SO-234

Southern Forest Experiment Station

Research Note

1978

May Burns Stimulate Growth of Longleaf Pine Seedlings

HAROLD E. GRELEN

SUMMARY

Annual and biennial fires applied around May 1 are more beneficial to the growth of young longleaf pines than March 1 fires. Four years of testing on a poorly drained silt loam soil in central Louisiana showed that more grass-stage seedlings survived. began height growth, and grew taller on plots burned in May than on March-burned plots. A biennial May burn was best for survival and initial height growth of grass-stage seedlings. Annual May fires favored growth of older seedlings and were more effective in the control of brown-spot needle blight.

Additional keywords: *Pinus palustris, scirrhia aricola.*

PRESCRIBED BURNING OF LONGLEAF

Fire has long been recognized as important in the silviculture of longleaf pine, (*Pinus palustris* Mill.) (Greene 1931, Pessin 1944). Burning apparently maintains vigor in seedlings by destroying foliage infected by brown-spot needle blight [*Scirrhia acicola* (Dearn.) Siggers] and by reducing competition. Despite indications that light summer fires result in superior height growth of longleaf seedlings (Bruce 1951), most prescribed burning is done in winter or late fall to reduce the risk of wildfire. But late winter or early spring burning has been recommended for proper management of pine forest range because it leaves forage for winter grazing and destroys the old growth about the time new growth begins (Duvall and Whitaker 1964). An earlier study (Grelen 1975) of the effects of March, May, and July fires on herbage yield and botanical composition established that May burned plots of longleaf pine showed best growth. Four-year results in a new study comparing the effects of May and March burns on longleaf seedling growth are reported here.

PROCEDURES

The study was installed in March 1973 in an 80-acre ungrazed unit of the Palustris Experimental Forest on the Kisatchie National Forest about 30 miles south of Alexandria, Louisiana. The soil is a poorly drained Acadia silt loam with abundant wax myrtle (*Myrica cerifera* L.) and sprouts of blackjack oak (*Quercus marilandica* Muenchh.), sweetgum (*Liquidambar styraciflua* L.), black tupelo (*Nyssa sylvatica* Marsh.), and other moist-site hardwoods. Scattered loblolly pines (*P. taeda* L.) of various ages were deadened by girdling when the study was begun. Longleaf pine was direct-seeded in 1968 and in 1970 survival averaged over 3000 seedlings per acre. Most of the 1968 seedlings were in the grass stage when this study began. Many older and some younger natural seedlings were also present. The unit was last burned and grazed in 1970. By 1973 there was a 3-year accumulation of herbaceous litter, primarily pinehill bluestem (*Andropogon scoparius* var. *divergens* Anderss. ex. Hack.) which provided abundant fuel for first-year burning treatments.

Three replications of the following treatments were randomly assigned to a block of fifteen ¼-acre square plots: unburned control, annual March 1 burn, biennial March 1 burn, annual May 1 burn, and biennial May 1 burn. All fires were set within 4 days of the target dates. Plots were burned with headfires except when hazardous burning conditions made backfires necessary. Although no fuel or climatological data were recorded on the study site, temperature, rainfall, and humidity records were kept at a weather station less than a mile away. Fires were applied no later than 9 days after a rain on days when the maximum temperature did not exceed 82 degrees. Lowest relative humidity recorded on a burning day was 28 percent on

March 1, 1977, but burning was completed before the minimum was reached. Generally, humidity was above 50 percent during the burns. When winds were high or fuel extremely dry, plots were not burned because of the danger to adjacent plots.

In each ¼-acre plot, 25 grass-stage longleaf pine seedlings that had not yet formed a terminal bud were selected and marked by wire pins with numbered aluminum tags. Five older seedlings, which had already begun height growth but were less than one foot in height when the study began, were similarly selected and marked. Treatment fires began March 1 or May 1, 1973, and have been repeated annually or biennially as scheduled. Each autumn after the 1973 growing season, seedlings were inspected for survival, height to tip of bud (or presence or absence of pointed bud in grass-stage seedlings), and degree of brown-spot needle blight infection. After 1976 treatments, annually burned plots had been burned four times. Biennially burned plots received the second treatment in 1975.

RESULTS AND DISCUSSION

The most obvious result of burning was the control of hardwoods. Some unburned plots were almost impenetrable by the end of the fourth year because of the hardwoods (fig. 1). Compared with unburned plots burned plots were significantly[1] higher in percentage of surviving seedlings beginning height growth, total height growth of both size classes of seedlings, and seedlings with less than 50 percent brown spot infection. Such benefits of burning are well known and have been thoroughly documented (Bruce and Bickford 1950, Siggers 1932, Wakeley and Muntz 1947). Although most of the reported burning was done in the dormant season, the following results indicate that burning in May is even more beneficial.

Grass-stage seedlings

At the end of the first growing season after initial treatment, over 90 percent of all tagged grass-stage seedlings were still alive, and fewer than 1 percent of the surviving grass-stage seedlings in any treatment had begun height growth. By the end of the second season, survival remained above 90 percent on May-burned and control plots but dropped to 80 and 88 percent on annual and biennial March burns (fig. 2). One percent of the seedlings on unburned control plots were in height growth, compared with 3 to 5 percent for March-burned plots and 7 to 14 percent for May-burned plots (fig. 3).

By the end of the fourth season, survival had dropped to 56 percent on annual March burns and 75 percent on biennial March burns but remained about 80 percent on May-burned plots. Survival on control plots averaged 76 percent (fig. 2). Sixty-five percent of the surviving grass-stage seedlings on plots burned May 1 were in height growth, and March-burned plots averaged 58 percent. The difference between March- and May-burn survival percentages was not significant. An average of only 25 percent of the seedlings on control plots were in height growth, which was significantly lower than on any of the burned plots (fig. 3). At the end of the fourth season, the actual number of seedlings in height growth on the May-burned plots was significantly higher than on the March-burned or control plots.

At the end of the second season, seedlings in height growth were found only on the plots burned every second May. Average height of seedlings exceeded that of other treatments by about 4 inches. By the end of the fourth season, seedlings on the plots burned biennially in May averaged 20 inches tall, significantly taller than seedlings in other treatments (fig. 4).

When measurements were made at the end of the fourth growing season, annually burned plots had significantly fewer seedlings with 50 percent or more brown-spot needle blight than either biennially burned treatment plots or the control. The annual May burn was little different from the annual March burn, but the plots burned every other May contained significantly fewer diseased seedlings than the ones burned every other March.

Older Seedlings

Since only five older seedlings were examined on each treatment plot, survival percentages may be unreliable. Highest survival after four seasons was recorded on annually burned plots, with 93 percent (14 of 15 trees) surviving on plots burned each May and 80 percent (12 of 15 trees) on those burned each March. Survival on biennially burned plots and on the control averaged about 50 percent. Superior survival on annually burned plots may be

[1]Significance was determined at the 95 percent level of probability.

Harold E. Grelen is Principal Range Scientist, Southern Forest Experiment Station, Forest Service—USDA, Alexandria, Louisiana.

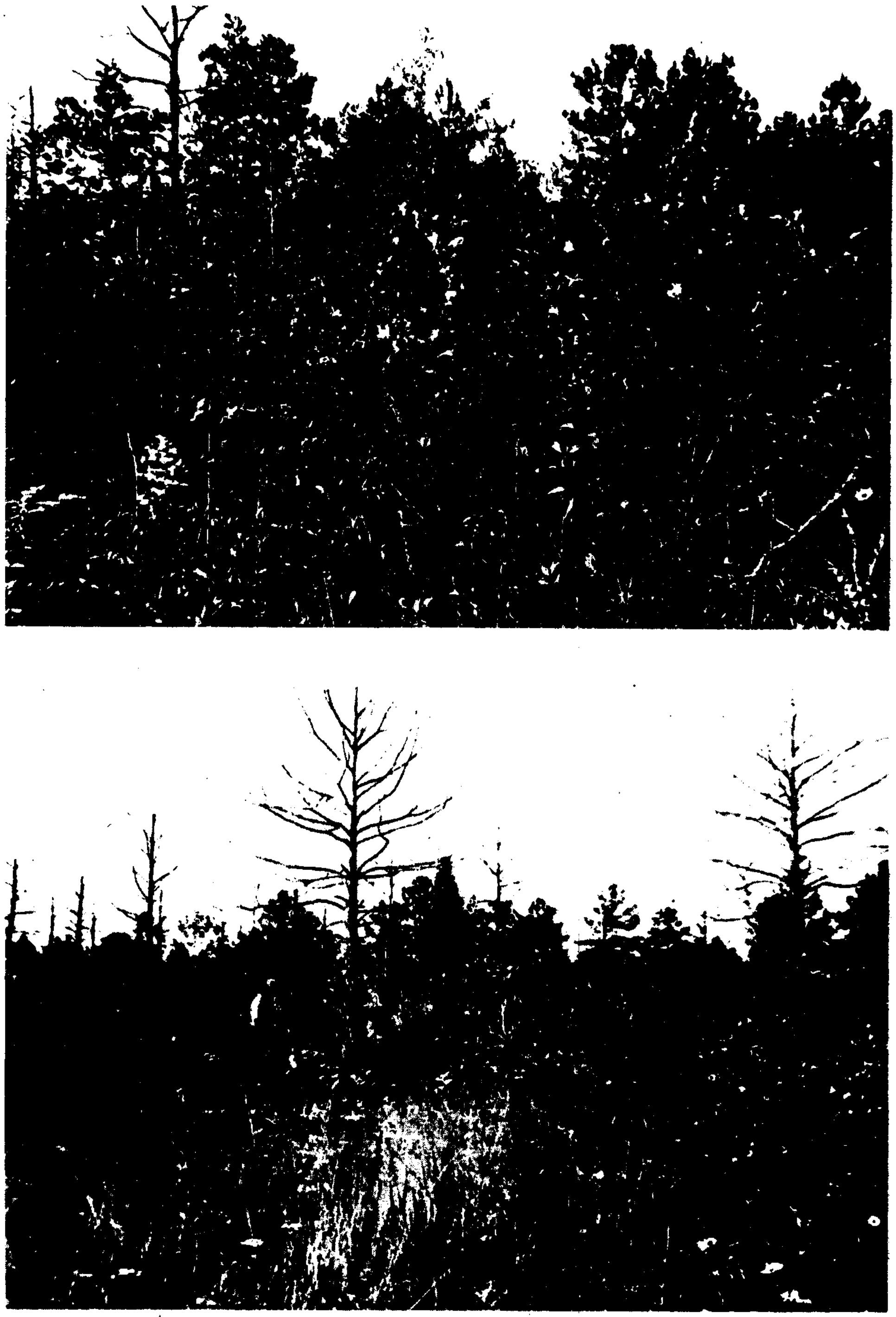

Figure 1.—*Top photograph shows an unburned control plot. Note that only the cap of the man in the center of the picture is visible. Bottom photo of plot burned four successive years shows excellent scrub oak control, herbage production, and longleaf pine height growth.*

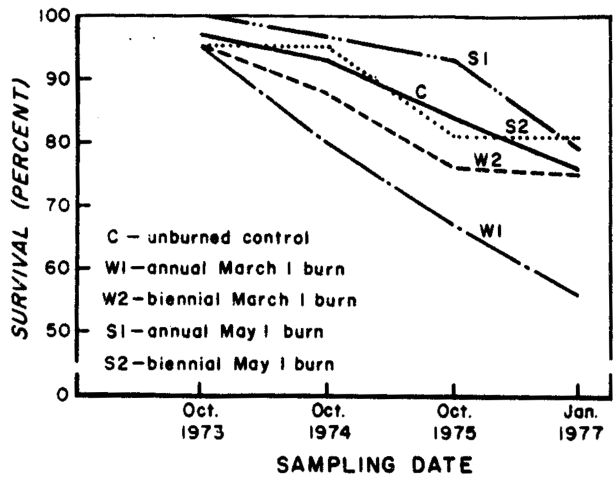

Figure 2.—*Survival of grass-stage seedlings.*

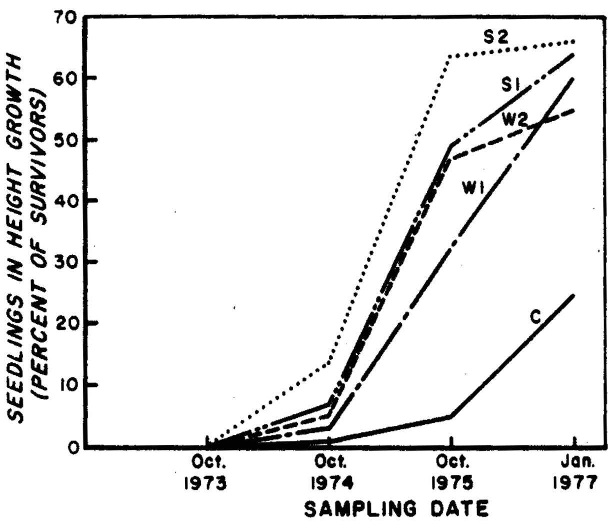

Figure 3.—*Percentage of surviving grass-stage seedlings in height growth.*

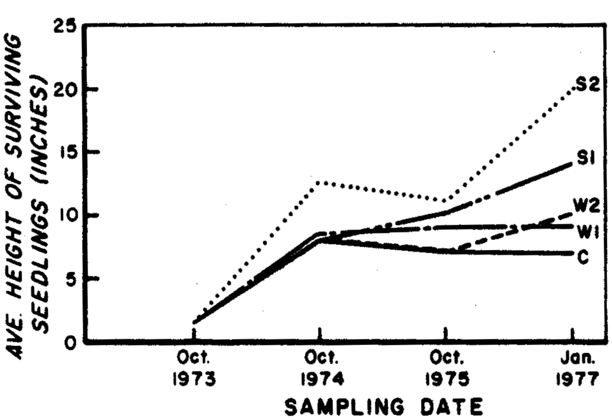

Figure 4.—*Cumulative height of surviving grass-stage seedlings.*

attributable to better control of brown spot and to the prevention of fuel build-up.

Height of surviving seedlings after four seasons was significantly greater on May-burned plots than on March-burned or control plots. The annual May-burned plots, in addition to having the highest survival, also had the tallest trees, averaging 67 inches tall from an initial height of less than 6 inches (fig. 5).

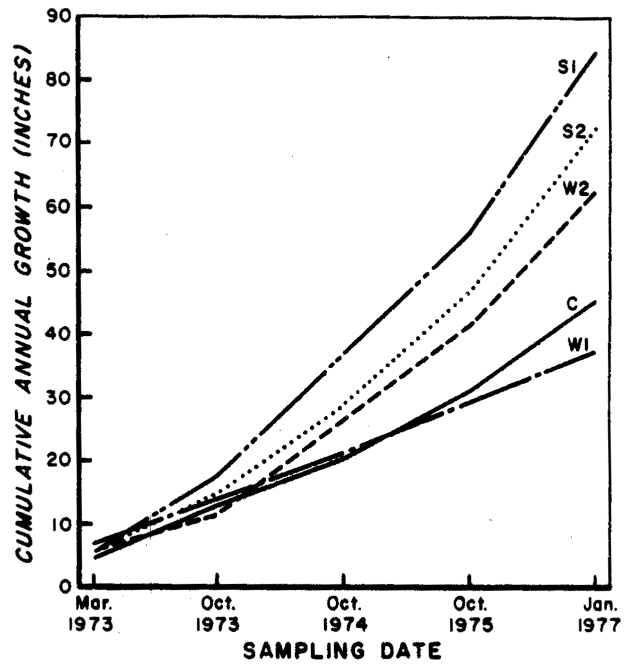

Figure 5.—*Development of older seedlings already in height growth.*

CONCLUSIONS

Results of this study confirm previous observations and measurements on the responses of longleaf pines to seasonal burning (Grelen 1975). Benefits of May burning may be related to the eradication both of brown-spot needle blight and of woody and herbaceous competition at a critical growth period. Another factor may be the timing of the fire in relation to the development of longleaf pine buds and twigs. About March 1 the twig or "candle," is elongating and bare except for a coat of white hair, and is vulnerable to flame and heat. By May 1, needles are developing on the candle, forming an insulating barrier that may prevent heat damage to terminal growth (fig. 6).

May burning is harmful to ground- or low-nesting birds and other small wildlife species. Thus, the purpose of this paper is not so much to recommend May burning as to report its beneficial effects on young longleaf pine seedlings. Since comparable results have been obtained on both well-drained and poorly drained sites, response of longleaf pine seedlings to burning on or about May 1 seems predictable throughout the range of the species. Recent tests on sandy soils in southwest Alabama corroborate these findings but also indicate that longleaf pine seedlings on clay soils do not respond favorably to a single mid-May burn (Maple 1977). Additional research may be necessary to fit May burning into multiple-use management of longleaf pine, particularly in regard to wildlife management.

LITERATURE CITED

Bruce, D.
1951. Fire, site, and longleaf height growth. J. For. 49: 25-28.

Bruce, D. and C. A. Bickford.
1950. Use of fire in natural regeneration of longleaf pine. J. For. 48: 114-117.

Duvall, V. L., and L. B. Whitaker.
1964. Rotation burning: a forage management system for longleaf pine-bluestem ranges. J. Range Manage. 17: 322-326.

Greene, S. W.
1931. The forest that fire made. Am. For. 37: 583-584, 618.

Grelen, H. E.
1975. Vegetation response to twelve years of seasonal burning on a Louisiana longleaf pine site. U.S. Dep. Agric. For. Serv. Res. Note SO-192, 4 p. South. For. Exp. Stn., New Orleans, La.

Maple, W. R.
1977. Spring burn aids longleaf pine seedling height growth. U.S. Dep. Agric. For. Serv. Res. Note. SO-228, 2 p. South. For. Exp. Stn., New Orleans, La.

Pessin, L. J.
1944. Stimulating the early height growth of longleaf pine seedlings. J. For. 52: 95-98.

Siggers, P. V.
1932. The brown-spot needle blight of longleaf pine seedlings. J. For. 30: 579-593.

Wakeley, P. C., and H. H. Muntz.
1947. Effect of prescribed burning on height growth of longleaf pine. J. For. 45: 503-508.

Figure 6.—*Longleaf pine seedling ignites during a May burn. Developing needles provide partial protection from the fire.*