Testimonials

Successful Installation in Wisconsin

This 5 minute *YouTube* video describes how reflectors mounted on posts near the side of a highway dramatically reduce the number of deer-vehicle collisions. When a car passes, light from the headlights is directed at right-angles and is seen by deer that wish to cross the highway as a row of sequential flashing lights. This startles them and causes them to wait until the vehicle passes.

The setting is Menomonie, Wisconsin in October 1995.

The Problem of Deer-Vehicle Accidents and the Solution
Wayne R. Wilson
Retired Wisconsin State Trooper

Wildlife Warning Roadside Reflectors—Proven By Road Tests To Be Most Effective Method Of Preventing Car-Deer Accidents

Increased traffic and deer population along with new suburban developments have increased the possibilities of car-deer collisions. These accidents are frequently very traumatic and may result in personal injury, vehicular damage and serious or fatal injury to the deer. After a careful review of information and road test data, it is my conclusion that wildlife warning roadside reflectors offer the best solution to the problem.

The reflectors are designed to work in the dusk-to-dawn hours when over 75% of car-deer accidents occur. The reflectors pick up car headlights and direct a reflected beam at the deer, deterring them from crossing roads in front of oncoming traffic. It is recommended that the reflectors be installed along roadways where previous car-deer accidents and/or heavy traffic and large numbers of deer crossings indicate a significant potential for these type of accidents. The basis for this recommendation was a detailed review of extensive road test data showing an average **reduction of 88% in car-deer accidents after installation of the reflectors.**

The *Strieter-Lite* wildlife warning roadside reflector system comprises a series of red reflectors placed along both shoulders of a road in a staggered pattern. If deer are about to cross a road into oncoming traffic, the deer see an unnatural moving red reflection from the approaching vehicles' headlights bouncing off the reflectors and are deterred from crossing until the vehicle has passed. Since the deer's night vision is much more sensitive than that of humans, the weak reflections are not bothersome to persons in the area but are very prominent to the deer. The *Strieter-Lite* reflectors are the only ones incorporating the patent design providing full no-gap coverage and have demonstrated superior proven performance in extensive, long term road tests.

Basis for the conclusion of the effectiveness of the reflector system was a detailed analysis of all available field test data obtained from the 13 states and British Columbia were accident data rates prior to and after reflector installations were recorded. The data

represents a total of 53 individual test sites covering a total of 52 miles. The average reduction of 88% in car-deer accidents corresponds to **preventing almost 9 out of 10 accidents from occurring**. Analysis of the accident data for all test sites including the duration of the pre and post reflector test periods, length of the road test site, and the recorded number of car-deer accidents prior to and after reflector installations provides a figure of merit that indicates the estimated number of accidents that will be prevented for a selected site. The data reflects an average **accident rate reduction of approximately 10 accidents per mile per year**. This is a very significant accident prevention technique that greatly enhances car travel safety where deer crossings are of concern.

The cost for the *Strieter-Lite* reflector system, including material and installation labor, is about $8,000 per mile. Since the reflectors are installed on selected roadways where accidents have previously occurred or deer crossings are prevalent, it can be expected the system will pay quick dividends. The average cost for a minor accident involving vehicular damage and no personal injury is about $2,500. Therefore, even if only 4 minor accidents can be prevented in one mile of highway in one year-the system will pay for itself in a little more than a year. Since the road test data indicates that an average of approximately 10 accidents per mile per year can be prevented, the pay back time can be expected to be much shorter, averaging less than 4 months. It is of interest to note that compared to sound barrier installations along roadways, the cost for reflectors is minimal. **15 miles of reflectors** can be installed for the cost of about **100 feet of barriers**.

The *Strieter-Lite* reflectors qualify under several **federal matching fund programs** that could serve to reduce State/Local funding requirements. The Federal Highway Administration's Federal Surface Transportation Funds/Hazard Elimination Fund provided 80% Federal funding matched by 20% State/Local funding. The Transportation Equity Act (TEA-21) includes a special category that the reflectors fully comply with "projects to reduce vehicle-caused wildlife mortality while maintaining habitat connectivity."

The wildlife warning roadside reflector system is a proven, cost effective concept that is here today and works very well. Roadside reflectors are a safety device that significantly reduces car-deer accidents preventing personal injury, the great trauma involved in this type of accident, and vehicular damage, as well as reducing the number of deer killed and injured. **There is no other known approach that has proven to be effective in significantly reducing car-deer accidents.**

Marvin Tenberg - Oct. 15, 2001

Helpful Suggestions for Installation, Comments on the Cost Benefit, End Conditions, and Snow on the Ground

Suggestions for Installation

The spacing depends on the characteristics of the road you are using the reflectors on. In Calhoun County (Michigan) we used them generally on 2-lane roads consisting of two 12-foot wide lanes plus an 8-foot wide shoulder on each side (hence 12+12+8+8 = **40 feet**). So depending on the road and where you place the reflectors (we put them at the back-edge of the shoulder) the number will change a bit, but the 40-foot number is good for planning purposes. The rule to follow is that the spacing *between* reflectors going

down the roadway is equal to the spacing from one side of the road to the other side of the road (where the reflector lines are).

I have used the reflectors generally for 1-mile segments. However, I also used them for as short as ¼ mile. I would recommend that while the ¼ mile segment did work well that you stick to ½ mile segments or longer. The real determining factor is the end conditions, and where there is a place for the deer to disperse or go to at the end points. Just putting ¼ or ½ mile in without provisions for the deer at the end could potentially mean a problem.

I see no reason why the reflectors should not work on a curve, provided that some engineering is done before installation to insure coverage by the reflected beam. In general it may mean reflectors spaced closer than say the 40-feet mentioned above. I did not use them on a 90-degree turn, again I feel they would work if laid-out properly. I did use them on the curve shown below on B Dr S, and they worked just fine.

When looking at the curve installation, I think that you certainly need a lead-in area on each end; again you need to make sure the end points are in areas where the deer will disperse safely and not cross in a group. This is the place where some engineering is important.

The reflectors do <u>not</u> cast a light or reflection that will bother any homes or people. I have been out along the road edge at night to witness the reflection. It is barely visible and very transient. This is not a problem or even a potential problem based on my observations.

John Strieter can give you the exact cost for reflectors. But I was able to save installation cost by using our Sheriff's Work Crew. It does not take a lot to put them in once you have done the engineering, and you have had the underground utilities staked. You need the following people, materials and equipment.

1. Reflectors and bolts for mounting (again for a 2-lane road with 8-foot shoulders you need about 265 reflectors per mile.
2. One mounting post per reflector. I used the same posts we used for mounting delineators (those little reflective buttons you see along the road). Delineator posts are a little lighter (about 1.12 pounds per linear foot), and cheaper than regular sign posts. You will generally need 7-foot long posts, so that you can get around 2½ to 3 feet of embedment.
3. You can drive the posts with either a pneumatic or hand-driver (cheaper), plus hand tools for tightening nuts and bolts.

4. You will need come traffic control signs when working a long the road. How many and where you need them will need to be approved by the local road authority.
5. A pick-up or small truck to carry equipment and materials and crew, with flashing lights.
6. A 2-person crew is enough to install them but you may need as many as two-more people if the road agency requires flag-persons.

Cost Benefit

Last year (2008) an agency in Michigan calculated a cost of $18,000 to $25,000 per mile for installation using a County sign installation crew. I made an estimate for installing 265 reflectors and it is in the table below. I tried to be conservative (on the high side) and you can add or subtract as needed.

Materials (reflectors, posts, hardware, traffic control signs)	$17,870
Labor (two-person crew)	$2,385
Equipment (small truck, post driver)	$1,325
Total	$21,580

So the cost per reflector was $81.

In terms of cost benefit, the average cost for damage to vehicles per car deer crash is about $2,500. I experienced 75 to 95 percent reduction in my County so if we use a 75 reduction, again to be conservative the numbers look like this:

◦ If we have a one mile section.
◦ If we have an average of 10 car deer crashes per mile per year on the section.
◦ If we install the delineators for the cost of $21,580
◦ If we experience a reduction of 70% (eliminate 7 crashes per year)

Then, we eliminate car damage of 7 x $2,500 = $17,500 each year.

If we divide installation cost by annual car damage saving we have $21,580 / $17,500 = 1.23 years for payback. In other words, **the installation costs are paid back by crash damage cost savings in 1.23 years**. This is a very quick and reasonable rate of return in the traffic engineering business.

If we eliminate only 30% (3 crashes per year) we still get $21,580 / (3 x 2,500) = $21,580/ $7,500) = 2.88 years for payback. In other words, the installation costs are paid back by crash damage cost savings in about 3 years. This is a typical payback period for safety projects.

End Conditions

The conditions at the ends of a particular installation are very critical. I did not experience any problems with deer crashes clustering at the ends of our reflector lines. However, we were very careful of where we ended them.

Generally, *you need a place where deer will disperse and not have a natural desire to cross the road*. We generally ended the delineator lines at major intersections which seemed to work well. We also ended them by bridges or places where there were clusters of homes. In one case we ended them by a cemetery and for some reason that worked very well. I think to a large extent it is a common sense thing, and needs some people who know the local deer herd and deer behavior to be in on the initial engineering to pick the spots where the reflector lines start and end.

Deep Snow on the Ground

As far as snow is concerned, first I would look at the crash data to see when the most critical time for car-deer crashes is. In Calhoun County our peak car-deer crash periods did *not* happen when we had a lot of snow on the ground, and we noticed that during high snow periods, deer movements tended to be down. While there certainly would be crashes, they were not the problem compared to November or even during harvest time or in the Spring and Summer.

In any case, if snow season is a concern, the bottom line is to remember that first the reflectors need to be visible, and secondly, they need to reflect light where the deer stop by the side of the road before crossing. If your delineators are going to be buried by snow, then I would say digging them out is not reasonable. If they are not buried, then remember that besides reflecting in a horizontal direction (along the roadside), there is also a vertical component to the reflection that will account for some elevation change due to snow. Again, the upfront engineering can look at this aspect, and it is mainly common sense. But again, we need to determine if winter crashes are the problem and then make our design fit the need. If you can get a reasonable payback by just reducing crashes during non-snow times then I would say go with it, understanding that no method works 100 percent all the time with the same effectiveness.

Conclusion

As long as the reflectors are able to reflect headlight beams to where the deer are going to be coming out to cross the road they, will work. That is the bottom line. If the deer cannot see the reflected beam, or reflectors are missing (or buried) in the snow they cannot work.

Dennis Randolph
Managing Director/County Highway Engineer (title when using reflectors)
Calhoun County Road Commission
Marshall, Michigan
April 7, 2009

Eyewitnesses of Deer Behavior near Reflectors

Background

Strieter-Lites do not necessarily frighten deer standing or grazing along the roadsides, but do deter those *running towards* the road to cross. We have never indicated that wildlife scatter in all directions while standing alongside the road when approaching vehicles with headlights light up the reflectors.

Eyewitness Observations

At least five people have witnessed and reported on various types of deer behavior on the roadside near the deer reflectors. One observation made in Canada was that as deer were running toward the road from an angle, they would veer off and leave the area. Another person from Algoma, Wisconsin reported seeing running deer approach the road perpendicularly, come to a stop, turn around, and run away faster than when approaching - as if frightened.

Conclusions

Running deer are more likely to react to moving objects such as the lights reflected from our reflectors from passing vehicle headlights than when the deer are stationary or grazing. Just because the deer do not move away from our lighted reflectors while grazing does not mean our reflectors are ineffective. It could indicate that the deer are kept from crossing by remaining somewhat inactive while the vehicles pass by and decide not to cross.

This condition was evident in the 2006 Wildlife Society Bulletin 34 article entitled "Evaluation of Wildlife Warning Reflectors for Altering White-Tailed Deer Behavior Along Roadways". The study reported only one collision out of 75 vehicular passes occurred during 90 observation nights consisting of 240 hours of an infrared camera recording reactions of deer grazing along the Berry College campus roadsides in our reflector test sites.

The article concluded that "wildlife warning reflectors were ineffective in changing deer behavior such that deer-vehicle collisions might be prevented". In fact, looking at these numbers, we conclude that the study actually *proves* the effectiveness of our reflectors since only 1 collision occurred during 75 vehicle passes. During the remaining 74 passes, the deer continued grazing along the roadsides, neither scattering nor crossing.

John Strieter - August 17, 2011