

FROM FIRE CONTROL TO FIRE MANAGEMENT

By B.D.DEXTER.

Eucalypts are the predominant trees of the mountain forests of southeastern Australia. These forests are required to satisfy rapidly increasing community demands for timber, water, wildlife habitat and a wide variety of recreational pursuits. The aim of forest management is to provide and maintain these products and facilities for both present and future generations.

It is widely recognized that fire is a natural component of these ecosystems and that many of the native fauna are linked ecologically to the pattern of vegetation. Consequently, the conservation of the vegetation types and their associated fauna requires management practices involving the control of wildfire on one hand and deliberate use of fire on the other.

FIRE OCCURRENCE

There is no doubt that for thousands of years prior to European settlement fire was a regular feature in many of our forests although the frequency and intensity of these fires can never be precisely known. Direct evidence of their occurrence comes from charcoal in river deposits, charred wood in the ground and fire scars on tree stems. Indirect evidence comes from the historical records of early explorers and settlers, which contain many accounts showing that fire was common over most of the continent when European settlers arrived. It is also well known that the Aboriginal population used fire for cooking, for warmth, to provide game habitat and to drive game when hunting. Their influence was probably least in the mountain forests and greatest in the savannah woodlands, which were favoured areas for tribal living.

In the wetter forests where rainfall exceeds 1500 mm the coincidence of periodic drought and lightning activity probably resulted in a natural high intensity fire frequency of once every 30 to about every 350 years (Gilbert 1959). The succession of the eucalypt forest was usually assured under this regime. Since settlement, destructive fires have probably burnt these forests more frequently (Costin et al 1959). These fires have spread via the adjacent drier sclerophyll forests, from land clearing and grazing interests.

Lightning is still a major source of fires today. Forests Commission records over 15 years show that lightning caused 16 per cent of all forest fires in Victoria and in any one year the number can be as high as 28 per cent. Lightning is often accompanied by rain and cooler weather but periodically lightning-set fires can cause widespread devastation.

In the period 1961-65 lightning caused 565 fires which burnt over some 283,000 hectares despite the efforts of fire fighters to control them (F.C. Vic. Annual Reports). On the afternoon of 22nd December, 1972, 39 lightning-set fires started in the forests and several developed into major wildfires.

FIRE BEHAVIOUR

The hill and mountain country of south-eastern Australia is one of the most fire susceptible areas in the world. The fuels in the drier forests remain highly flammable for long periods over summer and often burn fiercely during the day and the night. During the hot, dry summers it is quite common for the moisture content of the litter to fall below 8 per cent and under severe conditions below 4 per cent. In these circumstances the fuels are very easily ignited and burn vigorously.

There is also a very high potential for serious fires to occur in moderate to large fuel accumulations that typically build up in many eucalypt forests. Fire behaviour in eucalypt forests is such that if the quantity of fuel available for combustion doubles so will the rate of fire spread, all other factors remaining constant (McArthur 1962) and, consequently, the rate of energy release or fire intensity increases about fourfold (Byram 1959). This feature is of particular importance because fuels are the one factor that can be altered by the forester as a significant aid to wildfire control.

Most eucalypt forests also have a high "spotting" potential, the phenomenon whereby burning embers, particularly from trees with fibrous, stringy or ribbon-type barks, are carried by wind and convection currents ahead of the main fire. Spotting distances up to 8 km are common with many high intensity eucalypt fires and wind and convection currents have been responsible for transporting embers up to 28 km ahead of the main fire front (For. Comm. 1965). The spotting

process therefore has a significant effect on fire intensity and rate of spread and consequently on fire suppression.

The normal pattern of summer weather, whereby the succession of high and low pressure weather systems bring in hot, dry winds from the interior of the continent, also brings periods of extreme fire danger. Once a eucalypt fire assumes conflagration proportions it is physically impossible, using, known means of suppression, to bring the fire under control whilst it is making a major run. On such days the fire must be either stopped in the first 15 to 30 minutes or the head fire allowed to run until spot-fire production ceases due to changing weather or fuel conditions.

FIRE CONTROL

It is of interest to trace the history of fire control in the Forests Commission since its institution in 1918, as seen through the eyes of the Stretton Report (1939).

The report states that although the Commission had the experience afforded by the severe fires of 1926 and 1932 and the benefit of the history of previous bushfires, until about 1935 it had no general and coordinated fire protection policy. It was not until about 1935 that officers began to formulate and record prevention and suppression plans. A Chief Fire Officer was appointed in 1937 to devise comprehensive and permanent plans of fire prevention works.

It must be remembered that the Commission had, and still has, some 7,000,000 ha of forests to protect including its own Reserved Forest domain of 2.3 million ha. Access in many of the mountain forests was severely limited and in the early days fire suppression was usually confined to those fires within a day's ride on horseback.

Following the disastrous 1939 fires in which 71 lives were lost, whole townships destroyed and the State's most valuable hardwood resource killed, the Forests Act was revised to greatly extend the powers of the Commission and its officers in the prevention and suppression of fires. In the following two decades great emphasis was placed on setting up a comprehensive fire detection and suppression network, the main emphasis being placed on greatly improved access, a network of fire lookouts for early detection of smokes and a small but highly trained work force equipped to combat forest fires.

FIRE MANAGEMENT

The vital role of fire in the protection and management of forests continued to gain recognition, but it was not until the early 1950's that the Commission entered the era of fire management, a technology which is still gathering momentum as fire scientists further research the effects of fire on the forest environment.

The forester, aware of the heavy damage caused by uncontrolled fire especially in young stands and the fire sensitive commercial species, was slow to utilize fire as a protection and silvicultural tool. However, over the past twenty years foresters have used prescribed fire for a wide variety of purposes.

In the severe fire environment of Victorian forests, fire control is recognized as the first essential aspect of fire management. Fire prevention rates equally highly and it is in this and the silvicultural field that great advances in technology have been made in recent years.

Low intensity prescribed burning

The development of the grid type of control burning in eucalypt forests was pioneered by McArthur (1962). McArthur developed a system of low intensity burning to reduce the hazard residing in large accumulations of fuel in sclerophyll forests. The technique has been further expanded in its usefulness by the development of aerial ignition from both fixed wing and rotary wing aircraft (Packham and Peet 1967) (Hodgson and Cheney 1970).

High intensity prescribed burning

This aspect of fire management has been used for many years especially in association with site preparation for afforestation with exotic species.

Research into the silviculture of the eucalypts has shown that the wet sclerophyll and sub-alpine types are fire climax species and in the absence of fire do not regenerate naturally. Ash bed seed beds prepared by firing the slash remaining after harvesting provide the necessary conditions for reforestation of cut-over areas. To facilitate broadcast burning of the slash a system using electrical

ignition of pre-set incendiaries has been developed for firing difficult fuel types. This reduces the hazard of high intensity burns in these fuels and more advantage can be taken of suitable short term weather conditions in high rainfall areas.

The role of fire in park management

It is only recently that literature on fire as an ecological factor has been concerned with prescribed burning as a means of vegetation management, recognizing that wildlife landscape management is primarily the manipulation of vegetation for wildlife benefit. (Ashton 1969, Butcher 1970, Christensen 1974, Ealey et al 1969, Heislors 1973, Kimber 1974, Leonard 1974, Recher et al 1974, and Turner 1974.) Most of this literature, from which guidelines on the use of prescribed burning for habitat management can be inferred, deals with the drier sclerophyll forests. Considerably more research is required as a basis for fire management in park areas situated in the wet sclerophyll and sub - alpine forests in south-eastern Australia. Occasional high intensity fires are an integral part of these environments.

The objectives of park management are mainly to preserve and perpetuate the "naturalness" of the areas. Consequently, periodic high intensity fires are an important tool for maintaining vegetation in seral stages necessary for natural wildlife populations. The problem confronting resource managers is how to maintain the preferred complex of vegetation and associated fauna without severe and widespread destruction of scenic and forest values in what is essentially a fire landscape. Such problems are readily overcome where the forests are harvested commercially because the regenerative techniques applied recycle the desired environment. However, in national parks, where site disturbance is usually kept to a minimum the problems have yet to be solved.

These problems have been recognised, particularly in the U.S.A., where in the late 1950s and early 1960s fire suppression policies in national parks began to come under increasing scrutiny (Boardman, 1967; Murphy, 1967; Hendrikson, 1972; McLaughlin, 1972; and Habeck, 1973). Research was pointing out vegetative changes that were resulting from exclusion of fires. In 1963, the so-called Leopold Report summarized these ecological changes and proposed measures that resulted in the formulation of a revised fire policy for the national parks.

The first areas in the U.S.A. to come under consideration were the Sequoia forests. From a description of these forests given by Hartesveldt and Harvey (1967) it appears that some of the main silvical requirements are generally similar to those of the wet sclerophyll eucalypt forests. It is therefore of interest to examine the fire policies being applied to these forests.

The fire management policy for Sequoia and Kings Canyon and Yosemite National Parks has been outlined by Murphy (1967):

"The presence or absence of natural fire within a given habitat is recognised as one of the ecological factors contributing to the perpetuation of plants and animals native to that habitat.

"Fires in vegetation resulting from natural causes are recognised as natural phenomena and may be allowed to run their courses when such burning can be contained within predetermined fire management units and when, such burning will contribute to the accomplishment of approved vegetation and/or wildlife management objectives.

"Prescribed burning to achieve approved vegetation and/or wildlife management objectives may be employed as a substitute for natural fire. "Any fire threatening cultural resources or physical facilities of a natural area or any fire burning within a natural area and posing a threat to any resources or physical facilities outside the area will be controlled and extinguished.

"The Service will co-operate in programs to control or extinguish any fire originating on lands adjacent to a natural area and posing a threat to natural or cultural resources or physical facilities of that area.

"Any fire in a natural area other than one employed in the management of vegetation and/or wildlife of that area will be controlled and extinguished. "Wildfire, or any fire burning on Park Lands must be under surveillance and subject to control if deemed necessary."

Kilgore and Briggs (1972) draw attention to some important aspects of fire behaviour in these parks, which range over elevations of 496 metres to nearly 4,495 metres.

The so-called "let-burn" zone in the Sequoia and King's National Parks amounts to nearly 70 per cent of the 338,000 ha in the parks, most of which is above 2,790 metres. Naturally occurring fires at these elevations usually behave differently from those burning at lower elevations. High elevation fires

commonly spread slowly, rarely crown into and kill overstorey trees, and are usually far less intense than fires at lower elevations. Also, high elevation areas of these parks contain many natural firebreaks.

These factors are obviously in sharp contrast to the Australian scene where very intense fires can occur throughout the wet sclerophyll and sub-alpine forests.

Management alternatives

Heinselman (1970) in discussing the management of ecosystems which owe their composition and structure to periodic wild fires lists three general management alternatives where commercial logging is excluded:

- "(1) We can continue to suppress fire and force a totally new and uncertain sequence of successional changes in the plant and animal communities,*
- (2) We can reintroduce fire into the ecosystem by prescribed burning or by changing wildfire suppression practices,*
- (3) We can abandon the concept of natural ecosystems and turn to mechanical vegetation manipulation using the tools of applied forestry."*

The most attractive and feasible form of management in parks within wet sclerophyll eucalypt forest would appear to lie within the second alternative if our objective is to perpetuate, with least disturbance, the biotic associations.

Problems of fire management

The problem of maintaining fire in wet sclerophyll eucalypt forests is new to park management in this country. High intensity fires will be required for the maintenance of these ecosystems.

A great deal of experience has been obtained with fires of this nature in wildfire suppression and in prescribed burning for regeneration of clear felled forest. However, the deliberate ignition of high intensity fire for habitat management has not been attempted on any scale. At present it is not envisaged that wildfires will be deliberately allowed to burn, either wholly or partially unchecked, for habitat management. From the foregoing sections it is clear that the risk involved under the vagaries of weather and high fuel accumulations characteristic of the forests is unacceptable to the community. Commercial forests, communities and property on the periphery of parks must be protected from fire and the safety of park visitors must be assured. It is inevitable that wildfire will occur in these areas and in spite of the best suppression measures will occasionally burn significant areas. However, it cannot be assumed that the frequency, location and extent of the burns will meet the objectives of park managers. Also, unplanned fires are least likely to satisfy architectural landscape requirements even though they may satisfy wildlife landscape management.

It is expected that in the future, parks and reserves in these forest associations that are not subject to commercial cutting will occasionally require prescribed high intensity fire as an integral part of their overall management.

The deliberate introduction of high intensity fire will require intensive planning and skill in execution and must only be carried out by professionally competent people.

CONCLUSIONS

Fire has been an important force in the ecology of the eucalypt forests for thousands of years.

Prescribed fire is an indispensable management device for site preparation, fuel reduction, regeneration of desired tree species and for the maintenance of vegetation in seral stages necessary for natural wildlife populations.

Because of the severe forest fire problem the protection of forests from wildfire is of paramount importance and it must be the primary responsibility of resource managers to extinguish wildfire as quickly as is practicable with the available resources and under the prevailing conditions.

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