Soil Wetness Influences Log Skidding

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ONE of the least explored variables in timber harvesting is the effect of ground conditions on log production. The Southern Hardwoods Laboratory is studying this variable and its influence on performance of skidding vehicles in Southern bottom lands. The test reported here was designed to evaluate the effects of bark features on skidding coefficients, but it also yielded information on other log characteristics and on effects of soil moisture.

The test was conducted with two fresh-cut logs of each of six species — American elm, water oak, willow oak, sugarberry, sweetgum, and cottonwood. Logs were ground-skidded on a prepared Sharkey clay site uniform in soil moisture, texture, and compaction. 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 and they were free of sweep, excessive taper, and knots.

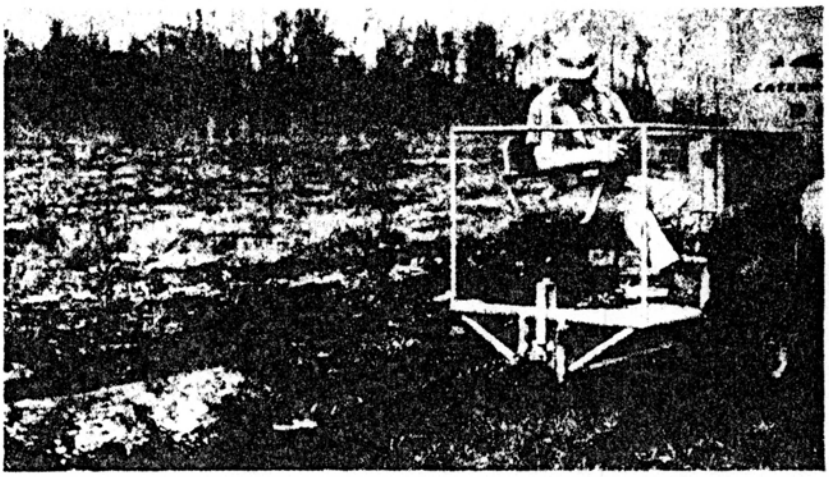
Tests were first run with soil at 61 percent moisture, by weight, and then repeated on soil at 50 percent moisture. In each series, the logs were skidded on an undisturbed surface, then stripped of bark on the face in contact with the ground and reskidded on the debarked face. The purpose in peeling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

Skidding speed was 2.5 m.p.h. and 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.

Skidding coefficients, computed as drawbar pull divided by log weight, averaged 0.997 on soils at the upper moisture level and 0.884 on drier soil. This means that it would require approximately 11 percent more drawbar pull to skid an equal weight of logs at the upper moisture level than at the drier condition. The differences in draft requirements were significant at the 0.01 level and the 11-percent change in soil moisture represents about one-third the possible range of Sharkey clay. When the soil was wet, the ends of the logs displaced considerable earth; this effect probably accounted for the higher coefficient.

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

Hardwood species vary considerably in their bark; sugarberry, for example, is notably smooth and cottonwood deeply fissured. With bark on, species differences did not affect skidding coefficients, and debarking did not reduce coefficients significantly.



Logs were skidded behind a two-wheel cart containing a hydraulic load cell and a continuous recorder.

Thus, in these well-formed logs, neither the bark nor other qualities caused species differences in skidding coefficients. Soil moisture was the only significant variable noted.

It is likely, however, that factors not measured in this test—soil texture, soil compaction, skidding speed, and load characteristics other than bark type—influence the performance of machines used in harvesting and skidding. The Southern Hardwoods Laboratory is studying these and other variables in an effort to develop information that will aid loggers to choose the equipment best adapted to their needs and to use it with maximum efficiency.