Does nature really care who starts the fire?

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Pages 98-100 in Proc. Symp. and Wkshp. on
Wilderness Fire, Missoula, Mont., Nov. 15-18, 1983.

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ABSTRACT: The shortest answer to the title question is that a fire's effect is independent of its mode of origin. So, rather than recreating the original fire regime per se, it might be more feasible to aim for the vegetation a natural fire regime would create. How to arrange the necessary fires then becomes a practical rather than a philosophical problem.

INTRODUCTION

The shortest answer to the question "Does nature really care who starts the fire?" is "No." I know of no laws of physics that support the argument that a particular fire's behaviour depends in any way on its mode of ignition once it has left the immediate vicinity of its point of origin. It follows that the effect of any fire should also be independent of how it started. Let us say, then, that the vegetation cannot tell the difference between lightning and any of the various ways in which people start fires.

Perhaps, one might argue, the spatial pattern of fire starts or the average fire behaviour might depend somewhat on how fires get started. For example, over a long period of time, lightning fires may be more evenly distributed over the landscape than human-caused fires along a road or trail system. Or, because lightning is usually accompanied by rain, the fire size and direction of spread may be influenced by the pattern of wet and dry areas after a storm, in a way that human-caused fires started in clear, dry weather are not. But all this, I think, is just minor qualification of the main answer: that nature does not really care how the fire starts, whether by lightning or humans, whether accidently or maliciously, or as prescribed fire lit for a purpose.

Suppose we ask another question, which may well be what the symposium authorities really had in mind when they phrased the question in my title: "Do we the people really care how the fires are started?" This slightly different question opens up a further set of problems and questions, some of which are as much a matter of philosophy as of science. I suppose that the science is relatively easy and the philosophy relatively difficult. I also suppose that we had better get both right before setting large-scale, long-term operations in motion.

With respect to fire, then, what are we really looking for in our parks and wilderness areas? Is it:

1. A set of fires ignited under the same conditions and by the same means as in primeval times, that is, the so-called "natural fire regime"; or

2. The vegetation that a natural fire regime would have created?

There is, it seems to me, a world of subtle difference between these two concepts. Most of the ideas that follow can be found in a treatment of this question with respect to the Canadian national parks (Van Wagner and Methven 1980).

THE NATURAL FIRE REGIME

Consider the concept of "natural fire regime." The first problem is defining the word "natural" as it applies to influences on vegetation. My private interpretation is simply that any factor that has been in effect long enough for the vegetation to come into equilibrium with it can be called natural. By this criterion, I suppose that the natural fire regime at the time of white contact would have included lightning fires and the fire load produced by the activities of native people, whether accidentally or deliberately. The vegetation at the moment that Europeans arrived was presumably in equilibrium with that fire regime. But observe that the concept of natural fire involves much more than just mode of ignition. It includes also the idea that all "natural" fires be allowed to spread with complete freedom at any intensity, and at the same time in the total absence of all "unnatural" fires.

I take it for granted that the re-creation of a truly natural fire regime in modern times is impossible for a host of social as well as physical reasons. We are, then, left--whether we like it or not--with the other alternative goal: "the vegetation that a natural fire regime would have created." If this point is accepted, it follows that the mode of ignition becomes almost irrelevant. Instead of a fire plan taking precedence, the governing instrument becomes the vegetation plan. The fires then follow in consequence by whatever means are feasible and necessary.

Paper presented at the Wilderness Fire Symposium, Missoula, Mont., November 15-18, 1983.

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THE NATURAL VEGETATION

Shifting the focus from the fires themselves to the vegetation has a major consequence that is both a complication and a challenge. If we could simply re-create the complete set of natural fires, we could then accept with blissful confidence that whatever vegetation resulted would be correct naturally. But, if this simple path is denied us, we have no responsible alternative but to enquire into the links between fire and vegetation and: (1) decide what kind of vegetation we want, (2) design a fire regime that will produce it, and (3) carry out the operations by one means or another.

At the same time, this view of the question relieves some of the philosophical pressure concerning mode of ignition. Instead of asking whether a fire is natural or unnatural, the distinction that counts is between wanted fire and unwanted fire. The criterion is the vegetation plan. An intriguing point now emerges.

Of all natural forces that affect vegetation, fire is the only one that pervades the landscape at large, whose accidental occurrences can be controlled, and which can also be applied at will within a chosen area at a chosen time. It is thus the only management tool available to any land unit on which the use of artificial means such as machinery or chemical sprays is denied. On such areas, which include both the Canadian and American national parks, the vegetation will therefore be managed with fire or it cannot be managed at all.

Choosing the desired vegetation is therefore the first step. Perhaps a reasonable goal is simply to perpetuate the vegetation now present. Or a philosophically ideal answer might be "that native vegetation in the best long-term equilibrium with the primeval natural fire regime." Whatever goal is decided upon must be compatible with the means available to achieve it. If fire is the only available tool, then the vegetation goal must be compatible with what can be achieved by managing fire.

THE PRACTICAL FIRE REGIME

The first question in the design of the appropriate fire regime will be: "What should be the average age of the vegetation or of time-since-fire?"

From the fire viewpoint, this translates into: "How much of the area should burn annually on the average?"

The answer is the reciprocal of the fire cycle and gives for a lethal fire regime the annual renewal rate of the vegetation. Where the fires are generally nonlethal, it gives simply the average length of time between fires at a point.

The second major question concerns the distribution of the intervals. Any vegetation system cycled by periodic fire has many faces, from freshly renewed to what might be called decadent old age. Such an ecosystem is not properly represented unless all faces are present. Thus a major feature of the landscape is, in a lethal fire regime, the age-class distribution. In a nonlethal fire regime, the distribution of time-since-fire will create an analogous pattern. This distribution of age classes or time-since-fire is an integral part of the vegetation plan, which is not complete without an answer to the question: "What is the desired form of the spatial distribution of time-since-fire?" This question has several possible answers, for example: the rectangular distribution in which stands are renewed at a single mature age, as if the vegetation were flammable at that age only (given as an artificial example); the negative exponential (Van Wagner 1978), in which stands are renewed at random, as if the vegetation were uniformly flammable at all ages; or the Weibull distribution (Johnson and Rowe 1977), which lies intermediate between the first two, as if flammability generally increased with age.

Again, the analogy of "time-since-fire" applies in a nonlethal fire regime. Having already estimated how much of the are to burn annually, we now have a guide as to where to expect or plan the fires (as the case may be).

The third major question deals with the problem of scale, both in space and time. Most parks and wilderness areas, being of limited size, must be managed as microcosms of the real world in which the very large fires that might occur in a state of nature would be considered undesirable. Furthermore, wide swings in burned area from year to year or decade to decade might also be most unwelcome. The question is, then, "What are the desired distributions of fire sizes and total annual burn?"

Ability to control these factors is presumably essential. Otherwise, a park could wind up at any time with some sizeable proportion of its vegetation in a single age class, to say nothing of the repercussions of fires escaping outside their preestablished boundaries.

These three questions, although worded in terms of fire, in fact proceed directly from the plan that describes the vegetation to be maintained within the chosen area and its pattern in space and time. However the fires spring into being and whatever the degree of control over their frequency and size, each fire contributes individually to this overall pattern and is seen to do so by the park management. Only from this viewpoint of the landscape as a whole, it seems to me, can the problem of maintaining fire-dependent ecosystems be approached with some hope of practical solution.

The obvious concern that now arises is the degree of artificiality that these questions' answers seem to imply. There are two points to be made on this score: (1) If the management mandate is set in terms of the vegetation rather than of fires only, these questions are hard to avoid, since their answers provide the basic means by which the vegetation must be described in terms of fire. (2) The answers do not of themselves force any particular degree of intervention. At least, they provide the yardsticks for measuring the degree to which the mandate is being carried out. At most, they provide guides to whatever intervention is undertaken.

THE FIRES THEMSELVES

It is one thing to ponder our problem philosophically and even to devise scientifically logical plans for meeting our goals. It is obviously quite another thing to be faced with the task of carrying them out. Even if park managers could bring themselves to face the amount and intensity of fire that might be needed to maintain the desired vegetation, it is the time-and-space scale problem that will always provide the major practical stumbling block. Once it is accepted that no class of accidental fires, not even of lightning origin, can be allowed to spread absolutely without control, then two points follow almost inexorably. The first is that an effective fire control force will have to be in place. The second is that the desired vegetation pattern in areas of limited size can probably never be achieved without some deliberately started prescribed fires. These latter offer, obviously, the best chance of confining fire to chosen areas at chosen times. Perhaps a combination of lightning fires allowed to run and prescribed fires, deliberately set and confined to specified boundaries, offers the most attractive fire regime from the philosophical and practical viewpoints. Heinselman (1973) has treated this subject and its ramifications in depth. Whatever the pattern of fires that ultimately make up the practical operational fire regime, it is the vegetation plan that must be able to bear the brunt of philosophical justification rather than the fires per se. The fires become the means to an end rather than the end in itself.

CONCLUSION

The question we started with refers figuratively to "Nature" as if she were a self-conscious entity that cares about how fire is started. I hope you will consider that question answered, even though I have strayed somewhat from its original narrow context. It seems that, whether we like it or not, we are about to take over Nature's ancient role in the management of fire-dependent ecosystems in certain areas called "wilderness." I only suppose that, if Nature is really conscious, she must be vastly amused at the trouble we have in duplicating something she has been doing so easily for untold thousands of years.

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