Head Fires in Southeastern Pines

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IN SPEAKING of the use of head fires in southeastern pines, my personal experience is limited to some half million acres in south Georgia and north Florida that have a history of almost continuous burning. A great portion of this land is in optimum condition due to the very frequent fires that have been used there. However, we have enough examples of different types to know what will happen with the exclusion of fire, or simply the reduction of the frequency of burning to almost any interval. With these examples we have also learned what to expect by using fire for the first time on those areas that have gotten out of condition.

My knowledge of the remainder of the southeastern pine belt is limited to observation, discussion, the literature, and in being fortunate enough to draw firsthand from the knowledge of others who are truly experts in the practical application of fire; some of this knowledge gained by personal experience and going back to the late 19th century.

My remarks concerning the use of fire will pertain directly to the land with which I am most familiar. However, I strongly feel that the principles involved can be applied throughout the southern pine area, with modifications to meet local conditions, and if applied correctly the results will be equally as good.

The two basic fires that can be used are head fires and back fires, with others being variations of these. On the properties we are working with, economics alone forces us to use head fires on most of the land, with back fires used only under unusual conditions or circumstances. We have also found that if correctly applied head fires are easier and safer to use.

In speaking of the cost of control burning, Lotti (1962) has stated:

> In 1958 the average cost on the Francis Marion National Forest is about forty-five cents per acre. There careful planning, the burning of large blocks, and long experience help to keep the costs down. Elsewhere, and on smaller areas, costs could easily reach $1.00 per acre.

Riebold (1964) states:

> The cost per acre for the past few years has been about 38 cents.

In our diversified land use, it is very difficult to pinpoint the actual cost of control burning. However, on every property we feel this cost is 5 cents per acre or less.

Carol Perkins and Dr. Charles Driver, in a discussion yesterday, told me that by using headfires under proper conditions they have improved their burning on the Southlands Experimental Forest at Bainbridge, Georgia, and the cost is less than 10 cents per acre.

To achieve the maximum results with head fires we burn using what I will refer to as the "Principle of Decreasing Combustibility." This is simply starting the fire at the peak of or past the most combustible period of any day, taking into consideration not only the type to be burned and the terrain, but all weather factors involved also. Stoddard (1962) refers to this principle as follows:

> 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. . . . Burn in pinelands from high combustibility to low.

The factors controlling the intensity of fire in southeastern pinelands are as follows:

1. FUEL—Duff combustibility. This is determined by the ground cover and overstory species, composition of the duff, and the physical condition, including the number of years rough.
2. MOISTURE—This includes both ground and duff moisture.
3. WEATHER—The most important weather factors are atmospheric moisture, wind velocity and direction, and temperature.
4. TERRAIN.

Now, many of these factors are interrelated, and consequently many variations of conditions occur. But after one has gained some experience with fire, the ability to determine these variations will be more evident, and better judgment can be used in applying them to the use of controlled head fires. One more important point, they also have to be considered in relation with time, i.e. the season and the hour.

One such head fire occurred on Mill Pond Plantation on March 7, 1964, using the principle of decreasing combustibility. From March 3rd through 5th we had about 2¼ inches of rain, thoroughly soaking the duff and adding moisture to the soil. March 6th was still unsettled but with no rain. We got some drying that day, and in fact March 6th would have been perfect for "spot burning" the area with head fires, about which I will have more to say later. On March 7th the weather cleared and by noon it was apparent that we would have steady weather conditions for the remainder of the day, with a brisk wind, steady in direction and normal in velocity for this weather pattern. We burned approximately 400 acres starting at 2:30 or 3 o'clock. Examining the weather data in retrospect for March 7, 1964 as presented to us by the stations at Thomasville, Georgia and Tallahassee, Florida, we find the following: The relative humidity dropped from over 90% at 8 A.M. to a low of 56% at 2 P.M. This held steady until 3 P.M. at which time it began to climb. This trend held and by 8 P.M. it was back up to 90%. The wind velocity rose from 6 mph at 8 A.M. to a peak of 15 mph at 1 P.M. The velocity stayed from 13 to 15 mph from 10 A.M. until about 4:30 P.M. when it dropped rather quickly then down to 4 mph at 8 P.M.

The temperature on March 7, 1964 rose from less than 50° F. at 8 A.M. to a high of 76° at 3 P.M., where this held until about 6 P.M. It dropped then as night approached into the 60's and 50's.

Now, considering these weather factors in relation to fuel, moisture and terrain we see that by starting the fire at 3 P.M. we were already at the peak of combustibility and from that point on we would get decreasing combustibility.

A fire burning demonstration was given at the Second Annual Tall Timbers Fire Ecology Conference in which a head fire using the Principle of Decreasing Combustibility was shown. This fire performed beautifully over two or three hundred acres while the audi-

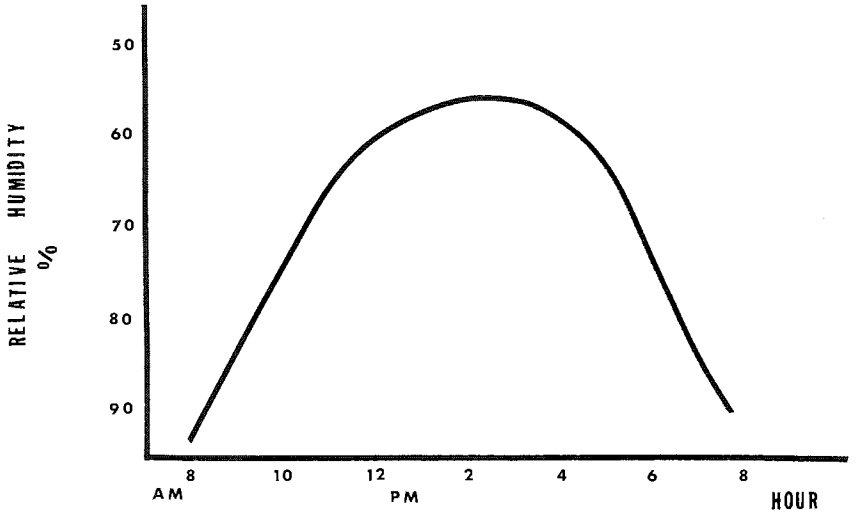

FIG. 1. Smoothed curve of hourly relative humidity based on U. S. Weather Bureau data for March 7, 1964 at Thomasville, Ga. and Tallahassee, Fla.

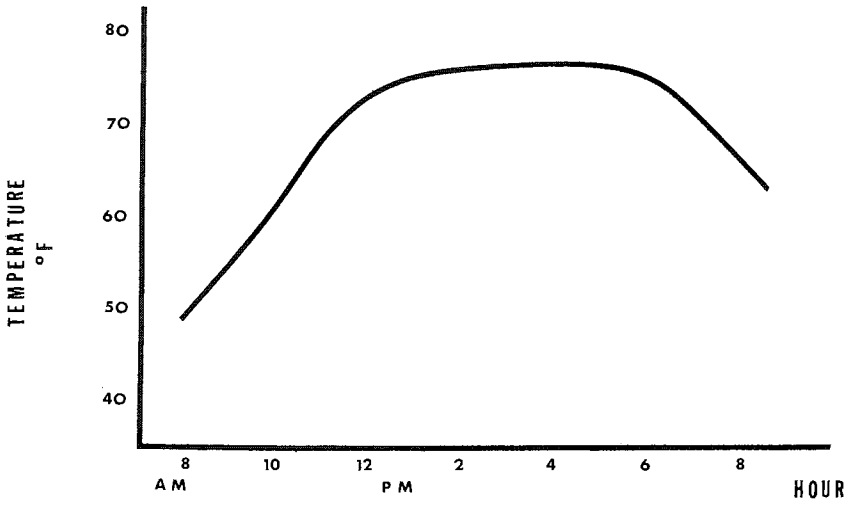

FIG. 2. Smoothed curve of hourly temperature based on U. S. Weather Bureau data for March 7, 1964 at Thomasville, Ga. and Tallahassee, Fla.

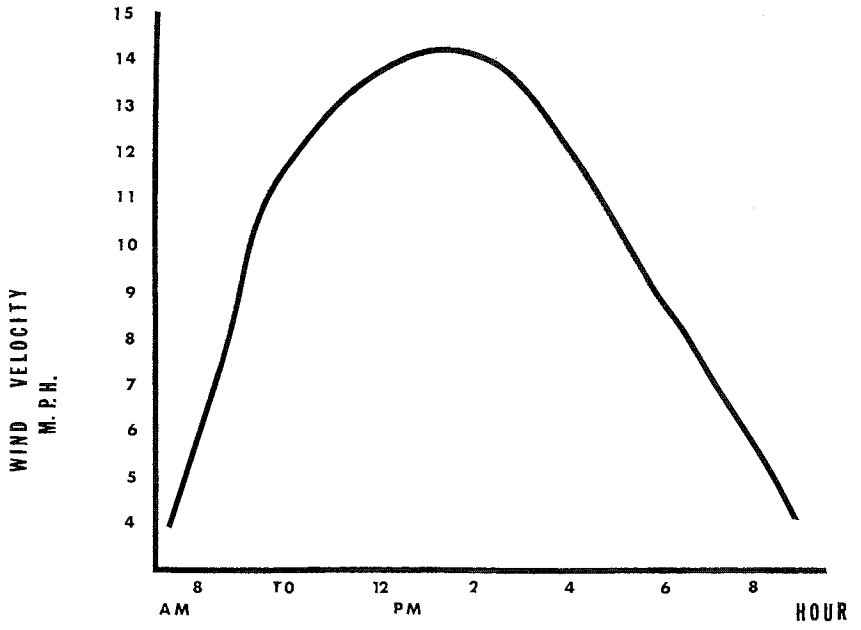

FIG. 3. Smoothed curve of hourly wind velocity based on U. S. Weather Bureau data for March 7, 1964 at Thomasville, Ga. and Tallahassee, Fla.

ence watched, photographed, and even some set a few short lines of fire. After two or three hours of this, our group had to move on, and so we all left, including the Manager of Mill Pond Plantation, Mr. Wilburn Gibson, who along with myself was the only other person present who had any responsibility with the fire whatsoever. There was no other labor or equipment present during or after the entire demonstration, for indeed it was not necessary. I think we heard more remarks about leaving the fire unattended, which of course we did, than about any other single phase of it. This was not planned, because it is a common occurrence with us to do this, but it certainly illustrates the control we had over this fire, and that control was due to "decreasing combustibility."

To illustrate further, we have an article in our files pertaining to the Thomasville-Tallahassee region and to Herbert L. Stoddard, Sr. from the Ferbruary 1, 1942 issue of *The Milwaukee Journal.* The

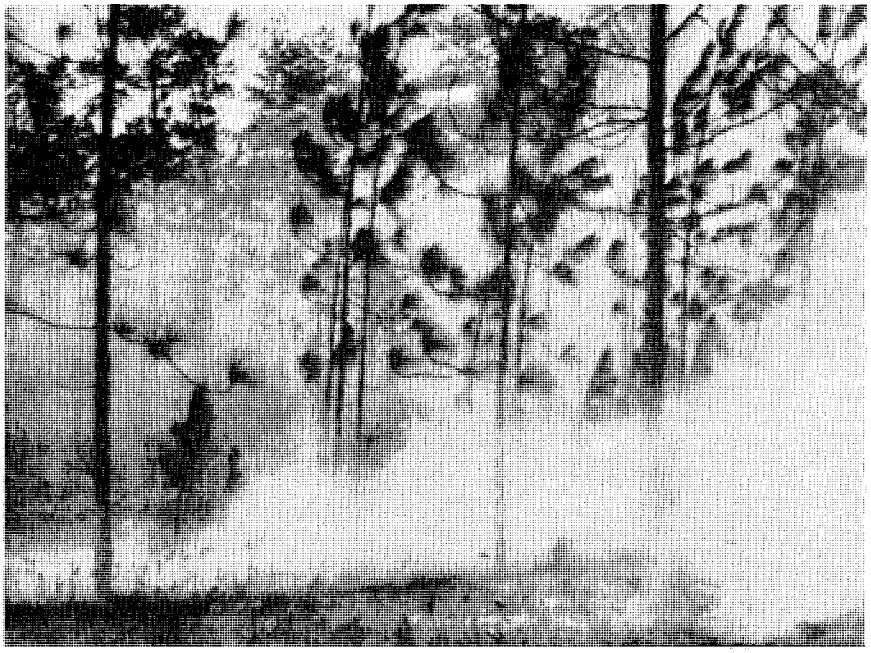

FIG. 4. View of head fire on March 7, 1964 with wind velocity up to 15 mph. Ground and duff moisture was so high that considerable wind was necessary for the vegetation to burn. Photo by Leon Neel.

FIG. 5. This plantation road was sufficient to stop the head fire under conditions prevailing during the March 7 burn. Photo by Leon Neel.

FIG. 6. Using the principle of decreasing combustibility, the low-intensity head fire did not cross this plantation road. The picture illustrates the low-sweeping flames of the fast moving head fire shortly after it was started again on the left side of the road. Note the white smoke indicating the high moisture content of the vegetation. Photo by Leon Neel.

headline of this article is "Southern Forest Fire Problem Gives Federal Authorities a Big Headache," with a sub-headline of "Visitor From North Gets Shock at Nonchalance of the Residents." This "nonchalance" does not illustrate maliciousness, but rather the ease of burning in our area. Again, this ease is due to experience in controlling fires by the people who burn, most of them knowingly or otherwise employing the decreasing combustibility method.

With the realization that with a few small exceptions we have not allowed hazardous conditions to develop in our area, these fires that sparked this article were not destructive fires, and in fact, the majority had to be head fires burning with decreasing combustibility. We know that they were not destructive because Mr. Stoddard has had continuous contact with almost our entire area since the early 1920's and he has seen very few destructive fires in that period here, and any that did occur were on ground where unnatural rough was allowed to accumulate.

Another very interesting period in our area, as in the entire Southeast, was the drought years of the late 1950's.

In parts of Florida and Georgia, as in other southern states, there

did occur disastrous fires that destroyed timber. By the second year of the drought, the fire danger in certain areas was tremendous, and wildfires increased. Large private industries, the state organizations and other agencies and organizations combined did not have enough fire suppression equipment to stop some fires after they had started. Anyone traveling on, over or through some of the country where these disastrous wildfires occurred could have no doubt about what uncontrolled fire could do under certain conditions. In every instance the greatest damage was done where heavy roughs had been allowed to accumulate. In *our* area the controlled fires continued through the three drought years as they had before and as they are occurring now. We suffered a little more discoloration than in normal years, perhaps, but I know of no timber in the Thomasville-Tallahassee area that was lost to fire, except possibly a few small patches of reproduction, and we have producing forests on our land with a base of some 500 million board feet of timber. The fires in most cases in our area during the drought years were head fires, and were conducted as usual, except under the severest dry conditions when some, notably Ed and Roy Komarek. as Managers of Greenwood Plantation, switched to night burning to keep the intensity of the fire as low as possible.

Obviously with moisture the key to the principle of decreasing combustibility, there might occur, as with a drought, certain times when a fire will not be controlled by decreasing combustibility alone. However, even then all other factors favorable to a fire of lower intensity can be employed to permit a proper controlled burn. If your ground is in optimum condition there is *no* excuse, such as a severe drought, to keep fire out of the woods. There was more loss of growth during the drought years due to insufficient moisture than occurred from burning in our area, except where unnatural and improper roughs have been allowed to accumulate.

Make no mistake that head fires are easier to use in "Maintenance Burning", where the ground is in an optimum condition due to frequent fires. We employ head fires in "Reclamation Burning" also, and in fact, in some cases head fires are the only kind we can get into certain types for reclamation. On some of our upland, where we have little pine and almost a complete overstory of hardwood, there is nothing but a mat of hardwood leaves for ground cover. Fire is

desirable in these areas for several reasons, and head fires under high wind velocities on the dryest day are about the only fires that we can get to burn there. Similarly, pine reproduction in some cases only furnishes a duff that can be reduced by head fires under driving conditions. This is especially true in dense stands of shortleaf reproduction of 10 to 20 years of age, and in some cases other species such as slash pine in dense plantations on old field land where only a tight mat of pine straw is on the ground.

Where any appreciable amount of combustibility occurs in upland areas that have been taken over by brush, or hardwood encroachment, rather severe head fires are desirable, except where a complete overstory of pine is present. In fact, one must be sure that in such areas the combustibility is not removed without the best killing effect on the hardwood brush, for it might be several more years before enough combustibility is accumulated to burn again. On the other extreme, in our most combustible types, the fire frequency should be such that no heavy and unnatural accumulation is allowed to occur. In the case of palmetto, gallberry, and other highly combustible species, frequent head fires are necessary to keep them in a stunted, or fire retarded condition, so that future fire difficulties are removed. The reclamation of this type by fire is very difficult, but this has been caused by fire exclusion in the past. It is certainly more practical and economical never to let this type get out of control by the accumulation of heavy roughs.

I have spoken several times about the optimum condition of our land, and of course I refer here to a pine overstory on our uplands with a *pure* herbaceous ground cover, if this is possible, below. In this situation the ground cover alone will furnish the combustibility to carry the fire, and the pine overstory will do the same. As the pine overstory thins, or the ground cover develops spots of low combustibility due to hardwood encroachment, it might take both the combustibility furnished by the ground cover as such plus whatever pine straw is added to carry the fire. But when in optimum condition, our ground produces enough combustibility in one year to completely discolor the pine overstory if fire is used at the wrong time or the intensity is too severe. Obviously, a two or more year rough would be that much more severe.

Where the land is in or approaching optimum condition, head fires

are employed with decreasing combustibility under wetter conditions to accomplish "spot burns." This is simply burning under extremely wet conditions so that no area is burned clean. The percent of land to be left can be judged by experience in this type of burn, so that the head fires will burn very irregularly and widely distributed within the block to be treated. More fire will have to be set for spot burning, for here we do not have a continuous line of fire that burns regularly, but many small fires burning independently.

To summarize, the use of head fires under proper moisture conditions, or burning with decreasing combustibility, is the most economical, the safest, and the easiest way to burn.

Obviously, the recognition of the values of the use of fire in managing southeastern pine land for timber, wildlife, recreation, certain agricultural purposes, esthetic reasons or any combination of these, will be the first requirement for any success with head fires, while experience and knowledge of fire behavior are other requirements that are equally as important.

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