Heavy vs. medium choppers for preparing sandhill sites for pine

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In the sandhills of West Florida, sites dominated by scrub hardwoods and wiregrass can be converted to pine after intensive site preparation. The recommended treatment is a prescribed burn in the spring, at the time of full leaf development, followed 6 weeks later by two successive choppings spaced at least 6 weeks apart with an 11-ton brush cutter or "chopper" (2). Chopping eliminates wiregrass and effectively reduces competition from hardwoods (fig. 1), but heavy equipment is expensive and costly to operate.

A recent study indicated that the costs of site preparation could be reduced by substituting an 8-ton or 4 1/4-ton chopper or a 1-ton disk harrow for the 11-ton chopper in the second treatment (1). This followup study was designed to compare the effectiveness of using an 8-ton chopper for both treatments with that of the conventional method of using an 11-ton chopper for both. Each method was compared in a stand of large hardwoods and in another of small hardwoods. The criteria in the evaluation were: 1) Time required for the two choppings, 2) reduction of hardwood sprouts, and 3) survival and height of slash pine 4 years after planting.

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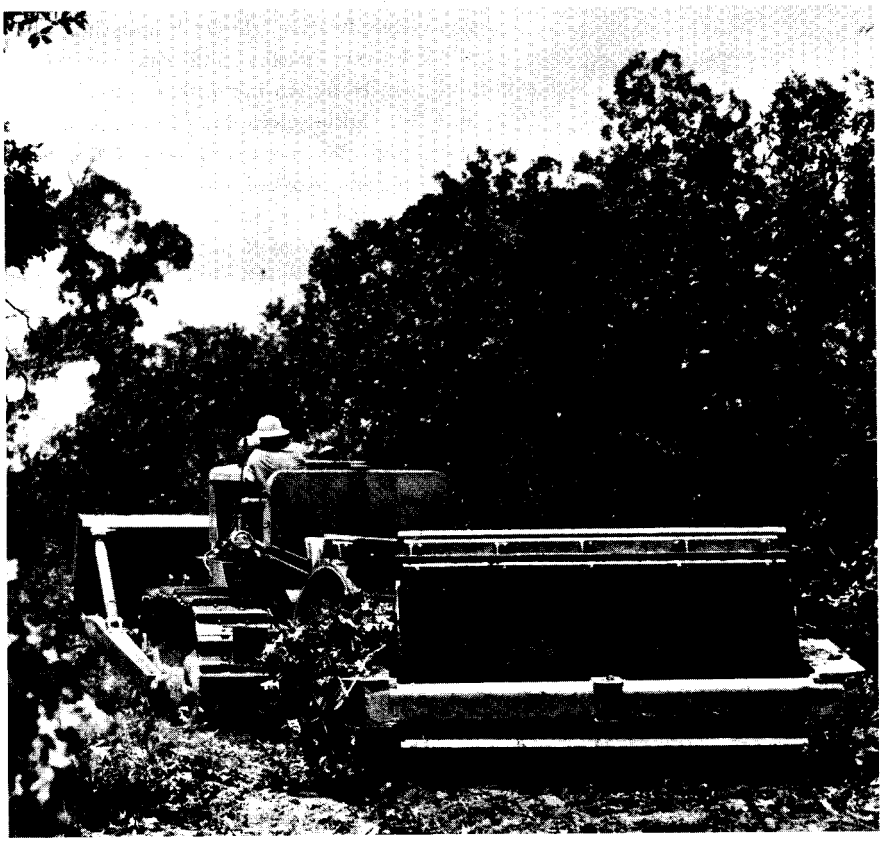
Methods

Two stands of scrub hardwoods, one with relatively small-sized and the other with large-sized trees, were selected in the West Florida sandhills for comparing the effectiveness of chopping with an 11-ton (heavy) and an 8-ton (medium) brush cutter. Each hardwood stand had reasonably uniform composition and tree-size distributions, thereby insuring that both brush cutters chopped similar numbers and sizes of hardwoods on each site (table 1).

Figure 1.—The duplex brush cutter pulled by a crawler tractor eliminates wiregrass and incorporates most woody vegetation into the soil while chopping it into small pieces.



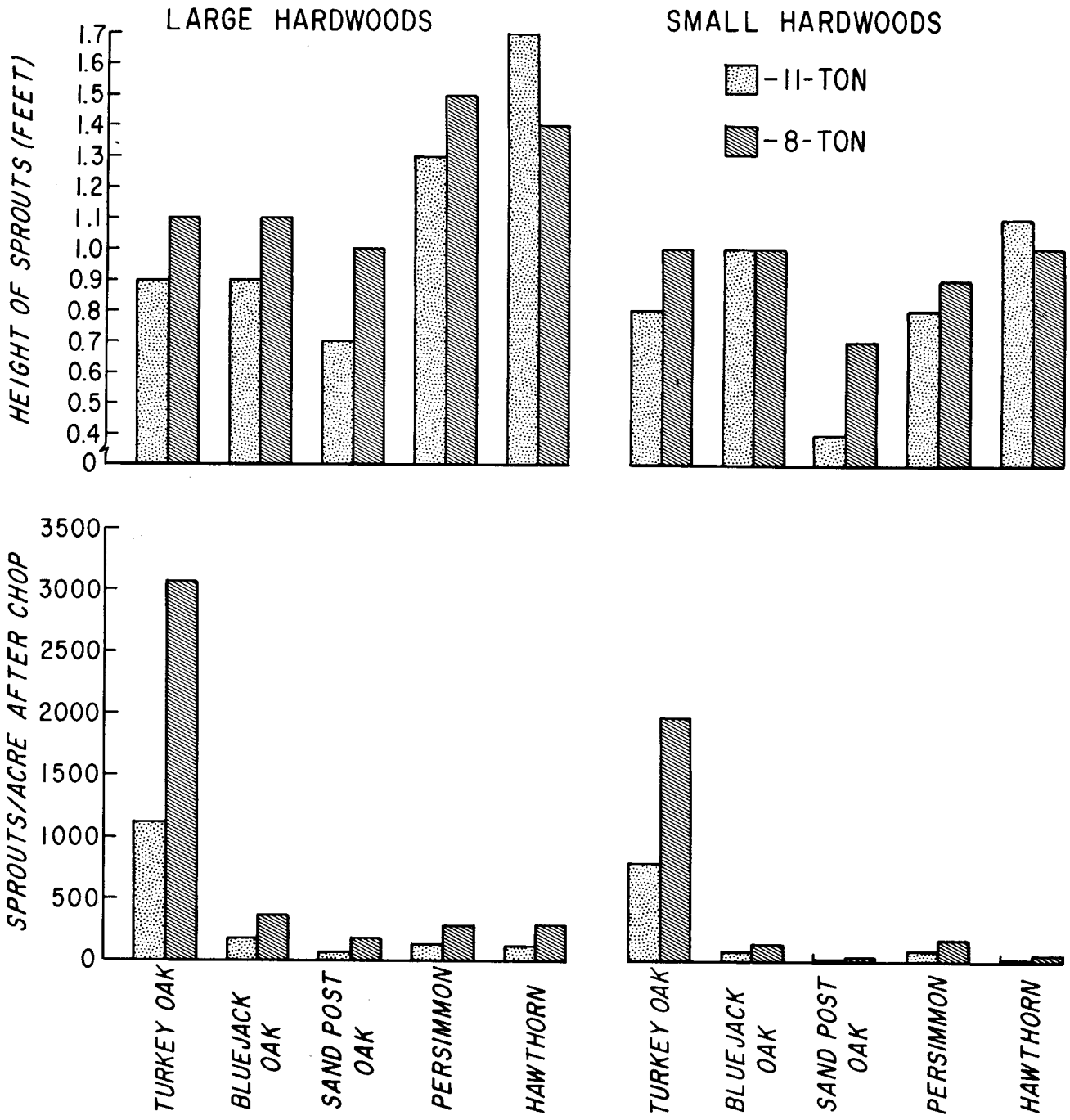


Figure 2.—Height and composition of hardwood sprouts in the strips of the two stands 15 months after chopping with 11-ton and 8-ton brush cutters.

TABLE 1.—Size and species composition of hardwoods in the strips of the two stands later chopped by the 11-ton and 8-ton brush cutters

Size and species	Large hardwoods		Small hardwoods	
Height (ft.)	11-ton	8-ton	11-ton	8-ton
	.....No. stems/acre			
6	3,640	3,958	4,655	4,402
D.b.h. (inch)				
0.5 - 3.5	1,273	1,219	1,107	1.309
3.5 - 6.0	92	88	0	0
6.0 +	22	22	0	0
Turkey oak	4,029	3,967	4,557	4,643
Bluejack oak	553	610	593	673
Sand post oak	195	303	245	27
Persimmon	148	127	347	348
Hawthron	102	280	20	20

The stand of small hardwoods was about 20 years old and consisited of trees 3 1/2 inches d.b.h. or less; most stems were smaller than 1/2 inch d.b.h. Trees in the stand of large hardwoods were of various ages; the stand contained more than 100 trees per acre *3 1/2* inches d.b.h. and larger, and several of these exceeded 12 inches d.b.h. Approximately 75 percent of the stems in the stand of large hardwoods and 72 percent of those in the stand of small hardwoods were turkey oak. Bluejack oak made up about 24 percent of both stands, and in each the remainder was composed of sand post oak, persimmon, and several species of hawthorn.

Both hardwood stands were burned late in April. In each stand, 10 paired strips, each measuring 25 by 600 feet, were then chopped in mid-June and again in early August. One randomly selected strip of each pair was chopped and later rechopped with an 11-ton brush cutter pulled by a crawler tractor with about 170 drawbar horsepower. The other strip was chopped and chopped with an 8-ton brush cutter pulled by a crawler tractor with about 80 drawbar h.p. Four passes with either cutter completed a strip. In January of the following year, the prepared strips were machine-planted with slash pine seedlings (1-0 stock) spaced 7 to 9 feet apart in rows 8 feet apart.

The time required to complete each of two choppings with the 11-ton and the 8-ton brush cutters was recorded in both hardwood stands. Fifteen months after the second chopping, the number and size of hardwood sprouts on the various strips were recorded. Survival and height of the pines on both stands were measured 1,2 and 4 years after planting, and a "t" test of paired replicates was used to compare the data.

Results and Discussion

Time Required

The limited width and area of the individual strips prevented the brush cutters from sustaining optimum operational speeds. For this reason, no accurate estimates could be made of machine production on an acre of hourly basis. Records of the time required for each machine to chop a strip were sufficiently accurate, however, for comparative purposes.

In the stand of large hardwoods, the 11-ton brush cutter did a more complete job and took only three-fourths as much time for the first chopping as did the 8-ton model (table 2). The time required for the 8-ton model to chop this stand included three occasions on which it hung on large stumps. The smaller model was forced to avoid an average of 21 trees per acre because they exceeded its capacity, whereas the larger model left an average of only 12 trees per acre. Therefore, time and cost of deadening the standing trees must be included in the overall site preparation cost. Despite the additional power requirement, the* 11-ton brush cutter chopped the stand of large hardwoods more efficiently and economically than the 8-ton model.

In the stand of small hardwoods, no trees were too large for either machine were encountered. The 11-ton brush cutter completed the job in less time than the 8-ton model, but it required a large tractor with high fixed and operating costs to pull it. Therefore, if cost alone is considered, the 8-ton model chopped small hardwoods more economically.

TABLE 2.—Time required for the 11-ton and 8-ton brush cutters to chop strips 25 feet wide and 600 feet long in stands of large or small hardwoods and then to chop sprout regrowth 6 weeks later.

Chopping treatment	Large hardwoods		Small hardwoods	
	11-ton	8-ton	11-ton	8-ton
	.....Minutes			
First	16.3	21.8	11.5	15.2
Second	17.3	14.6	13.6	13.3

Although the strips prepared by the two brush cutters were initially similar in composition and stocking of hardwoods, measurements made 15 months after the second chopping indicated that the strips chopped with the 8-ton model had 2¹h times as many sprouts as those treated with the 11-ton model (fig. 2). Not only were there significantly fewer sprouts (at the 1-percent level) on the strips chopped with the larger model, but, with the exception of hawthorn, these sprouts were as short as or shorter than those on the strips chopped with the smaller model. Therefore, when used for both the first and second choppings, the 11-ton brush cutter more effectively reduced the competitive influence of hardwood sprouts on both sites.

Pine Performance

In both stands, survival of the slash pines 1, 2, and 4 years after planting was higher on strips chopped by the

11-ton brush cutter (table 3). This difference occurred because the hardwood sprouts on these strips were shorter and less abundant and, presumably, fewer of these sprouts overtopped the planted pines. By age 4, this difference in survival was significant (at the 1-percent level) on the stand of large hardwoods and (at the 5-percent level) on the stand of small hardwoods.

The pines also grew faster on strips where competition from sprout regrowth was more effectively reduced. By age 4, the pines on strips chopped with the 11-ton brush cutter averaged 0.3 foot taller than those on strips chopped with the 8-ton model. Although this difference in growth appears inconsequential, 10-year records of slash pine growth in the previous study indicate that such differences will increase with age (1).

TABLE 3.—Survival and height of pines 1, 2, and 4 years after planting on stands of large and small hardwoods chopped by 11-ton and 8-ton brush cutters.

Age of pines	Large hardwoods		Small hardwood	
(years)	11-ton	8-ton	11-ton	8-ton
	..... *Survival (percent)*			
1	93	86	94	89
2	81	71	92	86
4	73	65	90	83
	..... *Height (feet)*			
1	0.9	0.9	0.8	0.8
2	1.6	1.5	1.6	1.5
4	4.0	3.7	5.0	4.7

Conclusions

When the time required for chopping, the cost of deadening hardwoods, the reduction in hardwood sprouts, and the performance of planted pines are considered, the 11-ton brush cutter was more effective than the 8-ton model in preparing both stands of hardwoods, regardless of size. At age 4, the stand of small hardwoods chopped twice with the 11-ton brush cutter contained the most successful planting of slash pine: these pines averaged 90 percent in survival and 5 feet in height. However, these results should not be interpreted to mean that the 8-ton brush cutter has no place in site preparation on the Florida sandhills. When preparation costs alone are considered, the 8-ton model does a reasonably satisfactory job of double chopping stands of small scrub hardwoods. Probably the best use that can be made of the 8-ton brush cutter, however, is for chopping sprout regrowth 6 or more weeks after chopping the original hardwood stand with the 11-ton model. As indicated in the previous study (1), planted slash pines survive and grow as well as on sites prepared with this combination of equipment as on sites prepared by double chopping with the 11-ton brush cutter, and at a lower overall cost.

Literature Cited

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