

Fire and the Changing Wildlife Habitat

ROY KOMAREK

Tall Timbers Research Station

FIRE, almost without exception, has appeared in wildlife conservation literature as a destructive agent. Yet, when fire is excluded, changes take place in the plant environment. The result of such changes has been known to starve out game populations and, in effect, destroy wildlife habitat. Through so-called educational media, the destruction illustrated by the charred remains of a burned out forest, has become a familiar picture to all. However, that the destruction of habitat through the natural changes in plant composition, that is, ecological plant succession which occurs in the absence of fire, may result in serious reduction of wildlife populations over large areas is not so well appreciated except among professionals who attend conferences such as this.

Wildlife has a strong, public appeal and conservation campaigns, particularly those of forest interest, frequently use wild animals to capture public attention, and such slogans as "Fire Destroys Forest and Wildlife" have been widely used for promotion purposes. Colorful posters carrying this message leave the impression that wildlife lives happily in the forest, and certainly no one, least of all the uninformed traveling public, would suspect that the developing forest might be choking off the food supply of some wild animal. This tying of wildlife to forest creates the impression that wildlife habitat has infinite stability, but a little study should convince anyone that the plant life which constitutes wildlife's environment is always changing, more or less, for better or worse.

ROY KOMAREK

The management of wildlife, basically, is management of the vegetation upon which it depends for its existence. Where the vegetative pattern develops beneficial characteristics, wildlife prospers, but when environmental patterns acquire detrimental characteristics as a result of ecological plant succession, wildlife suffers. The effect of change in vegetative pattern on a game species is clearly demonstrated in the following quotation where Durward Allen and L. David Mech (1963) write concerning the moose herd in Isle Royale National Park:

Murie and Hickie recommended immediate reduction of the herd. If it were not done, Murie said, "the moose will begin to be eliminated by disease and starvation." His prediction was borne out; the Isle Royale moose died off to a low level.

A ravaging fire in 1936 destroyed large areas of forest, but it also produced some benefits. The big burn developed a new growth of brush-stage vegetation—ideal moose browse. The moose survived, and the herd slowly began to build up again.

Here a forest pattern had developed as a result of uninterrupted ecological plant succession with a consequent diminished food supply which ultimately brought about starvation conditions for the moose herd. Fire changed the forest pattern back to a vegetative pattern of brush which provided an abundant supply of food, and the moose prospered. This example indicates the conflict that often occurs between wildlife and forest. In many cases extensive areas of unbroken forest which result from the exclusion of all fire provide only marginal living conditions for many species of game. It also suggests the administrative problems which confront those in charge of government lands. One might ask, for example, will the Park Service now attempt through management, to hold the plant succession in the brush stage on the big burn of 1936 on Isle Royale, or will ecological plant succession be permitted to run its course toward a mature forest and again result in hardship to the moose?

The conflict between wildlife and forest is essentially ecological. Wildlife requires a pattern of diversified vegetation and this pattern must be maintained through management if wildlife is to succeed in numbers. Forest demands a full stand of timber with a closed canopy, an ecological condition wildlife tolerates but in which it may not develop to maximum. The result of this conflict and its relation to

fire is indicated in the following quotation from a paper by R. Y. Edwards *et al.* (1956);

Reforestation and fire protection are additional activities, controlled by foresters, which influence wildlife habitat. Any process which speeds plant succession speeds the succession of animals. Any process which perpetuates mature forests perpetuates species requiring these forests. One result of fire protection will serve as illustration. The care of vegetation in large parks usually falls to foresters. While fires are a natural phenomenon over much of Canada, there has been universal agreement that fire protection is necessary even in such "natural areas" as national and provincial parks. Some parks in Canada are world famous for their wildlife, and their establishment was due, in part, to the spectacular animals they contained. Most such parks were created before fire protection was effective, and when recent burns covered large areas. Their abundant wildlife was largely a result of fire having controlled vegetation in their favor. Fire protection since has been so effective that game ranges have decreased in size and quality in a number of important game areas.

Abundant statistics are available as to the number of forest acres burned by wildfire and the monetary losses suffered therefrom. One might well inquire, however, as to the losses wildlife has suffered as a result of fire exclusion, particularly on lands dedicated to wildlife.

While the conflict between wildlife and forest is often an outgrowth of an administrative fire exclusion policy, it does not necessarily follow that wildlife, forest and fire cannot get along together on the same land. Within a relatively short distance of where this group is meeting there are approximately 300,000 acres on which the primary land use is recreation, quail hunting. On Greenwood Plantation near Thomasville, Georgia, for example, it is not unusual to move thirty or more coveys of quail in the course of a day of leisurely shooting, and during the ten-year period, 1945 to 1955, timber sales approached a million board feet per year. Furthermore, two timber cruises made by the same professional forester at the beginning and end of this period showed more timber volume in 1955 than in 1945. This property has been control burned annually for at least thirty years. On Greenwood, an ecological condition is maintained favoring wildlife at some expense to forest. The ecological



Fig. 1. Annual controlled burning maintains optimum environmental conditions for the Bobwhite Quail in this south Georgia pine woods without destroying valuable timber. Note fire-suppressed hardwoods in herbaceous understory. A few years of fire exclusion here would release the hardwood growth and produce a brush-choked forest thus destroying the habitat of the quail. Greenwood Plantation, Thomasville, Ga.

condition for quail is prevented from degenerating by annual controlled burning and the forest canopy is maintained in open condition to permit the production of an herbaceous ground cover. So adjusted to fire are the many hardwood species such as Sweet Gum, Dogwood, Sassafras, Wax Myrtle, to name a few, that annual controlled burning in the late winter months merely prunes back the annual growth while the root systems remain vigorous. The exclusion of fire on this area for a period of less than ten years, thus permitting the hardwoods unrestricted growth, would change this highly productive quail land of beautiful, open park-like pine forest to one containing a very low, marginal quail population struggling for existence in a brush-choked forest. For all practical purposes ecological plant succession would have eliminated the quail by destroying its habitat.

Man, through the ages, has manipulated the vegetation in various ways to suit his needs, and the distribution and composition of the native plants resulting from his use of the land very often created a variety of habitats which supported an abundance of wildlife. The south Florida cattleman during the open range days, for example,



Fig. 2. Some thirty years of fire exclusion has produced this brushed-choked pine forest in south Georgia. Through destruction of its habitat, the Bobwhite Quail has been eliminated and the recreational value of the forest has deteriorated.

was dependent upon native grass for his existence but in his efforts to produce grass he was continually faced with the problem of eliminating the competing brush, a transient stage in ecological plant succession on the way toward the creation of a forest. Nature and the cattleman were at war for possession of the land and the conflict more or less stabilized in the cattleman's favor. The forest remaining was poorly developed with the brush in a sort of state of equilibrium and this made it possible for him to produce enough grass for a livelihood in cattle production. However, the pattern of well diversified and well distributed vegetation that resulted in many places from this conflict was of decided benefit to wildlife. The following discussion is concerned with that pattern with speculation on what might happen when the factor controlling such a pattern is eliminated.

The landscape of the Florida open range cow country as modified by the cattleman about thirty years ago may best be described as open. Native grasses were abundant and extensive areas solid in grass occurred with a scattering of much suppressed woody plants. These areas were locally referred to as "prairies." Herbaceous vegetation was reduced by grazing but a few legumes and other plants were

ROY KOMAREK

to be found in protected places. Sandhill Cranes were commonly seen, particularly about the grassy depressions where water stood ankle deep during the wet season. White Ibis, egrets and other species of the heron tribe were abundant and conspicuous. In many places the land rose slightly forming sandy knolls covered with thin grass and this provided an ecologically suitable condition for the Burrowing Owl which might be seen standing at the entrance to a hole in the ground where it lives. Low palmetto patches were abundant and well distributed throughout the area and these provided excellent cover for the Bobwhite Quail, Cottontail Rabbit and other wildlife.

The original pine timber had long since been cut and the remaining trees were thinly scattered though small groups called "pine islands" were seen here and there. Sparrow Hawks, Bluebirds and Screech Owls nested in the numerous dead pines, and insects, particularly grasshoppers, on which the Sparrow Hawks and other birdlife fed, were plentiful in the low prairie-like vegetation. Dome-shaped cypress heads, hammocks containing Live Oaks, Cabbage Palms and perhaps a few isolated pines were present in scattered numbers and brushy areas were found along water courses or were distributed in patchwork fashion where the combustible material was too thin to carry fire. Such areas provided food and cover for the White-tailed Deer and Wild Turkey which would have been more plentiful had it not been for the unrestricted hunting.

During the open range days the cattleman had no mechanized equipment so he had to rely on an age-old tool, fire, to prune back the woody vegetation each year. Some areas he burned early in winter to provide early grazing while others were left unburned for winter feed, and the two-year rough usually burned more severely thereby reducing the shading effect of the brush the following year. The practice of burning the range annually checked the vegetative growth and the brush was prevented from taking over the grass. As a result the whole landscape presented a picture of open, prairie-like country with abundant and well distributed food and cover for wildlife. To the tourist traveling through Florida at the time it probably looked like land thrown away, discarded and abused, but it had the necessary habitat requirements for many species of wildlife and they flourished.

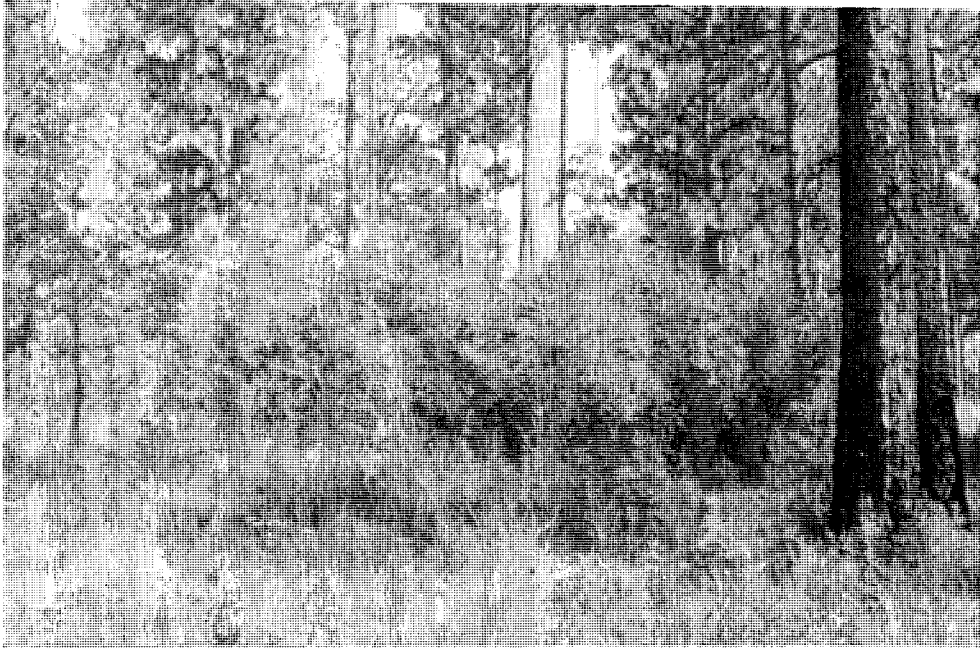


Fig. 3. A 6-foot fire lane made with a farm-type harrow in the annually burned, open pine woods permitted this brushy area to develop as a refuge covert for quail. Through the use of controlled burning at frequencies dictated by the food and cover requirements of the species together with temporary or permanent fire exclusion as needed in selected areas, the vegetation may be diversified and maintained to benefit a wide range of wildlife.

Now, it is an elementary observation that grass, brush and trees continue to grow if they are not mowed, cut, burned or otherwise disturbed. Yet, despite this ridiculously obvious observation, it is surprising that so many individuals, among them some students, fail to recognize that wildlife habitat is subject to change due simply to undisturbed plant growth, and many have little conception of the effect uncontrolled vegetation may have on wildlife populations. As has been stated, the use of fire by the cattleman provided the control of vegetative growth and this set the diversified pattern of grass, brush and trees which was attractive to wildlife. It might be well here, then, to consider what would happen if this control by fire were eliminated and speculate on how this pattern would be affected.

In the long growing season of south Florida, plant growth is rapid and in a relatively short time we can observe changes. If a good seed crop is in the pines, the seed will find good germinating conditions on the open ground grazed by cattle and where the grass was thinned by the annual fires. The pines are widely scattered but conditions are favorable so a good catch of seed is obtained in their vicinity,

ROY KOMAREK

and the young seedlings, particularly in the open areas, prosper in the absence of fire. The numerous and well distributed palmetto patches, once less than knee-high due to fire pruning are released. They thicken up, expand in area and may grow waist-high or higher. Similarly the brush-type vegetation, now continues to grow uncontrolled except by competition of the more vigorous species in its midst. The grass in the open areas is gradually smothered out by the shading effect of the young pines or the brush-type vegetation which the cattleman diligently fought and as a result the cattle carrying capacity is reduced to a very low point. The hammocks enlarge slowly and where the Live Oaks and other hardwoods form a closed canopy, an open understory may be present. Protected by water toward their centers, the cypress heads probably exhibit the least change except around their perimeters where in the absence of fire there will be additional growth.

Thus, with continued growth unchecked by fire, in ten or twenty years we find a completely changed vegetative pattern. Instead of a very open prairie-like original condition, with a variety of wildlife habitats, we have a pattern of more or less heavy brush vegetation and very much more pine forest development though the understory may be brush-choked. A heavy accumulation of litter has accumulated on the ground which is highly combustible, especially during the dry season. The Bobwhite Quail, Sandhill Crane and Burrowing Owl, are for all practical purposes gone, as are all of the songbird species whose habitat requirements call for open prairie-like conditions. The Wild Turkeys are greatly reduced if not entirely eliminated in many places. Only the deer and the few brush tolerant species of wildlife persist in any appreciable numbers. Thus we find many species of wildlife have been effectively reduced in numbers or eradicated through the process of ecological plant succession which resulted simply from the exclusion of fire. Wild animal populations are mobile and can move to areas more suitable to their environmental needs but when ecological succession destroys their habitat over a wide enough area they perish.

Land management where wildlife is concerned, if it is to be successful, must recognize the instability of the habitat and provide measures to maintain and control vegetative patterns once they have been established. Considering the wide range of native vegetation types which

FIRE AND WILDLIFE HABITAT

supported an abundant and varied wildlife and timber growth in the past, a pretty fair job of "management by uncontrolled fire" had taken place before the white man reached this continent. It is generally accepted that fire was at least one of the prime ecological factors responsible for this varied mantle of vegetation. It would not be surprising if a good, basic management program could be written for a large number of wildlife species simply by the judicious use of controlled burning coupled with the exclusion of fire where necessary to maintain a diversified pattern of vegetation.

LITERATURE CITED

- Allen, Durward L., and L. David Mech. 1963. Wolves versus moose on Isle Royale. *Natl. Geog. Mag.* 123:200-219.
- Edwards, R. Y. *et al.* 1956. Forestry and wildlife management—dual endeavours on forest land. *Forestry Chronicle*, 32:433-443.



Fig. 1. Typical Sonoran Desert vegetation consisting primarily of Palo Verde (*Cercidium microphyllum*), Bursage (*Franseria deltoidea*), Prickly Pear (*Opuntia* spp.), Giant Cactus (*Carnegiea gigantea*) and Ocotillo (*Fouquieria splendens*). In favorable years, as the one when this picture was taken, there may be a moderate ground cover of ephemerals.

Fig. 2. Tobosa (*Hilaria mutica*) swale on the Papago Indian Reservation in southwestern Arizona. Areas of this sort burn readily and fires must at one time have been the primary factor that maintained them as a pure grassland. The white-flowered annual forb is primarily Fleabane (*Erigeron*).

