

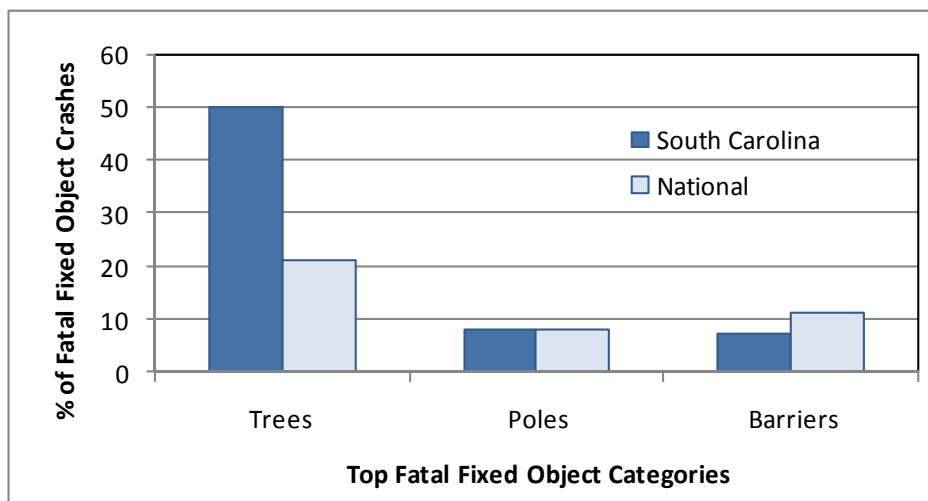
# SUPPORT FOR THE ELIMINATION OF ROADSIDE HAZARDS: EVALUATING ROADSIDE COLLISION DATA AND CLEAR ZONE REQUIREMENTS

## EXECUTIVE SUMMARY

Over a three year period (2004-2006), there were more than 60,000 crashes involving fixed objects (trees, utility poles, culverts, bridge piers, etc.) located within South Carolina roadsides. These fixed object crashes accounted for 20% of all crashes in South Carolina, and nearly 50% of all fatal crashes. In comparison, only 30% of fixed-object crashes result in fatalities nationally. Responding to the growing concerns of roadside hazard involvement in crashes, SCDOT selected a research project to analyze roadside collision data, evaluate the sufficiency of current clear zones along state roadways, and assess the benefits associated with minimizing consequences of leaving the roadway by providing and maintaining adequate clear zones. Clemson University was selected to perform this work.

The research effort began by analyzing three years of crash data to determine the magnitude of the problem and the factors associated with crashes involving roadside hazards. A number of interesting findings surfaced in this analysis:

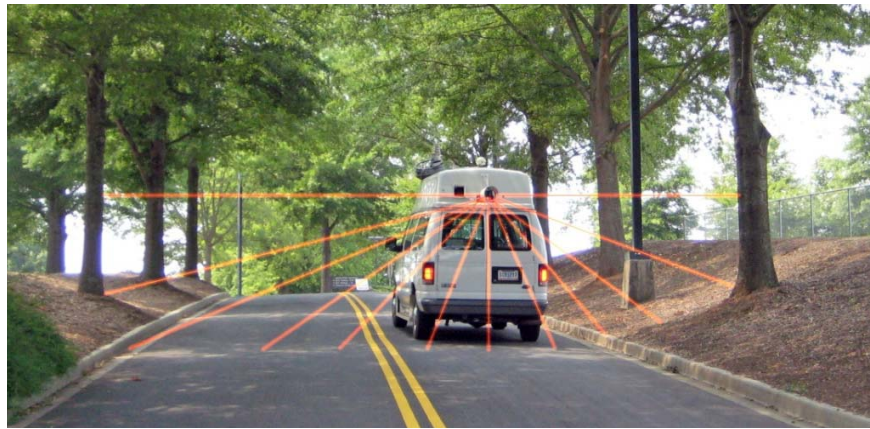
- The greatest contributor to fatal crashes on the roadside in South Carolina is trees. *Trees are involved in 25% of all fatal crashes in South Carolina, yet only 8% nationally.* These fatal crashes are estimated to cost South Carolina approximately \$750 million per year, not including injury and property damage only crash costs which bring the total to nearly \$1 billion per year.
- An analysis of the primary contributing factors in fatal fixed object crashes both nationally and in South Carolina showed a striking difference between the two in terms of the involvement of trees— *50% in South Carolina, yet only 21% nationally.*



- *Almost 50% of tree-related crashes occur on secondary roads*, with another 25% on primary roads. While only 12% occur on Interstates, approximately 15% of the fatal tree crashes occur on Interstates. Interstate 26 tops the list for tree related fatalities, and Interstate 95 follows closely .

- **72% of the tree-related crashes and 78% of the utility pole crashes occurred in curve sections.** Both tree and utility pole crashes in curves are particularly important when the clear zone requirement is taken into consideration because the Roadside Design Guide recommends that clear zones be increased by 10-50% along curve sections in areas where crash history indicates a need.
- Fatal utility pole crashes are consistent with national figures accounting for 8% of fatal fixed object crashes.

After using a combination of crash data, SCDOT roadway inventory data, and geographic information system analysis tools to identify 287 sites of interest in 14 counties across the state, Clemson researchers surveyed the sites with an instrumented van to identify exact parameters for roadside slopes and distances to obstacles in the clear zones. The van combines video-log capability with precision GPS location and a 360° rotating laser measurement device. The laser measures accurately within a few inches up to 50', and allows the determination of precise distances from the edge of the travel lane (pavement marking) to the nearest roadside obstacle (tree, pole, etc.) while also providing roadway cross-slope and roadside slope measurements.



Of the 287 sites surveyed, 131 were randomly selected and analyzed for clear zone requirements. Of these, only 12 met the criteria using automated software processing. Taking into consideration, variations in actual operating speeds and the presence of curves at these sites, six more would no longer meet clear zone requirements. The research team also analyzed 58 control sites. Control sites are areas that have no instances of fixed object crashes within the three year study period. For these 58 control sites, 47 met the minimum clear zone requirements, and only 11 did not. Using an odds ratio test for this sample, researchers determined that **the odds of a site having a fixed object crash are 42 times higher if the minimum clear zone is not met.** The 95<sup>th</sup> percentile confidence interval for this odds ratio ranges from 17.3 to 101.82 – indicating that the sites that do not meet clear zone requirements are significantly more likely to experience fixed object crashes.

Considering the magnitude of the roadside hazard problem, and the deficiency of the clear zones in these areas, it appears that **by providing recommended clear zones (or safe recovery areas) for motorists who leave the roadway, South Carolina could realize a notable decrease in roadway fatal and injury crashes.** This is particularly significant realizing that many times it is for reasons other than driver error (i.e. blown tire, struck by another vehicle, avoiding an accident, avoiding deer, etc.).