisions and slow driving speeds when the system warns drivers of wildlife in the right-of-way. Deer activate the system when they cross a cable within thirty feet of

the roadway. Without the brush to obscure the deer, drivers see both deer and the flashing electronic warning signs, which reinforces the driver's trust in the system. Signs alert drivers that they are entering and leaving the wildlife detection area and the electronic signs are spaced approximately every 1,200 feet through the mile-long detection zone. It's too early in the monitoring for reliable data, but CDOT has heard that drivers are becoming believers in the flashing electronic signs.

McVaugh says they will monitor the results for three to five years because other studies have shown drivers will slow down during the first couple years of a detection system, but then they begin to disregard the system and return to previous highway speeds. He believes this may be due to numerous false positive reports and general failure of the detection systems to trigger when animals are present.

Research led by Dr. Terry Messmer, also with the Berryman Institute, which is dedicated to improving human-wildlife relationships, found prominent temporary signs a low-cost solution that reduced vehicle collisions with deer by approximately fifty percent and reduced speeding, a primary factor contributing to these collisions. The signs were erected at specific locations during deer migrations based on advice of local biologists.

Transportation departments often fund wildlife-crossing projects and provide engineering expertise, but biologists offer insight for the wildlife side of the equation. The two groups often struggle to understand each other's perspectives, goals, and challenges.

In 2000, Messmer and his colleagues studied how the different cultures of state wildlife agencies and DOTs across the country influenced their perceptions and approaches to the wildlife-vehicle collisions in hopes of enhancing communication.

Just collecting dependable information can be difficult. For example, personnel with state wildlife agencies estimated a total of 600,000 deer-vehicle collisions a year across the country,

while DOT personnel estimated less than half that number—250,000.

The difference probably lies in the source of the data. State wildlife agency staff in many states record incidents of animals being removed from highway, while their colleagues in transportation often rely on police reports. Wyoming transportation officials also keep track of the animals they find dead along the highway.

Based on roadside surveys conducted in Utah in concert with the temporary sign study, only fifteen to twenty percent of collisions are reported to law enforcement. If motorists do report the accident, there is often not a separate box to check for "deer" on the form, further muddling the data.

One thing is clear, however: inter-agency communication, like the dialog that is developing between Wyoming Game and Fish and the Wyoming Department of Transportation, pays huge dividends. Dale Becker values the interchange.

"Collaboration with transportation people on design issues may be one of the best experiences I've had in my whole career by the time I'm done," he says.

In the West, free-ranging big game has no choice but to cross roads. If we want them to make the crossing without risking their own lives and the lives and property of passing motorists, we have to do a better job of designing highways and traveling them. The highway of the future should consider the behavior of drivers and wildlife. The design process should include a state's wildlife agency, its department of transportation, and the Federal Highway Administration. Communication among these agencies, with their different cultures, missions, and financial constraints, can be a challenge, but the projects in Nugget Canyon and at Trapper's Point suggest, that communication is happening in Wyoming. We're making progress which is good news for big game and travelers alike.

Writer Marilyn Stone covers issues of conservation and hunting from her home in Paonia, Colorado.