DEER-FLAGGING MODELS

Some experts believe that white-tailed deer raise their tails to expose their white undersurface as a warning communication between their species. One study was found that evaluated the unique idea that DVCs might be reduced if white-tailed deer could be warned away from roadway by the installation of placards that mimic this "flagging" behavior (See Figure 1) (*1*, *2*).

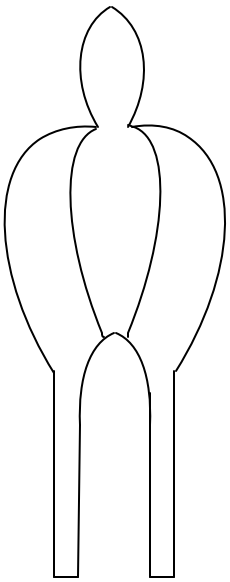

FIGURE 1 Example schematic of flagging model.

Study Design and Results

In 1978, researchers at Pennsylvania State University documented their attempt to verify and expand upon the results from an earlier study that indicated white-tailed deer avoided areas with plywood flagging models (See Figure 1**)** (*1*, *2*). The researchers assessed the effect of these flagging models in four experiments that focused on several fenced sections of Interstate 80 (*1*). During three of these experiments the following data were collected: the number of deer along 200-foot sections of roadway; the type of deer (i.e., adult, fawn, and undetermined); deer behavior (i.e., grazing, lying, walking, running, standing, and other); and the time of the deer sighting (*1*). In two of these three experiments the position of deer in the right-of-way was also recorded, but the document

reviewed offered no further explanation. The data were generally collected at night from a vehicle traveling at 15 miles per hour along the shoulder of Interstate 80. Observers used hand-held spotlights to observe the deer**.** The effectiveness of the flagging models was measured by comparing the number of the deer observed before and after the model installation within a treated segment, or by comparing treatment and control roadway segment observations.

Experiment One

Each of the four experiments had a slightly different approach to the measurement of flagging model effectiveness. In the first experiment, the researchers observed deer along the north side of a 2,400-foot roadway segment of Interstate 80. This segment had a right-of-way fence that was approximately 7.5 feet in height. Similar data were also collected along a comparable 3,000-foot control segment. Both segments were located in open valleys, and surrounded by mixed hardwood forests. Both segments also had a number of gaps in the fence that could be used by deer to enter/exit the right-of-way. The exact size and number of gaps in each segment was not documented for this experiment, but twelve flagging models with real deer tails were placed 6.6 to 9.8 feet in front of the fence gaps within the treatment segment. No models were placed in the control segment. The researchers gathered data for 16 nights before and after the models were placed.

The data collected show that the number of deer observed in the treatment and control segments declined from 120 to 12 (a 90 percent decrease) and 156 to 36 (a 77 percent decrease), respectively (*1*). Assuming that the control segment results are typical (i.e., they show what might be expected in the treatment segment without the models) and a uniformity of deer movement, the expected treatment segment results should have been about 125 and 29 if the models were not installed. In other words, the number of deer observed after the models were installed is about 60 percent lower than expected.

The number of nights the deer were observed along the treatment segment also declined within the treatment segment, but remained the same along the control segment. Deer were observed for 15 of the 16 nights along both segments before the models were

erected, but only during five nights along the treatment segment after the models were installed. The number of nights deer were observed along the control segment did not change after the models were installed. The researchers concluded that the results were not robust enough to allow them to make a conclusion about how effective the flagging models were at keeping deer out of the roadway right-of-way (*1*).

Experiment Two

In the second and third experiments, the researchers focused on deer behavior related to flagging model designs, and collected data for a longer period of time. Seven different types of flagging models were erected along Interstate 80 and their impact evaluated in the second experiment. The seven designs considered included painted and unpainted models with upright real and wooden deer tails, painted and unpainted models without an upright tail, and a plain plywood rectangle (*1*).

In the second experiment, six different flagging models (initially excluding the plain plywood rectangle) were randomly placed within the roadway right-of-way 6.6 to 9.8 feet in front of 24 fence openings for two months. Another 24 fence openings had no flagging model for the first month, but then received simple plywood rectangles for the second month. Two-thirds of the fence openings were on the north side of a 4.2-mile segment of Interstate 80. The other 56 openings were along the south side of a 6.0-mile segment. Deer movement data were collected by track counts on 24 days of the two months the models were erected.

The results indicate that during the first month of observation more deer used the fence openings with no model than those that used the other openings combined (65 versus 36 sets of tracks) (*1*). The researchers believed that the models with real or painted deer tails might also repel deer more than the plainer models, but that belief was not confirmed during either month of data collection (*1*).

The openings with the real or painted deer tails mounted on painted plywood models also did not appear to suppress deer crossings any more than the plain rectangle (*1*). In the

second month, when the unpainted plywood rectangle models were placed near the control openings, only 19 deer used these gaps (versus 65 in the previous month) (*1*). The total number of deer using those gaps with the six other flagging model designs remained about the same as the previous month (34 sets of tracks versus 36) (*1*). Overall usage of the right-of-way by deer decreased, but this may have been expected by the researchers (*1*).

Experiment Three

The third experiment was longer term in nature, and an attempt to respond to the high variability of deer crossings along Interstate 80 (*1*). In this experiment, three consecutive three-mile segments (i.e., two experimental segments separated by a control) were observed. On the north side of Interstate 80, painted models with wooden tails were placed (halfway between the highway edge and fencing) along one treatment segment at 200-foot intervals. Unpainted plywood rectangles were placed in the same area along the other treatment segment. The control segment had no models. The researchers conducted spotlight observations three to four nights per week in the fall months of the study, but from December to March only a few observations could and were made along both sides of the roadway study segments (*1*). The number and location (both longitudinally and laterally from the roadway) of the deer sighted were recorded (*1*).

The results of this experiment indicate that more deer were seen along the segment with the painted deer models (N = 666) than those with no models (N = 335) or plywood rectangle models (N = 490) (*1*). Almost the same numbers of deer were also seen between the roadway and the painted models as were observed between the roadway and the plywood rectangles (N = 186 and 204, respectively). Only 77 deer were seen within the control segment. An analysis of the relationship between the number of deer observed at different distances from the roadway indicated that there was more deer movement between the models and the right-of-way fence than been the roadway and the models (*1*). However, this pattern occurred in both treatment segments (*1*). From these results, the researchers concluded the installation of either deer model design may have discouraged deer movements, but that that the deer models did not appear to be effective

at reducing the total number of deer along the segments within which they were installed (*1*). No documentation was provided about number of deer that used each segment before the experiment began.

Experiment Four

The final experiment was similar to the third, and a three-mile section along eastbound Interstate 80 was divided into three one-mile segments. Within the three-mile segment, one-mile contained painted flagging models and was located between two one-mile control segments that had no models. The number of deer along the right-of-way of each roadway segment were then observed in the same manner as the other experiments, but for a time span of seven months (i.e., one month before installation and up to six months after) (*1*).

In the month before the models were installed, the number of deer observed within the one-mile segment where the models would eventually be installed was higher (N = 531) than that in either control area (N = 91 and 134). However, after models were installed, the number of deer observed in the following month increased along all three segments (*1*). The deer observed in the treatment segment increased by about 13 percent (N = 601), and increased by about 25 and 95 percent along the control segments (N = 114 and 261). The ratio of deer observed along the model segment and along one of the control segments remained about the same, but almost doubled with along the other control segment. The number of deer observed in the second month after the installation were higher than before the model installation in both control segments but lower in the treatment segment (*1*). Total deer observations for the following four winter months only ranged from 7 to 34 (*1*). Based on these results, the researchers concluded that this pattern of deer observations was contrary to their belief that the painted deer models would reduce the number of deer in the roadway right-of-way (*1*).

Conclusions

None of the four experiments summarized here appear to yield conclusive results that the addition of flagging models had an impact on and/or reduced the number of white-tailed

deer that would be typically observed and/or cross a roadway right-of-way. In some cases fewer deer were seen along the experimental segments than in the control segments, but in others the number of deer observed increased after the models were installed. The general fluctuations in deer movements and the variability in data observation approaches also appears to confound attempts, at least in some of the experiments, to connect deer behavior to the presence or absence of the flagging models. The experimental designs also added some factors that may have had some impact in the interpretation of the results as documented (e.g., different time periods of observation before and after model erection).

The investigators of the experiments reached the general conclusion that they had failed to demonstrate that deer flagging models were effective at reducing the number of deer observed along the highway right-of-way. They believed that this approach would not be effective at reducing the number of DVCs, and did not recommend the use of deer flagging models as a deterrent to DVCs. A similar study in the future, but with some different design characteristics (e.g., longer observations before and after model installation, and clearly defined comparable control and treatment segments), might be considered to validate or refute the results of the study summarized here.

References

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2. Bashore, T.L. *Redirecting Deer Movements By the Use of Flagging Behavior Models*. M.A. Thesis, Millersville State College, Millersville, Pennsylvania, 1975.