Is Prescribed Burning Paying Off?

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A FORESTRY operation, if it is to find its rightful place in the scheme of management, is eventually going to have to prove itself—both economically and by its accomplishments. The question that I would like to raise for your consideration today is this—“Is prescribed burning paying off in the management of forest land in the South?

Prescribed burning is a management tool much used in this part of the country—primarily for hazard reduction, but also for seedbed preparation, control of undesirable species, sanitation purposes, and a variety of other prescriptions. With respect to our fire use research at the Southern Forest Fire Laboratory during the past three years, I would like to take this opportunity to bring you up-to-date on some of our findings.

The effectiveness of a prescribed burning program from the standpoint of hazard reduction was evaluated on nearly a million acres of forested land in the Lower Coastal Plain by studying the relationship between the number, size, and intensity of wildfires, and age of rough during a four-year period, 1955-1958. The rate of fire occurrence was found to increase as the age-of-rough increased; in the 0-2 year old roughs the rate was 0.73 fires per 10,000 acres annually compared with 1.19 fires in the 3-5 year old roughs.

The rate of acreage burned by wildfires shows the same general trend: as the roughs become older, more acreage is
burned per unit area. In the case of 0-5 year old roughs, annual burn figures ranged from 0.02 to 0.13 per cent; in older roughs they averaged more than 7 per cent. This extremely high burn acreage in the older roughs was undoubtedly due to several factors; the most important being that twelve project-size wildfires occurred in the study area during the four-year period and all of them originated and burned primarily in the five-year plus roughs. Nevertheless, discounting twelve project-size fires, the annual burn per cent in roughs older than 5 years averaged 0.25 per cent, a figure considerably higher than that for the younger roughs.

In the two-to-three year old roughs, height of bark char ranged from a low of three feet to a high of twelve feet; in the older roughs, the char line varied from six to thirty-five feet. This limited distribution of bark char height in the younger roughs is indicative of low fire intensities.

Evidence of this nature lends support to the supposition that the use of prescribed fire in the coastal plain of the Southeast has substantially reduced and will continue to reduce the acreage burned over by wildfires. Does this benefit exceed the costs required to achieve it? This is a difficult question to answer clearly—it is like trying to figure the amount of money that we can afford to spend for fire protection. If we can assume, however, that as a result of fire prescriptions we prevented another twelve project-size fires (total damage of the actual twelve was in the millions of dollars) there is little doubt that the benefits of prescribed burning will exceed the costs.

This does not mean, however, that we have all the answers or that we are completely satisfied with these accomplishments. Indeed it spurs us on to develop even more effective techniques and procedures. For example, repeat or follow-up burning offers the possibilities of greater fuel reductions, slower regrowth, and less expensive subsequent fires. Under most circumstances, initial burning efforts often are limited to the use of backfires. After heavy fuel has once been reduced to a level where strip-head fires can be used safely and effectively, however, burning costs should drop considerably. In some fuel types and under
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specific weather conditions, it may even be possible to use rather large scale head fires after the available fuel has once been reduced to a very low level.

What about our weather conditions? How do they tie in with a prescribed burning program? We know that we can’t get much burning done when it’s raining; and we also know that burning during extremely dry periods can be risky and costly. Within this broad range, however, there are conditions that we should take advantage of and others that we should avoid. In fact, we must identify these conditions and optimize our burning periods to keep our costs down. Relative humidity and fuel moisture have been the only variables among many that we have measured that have consistently shown significance in the effectiveness of hazard reduction backfires in the coastal plains.

Wind, of course, is another important variable that we all recognize, but except for the limitations associated with light variable winds and completely calm conditions, we found that wind speed was not a significant variable. In other words, no differences were evident in the performance of a prescribed backfire exposed to a 3 m.p.h. wind and one exposed to a 6 m.p.h. wind. Persistency of direction, on the other hand, is a most important variable, particularly from a safety angle. Wind shifts have the potential of changing a prescribed fire to a raging wildfire in a matter of minutes. Weather records for a ten-year period in Georgia, South Carolina, and Florida show that during the winter burning season winds with a westerly component are more persistent than those with an easterly component. Burns made with westerly winds therefore stand a better chance of resulting in more effective, economical, and safe burning operations. Naturally, one of the problems associated with these statements is that of predicting wind direction—probably one of the most difficult things for the fire-weather forecaster to predict accurately. Some progress is being made, but completely reliable wind direction and persistency forecasts are still a thing of the future.

Temperature, we know, also affects fire prescriptions. More scorch (heat) is obtained with fires that burn during warm
weather than during cool weather. This then leads us into another subject—what time of year should we burn? The answer to this question depends primarily on the objective to be accomplished—the diagnosis and the prescription. In Loblolly Pine stands of the coastal plain, Lotti recommends a burning program for the control of undesirable understory species that incorporates summer burns into the general schedule of treatment. He suggests a succession of annual summer fires preceded by winter burns that are aimed at keeping the undesirables small even though not reduced in number. These summer fires, by virtue of their application time, can also serve as regeneration burns during the last growing season or just preceding a good seedfall.

At the Southern Forest Laboratory, we are currently engaged in a program of characterizing our prescribed fires—in order that we may study and understand more thoroughly their effect on living plants. When we have delineated time-temperature relations for different fires in a variety of fuel types, we will be in a better position to define their capabilities and limitations.

Up to now, I’ve been speaking mostly about fire use in the flat country. Is prescribed fire adaptable to hilly terrain and will it pay off as well here? Although our research data are not as extensive for the Piedmont sections of the South, we have been encouraged by preliminary findings, particularly regarding the control of undesirable hardwoods—one of the foremost problems in the management of pine stands in this region. Fire behavior has been much less of a problem than we initially thought it might be, primarily because we can use topographic conditions to our advantage and not be as much at the mercy of weather conditions—wind being the most troublesome. Downhill burns, for example, have tended to back downhill regardless of the wind direction while upslope fires have run uphill even against adverse wind conditions.

Summer burns again seem to be doing a better job of understory control than winter fires. To date, upslope strip fires offer the greatest promise of practical use—they are easily
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handled, are less expensive than other procedures, and produce the heat conditions believed necessary for understory hardwood kill, without damage to the overstory.

Have I convinced you that prescribed burning is paying off and can pay off more in the future? Perhaps you're thinking: “That sounds well and good, but what about the side effects?” Most investigators agree that prescribed fires in the flatwoods, even the annual summer burns, have no detrimental effect on bulk density, porosity, or percolation rate of the soil. On the contrary, burning treatments generally result in the addition of nutrients to the surface mineral soil as well as an increase in organic matter—both conducive to increased tree growth.

One of the important “unknowns” to be considered in the use of prescribed fire in the Piedmont has been the indirect effect of fire on subsequent soil movement and site deterioration. On a series of study plots on the Hitchiti Experimental Forest in central Georgia, on slopes of about fifteen per cent, and with an overstory pine stocking of eighty square feet of basal area per acre, no soil movement was detected following either winter or summer backfires and strip head fires. Further investigation is expected to shed light on situations that involve steeper slopes, repeat burning, sparse overstories, and different weather conditions.

A fire prescription is sound when it accomplishes an objective better than other methods. In the case of fuel reduction, prescribed burning costs considerably less than mechanical treatment or chemical applications. Seedbed preparation burns or those prescribed to correct a forest disease situation are no more difficult or costly; in fact, the right prescription may cure a number of ills at the same time. Understory control burns, on the other hand, generally require more exact weather conditions and a more skillful application because of the degree of fire intensity needed. These fires must be hot enough to kill the undesirables, but at the same time cool enough to leave crop trees undamaged.

Prescribed burning is paying off—there is no doubt about
that. The extent that it will continue to pay off depends strongly on us—how we use it, what we use it for, and the advancements that we make in prescribed fire technology.