South Carolina Tree Removal Noteworthy Practices

In the United States, roadway departures accounted for 57,475 highway deaths between 2016 and 2018. Trees were the most harmful event in 10,697 of these fatalities.

South Carolina Tree Removal Initiatives and Projects

Background

The South Carolina Department of Transportation (SCDOT) manages more than 41,000 centerline miles of interstate, primary, and secondary roadways. This equates to the fourth highest total in the Nation when compared to all other state agencies. Over the last decade, SCDOT has successfully completed a number of safety-based projects to remove trees from the median and roadside environment. Prior to these projects, tree removal activities had been limited to larger widening projects or maintenance activities, and challenges to vegetation management contributed to narrowing clear zones. A review of statewide crashes revealed that fixed objects (particularly those involving trees) were overrepresented in South Carolina statewide crashes and fatalities.

In 2009, SCDOT commissioned Clemson University to develop a technical report[1] that analyzed roadside collision data and assessed existing roadside slopes and clear zones. This study found that over a three-year period from 2004 to 2006, there were more than 60,000 crashes involving fixed objects. During this time period, the researchers determined that trees were involved in 25% of all fatal crashes in South Carolina. Similarly, trees were the primary contributing factor in 50% of all fatal fixed-object crashes in South Carolina.[2] Based on their assessment of existing roadside conditions at a random sampling of sites, the researchers further determined that sites where the minimum clear zone was not met were 42 times more likely to have a fixed-object crash. I-26 experienced the most tree-related fatalities, and I-95 was a close second. Figure 1 captures the site of a tree-related fatality along I-26.

Figure 1: Site of a Tree-Related Fatality along I-26

[1] Ogle, J., Sarasua, W., Dillon, J., Bendigieri, V., Anekar, S., and Alluri, P. (2009). *Support for the Elimination of Roadside Hazards: Evaluating Roadside Collision Data and Clear Zone Requirements*. Report No. FHWA-SC-09-01, Federal Highway Administration, Washington, DC.

[2] Nationally from 2016 to 2018, trees were the most harmful event for 10% of all fatalities and 19% of roadway departure (RwD) fatalities. Similarly, approximately 53% of fixed-object fatalities involved trees as the most harmful event. The FHWA RwD Strategic Plan website provides additional information regarding national crash statistics.

Projects

Responding to the growing concerns of fixed-object crashes, in 2009 SCDOT added a tree removal component to an existing construction project on I-385. The project consisted of reconstruction of 15 miles of interstate, and SCDOT was able to widen the existing clear zone to 50 feet while the interstate was closed for construction.

SCDOT then worked to address problem areas along I-95 and I-26 that were identified in the 2009 study. As a result of the safety analyses, SCDOT was able to program Highway Safety Improvement Program funds to remove trees from segments of both interstates that experienced high numbers of tree-related fatalities. In 2012, SCDOT and the South Carolina Forestry Commission jointly completed a timber harvest project to remove many of the trees along a 2.5-mile section of I-95 that was targeted as a pilot project due to that particular county having the second-highest number of fatalities involving trees in interstate medians in the state (14 fatalities from 2003 to 2008). The clear zone was increased from approximately 30 feet to approximately 46 feet.

Figure 2: Clear Zone Reclamation along I-26

SCDOT then undertook a safety project in 2014 and 2015 to remove trees from the median of I-26 and replace them with cable barrier, increasing the clear zone from approximately 25 feet to approximately 46 feet. The project originally targeted 30 miles to address fixed-object crashes involving trees, but ultimately only 13 of the 30 miles were approved for clear cutting by the local council of governments. Figure 2 provides before and after photos of the clear zone along a segment of I-26.

In 2018, SCDOT cleared trees from a 33-mile section of I-95, which the local newspapers had dubbed the "Coffin Corridor." The clear zone was increased from as little as 15 feet to 55 feet for both medians and roadside.

SCDOT also commissioned Clemson University to conduct another research project[3] that identified proven successful safety programs used in other states and assessed their potential to address safety concerns and reduce fatalities in South Carolina. The study focused on programs that could address the safety emphasis areas previously identified in SCDOT's Strategic Highway Safety Plan and provided crash statistics for each emphasis area from the most recent year available (2015). One of these emphasis areas was roadway departure crashes. Citing the 2015 crash data, the researchers found that South Carolina had the highest fatality rate in the Nation for crashes involving trees and that trees were involved in 25% of all fatal crashes in South Carolina. The 2014 and 2015 crash data did not include the full impacts of the two largest tree removal projects on I-26 and I-95, which were the highest tree-related crash locations in South Carolina. The researchers estimated that the tree-related fatal crashes in 2014 alone cost $2.26 billion, and that estimate would likely be even higher had the I-95 timber harvest project not been completed in 2012. Through a return-on-investment analysis included in the Clemson University study, the researchers estimated that clear zone reclamation through vegetation control and clearing of regrowth could save the state approximately $484 million. This analysis was based on the application of a crash reduction factor of 27% as developed in a 2010 Australian study.[4] This finding suggests an equivalent benefit-to-cost ratio ranging from 26:1 to 38:1 on South Carolina roadways.

[3] Ogle, J., Sarasua, W., Chowdhury, M., Brown, K., Huynh, N., and Davis, J. (2017). *Applying Successfully Proven Measures in Roadway Safety to Reduce Harmful Collisions in SC*. Report No. FHWA-SC-17-08, Federal Highway Administration, Washington, DC.
[4] Jurewicz, C., and Pyta, V. (2010). *Effect of Clear Zone Widths on Run-Off-Road Crash Outcomes.* 2010 Australiasian Road Safety Research, Policing and Education Conference, Canberra, Australia.

Project Successes—Improving Safety

Even though data were not sufficient to apply an advanced statistical assessment, SCDOT further analyzed the available crash data both before and after each of the three interstate projects. Table 1 summarizes the outcome of this simple before-after comparison for the I-26, I-385, and I-95 projects.

Table 1: Tree Removal Projects Before and After Crash Data

Analyzed Crash Type by Project	Crashes (All Severity Levels)			Crashes (Fatal and Severe Injury)		
	Before	**After**	**% Reduction**	**Before**	**After**	**% Reduction**
I-26 Safety Improvements						
Total Median Tree/Cable Barrier Crashes	165	73		37	4	
Years of Data Analyzed	5.0	3.3		5.0	3.3	
Median Tree/Cable Barrier Crashes per Year	33.0	22.0	33%	7.4	1.2	84%
I-385 Reconstruction						
Total Crashes Involving Trees	62	25		26	10	
Years of Data Analyzed	5.0	7.0		5.0	7.0	
Crashes Involving Trees per Year	12.4	3.6	71%	5.2	1.4	73%
I-95 Timber Harvest						
Total Median Tree Crashes	22	2		12	1	
Years of Data Analyzed	3.5	2.5		3.5	2.5	
Median Tree Crashes per Year	6.4	0.8	87%	3.5	0.4	89%

Each of these projects resulted in substantial reductions in the total number of crashes involving trees as well as a cumulative reduction of 81% in the number of fatal and severe crashes involving trees. The numbers shown for the I-26 project represent the 13-mile portion where trees were removed. By comparison, the total number of median tree crashes has remained consistent (30.2 per year before versus 30.9 per year after) within the uncleared section of the interstate.

Challenges

SCDOT noted several challenges that it faced in the implementation of these projects. The projects have typically required public outreach, and the I-26 project experienced significant public opposition. Due to concerns expressed at a public hearing, the local council of governments (COG) placed a provision in the state budget restricting any state funds from being spent on the project until approval was granted by the COG. The project was originally proposed to clear 30 miles of interstate, but ultimately, the COG only granted approval to remove trees along 13 miles.

Mitigating the potential disturbance of wetlands was a major obstacle for all the tree removal projects. Given their locations in the lower portion of South Carolina, each project required significant environmental coordination. Some areas required clearing without grubbing or the installation of guardrail to minimize wetland impacts. In addition, the I-95 safety project required detailed erosion control measures specific to each location within the 33-mile tree removal section. This additional effort resulted in delays to the project.

The Clemson University researchers also found that local tree ordinances may impact SCDOT's ability to remove trees as a means of improving roadway safety. Local and county tree protection ordinances limit the number and types of trees that may be removed and mandate replacement. In addition, many of South Carolina's secondary roadway locations have county-based ordinances that only permit clearing to 10 feet. SCDOT therefore had greater success in implementing tree removal projects on interstates, which were not subject to local ordinances.

Lessons Learned

Based on the challenges it faced with public opposition, SCDOT shared several lessons learned for successful public outreach:

- Begin outreach to public officials early, particularly on projects that may fall within sensitive areas. Early outreach to public officials provides an agency with the opportunity to explain the purpose and need of the project. Gaining public officials' buy-in early is key to keeping a project moving forward. If public officials are provided with the key background information before they begin receiving calls from the public, they are better equipped to explain the project and allay concerns.
- Typically, informal public information meetings provide greater engagement than formal public hearings. Some individuals may be hesitant to speak in front of a large audience at a formal public hearing, limiting who provides feedback, particularly those whose thoughts are contrary to the majority. Less formal public information meetings provide greater opportunity for one-on-one conversations, resulting in a more comprehensive cross section of public sentiment.
- SCDOT creates project webpages that provide copies of the public meeting materials and the project manager's contact information. Citizens are able to submit project feedback online via the webpage, and SCDOT's public outreach section tracks the number of hits on each project webpage. SCDOT has found that the number of individuals providing feedback online has typically been far greater than the number attending meetings in person.

Based on the successful safety performance of the early tree clearing efforts, SCDOT noted that the public has generally been more receptive to the clear zone reclamation concept and that more recent projects have faced less opposition.

Shaping of Standards, Policies, and Practices

Although there is no written policy requiring a 55-foot clear zone, SCDOT's Safety Office recommends acquiring this increased width on interstates experiencing high crash frequencies and where the speed limit is 65 miles per hour or greater. For interstates with speed limits below 65 miles per hour, clear zone values from the American Association of State Highway and Transportation Officials' *Roadside Design Guide* are considered acceptable. The recommended 55-foot clear zone is nearly double the width of the maximum, previously common practice of 30 feet. SCDOT works to achieve the recommended 55-foot clear zone primarily through safety projects, interstate rehabilitation projects, or maintenance activities.

For Additional Information

For additional information about the FHWA Roadway Departure Focus State Initiative, contact Joseph Cheung, FHWA Office of Safety, at **joseph.cheung@dot.gov**.

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