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STRIP CLEARCUTTING TO REGENERATE EAST TEXAS PINES

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Sporadic seed crops and frequent droughts have made natural regeneration of pines uncertain in the western part of the Texas pine region. The problem is accentuated on the rolling to steep terrain of parts of Cherokee, Anderson and Nacogdoches counties, where steep slopes and rock outcrops impede logging and site preparation, and make planting a difficult alternative. Clay surface soils in some of these same areas produce shallow-rooted trees, subject to windfall after partial or seed tree cutting.

The strip clearcutting method has many advantages for these terrain conditions. It is compatible with mechanized logging, which is almost a necessity on such areas. Harvesting all the timber in strips and leaving alternate uncut strips gives highest possible logging volumes per acre with the remaining stands relatively unexposed to windfall and logging damage and sufficiently concentrated for economic harvest at a later date.

This study tested the effectiveness of the strip clearcutting method of natural regeneration on a site fairly typical of difficult terrain in East Texas.

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Southland Paper Mills, Inc. provided the land for the experiment, removed timber according to the study plan, and provided equipment, supplies, materials and personnel for the experimental treatments.

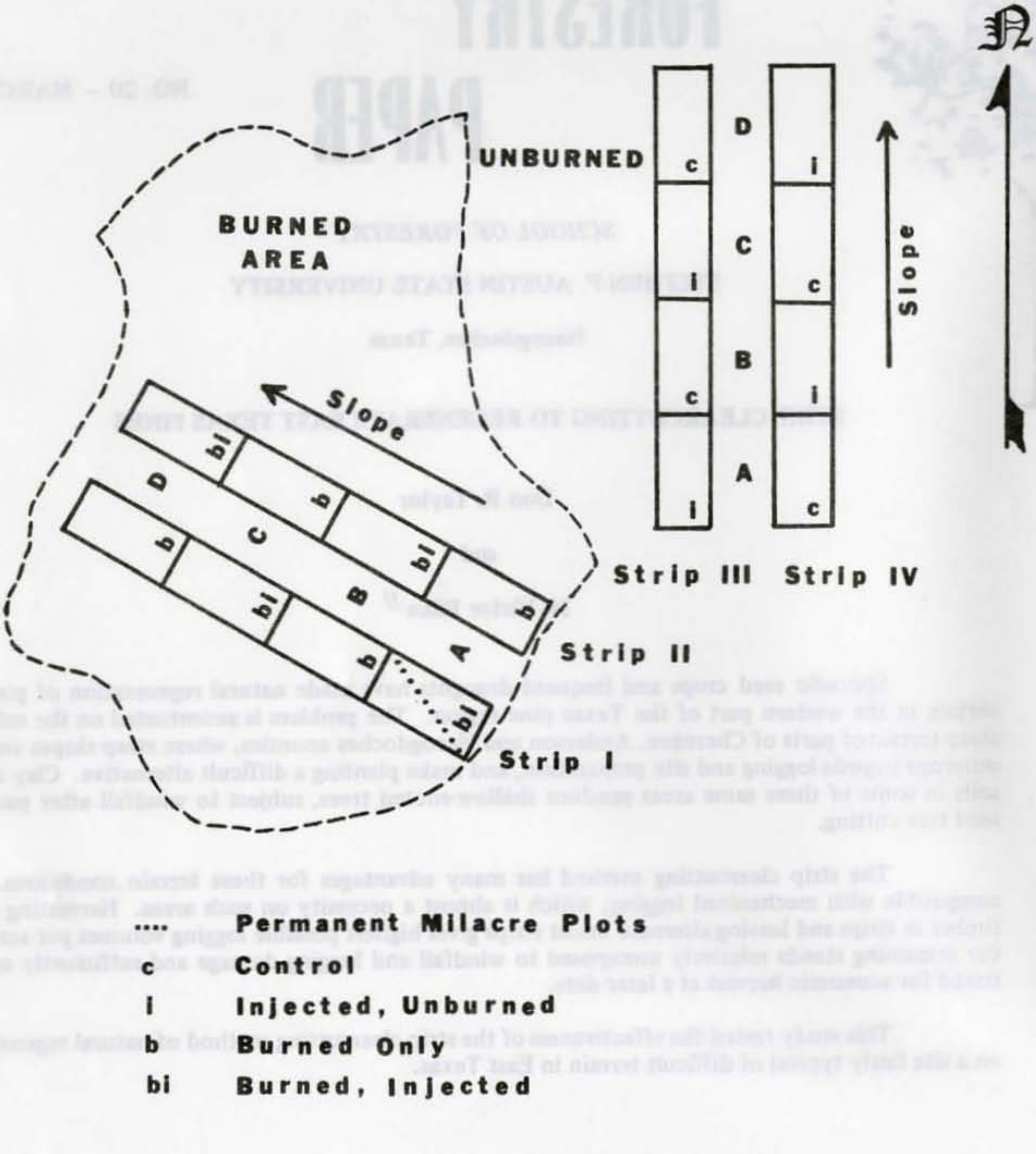

Figure 1. Arrangement of experimental blocks. Milacre plots were located diagonally through each block as shown in block IA.

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STUDY AREA

The study area, about two miles northeast of Rusk in Cherokee County was selected because of its typical rolling terrain and its representative timber stand. Pine sawtimber volume was 4,200 board feet per acre, Doyle scale, and 9.6 cords of pine pulpwood per acre, including sawlog tops. Of this, 94 percent was shortleaf pine (*Pinus echinata* Mill.) and the remainder loblolly pine (*P. taeda* L.). There was a total of 219 merchantable pine trees per acre. Understory hardwood averaged two cords per acre, mostlv along drainages. The principal hardwood species were sweetgum (*Liquidambar styraciflua* L.), red maple (*Acer rubrum* L.), white ash (*Fraxinus americana* L.), winged elm (*Ulnus alata* Marsh.), post oak (*Quercus stellata* Wangenh.), and blackjack oak (*Q. marilandica* Muenchh.).

Soils on the study area are classed as Sacul fine sandy loam. Surface soils, 4 to 8 inches in thickness, range from pale brown where undisturbed to light reddish brown in cleared areas where the surface soil is thin. The subsoil ranges from 4 to 12 inches deep, and is a red, strongly acid, heavy clay. Numerous fragments of iron-bearing sandstone occur on the surface in places. Slopes range from 3 to 45 percent.

Annual precipitation, virtually all as rain, averages 42.24 inches; rainfall at Dialville, Cherokee Co., was 62.34, 50.13, and 32.88 inches for 1968, 1969 and 1970 respectively.

METHODS

In 1967, four 150 by 1200 foot strips were laid out on a northerly exposure, their long dimensions extending up and down the slope (Fig. 1). These were to be clearcut. Two strips were aligned due north and south, the other two northwest and southeast. Each strip designated as a harvest-cut strip was bordered by an uncut strip at least 150 feet wide.

A prescribed burn of medium to high intensity was applied to strips I and II, covering about 80 percent of their ground area. Burning was done in late September 1967 before seedfall or logging.

All merchantable pine timber was removed from the four cut strips in November 1967 during peak seedfall. Sawtimber was logged in a tree-length operation using rubber-tired skidders. A shortwood operation followed the sawtimber removal, using farm tractors and pulpwood carts. Essentially all equipment movement and travel was confined to the cut strips.

Each cleared strip was divided into four 1-acre blocks designated A, B, C, and D, beginning at the upper end of the strip; block A denoted the highest elevation and Block D the lowest in each strip. Hardwoods were controlled by injection on two blocks of each letter group, one on the burned area and one on the unburned area; in each area there was a hardwood control treatment on one strip or the other at each of the four elevations. The experiment thus consisted of 16 blocks, eight burned and eight not burned. Since hardwood control was applied to four of the burned and four of the unburned blocks, each of the following treatments was replicated four times:

1. Control (no burning and no hardwood control)
2. Hardwood control by injection but not burned
3. Burned but no hardwood control
4. Burned and hardwood control by injection

On blocks designated for hardwood control, all hardwood stems one inch and above in basal diameter were injected at ground level. The herbicide used was Amchem's WEEDAR 64, amine salt of 2, 4–D, applied in a 5 percent mixture with diesel oil.

Table 1. Pine seedling stand, stocking, height and competition at 6 and 33 months after timber removal.

	Treatments			
	Control	Inject Hardwoods	Burn Only	Burn - Inject Hardwoods
Pine seedlings per acre				
June 1968	11,300	8,800	3,400	8,200
Aug. 1970	3,000	2,450	400	2,700
Two-year mortality, percent	73.5	72.2	88.3	67.1
Milacres stocked, percent				
June 1968	70	75	57	80
Aug. 1970	52	52	17	60
Two - year change, percent	- 25.7	- 30.7	- 70.2	- 25.0
Average height of pine seedlings, Aug. 1970, inches	18.7	16.4	11.4	16.1
Hardwood stems per acre, Aug. 1970	4,150	3,550	5,300	6,075
Competition rating[a/]				
June 1968	2.6	2.5	2.9	2.2
Aug. 1970	2.2	1.8	1.9	2.3

a/ Based on a scale of 1 (least) to 3 (most competition).

A fairly good crop of pine seed had matured in 1967 prior to logging; some cones had opened before trees were felled and the remainder continued to disperse seed from the cut tops. The tree-length harvesting scarified the ground surface over most of the area and much of the non-merchantable pine and hardwood cover was pushed over or broken down. Logging slash covering some 30 percent of the area was left undisturbed as a source of seed and a barrier to erosion.

The first sampling of pine reproduction was made in the latter part of June 1968, the first growing season after the harvest. Total pine reproduction was tallied on each of ten permanent square milacre plots equally distributed along a diagonal line on each of the 16 blocks. In addition to the pine reproduction count, a subjective rating was used to evaluate the degree of hardwood or weed competition and slash coverage.

Another survey on the same plots was carried out in August 1970 during the third growing season after harvesting. Again, pine reproduction was recorded and competition was rated subjectively. In addition, the height of the tallest pine seedling on each plot and the number of hardwood stems were recorded.

RESULTS AND DISCUSSION

Weather during the winter and spring of 1967-68 was favorable to seed germination and establishment; extended drought periods in 1969 and the spring of 1970 subjected seedlings to serious stress. Measurement and observations during June 1968 and in August 1970 are summarized in Table 1.

By June 1968, adequate stands (3,400 to 11,300 per acre) of pine seedlings had become established on all treatments, the highest stocking being on the control plots and the lowest on the area receiving only the burn. Distribution of seedlings was good (70-75 percent of milacres stocked) except for the burned plots, where milacre stocking was 57 percent. While statistical analysis was not made because of the non-random assignment of burns and hardwood control treatments, only the burn treatment, with much lower seedling numbers and milacre stocking, appears to differ to an important degree from the others. The values on the burn, however, are not too low to be acceptable to most forest managers in this area, had they persisted until the young stand was well established.

The inventory in August 1970 reflects the situation after most of the weaker seedlings had been eliminated by summer droughts. By this time mortality had averaged 75.3 percent, leaving 400 to 3000 seedlings per acre. Again the control treatment (no burn and no hardwood control) had a slightly higher seedling count than the plots on which hardwoods were injected and those where hardwood injection followed burning; poorest stand was again on the burned plots, where only 400 seedlings per acre survived.

Milacre stocking had also declined seriously by August 1970, especially in the plots which had been burned but received no further treatment. On plots of this treatment milacre stocking had declined by 70.2 percent, leaving only 17 percent of the milacres stocked. This distribution of regeneration is definitely unsatisfactory. Milacre stocking was 52 percent on both unburned treatments, and 60 percent on plots where hardwoods were injected after burning. On these three treatments, the numbers of surviving seedlings and the milacre stocking were adequate to provide an acceptable new stand.

In 1970, the tallest seedling on each milacre averaged highest on the control plots, and shortest on the burned plots; seedlings on plots receiving the other treatments were only slightly shorter than on the control.

Satisfactory regeneration of the experimental area can be attributed to a favorable combination of abundant seed crop in 1967 and 63 inches of precipitation (150% of normal) in 1968. Such favorable conbinations of seed supply and abundance of moisture in east Texas are the exception rather than the rule. Stephenson (1963) observed in a ten-year-study that seed was abundant only four years out of ten. The other years had almost no seed.

Obviously the burn treatment, without hardwood control, was least effective in establishing an abundant, well distributed stand of seedlings, and in fostering survival over the first two growing seasons. The 1970 count of competing hardwoods affords a partial explanation of this, since plots of both burned treatments had more numerous hardwood stems than the unburned plots. Weed competition, not included in the hardwood count was excessive on both burned treatments. Ferguson (1959) found that in East Texas prescribed burning to control undersirable hardwood was only moderately successful. A one-half to one-third reduction in hardwood stems, two inches and below in diameter, was largely offset by an increase in sprouts and root suckers. Burning reduces competition but only temporarily, unless subsequent burning is applied periodically.

It is concluded that the scarification resulting from logging afforded adequate exposure of mineral soil for a high catch from the available 1968 seed fall. Any additional removal of litter by the burn was evidently ineffective in enhancing germination. Competition by weed growth and hardwoods, possibly stimulated by nutrients released by the burn, had perhaps killed much of the seedling stand before June 1968. The lower mortality and better 1970 milacre stocking on the burn-plus-injection treatment may be a reflection of increased moisture availability in a very dry season, resulting from injection of competing hardwoods.

Under the conditions of this experiment strip cutting resulted in the establishment of satisfactory pine regeneration, but the effect of prescribed burning alone was detrimental. Burning followed by injection of hardwoods, however, produced the best stand of established reproduction on the basis of stocked milacres.

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