FPJ Technical Note

Skidding Coefficients on an Alluvial Soil

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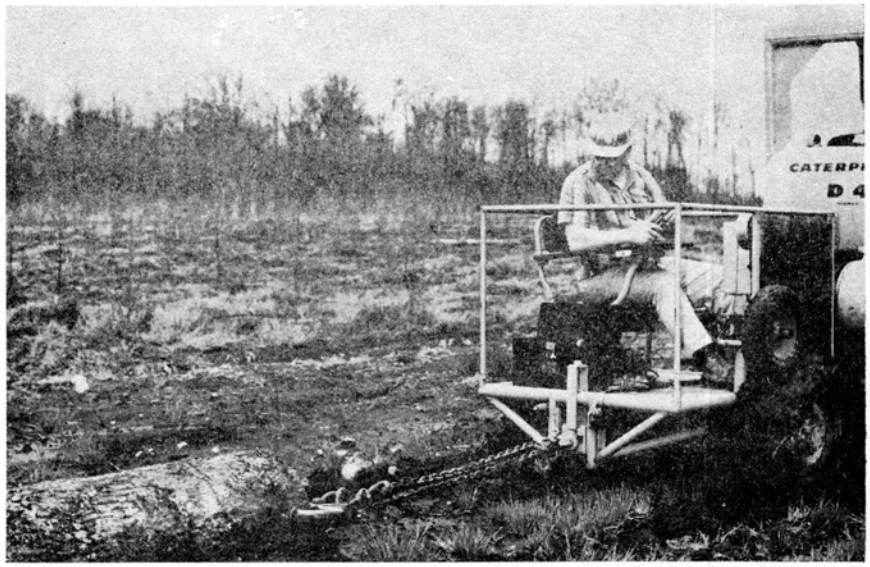

LOGS WERE SKIDDED behind a two-wheel cart containing a hydraulic load cell and a continuous recorder.

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 characteristcs 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 disking, packing with a sheepsfoot packer, and irrigating with sprinklers.

[1] Maintained at Stoneville, Miss. by the Southern Forest Experiment Station in cooperation with the Mississippi Agricultural Experiment Station and the Southern Hardwood Forest Research Group.

The logs were 16 feet long and averaged 19 inches in diameter inside bark at the small end, ranging from 16.4 to 22.3 inches. Their average weight was 2,700 pounds. They were free of sweep, excessive taper, and knots.

Tests were run first with soil at 61 percent moisture, by weight, and then repeated on soil at 50 percent moisture. In each series, the logs were skidded 50 feet on an undisturbed surface, stripped of bark on the face in contact with the ground, and then skidded another 50 feet on the debarked face. Opposite faces of the same logs were used for the two series of tests. The purpose in peeling was to isolate possible effects of differences in bark.

Skidding speed was 2.5 miles per hour. Horizontal drawbar pull required to move the logs was determined with a hydraulic load cell and recorded on a continuous recorder. The logs were attached to the load cell with tongs, small end foremost.

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.

Table 1.—SKIDDING COEFFICIENTS

Species	61 percent soil moisture		50 percent soil moisture	
	With bark	Without bark	With bark	Without bark
Willow oak	1.004	0.991	0.822	0.808
Cottonwood	1.014	.734	.869	.689
American elm	1.038	1.014	.738	.687
Sugarberry	1.076	1.038	1.032	1.016
Sweetgum	.948	.898	.996	.952
Water oak	.901	.884	.848	.806
Mean	.997	.926	.884	.826

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