Use of Fire in Wildlife Management

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MANIPULATION OF FOOD and cover to bring into useful association those conditions needed by a wildlife species for reproduction and survival, is a major objective in the field of wildlife management. Every acre of soil has a vegetative potential which is reached through successive stages. If the composition of the vegetation currently found on an area is below this potential, it will be displaced by the next in sequence, and that in turn by the next until the final or climax is reached. Climax alone is stable if undisturbed and represents attainment of full potential.

Depending on the present condition of the habitat and requirements of the preferred wildlife species, either disturbance or supplementation is required to develop or maintain suitable vegetative associations. Disturbance can be expected to move successions backward. How far, depends on the severity of the method used. Supplementation, on the other hand, can be expected to speed up successions. How fast, is largely a question of soil fertility. Plowing, burning, grazing, cutting and treatment with herbicides are common "tools" of disturbance. Planting, fencing against livestock, and protection from fire are supplementation methods for speeding up succession.

With only few minor exceptions, upland wildlife has a marked affinity for subclimax plant associations. This indicates that disturbance (whether wildfire, or other natural phenomena) has been a common occurrence throughout the vast reaches of evolutionary time. These creatures would never have survived the ages were this not so. If

we wish to perpetuate these wildlife species we must maintain the particular subclimax vegetation which is their natural habitat. In short, successful wildlife management today requires keeping subclimax associations in vigorous condition, high density, and proper composition. It also requires maintaining vegetation at proper height so as to be in reach of browsing species. Although there are several methods by which this may be done, it is the object of this discussion to review the use of fire as a "tool" of successional disturbance for maintaining and developing wildlife habitat.

BURNING FOR COVER

Probably the earliest planned cover control by use of fire was started by the gamekeepers on the moors of Scotland where Red Grouse and heather management are synonymous (Peterle, 1958). Heather, in which grouse thrives, is a second stage in succession—it follows an initial growth of grass, bracken, and moss. Density of the heather, as well as the successional sequence, is maintained by burning every 3-7 years.

Management of grouse cover in Michigan and Wisconsin requires the use of fire in interrupting successions at the proper subclimax stage. Three species of native grouse are under management, all of which have quite different cover requirements.

Following control of wildfires in the twenties, logged and burned lands in the Lake States became again stocked with timber species. For many years these lands supported good populations of Prairie Chicken and Sharptail Grouse. As the timber grew, the crowns came together with the result that food plants were gradually suppressed and finally almost eliminated. At the same time, fire fighting efficiency improved and fewer areas were burned to take the place of those which had closed in. Prairie Chicken range became sharptail country, sharptail country turned into Ruffed Grouse territory, and finally Ruffed Grouse territory became too dense for both birds and the hunters (Smith, 1947).

Although there is some overlapping of Prairie Chicken and sharptail habitat, each species has definite basic requirements. Prairie Chickens thrive best where woody cover does not exceed 25% (Amman, 1957). More important is their requirement for permanent grassland. Tree-free sweeps at least one half-mile long and nearly as

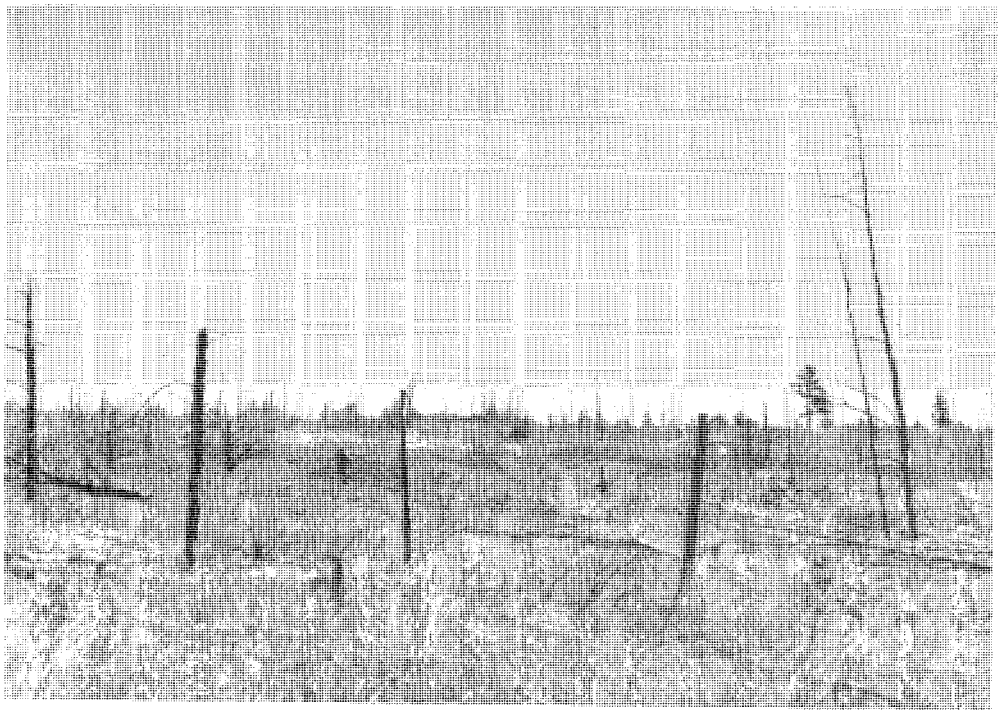
wide are essential for breeding range. Such qualities as height and density of grass are more important than species composition. Both brush invasion and height and density of the grass-forb association may be controlled by burning (Hamerstrom, 1957).

Sharptail do best where woody cover does not exceed 40%. Some describe this condition as semi-prairie (Grange, 1948). One significant requirement is that the woody cover be in scattered small groups, rather than evenly distributed. The most simple and efficient means of maintaining this condition against woody encroachment is controlled fire, selectively applied.

In the case of Prairie Chicken and sharptail cover, interference by fire stops the succession short of climax woodland. Other wildlife species have a greater affinity for woodland habitat. For these, fire maintains needed openings in the continuous forest canopy and controls the height and density of brush under the canopy.

Ruffed Grouse require both grass-forb and brush openings. Such openings should be distributed in a patchwork fashion in various degrees for optimum habitat. When the brush openings become too dense, fire is the best and most practical tool to return these to the grass-forb stage (Grange, 1948).

Fig. 3. Sharptail do best where woody cover does not exceed 40%. The most simple and efficient means of maintaining this condition is controlled fire.



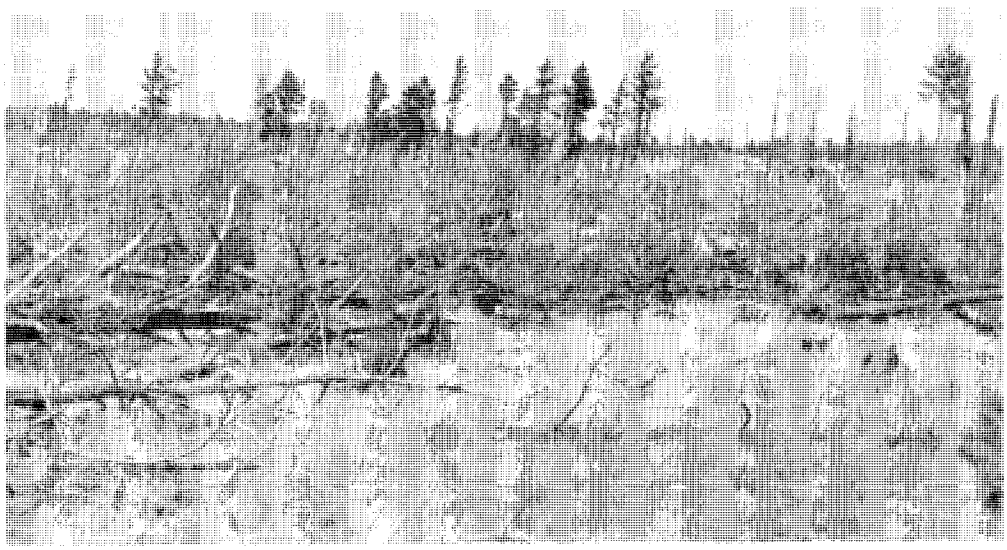


Fig. 4. Kirkland's Warbler habitat 6 years after fire, just becoming breeding habitat.

Grass-forb openings are likewise required for the management of the Eastern Wild Turkey (Wheeler, 1948). The principal difference is that turkey openings should be larger—sufficiently large so that a good supply of insects is available for the young poults. Openings of one quarter acre are suitable for grouse, two to three acres for turkey—distributed in patchwork fashion. Another requirement of Eastern Wild Turkey habitat is that a portion of the range be in park-like mature timber, having an "open" understory. In the southern pine types, for instance, this understory condition can be developed and maintained by use of fire—under the trees (Stoddard, 1962).

On the Huron National Forest in Michigan, burning is planned for a unique purpose—preservation of Kirkland's Warbler habitat (Anon., 1961). Kirkland's Warbler is a rare, vanishing species of wildlife. Its nesting habitat is restricted to the Jack Pine type in the Lower Peninsula of Michigan. Almost without exception, the warbler is found only in large homogenous blocks of pine varying from 5-15 feet in height and occurring in a patchy condition of dense stands interspersed with a near-equal area of small openings. The critical requirement of the species appears to be the presence of living pine branch thickets near the ground. Few, if any, warblers are found on tracts of less than 80 acres of this particular condition. Under natural conditions this type of habitat is produced only by forest fires.

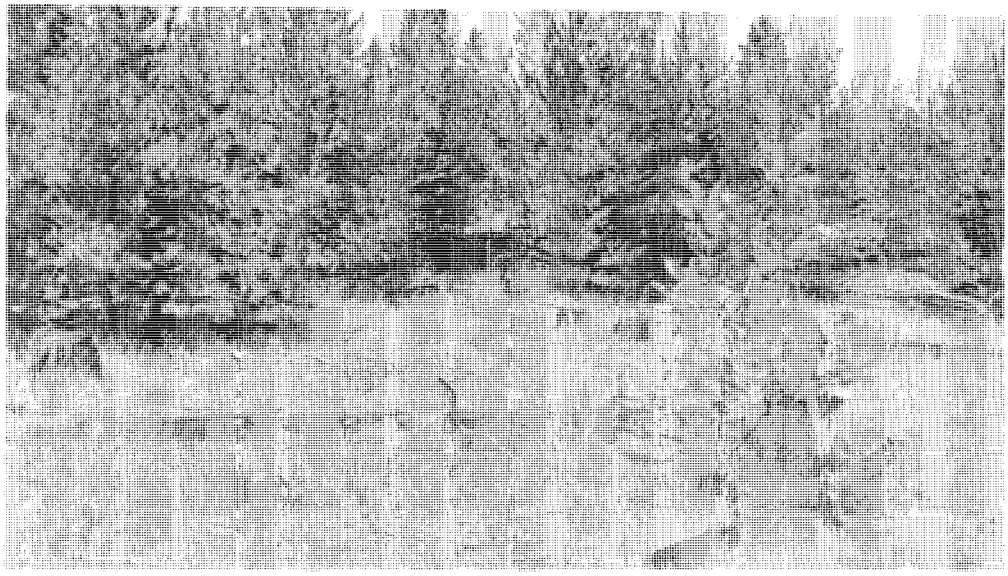


Fig. 5. Same area as in Fig. 4 but 9 years after fire, optimum Kirkland's Warbler habitat.

Management of the pine stands, for the warbler, will combine short cutting cycle management, prescribed burning and selective planting. Management in this fashion will replicate natural conditions without disastrous losses from wildfire.

BURNING FOR FOOD

In the case of the Prairie Chicken and sharptail, fire not only maintains proper cover conditions, but also promotes the growth of desirable subclimax food plants. Such species as Curly Sedge, Choke Cherry, Pin Cherry, Smartweed and Blackberry respond well to fire. Thus fire has a two-fold benefit.

Bobwhite Quail (Stoddard, 1962) and turkey (Wheeler, 1948) management in coastal plains pine forests require use of fire in maintaining desirable shrubs, forbs, and grasses in vigorous condition. This practice also benefits White-tailed Deer by pruning back the preferred browse species. Pruning by fire results in more succulent sprout growth at lower levels (Goodrum and Reid, 1958). Fire used in connection with Prairie Chicken and Sharptail management in the Lake States also has the same effect on overlapping White-tailed Deer range (Dahlberg and Guettinger, 1956). Thus fire used primarily for control of cover, also benefits food.

In the pine region of New Jersey, fire is beneficial in maintaining deer browse species in vigorous condition. Although burning at too

frequent intervals will eventually eliminate scrub oak when used for the purpose of increasing pine composition, nevertheless, scrub oak is a fire species and total exclusion of fire would do the same thing, in time. Season of burning and interval between burns are two factors which can be adjusted to favor deer management (Little *et al.*, 1958).

In Michigan, for example, fire has been used in off-site aspen stands to improve deer browse. It is estimated that upwards of 1600 pounds per acre of aspen winter browse can be produced by burning (Ryle and Foote, 1954).

Marsh burning is an accepted practice in management of the southern coastal National Wildlife Refuges (Givens, 1962). Burning removes dense marsh grass "roughs," thus exposing seed-bearing plants, such as millet and foxtail, to feeding by waterfowl. Burning also provides succulent sprout growth for browsing species of waterfowl such as the Canada Goose. Progressive burns in the Gulf Coast marshes supply fresh, succulent sprouts throughout the wintering period.

Burning in the Horicon marshes in Wisconsin accomplishes similar benefits to waterfowl habitat (Hovind, 1949). In addition to improving food supplies, the Horicon burning encourages development of needed potholes, through peat burns. Burning also retards the displacement of herbaceous marsh plants by willow-alder brush—worthless waterfowl habitat.

Mule Deer, Elk and White-tailed Deer inhabit the mountain regions of the West from the eastern slopes of the Cascades to the great plains. Their habitat consists of coniferous forests, interspersed woodland-shrub and grasslands. The most productive ranges are subclimax resulting from fires, logging and livestock grazing. Sagebrush invasions of overgrazed grasslands, and other shrub types, such as bitterbrush, which became established on cut-over and burned over pine forests, have extended the natural brush transition that formerly existed between forests and grasslands. Logged areas, and burns on the higher summer ranges, such as the extensive aspen type in the Rockies, support abundant weeds and browse. Thus, in the past, wildfires in timber types may have been beneficial to the big game herds. Uncontrolled fires on winter range shrub types, however, wipe out desirable browse plants, permitting invasion of inferior annual grasses and destroying soil and watershed. Large areas of

winter range have been lost by unwise burning of sagebrush and bitterbrush—key winter foods (Blaisdell, 1953).

In northern Rocky Mountain National Forest timber lands, fire is used in several ways to improve big game habitat. Prescribed burning following logging, to assist regeneration, frequently regenerates food plants and induces vigorous sprouting of browse shrubs. In oak brush types and chaparral species, fire is used to reduce the height of tall browse and promote seed germination. Redstem Ceanothus is one of the preferred staple deer and elk foods. Moderately hot fires are used to establish new crops of this shrub from seed. In some foothill areas, brush cover may be more important than low-grade commercial timber. Here, revegetation by browse species following fire on southern exposures improves the big game range (Hill, 1956).

The Black-tailed Deer, native to a narrow strip of terrain on the immediate Pacific slope of North America, makes productive thousands of square miles of chaparral brushland and woodlands where otherwise no species of big game mammal is found (Cowan, 1956). Its habitat in general comprises the Pacific coastal forest, where it is associated with the Roosevelt Elk, the coastal mixed woodland, which in turn grades into the chaparral and brushlands of California. Within this area, the Black-tailed Deer is closely associated with the early stages of forest succession. Primitive fire was the natural force removing the forest and reinitiating the succession so necessary to survival of the Black-tailed Deer. Closing of the resulting forest canopy reduces the quantity and quality of food plants and results in much lower populations of these animals. Studies have shown that Black-tailed Deer populations in virgin forests will increase twenty-fold where forests are set back by fire or logging (Dasmann and Dasmann, 1963).

Present-day west coast logging operations create patchwork-like clearcuts followed by prescribed burning for regeneration. For about ten years following these operations there is an abudance of shrubs and trees producing a palatable food of high quality. After ten years the range will start to decline, but for twenty years or so it is good deer range. Ideal deer range is achieved by leaving well distributed spots of various age classes, interspersed by old growth—for shelter. These patchwork-like clearcuts come close to this.

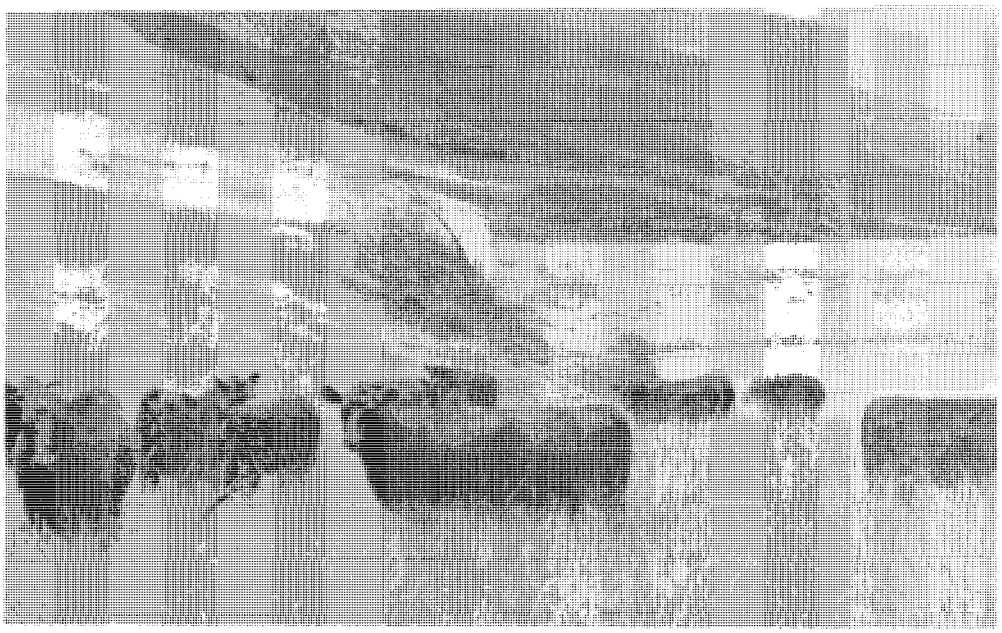


Fig. 6. Grassland, attractive to livestock and deer resulting from burning chaparral in Black-tailed Deer range.

A high percentage of the deer range in California is occupied by chaparral. Here, in solid brush types, herbaceous vegetation is scarce. Spot burning in chaparral benefits deer, as well as dove and quail. In planning brush burning, however, suitable cover must be saved. Studies indicate that around 50% of the area should be left in brush to serve as cover. Many areas with palatable forage remain unused if they are too far from shelter. If planned on a rotation basis and in proportion to the number of deer, spot burning provides proper interspersion of cover and forage. If burns are too large, they are wasteful in that brush on most of the area will grow out of reach quickly. Small burns, on the other hand, with brush acreage in balance with herd population will furnish herbaceous vegetation and palatable sprout growth for some time.

Removing chaparral from the steep slopes typical of the country is neither recommended nor advisable. However, wide ridge tops, moderate slopes and flat benches can be burned without damaging the soil and watershed. The Forest Service has developed a conversion program aimed primarily at changing chamise to permanent grassland on suitable sites (Reed and Bentley, 1960). Selected areas, on ridges and benches with moderate gradient and good soil are

prepared for burning by crushing the chaparral with a bulldozer. The crushed brush is then burned. Following burning, forage species are drilled in. As brush seedlings and sprouts appear they are over-sprayed with herbicides. The resulting grassland is maintained by conservative grazing—both livestock and deer. On adjacent slopes controlled fire is used to set back browse species to sprouting stages, thus offering an association of grassland, sprouting brush and cover that is beneficial to wildlife.

In the undisturbed boreal forest, moose habitat was confined to the muskegs and barrens associated with this simple forest formation. The arrival of the white man in the region, with his vices and devices of land exploitation started a set of ecological influences which, for the most part, were favorable for the moose. Fire was the most widespread of these influences (Leopold and Darling, 1953).

In Alaska, for instance, over 80% of the commercial forests have been burned in the past half century (Lutz, 1950). The quickened rhythm of fire generally favored the extension of willow-birch-aspen and encouraged the spread and local increase of moose. Eventually, the willow-birch-aspen subclimax will become hemlock-spruce —and poor habitat, unless measures are taken to halt the succession. Similar conditions occur in Newfoundland, except that the climax species are different (Pimlot, 1953).

Prescribed burning and logging offer the only hope for retaining large populations of moose. Logging under sustained yield management automatically works in favor of the moose—but only for a limited period of time. Keeping the willow-birch-aspen subclimax under a nine foot height, for moose, requires fire at 15-20 year intervals (Spencer and Chaletain, 1953). This prohibits the cover ever growing to commercial forest. To use fire in maintaining habitat requires basic land management decisions, particularly on commercial forest sites. For each specific area it must be determined whether moose or commercial timber has the greater public value.

Temporarily, management of old growth commercial forests will benefit moose where patchwork clearcutting is the accepted silvicultural system for regeneration. Following cutting, browse is plentiful on the clearcut areas and winter cover available in intervening uncut stands. Since moose does not exist in as high densities as some of the other big game animals, impact on timber regeneration should be

minimum. Intermediate cutting in second-growth forests does not appear to offer much in the way of releasing browse for moose.

EFFECT OF BURNING ON NUTRITION

Food quality, as well as quantity, is a major factor in determining carrying capacity of game ranges. A healthy and productive game population—be it birds or animals—depends upon year-round availability of an ample supply of essential digestible nutrients. Quality of vegetative portions of plants and, to a lesser extent, seeds and fruits, is influenced by age, vigor and soil. Age and vigor are variables which can be influenced by management techniques. Quality of browse portions of plants can be measured in terms of crude protein content. Under normal conditions this content varies throughout the year—high in spring and summer, low in winter. Assuming that a protein content of 5% in winter foods is vital to the well being of most ruminants, any treatment of browse species which would increase protein would be desirable.

Fire properly applied, increases crude protein as well as phosphoric acid. In the southern pine deer ranges, for example, burning increases protein content as much as 42% in preferred browse species, phosphoric acid 78% (Lay, 1957). Burning at any season will bring about these changes, but most of the benefits disappear in a year or so.

A similar response from fire may be expected in western deer ranges. Comparisons have been made between protein content of browse from newly logged and burned areas and that from scattered glades with more mature plants. The midwinter protein content from browse on the burned area was significantly higher (Einarson, 1946). This condition lasted about three years after which it returned to lower levels.

SUMMARY

The fact that fire can be enormously destructive when out of control should not preclude its regulated use in wildlife management. Fire, however, is not a cure-all for all habitat problems. Manipulation of vegetation for food and cover must be undertaken with a knowledge that vegetation is dynamic. It does not remain constant from year to year. Plant successions may be influenced by plowing,

mowing, burning, herbicides, planting, and protection against disturbance. All of these have certain capabilities and at the same time, limitations. For example, plowing is limited by slope and rocky character of the soil. Mowing, by slope and size and density of brush; herbicides do not remove suppressing litter—they increase it; fire is limited by slope and scarcity of combustible material. In short, whatever method is used must be carefully selected and wisely used within its capabilities.

Maintaining subclimax associations such as grasses, sprout aspen, and willow which have no commercial value requires a management decision on the part of the land manager. Where a multiple use charter furnishes management direction, habitat is a necessary part of the resource complex. Elsewhere, the value of a unique big game animal, for instance, moose, may from the land manager's standpoint exceed the returns from a commercial forest type, were it permitted to occur.

A decision to use fire should consider degree of wildlife emphasis by the landowner, habitat requirements of the preferred wildlife species, impact of fire on other resources, and efficiency of fires as compared to other methods.

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