

Some Techniques of Controlled Burning In the Deep Southeast

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THE QUESTION came up a while back about formal and informal programs. I learned some twenty-five years ago that anything I said on fire had best be read. This is about some techniques on control burning southeastern coastal plain pine lands. I want to mention at the start that this is only hitting it here and there, because we'll keep on developing techniques for the use of fire as long as we live. It's just one of those unlimited things; after much experience you burn properly by dead reckoning, so I'll read the paper as it's written here.

It is one thing to "prescribe" the burning of coastal plain pine lands; quite another to control what we have started unless common sense plans, based on adequate knowledge and experience, have been made before we strike the match. I think that's fundamental. Many, even some who should know better, discuss fire, and the damage fire may do, as if there was only one intensity of fire, and that always destructive to forestry and wildlife interests. We must realize, however, that some fires are so slow and creeping that one can lie down and roll through them, while others are fast travelling infernos that can almost overtake a man on horseback. Except for a few specific purposes, and where it is impossible for fire to escape, the burning we do in forestry and wildlife management is with fires of low intensity.

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We would like to make it clear at this point that our use of fire is to increase the production and availability of quail, wild turkey, and other upland game as well as the production of pine timber on private property; not exclusively for either. Combining the two, with the third angle of a profitable agriculture that fits in with both, has for many years taken much of the time and energy of Mr. E. V. Komarek, our moderator, as well as myself. We are here discussing the use of fire in the coastal plain of the deep Southeast, not in the Piedmont or Mountain Provinces, where the condition of the watershed may be of more importance to humanity than either timber or wildlife. The "Thomasville-Tallahassee region" in which we are meeting, and in which our more intensive studies have been conducted, is a detached segment of the Upper Coastal Plain, a vast adjacent region with much pine timber, that lies largely to the north of us. We are surrounded by the Lower Coastal Plain, and our experience with it, extending from North Carolina through Mississippi, makes us confident that our procedures are as practical in one part of the plain as the other. The majority of private upland game preserves are in the coastal plain; they are few in the upcountry.

At this point I want to say that we have very little experience in the palmetto-gallberry type of flatwoods that covers so much of Florida.

Within our region there is considerable diversification of flora and topography, and this has a bearing on just how control burning may best be handled. When I say best, that's my own viewpoint. Other people may have better ways of doing it. First: Whenever possible, and in almost all conditions in which we use fire as a tool in land management, the soil should be damp at the time of burning. The duff, and remains of limbs, logs, and other punky material and debris from past selective lumbering operations, should be wet. If dry, it may smoulder for days or weeks, often constituting a hazard for nearby pine areas through "pickup" fires. Second: Burn in pine lands from high combustibility to low. For example, the combustibility of Longleaf Pine debris under given conditions of wind and mois-

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ture, is much higher than that for Slash, Loblolly, Shortleaf, and Pond Pine. Set fires first under Longleaf stands, or where this pine predominates on the hilltops, when conditions of dampness and air movement are right for light burning. If wiregrass (*Aristida*) constitutes most of the ground cover, rather than broomsedge (*Andropogon*), the fires may burn "just right" soon after a "front" has gone through with an inch or more of rain, followed by sunshine and wind. A mixture of wiregrass and Longleaf straw traps much air, which accounts, in part, for its extreme inflammability, so it should be burned when so damp that "swingeing" fires will only burn downwind. Some of you may question the word "swingeing," but we've used it for a long time and think it has a real meaning. Such areas may best be burned only a few hours following the rain. Next day the fires may be re-set and burn farther down the slope under the less inflammable Loblolly and Shortleaf Pines; it may take several days of sunshine and re-setting of fires, before we can complete burning through the bottoms, and under scattered stands of pine.

Careless users of fire not infrequently reverse this procedure, starting to burn a unit only when the lower slopes can be made to burn through. The result is likely to be a severe "blow up," when the flames reach the top of the hill covered with highly inflammable Longleaf and wiregrass. That I think should be the "a" in the alphabet of controlled burning. Always burn from spots of high combustibility when conditions first becomes right to spots of lower combustibility when conditions may be right only after several days. Make a mistake and the woods are very unsightly and damage may be done to the Longleaf. True, it will live, but we are beginning to believe that Longleaf may not seed as heavily or frequently for several years after the terminals have been severely scorched. Intolerance of scorching in this species may be due to the fact it is unnatural to this tree. Man has only been in the Americas for some 40,000 years, according to the estimates of some scientists. It seems safe to assume that before man reached here most fires were set by lightning from June to September when

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electrical storms are most prevalent. I have witnessed the behavior of several lightning-set summer fires in Longleaf. They usually burned quite slowly, without high flame, even with much wiregrass and Longleaf debris on the ground. This of course was due to the amount of green foliage mixed in with dryer material on the forest floor. We burned about a hundred acres of Longleaf reproduction (mainly two or three years "rough," from October to early January 1962, a year with no killing freezes in our pine lands up to the first of the year. The burning was exceptionally satisfactory and easy and safe to handle. You may have a couple of frosts in open country before you get severe frost in pinelands that will kill green vegetation there.

There are few stands of Longleaf over forty to fifty years of age, that have not been defoliated from one to several times under the type of burning common up to quite recently. However, we well know that some old-time cattlemen and turpentine farmers had an almost uncanny knowledge of just when and how to burn for best results. We can learn much from them. Burning highly inflammable areas within two or three hours after rainfall stops, especially where there is a two- or three-year accumulation on the ground, is now our general practice. A three-year Longleaf-wiregrass "rough" may burn with several times the severity of a one-year "rough," under comparable conditions. This must be taken into account. One thing more, never burn Longleaf reproduction when the new growth "candles" project beyond the protection of the green needles. The result is as bad as where goats eat them off. This means that the burning must be done as soon as or before the white buds show growth; this may be as early as January in years when we have a week or more of seventy-to eighty-degree temperature in mid-winter. Our procedure of burning from highest combustibility to low, each stage being fired as soon as headfire will travel under steady airdrift and do the required job, saves much labor and expense in separating fire lines. Of course large units, say over fifty to one hundred acres, should be protected with ample permanent fire lines, which should be

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harrowed and freshened during periods of heavy strawfall and high fire hazard. The same with outside fire lines. Exceptional care is necessary until the one conducting the burning becomes experienced and expert in using fire. It is desirable that he have good training as a member of a fire crew under skilled supervision before being thrown "on his own." Considerable knowledge of weather and weather patterns is likewise necessary.

Third: Do not set fire in *large* blocks of pineland until after three or four o'clock in the afternoon when inflammability has begun to decline for the day. Reversing this procedure by starting fires in the forenoon or early afternoon when combustibility is rapidly building up, should not be attempted except where protected areas are small and can be burned through rapidly. To do otherwise is to court disaster and invite a "blowup" that may seriously scorch young timber and perhaps damage old. The tyro, still with a great deal to learn about the rudiments of controlling fire, can do no better than to practice when there is much green matter in the ground vegetation. After one or two hard freezes kill the intermixed green vegetations, and it has dried out, travelling fire takes on greater speed and severity, other things being equal.

We desire to go on record that we are not advocating, at this time anyway, May-to-August burning even for seed-bed preparation. Some are recommending summer burning without qualification for this purpose. This may start a conservation battle between wildlife enthusiasts and foresters, damaging to both and the conservation movement in general. Fortunately most "nature lovers" do not seem to have yet run across pamphlets of recent date recommending summer burning. We use fire for seed-bed preparation between early September and mid-October when fires do at least a fairly good job of brush suppression. By this time most birds and mammals have developed to the stage when they can escape the flames rather than meet a miserable death by being caught in the nest or lair. And pine seed usually starts to fall about mid-October, a good time to stop this type of burning. We plan soon to set up experimental plots on Tall Timbers Research Station, com-

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paring the effects of September to early October fires with those from May to August, for brush killing, under four commercial pine species, we need more information on this important point. We hope that other southern experiment stations will do likewise.

NIGHT VERSUS DAY BURNING. We became interested in night burning well before 1932. All of you appearing at this conference by invitation will be handed a book entitled "The Cooperative Quail Study Association, 1931-1943." If interested, you will find a good deal of discussion of night burning scattered therein; we have insufficient time for full discussion of it now. The procedure is based on the fact that dew begins to form soon after sunset on calm nights, particularly in open areas. The heavier the pine stands the less the dampness. Fires may then be set 50 to 100 or more yards apart, well distributed through the woodland. It will spread in circles in all directions more or less evenly and slowly under the pine stands. If ground is damp and atmospheric moisture high, the fires may die out in an hour or two. Under dryer conditions they may eat out ground cover throughout most of the night. The fires die out when openings in excess of a quarter of an acre are reached because conditions are damper and there is little or no pine straw to "carry" them. This principle has wide application. We developed many stands of young Loblolly Pine during World War II when no gasoline, machinery, or manpower was available for fire-line work. The Loblolly that seeded in the unburned openings continued to be skipped for several years as we selected quiet nights of heavy dew for follow-up burning. It would of course have been safer to cut fire-lines around the sapling thickets but we could not do so under the circumstances. A few of the thickets that fire crept through or into suffered no damage, as there was very little herbaceous vegetation under the stands; there was just a compact layer of dead pine straw. With damp earth within inches, the straw dampened so rapidly after nightfall that severe fire could not develop. Night burning for quail management purposes can give a mixture of burned and unburned cover in

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a balance difficult to duplicate by other methods. We get very good results also by daytime "head fires" set a few hours after rains. Occasionally we get sufficient air movement during the nighttime for ideal burning with "head fire," as will be discussed later. Such broken cover as we can get by night burning may be extremely important where there is a good deal of Runner Oak, fruiting shrubs as huckleberries, and dew berries, goose berries, and others that do not fruit the year of a fire but fruit heavily for two to four years thereafter. Clean burns are poor policy where valuable game foods may be produced in abundance by "patchy" burns.

RECLAMATION VERSUS MAINTENANCE BURNING. We have used these terms for fires of opposite types. Reclamation burning is used to reclaim brushy areas by fire use that otherwise would have to be put in shape for reforestation with machinery at higher expense. The other type maintains the status quo in pinelands that are already in desired condition and need only to be kept that way.

Reclamation Burning. Intense fire is routinely used to open up jungle areas that develop here and there where pines are few and scattered in otherwise heavy pine lands. There is so little of the inflammable pinestraw and grasses that the spots are repeatedly skipped in general burning. Large areas of brushland may also develop as a result of heavy cutting of old pine where much small brush has been permitted to get a firm foothold. None of our commercial pines can seed in satisfactorily and develop properly where broadleaf "brush" has become heavily established as a result of too little and too light burning in typical Upper Coastal Plain lands. After the hardwood stems reach about three inches or more in diameter, herbaceous vegetations are shaded out and little inflammable debris accumulates to "carry" fire. Such areas can, of course, be reclaimed by use of bulldozers or tractor-drawn rolling "bush cutters" at considerable expense. Use of machinery is the quick way and may at times be justified if a heavy pine seedfall is in the offing, for it will seed in heavily on the disturbed ground.

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We do a good deal of bulldozing of such "problem areas" if they happen to be where food patches for quail or wild turkey are desired. They can be broadcast-planted for two or three years. As soon as they seed in to pine, we disk a fire line to protect them. We prefer mixed stands of pines where we can get them. The game birds and much other desirable wildlife eat the seeds of all species of pines; it is a relished and important source of wildlife food. As each species of pine seeds independently of others, we usually have one or more species seeding each year in our mixed stands. Longleaf seed is preferred by most wild creatures when they can get it. Unfortunately, the thin-hulled seed germinates soon after the first hard rains. Pure stands of Longleaf may be "pine barrens" for sure most years, due both to the quick germination of the seed and to the fact that seed falls are not as frequent as with the hard-seeded Slash, Loblolly and Short-leaf Pines. Where land is bulldozed for game feed patches, it is usually planted to Chufas and Brown-top Millet for turkeys. Often the feed patches are not required in the problem areas and the job is simply to reduce brush so pine can seed in. Where such areas, large or small, are entirely surrounded by cultivated ground or recently burned over land, they may advantageously be burned by fires of maximum severity during September dry spells. The most effective burning can be done under the very conditions when woodlands are so tinder-dry that we are warned daily, through TV and radio, not to set fires for any purpose, and even hunting is prohibited. That's something that will have to be legalized in the future if we are to use this maximum fire intensity. Drastic fire is the only thing that can do the job under certain conditions. When you get into machinery, the use of one machine operation may equal in cost the value of the land that's worked over. Drastic fires, followed by bush-cutter work is often our practice, for this implement, when used in tandem, will largely expose or destroy roots of the brush, and at the same time scarify the ground so that heavier stands of young pine will seed in. This sort of reclamation is being accomplished by many progressive game preserves which largely depend on growing

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pine timber for income. Combined bush-cutter work and drastic burning is, of course, more costly than the latter alone, but often gives such superior results that it is justified. So far we have not experimented with herbicides to increase combustibility for making hotter fires possible for the purpose of killing back hardwoods.

Maintenance Burning. After we have our pine lands in the best condition we can achieve by the use of fire alone, or by fire and machinery together, as previously described, we can keep them that way indefinitely by frequent use of head-fire under conditions of favorable dampness and air movement, or even winds of considerable intensity. Some foresters have long recommended backfires only, and we used it more frequently in the early days. However, backfires are so slow that most game preserves have insufficient time to use such fires on the thousands of acres requiring burning after the close of the hunting season, and before the nesting time of quail, turkey, and other valuable wildlife. We occasionally use backfires for special purposes, as where we desire to play flames for some time around the stems of sizable hardwood sprouts. Fully ninety per cent of our maintenance burning is on lands where the ground cover is largely herbaceous mixed with pinestraw, and little more than two years "rough." Here we consider swingeing headfires superior in every way if properly handled, and they cost only a fraction as much in time and money. If duff and debris are light and very damp next to the ground, we burn with winds up to ten or fifteen miles per hour by preference, for an ideal maintenance job. When conditions are "just right," we try to get over as much ground as possible; within a few hours it may be too dry and dangerous to burn. If conditions are right and we follow our rule of not starting until mid-afternoon in winter and early spring burning, we have little to fear. If rains were quite recent, the cover burns as we want it to until sunset, if we are working on only one- or two-year "rough." This is because the moisture is rising from the wet ground and wind is slackening off toward sunset. That's a general thing. On succeeding days we usually find the fires

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will burn satisfactorily an hour or two later, but we may cover about the same amount of ground as we start later in the afternoon. As previously mentioned we may end up, unless further rains come, by setting fires as late as eight or nine at night, and burning almost all night. If we continue this too long, however, we may have to beat out a little slow moving fire next morning before the creeping flames get renewed life, making the job too difficult. They soon get renewed life when the breezes start and the sun bears down. If we do not completely extinguish them we may be setting the stage for a real wildfire.

Some nights we get enough steady breeze so that we can cover a lot of ground with headfire. Our breezes locally seem to be somewhat affected by the tides on the Gulf some fifty miles to the south, changing direction and freshening with incoming tide. That's a condition we have to take into consideration.

In the wiregrass-Longleaf lands, we burn mainly at one- or two-year intervals, to thin ground cover so that quail can nest and feed freely with their feet on mineral soil. That's a requirement of quail. Huge areas of this type may have little or no brush problem unless Saw Palmetto or Blackjack Oak complicates the matter. In the grasslands we attempt to burn each year a portion only and this to thin the cover. The entire purpose of burning it is to thin the wiregrass so the quail can feed through it. This is the fastest and most economical type of maintenance burning. We may decide to burn approximately half of the acreage in a block of this type of Longleaf land. A front comes through and gives us one to three inches of rain. Skies then clear and a steady cold wind of 10-15 m.p.h. develops. Two or three hours later we repair to the area to be burned with our "Cranco" drip torches. We find the earth wet and the duff still damp. Even two or three inches of the wiregrass next to the ground maybe damp to touch. We fire twenty paces of the ground cover at right angles to the wind direction, which is northwest. We note that the headfire travels downwind at about two or three m.p.h. without being able to burn at all

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backwards and very little on the flanks. As the wind is traveling faster than the fire can go, the flames are beaten nearly to the ground, a true "swingeing" fire. Noting that all is going as we desire, we set the remainder of the tract, twenty paces fired and twenty paces left. Within less than a quarter of an hour the tract is burned just as we want it. The burned strips are nearly straight, and true as the stripes on a Zebra. We have noted little black smoke mixed with the whitish steam. The severity of a fire can be judged by the degree of black in the smoke. Of course, everybody with burning experience knows that. But we mention it for those who haven't had a lot of experience.

We go to the next similar area as fast as our auto will take us and repeat, and keep on repeating until we have done a satisfactory job on all of the wiregrass-Longleaf type we have to burn. As we may get very few days of such perfect burning weather during the season, we work as fast as we can when they do come. Galloping along on horseback would be a good way to get there if you can't go by jeep.

We try to burn all of our strips of artificially planted pine of the right size and age under similar conditions, especially plantings that run approximately at right angles to the wind direction. They are fired from the windward side as fast as one can walk with the drip-torch. If the strips are more than ten rows wide, the area in the center may have to be fired a day later; very light fires cannot carry across wide strips at a single setting. The pines are so thick that little sunlight and wind can penetrate to dry out the centers. If we wait until the centers burn well the edges will be more severely burned than we desire and may injure the cambium or cause undue scorching. There is still much duff left on the ground to prevent erosion, if the burning has been done as suggested. We like this method of burning through pine sapling thickets, either naturally seeded or artificially planted, so well that we seldom use any other method. We prefer not to backfire through such stands as is so often done. If we get too little ideal burning weather, we usually wait until the following year. On the other hand we

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often burn through stands a year or two before we otherwise would, if there are many days suitable for the use of fast, wind-driven fire. Here again we want to see largely white steam rather than black smoke. This is about all we have time to discuss here, though there are many other refinements of fire use that could be discussed as well.

I know a paper like this may be just the "a" of the alphabet to many of those in attendance, but I thought a little reiteration doesn't hurt when you're talking about fire; we don't want to take any chances with a tool as dangerous as fire. Almost all tools that are effective in land handling can do great damage if wrongly used. An inexperienced operator with a bulldozer, in a young stand of pine, can do just about as much damage as a wildfire. I'm inclined to agree with some others here that we can learn a great deal from primitive man if we are humble enough.