

An Evaluation of Roadside Activity and Behavior of Deer and Black Bear to Determine Mitigation Strategies for Animal-Vehicle Collisions

Perspectice Virginia is consistently among the top 10 states with the highest number of deer-vehicle collisions — more than 56,000 per year from 2007 through 2015. Previous research has found that properly designed wildlife crossings — overpasses or underpasses used by wildlife to cross over or under a road — can effectively reduce animal-vehicle collisions. When combined with fencing, which helps funnel the animals toward such crossings, these structures can reduce collisions by more than 80 percent.

A driver warning system, such as an electronic changeable message sign, may be another way to reduce collisions. These warnings may help reduce driver speed, which, in turn, has been shown to decrease animal-vehicle collisions.

Researchers from the Virginia Transportation Research Council (VTRC), the research division of the Virginia Department of Transportation (VDOT), conducted a study of wildlife activity and behavior along a segment of Interstate 64 between Charlottesville and Waynesboro, Va., which includes Afton Mountain. The researchers concluded, based on the study's results, that VDOT could mitigate animal-vehicle collisions in the study area with well-placed fencing and electronic signs.

The VTRC research team recommended that VDOT add fencing to channel animals into two existing underpasses not originally designed for wildlife passage but known to be used for that purpose. The team also recommended posting fall-seasonal deer crossing advisories on existing I-64 electronic message signs on Afton Mountain. In this area, several streams flow under the highway through drainage culverts that are too small for deer passage. Deer and other wildlife — including black bears — attempt to cross I-64 at these intersections of mountain stream corridors and the highway.

VTRC researchers installed 54 digital motion-activated cameras for two years beneath the two unfenced underpasses, along roadside sections adjoining the underpasses and along the roadside at an intersection of the highway and the stream corridor. The cameras took thousands of photographs of animals in the study areas, with the date, time and location recorded. The research team evaluated the images for data about animals' activity and behavior along the roadside. The team also analyzed a VDOT contractor's records of animal carcass removal along I-64 to gauge animal-vehicle collisions.

The study provided evidence that the two mitigation measures under consideration could have a high probability of reducing vehicle collisions with white-tailed deer at these sites. They could also reduce vehicle collisions with black bears and other wildlife. The research team estimated that fencing both sides of just one underpass would result in a savings in costs associated with avoided deer-vehicle collisions of more than \$501,000 over a 25 year fence service life.



Animal activity alongside the interstate (left) was captured by a digital motion-activated camera (right).

This VTRC study is the first in the United States to evaluate deer activity and behavior at unfenced underpasses and adjoining sections of interstate roadside. The data obtained provide VTRC with a firm base to use to determine in a future study whether VDOT should retrofit existing individual underpasses with fencing as a strategy to improve driver and wildlife safety. Further, a future study will determine whether driver warning systems reduce animal-vehicle collisions.

Background VDOT targeted a section of I-64 for safety and mobility improvements because of a high number of vehicle accidents and traffic stoppages. The safety improvement area includes a segment of I-64 along and on both sides of Afton Mountain (passing through Augusta, Nelson and Albemarle counties).

Deer-vehicle collisions are the third-most frequent type of accident on the Afton Mountain segment of I-64, according to Virginia State Police reports. Collisions with black bears also are frequently reported for this stretch of I-64. VTRC began this wildlife study when operations staff in VDOT's Staunton District requested assistance to identify strategic locations for effective mitigation of animal-vehicle collisions.

For the full report, search [16-R4](#) at vtrc.virginiadot.org. For more information about the study, contact Bridget M. Donaldson, VTRC senior research scientist, Bridget.Donaldson@vdot.virginia.gov.

Question	Methods	Analysis
Do data support the addition of fencing to existing individual underpasses used by deer?	Installed 36 cameras beneath two underpasses and along the adjoining roadside extending a half mile on both sides of underpasses	<ul style="list-style-type: none"> • Compared deer use of underpasses to deer activity along adjacent roadside • Evaluated deer roadside behavior, i.e. crossing attempts, feeding, walking • Evaluated relationships between deer-vehicle collisions and deer roadside activity and behavior
Do data support the use of a driver warning system at select intersections of stream corridors and highways?	Installed 16 cameras along a half mile roadside segment centered on the intersection of a stream corridor and a highway	<ul style="list-style-type: none"> • Determined whether roadside deer activity is greater at the intersection of the stream corridor and highway than farther down the highway • Evaluated seasonal and temporal variations in deer activity and behavior • Evaluated relationships between deer-vehicle collisions and deer roadside activity and behavior



Research and Recommendations The table above summarizes the methods and analyses the VTRC researchers used as they evaluated deer and black bear activity and behavior along the two unfenced underpasses used by deer and at the identified intersection of the stream corridor and the highway.

Researchers found that deer pose a threat to driver safety near the two unfenced underpasses. Despite frequent use of the two studied underpasses by deer (1,187 per year), there was high deer activity along the adjacent roadside (1,182 per year). At the underpass sites, the 160 attempted at-grade highway crossings by deer and the high frequency of deer-vehicle collisions (an average of 7.5 per mile per year) indicated that many deer choose to cross the accessible interstate rather than use a nearby underpass.

The researchers concluded that fencing installations along the road adjacent to the two underpasses likely would reduce roadside deer activity and associated deer-vehicle collisions, while guiding deer to access safely the habitat on the other side of the highway.



A study photograph shows a deer running along the interstate near unfenced underpasses.

Roadside deer activity at the intersection of the stream corridor and the highway totaled 1,685 per year. Researchers found that the stream and associated sloped topography funneled deer movement toward a relatively short section of highway. Deer activity was statistically higher nearest the stream corridor and decreased farther away.

At all sites, deer activity along the roadside was significantly associated with deer-vehicle collisions, i.e., as deer activity on the roadside increased, deer collisions with vehicles increased. This relationship was strongest each October and November when the fall mating season spurs increased deer movement.

VDOT’s Culpeper District will ensure, as recommended in the study, that fencing is installed in the coming months along the roadside adjacent to the two existing large underpasses. VDOT’s Northwest Operations Region began posting deer advisories from dusk through dawn on VDOT’s electronic message signs on Afton Mountain during the 2015 fall mating season; these deer advisory postings will run annually during the months of October and November. That schedule corresponds with periods of higher deer-vehicle collisions and reduces the potential for drivers to get so accustomed to year-round warnings that they ignore them.

After the mitigation measures are implemented, VTRC researchers will conduct additional monitoring studies. They will compare the data from the next studies to the baseline data collected in this study to determine whether these low-cost forms of mitigation result in a significant reduction of animal-vehicle collisions. If so, a next step could include installing fencing at other select existing highway underpasses and late fall deer advisory signs along targeted intersections of stream corridors and highways — providing a substantial safety benefit for both drivers and wildlife across Virginia.

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