Skidding Coefficients on an Alluvial Soil

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The Southern Hardwoods Laboratory is studying the influence of ground conditions and load characteristics on the performance of skidding vehicles in southern bottom lands. The exploratory test was aimed at evaluating the effects of bark on skidding coefficients, but it also yielded information on other log characteristics and on effects of soil moisture.

Procedure

Two freshly cut logs of six species—American elm, water oak, willow oak, sugarberry, sweetgum, and cottonwood—were ground-skidded on a level Sharkey clay site that was uniform in texture, moisture, and compaction. The site was prepared by disk ing, packing with a sheepsfoot packer, and irrigating with sprinklers.

Table 1.—SKIDDING COEFFICIENTS

<table>
<thead>
<tr>
<th>Species</th>
<th>61 percent soil moisture</th>
<th>50 percent soil moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With bark</td>
<td>Without bark</td>
</tr>
<tr>
<td>Willow oak</td>
<td>1.004</td>
<td>0.991</td>
</tr>
<tr>
<td>Cottonwood</td>
<td>1.014</td>
<td>0.734</td>
</tr>
<tr>
<td>American elm</td>
<td>1.038</td>
<td>1.014</td>
</tr>
<tr>
<td>Sugarberry</td>
<td>1.076</td>
<td>1.038</td>
</tr>
<tr>
<td>Sweetgum</td>
<td>.948</td>
<td>.898</td>
</tr>
<tr>
<td>Water oak</td>
<td>.901</td>
<td>.884</td>
</tr>
<tr>
<td>Mean</td>
<td>.997</td>
<td>.926</td>
</tr>
</tbody>
</table>

Results

Skidding coefficients—computed as drawbar pull divided by log weight—averaged 0.997 on soil at the upper moisture level and 0.884 on drier soil (Table 1). The difference was significant at the 0.01 level. The 61-percent moisture level approximates field maximum for Sharkey clay, while the change of 11 percentage points represents about one-third of the natural range of moisture. When the soil was wet, the ends of the logs displaced considerable earth, and this effect probably accounted for the higher coefficient.

Log diameter, specific gravity, and weight did not influence skidding coefficients. Weights ranged from 1,640 to 4,200 pounds.

The hardwood logs varied considerably in their bark. Sugarberry, for example, was notably smooth and cottonwood was deeply fissured. With the bark on, species differences did not affect skidding coefficients, and debarking did not reduce coefficients significantly, either between or within species.

Thus in these well-formed logs neither the bark nor other qualities caused species differences in skidding coefficients. The effect of bark removal in cottonwood, while short of significance, was nevertheless large enough to suggest segregation of this species in future skidding research.