Special Investigation

NORTH-EASTERN VICTORIA
OVENS SOFTWOOD PLANTATION ZONE

LAND CONSERVATION COUNCIL, VICTORIA
MELBOURNE, APRIL, 1981

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GOVERNMENT OF VICTORIA

LAND CONSERVATION COUNCIL

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REPORT

SPECIAL INVESTIGATION
NORTH EASTERN VICTORIA -
OVENS SOFTWOOD PLANTATION ZONE

This Report is published to allow all who are interested the opportunity to comment by making written submissions to the Land Conservation Council.

All such submissions must reach the Secretary no later than Monday 22 June, 1981.

These submissions will be considered by the Council before Proposed Recommendations are made on the use of public land in the area.

I. KUNARATNAM
Secretary
Land Conservation Council

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PART I : INTRODUCTION

Foreword

The Land Conservation Council, Victoria, established by the *Land Conservation Act* 1970, carries out investigations and makes recommendations to the Minister for Conservation on the balanced use of public land throughout the State.

In March, 1981, the Council was directed to make an investigation of an area of public land in north-eastern Victoria according to the following Order in Council:

> 'Whereas it is provided in Section 8 of the *Land Conservation Act* 1970, that where the Governor in Council is of the opinion that an investigation and recommendation of the Land Conservation Council in relation to any particular district or area of Victoria is necessary or expedient, the said Council may be required to make such investigation and recommendation within such time as is fixed by the Governor in Council.
>
> And whereas the Government has directed the Forests Commission to increase the planting rate of softwoods in north-east Victoria by 800 hectares per annum, a total of 14,500 hectares of suitable land is required by the Forests Commission over the next ten years for plantation establishment.
>
> Now therefore, His Excellency, the Governor of the State of Victoria by and with the advice of the Executive Council thereof, hereby requires the Land Conservation Council to carry out an investigation of public land within the area delineated on the plan hereunder and to make recommendations by the ninth day of November, 1981 on the best use of this land including the extent to which it might be used to fulfill the Government's softwood establishment objectives.'

Land Conservation Act - Extract

Public land

Section 2.

(1) "Public land" means -

(a) land which is not within a city town or borough and is -

(i) unalienated land of the Crown including land permanently or temporarily reserved under section 14 of the *Land Act* 1958 and State forest;

(ii) vested in any public authority (other than a municipality or a sewerage authority within the meaning of the *Sewerage Districts Act* 1958); or

(iii) vested in the Melbourne and Metropolitan Board of Works; and

(b) any other land which the Governor in Council declares under sub-section (2) to be public land for the purposes of this Act

"Reserved forest" and "State forest" have the same meanings as in section 3 of the *Forests Act* 1958.

(2) The Governor in Council may on the recommendation of the Minister made after consultation with -

(a) any Minister of the Crown in whom any land is vested; or

(b) the Minister responsible for a public authority in which any land is vested -

by proclamation published in the *Government Gazette*

declare any such land to be public land for the purposes of this Act.

Functions of the Council

Section 5.

(1) the Council shall -

(a) carry out investigations and make recommendations to the Minister with respect to the use of public land in order to provide for the balanced use of land in Victoria;

(b) make recommendations to the Governor in Council as to the constitution and definition of water supply catchment areas under the *Soil Conservation and Land Utilization Act* 1958; and

(c) advise the Soil Conservation Authority concerning policy on the use of land (whether public land or any other land however vested) in any water supply catchment area.

(2) In making any recommendation the Council shall have regard to the present and future needs of the people of Victoria in relation to -

(a) the preservation of areas which are ecologically significant;

(b) the conservation of areas of natural interest beauty or of historical interest;

(c) the creation and preservation of areas of reserved forest;

(d) the creation and preservation of areas for national parks;

(e) the creation and preservation of areas for leisure and recreation, and in particular of areas close to cities and towns for bushland recreation reserves;

(f) the creation and preservation of reserves for the conservation of fish and wildlife;

(g) the preservation of species of native plants; and

(h) land required by government departments and public authorities in order to carry out their functions.

(3) Where the Council recommends the alienation of any land the recommendation shall include the Council's opinion as to the best method of alienating the land to ensure the most satisfactory use and management of the land in the public interest.

(4) Any person or body may make submissions to the Council as to how any public land can be better used to meet the needs of the people of Victoria and the Council shall consider any such submissions before making any recommendation under paragraph (a) of sub-section (1).

Investigations, Notices and Reports

Section 9.

(1) The Council shall not make any recommendation under this Act in relation to any district or area without a prior investigation of the district or area.

(2) Before commencing any investigation under paragraph (a) of sub-section (1) of section 5 the Council shall publish a notice in the *Government Gazette*, in a newspaper circulating throughout the State and in a newspaper circulating particularly in or in the vicinity of the area or district to be investigated stating that an investigation of the district or area described in the

notice is to be carried out for the purposes of this Act.

(3) On completing an investigation of a district or area under paragraph (a) of sub-section (1) of section 5 the Council shall -

(a) publish a report of the investigation;

(b) give notice in the *Government Gazette* of the publication of the report, the address where copies of the report may be obtained or inspected and stating that any submissions to the Council in relation to such report will be considered by the Council if they are made within 60 days of such notice; and

(c) publish notice in a newspaper circulating throughout the State in a newspaper circulating particularly in or in the vicinity of the area or district investigated of the publication of the report, the address where copies of the report may be obtained or inspected and stating that submissions may be made to the Council and the date before which they should be made.

(4) The Council shall consider any submissions in relation to such report made by any person or body within 60 days of notice being given under paragraph (b) of sub-section (3).

Notice to be given to public departments and authorities in certain cases.

Section 10.

(1) Not earlier than 60 days after notice being given under paragraph (b) of sub-section (3) of section 9, the Council shall send a copy of its proposed recommendations to -

(a) the Council of any municipality in the municipal district to which the recommendation relates is situated;

(b) any other public authority or government department that in the opinion of the Council has an interest in the area of the proposed recommendation; and

(c) any person or body who made a submission under section 9 -

and shall consider any submissions received within 60 days of the sending of such copy to the council, authority, department, person or body or in the case of a public authority or government department within such longer period as may be agreed upon between the Minister and the Minister administering that department or responsible for that authority.

(2) Where any recommendation is made to the Minister under this Act it shall be accompanied by a copy of any submissions received from any person body department authority or council pursuant to the provisions of sub-section (4) of section 9 or sub-section (1) of this section.

(3) Where the Council has made a recommendation to the Minister under paragraph (a) of sub-section (1) of section 5 the Minister may, after he has given not less than fourteen days notice of his intention so to do to the Minister administering a government department or responsible for a public authority recommend to the Governor in Council that notice of the recommendation or that part of the recommendation that affects the government department or public authority concerned and where notice of that recommendation or part is so given by the Governor in Council it shall be the duty of the government department or public authority to use all diligence and dispatch to give effect to such recommendation so far as it affects any land vested in or controlled by it.

Copy of every recommendation and of proposals to be tabled in Parliament.

Section II

A copy of every recommendation of the Council made under sub-section (1) of section 5 and of the proposals of the Council submitted to the Minister pursuant to section 7 shall be laid before both Houses of Parliament within fourteen days of the making thereof if Parliament is then sitting and if Parliament is not then sitting within fourteen days after the meeting of Parliament.

A copy of the *Land Conservation Act* 1970 can be obtained from the Government Printing Office, 7a Parliament Place, Melbourne, 3002.

Aims and method

The major impetus for this study comes from the need to establish whether further public land should be made available for softwood plantations, but at the same time the other values and capabilities of all public land in the study area will be investigated.

The land designated in this special study is part of the North-eastern Study Area, Districts 3, 4, and 5, and was first investigated by the Land Conservation Council in 1974. Final recommendations on the use of public land were published in April, 1977. These recommendations have been accepted by the Government and have been or are being implemented.

This descriptive report uses information contained in the original 'Report on the North-eastern Study Area, Districts 3, 4, and 5' published in 1974. Where necessary, information has been updated, and additional material that was previously unavailable has been incorporated. However, for a more comprehensive description of the study area, readers are referred to the original descriptive report, copies of which are held in many libraries and government

departments. They are also available for purchase from the Government Printing Sales Office. The report contains information on which members of the community may base their submissions to Council, and on which land use decisions can eventually be made. Information for the report has been obtained from government departments, public authorities, and interested individuals, as well as from published reports.

The study area

The Ovens Softwood Plantation Zone comprises parts of the Shires of Oxley, Myrtleford, Beechworth, Yackandandah, and Bright and contains approximately 267,000 ha of public land. The study area lies on the forested northern slopes of the Eastern Highlands and includes a small area of the northern plains, which have been cleared extensively for agriculture (see Map 1).

PART II : NATURAL FEATURES

Climate

The study area lies between the 36° and 37° south parallels of latitude and the weather pattern is influenced by sub-polar maritime air in the winter and continental subtropical air in the summer.

During winter, frontal activity associated with a succession of low pressure systems dominates the weather in the region and is responsible for most of the winter precipitation. In the summer, subtropical high pressure systems bring warm, dry weather to the region.

The prevailing winds throughout the year are westerlies, coming either from the south-west or north-west, but southerlies and northerlies increase from September to February. In summer, slow-moving anticyclones centred over the Tasman Sea result in an influx of hot, dry air from the interior of the continent. The ensuing very hot, dry, windy weather can last for several days, creating a high bush-fire danger. A cool southerly change usually interrupts this weather pattern, bringing with it thunderstorm activity (also a bush-fire hazard) and perhaps rain. Mountainous terrain forms an obstacle to the moist westerly winds, thus intensifying rainfall and thunderstorm activity in the region.

Precipitation

Rain is the main form of precipitation, although above 1,400 m a large proportion of the winter precipitation falls as snow. Much of the elevated terrain is snow-covered during part of the winter. Some 65% of all precipitation occurs during winter, when local flooding along major streams is a common phenomenon. Summer rain is infrequent and erratic, but is often heavy because of the capacity of warm air to carry large volumes of moisture.

Temperature

Wide variations in temperature exist within the study area, primarily because of differences in elevation. In general, the northern plains are hot in summer and mild in winter while the mountainous country in the south and east is mild in summer and cold in winter.

Most of the study area has a favourable climate for softwoods. The northern plains between Moyhu and Wangaratta, however, receive insufficient rainfall, and areas prone to heavy snow-falls are also unsuitable for plantation establishment.

Geomorphology and Soils

Landscape evolution within the region has been governed by the distribution of rock types and tectonic activity, which have led to the development of four distinct geomorphic regions.

The south-western region

The eastern part of this region lies to the south of Cheshunt, and consists of a plateau of gently tilted upper Devonian and lower Carboniferous conglomerates. A fold axis on the eastern side of the plateau has produced a more rugged topography, particularly around Mount Typo and Mount Warrick.

The plateau consists of friable reddish gradational soils, with undifferentiated sandy loams on the ridges and steeper slopes to the east. The lower slopes and foothills consist of friable brownish gradational soils that are suitable for softwood production.

The western part of this region is composed of resistant volcanic rocks of Devonian age capped in places by Tertiary basalts. Drainage within the region is afforded by the King River and its tributaries and Fifteen Mile Creek.

The upper slopes and ridges on the Devonian volcanic rocks carry shallow stony loams and friable gradational soils, while the lower slopes and foothills consist of yellowish duplex soils. Reddish gradational soils have developed on the isolated hill cappings of Tertiary basalt throughout the region. The gradational soils are generally suitable for the growth of softwoods. The eastern boundary of this region is marked by a major structural feature known as the Eastern Boundary Fault.

Central region

To the north and east of the Eastern Boundary Fault lies an extensive area of mountainous terrain composed of Ordovician sandstones and mudstones that are less resistant to erosion than the rocks of the south-western region. The drainage pattern is dendritic and the streams are separated by sharp ridges and spurs. The mountains to the south of Mount Buffalo are typical of this region, which extends east to Mount Beauty and north to Myrtleford. In the north-west around Moyhu and Bobinawarral the ridges of Ordovician sediments become buried beneath the alluvial deposits of the riverine plain.

Within the region, exposures of granitic rocks have intruded into the surrounding Ordovician sediments. Intense heat associated with the intrusions has altered (or metamorphosed) the adjacent sedimentary rocks.

The granite outcrops at Mount Buffalo and Mount Emu are extremely resistant, while the surrounding sedimentary rocks which are less resistant have been deeply dissected. In contrast, the granite in the Pinnacles area to the east of Myrtleford is more susceptible to weathering and erosion and as a consequence the terrain in this area is more subdued. A ridge of metamorphic rocks borders Happy Valley to the east of Myrtleford.

Friable reddish and brownish gradational soils occur on the Ordovician sediments of this region, while the granitic rocks of Buffalo Plateau and Mount Emu exhibit a variety

of soil types. Stony loams are characteristic of rocky outcrops while poorly drained sites contain organic loams and peats. Sandy loams and friable gradational soils are found on the lower slopes of these intrusions. The less resistant granitic rocks at the Pinnacles and Abbeyard carry a variety of gradational soils on the upper slopes and a range of duplex soils at lower elevations. The gradational soils are suitable for softwoods, but the poorly drained duplex soils are not.

The eastern region

The eastern part of the study area - which extends north from Mount Beauty, along the Kiewa Valley, and as far west as Havilah - consists of mountainous terrain composed of metamorphic rocks. These rocks are more resistant to erosion than the sedimentary rocks of the central region and have been subjected to intensive faulting, which in turn has influenced the alignment of major streams in the area. The Kiewa Valley is bounded by faults, and many of its tributaries - for example, Running Creek and Glen Creek - follow fault lines.

Friable reddish and brownish gradational soils dominate the steep mountainous country, while duplex soils are common on the lower valley slopes and alluvial fans. These soils are generally suitable for the growth of softwoods unless they are poorly drained.

The northern plains region

The north-west of the study area towards Wangaratta contains part of the extensive riverine plains. The plains, which border the major streams such as the King and Ovens Rivers and their tributaries, consist of alluvial deposits, often more than 50 m deep. Alluvial fans occur along the foothill margins, and features such as river terraces and ox-bow lakes, typical of a riverine flood plain, occur along the major river valleys.

The river terraces are characterized by uniform sandy loams

and gradational soils, while the alluvial sediments of the flood plain are duplex soils, usually consisting of a sandy loam overlying a clay subsoil. These soils are found in all major river valleys throughout the study area. At least some of them would favour the growth of softwoods, but the limiting factor in the region is insufficient rainfall.

Vegetation

The natural vegetation of an area is determined largely by the environmental factors of the site and can therefore be a useful guide in assessing land use capabilities.

The vegetation on public land within the study area has been classified into a number of structural forms, based on the height of the tallest stratum and on the percentage of projective foliage cover. These are shown on Map 3, together with their distribution. The classification presented here is a modified version of the scheme developed by Specht.

Sub-alpine complex and dry heath

This complex, consisting of a mosaic of heaths and herb-fields, occurs only on the highest parts of the Buffalo Plateau. It commonly contains alpine bogs and snow grass meadows. At mid elevation the rocky escarpments of the plateau support a dry heath community. Stands of brittle gum (*Eucalyptus mannifera*) are relatively common on these rocky slopes with shallow soils.

Snow gum open forest I and woodland I

Exposed rocky outcrops within the sub-alpine zone, which occurs above 1,200 m, are dominated by snow gum (*E. pauciflora*). The species occurs as a multi-stemmed mallee between 2 and 10 m high. Buffalo sallee (*E. mitchelliana*), which is endemic to the Buffalo Plateau, occurs within the snow gum woodland at lower elevations, and predominantly in very rocky areas.

Candlebark--snow gum open forest I and II

This forest type occurs in areas where soil moisture is less than optimum for alpine ash (*E. delegatensis*), and is commonly found on drier aspects and on exposed ridges between 900 and 1,400 m. The principal tree species are candlebark (*E. rubida*) and mountain gum (*E. dalrympleana*) in association with snow gum. At lower elevations the unit grades into broad-leaf peppermint (*E. dives*) open forest II.

Messmate open forest III and IV

The messmate forests are confined to the south-west of the study area, where they occupy the deeper soils found in sheltered gullies and also grow on the plateau of carboniferous sandstones. Messmate stringybark (*E. obliqua*) occurs in pure stands, but is often found in association with narrow-leaf peppermint (*E. radiata*), blue gum (*E. bicostata*), manna gum (*E. viminalis*), and mountain gum.

Narrow-leaf peppermint open forest III

The deep, well-drained soils at elevations ranging between 460 and 1,100 m carry narrow-leaf peppermint forests. These occupy a large proportion of the forested public land within the study area, but pure stands of narrow-leaf peppermint are rare. The moister sites usually support candlebark, manna gum, and blue gum as associated species, while on the drier sites broad-leaf peppermint, brittle gum, and sometimes red stringybark (*E. macrorhyncha*) are common.

Broad-leaf peppermint open forest II

This vegetation type is also widely distributed throughout the study area, occurring on the drier ridges and northerly aspects of the foothills where rainfall exceeds 900 mm, and on the southerly aspects in areas further north where rainfall is between 700 and 900 mm. The dominant species, broad-leaf peppermint, is found over the whole range of elevations from 300 to 1,100 m.

At lower elevations and on drier sites associated species such as red stringybark and red box *(E. polyanthemos)* are common, while at higher elevations candlebark and brittle gum occur. The unit extends up to the margin of the snow gum country on the northern and western aspects of some mountains in the study area.

Such forest is replaced by narrow-leaf peppermint on deeper soils and in sheltered aspects at lower elevations, and by alpine ash on similar sites at higher elevations. The understorey vegetation of the broad-leaf peppermint forest usually consists of scattered shrubs, but a denser heathy understorey occurs on the plateau of carboniferous sandstone in the south-west of the study area.

Long-leaf box open forest I and II

Long-leaf box *(E. goniocalyx)* and its associated tree species occur in areas where rainfall is about 760 mm and the elevation is generally below 600 m. On dry exposed ridges where the soil is shallow and stony, the trees are generally less than 15 m tall.

River red gum open forest II

Although widespread across the northern plains prior to European settlement, river red gum *(E. camaldulensis)* is now confined to stream frontages and other small blocks of public land on the riverine plain.

Mountain swamp gum open forest II

Isolated occurrences of mountain swamp gum *(E. camphora)* occur in the study area on stream flats and areas of poor drainage at elevations above 300 m. Black sallee *(E. stellulata)* occurs in association with mountain swamp gum, but it usually occupies better-drained sites.

Softwood forests

Some 6% of the public land in the study area is forested

with exotic softwood plantations. The major species is radiata pine *(Pinus radiata)*, with smaller areas of several other exotic conifers.

Land below 900 m elevation, which supports narrow-leaf peppermint open forest III, is heavily utilized for softwood production. Areas carrying messmate stringybark open forest III and IV have a high capability for softwood production, while those supporting broad-leaf peppermint open forest II have a lower capability.

Grassland--bracken

Small areas of public land have been cleared in various parts of the study area for a variety of purposes. Vegetation on these areas consists of native or introduced grasses and may also include bracken *(Pteridium esculentum)*.

Fauna

A number of faunal habitats occur within the study area and are discussed below. This section should be read in conjunction with Table 1, which correlates the fauna habitats with vegetation types.

Wet Open Forest

Mammals and birds

Eighteen species of native mammal have been recorded in this habitat and several others are expected to occur. The most common small ground mammals are the brown antechinus and bush rat. Dusky antechinus, another small ground mammal, is restricted to areas with a dense, wet understorey. Wombats are common as are black wallabies. Dingoes, echidnas, and long-nosed bandicoots are less common. Great grey kangaroos are restricted to peripheral forest areas.

Seven arboreal species - bobuck, common ringtail, eastern pygmy-possum, sugar, feathertail, and greater gliders, and the koala - are known to occur. Many of the koalas have

been introduced from other areas. The yellow-bellied glider probably also occurs here, but there are no confirmed records.

Introduced species found in this habitat include foxes and cats (which are widespread), rabbits (which are restricted to fairly clear areas), and sambar deer and pigs (which are confined to areas around Toombullup and Tolmie).

More than 100 species of birds have been recorded in wet and dry open forest areas, with many families represented. Many feed on nectar when available, but usually supplement this diet with insects and occasionally seeds and fruits. Honeyeaters and warblers are the most common families represented and most breed within these habitats.

Species largely restricted to dry open forest include the painted button-quail, restless flycatcher, speckled warbler, white-throated warbler, buff-rumped thornbill, brown tree-creeper, diamond firetail, white-winged chough, and barking owl.

The two families of raptors (eagles--goshawks and falcons--kestrels) each have four species occurring both in the wet and dry open forests of the north-east. All are predatory and their diets include a variety of mammals, birds, reptiles, fish, and occasionally insects and carrion. Six of these species are recorded as nesting here; most utilize tall trees for this purpose, but the peregrine falcon often nests on rock ledges. In view of the world-wide population decline of the peregrine falcon, the apparent continued success of the species in the study area deserves special mention.

Reptiles

The wet forest is generally less suitable for reptiles than other habitat types because of lower temperatures and reduced light penetration to the forest floor. A number of skinks and lizards occur within this habitat, however, predominantly in areas where there is a lack of dense understorey vegetation.

Table 1

FAUNA HABITATS: VEGETATION MAPPING UNITS

Fauna Habitats	Major species of tallest stratum and map symbol		Structural form	Locality
Wet open forest *	Snow gum--candlebark	4	Open forest I & II	Widespread in the hilly and mountainous country
	Alpine ash	5	Open forest IV	
	Messmate stringybark	6	Open forest III & IV	
	Narrow-leaf peppermint	7	Open forest III	
	Mountain swamp gum	11	Open forest II	
Dry open forest +	Broad-leaf peppermint	8	Open forest III	Widespread on the dry northerly aspects of the hilly and mountainous country
	Long-leaf box	9	Open forest I & II	
Flood-plain woodland	River red gum	10	Open forest II and woodland II	Distributed along major streams

* Wet open forest is approximately synonymous with the term wet sclerophyll forest.

\+ Dry open forest is approximately synonymous with the term dry sclerophyll forest.

White-lipped snakes are mainly confined, in north-eastern Victoria, to wet open forest and sub-alpine woodland, where they usually live in open grassy clearings or sub-alpine meadows. The copperhead snake, the only large snake found throughout this habitat, is particularly common in areas with adequate sunlight penetration such as clearings or creek sides.

Dry Open Forest

Thirteen species of native mammal have been recorded in this habitat and several others, particularly some bats, are almost certainly present. Small terrestrial species occurring here include the yellow-footed antechinus, brown antechinus, and tuan. Echidnas are common throughout, as is the eastern grey kangaroo, particularly adjacent to improved pasture. Black wallabies are less common, since they usually require a dense to medium-dense understorey. Common brushtails are present in considerable numbers, as are sugar gliders and the feathertail glider. Squirrel gliders, which are probably the rarest possum species in north-eastern Victoria have been recorded within this habitat. Koalas are rare but they have been reintroduced in a number of areas. Four introduced species, - rabbits, foxes, house mice, and cats - are all widespread and common.

Reptiles

The dry open forest provides a more favourable habitat for reptiles because of increased sunlight penetration to the forest floor. Skinks and lizards are therefore more common, particularly where rocky outcrops occur. These provide ideal sites for basking and crevices for protection. Tree dragons and southern bluetongue lizards are common throughout, but the tree goanna is uncommon and probably restricted to peripheral areas.

Several species of snake are also common within this habitat. Two small ones (Dwyers snake and the small-eyed snake) forage among the ground litter and rocks. Copperhead

snakes are confined to moist localities, particularly along streams, while brown snakes prefer dry, open, usually grassy areas. One species of blind snake is restricted to dry areas, often in association with rocks and termite mounds, and is rarely found.

Flood-plain Woodland

Mammals and birds

The most common native mammal found in this habitat is the common brushtail, which usually occupies stands of mature red gum. Feathertail gliders, tuans, and squirrel gliders have also been recorded here.

Where drainage for agricultural purposes has not been too extensive, several terrestrial mammals such as the echidna and the yellow-footed antechinus may be present. The remaining areas of riverine woodland are probably too small to support populations of the eastern grey kangaroo. Five introduced species (rabbit, black rat, house mouse, fox, and cat) have all colonized this habitat.

Almost 90 species of birds, representing a large number of families, have been recorded in the flood-plain woodlands in the study area. Many water-birds and raptors utilize the woodland for foraging and nesting sites and the numerous tree hollows in mature river red gums provide important breeding sites for species of cockatoo, parrot, lorikeet, kingfishers, owls, martins, etc.

Reptiles

The presence of surface water provides suitable conditions for tiger snakes, red-bellied black snakes, and eastern water skinks. Large trees are the favoured habitat of the carpet snake and a variety of lizards, including the tree dragon.

Aquatic Habitat

Mammals and birds

Two mammal species, the platypus and eastern water-rat, rely on the presence of surface water. The platypus inhabits most streams, including lowland rivers and mountain creeks, and is common throughout the study area. The eastern water-rat does not occur in cold mountain creeks but is common on the lowlands.

More than 60 bird species regularly inhabit aquatic environments within the study area. The habitat can be divided into three feeding zones (open water, shallows, and swamps and margins), which support different species employing various feeding methods. The best-represented families in this habitat are ducks and swans, egrets, herons and bitterns, and rails and waterhens.

Reptiles

Few reptiles are exclusively aquatic, although the snake-necked tortoise spends a major proportion of its life in water.

Fish

The various fish species recorded as occurring in the study area may be divided into three categories, based on geographical distribution.

One group occupies 'mountain streams' characterized by well-oxygenated, generally cool, clear, swift-flowing water and gravel beds. The second group inhabits the 'lowlands', where slower, more turbid, and warmer water occurs and flooding is regular. The third group can utilize habitats in both these regions. Blackfish and trout are common in mountain streams, while a wide variety of species occupy the lowland rivers and lakes.

PART III : SOFTWOODS

Softwoods are commercially important because they grow more rapidly and have a greater range of uses than hardwoods. They are, in general, relatively light, of adequate strength in relation to weight for a variety of uses, straight-grained, and easy to season, machine, and nail. In contrast, hardwoods as a group (and particularly the eucalypts) are heavy, strong, hard, not straight-grained, and not readily seasoned, nailed, or worked.

The softwood species of greatest significance in south-eastern Australia is radiata pine (*Pinus radiata*), since it grows rapidly on a wide range of sites throughout the region. It is a hardy species well suited to growth in an even-aged plantation and its wood, although of a lesser quality than that of some slower-growing softwoods, is readily acceptable for a variety of uses. It is by far the most common species used in Victorian plantations, occupying 98% of the total planted area.

Radiata pine in Victoria

The first commercial plantings of radiata pine in the State were made in 1880 at Macedon and the area planted now totals 166,000 hectares, of which 51% is in public ownership (1981). The bulk of these plantings have been established since the early 1960s, when there was a renewed appreciation that Australia should not rely on the continued availability of imports to make up the shortfall between future requirements and supply of wood from native forests. A study by the Commonwealth government at that time showed that timber and timber products worth $200 million were being imported annually, and a scheme was started to increase softwood plantings to 1.2 million hectares. The aim of this scheme was to supply at least half of the estimated requirement by 2000 A.D. and it is steadily being achieved. Softwood plantation areas in Australia now total 700,000 hectares and they supply 30% of national sawn-wood consumption. At the same time, however, the annual wood and wood product import bill has risen to $579 million (1979/80).

The Victorian response to the national program was to define eight softwood plantation development zones in regions of the State that had suitable soils and climate and where decentralization would be assisted by government investment in the establishment of a resource base. The eight zones are widely distributed from south-western to north-eastern Victoria in the following regions: Portland/Rennick, Otways, Ballarat, Acheron, Latrobe, Benalla/Mansfield, Ovens, and Upper Murray. The last three are in north-eastern Victoria and now total 36,000 hectares.

The Benalla/Mansfield and Upper Murray Zones are new plantation areas, begun during the 1960s, while the Ovens Zone development has built upon a base established in earlier years. In each case, new industries are becoming established to process the developing resource, thus diversifying and strengthening the rural economy.

The Ovens Zone is, however, by far the most important at present because the 3,000 ha of mature plantation it contains are the mainstay of sawlog and veneer log supplies in the region. The other two zones do not as yet have mature stands, although some sawlogs are becoming available from thinnings.

Development of processing industries in north-eastern Victoria

The industries that draw softwood supplies from north-eastern softwood plantations comprise 5 sawmills, 2 veneer plants, 1 pulpmill, and 8 preservation plants and have a total annual consumption of 240,460 m^3 at present. There is also a large pulpmill under construction and the total annual consumption in 1981/82 is expected to be 320,000 m^3, rising to at least 365,000 m^3 by 1985. The location of the various industries is set out in Table 2.

The two major industries are the Australian Forest Industries integrated plant at Myrtleford and the Australian Newsprint Mills plant now coming into production at Albury/Wodonga. The sawmill and drying works of A. Dunstan and Sons at

Wodonga and the Savaco veneer mill at Benalla are also developing into substantial decentralized industries.

These companies, especially the sawmills and veneer mills, as Table 2 shows, depend mainly on the Ovens Zone for their raw material. Together with associated contractors they have large capital investments in harvesting, transport, and processing systems.

The *Forests (Bowater Scott) Agreement Act* 1971 provides for an annual supply of pulpwood to Australian Forest Industries Ltd, which rises steadily from 42,500 m^3 a year at present to 63,750 m^3 a year in 1992.

This supply is to come from the Ovens Plantation Zone. The supplies to Australian Newsprint Mills Ltd are guaranteed by the *Forests (Australian Newsprint Mills Ltd Agreement) Act* 1980, under which supplies are to increase from 80,000 tonnes a year in 1981/82 to 120,000 tonnes a year by 1984/85 and be maintained at that level until 2010. These supplies are expected to be drawn primarily from the Upper Murray and Ovens Zones. A similar agreement provides for 300,000 tonnes a year from plantations in New South Wales.
(Note: 1 tonne green weight is approximately equivalent to 1 cubic metre for radiata pine).

The guarantee agreements provide that the royalty for at least 90% of the guaranteed annual supply will be paid to the government, regardless of whether the wood is actually taken by the company.

Both pulpmills use a refiner groundwood process that is entirely mechanical. The likelihood of pollution from the operations is therefore minimal, as the effluents are entirely biodegradable.

Table 2 SOFTWOOD PROCESSING INDUSTRIES: NORTH-EASTERN VICTORIA 1981

Industry	Mill type	Supply zone*	Location
Australian Newsprint Mills Ltd	Newsprint (refiner groundwood)	1,2,3	Albury
Bowater Scott Ltd (Australian Forest Industries)	Sawmill Veneer Mill Preservation Plant Pulpmill (refiner groundwood)	2	Myrtleford " "
A. Dunstan & Sons	Sawmill Preservation Plant	1,2	Wodonga "
Savaco Pty Ltd	Veneer Mill	2	Benalla
Brown Bros.	Preservation Plant	2	Milawa
Carlton Jones Pty Ltd	Preservation Plant	2	Eurobin
Permalast Timber P/L	Preservation Plant	1	Corryong
Buckley Sawmills P/L	Sawmill Preservation Plant	3	Euroa Euroa/ Mansfield
Marbut-Gunnersen Industries Pty Ltd	Sawmills Preservation Plant	3	Mansfield/ Benalla Benalla
A D, D G & J F Barker	Sawmill Preservation Plant	3	Violet Town "

* Supply Zones: 1. Upper Murray
2. Ovens
3. Benalla/Mansfield

Employment in the softwood industry

It is estimated that, at present, 530 people are directly employed in the establishment, tending, protection, harvesting, and processing of wood from softwood plantations in north-eastern Victoria.

The planned increase in production by Australian Forest Industries and the introduction of the Australian Newsprint Mills Plant will increase this number to about 800.

These figures do not include employment in the re-manufacturing industries or in retailing. Similarly they do not include indirect employment such as plant construction and service industries.

Demand and supply (Ovens Zone)

The total cutting rate permitted annually from a State plantation complex is normally regulated to achieve a dual goal: to obtain a maximum financial return to the State while providing a sustainable or increasing supply of wood suitable for processing by dependent industries.

In the Ovens Zone the supply that can be made available on this basis is illustrated in Figure 1 (line 2). The cutting rate had previously been held at this level, despite the fact that demand exceeded availability, especially of sawlogs and veneer logs. It was expected that increased supplies would be released as the young plantations came into production and that industrial development would follow. This planning was based on a 35-year rotation with several production thinnings, as this has been found to produce wood of the optimum size and quality in the most economic manner. The government has recently decided that the need for softwood products and the social benefits of industrial development in the region are such that the utilization of the resource should be accelerated. An immediate increase in cutting rate can be accommodated if the plantations are adequately thinned and the timing of wood flows varied considerably. There is a loss of gross wood yields per hectare, and the trees are smaller and more costly to handle but can still be utilized successfully.

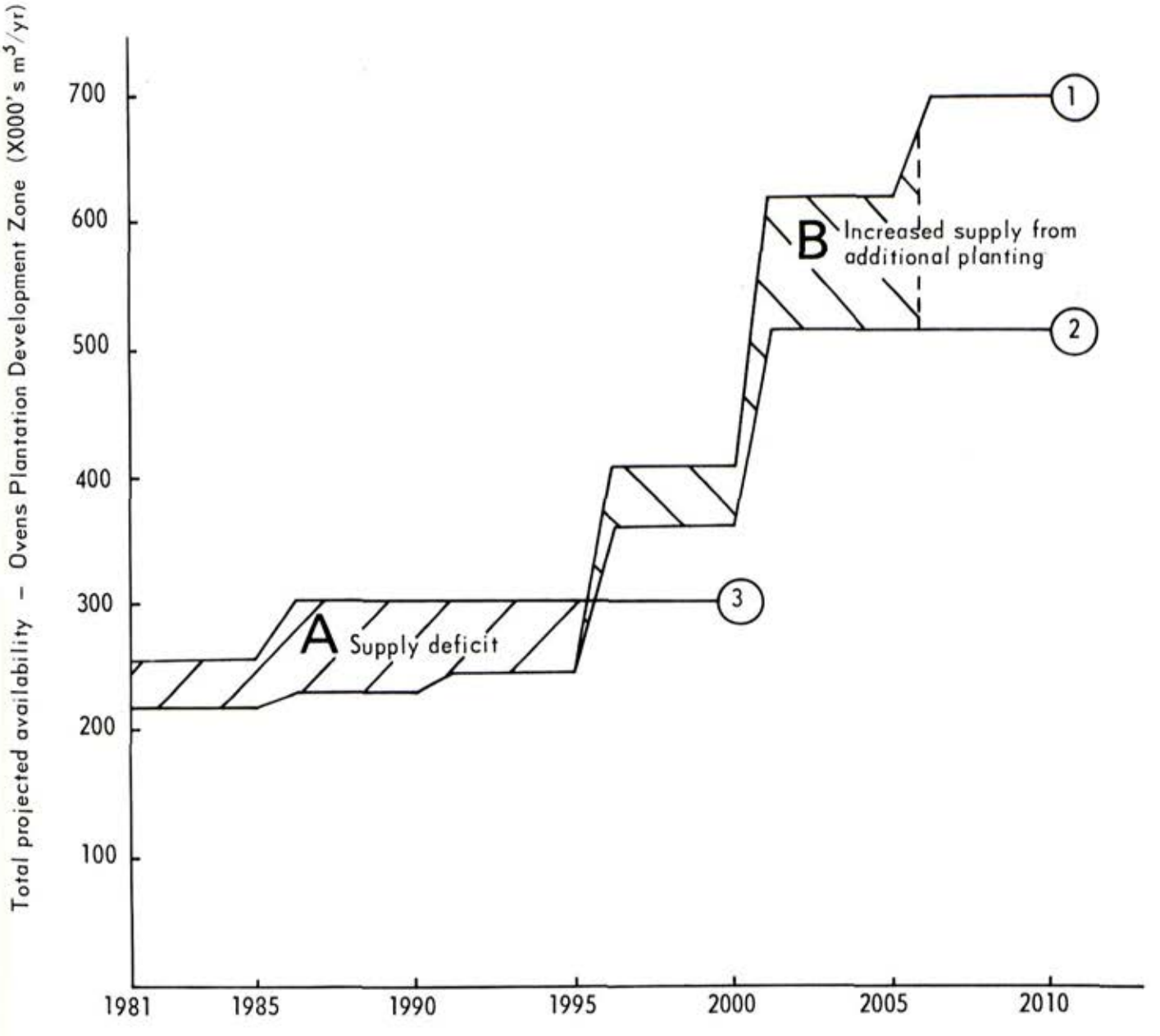
This management strategy brings forward the age of final felling - that is, it reduces the rotation age. This can be done without jeopardizing future supplies, provided additional plantings are made now. The situation is illustrated in a simplified form in Figure 1, which shows that accelerated cutting during the next decade will make it possible to make up the expected supply deficit (A). The quantity harvested prematurely can be compensated for by

FIG 1 GRAPH SHOWING PROJECTED TOTAL AVAILABILITY AND COMMITMENTS FROM OVENS ZONE PLANTATIONS (5 YEAR AVERAGES, 1981 – 2010; X000's m^3/yr)

(1) Availability assuming 800 ha/yr additional planting 1981–96 (to compensate for volume harvested prematurely to meet supply deficit A)

(2) *Base rate availability* *

(3) Existing commitments



* includes 650 ha/yr plantation extension as Ovens Zone contribution to State requirements.

increased plantings to provide replacement supplies (B) and the total supply will, in the long run, be sustainable at the planned base rate availability (line 2).

The amount of additional or compensatory planting necessary to provide an equivalent volume (B) is about 800 hectares per annum for a period of at least 15 years and possibly 20 years, and Figure 1 is based on the assumption that planting at the increased rate will continue until 1996.

This planned base rate availability (line 2) will maintain the ability to make further increase in commitments in the future as demand increases. As shown in Figure 1, supply begins to exceed the present commitment level in about 1995. The increase in supply that is expected at that time will occur because the large areas of post-1960 plantings will begin reaching an optimum rotation age (35 years).

Site requirements for softwoods

For satisfactory growth of radiata pine the following conditions are desirable:

* a minimum rainfall of 760 mm (30 inches)
* a neutral or slightly acid soil of at least moderate nutrient status (pH 5.6--7.4)
* soils with physical characteristics that allow vigorous root growth and with sufficient volume to support an adequate root system
* freedom from heavy snowfalls

These conditions are available over a wide area in north-eastern Victoria and, by world standards, radiata pine grows quite rapidly in the region. Wide variations in growth rate do occur, however, because of differing site factors. Plantations are assessed at 10 years of age to determine the productivity of each stand, so that the quantities of the various classes of log material that will become available can be estimated.

The productivity of a site is measured in terms of the average

annual growth of wood volume per unit area. It is expressed in cubic metres per hectare, and is known as the Mean Annual Increment (M.A.I.).

The M.A.I. potential of a particular site can be estimated from the form and composition of the native vegetation, the soil, and the climate at the site.

Table 3 shows the suitability for growth of radiata pine indicated by each of the native vegetation categories that occur in the study area. This table should be read in conjunction with Map 2, which shows the area that remains suitable for pine growth after the areas of steep slope and difficult access have been eliminated.

The areas shown as having high capability are mainly vegetation class 6 with some of class 7, and the areas shown as having some capability contain vegetation classes 8 and 9 (see Table 3). The range of potential productivity given for each class is necessarily broad, since it is influenced significantly by the intensity of silvicultural treatment applied. These treatments include site preparation such as ploughing and ripping, weed control, and fertilization. Significant gains are also expected from genetic improvements through tree-breeding.

Table 3

RADIATA PINE POTENTIAL PRODUCTIVITY

Vegetation map reference number	Native vegetation	Major soils	Potential Mean Annual Increment (cu m under bark to 10 cm DSE per ha)*	Suitability for plantation establishment
6	Messmate stringybark open forest III and IV	Friable brownish gradational, reddish duplex	26--29	Suitable
7	Narrow-leaf peppermint open forest III above about 900 m elevation	Friable reddish gradational, friable brownish gradational	26--32	Unsuitable - snow damage lowers yields
7	Narrow-leaf peppermint open forest III below about 900 m elevation	Friable reddish gradational, friable brownish gradational, reddish duplex	20--30	Suitable
8	Broad-leaf peppermint open forest II, grassy understorey	Reddish and yellowish duplex, weakly bleached gradational	11--23	Suitable with site treatment
8	Broad-leaf peppermint open forest II, heathy understorey (Wabonga Plateau)	Reddish and yellowish duplex, weakly bleached gradational, undifferentiated stony loams	8--20	Marginal because of poor drainage
9	Long-leaf box open forest I and II	Undifferentiated stony loams, weakly bleached gradational	8--20	Marginal; generally unsuitable

* DSE - small-end diameter

PART IV : CONSERVATION

Nature conservation

The past extensive clearing of native vegetation for agriculture and the more recent clearing for the establishment of softwood plantations has had a major impact on indigenous flora and fauna. At the present time some 14,000 ha of native forest has been allocated for softwood production, most of which has been planted to pines. A further 14,500 ha will be required over the next 10 years. Should public land be used to meet that requirement, then some 10% of the public land in the study area would be put to this use.

In addition, the Forests Commission would require areas of public land adjacent to plantations for management purposes, such as fire protection and access.

The land being cleared for softwood plantation establishment supports predominantly mature peppermint forest. Although the continued existence of this forest type is not in jeopardy, it is of conservation significance insofar as it contains a variety of habitats and therefore a diverse fauna. The allocation of 14,500 ha from public land for softwood production over the next 10 years would mean that 7% of the total area of peppermint forest in the study area would be lost. However, it is apparent from the information shown on Map 2 that most of the suitable land for softwoods occurs in the Paradise Falls and Emu blocks. If the total area required for softwoods is allocated on public land within these blocks more than 20% of the peppermint forest in these areas will disappear, thus resulting in a significant local reduction in this habitat type.

Softwood plantations support fewer native species than the adjoining peppermint forests: some 60% of all the native bird species and 25% of native mammals known to occur in the peppermint forests of north-eastern Victoria cannot survive in softwood plantations because of their total

Table 4

HABITAT CORRELATION FOR MAMMALS IN NORTH-EASTERN VICTORIA

	Forest Dependent	Require hollows	Habitat: Wet open forest	Habitat: Dry open forest	Recorded in Pine Plantations: Young	Intermediate	Mature
Echidna				X	U	R	U
Platypus							
Tiger cat			X	X			
Tuan		X		X			
Brown antechinus		X	X	X	A	A	C
Dusky antechinus			X		A	U	R
Yellow-footed antechinus		X		X			
Long-nosed bandicoot			X		R	R	R
Bobuck	X	X	X				
Common brushtail		X		X	-	U	C
Feathertail glider	X	X	X	X			
Eastern pigmy-possum		X	X	X	-	R	-
* Yellow-bellied glider	X	X	X				
Sugar glider	X	X	X	X			
Squirrel glider	X	X		X			
Common ringtail			X	X	R	U	U
Greater glider	X	X	X				
Eastern grey kangaroo			X	X	U	C	C
Black wallaby			X	X	A	R	C
Koala	X		X				
Common wombat			X	X	A	U	-
White-striped mastiff bat		X		X			
Gould's wattled bat		X	X	X			
Chocolate wattled bat		X	X	X			
Eptesicus spp. (bat)		X	X	X			
* Common bentwing bat			X	X			
* Large-footed myotis (bat)			X	X			
Lesser long-eared bat		X	X	X			
* Great pipistrelle (bat)	X	X	X				
Water rat							
Bush rat			X	X	A	A	A
Totals 31	9	17	23	21	9	11	9

* Probably present in study area but no confirmed records.

A - Abundant C - Common U - Uncommon R - Rare

Source: Fisheries and Wildlife Division and Forests Commission

dependence on the indigenous forest for their basic requirements (see Table 4). These animals feed principally from the canopy and bole of eucalypts. All species of honeyeater, which feed on nectar, pollen, and nectar-seeking insects from the flowers of eucalypts are included in this group. The arboreal mammals feed on the foliage of native trees and shrubs and depend on tree hollows for nesting sites and shelter. These basic requirements are not available in softwood plantations.

The removal of native forest has three major effects on the native fauna of the area.

1. In some species, such as the greater glider (*Schoinobates volans*), individuals whose territory is cleared will perish because of their inability to establish new territories in the adjoining native forest. As a result, population numbers of such species will decline in proportion to the area cleared.

2. Species that require a relatively large contiguous area to survive may be eliminated because the blocks of remnant native forest may be too small to support viable populations. Studies carried out in south-eastern Australia indicate that a minimum area of 1,000 ha is required to support a viable population of arboreal mammals such as the greater glider. Smaller areas would have to rely on migration from adjacent habitat in order to maintain population numbers and genetic variability.

3. Separation of blocks of native vegetation by areas of unfavourable habitat results in the fragmentation of the original population into a number of smaller isolated groups. This isolation leads to a restriction of gene flow and inhibits recolonization movements. Moreover, animals occurring in low numbers in an

isolated block are more susceptible to destruction by natural causes such as fire and predation. Where large continuous areas of favourable habitat occur, sensitive species would usually survive somewhere, even during a major bushfire, and the surviving individuals and their offspring could ultimately recolonize the vacant habitats.

The impact of these effects on populations of native fauna can be reduced by the maintenance of strips of native vegetation within the plantation complex. It would appear that these strips within softwood plantations, are of major importance to some species, but as yet little information is available on their optimum size to conserve viable populations of indigenous fauna.

The current practice in softwood plantations is to retain native vegetation along streams and ridges and clear the intervening slopes. It appears that in regions where large areas of softwood plantations are established, conservation of many mammal species can best be achieved by retaining adequate areas of protected and preferably inter-connected habitats. If such corridors were provided, however, more land would need to be allocated to softwoods in order to achieve a net area planted to pines. The question then arises as to whether it is more beneficial, in terms of wildlife conservation, to concentrate the alteration of habitat in one large area or to distribute the impact over several smaller ones. The former alternative may allow for more viable reserved areas for wildlife, while the second allows greater scope for conserving a range of environments. This argument assumes, however, that the distribution, status, and habitat requirements of every native species are adequately documented, so areas for softwood production could be allocated without endangering the survival of any species. Unfortunately this information is not available for many species.

A number of native mammals and birds do inhabit softwood plantations. These include the great grey kangaroo, black

wallaby, wombat, echidna, long-nosed bandicoot, bush rat, two species of antechinus, and several species of possums and bats (see Table 4). The ground-dwelling mammals survive in plantations either because the plantation environment provides adequate food and shelter or because sufficient areas of native ground vegetation within the plantation complex remain to support them. The echidna and long-nosed bandicoot obtain food and shelter in plantations of all ages, whereas black wallabies and wombats are abundant only in young plantations where food supply and low cover are plentiful. Small mammals such as the bush rat and brown antechinus appear well adapted to survive and reproduce in most plantations, particularly where native vegetation is retained along creeks. However, the common brushtail, eastern grey kangaroo, black wallaby, and the bats all depend on native forest for at least one of their basic requirements.

The groups of birds best represented in softwood plantations are those species that mainly feed from the ground and understorey of eucalypt forest, such as the crimson rosella, red-browed firetail, kookaburra, and various species of thrush, wren, and robin.

Landscape considerations

Softwood plantations have a strong visual impact on the local and regional landscape. This impact is accentuated when large softwood plantations are established in a relatively small area close to softwood-processing plants.

Plantations often have greater visual effect because of their position in the landscape. Those within the study area have generally been established on hilly or mountainous terrain in areas of visual dominance. Consequently they can be visually prominent and, if not properly planned, have a major impact on recreational and aesthetic value of the landscape as viewed from major tourist roads or look-out points.

The uniformity of plantations contrasts with the variation in adjoining native forest. Maintenance of native vegetation to screen the plantation from view is important in reducing the visual impact on the landscape, particularly in areas of outstanding scenic value.

Soil erosion

The soil erosion hazards associated with the establishment of softwood plantations depend on a number of interacting factors, These factors include steepness and length of slope, drainage, aspect, topography, climate, and soil profile structure.

In addition, the establishment of softwood plantations must take into account the effect on adjoining areas of land and other land uses. For example, when softwood establishment in water catchments is under consideration, the extent to which it may affect water supply and quality must be assessed.

The principal soil erosion hazards associated with softwood plantations are mainly due to the construction of roads and tracks, the clearing of extensive areas of native forest, the establishment of plantations on excessively steep slopes, and the thinning and harvesting of the plantation.

In reducing the hazards, the methods used in establishing, managing, and harvesting softwood plantations are very important. For example, the retention of strips of native vegetation along streams and the staging of operations so that large parcels of land in close proximity are neither cleared for planting nor harvested at the same time reduce the soil erosion hazards associated with softwood plantations.

Land cleared for establishing softwood plantations normally covers quite a large area. It is allowed to dry over the summer months before being burnt in the autumn, then planted during the following winter, and a vegetation cover is established within about 12 months. Soil erosion and associated problems are likely to recur during harvesting and

replanting of the area, normally 30--40 years later. The Forests Commission and Soil Conservation Authority have developed management principles to minimize these problems.

Many factors influence the upper practical limit of steepness for establishing softwood plantations. One of these can be the shortage of suitable less-sloping land. In general terms a slope not exceeding 20° (36%) is regarded as a desirable upper limit. Even this slope, however, could be regarded as excessively steep because of other limiting factors such as erosion-prone soils. On the other hand slopes as steep as 40° (84%) have been planted to pines in the Myrtleford district. Despite this extreme steepness, most of these areas have been cleared of original vegetation, planted to pines, and harvested within acceptable limits of erosion risk. This is very largely due to the inherent soil stability in these areas.

The soil erosion hazards associated with the establishment of softwood plantations vary to such an extent within each of the six descriptive blocks that it is necessary to assess the hazard separately for each site under consideration for softwood plantation establishment. Many of the soil erosion hazards can be reduced to acceptable levels, however, by the adoption of appropriate development, management, and harvesting methods.

Water

North-eastern Victoria is used to supply water to drier parts of Victoria, New South Wales, and South Australia. The surplus of water from within the study area eventually reaches the sea via the Murray River, but a large quantity of this water is also used for irrigation (approximately 10% of the Murray River's annual flow).

The use to which land is put affects its usefulness as a catchment area. Changes in vegetative cover alter the rate, quantity, and quality of run-off as well as the recharge of groundwater.

Dense vegetation, which includes deep-rooting species, reduces surface water yield, but acts as a reservoir that releases water, usually of good quality, over a longer period. Poor vegetative cover can result in rapid surface run-off of silt-laden water and can result in flash flooding, which increases the cost of collecting and utilizing this water.

Of existing softwood plantations concentrated in certain parts of the study area, a number have a potential for future expansion (Map 2). It must be remembered that extensive softwood plantations could affect the quantity and quality of water supplied from some areas.

Areas that are cleared of native vegetation generally produce a higher water yield, but the quality can be reduced because of increased sediment load. In softwood plantations the current practice is to retain a strip of native forest along watercourses, which filters out the sediment washed from the cleared slopes before the run-off enters a stream.

Some information is available, from studies in Australia and overseas, on the effect of softwood plantations on stream flows. This indicates a reduction in stream flow from younger (up to 22 years old) plantations, principally because of higher rates of canopy interception. One Australian study indicates that thinning operations can lead to at least temporary increases in stream flow.

PART V : BLOCK DESCRIPTIONS

This chapter describes for each block its general characteristics, the nature of the land, and its capability for various uses, and finally highlights those outstanding capabilities or other features that are of special significance.

A consistent format of sub-headings has been used so that the reader can readily find specific information within one block and compare it with others. The discussion under most sections refers specifically to public land. Block boundaries are shown on the map titled Softwood Capability and Descriptive Blocks at the back of this report. Reference should also be made to the Public Land Use map when reading these descriptions.

Moyhu

Present tenure and general description

The public land occupies 9,000 ha (8% of the total area), most of which remains as uncommitted Crown land. An education area at Upper Edi and a number of other smaller reserves make up the remainder.

The plains in the north of this block mainly support agriculture, while the small parcels of public land are located in the foothills of the mountainous terrain further south.

Capabilities

Nature conservation

The public land has moderate to high capability for nature conservation. The flora and fauna of the southern hill country are not known in detail, but are probably typical of the long-leaf box and peppermint forests in the area. Representative examples of these dry open forests are

reserved within the Mount Pilot Regional Park to the north of the study area. Stream-side reserves and road reserves within this block are important areas for flora and fauna conservation, as they often contain mature native trees.

Recreation

Recreational capability of the public land is moderate. Access to most blocks is reasonable, with highways close by. These areas provide opportunities for nature study, picnicking, and walking.

River and adjacent stream frontages are favoured areas for picnicking, walking, and fishing, and they also form part of the general scenery for activities such as pleasure driving. However, access is often restricted to a few points along the frontage.

Softwoods

Public land in this block is generally too dry for softwood production. With newly developed establishment techniques, however, some areas previously considered marginal may now be suitable. At present no softwoods grow within this block, but some 470 ha have been assessed as suitable and a further 6,000 ha may contain areas of suitable land.

Other uses

While the public land has low capability for agriculture and hardwood production, substantial areas of box--stringybark forest give this block a high capability for apiculture - it forms part of the most honey-productive area in the region. The Ovens River is an important source of gravel and sand, while large quantities of granite are quarried at Glenrowan.

Significance

The public land in this block has significance for nature conservation, recreation and apiculture.

Emu

Present tenure and general description

The public land occupies 38,900 ha (74% of the total area), approximately 60% of which is uncommitted land, and the remainder is reserved forest used primarily for softwood production. The State Rivers and Water Supply Commission has acquired some land bordering Lake Buffalo for the second stage of the Buffalo Dam. This hilly to mountainous block is predominantly public land consisting of a ridge of sedimentary rocks running southwards from Myrtleford. It supports a wide variety of forest types, from the dry long-leaf box forests in the north to the alpine ash at higher altitudes in the south.

Capabilities

Nature conservation

The block has moderate to high capability for nature conservation. The Black Range and Mount Emu areas contain good examples of narrow-leaf peppermint, mountain swamp gum, and candlebark--snow gum forests. These mature forests provide important habitat for numerous arboreal mammals that rely on native vegetation for food and shelter. The bobuck, an uncommon arboreal mammal in the study area, has been recorded at Mount Emu.

Recreation

Diversity of environments, proximity to major towns, and good access give this block a high capability for recreation. Access to the public land is generally good, particularly throughout the softwood plantations in the north. Fewer tracks serve the uncommitted land to the south and most are only suited to four-wheel-drive vehicles.

The softwood plantations provide opportunities for pleasure driving, walking, and orienteering. The native forests are ideally suited to activities such as nature study, bush-

walking, picnicking, and the use of four-wheel-drive vehicles.

Streams in the block are good for fishing and in some areas fossicking for gold and gemstones is a popular recreation pursuit.

Softwoods

Capabilities for softwood plantations in this block are high. The land in the north-west of the block is too dry for softwoods, but it is used as a buffer for the protection of both private land and plantation areas, particularly in relation to the fire hazard.

The remaining areas of peppermint forest, where not too steep, have a high capability for softwoods (see map 2). Some 7,200 ha of presently uncommitted land has high capability and a further 3,300 ha has a lower capability. Softwood production on this land also has economic advantages due to the existence nearby of established pine plantations and the proximity of a softwood-processing plant at Myrtleford.

Other uses

The block has a generally low capability for hardwood production, but a high capability for water production, particularly from the Black Range. Part of the Myrtleford gold- and tin-field occurs within this block, where both alluvial and reef deposits of gold have been mined. River gravels suitable for road-making are extracted from the King and Ovens Rivers.

Significance

The block is significant for softwood production, nature conservation, recreation, and water production.

Buffalo

Present tenure and general description

The public land occupies 32,000 ha (81% of the total area). Most of it lies within the Mount Buffalo National Park. A small area in the south-west of the block is uncommitted land and some land near Lake Buffalo is owned by the State Rivers and Water Supply Commission.

The Buffalo Plateau, which dominates this block, is composed of very resistant granite, surrounded by metamorphic and sedimentary rocks that comprise the foothills. The block contains a wide variety of forest types and is bounded in the west by the Buffalo River and in the north and east by the Ovens and Buckland Rivers.

Capabilities

Nature conservation

Capability for nature conservation is high. Altitude, topography, and geology are important factors contributing to the wide range of vegetation types and habitats present, some of which occur only within this block. Much of the area is inaccessible and relatively undisturbed.

Recreation

Diverse vegetation, scenic grandeur, and cool climate give this area outstanding capabilities for recreation. Bush-walking, nature study, picnicking, and skiing in winter are the main recreational pursuits. The streams are used for fishing, and Lake Buffalo provides an attractive area for sight-seeing, picnicking, and water-skiing.

Softwoods

The block has low capability for softwood production mainly because of unfavourable growing conditions, together with

steepness of the terrain.

Other uses

In addition to large areas of narrow-leaf peppermint, extensive areas of good-quality alpine ash forest occur within the block. The capability for hardwood production is therefore high, but none of these forests have been logged because of their conservation significance and recreation values. High rainfall and steep slopes help to make this block especially significant for water production. Myrtleford obtains its domestic supply from the headwaters of the Buffalo Creek, and Lake Buffalo provides water for irrigation, urban, stock, and domestic purposes in the area. Gold has been found in the Ovens and Buckland Rivers and also in the Buffalo Creek area. River gravels are extracted from the Ovens River.

Significance

The block has significance for nature conservation, recreation, and water production.

Porepunkah

Present tenure and general description

Public land covers 46,000 ha (55% of the total area). Most of the Crown land remains uncommitted to any specific use, but a substantial area is reserved forest used for softwood production or as forest areas adjacent to softwood plantations. Scenic reserves occur at Mount Porepunkah and Tawonga Gap.

The block consists of mountainous terrain with a range of vegetation types, distributed in response to rainfall and elevation. The public land is surrounded by valleys cleared for agriculture.

Capabilities

Nature conservation

This block has moderate to high capability for nature conservation.

A granite outcrop at the Pinnacles and the structural features to the east are geologically significant. A wide range of forest types occur, and hence a diversity of habitats. Much of the uncommitted land is relatively undisturbed.

Recreation

The rugged and varied terrain, locality, and access provide high recreation capability. The public land is surrounded by major highways, including the Kiewa and Ovens Highways. The scenic reserves at Mount Porepunkah and Tawonga Gap offer impressive views of the surrounding country, and are used by picnickers and sightseers. Historical features, associated with gold-mining activities, are also an important tourist attraction.

Softwoods

Within this block, 4,250 ha of native forest have been converted to softwood plantations. Some suitable land for softwoods remains, but the areas are isolated and generally small, and as a consequence, much of this remaining land may not be economic to plant. Approximately 3,000 ha of uncommitted land and forest reserved for hardwood production within this block has some capability for softwood production.

Other uses

Small stands of alpine ash at Mount Jack, Running Creek, and German Creek and on the ridges between Running Creek and the Kiewa River have a high potential for hardwood production. The block also forms part of the catchment for the Kiewa and Ovens Rivers and has moderate capability for water production.

Gold-mining has occurred in the area and river gravels are extracted from several localities on the Ovens River.

Significance

The block has significance for nature conservation, recreation, softwood production, hardwood production, and water production.

Paradise Falls

Present tenure and general description

Public land occupies 44,000 ha (74% of the total area). The Wabonga State Park occupies the south-eastern portion of the block, while in the west an area of reserved forest is used for hardwood production. Three reference areas and one scenic reserve occur in the block, and the remaining public land is uncommitted.

The Wabonga Plateau, which dominates this block, consists of horizontally bedded carboniferous sandstones that are deeply dissected. The western portion of the block consists of mountainous terrain separated by narrow valleys that have been cleared for agriculture.

Capabilities

Nature conservation

The block has a high capability for nature conservation. Its geology, topography, and altitude are important factors in the diversity of vegetation types and habitats present. Messmate stringybark and broad-leaf peppermint with a heathy understorey occur only in this block within the study area. The southern portion of the block is relatively undisturbed and is therefore important for nature conservation. Bobucks - uncommon mammals with a restricted distribution - have been recorded in the area around Archerton. Several breeding records for the peregrine falcon, which is declining in numbers on a world-wide basis,

have also been reported.

Recreation

Location, access, topography, and scenic values provide this block with a high recreation potential. The main Whitfield--Tolmie Road passes through the centre and a number of minor roads traverse the rest of the public land, making access relatively easy. Significant tourist attractions include Power's Look-out, Paradise Falls, and Lake William Hovell. The varied and impressive topography adds to the scenic qualities of these areas. Lake William Hovell provides opportunities for some water sports as well as for fishing and duck-shooting. Deer-hunting (Sambar) is also a popular recreational activity in the area. Other recreation pursuits include nature study, bush-walking, picnicking, pleasure driving, and fossicking, particularly at the old Toombullup Diggings.

Softwoods

The location of this block makes it potentially suitable to supply both the Ovens and Benalla--Mansfield plantation development zones. Although poor soil moisture status and steep valley sides reduce the suitability of some areas within this block for softwood plantations, most of the western portion - between the headwaters of Middle Creek and the west branch of the King River - has a high capability. Other areas with a high capability occur near Mount Warrick in the south-east. Some 19,000 ha of land within this block has a high capability for pines, in addition to the 500 ha at Toombullup already allocated for softwood production.

Other uses

Capability for hardwood production is low to moderate. Mess-mate stringybark and some of the associated narrow-leaf pepper-mint forests have a potential for intensive hardwood production. Land around the headwaters of Middle Creek is used for intensive hardwood production, but other areas supporting long-leaf box and broad-leaf peppermint forests are generally unproductive.

The block has a moderate to high capability for water production. The major streams draining the block are the King and Rose Rivers and Middle, Fifteen Mile, and Boggy Creeks. In addition, Lake William Hovell on the King River impounds 12,300 ML and provides water for additional irrigation, as well as securing the local water supply. The block is also important for apiculture, particularly the valley of Fifteen Mile Creek, which is a major breeding area for queen bees.

Significance

The block has significance for nature conservation, hardwood and softwood timber production, water production, recreation, and apiculture.

Abbeyard

Present tenure and general description

Public land occupies 102,700 ha (97% of the total area), most of which is uncommitted land. South of Porepunkah and Bright, an area of reserved forest is used for softwood production. Land near Dandongadale has been acquired by the State Rivers and Water Supply Commission for the second stage of the Buffalo Dam.

The block is mainly forested mountainous terrain separated by narrow river valleys, parts of which have been cleared for agriculture.

Capabilities

Nature conservation

The block has a high capability for nature conservation. It contains extensive areas of peppermint forest and small stands of alpine ash, snow gum--candlebark woodland, and mountain swamp gum. Much of the block is inaccessible and is therefore relatively undisturbed.

Recreation

Extensive areas of native bush, rugged terrain, attractive stream environs, and proximity to accommodation centres such as Bright provide this block with a high recreation potential. Access is via main roads along the stream valleys, but few tracks (which are generally suited to four-wheel-drive vehicles only) traverse the more isolated parts of the block. The streams provide good fishing and are also popular areas for sightseeing and picnicking. Fossicking for gold is a recreational pursuit carried out along the Buckland River and Morses Creek, and suitable tracks and look-out points near Bright make this a popular area for sightseeing and pleasure driving.

Softwoods

Capability for softwood production is low. Most of the suitable areas for plantation establishment near Bright have already been allocated for softwood production, and no further large area of public land within the block has any potential. Only one small area of about 900 ha in the valley of Devils Creek is marginally suitable for plantation establishment. Steepness is the limiting factor in this area.

Other uses

Where access permits, the peppermint and alpine ash stands are suitable for low-intensity hardwood production, but in general the terrain is steep and access is poor. Most of the public land is leased for light grazing, but other agricultural pursuits on public land are not appropriate, mainly because of steepness and the short growing season. The mountainous terrain and associated high rainfall gives this block a high capability for water production. Several major streams drain a well-forested catchment that provides good-quality water.

Significance

The block has significance for nature conservation, recreation, and water production.

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