

Concluding Remarks of the Co-Chairman (*Ecological Section*)

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THE TWO CONFERENCES on fire ecology at the Tall Timbers Research Station in 1962 and 1963 have served to call attention to the fact that fire is and has been in the past an important factor in many environments and that it can be used as a tool in management on a much wider scale than is generally realized. Above all, the Conferences have pointed up the necessity for an interdisciplinary approach and more experimental research. Most of what we now know about fire in the environment is empirical, that is, our knowledge has been gained by trial and error, correlations that may or may not represent cause and effect, and observations on situations not well controlled from the standpoint of science. Overcoming the widespread bias against fire on the part of the public and land management administrators, in order to open the way for objective research, has been one of the main objectives of the Tall Timbers Conferences. I would say that this objective has been accomplished and that we need now to turn to the question of the "whys", and the mechanisms by which fire exerts its selective effect in the total ecological system. The research now needed cannot be done by any one group of specialists. The second Conference was noteworthy in that it brought together foresters, soils men, wildlifers, range managers, watershed men, botanists, zoologists and ecologists. Only by the combined effort of many approaches can the role of fire be understood. To my way of thinking, of course, cooperation of all these specialists is feasible *only* if everyone under-

stands the basic principles of the ecosystem. Since man can control fire to a considerable extent it is especially important that he understand the consequences of his actions. If man cannot learn to handle intelligently this relatively simple factor in his own best interest he has no business attempting to control rainfall or other vastly more complex matters.

At this congress the well documented stories on effect of fire in the yellow pine and Douglas-fir regions were outstanding contributions. The usefulness of controlled burning in Longleaf Pine, chaparral and grassland is now well recognized, but the fact that fire, properly controlled, can be useful in the western forest will come as a surprise to many. It is perhaps well to point out that the useful role of fire is apparently different in the two regions; in yellow pine, fire acts as a thinner producing fewer but better trees and providing more diversity that is very favorable to wildlife. In Douglas-fir, as I understand it, fire is most useful in preparing the way for young growth following cutting of old growth.

If I had to single out our greatest unknown in the field, I would point to the question of *the effect of fire on mineral regeneration*. In many terrestrial ecosystems the cycling of the scarce elements necessary for life is the bottleneck which controls the rate of production. Through long evolution ecosystems have developed many mechanisms to speed the return of minerals to the site of photosynthesis. A diversity of soil animals, bacteria and fungi are the chief agents of decomposition and recycling. Under moist conditions these agents are effective, but in dry or hot regions, or regions with dry seasons, the microorganisms are greatly inhibited; consequently, dry litter piles up and nutrient recycling slows down. We theorize that fire can act as a decomposer in such a situation and thus may play the same useful role in increasing or maintaining productivity as do microorganisms. Actually, we have no good scientific proof of this, and many soil scientists are skeptical. Radioactive tracers are an ideal tool for testing the theory. It is a simple matter to "tag" vegetation so that labelled minerals are assimilated into tissues of plants. Following an experimental fire one could then determine exactly what happened to the minerals in combusted vegetation. Likewise, the rate of uptake into new vegetation could be measured with precision. Lack of familiarity with radioisotope technics is no

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longer an excuse for not using these new tools; training courses are available at Oak Ridge for any qualified scientist. Let us hope that we shall hear reports along these lines before too many more fire ecology Conferences are held.

Another basic question that must be answered before we can really be sure about the long-term effect of continuous or "chronic" burning (as contrasted with the occasional severe or "acute" fire) is this: Can a fire climax be maintained indefinitely as a stable and productive ecosystem in the same manner as a non-fire climax? In other words, can ecological succession be stopped and held at an early stage which is productive to man without benefit of the stability mechanisms which are evolved in the mature ecosystem? It may be necessary for man to engineer into the ecosystem some of these protective devices found in mature nature if he is to keep nature youthful by means of such tools as fire. In other words, we should not be lulled into complacency just because the immediate harvest is greater.

The fact that fire when used to control brush vegetation reduces the amount of litter, while herbicides used for the same purpose increase the amount of dry litter (and hence increase the fire hazard) is an important point brought out at the Conference. In view of the many questions now being raised about the use of toxic chemicals on a wholesale scale in nature it is important that controlled burning be considered as an alternate measure. Techniques of controlling the exact area treated will, of course, have to be improved if controlled burning is to compete with herbicide spraying.

While no mention was made of fire as an aftermath of a nuclear attack, or other nuclear catastrophe, such a possibility, however remote, should be considered. We are told that the thermal blast from a nuclear explosion would be like dropping millions of lighted matches into the surrounding environment. Dry tinder materials would be ignited with possible large forest or grassland fires resulting, providing the kinds of fuels that could be ignited by a brief match flame are present. It would seem that vegetation subjected to regular controlled burning might be relatively safe from such hazards as compared with vegetation containing much litter.

The situation we now find ourselves in reminds me of the story of the stubborn mule. A man took this mule to a trainer and asked if the

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animal could be trained to do useful work. The trainer replied that he could indeed train the animal whereupon he began hitting the mule over the head with a large club. "Wait a minute," cried the owner, "I want you to train the animal not kill him. Don't worry," replied the trainer, "I will train him later but first I must get his attention!" Thus, I hope our Conferences have acted as a club to get the attention of the busy administrators who are beset with complex problems, so that a few dollars can be shaken loose for badly needed basic research on the effects of fire. The wonderful experimental setup here at Tall Timbers, and that described by Dr. Ahlgren in Minnesota, are examples of what needs to be done on a larger scale. Until our theories are tested experimentally no amount of discussion will be convincing.

In looking over the list of research projects supported by the National Science Foundation and other granting agencies, I am impressed with the lack of projects on basic fire ecology. There is no bias on part of these agencies; lack of basic research simply means that no one has asked for funds for well-planned work in this area. We need to attract young investigators into the field. Our current generation of ecologists is becoming increasingly better trained in basic science. I was delighted to see so many graduate students attending the Second Conference and hope that some of them will seek funds to answer some of the basic questions mentioned above.

Thus, I feel we are entering a second phase in the fire business. We have "clubbed" the public and the administrators into recognizing that fire should be considered as an environmental factor along with temperature, rainfall, photoperiod and the like. Now it is up to us actually "to train our mule" in the best long-term interest of mankind.