

FORESTRY

FORESTS OF VICTORIA

Introduction

Forests are complex and dynamic ecosystems of living organisms and their physical habitat. The living organisms include plants, animals, birds, fungi, and a vast collection of micro flora and fauna. The physical components of the ecosystem include those associated with the atmosphere, the soils, and the rock formations from which the soils have been derived.

The objectives of forest management vary according to the demand for the benefits that a forest ecosystem can provide and the capability of the ecosystem to supply the desired benefits without detriment to its long-term productive capacity. Forests owned by the community, such as the State forests of Victoria, provide a wide range of benefits both tangible and intangible. The efficient management of forest ecosystems to produce these benefits is a demanding task involving considerable resources of skilled manpower, finance, and equipment. The services of a wide range of expert personnel are required, including foresters, botanists, zoologists, pathologists, entomologists, hydrologists, engineers, surveyors, management specialists, economists, sociologists, landscape architects, and administrators.

Approximately 36 per cent or 8.1 million hectares of the total land area of Victoria is occupied by forests. Of this, 6.9 million hectares are State forest of which 2,230,000 hectares are reserved forest. The reserved forests are permanently reserved as forest land and can be excised or alienated only in exchange for other areas of Crown or private land. The remaining 4.7 million hectares are mainly protected forest which are not permanently reserved although the Forests Commission is responsible for their management.

The major belt of forest in Victoria is located in the eastern half of the State extending from a point to the north of Melbourne to the New South Wales border. This area forms the southern end of the vast and continuous belt of forest that straddles the Great Dividing Range along the length of the eastern coast of Australia. Other extensive areas of forest in Victoria are situated to the north-west of Melbourne, in the South Gippsland Ranges, the Otway Ranges, the south-western region, the Mallee, and the northern and central parts of Victoria where forests of red gum, ironbark, and box are present.

Types

The forests of Victoria embrace many types ranging from the tallest of hardwood forests in the world, which occupy the cool mountain regions in the east, to the stunted mallee heathlands of the arid north-west. The main types recognised within State forests are mountain forests, stringybark forests, red gum forests, ironbark and box forests, arid woodlands, arid heathlands, and forest plantations. The majority of native forests are hardwoods, while most forest plantations are of softwood species.

Mountain forests

The mountain forests occupy about 840,000 hectares of the cool, high rainfall country in the Central and Eastern Highlands, the South Gippsland Ranges, and the Otway

Ranges. The forests comprise two main types, namely, sub-alpine woodland, and ash forests of alpine ash, mountain ash, and shining gum.

The sub-alpine woodland occupies the highest elevations in the State ranging from approximately 1,400 metres to 1,800 metres. It covers about 210,000 hectares in Victoria and typically consists of snow gum forests interspersed with snow grass and herb plains. Because they occupy an area where the climate is severe, sub-alpine woodlands must be carefully managed to ensure the protection of vegetation and soils.

The sub-alpine woodland yields large quantities of water which is used for domestic, irrigation, and hydro-electric purposes. It also provides an environment suitable for specialised recreational use, including intensively developed ski resorts, scenic roads, and walking tracks. The alpine walking track, which is planned to extend along the total length of the Great Dividing Range, passes through sub-alpine woodland for a considerable portion of its length.

The ash forests of alpine ash, mountain ash, and shining gum extend from the lower limits of the sub-alpine woodland down to elevations of approximately 600 metres, or lower on some southern aspects. They occupy the cool, moist regions to the east of Melbourne and in the South Gippsland and Otway Ranges, and cover a total area of approximately 630,000 hectares, of which 380,000 hectares are reserved forests.

The mountain forests play an important role in Victoria's economy because they are among the most productive forests in the State, yielding large quantities of wood and water, and providing an environment for recreational activities. They produce large volumes of timber of seasoning quality, and the majority of the hardwood pulpwood used by the paper making industry in Victoria. They occupy significant portions of the catchment areas used to supply water to major population centres. The very tall trees and dense understorey of shrubs and ferns found in ash forests provide magnificent scenery, and afford an excellent habitat for well known wildlife species, such as lyrebirds, possums, and wallabies.

Stringybark forests

The stringybark forests of Victoria include a wide variety of forest types in which various stringybark eucalypts and associated species occur. They are the most extensive of the Victorian forest types and occupy practically all of the forest land on the coastal plains, and in the foothills to the north and south of the Great Dividing Range up to elevations of 900 metres. The total area of stringybark forests is 3,820,000 hectares of which 1,380,000 hectares are reserved forests.

The presence of the root-rot fungus *Phytophthora cinnamomi* (Rands) in the stringybark forests is currently causing concern. Sections of the coastal silvertop forest in eastern Gippsland and other stringybark forests in south-west Victoria have been damaged, and in some cases killed, by the fungus. A detailed research programme is currently in progress, and in the meantime controls have been imposed to restrict the spread of the fungus through transfer of soil by trucks and tractors.

The stringybark forests provide wood, water, and recreation. They yield some 65 per cent of the total volume of timber produced from State forests. The principal uses of the timber are for house framing, general construction, and wood pulp for hardboards, paper, and packaging material. A large portion of the total yield is now coming from the extensive forests of eastern Gippsland. Some areas of intensively managed stringybark forest in the central part of Victoria have been producing regular timber yields for over a century and some have entered their third rotation of timber production. In western Victoria, where they are practically the only reserves of original native vegetation, they are an important source of timber for farm buildings, fencing, and fuel.

Stringybark forests occupy the water catchments of many cities and towns in Victoria. They are rich in birds, animals, and wildflowers, and their distinctive character makes them an attractive location for recreational activities. They attract large numbers of day visitors throughout the year, and are frequently used for fishing, camping, and hiking, especially during the early summer and autumn months.

Red gum forests

The red gum forests are the most widely distributed of the Victorian forest types although their total area is relatively small. Extensive areas of river red gum can be found

along the flood plains of the Murray River downstream from Cobram, and along the northern reaches of its tributaries. Savannah woodlands of red gum occur on the western plains and the species is common along watercourses throughout most of Victoria.

The red gum forests produce substantial quantities of wood and are extensively used for recreational pursuits. In addition, they play an important role in the control of water flows along the Murray River system and its tributaries. The forests have supported a viable timber industry since the earliest days of settlement. Red gum timber is used for sawmilling, sleepers, posts, and piles, and because of its strength, durability, and attractive appearance it is keenly sought.

The open woodland and gentle slopes of the red gum forests are well suited for outdoor recreation. Roads and tracks are inexpensive to construct and there are many suitable sites for camps and picnics. Streams and billabongs are focal points for recreation and the numerous species of birds and animals associated with the water are major attractions. The red gum forests also provide an excellent grazing area for domestic stock and native animals.

Ironbark and box forests

The major areas of ironbark and box forests occur on poor soils in the north-central regions of Victoria where low rainfall and hot, dry summers are characteristic of the climate. The main forests are mixtures of red ironbark and box eucalypts with the species mixture generally being determined by the fertility and water holding capacity of the soil. The ironbark and box forests are used for railway sleepers, fencing timbers, and fuel, and they are highly valued for honey production and recreation.

Arid woodlands and heathlands

The arid woodlands and heathlands occupy large areas of the Murray Basin plain in the north-west of Victoria. They are forests of tremendous diversity with a wealth of plant species and many distinct associations. The diversity of these ecosystems is mainly a result of variations in soil type and the history of the areas they occupy. The arid woodlands and heathlands offer environments suitable for recreation and they are of considerable scientific and aesthetic interest. Because they occupy low rainfall areas, and are of a stunted form, they are of relatively minor value for water and wood production.

Forest plantations

The lack of native species suitable for the commercial production of softwood and the presence of derelict and marginal farmland have led to the development of extensive forest plantations in Victoria. The total area of these plantations (including privately owned plantations) is approximately 170,000 hectares.

Early planting trials covering a wide range of softwood species indicated that radiata pine was eminently suited to the medium rainfall environments of Victoria, and it has been used in the majority of plantations. Small areas of Corsican pine, maritime pine, ponderosa pine, and Douglas fir have also been established. Mountain ash is the only native species that has been used on any significant scale for plantation purposes.

The prime use of forest plantations is for wood production, but they also provide valuable cover for water catchments, and recreational benefits, such as those obtained from driving, picnics, and general scenic enjoyment. Another benefit from plantation development has been the reforestation of abandoned farmlands and rehabilitation of lands degraded by mining and bad farming practices.

Management

The State forests of Victoria are managed by the Forests Commission under the *Forests Act 1958*. This Act provides for State forests to be managed to produce a sustained yield of wood, and to provide protection for water catchments, recreational and educational opportunities for people, a habitat suitable for native flora and fauna, and a range of minor forest products such as forage for grazing, honey, essential oils, gravel, and stone. The Forests Commission also has explicit responsibilities under the Act to protect State forests from misuse and damage by fire, insects, and fungi.

In order to fulfil its obligations under the Act, the Commission is organised into functional and territorial divisions. The functional divisions cover administration, forest

management, forest operations, economics and marketing, forest protection, and forestry education and research. Territorial organisation is based on seven field divisions each of which is subdivided into a number of forest districts. The forest district is the basic territorial unit through which the management of State forests is implemented. There is a total of 47 districts in Victoria, each of which is under the control of a professional forester.

Establishment and tending of State forest plantations

The establishment of plantations to meet future requirements for wood and to reafforest derelict areas of farmland continued on a major scale in 1979-80. A total of 329 hectares of native hardwood plantations was established during the year, the main planting being mountain species in the eastern Strzelecki Ranges of South Gippsland. During 1979-80, a total of 2,940 hectares of new softwood plantations was established, the whole area of which was radiata pine. Softwood plantings were again concentrated in each of eight development zones, where it is planned to establish an area of plantation sufficient to support large and integrated wood using industries.

The establishment of softwood plantations on a major scale in Victoria has many beneficial effects including provision of much needed timber supplies, decentralised industry, employment, and an environment suitable for picnics, pleasure drives, and other recreation. However, the establishment of new plantations may involve environmental changes, and before a plantation is established a considerable amount of research and planning is carried out to minimise undesirable effects. Where a new plantation is to be established within an area of native forest, an ecological survey is conducted and the plantings are located to minimise their influence on the environment. Types of native forest that are limited in extent, or are of special ecological significance, are excluded from the planting area. In addition, substantial blocks and corridors of the original vegetation are retained to provide undisturbed habitats for native flora and fauna.

VICTORIA—STATE FOREST SOFTWOOD PLANTATIONS:
ESTABLISHMENT AND TENDING ACTIVITIES
(hectares)

Activity	Area				
	1975-76	1976-77	1977-78	1978-79	1979-80
New planting	3,889	5,000	4,136	3,667	2,940
Re-planting felled areas	486	388	545	520	719
Thinning—					
commercial	760	934	396	940	1,094
non-commercial	32	65	112	149	5
Pruning	391	131	387	342	127
Fertilisation	2,110	2,764	3,006	3,631	3,488
Firming	430	—	—	—	—
Cleaning—					
ground	5,090	6,738	5,263	4,772	6,040
aerial	1,915	1,107	1,751	9	—

Source: Forests Commission, Victoria.

VICTORIA—NATIVE STATE FORESTS ESTABLISHMENT AND
SILVICULTURAL TREATMENT
(hectares)

Activity	Mountain forests			Stringybark and other forests		
	1977-78	1978-79	1979-80	1977-78	1978-79	1979-80
New planting	873	325	299	328	63	30
Aerial seeding	1,244	1,133	1,406	410	476	1,104
Hand seeding	484	948	709	596	718	1,041
Induced seed fall (a)	20	7	94	3,073	3,626	3,771
Regeneration felling/natural seed fall	10	78	212	4,201	6,538	7,326
Liberation felling	344	56	62	2,021	1,762	2,464
Thinning	3	8	29	4,481	2,762	2,741
Coppicing	—	—	—	1,250	830	623
Other	—	—	68	2,138	1,371	809

(a) Artificially induced seed fall from standing trees.

Regeneration and tending of native forests

The regeneration and tending of native forests is aimed at maintaining them in a healthy, productive condition so that they can continue to supply benefits to the community in perpetuity.

During 1979-80, a total of 22,459 hectares of native forest was subjected to regeneration or other silviculture treatment. Labour made available through Commonwealth Government employment relief schemes assisted considerably in this work.

VICTORIA—SILVICULTURAL TREATMENT OF NATIVE FOREST TYPES IN
STATE FORESTS, 1979-80
(hectares)

Treatment	Area treated					Total
	Ash forest	Stringy-bark gum	Box, iron-bark	Red gum	Native pine	
Aerial seeding	1,406	1,104	—	—	—	2,510
Hand seeding	709	1,041	—	—	—	1,750
Induced seed fall (a)	94	3,671	—	100	—	3,865
Regeneration felling/natural seed fall	212	3,837	369	3,120	—	7,538
Liberation felling	62	1,584	780	100	—	2,526
Thinning	29	518	1,283	468	472	2,770
Coppicing	—	40	562	21	—	623
Other	68	804	5	—	—	877
Total	2,580	12,599	2,999	3,809	472	22,459

(a) Artificially induced seed fall from standing trees.
Source: Forests Commission, Victoria.

Forest protection

The worst fire danger during 1979-80 occurred in the far east and far west of the State. During the season, Forests Commission personnel attended 713 wildfires. These fires burnt a total of 27,636 hectares of State forest, national parks, and protected public land. The area of State forest and national parks burnt in the five fire seasons up to and including 1979-80 is shown in the following table:

VICTORIA—AREAS OF STATE FOREST, NATIONAL PARKS
AND PROTECTED PUBLIC LAND BURNT BY WILDFIRES
(hectares)

Year	State forest	National parks	Protected Public Land (a)	Total
1975-76	51,166	2,144	..	53,310
1976-77	118,461	10,379	..	128,840
1977-78	68,151	460	..	68,611
1978-79	37,454	3,610	..	41,064
1979-80	25,773	628	1,235	27,636

(a) The area of Protected Public Land (PPL) is recorded from 1979-80. PPL is public land, managed by other Authorities, for which the Forests Commission is responsible for fire protection.
Source: Forests Commission, Victoria.

The wildfires occurring in the State forests originated from a variety of sources. Of the total number of outbreaks, 16 per cent were attributed to landholders and householders, lightning caused 22 per cent, and deliberate lighting accounted for 14 per cent. The causes of fires attended by Forests Commission personnel during the years 1975-76 to 1979-80 are shown in the following table:

VICTORIA—CAUSES OF FOREST WILDFIRES

Cause	Number of fires				
	1975-76	1976-77	1977-78	1978-79	1979-80
Grazing interests	1	—	2	1	6
Landowners, householders, etc.	58	41	117	62	120
Deliberate lighting	68	43	94	24	109
Sportsmen, campers, and tourists	50	41	67	42	115
Licencees and forest workers	14	5	27	13	41
Smokers	6	5	29	17	50
Lightning	48	95	158	113	154
Tractors, cars, trucks, locomotives, and stationary engines	26	8	23	29	29
Children	14	6	22	5	20
Sawmills	1	5	8	4	18
Miscellaneous known causes	28	30	42	7	15
Unknown origin	20	11	17	24	36
Total	334	290	606	341	713

Source: Forests Commission, Victoria.

A central strategy of fire protection in Victorian forests is to dispose of the dry plant litter, especially bark, leaves, and small dead branches of the eucalypts which are shed every year in great quantities. Removal of accumulations of this flammable material is the most effective means of preventing intense destructive wildfires and enables fire fighters to control any outbreaks.

Control of the fine fuels in the eucalypt forests has become a major activity in forest protection and is an important factor in protecting the softwood plantations. It is achieved by the most natural and least disruptive means, namely, controlled fires which burn at low intensities. Large areas of State forests, approximately 200,000 hectares, are treated in this way each year.

Burning operations to reduce the accumulations of fine fuels are carried out in spring and autumn. The operations are controlled to confine them to periods when weather conditions and dryness of the fuels are suitable for slow controllable fires. Another factor in control of the fires is the method of ignition. Numerous fires are lit more or less simultaneously and allowed to spread slowly. The objective is to burn a mosaic within the planned area with the balance, perhaps as much as half the area, remaining unburnt.

The spacings of these fires are adjusted to suit the conditions of fuel, topography, and weather of each situation, and the fires are ignited by hand with special torches; in large projects, lighting from the air is used, with incendiary capsules dropped at controlled spacings from helicopters and other aircraft.

The fuel reduction system has been developed as a result of research on the conditions under which fires can be lit and kept at low intensities, on equipment and techniques for lighting, and on the effects of controlled fires and wildfires on the vegetation, wildlife, forest growth, and timber quality.

Major improvements have been made in the methods of fire suppression by using aircraft. An effective technique of aerial attack on fires has been developed in which small aircraft that are normally used for agricultural spraying and dusting, fitted with hoppers of 350 to 1,200 litres capacity, are loaded with a fire retardant substance which they drop on the vegetation at the edges of fires. The fire retardant is a formulation with water selected for its lasting effect when applied to forest vegetation in hot weather. It is applied in short-overlapping bands around isolated fires in remote areas and to troublesome sections of other fires. It thus reduces heat intensity and enables the fire fighters to gain control.

The aircraft operate from airstrips within the forest, where facilities have been installed for storage, mixing, and loading the retardant and from other small airstrips near the forests. Helicopters also are used to great effect in fire suppression. Fire officers travel by helicopter to search for small new fires and make rapid inspections of fires; they then inspect and direct the fire fighting operations. Helicopters are also used for transporting men, equipment, and supplies to remote areas.

There are 227 sites in and near the forest, known as helipads, which have been developed for helicopters. Several helicopters are held ready, during the fire danger period, for immediate dispatch to fire duties. Other helicopters are hired if necessary to supplement them. Helicopters of the Armed Services also take part in major fire suppression operations.

Further reference: *Victorian Year Book* 1970, pp. 365-7

Research and development

The Forests Commission maintains a research programme to ensure that factual information is available for planning and monitoring forest management practices to meet changing community needs. Both short and long-term studies are in progress into many aspects of silviculture of both native hardwood and exotic softwood forests, and also into genetics and tree breeding, entomology and pathology, protection, hydrology, other environmental effects, and planning techniques.

In nurseries, studies are being made of the nutritional and soil physical requirements of both eucalypts and conifers, the treatment of seeds and seedlings, methods of site preparation, planting and seeding, fertiliser and nursery techniques, and the identification and control of pests, weeds, and diseases, for the efficient production of seedlings.

Investigations are being conducted to develop cultural practices for optimal establishment and growth of first and second rotation radiata pine plantations and maintenance of long-term site productivity. A tree breeding programme with *Pinus radiata* is now yielding improved seeds for general planting purposes, and crossbreeding is proceeding to further develop the desired characteristics. Outstanding individuals of various eucalypt species are also being sought for use as future sources of seed in extensive field studies of the natural variation of these species. The selected trees are propagated by grafting and their offspring are planted in progeny trials and seed orchards.

Other silvicultural studies concern the use of native trees as an effluent disposal system; the tolerance of trees and shrubs to salinity for reclamation of salt-affected land; the regeneration of burnt sites and high-elevation forests; the reforestation of former pine plantation sites; and the effects of thinning on growth and wood quality of eucalypts and conifers.

Continuing surveys of the mechanisms of, and factors controlling, the biology of major pests and diseases of forests, are concerned with specifying the timing and type of control procedures to be adopted; monitoring and evaluating the effectiveness of these measures; assessing the likely environmental impact of control measures; and providing service information within and outside the Department.

The major emphasis in entomological research is directed at the siren wood wasp (*Sirex noctilio*) and its impact on the management of *Pinus radiata* plantations; and at populations of the stick insect (*Didymuria violescens*), which cause defoliation of ash-type eucalypt forests. Pathological research continues on the cinnamon fungus (*Phytophthora cinnamomi*) and honey fungus (*Armillaria spp*), including assessment of site and stand characteristics associated with eucalyptus-crown dieback, and the rate of spread and effect of the fungus on different species in mixed eucalypt forests; while in softwood plantations the needle cast fungus (*Phaeocryptopus gaeumannii*) is being monitored.

Research into the ecology of birds and animals in the forests is being conducted to assess the influence of management practices on forest flora and fauna. Studies look at the distribution and abundance of species and their habitats in the various layers of forest vegetation, especially in streamside reserves and corridors of native vegetation in plantations, and in plantations and adjacent native forests after utilisation. Emphasis is also being given to evaluating the effect of harvesting, flooding, pesticide application, fire, and controlled burning; on water quality and yield, nutrient status, site productivity, and flora, fauna, and wildlife habitats. This information is used to develop forest management procedures which allow for the efficient production of wood consistent with the conservation of other forest values such as water quality, recreation, and wildlife habitat.

Information for planning forest management is generated by computer analysis of growth habits of major commercial species under various cultural regimes. This data enables prediction of the quantities and sizes of future timber supplies as stands develop under different patterns of use.

Further references: Fire protection, *Victorian Year Book* 1965, pp. 553-4; Economic aspects of forests, 1967, pp. 361-2; Commonwealth State Reforestation Agreement, 1969, pp. 372-4; Forests of Victoria, 1972, pp. 1-26; Victorian School of Forestry, 1977, pp. 399-400; Victoria's forests and man, 1979, pp. 1-35; R. J. Hamer Forest Arboretum, 1979, pp. 313-14; Forests along the Great Dividing Range, 1980, pp. 325-6; Tree planting on farms, 1981, p. 324

BIBLIOGRAPHY

ABS publications

Agricultural sector, part I — structure of operating units (7102.0)
Manufacturing commodities, principal materials used (8210.0)
Building materials (8327.0)