

## VICTORIA'S FORESTS AND MAN

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### INTRODUCTION

The forests of Victoria cover one third of the State. They offer a wide variety of ecosystems for man to study and enjoy. They protect water catchments upon which cities and towns, farmland, and industries depend; they provide a supply of wood and other products; and they provide diverse habitats which are a haven for native animals. Mountain forests occupy about 800,000 hectares of the cool, high rainfall areas of the mountain country. On the highest ranges and high plains (above 1,300 metres elevation), sub-alpine woodlands are interspersed with grassland, herbfield and marsh. On less exposed slopes adjoining woodland, extending down to 1,100 metres and as low as 730 metres on southerly aspects, tall pure stands, mainly of alpine ash, occur. Mountain ash grows at lower elevations on deep fertile soils and sheltered sites. Mixed species forests, comprising stringybarks, peppermints, silvertop, and various gums, cover about 5,000,000 hectares of coastal plains and foothills north and south of the Great Dividing Range up to elevations of 900 metres. Red gum forests, covering about 300,000 hectares, occur along the flood plains of the Murray River and other rivers and watercourses throughout the State. Ironbark and box forests occupy about 400,000 hectares mainly north of the Great Dividing Range, on poor soil types in regions with low rainfall and hot dry summers. Low woodlands, mallee woodlands, and mallee heathlands cover about 500,000 hectares of the arid Murray Basin plains in north-western Victoria.

The present forests of Victoria are the result of complex interactions between the physical environment and historical factors such as the activities of man. Before the arrival of European settlers, the main influence of man was probably the use of fire by the Aborigines for hunting. The European settlers had access to foods and technology which made them less dependent on the natural environment than were the Aborigines but their activities and those of their followers and descendants became a dominant influence on the forest ecosystems.

Modern man is greatly affected by the balance which he strikes between present forest use and provision for future needs; between use of the forests for raw materials for industry and use for aesthetic purposes; and between intensive use and maintenance in the natural condition for passive uses. These problems develop as the intensity of the various uses increases and they come into competition with each other. Such problems are being resolved principally by recognition of the different primary capabilities of sectors of the forests, by constraining some uses to prevent them from coming into conflict with others, and by managing compatible uses together wherever possible.

This chapter begins with an historical account of the use of Victorian forests since early European settlement, with special reference to the changing needs



of man from the time of settlement until the present day. It then describes the present forest resource available to man and the way this resource can be managed to ensure that forests may satisfy man's present needs and provide for his future.

## HISTORICAL OUTLINE

### Early settlers

To the early European settlers the bush was the enemy, brooding sombrely over their brave attempts to master an alien environment. The bush crowded in on them in times of drought and flood, and mocked their weaknesses by its own ability to withstand the extremes of nature. This apparent antagonism of the forest, combined with their longing for the "old country", blinded many of the pioneers to the peculiar enchantment and beauty of the Australian bush. They found the colours and shapes of the trees very strange and had difficulty in using them in their houses and farm buildings.

The earliest descriptions of the forests are poor and fragmentary, often being expressed in terms of an evaluation of their potential for pastoral use. The early literature makes frequent reference to the park-like condition of the forests. Journals of explorers indicate that they were able to travel through much of the forest, either on foot or with horses and drays, without the need to clear tracks. There were exceptions to this pattern. For example, the eucalypt forests between Port Albert and the Erica-Walhalla district were wet and dense, being termed "the big scrub" by those who traversed them. Records indicate that the undergrowth in these forests was of a density almost unmatched elsewhere in Australia.

The original vegetation of Victoria is described in an article written by the Victorian Government botanist, Ferdinand von Mueller, in 1861, titled "The

Vegetation of the Colony—especially in reference to its resources”. Although not detailed, his description gives an idea of the extent and richness of the forests before the period of settlement after the gold rushes. In brief he refers to many sub-tropical forms of vegetation existing from the extreme south-east of the State to Lake King in the Gippsland Lakes. East of Orbost the dominant eucalypt species gave way to rainforest vegetation characterised by umbrageous, dense, horizontal foliage, adorned with vines and masses of parasitic plants. Eucalypt dominated the forests at the higher altitudes although trees were smaller above 1,300 metres and above 1,600 metres only existed in sheltered pockets. The rainforests of the east were again present in south Gippsland, spreading eastward from Westernport Bay, covering most of the Strzelecki Ranges. The south-western portion of the Australian Alps (Otway Ranges) was dominated by myrtle beech and dense gullies of tree-ferns. These tree-fern gullies extended from the Hopkins River in the west through to Gippsland. The “desert” country to the north and west of the State contained various shrubs and pasture grasses, and a great variety of salt bushes. Large tracts were covered with Mallee eucalypts, interspersed with areas of *Callitris* pine and *exocarpus*. Red gum grew along the dry creek beds. Between the desert and alpine areas lay gentle mountain tracts and lowlands, dominated by eucalypt forests often interrupted by heathland and swampy depressions. Von Mueller saw the potential of these forests:

“by those hills and vallies lie the golden treasures on which the continued rapid development of our industry so materially depends.”

The pattern of the original vegetation was related to climate, soil, and fire. It is certain that lightning was a natural cause of fires, then as now, and that lowland forests were frequently burned by the Aborigines. It is also certain that the entry of Europeans into the Victorian forest environment has had far reaching effects, with the extent and condition of the forests undergoing a massive change since colonisation began. An indication of this change can be gained by comparing the maps facing pages 4 and 6 which show, respectively, the forest area of Victoria during the early days of settlement and at the present time.

The major impact of European settlement on Victorian forest began in 1836 when Victoria was part of New South Wales. The Government of New South Wales passed an Act which allowed squatters to occupy land for payment of a fee of £10 per year. Pastoralists moved south from the more settled regions of New South Wales and, by 1844, almost three quarters of what is now Victoria was held by the squatters. Naturally, the areas that first attracted the settlers were the grassy plains and open woodlands of the central, northern, and western areas of the State.

This migration of pastoralists marked the beginning of an era of destructive exploitation in Victoria's forests. Trees were regarded as a nuisance and a hindrance. The majority of settlers were pastoralists who showed little feeling for the bush; their sole ambition was to “make a do” on the land, running as many sheep to the acre as possible. As a result, trees were extensively ring-barked in the expectation that more grass would grow, and in many areas a dreary, treeless landscape was produced.

On 1 July 1851, Victoria was proclaimed a separate Colony, being at that time a pastoral settlement with a population of 77,345 persons\* recorded at the 1851 Census. At about the time of proclamation, gold was discovered and this marked the beginning of a period of rapid population growth. By the Census of 1854, the population had reached 236,798 persons,\* and by the Census of 1857 it was 408,998 persons.\* The Victorian Government was conditioned to the needs of the mining industry, and as timber was a necessity to enable that activity to function, virtually no restrictions were placed in the way of its

\* Excluding Aborigines.

easy and cheap procurement. The forests adjacent to mining operations were soon denuded of merchantable timber, and it was only because of the necessity of going further afield for pit props, laths, and other wood necessities for the mines, that any thought was given to the reservation or protection of forests.

The spirit of forest destruction engendered by the early pastoralists and the mining community subsequently became a characteristic of the settlement period after the gold rushes. As the gold began to peter out, forest areas were leased to settlers who destroyed them with axe and fire (clearing of the forest was often included as a condition of the lease). Between 1867 and 1894, 8,546 of the 10,733 hectare Dandenong State Forest were opened up by selectors. A report dated 1887, referring to the valuable Cape Otway Forest, stated:

" . . . . . owing to the pressure brought to bear on the Minister (for Lands), the whole of this fine forest, with exception of Otway parish, was recently thrown open . . . . The majority of the selectors have not seen the land . . . . ".

The results of this action were soon apparent, for in 1910 it was noted that:

" A marked feature of this district (Cape Otway) is the wilderness of inferior growth and scrub, the result of partial clearing by fire, which is taking the place of the great forest of blue gum and ash which once occupied it . . . . ".

Similarly, what was once the Great Forest of South Gippsland, roughly 5,180 square kilometres of dense, valuable mountain ash and blue gum forest, extending eastward almost from Westernport, and covering most of the Strzelecki Ranges, was cleared by axe and fire for conversion to dairy farms. The hill farms on precipitous slopes at the eastern end of the range were abandoned to revert to bracken and scrub. A comparison of the maps facing pages 4 and 6, respectively, clearly shows that the instances of destruction described above were not isolated cases. The clearing of the forest was State-wide.

Extensive use was made of fire for clearing selections, and it was often left to burn out of control in the forests and scrub of the back country. Early in 1851 the country was "dry almost to whiteness", but selectors took advantage of the abnormally dry conditions to "get a good burn". Fires roamed the countryside, while five weeks of thirsty winds and high temperatures made the bush tinder dry. Apprehension grew sharply as the fires became threatening and on Thursday, 6 February 1851:

" . . . . . there was terror in the very dawn . . . . temperature 117°F. in the shade at 11 am. in Melbourne . . . . blistering winds . . . . the whole territory may be said to have been on fire, from the north-eastern border to Mt Gambier, and from the coastline to the River Murray . . . . ".

Bushfires were a scourge of the young State, causing widespread damage in 1886, 1898, 1901, 1906, 1913, and in 1919, when 48,600 hectares of forest were devastated. It was a reflection of the general attitude of the community toward forest values that the majority of fires which caused so much damage were deliberately lit.

In these early years the exploitation of forests was not confined to the squatters and selectors; it was also common among the timber splitters and sawmillers who derived their livelihood from timber harvesting. During the early period of settlement the resources of timber in the Colony must have appeared almost unlimited in relation to the demands being placed on them. As is often the case when natural resources occur in apparent abundance, this led to virtually uncontrolled exploitation of the resource. For many years timber was cut under a system of licences at fixed rates per quarter, there being no restriction on quantity, kind, or size. Subsequently, the licensing system



## DISTRIBUTION OF FOREST TREES

## REFERENCE

Stringy Bark ( <i>Eucalyptus</i> <i>White</i> )	Box ( <i>Eucalyptus</i> <i>Melliodora</i> )	Messmate	Honeysuckle ( <i>Banksia</i> <i>Australis</i> )	Lightwood ( <i>Agonis</i> <i>Mollemagnum</i> )	She Oak ( <i>Empyga</i> <i>Lagaropus</i> <i>Quadrifida</i> )
Gums ( <i>Red Gum</i> <i>Black Gum</i> <i>of various kinds</i> )	Wattle ( <i>Acacia</i> <i>ginnobadia</i> <i>lancea</i> <i>divaricata</i> )	Murray Pine ( <i>Callitris</i> <i>Torresiana</i> )	Iron Bark ( <i>Eucalyptus</i> <i>terrestris</i> <i>and</i> <i>Eucalyptus</i> <i>Black</i> <i>Alyssa</i> )	Mallee and other scrubs	The whole species represented timbers of nearly treeless Plains

NOTES BY DR. F. VON MUELLER, C.M.O., GOVERNMENT BOTANIST.

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was put on an annual basis that enabled persons to cut timber without restriction for the sum of £5, later reduced to £2. From 1870 to 1873 there was a brief period during which a royalty system involving payment by volume was implemented, but this failed under pressure and the former licensing system was reintroduced.

The lack of control over timber harvesting led to incomplete use of the wood resource. Under the licensing system it was customary to take only the prime parts of felled trees. In particular, when splitting was being carried out, up to three quarters of the trunk was left untouched. If a tree did not split easily it was left to rot and another felled, often to share the same fate as the first. In the case of sawmillers, it was a common occurrence for licences to be issued to several rival sawmillers whose areas for wood extraction were grouped within a few kilometres of each other. The millers attempted to secure a monopoly of the area in which their plants were erected. To achieve this, trees were felled in quantities far in excess of the licensees' own requirements, and felled across tracks and gullies to block access to the hauling teams of the rival mills. This wasteful exploitation, so evident in the Wombat and Mt Cole forests, resulted in the loss of much valuable timber, which when it became dry, added fuel to the bush fires.

#### Legislative developments to 1939

The general indifference of the early settlers to their forest environment was reflected in the attitudes and actions of early Victorian Governments. The first meeting of the Victorian Parliament took place in November 1856, and at that time the control of forests was placed with the Department of Lands and Survey. The responsibility for forests was considered to be of minor importance, not meriting the establishment of a separate department. Under the auspices of the Department of Lands and Survey, local Forest Boards were formed, but these were abolished in 1879. In 1883 a State Forests and Nurseries Branch was established. During the period until 1907, this branch was shifted around between the Departments of Lands and Survey, Agriculture, and Mines. Each of these departments had an interest in exploitation of the forest resource and little interest was shown in its long term conservation and management.

During the latter part of the nineteenth century, pressure began to mount on the Government to implement more effective controls over the alienation and use of forests. Several far-sighted persons strove for the permanent reservation of forest areas, and for effective legislation to control the timber splitters, sawmillers, and the graziers. On several occasions forest Bills were prepared for presentation to Parliament in attempts to improve the situation. Forest Bills were read in Parliament in 1879 and 1881 but they lapsed, and a Bill which was prepared in 1887 was not even laid before Parliament. Another attempt in 1892 shared the same fate. It was a short Bill dealing with licences, permits, offences, and penalties as the previous Bills had done and it sought to set aside thirteen valuable forest areas as permanent reserves. It was quietly laid aside.

These early efforts at introducing legislation to control the use of forests failed because they opposed the interests and profits of those who could exert influence on the legislation. Trees had no votes, but the sawmill owners, the splitters, the miners, and the selectors did. Hence, when attempts were made to conserve the forests and protect them, these groups organised deputations, questions were asked in Parliament, and concessions were made.

The tide against legislation to control forests was eventually turned in 1907 when a Forests Bill successfully passed through Parliament. As a result the State Forests Department of Victoria was constituted on 4 February 1908. The *Forests Act* 1907 resulted from a gradual realisation by the Government that the welfare of the community would suffer if protection and management of the forest resource continued to be virtually disregarded. This Forests Act laid

the foundations of a system of sound practical forestry, but, these foundations could not be built on, because insufficient resources were provided to permit the implementation of a sound forest policy.

The legacy inherited by the new department comprised forests that were impoverished to varying degrees. From the point of view of both finance and manpower, the Department was impotent to reverse the situation at that time. Alienation of land from forest reserves continued well in excess of the additional areas "permanently" reserved. Extensive areas of high value forest remained as unreserved Crown land, particularly in the high ranges of the north-eastern and Gippsland regions. These tracts, which included valuable stands of blue gum, alpine ash, and mountain ash, were let annually for small sums by the Department of Crown Lands and Survey for cattle grazing and were frequently burnt by graziers to promote grass growth. The widespread practice of ring-barking all timber on Crown lands occupied under lease, was accepted as a permanent improvement of the land, and the State Forests Department was again impotent to control the practice. The general attitude working against the Department was that only land unsuitable for agriculture should be reserved for State Forest purposes; hence, efforts directed towards forest conservation continued to be hampered by the ignorance and apathy of the public.

Perhaps the most significant event that occurred during the term of this early State Forests Department was the opening in January 1910 of the School of Forestry at Creswick, near Ballarat. The School was opened to train students in the management and protection of forests. From relatively inauspicious beginnings, the school developed into a respected learning institution and has been responsible for training most professional foresters engaged in the management of Victoria's forests.

The impotence of forest legislation was eventually reversed on 1 October 1919, when the Forests Commission, Victoria, was constituted under the *Forests Act* 1918. The legacy passed on to the Commission was no better than that which had been given to its predecessor, but the establishment of a separate Forestry Fund (and later other sources of finance) for the improvement and re-forestation of denuded areas, as well as for the overall development of forestry in Victoria, meant that the Forests Commission now had the financial capability at least to begin implementing the powers vested in it under the Act. Although there were indications of an increasing public awareness that the forests were a necessity rather than a nuisance, there still remained a constant pressure on the Government to excise land from, or to refuse additions to, the forest reserves. Forest fire protection remained a serious problem, mainly because of graziers and land holders who deliberately raised bush fires, and thereby reduced the timber value of any neighbouring forest reserve. Such land was then more likely to become available for selection.

In the face of these problems the Forest Commission's initial stated policy was (1) the protection of, and the introduction of systematic management into, the natural forests; and (2) the establishment by planting or sowing of sufficient areas of softwoods.

In spite of early difficulties the constitution of the Forests Commission marked the beginning of a new era in the management of Victoria's forests. The State now had the nucleus of an organisation that could manage and protect the forest resource for the benefit of the whole community. This new era was reflected in the following statement from the 1936-37 Annual Report of the Commission:

" . . . . . Although its forest policy is directed chiefly by considerations of timber production, soil conservation, and stream regulation, the Commission is of the opinion that wherever possible and desirable . . . recreational use of the forest domain should be catered for and encouraged . . . . The possibility of further fostering a forest conscience within the community is of considerable importance, and it is

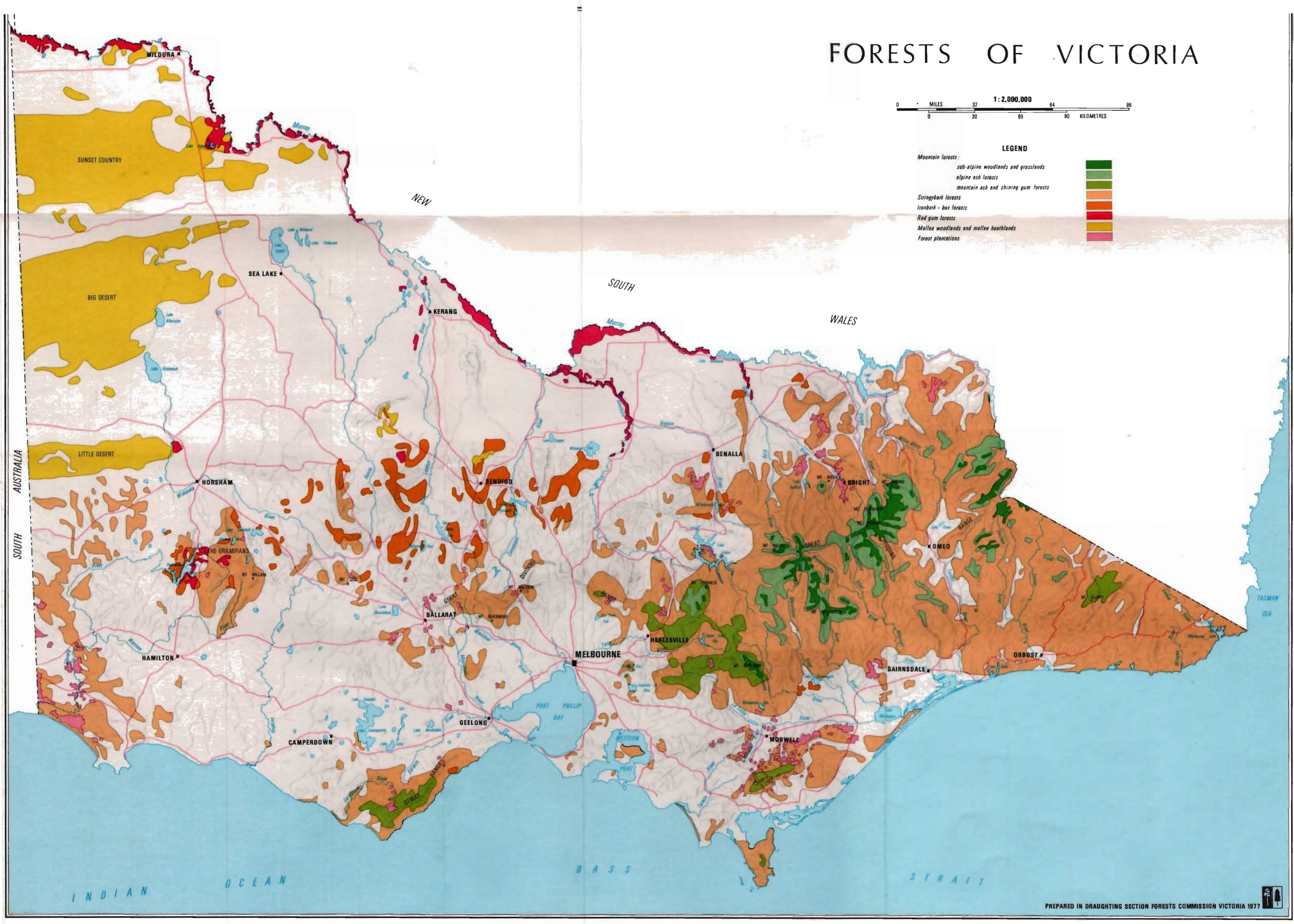


# FORESTS OF VICTORIA

1:2,000,000  
0 32 64 96  
0 30 60 90 KILOMETRES

## LEGEND

Mountain forests:  
sub-alpine woodlands and grasslands  
alpine ash forests  
mountain ash and shining gum forests  
Stringybark forests  
Ironbark - box forests  
Red gum forests  
Mallee woodlands and mallee heathlands  
Forest plantations





considered that a great deal can be achieved in this direction by stimulating public interest through the development of the recreational use of the forest estate."

The establishment of the Forests Commission led to many valuable forest areas being surveyed and dedicated as reserved forest. These included major areas of the durable hardwoods of box, ironbark, and red gum. In addition, large areas of mountain ash forests were dedicated. Forest works and the output from the forests increased rapidly, and the first government loan, of £500,000, was granted in 1925 for the development, conservation, and establishment of forests. These works in the native forests and plantations of softwoods progressed steadily, but the problems of fire, exploitation of uncommitted Crown land, and erosion remained. The Commission continuously sought dedication of additional mountain forests, together with improved control of grazing in the mountains, to combat these troubles.

The Commission made useful progress in forest management and silviculture in the late 1920s. Working plans were prepared for some larger areas of forest. The development of power winches and forest tramways had made available lightweight timber from eucalypts, such as mountain and alpine ash, in Victoria's mountain regions. A major development in the use of this timber was the application in the 1920s of the kiln drying and reconditioning process. This process was further developed by the Division of Forest Products of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), established in 1928. This division made a notable contribution to the Australian timber industry, assisting the sawmilling industry in improving production, recovery, and quality of sawn timber. In 1931 the Commonwealth Government introduced tariffs on imported timbers, thus increasing the use and development of techniques to replace imported timber with lightweight, high quality, Victorian hardwoods.

During the depression in the 1930s, the Government provided rural relief funds to employ labour to establish softwood plantations and tend hardwood forest. The plantations established during this period are now of great value, but much



of the benefit of work undertaken to improve the hardwood forests was lost during the 1939 fires. During the 1930s the first economic pulping process and paper-making process for short fibre (eucalypt) wood was developed and in 1937 a mill was established at Maryvale.

Although an awareness of the danger of forest fire was developing and road building and other fire protection works were in hand, the community was not prepared for the conflagration which developed in one catastrophic week in January 1939, when fire in all districts of the State caused disastrous losses of life and property and destroyed 1,364,140 hectares of forest lands. The destruction wrought by these fires is summarised by Judge Stretton in the introduction to the report of the Royal Commission into the fires:

"And so it was that, when millions of acres of the forest were invaded by bushfires which were almost State-wide, there happened, because of great loss of life and property, the most disastrous forest calamity the State of Victoria has known."

"Seventy-one lives were lost. Sixty-nine mills were burned. Millions of acres of fine forest, of almost incalculable value, were destroyed or badly damaged. Townships were obliterated in a few minutes. Mills, houses, bridges, tramways, machinery, were burned to the ground; men, cattle, horses, sheep, were devoured by the fires or asphyxiated by the scorching debilitated air. Generally, the numerous fires which during December, in many parts of Victoria, had been burning separately, as they do in any summer, either "under control" as it is falsely and dangerously called, or entirely untended, reached the climax of their intensity and joined forces in a devastating confluence of flame on the 13th of January."

"On that day it appeared that the whole State was alight. At midday, in many places, it was dark as night. Men carrying hurricane lamps, worked to make safe their families and belongings. Travellers on the highways were trapped by fires or blazing fallen trees, and perished. Throughout the land there was daytime darkness. At one mill, desperate but futile efforts were made to clear of inflammable scrub the borders of the mill and mill settlement. All but one person, at that mill, were burned to death, many of them while trying to burrow to imagined safety in the sawdust heap. Horses were found, still harnessed, in their stalls, dead, their limbs fantastically contorted. The full story of the killing of this small community is one of unpreparedness, because of apathy and ignorance and perhaps of something worse."

"The speed of the fires was appalling. They leaped from mountain peak to mountain peak, or far out into the lower country, lighting the forests 6 or 7 miles in advance of the main fires. Blown by a wind of great force, they roared as they travelled. Balls of crackling fire sped at a great pace in advance of the fires, consuming with a roaring, explosive noise, all that they touched. Houses of brick were seen and heard to leap into a roar of flames before the fires had reached them. Some men of science hold the view that the fires generated and were preceded by inflammable gases which became alight. Great pieces of burning bark were carried by the wind to set in raging flame regions not yet reached by the fires. Such was the force of the wind that, in many places, hundreds of trees of great size were blown clear of the earth, tons of soil with embedded masses of rock, still adhering to the roots; for mile upon mile the former forest monarchs were laid in confusion, burnt, torn from the earth, and piled one upon another as matches strewn by a giant hand."

The Royal Commission report attributed most of the fires to deliberate burning by graziers, settlers, and miners. It attributed the extent of disaster to the combination of abnormal seasonal conditions; the increased forest undergrowth due to past burning; the lack of a permanent fire authority in the country area;



the lack of co-ordination of interests and duties of government departments and forest users; the general apathy of many people in relation to the fire protection of rural communities; and the practice of applying a prohibition on the use of fire throughout the State by means of a single proclamation for a specific period with little or no regard to varying fire danger in different areas, thereby bringing the law into disrepute and open abuse. The Royal Commission's report prompted the revision of existing fire protection legislation and the Forests Commission's responsibility for protection of State forests was clarified and extended. Grazing was to be strictly controlled and burning by graziers limited or curtailed. The finance and resources available for fire protection and suppression were increased considerably and a vigorous programme to construct access undertaken. A most important change was the adoption of a policy to remove sawmills from forest areas and to improve the safety of any which remained by requiring increased protective measures and the provision of dugout shelters at every site.

### **Developments after 1939**

The period during and after the Second World War saw a tremendous demand by the community for wood products to satisfy war requirements and the post-war housing boom. This demand, combined with the effect of the 1939 fires, resulted in a gradual shift in the harvesting of native hardwood forests, from the central region, to the east and north-east of the State. In addition it provided a further motivation for extension of the softwood resource.

After the 1939 fires a major project was initiated to salvage wood from the fire-killed ash forests. During the decade up until 1950, a total of 4,500,000 cubic metres of sawlogs and large quantities of pulpwood were harvested. As the supplies of fire-killed timber began to dwindle, the construction of major trunk roads into the mountain regions of the north-east, and north-central Gippsland was undertaken. These regions subsequently became the main source of high quality timber. Since the mid-1960s the forests of east Gippsland also have been providing large volumes of wood. Although the main centres of wood production have shifted eastward during the post-war period, many of Victoria's smaller and more intensively managed forests, such as the Wombat State Forest in the Daylesford-Trentham area, have continued to provide a steady supply of wood to the community.

The lack of native softwoods suitable for commercial production; the high import cost of softwood timber; and the presence of extensive areas suitable for culture of exotic softwood, including areas of abandoned and neglected farmland, have led to the development of large softwood plantations in Victoria. Plantations were developed on an experimental basis at Macedon, Creswick, and the You Yangs in the late nineteenth century. It was soon realised that radiata pine had a remarkable potential and this species was widely planted, especially during the 1930s. From the Second World War until 1961 the establishment of State owned plantations continued at a fairly low level. Following this an expansion programme was implemented and by 1966 the rate of establishment had risen to about 2,100 hectares per annum. In 1964, the Australian Forestry Council was formed to act as an overall co-ordinating body for forestry affairs. One of the Council's first decisions was to instigate a planting programme which aimed to make Australia self sufficient in softwoods by the year 2000. In July 1966, loan funds from the Commonwealth Government began to flow to the State for plantation development. A substantial increase in the planting rate followed and at June 1976, there were 68,326 hectares of State owned plantations. Approximately 90 per cent of these plantations are pine.

State owned plantations are now being concentrated within eight major development zones, each of which will eventually contain sufficient plantation to support large integrated wood using industries. The development zones are located in the Central, Benalla-Mansfield, Ovens, Upper Murray, Latrobe,

Portland, Ballarat, and Otway regions. Substantial areas of plantation have been established on marginal agricultural land. In the 10 years preceding June 1976, a total of 11,497 hectares was purchased for plantation development. This area represents approximately one third of that planted during the period.

Large areas of privately owned plantations have been established in Victoria. The majority of these plantations have been developed in the south-west of the State, and in the La Trobe valley where APM Forests Pty Ltd began planting on a major scale in 1951. Private planting has been encouraged by the provision of long term leases of unoccupied Crown land, and farm forestry loans for small scale development by private landholders. At January 1976, the total area of privately owned softwood plantations was 66,202 hectares.

Perhaps the most significant post-war development has been the telling change in the attitudes and interest of the public to the management of natural resources, including forests. The demand for forest benefits, especially those related to recreation and the environment, has increased considerably as has the demand for efficient management techniques to ensure long-term conservation of the resources. Concern for the quality of Victoria's forest environment has always existed among a few dedicated and far sighted individuals, but this concern expanded throughout the community in the later 1960s, culminating in the Little Desert controversy of 1969. This controversy led directly to the formation in 1971 of the Land Conservation Council, a government authority that was constituted to make recommendations on the balanced use of public lands in Victoria. The majority of public lands are forested, and hence the importance of this authority to forest management in Victoria.

The formation of the Council was the start of a new era of decision making about land-use in Victoria. The Council comprises an independent chairman, the heads of the government departments concerned with soil conservation, agriculture, forests, lands, rivers and water supply, mines, fisheries and wildlife, and national parks, and three members appointed by the Governor in Council. Of these, one has experience in conservation techniques used in primary production and two have special knowledge and experience in the conservation of natural resources. Direct public involvement in the decision making process is encouraged.

The function of the Council is to make detailed investigations of the basic resources of public lands and to receive submissions on land-use from private individuals, organisations, industry, and government departments. Proposed recommendations are formulated and made available for comment before submission of the final recommendations to the Government through the Minister for Conservation.

The pattern of increased public involvement in decisions relating to forest management is also evident in the recent public inquiries by the Commonwealth Government into the woodchip industry and the plantation extension programme. In addition, the Forests Commission has sought public involvement in the development and revision of management policies for particular forest areas such as the Grampians State Forest.

Other important developments in forest land management that have resulted from increased public concern with the quality of the environment are the formation of the Ministry for Conservation, the rapid expansion of the National Parks Service, and the increased emphasis, within the Forests Commission, on recreational usage and the protection of the forest environment. The Ministry for Conservation was formed in January 1973 with the objective of co-ordinating those aspects of government concerned with conservation and environmental protection. It brought together the experience and knowledge of the Environment Protection Authority, Fisheries and Wildlife Division, Land Conservation Council, National Parks Service, Port Phillip Authority, and Soil Conservation Authority. The National Parks Service was originally constituted as an Authority in 1956



to provide co-ordinated management of a number of areas that had already been reserved under the Lands Act. Its development continued slowly until 1970, when the Act was amended and the Authority renamed the National Parks Service. It came under the control of the Ministry for Conservation in 1973. With the changes in administrative structure and adoption of the Land Conservation Council's recommendations, the National Parks Service began to expand more rapidly.

The major responsibility for the management of forested public lands lies with the Forests Commission. The Commission controls all uses of reserved forests, and the use of timber and other forest products on protected forests. It is responsible for the protection of all State forests from damage by fire and destructive biological agencies, and for fire protection of National Parks, Crown lands which have been declared to be protected public lands, unused roads, and water frontages. The Commission establishes and regenerates forests, regulates their use for timber, and provides facilities for forest use for recreation. Where forests form water catchments, scenic landscapes, and natural systems of special value, the Commission protects them for these purposes.

Several other departments and agencies are involved in the management of forests, mostly in connection with forest uses other than wood production. Forests on the catchments of the metropolitan water supply reservoirs, and on land adjoining the waterworks installations, comprise 130,950 hectares and are managed by the Melbourne and Metropolitan Board of Works. The forests are devoted almost exclusively to protection of the water catchments; public access and use of timber and other products are excluded or strictly controlled. Small areas adjoining the major storages are developed for visitors' use, and over 1.5 million persons take advantage of the facilities each year. The State Rivers and Water Supply Commission manages several small softwood plantations comprising 76 hectares on lands adjoining storages and water works, and several small forested water supply catchments in conjunction with local water supply authorities. The Forests Commission advises and assists with the management of these areas.

Many of the national parks in Victoria are forested, ranging from dense mountain forest to arid mallee woodland. The forested area in the parks is about 268,000 hectares and is managed by the National Parks Service primarily for purposes of conservation and the enjoyment and education of the public. The Fisheries and Wildlife Division of the Ministry for Conservation manages 18,700 hectares of forest within State Faunal Reserves and Game Reserves for use as wildlife and game habitats. Principally it protects the forest against damage and misuse, and undertakes some silvicultural works for the control or modifications of the structure of the vegetation. This Division also advises the Forests Commission on wildlife habitat requirements in connection with the management of State Forests.

There are 10,000 hectares of forest associated with the Kiewa hydro-electric stations, which are managed by the State Electricity Commission (SEC) of Victoria in consultation with other authorities. These alpine forests protect the catchment for the hydro-electric stations. The SEC also manages small areas of pine plantations and native forest at Yallourn.

Many hundreds of permanent reserves of Crown lands for water frontages and other public purposes are forested. They are mostly small in area, but they comprise a substantial total area. The forests are protected for public use by the Department of Crown Lands and Survey and by local committees appointed for the purpose.

The Commonwealth exercises its functions in relation to forestry through the Forestry and Timber Bureau of the Department of Primary Industry, the Australian National University, and the CSIRO. The Bureau collects and distributes forestry information and carries out investigations relating to

supply, production and distribution of timber. The Department of Forestry of the Australian National University trains students in forestry and forest research. A Division of Forest Research of CSIRO was formed in 1975 to undertake studies of problems in hydrology, genetics, diseases, fire, and harvesting of forests. Other divisions of the CSIRO are engaged on research of forest products and some other fundamental studies related to forests.

### CHARACTERISTICS OF VICTORIAN FORESTS

Victoria now has 8.27 million hectares of forests. The major belt of forest is located in the eastern half of the State extending from the north of Melbourne, eastwards to the New South Wales border. This area forms the southern end of the vast and continuous forest zone that straddles the Great Dividing Range along the full length of the east coast of Australia. Other extensive areas of forest are found in the Daylesford-Trentham area to the north-east of Melbourne, the South Gippsland Ranges, the Otway Ranges, the South-western Region, the Grampians, the Mallee, and in the northern and central parts of the State where forests of red gum, ironbark, and box are present.

Although much of the forested land affords pleasant surroundings in which people may live and work in comfort, there are distinct differences between the various types of forests as human habitats. Differences may be due to variations in structure or density of the forests, or to the climate or terrain in which they grow. Patterns of human habitation and activity have been influenced since prehistoric times by such variations in forest conditions.

The forests of the mountains in central and eastern Victoria, and in South Gippsland and the Otway ranges, are dominated by tall dense uniform stands of mountain ash. These stands thrive in the deep soils of the high rainfall areas. Alpine ash and shining gum predominate at the higher altitudes where winter snows are frequent, and give way on the highest ranges to woodlands of snow gum.

Mountain ash, alpine ash, and shining gum are Victoria's prime timber trees. They produce light timbers of great value for housing components and industrial products. These timbers have influenced house design and methods of building and they have enabled the development of a local paper-making industry. Wood removed as waste after logging or during thinnings is now the basic raw material for paper manufacture. Equally important is the role of the mountain forests in the protection of water catchments. The metropolitan water supply and the major supplies for irrigation and dry-land farms in northern Victoria are dependent on these forests.

Though the explorers and early settlers found the mountain forests almost impenetrable due to the heavy undergrowth and the tangle of fallen branches, these forests now attract thousands of visitors throughout the year. Along highways and tourist roads the forests form spectacular avenues of tall straight trees with walls of deep green foliage below and soft ferns at the roadsides. Areas of mountain forest close to the main population centres are reserved for recreation and for conservation of native flora and fauna. These areas receive special protection to prevent damage by trampling and other forms of over-use.

Pioneer settlements of timber workers and farmers which were established in the mountain forests rarely persisted. Settlers were in constant battle against the regrowth of trees and shrubs. Roads, protected by tall trees from sun and wind, became muddy and impassable. The dense walls of undergrowth engendered many fears; harmless animals were named devils, tigers, wolves, and bunyips in an expression of these fears. In more recent times public opinion has prevented much increase in dwellings in these areas. There is a strong demand to conserve the remnants of mountain forest on freehold land. Though wildfires are rare in





these forests, they are extremely destructive. Fire destroyed many of the early farming and timber settlements.

The uses of alpine ash forests and snowgum woodlands are constrained by both the danger of fire and exposure to cold. Cattlemen who use the woodlands for grazing and timbermen who harvest mill-logs and pulpwood from the forests restrict their activities to summer and autumn. Recreational activities are also seasonal, some visitors making use of the snow and others waiting for the thaw. The alpine forests and woodlands afford little shelter against the cold, and huts have been built for the refuge of skiers and cattlemen. There have been few attempts at settlement, except in the best snowfields and the most favoured grazing areas.

The mixed species forests on the foothills and coastal plains offer a favourable environment for work, travel, and recreation. Stringybark, peppermint, and gums are the main species, and silvertop is predominant in East Gippsland stands. Although wildfires are frequent and may sometimes be severe, these species have various growth mechanisms which enable them to recover from fire damage, and the danger of fire is a less serious environmental problem than in the mountain forests. The trees produce large quantities of litter which accumulate on the ground, and clearings and controlled burning are used for protection against wildfire. The open forest and easy terrain have enabled many roads and tracks to be built for protection purposes.

Many farmlands and townships were developed by clearing these forests, and the mixed species forests now form the background of the typical Victorian country landscape. They cover many water catchments and are in continuous light use for a variety of purposes. These forests produce a greater volume of timber each year than any other forest type in Victoria. This timber is the main material used for house frames and general construction. In the past many hundreds of forest workers lived and worked in the central Victorian forests

cutting logs for sawmills, and timber and fuel wood for mines, other industries, and homes. The number of forest workers has declined in recent years as have the uses for timber and fuel wood.

Ease of access to the mixed forests and the pleasant surroundings in them make possible many activities. There are sites for youth camps and recreation areas, reserves for wildflowers, koalas, and other wildlife, places of geographical, historical, and cultural interest. Some areas have sufficient grass and herb cover to be used for cattle grazing.

In the ironbark and box forests, on the dry northern slopes, the small trees are widely spaced with light undergrowth and sparse ground cover. Tree canopies give only slight shading against the strong sunlight except for the occasional dense crown of an older tree. There are few streams and the shallow stony soils are usually dry. The many roads and tracks in these forests have been in constant use since the earliest days, when trees on thousands of hectares of these goldfield forests were felled for mining timber, buildings, and fuel. The dense regrowth of small trees which followed that first heavy cutting was carefully thinned during the 1920s, leaving only the best trees with ample growing space. These forests are still under intensive use. Timbers from trees felled during current thinnings are in strong demand because of their durability for fence posts and railway sleepers, and their high calorific value as firewood. When the box and ironbark trees are in flower, bees from thousands of hives are used to harvest the large quantities of valuable honey and wax. Flowers on the trees and shrubs attract a large population of birds. These forests are popular with naturalists and sightseers, especially in late winter and spring when the weather is finer and warmer than in southern Victoria.

Woodlands of white box in mixture with cypress pine grow in parts of the Deddick River and Snowy River valley in eastern Gippsland, forming an unusual and attractive landscape.

Forests of river red gum on the flood plains of the northern rivers are occupied by large numbers of water birds, amphibians, and fish when flooded during winter and spring and by reptiles and marsupials as the plains become dry and hot in summer. Strong durable red gum timbers have been harvested during dry periods for almost a century. Beekeepers use the forests when the red gums are flowering, domestic cattle graze the grasses which flourish when the floods recede, and many hundreds of visitors arrive in summer and autumn to picnic or camp among the huge shady gums by the river in order to fish, hunt, swim, and generally appreciate the scenery and wildlife. This environment provides good shelter, water, and ample food, and was inhabited by the Aborigines for thousands of years.

On the expanses of arid sands in the north-west of the State which have not been used for wheat farming, stunted clumps of mallee eucalypts afford little shelter from sun and wind, water is scarce, and travel is hazardous because of loose sands and the risks of fire and exposure. Such conditions have restricted use of the mallees, though recently the challenge and beauty of the strange landscape has attracted increasing numbers of visitors. The vegetation, however, can sustain only limited use of this kind.

Forests of exotic pine established for commercial production of softwood timber are located in the vicinity of mixed species forests of low productivity on land formerly used for farming or on land cleared of native forest. As the pines grow they form tall stands with dense canopy and deep shade below. Mature plantations are more open with fewer larger trees and a ground cover of pine needles and some native shrub vegetation. These stands form attractive surroundings for picnics and walks.

### Forest fires

Australia's forests of eucalypts present a unique fire-control problem. Victorian species especially shed bark, leaves, and branchlets at rates of up to 6 tonnes per hectare per annum with the result that deep layers of inflammable litter accumulate on the ground, the potential fuel for severe fires. This fuel, combined with a summer climate characterised by periodic drought, high temperatures, and strong winds, puts Victoria's forests amongst the most fire hazardous in the world.

The activities involved in working and living in forests, or just visiting for recreation, cause numerous outbreaks of fire. In hot, dry, windy conditions the outbreaks intensify and become destructive wildfires. Although laws and regulations prescribe penalties for the use of fire in dangerous circumstances, and require the provision of equipment and removal of hazard, most outbreaks still are caused by man's activities (see table below). Lightning, a natural agent, is also a major source of fires and although it is often accompanied by rain and cooler weather, it occasionally starts numbers of fires and causes widespread damage.

Evidence in the form of charcoal deposits and physiological characteristics of the eucalypts and associated species indicates that the present forests have evolved in an environment in which fire was a major factor. Many eucalypts have a thick heat-resistant bark and dormant buds within the trunk and branches which produce epicormic shoots when the crown is destroyed. Many acacias and other legumes produce seeds with hard resistant coats capable of surviving fire and then germinating prolifically after the fire.

Fire affects the character of a forest. Short-term effects such as the removal of vegetative cover, the mortality of some plants and animals, changes in soil nutrition and surface run-off, depend largely on fire intensity. Long-term effects, such as changes in the composition and species of plant and animal communities, are related to the time taken for a particular species to reproduce or recolonise the site, and depend on the season, frequency, and intensity of fires. Wildfires seriously affect the value of the forests as an environment for man's habitation. Forest products are destroyed and wood production arrested. Forest landscapes and scenery are damaged, animal populations temporarily depleted, and streams affected by rapid run-off, sedimentation and discolouration until the area is recolonised.

The following table lists the known and suspected causes of fires from the years 1971-72 to 1975-76:

VICTORIA—FOREST WILDFIRES: KNOWN OR SUSPECTED CAUSES

Causes—known or suspected	1971-72	1972-73	1973-74	1974-75	1975-76	Percentage per cause on a 10 year average
Grazing interests	1	5	..	1	1	<1
Landowners or householders	56	148	37	89	58	20
Deliberate lighting	56	75	54	73	68	18
Sportsmen, campers, tourists	34	68	23	43	50	10
Licensees and forest workers	15	13	11	19	14	4
Smokers	12	23	6	25	6	5
Lightning	95	100	24	70	48	16
Tractors, cars, trucks, stationery engines	11	21	12	25	26	6
Children	8	18	8	14	14	3
Sawmills	3	12	6	8	1	2
Miscellaneous known causes	21	40	15	33	28	8
Unknown origin	13	47	15	40	20	8
Totals	325	570	211	440	334	..

The infrequent but extremely intense fires which occur in the cool mountain forests kill trees and all plant material including litter and humus on the soil



surface. These forests recover by germination of seed from capsules in the crowns of trees which have survived the fire. Dense crops of seedlings of eucalypts and acacias develop, and ferns and shrubs regenerate from buried stems and roots. In other forest types where fires are more frequent but usually less severe, eucalypts recover by shooting from major branches, the bole, or the stump. The most severe fires may kill mature trees in these forests, however, or damage them so that they will die after some years.

Prevention and suppression of wildfires is a major objective of the Victorian Forests Commission. All development, management, and operations in the forests are strongly influenced by considerations of fire protection. The Commission maintains a network of fire lookout towers supplemented during periods of high fire danger by aircraft patrols, which, together with a well trained mobile work force equipped with bulldozers, tankers, pumps, hoses, hand tools, and an effective communications system, form the essential organisation for the suppression of fires. Chemical fire retardants are stored at strategic locations and used for aerial attack on remote or difficult spot fires. Helicopters are used for patrol, to transfer crews along fire lines, and to ignite unburnt areas within the control lines.

Approximately 70 per cent of all forest fires in Victoria are confined to areas of less than four hectares. The largest fires occur under severe weather conditions when they spread so rapidly as to be uncontrollable by any known means of suppression. The major fires in Victoria since 1851 are listed in the following table :

#### VICTORIA—MAJOR FOREST FIRES

Date	Location and damage
6 February 1851	"Black Thursday." The greater part of the colony affected.
4 January 1886	Otway and Heytesbury Forest.
13 January 1898	Trentham, Avoca, Beaufort, Benalla, Colac, Gippsland. Three deaths, great losses of property.
12 February 1901	Wangaratta, Casterton, Yea, Neerim North. Serious outbreaks, four lives lost.
26 January 1906	Gippsland. Large fires burnt until March.
13 January 1913	Gippsland. Serious bush fires in mountains—36,760 hectares.
18 January 1919	Maffra, Bendigo, Swan Hill, Upper Murray, Dandenongs, Ararat.
16 February 1919	Otway Ranges, three deaths, seven sawmills, 150 houses.
February 1923	Large areas of forest. 48,480 hectares
27–28 January 1926	East Gippsland, Otways, Grampians, Wombat, North-east Dandenong forest. 213,700 hectares.
13–14 February 1926	Healesville, Warburton, Kinglake, Powelltown.
	Dandenongs, Erica, East Gippsland, North-east. 31 deaths. Large losses of property and stock. Township of Noojee destroyed. 394,300 hectares.
4 February 1932	Noojee, Gilderoy, Erica, Grampians. 15 deaths. Large losses. 206,040 hectares.
17 October 1938	Ballarat, Daylesford. Thousands of hectares burnt.
8 January 1939	Gisborne, 10,360 hectares.
10 January 1939	Erica, Yallourn, Toombullup. 12 deaths, many sawmills and houses.
13 January 1939	Healesville, Narbethong, Black Spur, Alexandra. Seven deaths, towns destroyed.
23 December 1943	Throughout the State, 52 deaths, hundreds of homes, sawmills, etc. Total area burnt 1,364,140 hectares.
14 and 21 January 1944	Wangaratta District. 10 deaths. Thousands of hectares of grass. Central and Western District. 19 deaths. 500 homes.
7 and 14 February 1944	Gippsland. 13 deaths. 200 houses. 158,940 hectares.
January 1946	Anglesea fire. 12,140 hectares.
February–March 1951	Kennedys Creek fire. 45,320 hectares.
November 1952	East Gippsland fires. 154,590 hectares.
January 1953	Upper Murray fires. 65,850 hectares.

VICTORIA—MAJOR FOREST FIRES—*continued*

Date	Location and damage
December 1957	Sunset and Little Desert fires. 45,850 hectares.
January 1959	Orbost and Cann River fires. 80,800 hectares.
November 1959	Big Desert, Dimboola fire. 441,770 hectares.
16 January 1961	Daylesford fire. 5,650 hectares.
March 1964	Macalister fire. 72,000 hectares.
February 1965	Glenmaggie, Dargo. 317,000 hectares.
	Omeo. 60,700 hectares.
23 November 1966	Anglesea fire. 6,870 hectares.
22 February 1967	Lal Lal fire. 8,480 hectares.
1 February 1968	Myrtleford fire. 19,990 hectares.
January 1969	Yea fire.
December 1972	Mt Buffalo fire. 12,880 hectares.

**Effects and uses of forests**

Man benefits from forests in many ways. They store large quantities of solar energy and in the process release oxygen into the atmosphere; they play a protective role, building up organic matter, regulating water supply, and preventing erosion; they provide environments suitable for man's recreation and education; and they provide wood, fossil fuels, extractive materials, and other vegetative materials.

*Effects on the biosphere*

Plant growth in the forests of the world forms a major part of the primary resource of materials which are consumed in the food chains of the natural animal communities. Forests occupy almost one third of the land surface and their rates of production of starches, celluloses, and other plant materials are substantially higher than those of other major ecosystems.

In the process of photosynthesis by which the basic plant substances are made, forests store large quantities of solar energy. They also utilise carbon dioxide from the atmosphere and release oxygen in great quantities. The balance of these gases in the atmosphere is believed to have been a regulating factor in the evolution and multiplication of animal life on earth, and is now seen as a critical factor of the human environment as the world population expands.

Forests play a direct role in food production for some societies by providing edible plants and forage for animals. In our society, where agriculture is highly developed, forests are of little importance for food production for animals and the energy transformed by photosynthesis is utilised through commodities such as wood and fossil fuels. Forest activity contributed to the formation of the brown coal deposits of the La Trobe valley. These deposits are huge by world standards and they form the largest known resource of fossil fuel in Victoria.

Forests also have significant effects on the biosphere through the process of evapo-transpiration. This process uses large quantities of energy to transfer water from the soil and vegetation to the atmosphere. The cooling and humidifying effect of a forest is roughly equivalent to the same area of ocean. Forests play an important protective role in the biosphere by building up organic matter, regulating water supply, preventing erosion, and acting as a temporary storage to limit high surface run-offs that may cause flooding of land developed for agriculture or urban purposes.

*Recreation*

Victoria's forests offer excellent opportunities for activities that provide inspiration, education, and physical recreation. These opportunities are of tremendous importance to our urban community, where the pace and complexity of modern living create tensions and anxieties that limit the enjoyment of life.

At the present time, Victorian forests are used for activities such as pleasure driving, picnics, bushwalking, camping, observation of flora and fauna, fishing, hunting, skiing, and motor car rallying. Activities that are increasing in popularity include orienteering, climbing, caving, cross country skiing, trail riding, and canoeing. Educational uses include those by schools, scientific societies, clubs, and naturalists. Studies cover fields such as native flora and fauna, geography, geology, and the ecology of plant and animal communities. The demand for forest recreation has risen steeply in line with increasing community interest in the conservation of natural resources.

The influence of forest recreation on the community is twofold. It includes the subjective benefits of the recreational experience, and the economic effect of recreation activities. The benefits of the actual recreational experience are difficult to evaluate because they are usually of a personal, intangible nature, but their importance to the community as a whole can be gauged from the wide use of Victorian forests for recreation. In 1975 it was estimated that 5,000,000 day-visits were made to the State forests of Victoria (see below). Economic effects include those from the manufacture of equipment (e.g., camping equipment, trail bikes, etc.), and the provision of accommodation, food, fuel, and other needs of visitors to the forest. In 1975-76, visitors to State forests were estimated to have spent approximately \$30m on transport, accommodation, and incidentals directly connected with their visits.

The following table shows the estimated number of day-visits :

VICTORIA—ESTIMATED DAY-VISITS MADE BY  
VISITORS SEEKING FOREST RECREATION  
ACTIVITIES DURING 1975

Activity	Estimated day-visits
Picnicking	575,000
Walking on tracks	137,000
Camping	47,800
Youth camps	51,000
Pleasure driving	3,477,600
Rally driving	60,500
Trail bikes and four wheel drive vehicles (Club activities)	26,600
Swimming	60,000
Boating	68,000
Canoeing	5,300
Fishing	115,000
Hunting and shooting	65,000
Bush hiking	58,200
Skiing	228,000
Total	4,975,000

Over several years the demands on forests for recreational purposes have increased rapidly. It is now estimated that the number of visitors to State forests is increasing at the rate of 10 to 15 per cent per annum. Thus, it is likely that visitor numbers will double approximately every five years. The rising demand is the result of an increasing public awareness of forests, combined with increases in available leisure time, income, and mobility.

The recreation resources of Victoria's forests are considerable, although most use is concentrated near population centres. This leads to over-use of some areas, such as the You Yangs and Sherbrooke Forest Park, and careful management is needed in order to control visitors and minimise damage to the plants and the soils.



A number of methods are available to help minimise these adverse effects. In many instances it is possible to enhance the recreation experience of visitors and at the same time to channel them from the more sensitive unstable environments into areas which can withstand greater recreation pressures. Picnic grounds, parking areas, walking tracks, and other facilities for the visitors are best located where the soils can withstand compaction and alteration of the drainage is acceptable.

Recreation areas, in which the natural surroundings are retained and featured and natural materials are appropriately used in the construction of facilities, appear to contribute most to the pleasures of forest recreation and, being appreciated by the visitors, are least subject to damage and deterioration. Counter measures are necessary where undesirable impact has already occurred, perhaps because there have been rapid increases in the use of well known sites. Some picnic areas have been closed to the public to allow rehabilitation; roads may be closed permanently or temporarily to prevent damage or erosion; and the number of camp sites may be restricted in some areas.

### *Water*

The forests of Victoria produce most of the surface run-off in the State and probably make significant contributions to groundwater supplies. They occupy almost all of the high rainfall areas and cover about 35 per cent of the total land surface.

The basic role of forests on water catchments is to protect the soils and favourably to influence water conservation. Forest cover prevents erosion by protecting the soil surface from the impact of rain and hail, and thus retarding the surface movement of water; it also shades the soil from the sun's radiation, thus reducing desiccation, oxidation, and decomposition of the soil structure. In mountain areas, forest cover also delays cooling in winter and prevents soil breakdown and erosion due to frosts. The depth of forest cover is important for shading and protection of soils. At the lowest levels herbs, grasses, mosses, litter, and humus form the immediate protective layer. Native fauna aid the process of incorporating litter into the soil structure, thus increasing resistance to movement by water.

Forests absorb a large proportion of rainfall. Water percolates readily into the absorbent soil surface and moves to lower levels, where it is held and released gradually to streams. Greater quantities of water can be conserved and used because of the gradual flows, and watercourses are protected against erosion. Forested catchments can lose an appreciable amount of water through the growing trees. Transpiration is most rapid in early summer when growth is vigorous and there is ample soil moisture. Mountain forests use the greatest quantities of water. Forests in drier locations are capable of restricting transpiration from leaves when soils are dry, but use water freely when available.

The consumption of water for domestic and irrigation purposes has risen steadily during past decades, with a consequent increase in the importance of forests as water catchments. Of particular note is the rapidly increasing consumption in the area under the control of the Melbourne and Metropolitan Board of Works. It has been estimated that consumption within this area will double between now and the end of this century and thus the need for a similar increase in the area of forested catchment. However, this projected increase could be offset to some extent by an improvement in the efficiency of water usage.

### *Wood*

Wood is a natural and versatile material. Its parallel interlocked fibres give strength characteristics which can be matched by very few other materials. It can be disassembled and reassembled to develop particular properties, such as

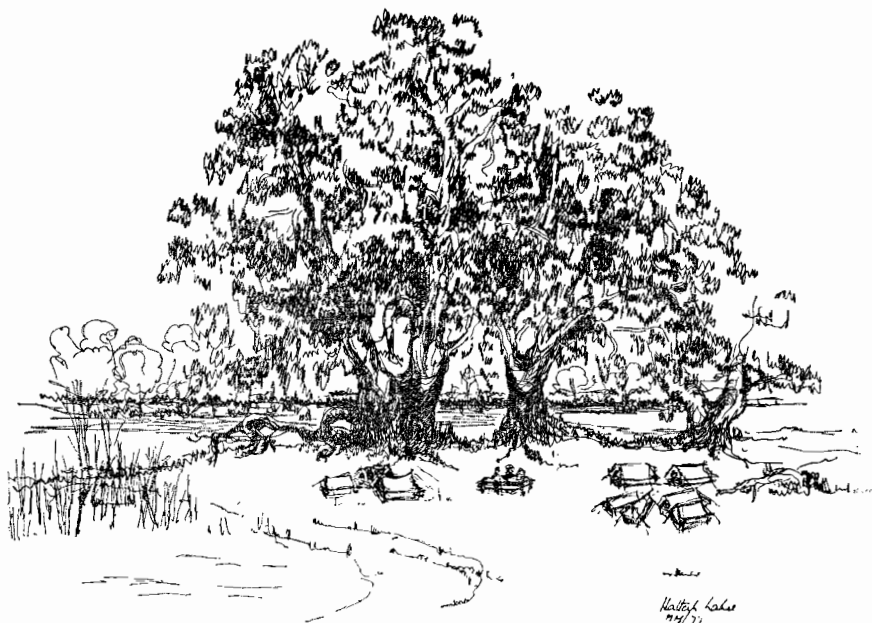
those found in plywood. It can be separated into fibres and reconstituted in various sheet forms such as paper and board. The fibres can be broken down into cellulose to make rayon and cellulose plastics. The cellulose can in turn be further broken down into sugars, alcohol, and a host of other organic chemicals with a wide variety of uses.

Wood has a twofold influence on society. Timbers, boards, and papers are vital commodities in everyday use, and the industries and commerce of growing, harvesting, and processing wood as a raw material are important elements of the economy. Wood products are used for a wide variety of purposes. Because of their strength, durability, easy working characteristics, and relatively low cost they are used in the construction of many buildings, as well as of wharves, transmission lines, railways, bridges, fencing, and playground equipment. The warmth and natural appeal of wood make it popular for furniture and the interior fittings of many homes. Wood provides the raw material for the manufacture of paper and paperboard products, and it is a storehouse of energy that can be used as fuel for domestic and industrial purposes. In addition, wood has many other highly specialised uses including the building of boats and the manufacturing of sporting equipment and musical instruments.

The impact of wood products on the community is reflected in the table on page 21 which shows the estimated output of wood produce by various product classes from 1971-72 to 1975-76.

The economic activity generated by the use of wood as a raw material is considerable. In 1973-74 the wood, wood products, furniture, paper, paper products and printing industries of Victoria had a turnover of \$1,118m. This amounted to 10 per cent of the manufacturing industry turnover in the State. These industries employed a total of 56,391 men and women, which represented 12 per cent of the workforce employed in manufacturing industries. Wood is a basic raw material and hence its contribution to the national economy extends much further than these figures would indicate. Many service and other tertiary industries are dependent on the wood-based sector for their livelihood.

The consumption of wood has increased steadily during past years and this increase is expected to continue approximately in proportion to future population



growth. Although the total consumption has been rising only gradually, significant changes have been taking place in the proportional consumption of individual products. The share of the market enjoyed by paper and panel board products has increased, while that for sawn timber has decreased. The market for sawn timber is extremely competitive and consumption is strongly influenced by price levels of substitute materials (e.g., steel, aluminium, panel, and paperboard products). The panel products are extremely versatile being available in large sheets, and their consumption has increased as wood suitable for their manufacture has become available from softwood plantations. The market for paper and paperboard products has grown at the average rate of 6.5 per cent per annum in recent times. This rapid growth rate could continue, although more efficient use of paper products through recycling and limitations on disposable packaging could lower the rate of growth. Consumption of fuel wood reached a peak during the Second World War and has since declined steadily as fossil fuels became widely used. However, limitations on availability of fossil fuels, or drastically reduced income levels, could create a greater demand for fuel wood, and it could again become a major product of Victorian forests.

## VICTORIA—STATE FORESTS' OUTPUT OF PRODUCE

Particulars	1971-72	1972-73	1973-74	1974-75	1975-76
Sawlogs, hardwood (cubic metres—m <sup>3</sup> )	1,287,586	1,226,404	1,212,430	1,224,570	1,200,498
Sawlogs, softwood (m <sup>3</sup> )	157,927	184,445	149,933	190,473	197,333
Veneer logs, hardwood (m <sup>3</sup> )	2,138	742	1,472	1,503	1,530
Veneer logs, softwood (m <sup>3</sup> )	8,261	7,756	6,575	3,738	2,554
Fencing timbers—					
No. posts, strainers and stays, hardwood	1,029,532	993,769	919,602	926,120	677,610
No. posts, strainers and stays, softwood	492,918	594,543	552,562	473,100	575,186
No. droppers, pickets, split palings	15,579	16,312	9,206	10,749	10,958
No. rails	8,248	9,493	20,596	19,673	29,051
Heavy timbers—					
Beams and bridge timbers (m <sup>3</sup> )	419	530	702	(a)3,669	(a)8,808
No. sleepers	327,439	309,761	198,691	226,633	204,256
Piles (lineal metres—m)	22,166	21,390	10,680	2,774	3,689
Poles and Spars—					
Transmission poles, hardwood (m)	174,690	128,564	180,147	151,407	138,367
Transmission poles, softwood (m)		2,372	822	3,269	
Miscellaneous poles, hardwood (m)	125,900	177,240	245,375	298,210	195,185
Miscellaneous poles, softwood (m)	67,578	64,682	64,901	91,599	36,562
Mining Timbers—					
Round (m)	6,945	9,342	8,016	5,138	110
Split (m <sup>3</sup> )	107	184	179	(a)9,234	(a)2,748
Pulpwood—					
For paper, hardwood (m <sup>3</sup> )	294,953	206,199	209,612	256,718	274,785
For paper, softwood (m <sup>3</sup> )	49,056	35,431	23,180	18,089	19,673
For panel products, hardwood (tonnes—t)	55,498	50,259	36,616	34,934	23,172
For panel products, softwood (m <sup>3</sup> )	31,559	45,226	59,140	41,343	48,724
Firewood—					
Stacked and longwood (m <sup>3</sup> )	232,902	170,190	149,434	115,115	105,547
Milled wood (t)	555	913	498	7,840	10,301
Miscellaneous timbers—					
No. stakes and props	355,786	201,477	130,855	216,945	115,547
No. chopping logs	12,081	11,102	11,936	12,213	12,091
No. sleeper off-cuts	23,482	15,506	28,169	34,646	64,082
No. bed logs	5,023	5,052	6,631	2,365	1,018
No. house stumps	6,304	878	..	..	..

(a) Unit of measurement changed to lineal metre.

Wood plays an important role in decentralisation. The majority of activities related to growing, harvesting, and conversion of wood products are carried out in rural areas, and beside agriculture, the forest based industries are the main employers of rural labour. The extensive softwood plantations now being established are expected to be a major factor in increasing rural employment. Major plantation based industries have already been developed at Ballarat, Myrtleford, the La Trobe valley, and the Portland area. An excellent example of the decentralising effect of plantation development can be seen in the Mt Gambier region of South Australia.



The management of forests for timber production by means of periodic harvesting operations leads to the development of a variety of vigorous stands of trees of different ages and sizes. The least valuable and least vigorous trees are harvested and the best trees left ample growing space. As knowledge of environmental factors has increased there have been modifications of management of timber harvesting. Very old trees are retained if they are considered valuable food sources or habitats for certain birds or mammals. Strips of undisturbed vegetation are retained between harvesting areas and adjacent streams so that wildlife habitat and streams are protected. In some forests trees are selected for felling in small patches rather than singly in order to increase the proportion of desired species in the mixture of seedlings which develop in the openings. In harvested areas in the mountain forests all trees are felled so that the litter and ground cover can be cleared or burned as a bare soil surface is needed for germination and growth of a new crop. As harvesting operations only affect a number of small separate areas, landscapes are not impaired and only small areas of flammable debris are created. Residues of hardwood logging operations are used for the manufacture of paper and hardboards. Forests are then left undisturbed until another harvesting operation is undertaken.

#### *Other plant products*

In addition to wood, the forests of Victoria provide a range of plant products. Most of the honey produced by Victorian beekeepers is harvested from the forests. The industry has achieved a high degree of mobility. Apiarists hold 750 licensed sites in the forests which they use in rotation as the different species come into flower. Box and ironbark forests are the most important source, although the beekeepers also use the alpine forests, river red gums, messmate, red stringybark, and the mallees. Many sites yield up to 20,000 kilograms of honey and 25 kilograms of wax during one flowering period.

Oils are distilled from the leaves of eucalypts for use in the medicinal and pharmaceutical industries, and to a minor extent in other industries. Foliage of the mallee eucalypts is preferred. The industry which is very small is centred mainly in mallee scrub areas located near St Arnaud and Bendigo.

Cattle are grazed in the red gum, ironbark, and box forests of northern and western Victoria and, to a lesser extent, in Gippsland and the north-east. Cattle are taken in limited numbers to the alpine woodlands for summer grazing. In all cases the grazing is restricted to levels which will minimise conflict with recreation, conservation of native plant species, protection of catchments, honey and pollen production, wildlife conservation, and other uses.

Very minor products are charcoal, produced by cutting timber as fuel wood and firing it in a closed kiln; moss, gathered from cool moist forest areas for use in horticulture; small pines for Christmas trees; and occasionally a few pine cones and gum tips.

#### **Management of State Forests**

Modern management aims at maintaining the forests in use as viable ecosystems complete in their natural plant and animal communities and productive of the materials and amenities needed by the community.

The objective of timber production depends upon the maintenance of the forests in well-stocked condition and the Commission aims to regenerate and rehabilitate all forests used for timber production. In the management of native forests an underlying objective is to preserve and protect the variety of native plant and animal associations and control forest uses so that adequate habitat for birds and mammals is maintained. The scenic qualities of forests are preserved by controlled utilisation and the reservation of areas of special significance. Forests are managed also to ensure that they adequately protect water catchments,

and uses are controlled to ensure the prevention of discolouration of streams. The Commission endeavours to achieve continuous improvement in all aspects of forest management and undertakes extensive research of silvicultural, biological, nutritional, ecological, and hydrological factors. The Commission also provides and maintains facilities in the forests to enable the community to enjoy the aesthetic qualities and engage in various recreational activities.

Immediate field responsibility for the management of the forest rests with 46 District Foresters whose offices are located throughout the State. The districts are grouped into seven regional divisions each headed by a Divisional Forester. A central administration unit, situated in Melbourne, comprises six divisions, each with distinct functional responsibilities. Secretarial, accounting, personnel, and financial services are provided by the Administrative Division. The Division of Forest Management plans the development and management of the forest resource, and the promotion of community interest and understanding of forests. The Division of Forest Operations controls the work programmes for the establishment and treatment of forests, road construction, and building; it also provides advice and assistance on treeplanting and farm forestry. The Division of Economics and Marketing administers the marketing of timber pulpwood and other forest products, and undertakes economic studies related to this function. The Division of Forest Protection directs fire protection activities and deals with the protection of the forest against insects and fungi. The Division of Education and Research is responsible for professional and technical forestry education for the Commission and other land management authorities, and for research into the growth and management of native and exotic forests.

Overall the Commission controls a large and diverse organisation employing people in a wide variety of occupations. In 1975-76 when the total work force was 1,779, the annual expenditure was approximately \$23m.

The following table shows the number of staff employed in various capacities for the years 1971-72 to 1975-76:

VICTORIA—FOREST COMMISSION: STAFF

Particulars	1971-72(a)	1972-73(b)	1973-74	1974-75(c)	1975-76(d)
Administrative officers	91	91	96	97	100
Draughtsmen	14	14	14	12	15
Engineers	5	5	5	6	7
Foresters	222	224	227	222	226
Research officers	12	12	11	16	18
Surveyors	3	4	6	6	6
Other professionals	2	2	2	3	7
Workshop personnel	41	41	37	45	47
Forest overseers	167	164	167	172	169
Technical personnel	30	29	30	30	35
Clerical staff	160	156	157	159	170
Casual work force	1,188	1,268	936	1,597	979
Totals	1,935	2,010	1,688	2,365	1,779

a) Casual work force figures include 420 employed under the Rural Relief Scheme.

b) Casual work force figures include 503 employed under the Rural and Urban Development Scheme and 54 employed under the Drought Relief Scheme.

c) Casual work force figures include 694 employed under the Regional Employment Development Scheme and 73 employed under the Commonwealth Employment Service Trust Account.

d) Casual work force figures include 78 employed under the Dairy Farmers Employment Scheme.

Management of forests for the variety of different uses required by the community is achieved by recognising sectors of the forests, known as management zones, which have suitable characteristics for different sets of uses. Inappropriate uses which would be detrimental to particular zones or would come into conflict with other uses are discouraged or excluded. In some zones

a number of compatible uses may be encouraged. In planning the uses of management zones, intensive surveys are made to ascertain forest values and use compatibilities of different zones. Three examples of management of zones for multiple uses are described below.

## EXAMPLES OF STATE FOREST MANAGEMENT

### The Grampians

The Grampians State Forest covers an area of approximately 210,000 hectares. The ranges rise to a height of 1,164 metres above sea level and dominate the landscape of much of western Victoria. The differential erosion of the folded sandstones, plus the intrusion of sills, dykes, and granite batholiths, produce the unique and spectacular scenery for which the Grampians are renowned. The topography produces a diverse pattern of vegetation and a wide range of habitats for wildlife. The plant communities are of particular interest to naturalists, as they contain many endemic species, including several rare varieties. The Grampians are also of considerable archaeological interest as they contain many relics of Aboriginal culture, including paintings, middens, campsites, and some canoe trees.

Over 75 per cent of the Grampians are used as a catchment for dams that provide water for urban, stock, domestic, and irrigation purposes. They form the sole water catchment for a very large portion of the State and continued effective management for this purpose is vital to towns and rural communities as far away as the northern Mallee.

The Grampians State Forest provides an outstanding environment for recreation, and is used extensively for pleasure driving, hiking, scenic viewing, rock climbing, camping, and field studies.

Timber harvesting has been conducted in the Grampians for at least 130 years. At present some 20,000 cubic metres of sawlogs are allocated on an annual basis to six sawmills located in townships adjacent to the forest. In addition, significant quantities of railway sleepers, poles, and posts are produced and two small areas of pine plantation yield sawlogs plus posts, poles, and rails for timber preservation.

Honey production also is important and the value of honey drawn from the forest is estimated to be about \$600,000 annually. There are over 200 apiary sites within the forest. Grazing by domestic stock is authorised over some 24,000 hectares of grassy woodland of red gum and yellow box surrounding the ranges. Management for these various uses is carried out in accordance with a specific plan which recognises the following zones (see Figure 1 on page 26) :

(1) *Primitive*. The primary objective is to preserve opportunities for recreational experience in a natural environment without developed public access. Forest produce is reserved from utilisation.

(2) *Special feature*. Conservation of natural and historical features for recreational, aesthetic, educational, and natural history purposes is the primary objective with development of public access and facilities where appropriate. Forest produce is reserved from utilisation.

(3) *Natural*. The primary objective is to conserve natural and historical features for recreational, aesthetic, educational, and natural history purposes. Other uses, including low intensity timber harvesting and silvicultural operations, are permitted to the extent that they are consistent with the primary objective.

(4) *Recreation sites*. Limited areas are intensively developed for recreational purposes.

(5) *Hardwood timber production*. The primary objective is the sustained production of native timber in accordance with prescriptions to harvest and regenerate the forest and to protect soil, water catchment, ecological, historical, and recreational values.





(6) *Softwood timber production.* Approximately 1,000 hectares of established softwood plantations are managed primarily for the sustained production of softwood timber. Forest based recreation is a significant secondary use.

In addition to the above zones, the whole of the area yields water, and a general set of prescriptions is laid down to cover water catchment management.

The protection of the Grampians from wildfire is a critical aspect of management. The inflammable vegetation, rugged topography, and climate combine to produce a situation where forest wildfires can sweep large areas with appalling effects. These natural factors along with the increasing risks associated with heavy visitor usage, make effective fire control essential to the safety of the area. Toward this end a complex fire management and control system has been developed including a sophisticated detection and communications system, access based on ground vehicles and helicopters, specially trained fire fighters, air drops of fire retardant, and co-operation with rural fire brigades. In addition, prescribed burning is used to reduce the accumulation of fuel that builds up on the forest floor. Prescribed burning as a technique for wildfire control and vegetation management is of considerable importance in the Grampians where fire is a natural factor of the environment.

#### **Toolangi-Black Range Forest**

The climate is cooler in Toolangi-Black Range Forest than in the Grampians and the rainfall is higher. It is situated on the Great Dividing Range and its northern slopes, mainly on the Kinglake-Black Range plateau at elevations between 450 and 900 metres. The highest points are Mt Tanglefoot (1,009 metres), Mt St Leonard (1,008 metres), and Mt Mitchell (935 metres). The forests occupy 68,000 hectares.

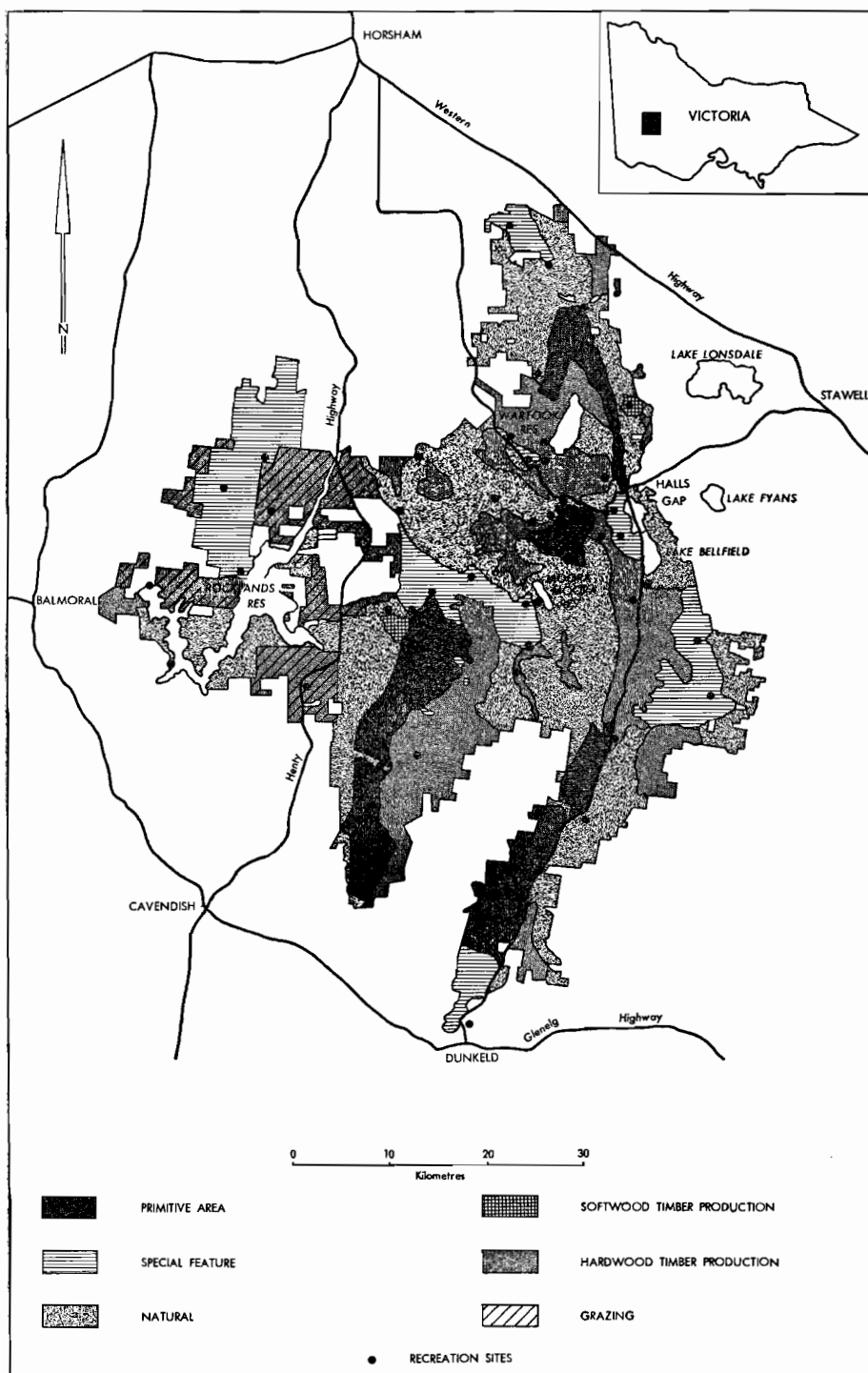


FIGURE 1. Victoria—Grampians State Forest management zones

Fertile soils have developed on the Upper Devonian granodiorite of these highlands. The soils of the northern foothills are derived mainly from Lower Devonian sandstones, mudstones, siltstones, and shales.

The vegetation varies from the dense mountain type occupying the high rainfall areas, to the stunted and relatively sparse foothill forests of the drier and more exposed sites. The mountain forests are dominated by regrowth stands of mountain ash that range in height from 45 to 70 metres. The bulk of these stands originated from the 1939 fires with smaller areas arising from fires in 1901, 1905, 1911, 1919, 1926, and 1945. Shining gum, mountain grey gum, and messmate also occur in the mountain forest type. Understorey vegetation includes tree ferns, musk daisy bush, blanket leaf, silver wattle, mountain hickory wattle, blackwood, sassafras, and myrtle beech. The foothill forests occupy a wide range of sites. They contain a variety of species, including messmate, manna gum, mountain grey gum, and narrow-leaf peppermint. Red and brown stringybark are found on drier and more exposed areas. In these forests the high quality sites carry a dense and tall understorey, whilst on the drier sites the understorey is generally sparse and may consist only of grasses and low shrubs.

Utilisation of the Toolangi forest began with clearing for agricultural purposes in the latter half of the nineteenth century. Milling of timber was carried out on a small scale until the advent of rail transport. The milling of messmate then pushed deeper into the forest and before 1920 wagons hauled timber to the railhead at Yarra Glen from mills to the north of the Victoria Range. During the early part of this century the paling splitters were also active. They penetrated deep into the ash forests and felled those trees which split easily. Their produce was hauled to the railhead at Healesville. During the 1920s, techniques were



developed for milling, drying, and reconditioning of mountain ash timber. Large scale harvesting of the species followed, with tramlines extending into the forest from the south near Toolangi, and from Murrindindi in the north. Following the 1939 fires, roads were developed to permit extraction of fire-killed timber. Wartime and post-war requirements accelerated the development of the roading system, and provided the impetus for harvesting in the more remote stands of lower quality. Since this time, the milling industry has gradually declined and is now on a relatively small scale. However, with the extensive regrowth forests approaching maturity, timber production will once again become a major activity in the Toolangi forest. The regrowth mountain ash forests are already important for the production of small sawlogs together with pulpwood for the manufacture of packaging paper and cardboard.

The Toolangi-Black Range Forest protects the catchments of streams which flow both north and south from the Divide, and it provides opportunities for many and varied recreational and educational pursuits, and the study of natural history. To facilitate management in a way which makes provision for the various demands, the forest is being divided into zones along the following lines :

(1) *Hardwood production.* This is eucalypt forest managed primarily for the sustained production of wood products. Harvesting and regeneration are conducted in accordance with prescriptions designed to conserve other forest values. Wood production by these forests in 1975-76 was 71,200 cubic metres, most of which was obtained from this zone. For the purposes of management the zone is subdivided into three sub-zones.

The mountain forest sub-zone carries stands of mountain ash, shining gum, and messmate, and has a very high potential for wood production. The forest is managed as an even aged crop. The foothill forest intensive silviculture sub-zone also has high potential for wood production, with the main commercial species being messmate, manna gum, and mountain grey gum. The forest is normally managed as an even aged crop. The foothill forest low intensity silviculture sub-zone is managed as an uneven aged forest with periodic harvesting of selected trees. The productive potential is relatively low. Messmate is the main commercial species.

(2) *Conservation.* This zone embraces native forest managed primarily for the conservation of landscape, flora, fauna, or other special features. Other uses are permitted only where they are compatible with the primary objective. Included are special features such as the Murrindindi Falls, Myers Creek scenic reserve, flora and fauna reserves, sensitive landscape areas, certain native forest areas that have been set aside within plantation areas, and some areas which are to be retained more or less in their present condition pending future land-use decisions.

(3) *Softwood production.* The primary objective is the production of softwood timber under intensive management. Establishment of the plantations commenced in 1937 and at the end of 1976 a net area of 445 hectares had been planted.

(4) *Education.* These areas are managed primarily for educational purposes. This zone covers 300 hectares and includes the extremely popular forest camp at Kinglake West. During 1975 approximately 3,300 persons used the facilities of the camp and surrounding areas.

(5) *Recreation sites.* These are limited areas under, or selected for, intensive development as recreation sites, e.g., picnic grounds and camping areas.

(6) *Utilities and services.* Small areas being used for such purposes as easements (e.g., SEC transmission lines), gravel pits, and rubbish tips.

The whole area is managed under special water catchment prescriptions and areas of strategic importance for fire protection are identified for special management.



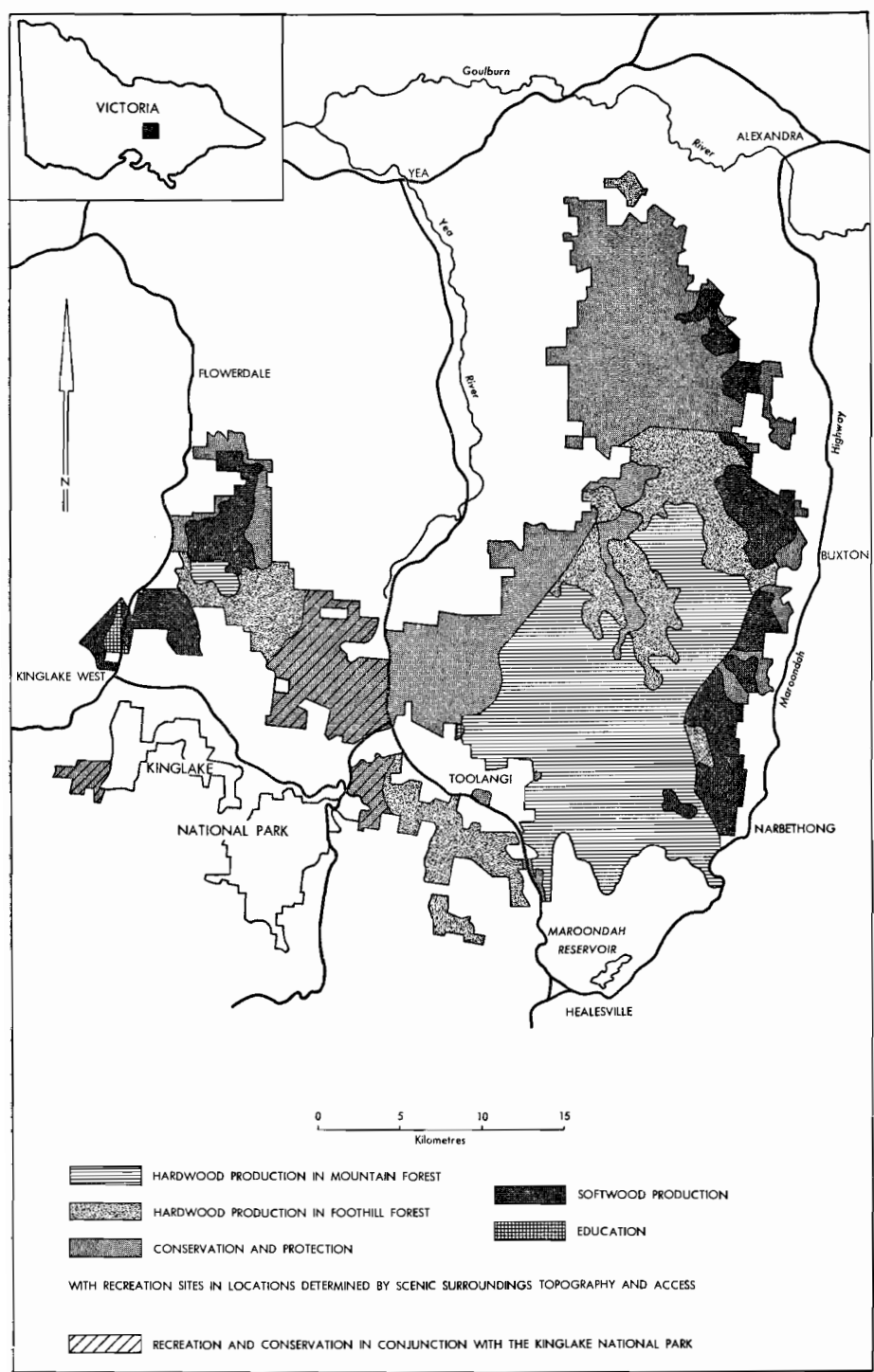


FIGURE 2. Victoria—Toolangi-Black Forest proposed management

### Mount Macedon Forest Park

The Mount Macedon Forest Park comprises 1,295 hectares of reserved forest on the Macedon Range approximately 60 kilometres north-west of Melbourne. The range rises steeply to 600 metres above the surrounding plains. It dominates the rural landscape and attracts numerous visitors from the country and the metropolis.

The range has a marked effect on the local climate, receiving an annual precipitation of 1,000 mm of rain and snow, compared with 500–600 mm on the plains. The streams are important sources of water for domestic use in the nearby townships. In the dense forests on the range there is a variety of plant associations and wildlife habitats. The forests were heavily exploited in the early years of settlement for building timbers and firewood. Denuded sections of the range were reforested with plantations of pines and other conifers which now yield a steady output of softwood timber for local industry.

This small area of forest has very high values for five essential uses—nature conservation, forest recreation, water production, timber production, and landscape. Management of the Forest Park is concerned predominantly with co-ordination of these uses.

(1) *Nature conservation.* As the Macedon Range is isolated from similar forests by expanses of grassland 50 kilometres wide to the east and 150 kilometres to the south, the area is especially valuable for conservation of native vegetation and as a natural habitat for native birds and animals. Many of the species of native plants, birds, and animals that are typical of such forests are present in the Forest Park, and some rare species of smaller plants and shrubs have been recorded.

In addition to the 30 bird species which reside on the range throughout the year, about 70 species frequent the range in spring and early summer to use the luxuriant forest habitat for nesting and feeding young. Many species use the shelter of the small areas of dense pine forest for roosting and foraging, and some nest in the plantations. Conservation of the bird habitat within the Park thus contributes to conservation of the bird populations in widespread areas of the country.

Composition and structure of the forest vary rapidly with elevation and aspect. Although the range does not rise to the same elevations as the eastern highlands, the highest points are forested with snow gum and alpine ash, and there is tall mountain ash forest on the most sheltered slopes. There are short forests of messmate, peppermint, and manna gum on the lower slopes and drier aspects, with a short open forest of long leaved box on exposed shallow soils west of Mt Towrong, and swamp gum in low moist situations.

The primary management concern is protection against wildfire. Roads and tracks are located and maintained as access for fire suppression crews, and forest fuel levels are controlled in strategic locations wherever burning can be carried out with only minimal disturbance of the habitat. Facilities in recreation areas are maintained and the areas are controlled during the summer to prevent outbreaks of fire from picnics and barbecues. Large areas of the forest are kept inaccessible to the majority of visitors and forest operations in the eucalypt forests are confined to works which are needed to maintain the forest in healthy condition.

(2) *Forest recreation.* The Macedon Range has attracted visitors from Melbourne since the 1850s when the first of a number of luxurious holiday homes was built at Mt Macedon.

About 150,000 persons visit the Park each year, but their use of the forest is concentrated almost completely on Cameron Drive, the main tourist road which leads to the two best vantage points on the range at the Camel's Hump and the Memorial Cross, together with several small picnic grounds among the pine plantations and native forests adjoining Cameron Drive. Most visitors stay

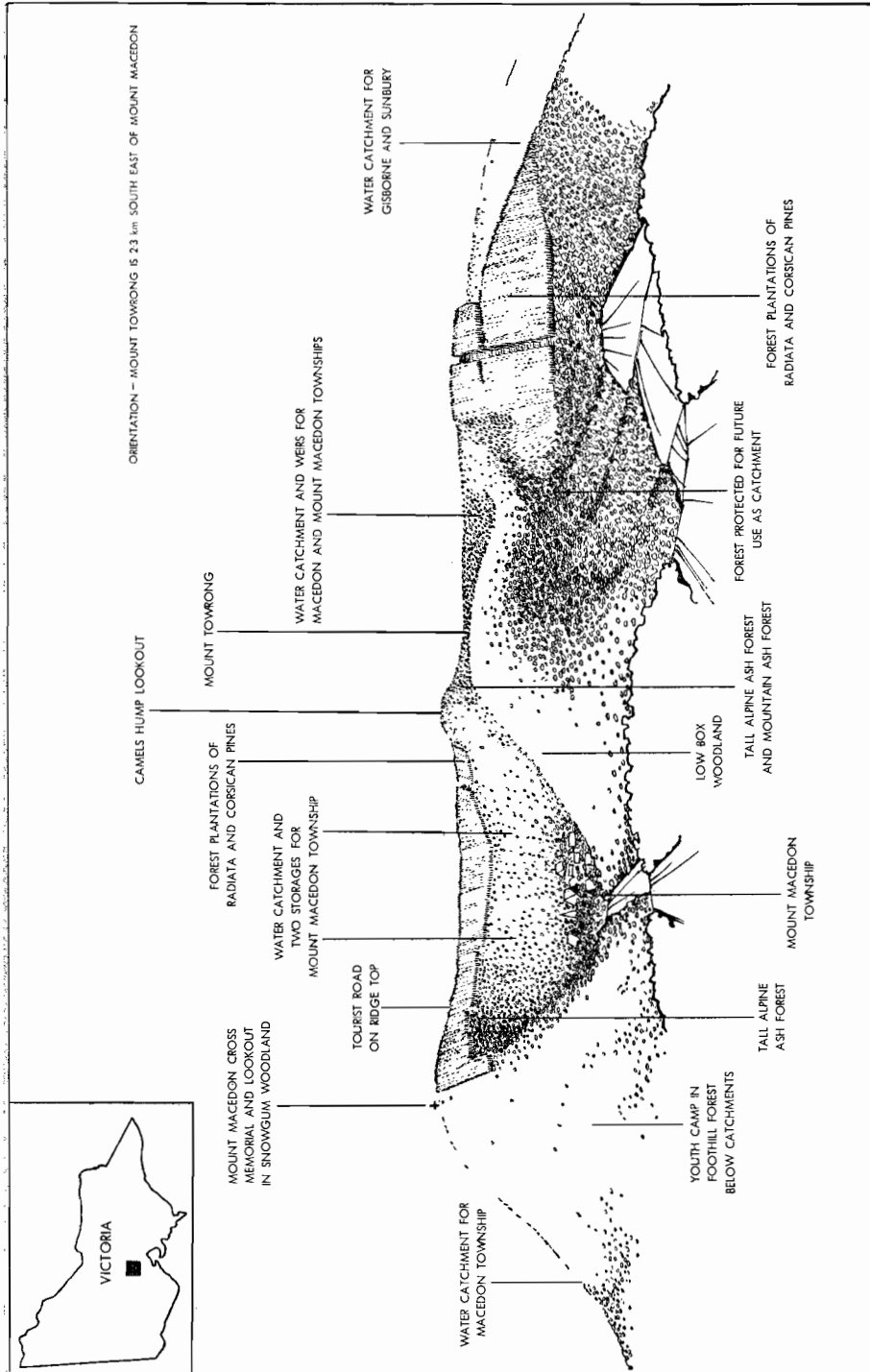


FIGURE 3. Victoria—Mount Macedon Forest Park location of forest uses

less than two hours in the area. The intensive recreation zone is thus restricted to a small area which has little impact on the water catchment and nature conservation functions of the Park.

Development of an intensive recreation zone is planned for an area of forest outside the Forest Park, below the water catchments in an area of pine plantations adjacent to the Calder Highway. Picnic facilities and walking tracks with views of the mountain will meet the requirements of many additional visitors to the area.

(3) *Water production.* Small sections of the southern extremities of the Park are the only parts which are not in direct use as water supply catchments. Nine catchments for domestic water supply purposes are in different sections of the Park, and small parts of the catchments of the major water storages, Lake Eppalock and Rosslyne Reservoir, are also in the Park. There are five small reservoirs and several diversion points on streams within the Park boundaries and several just outside the boundary.

Forest operations in all catchments are conducted under strict controls. Harvesting, reforestation, and road works are restricted during winter and early spring, and when conditions are wet after heavy rains. The operations are planned and controlled to prevent damage to soils or movement of sediment out of works areas. Strips of vegetation along streams are left undisturbed, steep slopes are avoided, and the sites of concentrated activities such as log landings are carefully selected. Potential sources of pollution associated with the works are also under strict controls. Road works are planned and controlled to ensure that the roads do not promote erosion and that they do not discharge sediment to streams.

Buffer areas around the small reservoirs are managed exclusively for water production purposes and two reservoirs are enclosed by fences to exclude visitors.

(4) *Timber production.* Plantations of exotic conifers occupy 18 per cent of the area of the Park. They are located in twenty separate stands scattered through the Park, and they comprise a great variety of species and ages, ranging from extremely dense stands of some of the finest Douglas fir in the State to picturesque small plots of cypress and redwood. There are 222 hectares of radiata pine, pine, and Douglas fir, which are prime commercial species.

Mill logs and small timbers suitable for preservative treatment and pulpwood are harvested by thinnings and clear fellings. The clear fellings are limited to small areas and all operations are controlled for protection of the catchments. The output of timber is currently approximately 2,500 cubic metres per year.

(5) *Landscape.* Steep forested slopes rising to Mount Macedon and the Camel's Hump are the main features of the Forest Park landscape.

Protection against wildfire and control of works for timber harvesting prevent major changes in forest cover and maintain the landscapes seen from nearby townships and surrounding farmlands. Vegetation along roadsides within the Park is also managed primarily for its scenic value. Forests on the foothills of the range form the foreground of views of the range as seen from most of the roads.

Management of the Macedon Forest Park is co-ordinated with management of adjoining State forests and freehold land. Fire protection in particular involves regional prevention work, communication between forest and rural fire fighting organisations, and complementary fire laws and regulations. Conservation of native vegetation, landscape, and habitat within the Park is co-ordinated with planning for uses of other lands. Municipal planning schemes now in preparation propose that freehold land adjoining the Park should be used only for purposes which are complementary to protection and conservation objectives. The schemes envisage controls to ensure that native forest within certain zones will be conserved, and that developments which would increase the risk of fire or cause damage to water catchments are prevented.



# FORESTS IN THE ENVIRONMENT

Deep shade and shrub understorey in a forest plantation of radiata pine in north-east Victoria.







Young children in a forest setting in the You Yangs Forest Park.

Timber feller at work harvesting sawlogs of radiata pine in a plantation at Macedon.



Growing seedlings of radiata pine in a forest nursery.





A road through a mountain forest of mixed eucalyptus species used for timber harvesting, fire protection, and sightseeing.

Mallee vegetation of short multi-stemmed eucalypts and light ground cover of grasses and low shrubs.







Low clouds and fog over sub-alpine forest on snow covered mountain sides near Omeo.

Ironbark forest, a favourite setting for picnics and walks, especially in the former goldfields of northern Victoria, in use at Angahook Forest Park.







Alpine landscape visible for many miles from an opening in the snow gums.

An old red gum stump in use by ibis during a flood for nesting in the shelter of tall red gum saplings.





Forested landscape forming the background of rich farmland and the catchment of Toorourrong Reservoir, part of Melbourne's metropolitan water supply system.

A dense forest of mixed eucalyptus species on the hills surrounding a farm near Whittlesea.

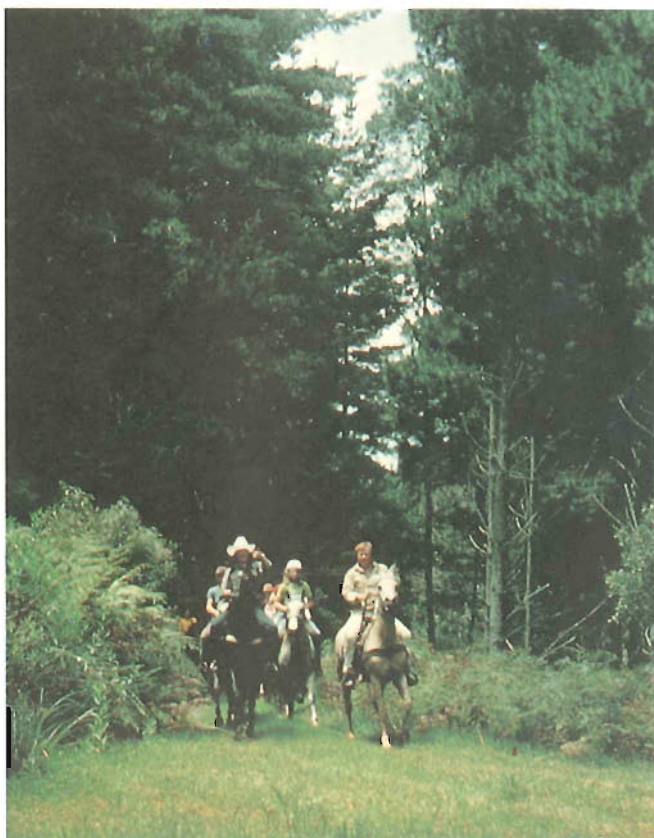






Tall mature forest of alpine ash with dense shrub understorey in north-east Victoria.

Visitors on a pony trail through radiata pine forest.







Tall dense re-growth forest of mountain ash near Powelltown.



## CONCLUSION

Magnificent expanses of forest lie within easy driving distance of most cities and towns in Victoria. They line much of the Murray River, the coast and other State borders, and cover the central ranges and the whole of the eastern segment of the State. The variety of forest types, ranging from spectacular alpine ash stands to arid expanses of stunted mallee, and the vigorous conditions of trees and shrubs within them, offer diverse environments for the multiplicity of uses the community demands.

Since European settlement the community attitudes towards the forest resource followed a pattern that is commonly found in the development and use of natural resources. During the early days of settlement, community attitudes were dominated by the need for agricultural land, mining timber, fuel and construction wood. This led to virtually uncontrolled exploitation of what to the early settlers would have appeared to be an almost limitless resource. Very few persons were interested in forest conservation and management, and they were given little encouragement by the governments of the day. The need for wood and agricultural land continued into the present century, and with the development of towns and cities, water became an important factor. Following the efforts of a few enlightened individuals, an effective forest authority in the form of the Forests Commission was eventually formed in 1919. In the face of considerable resistance it began to implement controls and introduce more constructive forms of management. The interest of the community in forests slowly increased until the mid 1960s, when the rising pressure of urban life and the environmental movement led to a rapid expansion in recreational and environmental demands. This was accompanied by an upsurge of interest in forest management practices, and present community awareness of the need for positive forest management is rapidly increasing.

There are now more visitors to State forests; timber production continues to rise; and the demand for water increases. In the community greater emphasis is being given to the role of forests as the major heritage of native plants and animals, and it is recognised that the management of each complex forest association in stable healthy conditions for use by future generations is a fundamental requirement. Continuous research and advances in forest management should enable forest uses to keep pace with demand. The Forests Commission is applying its experience in the control of traditional uses to new forms of use in recreational and leisure activities.

The Commission is studying the capabilities of forests for new uses; surveying landscape and recreational values; and monitoring ecological effects of uses. Its research programmes investigate growth rates, population characteristics, regeneration methods, competition factors, density effects, site qualities, genetic resources, and tree diseases and disorders. All these projects aim at the best possible management of forests in use.

In future management skills will determine the level of use that the forest ecosystems can sustain, but the fundamental need to protect the forests from fire damage will be paramount. Protection from fire is essential for all forest uses, whether the objectives be commercial, scientific, or aesthetic. Fire protection will remain a crucial consideration in planning of developments, roads, uses, management zones, conservation strategies, and all aspects of management of Victorian forests. Fire prevention works, maintenance of fire fighting equipment, and training of fire fighters will always have the highest priority; protection from disease and misuse will also be important responsibilities.

The growing appreciation by the community of the values of the forest environment necessitates that forest management skills continue to develop in line with the increasing demands and uses so that the forests may best serve the present and the future.

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