

PREPARING SITES FOR PINE PLANTINGS IN SOUTH FLORIDA

Abstract.—Typical slash pine and South Florida slash pine were planted on prepared flatwoods sites at three Florida locations. Site preparation treatments were burning, strip-chopping, double-chopping, clearing, and bedding. Results through the fifth year show that bedding provided the most favorable site for early growth, and that properly planted seedlings survived no better on treated than on unprepared sites.

INTRODUCTION

During the past decade mechanical site preparation prior to planting pines has become common in the southeastern Coastal Plain. This has occurred partly because of observed superior pine growth on land that has been farmed and later abandoned. However, mechanically prepared sites may not be comparable to abandoned fields for various reasons, such as greater fertility of farmed soil and eradication of native vegetation during farming. Consequently, land managers often question the value of site preparation.

In January of 1958, 1959, and 1960 the Southeastern Forest Experiment Station, in cooperation with the Alico Land Development Company and Agrico, Inc., established plantations in south Florida. Objective of the plantings was to evaluate the influence of selected site treatments on the survival and growth of typical slash pine (*Pinus elliottii* var. *elliottii*) and South Florida slash pine (*Pinus elliottii* var. *densa* Little & Dorman). A second objective was to compare the performance of these varieties under conditions of the study. This report is based on results through the fifth year after planting.

METHODS

The study was established on "flatwoods" sites near Corkscrew, Frostproof, and Pierce, Florida (fig. 1). The flatwoods soils are characterized by nearly level, acid sands with

poor surface drainage and underlain either by marl or an organic pan. They are subject to drought and flooding. The predominant shrub is saw-palmetto (*Serenoa repens* (Bartr.) Small), and the most common herbaceous cover is pineland threeawn (*Aristida stricta* Michx.).

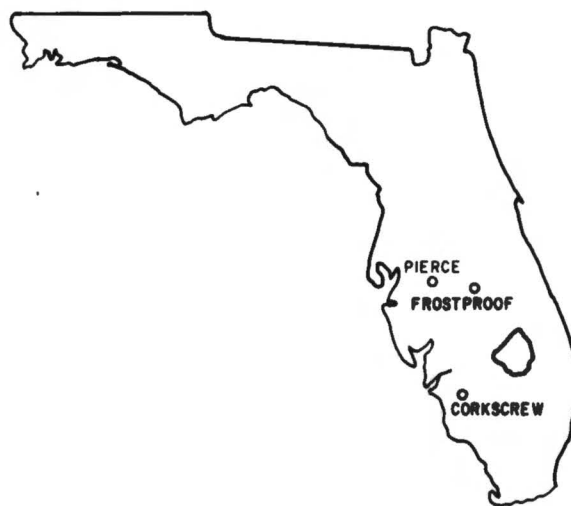


Figure 1.—Location of study sites.

Site preparation treatments included burning, strip-chopping, double-chopping, clearing, and bedding. Control plots were untreated.

Burning consisted of a prescribed burn with no additional treatment.

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Strip-chopping was accomplished by drawing a Marden L-7 Duplex Light Brush Cutter on 10-foot centers over unburned plots with a crawler tractor. The effect was to cut and mix vegetation into the soil with some scarification, but no inversion, of the topsoil.



The strip-chopping treatment.

Double-chopping consisted of chopping the plot twice with the Marden L-7, the second chopping immediately after the first and perpendicular to it.

Clearing included prescribed burning, bulldozing the stumps, collecting the debris with a root rake and burning it, and disking the plots with a heavy-duty, offset-disk harrow.



A cleared flatwoods site.

Bedding consisted of plowing fireline furrows at 10-foot intervals on unburned plots so that the ridges thrown to each side of a furrow abutted the ridges of adjacent furrows.

These abutting ridges, or "furrow slices," were then chopped to prepare smooth beds for planting. Bedding was not included in the study until the second year.

All treatments for a given planting were applied at about the same time. Site treatment generally preceded planting by 6 to 8 months, although the range was from 1 to 12 months.

Seedlings were planted during late December or in January.

Four replications of each site treatment were established for each location and year. Plots were established near Pierce the last 2 years only. Each treatment plot is 4.2 acres, and planted to both typical slash pine and South Florida slash pine in a split-plot arrangement. Seedlings were planted with a drag-type tree planter and spaced 6x10 feet. Measurements and observations were made on 100 trees near the center of each subplot.

SURVIVAL

Survival of properly planted seedlings was in no instance significantly enhanced by site preparation (table 1).

In some cases survival was poorer on prepared plots than on control plots. In the 1958 plantings at Frostproof, for example, survival on all prepared plots was significantly poorer than on control plots; in the 1960 planting at Corkscrew, survival on beds was significantly poorer than on control plots. There was no consistent relationship between survival and the time interval between preparation and planting.

Although the experimental design precluded statistically analyzing effect of years, the gross data suggest more than just chance variation among years. No environmental occurrence accounted for the poor survival of the 1958 plantings, but poor condition and handling of planting stock are suspected factors.

HEIGHT GROWTH

Tree growth was significantly improved by site preparation at five of eight typical slash plantings and at six of eight South Florida slash plantings (table 2). Generally, growth was best on bedded or cleared plots.

Table 1.--Percent survival of seedlings 1 year after planting

TYPICAL SLASH PINE

Year planted	Location	Site treatment					
		Control	Burning	Strip-chopping	Double-chopping	Clearing	Bedding
----- <u>Percent</u> -----							
1958	Corkscrew	74	72	77	67	64	--
1958	Frostproof	52	44*	34*	16*	33*	--
1959	Corkscrew	93	96	91	93	94	93
1959	Frostproof	84	86	84	91	88	90
1959	Pierce	93	93	90	90	86	84
1960	Corkscrew	93	92	88	83	90	75*
1960	Frostproof	80	76	88	90	86	84
1960	Pierce	81	72	73	89	84	86
1959-60 ¹	Average	87	86	86	89	88	85

SOUTH FLORIDA SLASH PINE

1958	Corkscrew	74	80	69	64	48	--
1958	Frostproof	40	24*	28*	28*	21*	--
1959	Corkscrew	78	86	77	85	80	86
1959	Frostproof	78	77	74	74	71	76
1959	Pierce	84	87	84	78	74	76
1960	Corkscrew	73	59	56	53	66	37*
1960	Frostproof	57	32	45	55	51	50
1960	Pierce	52	41	52	51	52	66
1959-60	Average	70	64	65	66	66	65

*Significantly different from the control at .05 level by Duncan's test.

¹Years which included all locations and treatments.

Strip-chopping resulted in no significant improvement. In one case, 4-year heights of typical slash were significantly poorer on burned than on control plots. Double-chopping significantly improved growth in several cases, but improvement was not as great as that achieved with clearing or bedding treatments. Figure 2 presents a general picture of the treatment effects. Most of the height differences at 5 years developed during the first growing season after planting.

Bedding facilitates drainage, permitting more favorable aeration than would otherwise exist. But soil moisture data obtained during the dry season indicated another benefit: With one exception the highest soil moisture percentage was in beds, possibly because of the "sandwich" of organic material and surface horizon formed as the two furrow slices

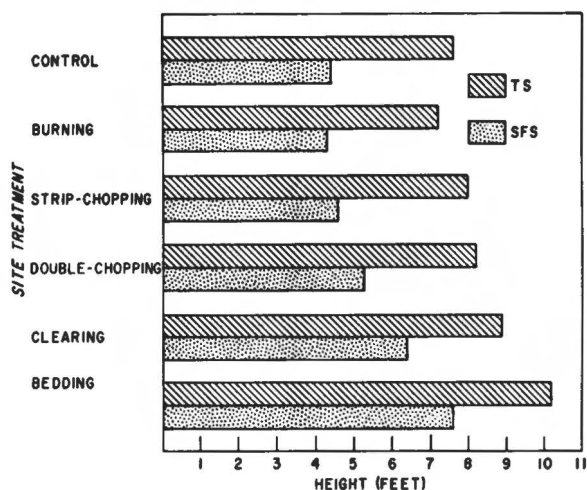


Figure 2.—Five-year height of typical slash pine (TS) and South Florida slash pine (SFS) averaged for all treatments and locations.

were rolled together in constructing the beds. The concentrated stratum of organic matter absorbs and retains more moisture from occasional precipitation than the surrounding sand



Trees growing on raised beds.

or sand-litter mixture. The net effect is fewer days per year with excessive or deficient soil moisture, and more days when soil moisture is within the range for optimal growth of seedlings. This effect is illustrated by the soil moisture (percentage of dry weight) in the 2- to 6-inch zone of three treatments at Corkscrew during the dry season in 1959:

	Control	Cleared (Percent)	Beds
February 16	14	11	15
March 13	13	12	20
April 10	12	11	18
May 8	6	5	12

VARIETAL DIFFERENCES

Initial survival was higher for typical slash pine than for South Florida slash pine and remained relatively stable after 6 months. Mortality continued in South Florida slash through the fifth year:

Table 2.--Heights of trees 5 years after planting
TYPICAL SLASH PINE

Year planted	Location	Site treatment					
		Control	Burning	Strip-chopping	Double-chopping	Clearing	Bedding
----- Feet -----							
1958	Corkscrew	5.2	4.9	5.1	5.3	5.5	--
1958	Frostproof	3.8	4.8*	4.2	5.4*	7.3*	--
1959	Corkscrew	6.7	7.4	7.9	6.8	8.7*	8.6*
1959	Frostproof	4.6	4.4	4.7	5.8*	6.3*	7.0*
1959	Pierce	10.1	8.0*	9.4	8.8	9.2	11.2
1960	Corkscrew	8.8	8.1	8.9	8.5	8.0	8.4 ¹
1960	Frostproof	6.9	6.9	7.8	8.5	9.4*	10.9*
1960	Pierce	8.7	8.7	9.4	10.6*	11.7*	15.3*
SOUTH FLORIDA SLASH PINE							
1958	Corkscrew	2.4	2.2	2.2	2.6	2.8	--
1958	Frostproof	2.2	3.3*	2.4	4.0*	4.6*	--
1959	Corkscrew	4.6	5.0	4.4	5.8	6.7*	8.1*
1959	Frostproof	2.9	2.8	3.2	4.7*	5.8*	4.8*
1959	Pierce	6.8	5.6	5.7	6.0	8.0	9.4*
1960	Corkscrew	4.8	4.1	4.4	4.9	4.6	5.2 ¹
1960	Frostproof	3.2	3.7	4.6	4.1	5.7*	7.5*
1960	Pierce	4.4	4.8	5.4	6.2*	7.7*	10.4*

*Significantly different from the control at .05 level by Duncan's test.

¹Beds for the 1960 outplanting at Corkscrew were poorly constructed, generally consisting of a concentrated strip of organic material with little or no mineral soil drawn in from the sides.

Age from planting	Typical slash	South Florida slash (Percent survival)
6 months	90	73
1 year	87	66
5 years	84	55

Survival checks were too infrequent to detect the cause, but in a 1966 study Bethune¹ observed that "... continued mortality of the South Florida slash pine was related to infection by brown spot needle blight disease, caused by *Scirrhia acicola* (Dearn.) Siggers." Initial survival of both varieties was lower than can be attained with present handling and planting techniques.

Overall 5-year height was 7.2 feet for typical slash and 4.7 feet for South Florida slash in all treatments at all locations. This height difference was significant.

The observations on varietal differences confirm Bethune's earlier conclusions. Typical slash pine survives better and grows faster, at least through the fifth year, than South Florida slash. However, South Florida slash is more resistant to fire² and has the added advantages of resisting insects and diseases once height growth begins, sustaining growth after cattle damage, and being adaptable to elements of the environment in southern Florida.³ Also, observations of several 8- to

¹Bethune, J. E. Performance of two slash pine varieties planted in south Florida. Southeast. Forest Exp. Sta., U.S. Forest Serv. Res. Pap. SE-24, 9 pp., illus. 1966.

²Ketcham, D.E., and Bethune, J.E. Fire resistance of South Florida slash pine. J. Forest. 61: 529-530. 1963.

³Bethune, *loc. cit.*

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15-year-old plantations indicate the early lead established by typical slash may not be maintained for a full rotation. White and Saucier⁴ made the following observations on wood samples collected near Corkscrew: "Variety *elliottii* had greater diameter growth than variety *densa* in the first 3 years, approximately the same in the fourth year, but less than variety *densa* in the succeeding 4 years."

CONCLUSIONS

Bedding provided the most favorable site for early growth of planted slash pine. Possible reasons for better tree growth on bedded sites are reduction in competing vegetation and improvement of soil moisture conditions. Beds can be prepared at lower cost than clearing, and at about the same cost as the double-chopping treatment. Consequently, bedding is the best site preparation when both tree response and cost are considered. A full appraisal of costs and benefits of these site treatments must be deferred until tree volume estimates can be made.

Tree response to treatments other than bedding indicates that early growth may be increased by site preparation and be related to the degree of disturbance or reduction in competing vegetation. Under the conditions of this study, site preparation cannot be expected to improve the survival of properly planted seedlings.

Other factors must enter into site preparation decisions. Among them are ease of planting, degree of fire protection to the young plantation, multiple use considerations, and improved working conditions during later cultural operations, such as thinning or prescribed burning. Until better guides to the benefits of these factors are developed, the individual forest manager must judge how important they are in attaining his objectives.

⁴White, J. F., and Saucier, J. R. A comparison of the specific gravity of two slash pine varieties grown in south Florida. Tappi 49(5): 230-232. 1966.

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