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U.S. Department of Transportation
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PROJECT SUMMARY

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SIGN LIFE EXPECTANCY

This project investigated the degradation of traffic signs in South Carolina. Data from 1,600 SCDOT-maintained signs, collected over a nine-month period, were analyzed. The signs were selected to provide a representative sample in terms of geographic location and age. Models were developed to predict a sign's expected life (i.e., how long a sign will last until it no longer meets the standard specified by the Federal Highway Administration). Based on the modeling results, it is recommended that the SCDOT's sign replacement interval be extended to 12 years. In addition, it is recommended that the SCDOT

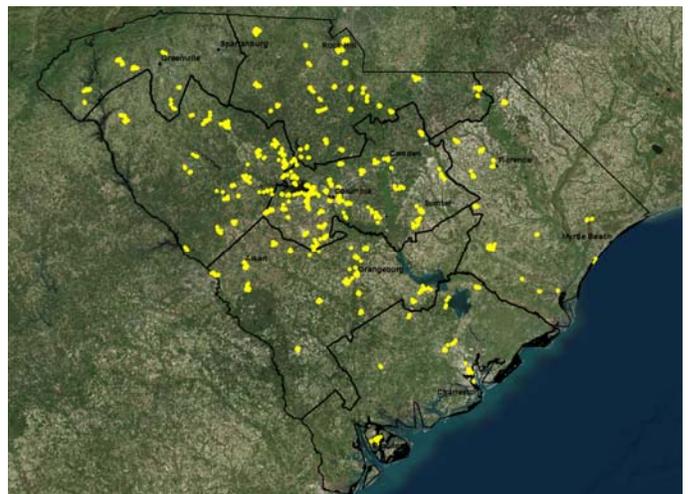
incorporates sign washing in future sign maintenance activities to extend the life of signs.

PROBLEM

In 2007, the Federal Highway Administration adopted new retroreflectivity standards for traffic signs to be implemented by agencies in their jurisdictions. Along with these standards, agencies were to adopt a management method to maintain the minimum standards. The SCDOT uses a combination of the "Blanket Replacement" and "Expected Sign Life" methods. That is, the SCDOT replaces signs based on the sheeting warranty as set by the manufacturer, which is 10 years. The SCDOT uses the nighttime inspection method as a quality control check. This project investigated the expected life of traffic signs managed by the SCDOT so that recommendations can be made regarding the sign replacement interval.

RESEARCH

In this project, linear and non-linear regression models were developed to predict sign life using data collected from 1,600 traffic signs in South Carolina.



Location of signs measured in this study (sample size = 1,600); approximately 10 to 20 signs were measured at each location.

Regression models were developed for four sign colors (red, yellow, white, and green) to determine which factors have an effect on the retroreflectivity of signs. This work introduced a new variable not considered in previous studies, degree of shade, which was found to have a significant effect on the degradation of sign retroreflectivity, primarily from mildew growth. The major findings from the regression models are the following:

- For red signs, the regression model with exponential form provided the best fit, while for white, yellow, and green signs, the regression model with quadratic form provided the best fit.
- The explanatory variables, age and degree of shade, were found to be statistically significant for all four sign colors. For red signs, the variable, northwest facing direction, was also found to be significant.
- All models have adjusted R^2 values greater than those reported in previous sign studies.



Shade rating system used in this project (from left to right): full shade, mostly shade, partial shade, and no shade.

RESULTS

Based on the calculated expected life of signs in South Carolina, it is recommended that the SCDOT extends the sign replacement interval to 12 years. This conclusion is supported by both the SCDOT historical sign replacement data and measurements taken from older signs in

Spartanburg. That is, very few signs replaced at the 10, 11, or 12-year mark were due to poor retroreflectivity, and upon examination of older signs collected by the Spartanburg maintenance team, it was found that all of the signs that were 12 years or older have a higher retroreflectivity value than the minimum required.

In addition, it is recommended that the SCDOT incorporates sign washing in future sign maintenance activities to extend the life of signs. In this project, a small number of signs (49 signs) located in fully-shaded areas were evaluated under washed and unwashed conditions. That is, the signs were first measured under unwashed conditions. Then the signs were measured after being washed by hand with a glass cleaner and paper towels. The average improvement among the measured signs was 22.5%; this equates to about two years for yellow, white, and green signs and about five years for red signs.

VALUE

The SCDOT maintains approximately 750,000 signs. Extending the replacement interval of these signs from 10 to 12 years will result in direct cost savings to the SCDOT. Additionally, by incorporating sign washing in future maintenance activities, particularly those located in fully-shaded areas, the SCDOT will be able to extend the life of these signs. In doing so, the SCDOT may be able to eliminate or cut back on the night time inspection which costs about \$300,000 annually. Lastly, by improving its sign management program, the SCDOT will also improve roadway safety and support its Target Zero initiative and commitment to eliminating traffic fatalities and severe injuries over time.

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