

## USE OF FIRING TECHNIQUES TO ACHIEVE NATURALNESS IN FLORIDA PARKS

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Statutorily charged with obtaining and preserving "... representative portions of the original domain..." the Florida Park Service (FPS) has for many years proudly professed to be managing "original natural Florida," yet for most of the fifty plus years of our existence we actively suppressed and fought fire rather than applying it prudently to pyric communities. Today we are trying to restore and maintain fire-type communities and must cope with conditions evolving from a history of fire exclusion, suppression, or too infrequent burning in our older properties as well as more recent acquisitions. There are currently sixty operating units within the FPS, containing from a few acres to as many as 20,000 acres of land, to which fire must be applied.

Original conditions, most often described as those extant when the Spanish first arrived, are of necessity perceived, for we are not likely to ever know the original species composition and must draw conclusions from early descriptions. Our assumption that herbaceous species were far more abundant and woody species less conspicuous in most fire-dependent communities is bolstered by numerous early chroniclers as well as a growing volume of data generated by research on the effects of natural fires.

By natural fires I mean lightning-initiated fires and fires set by indigenous people. Any hypotheses regarding when and how Indians burned must be accepted as conjectural, yet one must recognize that it is improbable that aboriginal groups burned the second day after passage of a cold front with at least one-half inch of rain, with temperatures under 50 degrees Fahrenheit and relative humidity around 50 percent, with steady winds of 8 to 12 mph, and used backing fires off of prepared lines. In a more serious vein, we know that unless winter (or more appropriately dormant season) burns are performed at very close intervals, woody species are favored and, where pines occur, greater stand density results. Such conditions were not described in the period prior to extensive European interference. Whether Indians ignited most of Florida with any frequency is another unknown subject to debate; however, when more herbaceous assemblages existed indigenous people certainly could have increased the frequency within which many areas burned.

Perhaps a more significant facet of Indian fires was the manner in which they may have burned. Like lightning fires, their burns probably (yes, another assumption) developed into sweeping headfires with the majority of acreage burned from any fire being subjected to this more intense component. Even today, headfiring is a common practice among native groups worldwide. The flank fires consumed a lesser amount of ignitable fuels and the backing fire the least acreage. If today, naturalness is to be achieved via firing techniques, this relationship of proportions burned and the probability of frequencies

at which a given area might be subjected to the different types of fires merits consideration.

The duration and the time of day that a fire is initiated is another factor to be weighed, as intensity varies greatly over the course of a lightning fire, and certainly Indian fires were no different.

Winds prevalent during seasons of natural burns were responsible for patterns of vegetation, for they, in conjunction with topographic features, directed the types of fire and a major part of the naturalness equation prior to extensive cultural development and interference.

These factors and assumptions are applied to prescriptions and firing techniques whenever possible in our pursuit of approximating original conditions. Although the primary "seasons" in which we burn are often called lightning-season or growing-season burns, these terms are not synonymous and our program includes both as well as traditional winter burns. These seasons overlap—the growing season in Florida is March through September and the period of most frequent lightning activity is May through August. The bulk of our prescribed fires are scheduled during May and June, the months in which most lightning fires occur and burn extensive acreages. Growing season fires are generally conducted in the month of April when a quick flush by herbaceous species can be expected. Dormant season burns are scheduled for purposes of fuel reduction prior to those zones being placed on growing and lightning season inter-fire intervals, to serve as blacklines that provide safe buffers and facilitate burning of adjacent zones with headfires, and for a variety of other park-specific reasons dictated by location.

Firing techniques must often be geared to cope with heavy or aberrant fuel composition and cultural constraints—regulations as well as perceptions. In the case of the latter, we are at times obligated to burning in a manner that is not in the resource's best interest as far as attainment of aspects of naturalness. For the most part, however there are measures which can be taken to achieve desired results without too many compromises, by using appropriate planning and preparation. As we are increasingly prescribing headfires the key to success is the preparation phase which will permit their use.

To permit broader use of headfires and to more safely burn long-interval communities (e.g. sand pine scrub and scrubby flatwoods) we have reduced the size of burn zones in many cases and employed equipment such as Marden roller-choppers and Brown tree-cutters to either establish wide enough perimeters or to treat entire zones which could not be safely burned unless such actions were taken. Resource impact is minimal with such treatment and a fuel bed is created that will reduce the "hedge effect" so often encountered when ignition off of an earthen line is performed. In the case of those communities having heavy fuel loads the treated perimeter provides the opportunity to burn under more amenable conditions for control and to establish backing and flanking fires which might otherwise be difficult to ignite prior to initiating a headfire.

Blacklining to the leeward side of prescribed winds is a growing practice,

especially at larger parks with high scheduled acreages. Establishment of wide perimeter lines around park boundaries, and zone size and alignment which will facilitate blacklining is not yet widespread but is highly recommended.

Areas which are reasonably safe due to low fuel loads (e.g. two-year roughs in palmetto dominated flatwoods), have extensive natural barriers downwind, or have other features or preparations which create favorable conditions to permit use of a simple headfire, can be burned easily. Such firing is increasingly performed, especially at small parks where close interval burning has been possible. Natural aspects dictate a blend of fire types, therefore most areas should not receive headfiring all the time, and frequent headfires with winds which will skew wind patterning should be avoided. Burning during the same month, or time of day, time and again is to be avoided also, although the majority of treatments of any given zone will generally occur in the lightning season months of May and June.

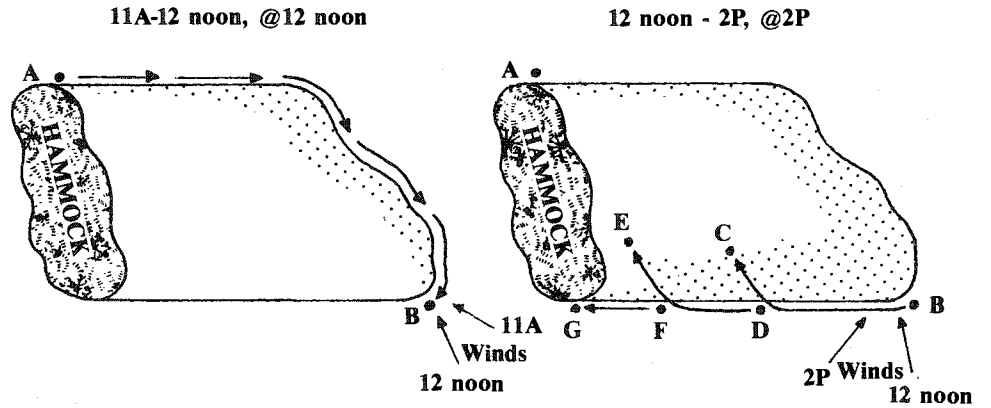
More typical of our burning practices is the use of multiple firing patterns, both to gain better control and to achieve treatment by all types of fire. Firing is done off of zone perimeters unless interior roads or trails exist which can provide breaks. We eschew the use of plowlines or firing patterns that lead to development of broad coalescing firelines within zone perimeters and we commonly initiate a backing and single flank fire prior to use of headfiring techniques. Once the flank and backing components have spread enough to gain control lines they can be permitted to burn more, or less, depending on how much of the zone is desired to be headfired. As soon as the control lines attain the desired size, a staggered headfire pattern is frequently utilized.

A staggered headfire under these circumstances is best described as igniting a line with the wind in increments based on distance from the firelines initially established. The rate of spread anticipated within those areas which will be encountered by each segment of the headfire determines the speed at which firing will occur and the length of the increments. Firing is timed to create a line of fire which will not become parallel to the backing line set but will progressively coalesce with the backing fire at an angle or arc. Use of this technique is illustrated in Figures 1 and 2.

Staggering the firing pattern in intervals can be timed to achieve a variety of goals related to control, as well as to attainment of that mosaic we so often look for. Spotover monitoring and suppression is facilitated when limited-width downwind lines exist as only narrow heads meet the lines progressively. Conditions over the span of burns performed this way can provide enough range of intensities to elicit considerable variation in vegetative responses. On burns of up to 3,000 acres, such patterned headfires are used with either predicted steady winds or with winds which can be expected to shift during the course of the day owing to local conditions. Lightning season winds are fairly predictable; they are generally light but strengthening until midafternoon and usually swing clockwise as unstable conditions develop with land-mass heating. Owing to the broader vector which smoke will occupy under such circumstances, most burns must be kept small (600-1,000 ac) because

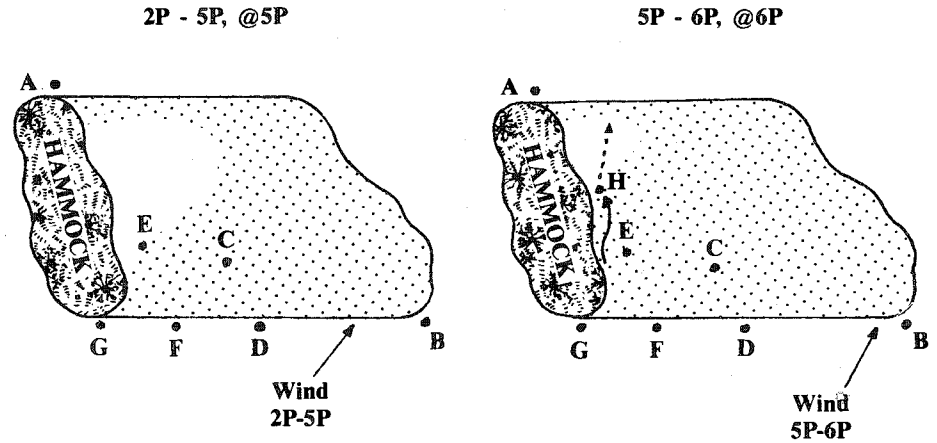
Figure 1

HEADFIRE PATTERN TO ANTICIPATED SHIFTING WINDS (SE-SW)



A backing and flanking line is executed as a control line.

Firing proceeds at a pace determined by fuels and rate of spread to achieve "pinch-out". As the wind shifts more Westerly, lines are strung into the zone interior to hasten completion.



The fire is allowed to flank and back to lend greater variation to the burn pattern and simulate fire shadowing.

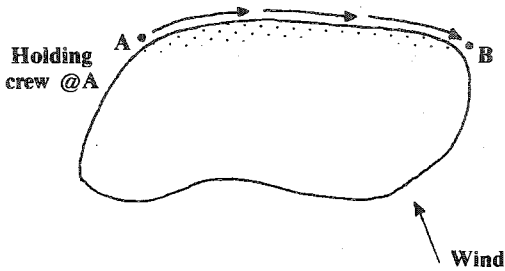
If time constraints dictate more rapid completion E - H may be fired away from the hammock and the line carried beyond H at a rate which will preclude a ring fire.

Figure 2

**PREDOMINANTLY HEADFIRE PATTERN  
WITH ANTICIPATED STEADY WIND**

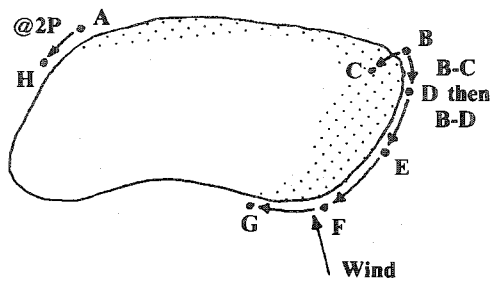
An area one to two thousand acres in size may be burned within the timeframe illustrated in most pyric communities not too successionaly advanced.

11A-12 noon, @12 noon



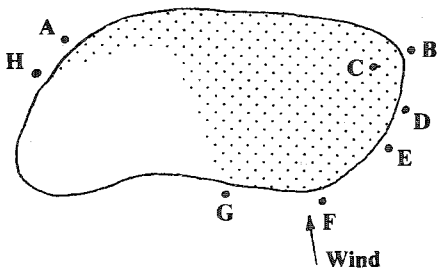
A backing fire is established as quickly as possible to afford control prior to headfiring. One crew is maintained at A to permit firing from this point rapidly if windshift occurs and to hold the line. If windshift is more likely to be Eastward, the firing pattern would be reversed from as shown.

12 noon - 2P, @2P



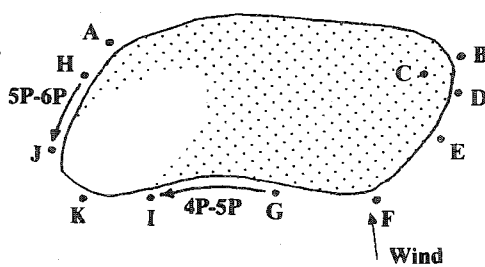
The corner may be widened quickly by firing a short head-fire (B-C) and then proceeding to headfire at intervals to achieve a staggered effect to the line. The objective is to create a situation which has the backing lines and headfires "pinching" out.

2P-4P, @4P



Firing is stopped until the initial lines pinch out. The goal is to avoid long coalescing lines as well as optimizing animal-life movement away from the fire.

4P-6P, @6P



Lines are extended and the balance of the zone permitted to burn out. Should time constraints require it, I-K can be fired at a pace which will avoid a ring fire upon completion.

of smoke management concerns. Firing patterns should be worked against predicted windshifts (e.g. initially set in a manner to start, or develop into, backing fires as the wind swings). Like any other firing pattern used it is much more comfortable if one or more sides of the zone to be burned are secure with natural or other barriers (especially blacklines), however large areas can be burned with small crews in a relatively short time with this technique and a very good mosaic and responses achieved. Alternatively, the period of the burn can be extended to accommodate specific prescription goals.

Anyone who has ever done much prescribed burning recognizes that my descriptions and illustrations are simplistic. Caution must be exercised with such burns and knowledge of rates of spread and local weather is a must. Minimization of coalescing lines must be kept in mind, and as the burn is allowed to "pinch out," the unset portion must be wide enough to permit a shallow arc to form, rather than a bottleneck, which will create its own wind and potentially, spotovers. This technique is also not suitable in normally short interval fire-type communities where there are dense stands of pines which have experienced prolonged fire protection and are surrounded by heavy fuels. In such situations damage may be incurred as the fire is pinched out due to the higher intensity of the converging lines. Properly applied, headfires are not overstory killing. I have used this technique successfully on dozens of occasions with no adverse effects on pines (it seems many people really worry about this) even under very dry conditions and moderately heavy fuel loads, and have had opportunities to observe many other burns similarly conducted.

When headfires can be used most frequently in a burning regimen we have gained very positive results. The Florida Park Service has only recently embarked (1981) on a program of growing season and lightning season burning. Although visual introduction to areas burned, using the techniques described, would no doubt be more comforting to many of you, the preassessment, degree of preparation made, and responses often observed following burns are:

1. Aerial photography can be invaluable in determining wind patterns. This is particularly true of older aerials which may reveal the condition of vegetation as it existed in the days before fire suppression. "Fire shadows" of unburned, or less frequently burned, vegetation can often be identified on the lee side of wetlands. This evidence of the original vegetative response to natural fires can be used to plan their duplication and to design burn zones accordingly.
2. When the FPS first embarked on a serious ecological burning program many of our areas had not experienced fires in many years so we were forced to give serious consideration to creating wider fire lines to permit burning. Winter fuel reduction burns to minimize potential damage to mature slash and longleaf pine are recommended in our policy, however I believe they are really of little value. They are more of a placebo. The primary factor to avoiding damage when heavy duff layers have developed in pinelands is the degree of moisture present in the duff and type of fire used—not the season of burn. Areas with a pine

overstory and moderately heavy fuel loads can be burned successfully at any time of year by sound prescription development.

3. Blacklining, burning areas to provide wider zone perimeters, and allowing freer use of headfiring is both useful and necessary in many cases.
4. Firelanes can be created without seriously impacting the resource. In many cases wet-down lines can be used to fire off of rather than mechanically preparing firebreaks. Of course, some communities such as sand pine scrub and scrubby flatwoods defy adequacy of lines. The roller-chopper or tree cutter can be used to create wide lines or break up zones without much soil disturbance. Such preparation must be done in communities which will only burn under conditions which lend to intense fires.
5. Roller-chopped lines used thus far vary from thirty to one hundred feet and are used in conjunction with ten to twenty-foot disked lines around park boundaries when heavy fuels exist. Internal lines are much narrower and close mowing or very light disking of zone perimeters is often adequate preparation.
6. Mechanical treatment has proven necessary to permit safe burning of volatile communities like sand pine scrub and scrubby flatwoods. Such modification allows tailored prescriptions having perimeters under which a "natural" fire might not be possible. We cannot yet state that "naturalness" is truly gained yet results are, thus far, promising. The key is that we can burn safely and avoid cultural problems.
7. Where conditions prohibit burning, such as in small parks surrounded by urban development, mechanical treatment of an entire zone may be all we can do. However, where use of fire is possible if fuel loads are lowered mechanically, burns can be conducted shortly after treatment, before the cut fuels become too dry, to avoid soil scarification. We are only entering the second year of experimentation with this "cut/burn" practice but the results are encouraging thus far.
8. Headfires do produce a great deal of smoke but as long as you have reasonable winds of at least 5-8 mph and unstable conditions you get good dispersal and shorter duration of smoke than with other techniques. When situations permit, winds of up to 20 mph can be used. I have often heard concerns about residual smoke and "after burn" from headfires, however I have not encountered this even in pine plantations with heavy needle layering. When used in conjunction with good control lines, areas of up to 2,000 acres can be burned in six hours or less with primarily headfires.
9. Headfires sweep through areas, and spotty or uneven burns are frequently achieved. Even with very dry conditions, headfires frequently result in patchy burns. This is especially true in palmetto prairie (dry prairie) areas and other communities with much heterogeneity of fuels.

10. Headfires have much less impact at ground level than backing fires and it appears that the shorter residence time is less damaging to finer seeds and meristems.
11. Although the FPS policy states that rain within 1-7 days of a burn is desirable, I have noticed far more flushing and extensive meristem reproduction and seeding response by many herbaceous species after fires during droughts, especially headfires. Fires during drought periods were most common and probably always have been the most extensive. Wetlands, especially the innumerable seasonal ponds of Southwest Florida, require fire during driest periods for maintenance. A major hurdle to effective and appropriate fire management is the prohibition of burning during such times. Unless areas are so desiccated and fuels so unnatural owing to human interference (e.g. the Everglades) there is no reason to prohibit fire during droughts if adequate controls exist.
12. Areas that have become dominated by woody plants can be burned with headfires but will often not sustain a backing fire. Lightning season burns are especially effective in eliminating invasive hardwood species and suppressing woody species, and are moderately successful in palmetto control if this plant is not so dominant that petiole length is extreme due to crowding. Once palmetto assumes an ascendent aspect and has long frond stems, it resists even the most intense fire and will survive when nothing else will. Too little monitoring has been performed to make definitive statements, however it appears that fires which occur following lengthy exclusion may actually induce monocultural aspects of palmetto in many instances.

Admittedly, we are not yet where we want to be with our restoration efforts. Our quest is admirable indeed, but there are many strings which tug at us. While I would like to think that what will benefit the resource the most should be given primary consideration, the reality of ecological burning is that we better not ruffle the feathers of citizens (no matter how benighted) if we wish to continue to burn. We know we must burn, yet we find ourselves in an increasingly difficult and complex situation owing to the way fire is treated by the media, perceived by the public, and advertised as a destructive force to be prevented by even some state and federal agencies which authorize and use prescribed fire. Hopefully, constraints will not become so cumbersome that attainment of our goal is made impossible, for I think we are on the right track.