Inspection of Timber Bridges in the Southern US

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Summary

Nineteen timber bridges were selected in Alabama, Mississippi, and Tennessee for inspection for the field performance of timber bridges study. All bridges selected had both super and sub structures manufactured out of Southern pine, treated with various preservatives and installed at different points in time. Alabama had four bridges in the study followed by Tennessee with seven bridges and Mississippi with a total of eight bridges. All of the bridges inspected in this study were built using a sawn lumber stringer system.

Keywords: Mississippi, Alabama, Tennessee, Timber, Wood, Bridges.

1. Introduction

1.1 Problem

Timber bridges are widely used in the Southern US, but there use is often related to the county engineer’s preference for construction material and cost. Many of the engineers do not know the life cycle of the bridges and may specify bridges manufactured of other materials in place of wood because of a lack of information. The purpose of this study was to examine the condition of bridges in service, and there likely longevity.

In an effort to research timber bridge populations and information pertaining to these bridges, an excel macro was programmed to label and sort through the National Bridge Inventory (NBI) data. The program is similar to what is used on the www.nationalbridges.com website, but differs by including additional information such as average daily traffic, deck type, superstructure and deck rating, bridge width, number of lanes, etc. Having more of the NBI data available in one location has proven useful in narrowing down bridge candidates. From the NBI data, nine potential clusters throughout Mississippi, Alabama, Georgia, South Carolina, North Carolina, and Tennessee have been identified and are shown in Table 1. These clusters account for both American Wood Protection Association hazard zones 4 and 5 as well as bridges in rural and urban environments.
The clusters were primarily being targeted because of the relatively high number of timber bridges located in a single county or neighbouring counties in their respective states.

*Table 1: Potential Bridge Clusters*

<table>
<thead>
<tr>
<th>Potential Cluster</th>
<th>State</th>
<th>Counties</th>
<th>Timber Bridges in County or Counties</th>
<th>Median Year Built</th>
<th>Median Superstructure Rating</th>
<th>Median Bridge Rating</th>
<th>Median Average Daily Traffic</th>
<th>AWPA Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mississippi</td>
<td>Hinds</td>
<td>28</td>
<td>1992</td>
<td>7</td>
<td>39</td>
<td>650</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Mississippi</td>
<td>Attala, Choctaw, Montgomery, Oktibbeha, Webster, Winston</td>
<td>109</td>
<td>1967</td>
<td>5</td>
<td>28</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Mississippi</td>
<td>Lafayette</td>
<td>68</td>
<td>1992</td>
<td>7</td>
<td>46</td>
<td>55</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Alabama</td>
<td>Pickens, Tuscaloosa</td>
<td>105</td>
<td>1980</td>
<td>7</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Tennessee</td>
<td>Crockett, Gibson, Henderson, Madison</td>
<td>136</td>
<td>1970</td>
<td>6</td>
<td>53</td>
<td>55</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Georgia</td>
<td>Colquitt, Mitchell, Thomas</td>
<td>78</td>
<td>1980</td>
<td>5</td>
<td>26</td>
<td>140</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Georgia</td>
<td>Bryan, Liberty</td>
<td>78</td>
<td>1993</td>
<td>7</td>
<td>95</td>
<td>500</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>South Carolina</td>
<td>Laurens, Newberry</td>
<td>36</td>
<td>1982</td>
<td>6</td>
<td>30</td>
<td>126</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>North Carolina</td>
<td>Cherokee, Clay, Graham, Haywood, Jackson, Macon, Swain, Transylvania</td>
<td>275</td>
<td>1961</td>
<td>7</td>
<td>52</td>
<td>220</td>
<td>4</td>
</tr>
</tbody>
</table>
1.2 Bridge selection
The number of clusters was reduced from above down to three clusters. One of the clusters was Pickens County, Alabama, a second cluster was chosen in Lafayette County, Mississippi and the third cluster was located within the two counties of Crockett and Madison, Tennessee. All of the bridges selected are of a sawn lumber stringer construction and had varying deck materials and road surface materials. The bridges in this study were all found in AWPA decay zone 4. A total of nineteen bridges were inspected using non-destructive techniques.

2. Inspections

2.1 Methods used
All bridges were examined ocularly first to identify obvious issues or deficiencies. In many cases this was the method used to find mechanical damage and seepage through the deck onto the stringers below. After the initial inspection the bridge was labelled using sidewalk chalk to identify stream flow, the beginning and end of the bridge, and to number and label the parts of the bridge. Once this was complete, the use of a moisture meter, microsecond timer, and resitograph along with a hammer were used to closely inspect the integrity of the wood.

2.2 Examples

2.2.1 Alabama
All four of the bridges in Alabama were of similar construction, utilizing creosote treated stringers, caps, and pilings. Figure 1 shows and example of the bridge construction in Pickens county Alabama. The bridges were constructed between 1986 and 1997.

![Alabama bridge 14268](image)

2.2.2 Mississippi
All eight bridges inspected in Mississippi were treated with CCA and had similar construction. Figure 2 is an example of the timber bridges found in Lafayette county Mississippi. The bridges ranged in age from 22 years in service to only 16 years in service.

![Mississippi bridge example](image)
2.2.3 Tennessee bridges

The seven bridges examined in Tennessee were of a similar construction of those in Mississippi. Chromated Copper Arsenate treated Southern pine sawn stringer construction, with similarly treated piles and caps. The decks were varied in that some were concrete poured in place and others were lumber based. The bridges in Tennessee that were inspected were built between 1960 and 1974 with improvements made over that time.

3. Discussion, Conclusions and Acknowledgements

3.1 Discussion and Conclusions

The purpose of inspecting bridges in the Southern US was to collect data for the Field Performance of Timber Bridges: A National Study was to examine how timber bridges have held up over time. The timber bridges inspected in Alabama, Mississippi and Tennessee were all of similar sawn stringer construction, spanning both active streams and relief streams that help reduce flooding. All of the bridges that were inspected had been in place for more than two decades and were still ranked well using the NBI guidelines indicating that timber bridges hold up better than previously considered.
3.2 Acknowledgements

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Pickens County, Alabama, Mr. Daniel Hallman

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