Fire, Research, and Education

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THE DIVERSE FIELDS of interest that are related to fire in nature are clearly shown by the range of disciplines present here today. As Conference Chairman, I would like to review certain lines of education and research connected with this interesting subject. The speakers at last year's Conference along with the able presentations of the last two days have given us a broad, detailed, though by no means complete cross-section of the many aspects of fire in nature and its use by man. To a mammalogist, who has become a fire ecologist by the sheer force of the impact of fire on vegetation and the mosaic of conditions so created, there is a seemingly unlimited number of interesting problems that need attention.

As an ecologist, and not as a forest, range, or wildlife land manager, I must realize that there is in nature no bad or no good fire—no beneficial or no catastrophic fire. These are human values and become of importance to the fire ecologist only from that viewpoint. His primary interest might be called the *why* of the conditions we see by fire use or by fire exclusion—both are of immense interest. To the manager of the land and the things of value to man upon it, this interest is primarily one of the *how* of fire use and fire exclusion, although to be proficient in the use of fire or to practice fire exclusion he, too, should certainly understand some of the reasons behind his actions and the results he obtains.

Basic to both, however, is fire itself. What is it? What is its environment? What is its behavior? Why does it begin? Why does it die?

What does it do? If we understand these basic properties then fire will be the slave of man and not his master.

Fire is related to many different disciplines. These have now become so specialized and it becomes most difficult to keep informed as to what fire research is being conducted and where. Various science disciplines appear to be as seperate satellites in orbit—all in touch with the earth and some with each other—but I sometimes fear the solar batteries so necessary for intercommunication are getting weaker.

Perhaps a personal incident will not be out of place. It will at least show how shallow orbited, or at least how specialized, my own satellite had become. This past year an attempt was made to visit most of the Forest and Range Experiment Stations of the Forest Service in the Northwest while conducting fire ecology studies of my own. Time was not available to make more than a brief visit at most. Information relative to the Fire Laboratories had somehow given me the impression that they were conducting studies only for fire control. Upon visiting the Fire Laboratory at Missoula, Montana and being shown around by Mr. Alan Ray Taylor, and chatting a bit with other members of the staff, I was tremendously impressed not only by the physical completeness of the laboratory but by the young scientists themselves. I still cannot pass a tree struck by lightning without a careful check to see whether or not the bolt had caused two streaks. But there, so many miles from home I learned of some of the studies going on at Macon, Georgia—slightly more than a hundred miles from here. The fact that the Southern Fire Laboratory has had three very able speakers on the program of this Conference speaks for the importance of these laboratories in basic fire research. I urge all of you to visit one of them at your earliest opportunity.

The influence of fire on vegetation and on plant succession is coming under more scrutiny, and detailed research is appearing as never before from many agencies. The Forest and Range Experiment Stations of the Forest Service, along with cooperating agencies, have been concerned with this subject for many years. Although their publications have had to be mainly concerned with management of forest and rangelands there are many papers of much interest to the fire ecologist. These should also be of interest to *any* biologist interested in biological problems in nature. We are fortunate here in the Southeast

in having two of the finest of these stations. If the studies of the Southern Forest Experiment Station had had the same popular coverage as that of another division, the science and art of fire ecology would be much farther ahead than it is now. Only a very few universities have conducted studies in fire, these largely by schools of forestry. Some of these studies go far back into the early controversial period.

However, in my personal opinion, the greatest lack of understanding and research on fires as a part of the environment of both plants and animals has been, with few exceptions, in the science departments of most of our universities and colleges. In the biological sciences particularly, the teaching, the publications, the research, as well as the attitudes of those teaching, has been to either totally ignore fire as if it were nonexistent in nature, or to condemn fire and blame it entirely on the bad habits of man. Until quite recently, that these departments, science departments, should close their eyes to such a natural factor as fire in the environment, seems nearly unbelievable, but the record is clear. We cannot justify their attitudes simply because some agency over-sold or over-advertised its viewpoint, for they presumably are not to be influenced by such propaganda. Much reeducation of the public mind on the place of fire in forestry, range, wildlife, and other land use has become necessary because of this.

I must admit, however, that there is a great gap in information available to teachers between technical journals, which in most cases now have a specialized "jargon" of their own, and Smokey Bear who also has a language of his own though more angled to emotion than fact. However, the many requests for the Proceedings of the first Conference from the many university departments of zoology, entomology, botany, geography, as well as schools of forestry and wildlife management are indeed gratifying. Even more gratifying is the presence at this Conference of groups of students from several such departments of three universities—and more would have been present had facilities been available. The climate for unbiased education and research on fire, as well as for realistic policies of various agencies has improved considerably.

The impact of fire propaganda in the past has also left its mark on the many and diverse natural resource conservation groups over the country. Because of this, many agencies concerned with the protection, preservation and use of many areas wish to use fire in the

maintenance of certain types of vegetation and animal life. Others wish to allow the lightning caused fires, which in many instances created the very values for which an area was set aside but dare not do so for fear of public reaction. One cannot blame public attitudes when for over a generation the public has never been told that fire, in many cases, is a necessary part of the environment.

Perhaps what is needed is best illustrated by what has been done by the Park Board responsible for the protection and maintenance of the Kruger National Park in South Africa. Detailed and complete studies, without bias for or against the use of fire, have been made and are being continued. On the basis of these data, common-sense plans have been made for the maintenance of fire type grasslands so necessary for the large herds of mammals for which the park was first established. This includes the use of control burning in addition to the frequent wildfire caused by lightning. There is also provision for fire exclusion in many sections of the park, to protect and allow to develop interesting and unique non-fire type vegetation and animals, or those requiring a different frequency of fire. The bulk of the controlled burning is on a three year rotation. The public is kept informed through their magazine *Koedoe* on the detailed plan and necessary changes as they occur. There is no attempt to insist on either a policy of fire exclusion or on the use of fire except as studies and common sense dictate.

I believe that we need just this kind of approach here in this country in connection with our natural areas. It is just as important to protect the subtropical hammocks of the Everglades as it is to allow lightning caused fires and additional fires to perpetuate the glades and the pine types. The hammocks should be protected from fire by every manner necessary and if a fire-break jars some sentimentalist let it be, for it takes some 200 years or more to develop a unique sub-tropical vegetation.

The same type of reasoning should be applied to the place of lightning caused fires in wilderness areas, particularly in the West. If it is a unique and rare area, and can be protected from fire so that catastrophic fires do not destroy it, then protect it by whatever means are necessary including roads. In other areas if they are not of unique distinction let lightning go its way, even to bare rock, for at times that is nature's way. There may be places, such as wilderness areas,

where it may be necessary to assist lightning fires with controlled burns so that unique plant and animals can exist.

As our people become more urban, and fewer people live in rural regions, there is a continued, growing interest in the outdoors. I think this is good. However, as we make plans for this increased use let us also use common sense in taking care of this increasing group. No self-respecting woodsman or outdoorsman, for example, is going to pitch his tent in a 10 to 20 year rough here in the South in the summer. Why should we place these unsuspecting city people in situations avoided by the seasoned camper who has learned by experience that redbugs and ticks are more tolerable on burned land. Why not use fire, not only to keep these things under control, but also to let the air circulate so that such campsites provide a more pleasant environment for the camper?

Other questions also come to mind. Are the mosquito and other pest problems in our coastal areas of our own making? Is fire exclusion in our marshes changing certain ecological conditions? I do not know. Where are the studies to show us the way? I do know that investigators in Canada have found that black fly larvae do not reproduce as readily in waters from burned areas as they do in unburned. The Eskimo and the Indian have long contended that such was the case. Surely the problem of pest control along our southern beaches and coastal cities is worthy of such study. Once the marshes were burnt regularly, but where are they who know all of the ecological answers concerning our marshes?

The possible cause of the tremendous insect and disease attacks in certain forest areas where fire has been excluded for a long time over vast areas could be that the ecological conditions created by such fire exclusion has made conditions more favorable for the destructive insects and disease and thereby impair the health of the forest. Perhaps this is just another facet of nature's plant and animal succession. What happens to insect populations when vast areas are protected from fire for a long period of time so that we lose the mosaic of vegetation created by fire of varied frequency and intensity, and which is so noticeable to any investigator from the tundra of Alaska to the subtropical hammock of south Florida? I would be remiss as Chairman, with so many students present, not to at least mention certain types of studies that can be carried out in the laboratory or in the field.

Here in the Southeast because of our soils, types of vegetation and climate, plant succession is most rapid and thus easily studied. As a personal example, covered more fully elsewhere, I may mention quadrat studies carried on by my wife and me a number of years ago. The rapid rate of plant succession is perhaps best illustrated in the following quotation from a published paper:

> In one of our quadrats in an open pine woods with a broomsedge and herbaceous ground cover we had a fair population of Cotton Rats. This area was then protected from fire for four years. As the ground cover changed to low bushes and tangles of vines the Cotton Rat population decreased, although on check quadrats it did not. At the same time the Golden Mice (*Peromyscus nuttalli*) and Cotton Mice (*Peromyscus gossypinus*) increased. The same changes occurred in old sedge, which, in the absence of fire, began to be replaced by dense growths of young pines and deciduous bushes. Redbugs and ticks increased on the rodents on the unburned plot.

In another experiment we took a four-acre field of thick broomsedge, trapped and marked the Cotton Rats in it and then released them. We secured the area with a wide fire-lane and with additional help stationed around the firebreak, we set fire to the area on a dry and windy day. To our surprise, of the fifty-two rats only six were caught or seen on the fire break. Close scrutiny did not find any dead animals. The field was then ploughed with a bush-bog harrow. In this manner we retrieved most of the Cotton Rats and none were harmed by the fire. All had apparently taken refuge in shallow "pop holes."

Another test with fire showed that Oldfield Mice were much more adapted to fire conditions than a feral population of House Mice. I would like also to point out that the coloration of many of our grassland mammals are of a blackish and grizzled olive color. This, I believe, is protective coloration for existence in burned grasslands. After a fire, several months may elapse before the vegetation is high enough to give protection from raptorial birds and they are therefore vulnerable for this period. These species do not burrow to the extent that the rodents in more arid climates do; most utilize surface nest and shallow "pop holes." Mr. Stoddard has also pointed out the protective coloration of some birds in the same manner. I should like to stress the importance of Mr. Stoddard's remarks on the habits of migratory

birds where their fate can be decided by the lack of proper habitat either during migration or on the wintering grounds.

There is much to be learned of the ecological relationship of insects in general to fire as well as insects of economic interest in the forest. Some few years ago I collected some specimens of a hair-streak butterfly. I soon learned that somehow its life history is not only dependent upon burned pine land, but directly on a period of time after burning. Jersey Tea, one of the plants most frequented by this insect, blooms at a certain period after burning. It so happened on one of our pine areas at Greenwood that the same tract had to be burned in portions over a period of a few weeks. The butterflies were found only when the Jersey Tea bloomed at a certain period in the spring and this was correlated with the time of burning. The same behavior was found to apply the following year.

I want to point out also, that fundamental ideas and information can be gathered by anyone with good powers of observation—from the man on the land to the scientist in the laboratory. This corridor must be left open between them with each accepting the contribution of the other. In this world of statistical design and massive computers it behooves me to call attention to the basic discoveries made by careful observation. Perhaps one particularly important example should suffice for those who are interested in fire—Darwin's studies leading to the basic theories of evolution and natural selection. These were based on the close observation of many natural experiments around him, carried on over a long period of time. These experiments, whether in the laboratory or in the field, nature still conducts all around us—need more be said?