

**EAST GIPPSLAND  
FOREST MANAGEMENT AREA**

**ESTIMATE OF SAWLOG RESOURCE**

**Department of Natural Resources and Environment  
Victoria**

**March 2002**

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## FOREWORD

In March 2001 the Minister for Environment and Conservation initiated a process to issue new sawlog licences at appropriate levels. This process culminated in the preparation and release of the *Our Forests Our Future* Statement in February 2002. This Government Statement announced wide ranging reforms to the management of Victoria's native forests and will result in a sustainable timber industry. In the short term a reduction of about 30% to the sawlog levels across the State is required.

This report describes the data and method used to calculate the appropriate sawlog level for the East Gippsland Forest Management Area. This level has been adopted in the *Our Forest Our Future* Statement.

The estimate of the sawlog levels in this report is based on the information that is known about our forests and a series of estimates about the future, the preferences of industry and the best way to analyse the data. These estimates may be improved in the future as new information becomes available and more measurements of actual performance are recorded. Consequently the sawlog resource available in the future may also change. The *Our Forests Our Future* Statement outlines how these changes will be managed.

An independent Expert Data Reference Group was commissioned to review the data and methodology used to determine this estimate. This group reported in October 2001. It made extensive recommendations on how the processes and data could be improved. This document has considered the advice of the group.

This report provides the opportunity for the timber industry and interested people to gain access to information on how sawlog resources are estimated for Victoria's native forests.

A handwritten signature in black ink that reads "Ken King". The signature is written in a cursive style and is positioned above a solid horizontal line.

**Ken King**  
Executive Director, Forests Service

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## **1 Introduction**

This Estimate of Sawlog Resource (ESR) summarises current East Gippsland Forest Management Area timber resource volume, growth and area information, licence commitments and ten-year timber production history in public native forests. The level of forest timber resources available into the future is determined by scheduling future harvesting and growth. This estimate has been prepared as part of a process established by the Minister for Environment and Conservation in March 2001 to develop a strategy for the issue of sawlog licences following the expiry of current licences, which will occur from 2002. The information contained in this document has been reviewed by an independent Expert Data Reference Group and peak industry and union groups, and is intended to assist in identifying soundly based estimates for future sawlog availabilities for the timber industry.

## **2 Background**

East Gippsland FMA occupies the most easterly part of Victoria from Lakes Entrance on the coast to the source of the Murray River in the North (see Map 1).

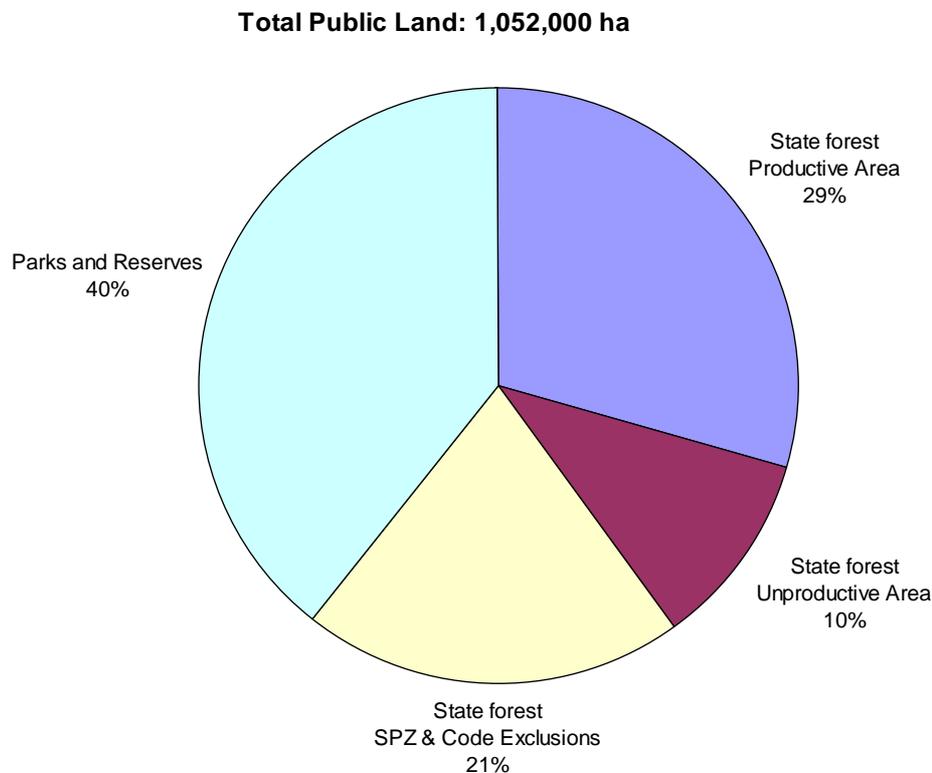
The Forest Management Area is currently divided into four forest districts for operational management purposes, Bendoc, Cann River, Nowa Nowa and Orbost.

The Timber Industry Strategy (TIS) released in 1986, established the basis for regional sustainable harvesting of sawlogs from State forest in Victoria. Based on resource data available at the time, sustainable sawlog yield rates were determined for each one of 15 Forest Management Areas identified by the TIS in order to facilitate the proper planning, management, and administration of publicly owned native forest. The TIS also provided resource security to the timber industry through the introduction of fifteen-year licences, and flexibility to cope with market variations by allowing annual intake variation between 70% and 130% of annual licence volume. The concept of value adding was introduced with the establishment of four grades of sawlog and the allocation of the better grades of sawlog to those licensees with better value adding performance. It also provided a planning hierarchy of Forest Management Plans (FMP), Wood Utilisation Plans and Coupe Plans.

The TIS stated that in East Gippsland Forest Management Area there was insufficient hardwood resource to sustain the (then) allocation of sawlogs. The sustainable yield was set at 179,000m<sup>3</sup> nett C grade or better sawlogs (C+) per year. Following additions to the parks systems in 1987, the sustainable yield was set at 174,000m<sup>3</sup> nett per year C + sawlogs as reported in the East Gippsland FMP (CNR 1995).

The forest resources of East Gippsland were quantified in the HARIS report published in 1993 (CNR 1993). It describes the forest estate by area and volume as at 30 June 1990 for the Cann River, Bendoc and Orbost Districts and as at 30 June 1991 for the Nowa Nowa District.

The East Gippsland FMP provided for the protection of all conservation values to agreed targets in Special Protection Zones (SPZ), and allowed harvesting in General Management Zone (GMZ) and Special Management Zone (SMZ) under specific conditions (Figure 1).



**Figure 1. Public Land in the East Gippsland Forest Management Area**

The 1996 review of sustainable yield for East Gippsland FMA used the HARIS resource statement with nett area adjusted for the new zones established by the East Gippsland Forest Management Plan. At the same time the yield calculation was adjusted from C+ to D grade and better sawlogs (D+). The outcome was a sustainable yield of 250,000m<sup>3</sup> nett D+ per year.

The East Gippsland Regional Forest Agreement was established between the Commonwealth and State Governments in February 1997 with no significant change to the area available for timber production. The Regional Forest Agreement formally accredits the East Gippsland RFA as part of Victoria’s Ecologically Sustainable Forest Management system.

Current resource age structure is predominantly mature (mature/uneven-aged 17%, mature/over-mature 39%), with 41% of the resource being logging and fire regrowth.

### 3 Licence Commitments

Current licence tenure and commitment by grade are shown in Tables 1 and 2.

*Table 1. Current East Gippsland FMA Commitments Licence Type and Expiry*

Licence Type	Product	Expiry Date	Volume m <sup>3</sup> nett	No of Licences
Evergreen	Sawlog	30/06/08	69,222	4
Evergreen	Sawlog	30/06/09	36,697	5
Standard	Sawlog	30/06/03	90,936	9
Standard	Sawlog	30/06/05	3,145	1
Standard	Sawlog	30/06/09	49,048	1
Standard	Speciality timber	30/06/02	360	1
<b>Total</b>			<b>249,408</b>	<b>21</b>
			<b>Volume m<sup>3</sup> gross</b>	
Standard	Speciality RL	30/06/02	75	1
Standard	E grade	30/06/03	7,000	1
Standard	E grade	30/06/05	10,000	1
Standard	E grade	30/06/09	2,000	1
Standard	Thinning	31/12/06	25,000	1
Standard	Residual Log	31/12/07	20,000	1
Standard	Residual Log	30/06/12	174,000	1
<b>Total</b>			<b>238,075</b>	<b>7</b>

*Table 2. Current East Gippsland FMA Commitments by Species and Grade*

Product / Grade	Annual Allocations
<b>Sawlog (m<sup>3</sup> nett)<sup>1</sup></b>	
B+	8,022
C	175,342
D	65,643
Speciality Timber	360
<b>Total</b>	<b>249,408</b>
E Grade (m <sup>3</sup> gross)	19,075
Residual Log (m <sup>3</sup> gross)	194,000
Thinning Residual log (m <sup>3</sup> gross)	25,000
<b>E Grade/RL Total</b>	<b>238,075</b>

Note: 1. This assumes current annexures

Value-adding opportunities have also been enhanced through species annexures introduced in 1998/99. Current species targets based on supplies for 2000/01 are shown in Table 3. Some targets are specified as a proportion of the volume produced within the East Gippsland FMA while others are specific volumes.

**Table 3. Current species targets**

	<b>Target Volumes (nett cubic metres)</b>
<i>Eucalyptus delegatensis</i> / <i>E. regnans</i> , Alpine/Mountain Ash	2,000
<i>E. globulus</i> , Blue Gum	626
<i>E. cypellocarpa</i> , Grey Gum	2,317
<i>E. obliqua</i> , Messmate	38,698
<i>E. nitens</i> , Shining Gum,	2,600
<i>E. botryoides</i> , Southern Mahogany	300
<i>E. sieberi</i> , Silvertop	39,290
<i>E. viminalis</i> , Manna Gum	907
<i>E. muelleriana</i> , Yellow Stringybark	1,500

There are also two current short term licences, which expire in June 2002. These licences supply 217,500m<sup>3</sup> gross of residual roundwood and 55,000m<sup>3</sup> gross from thinning operations.

In October 2000, an expression of interest was called for a further 612,000m<sup>3</sup> per year of residual log, including 63,840m<sup>3</sup> from thinning operations. If all tendered residual log material is sold as part of this expression of interest, approximately 806,000m<sup>3</sup> per year would be produced in all districts within the FMA. This volume would include a commitment to 88,900m<sup>3</sup> per year of thinnings. The expression of interest allowed for licences to be issued for a period of up to 15 years. The levels of any new licences issued as part of the expression of interest will be set based on the residual logs required to support the harvesting of sawlogs at the new levels.

## 4 Harvest History

### 4.1 Total Sawlog Production

Figure 2 shows sawlog volumes produced by forest type from 1990/91 to 1999/00.

Production levels have cycled over the last 10 years, with the volume produced in 1992/93 being 20% higher than the licensed level and the volume in 1996/97 being 20% less than the licensed level.

Over the past 10 years, Foothill Mixed Species (FMS) and Mountain Mixed Species (MMS) have made up 90% of the annual volume harvested, Alpine and Coastal Mixed Species (AMS/CMS) approximately 8% of the annual volume, while Ash species and Shining Gum (SHG) contribute only 2% of the annual volume.

The average volume produced over this period was 250,386m<sup>3</sup> nett.

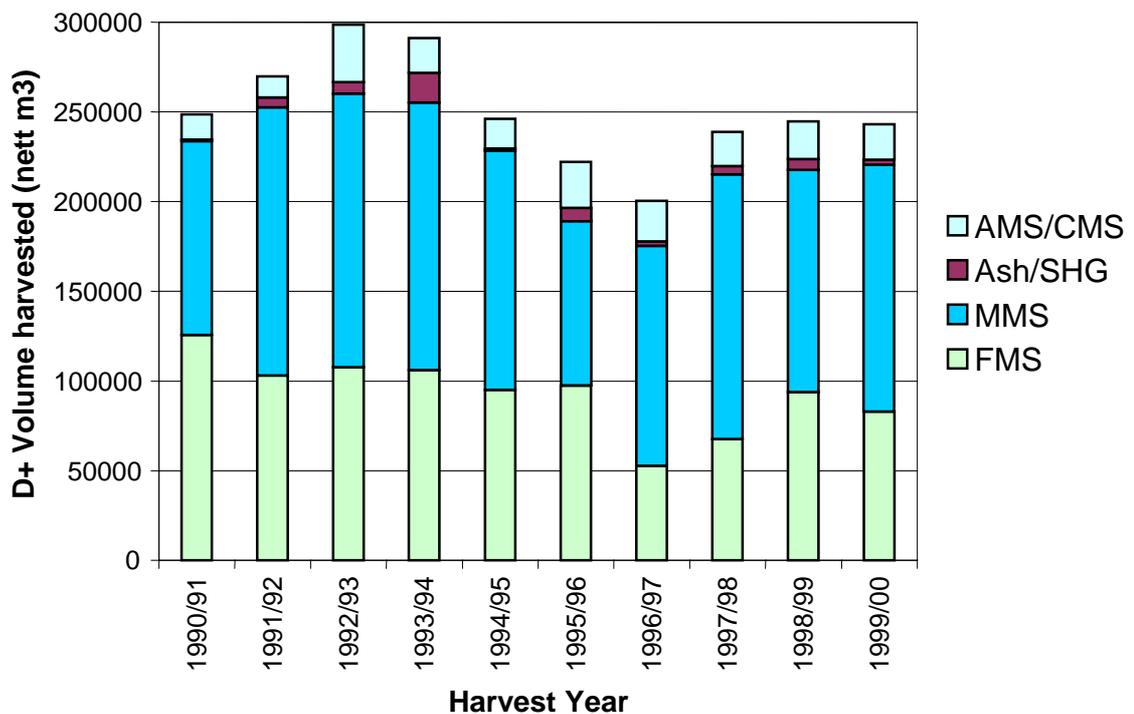


Figure 2. D+ Sawlog Produced by Forest Type by Year from 1990/91 to 1999/00

## 4.2 Sawlog Grades

Figure 3 shows that sawlog production by grade has remained relatively constant from 1990/91 to 1999/00.

The proportion of A and B grade sawlog nett volume has been consistent at 0.3% and 3% respectively, while C grade production has averaged 68% and D grade, 29% over this time. The proportion of C grade sawlog nett volume produced over the ten years has increased slightly, from 64% of the volume in 1990/91 to 75% in 1997/98; then reduced to 70% in 1999/00. A corresponding decrease/increase in the volume of D grade sawlog can be observed due to improved grading by harvesting crews.

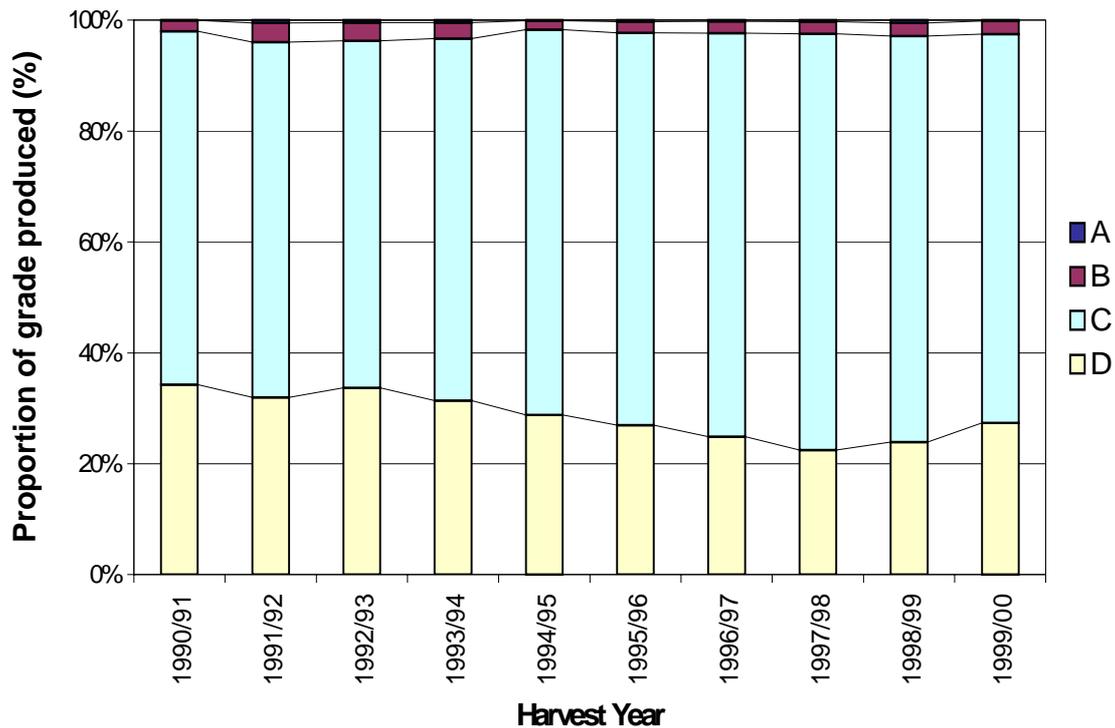


Figure 3. D+ Sawlog Grade Proportions by Year from 1990/91 to 1999/00

### 4.3 Sawlog Size Classes

Figure 4 shows that the majority of sawlogs produced from 1995/96 to 1999/00 were size class 1 (45cm and greater in diameter under bark). Since 1998/99, all logs have been classified into a size class and on average 84% of all sawlogs have a diameter of 45cm and greater under bark.

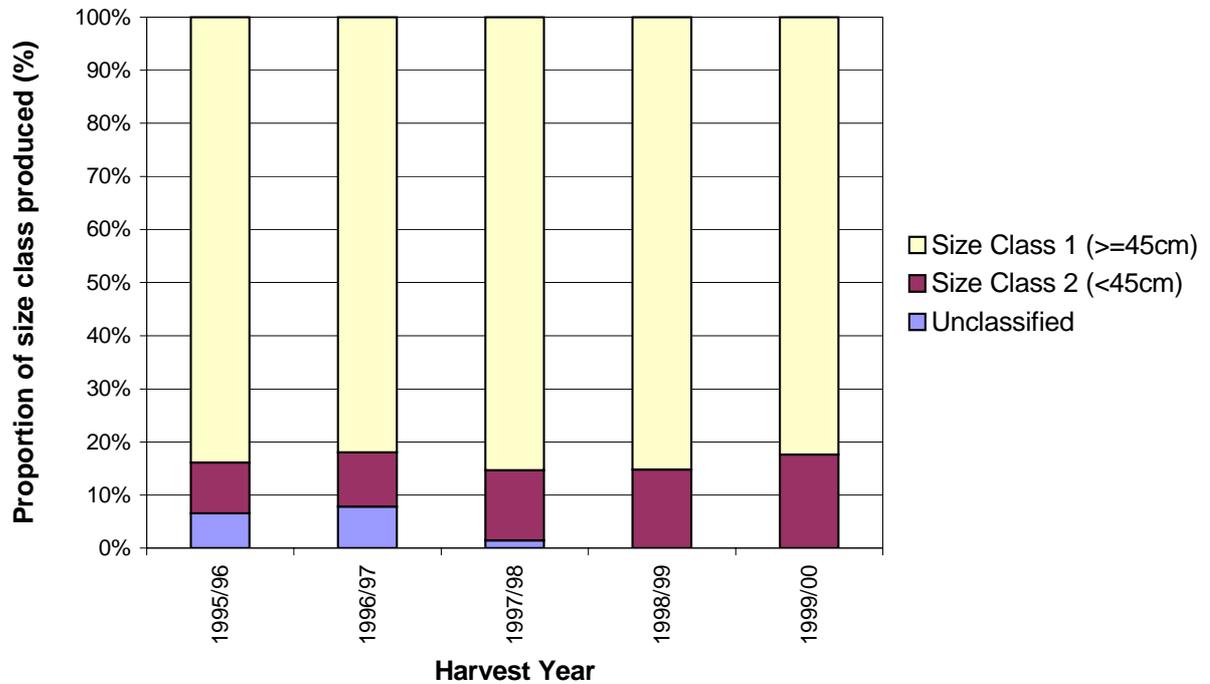


Figure 4. D+ Sawlog Size Class Distribution by Year from 1995/96 to 1999/00

#### 4.4 Area Harvested

Figure 5 shows the annual area harvested in each forest type from 1991/92 to 1999/00.

Over this period, areas harvested in the Foothill Mixed Species (FMS) and Mountain Mixed Species (MMS) forest types represent 50% and 30% respectively of the total, while 15% and 1.4% of the area is harvested in Alpine Mixed Species (AMS)/ Coastal Mixed Species (CMS) and Ash/Shining Gum (Ash/SHG) respectively.

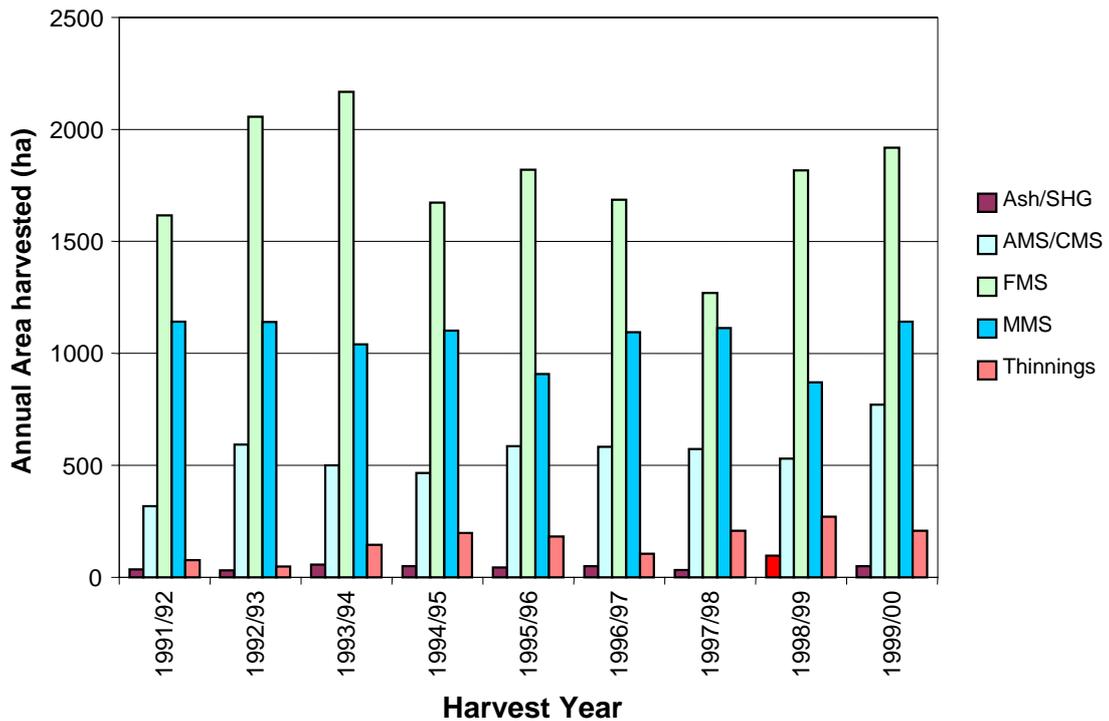


Figure 5. Area Harvested by Forest Type by Year from 1991/92 to 1999/00

## 4.5 Sawlog Yields

Figure 6 shows sawlog yields by forest type from 1991/92 to 1999/00. The average sawlog production across all forest types, including thinning operations, was approximately 70m<sup>3</sup> nett per hectare.

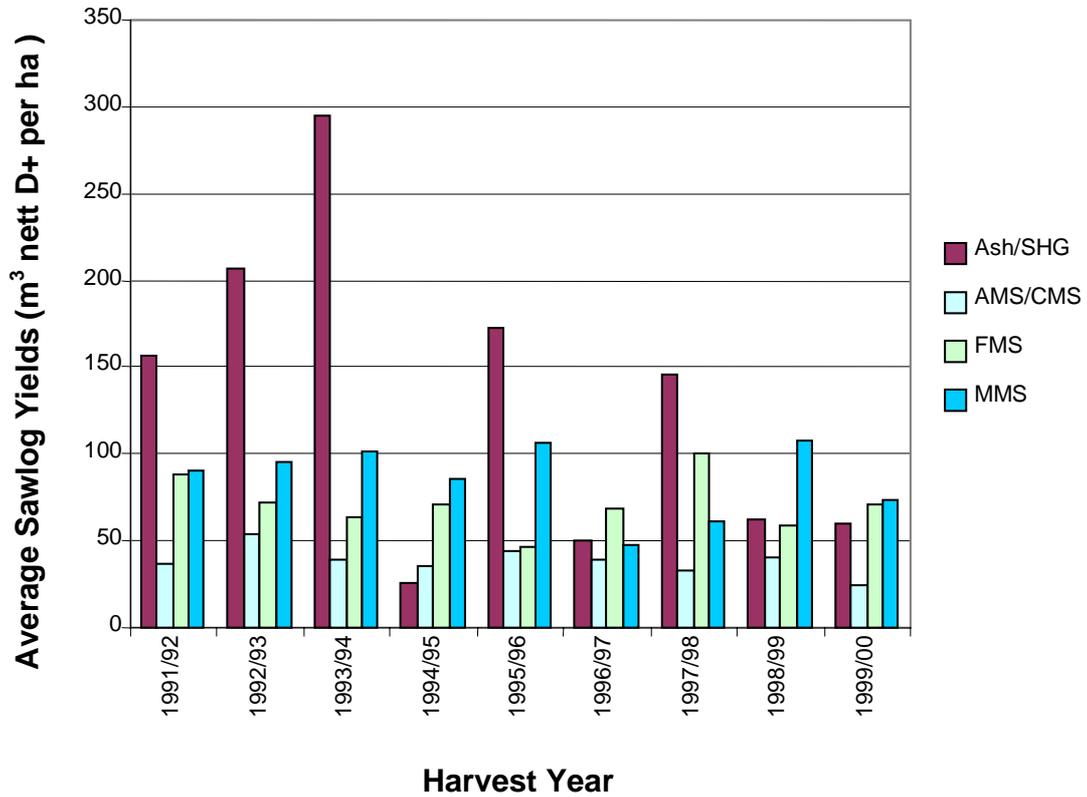


Figure 6. D+ Sawlog Yields by Forest Type by Year from 1991/92 to 1999/00

#### 4.6 Residual Log Sales

Figure 7 shows that the sale of residual wood has increased over the decade from 1990/91 to 1999/00. There has also been an overall decrease in residual wood production over the same period.

The largest volume of residual wood was sold in 1999/00 with a total of 237,426m<sup>3</sup> gross. Most of the residual log sold is processed for paper manufacture overseas, however, some is sawn in local sawmills. It also includes volume from regrowth thinnings operations. Residual logs not sold remain on the coupe and are burnt in operations required to create a seedbed for regeneration.

Significant quantities of residual log have been produced but not sold in this FMA. There is scope to further increase the volume of residual logs sold from all forest types if further markets can be found for the residual logs that are produced and currently wasted in sawlog harvesting operations.

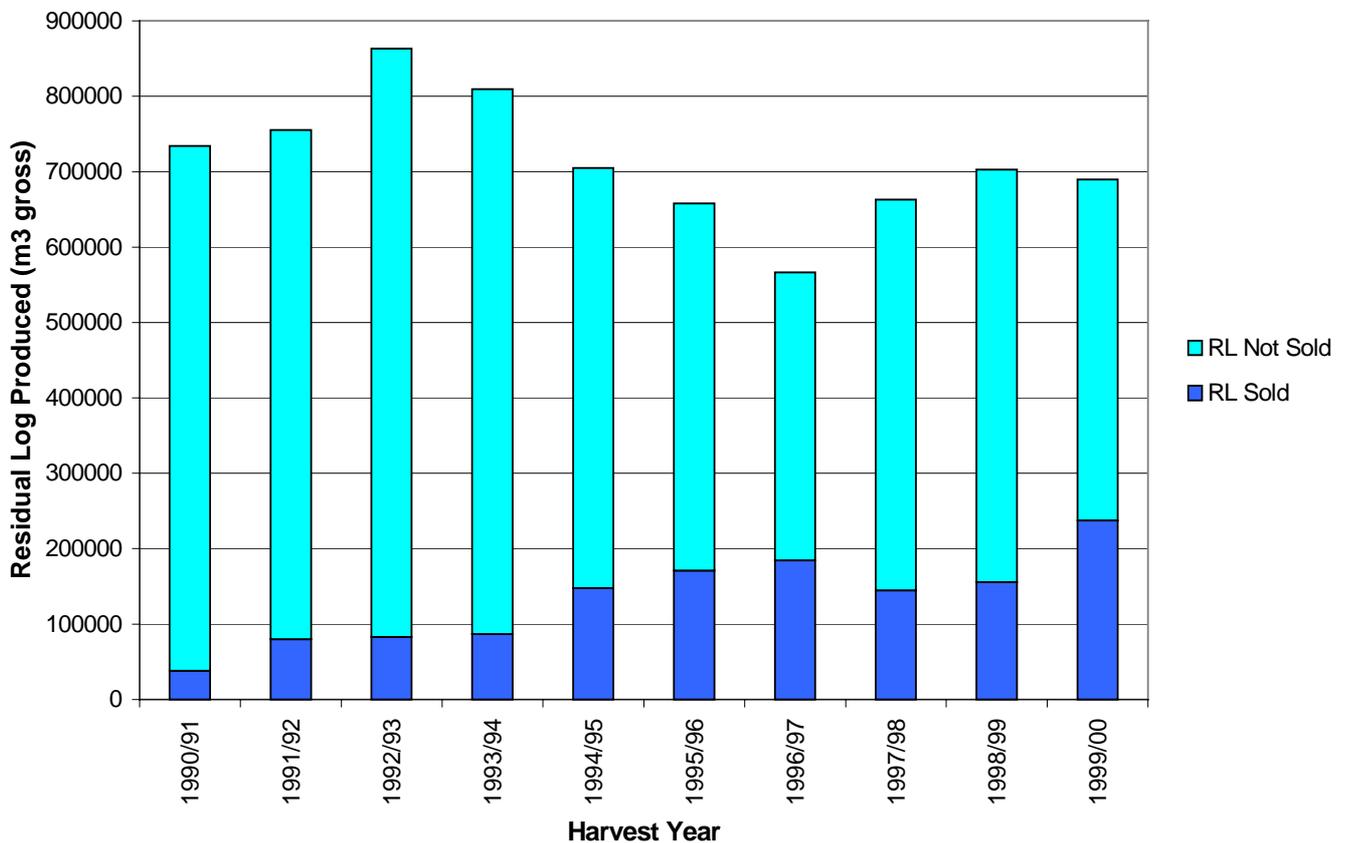


Figure 7. Residual Log Production by Year

## 5 Volume and Growth Information

### 5.1 Standing Volume

The SFRI stand class volume prediction models have been used to estimate current standing volumes for all productive mature stands (including 1939 regrowth). These volumes have been summarised as average volumes by forest type and broad age categories.

As the SFRI field inventory work in East Gippsland FMA has not been completed, the volume model developed for the Tambo FMA Estimate of Sawlog Resource (ESR) was used.

To provide SFRI based volume estimates for East Gippsland, the SFRI volume model developed for Tambo and Central Gippsland were extrapolated to East Gippsland. Comparison of these model estimates with yields from 628 coupes in East Gippsland indicated that the extrapolated estimates from Tambo and Central Gippsland were biased, averaging only 56% of the coupe yields.

The East Gippsland coupe yields have been used to develop a new calibration model to align the Tambo-Central Gippsland model with the harvested volumes. The calibrated volume estimates have been scaled to 90% of the predicted coupe yields, to allow for the likelihood that the harvested stands will have higher than average volumes. This figure of 90% is in line with the observed difference between SFRI predictions and coupe yields in Tambo FMA.

There was also a further reduction in the Alpine Mixed Species forest type of 50m<sup>3</sup> nett D+ per ha to reflect expected coupe yields, therefore stands with yields less than 50m<sup>3</sup> nett D+ per ha were completely removed. Also, an area north of Cann River, badly affected by the 1983 fire, had modelled volumes reduced by 25% as a result of comparison of modelled and actual yields.

Of the available forest a certain amount was considered to be economically unviable due to low yields based on current industry practice. Stands with less than 25m<sup>3</sup> nett D+ per ha nett of sawlog, and stands with 25-42m<sup>3</sup> nett D+ per ha of sawlog that had species unsuitable for the current Residual Log market were considered uneconomic to harvest. Stands unsuitable for the current Residual Log market were those dominated by *Eucalyptus cypellocarpa* (Mountain Grey Gum), *E.botryoides* (Southern Mahogany) or *E.consideniana*, Yertchuk.

Reductions in yields caused by retained habitat and seed trees and harvesting losses have been accounted for by the use of yields based on actual harvesting

## **5.2 Growth**

Sawlog yields for unthinned regrowth stands are based on the Mean Annual Increment (MAI) specified in the 1996 Review of Sustainable Sawlog Yield for the East Gippsland FMA. These yields were in turn derived from those specified by the TIS.

In the 1996 analysis, all yields were portrayed by constant Mean Annual Increments.

The assumption of constant (MAI) has been replaced by a set of yield curves, which match the previously specified MAIs at the appropriate nominal rotation age. A different approach was used for the different forest types.

The ash yield curves have been derived from the stand simulator (STANDSIM) based yield curves developed for the North East Statewide Forest Resource Inventory project (NRE 1990).

The mixed species yield curves have been derived from the generalised yield curves used in the North East SFRI project, but with variations in the assumptions of the initial age of sawlog occurrence (rather than 20 years as in the North East yield curves).

Thinning yield curves have been provided for all forest types. Thinned ash and mixed species yield curves have been developed based on the thinning response modelled for the ash forest in the Central Highlands in the absence of yield data from East Gippsland.

## **6 Resources**

### **6.1 Wood flows**

In the East Gippsland FMA the predominant silvicultural systems used are clearfelling and seed-tree. They result in even aged regrowth of a known age. Trees are retained in clearfelling and seed-tree operations for habitat, seed fall and in buffers along streams. The estimate of the availability of sawlogs into the future is based on the assumption that clearfelling and seed-tree will continue as the predominant silvicultural systems.

To estimate the availability of sawlogs into the future a method of scheduling wood flows is required. This estimate uses a spreadsheet developed by NRE for this task. It uses the area of each forest type of known age and the yields for a range of ages. Areas of forest can then be scheduled at or near the nominal rotation age during periods into the future. The availability of sawlog has been called the Economically Accessible Resource and is based on the level that can be maintained or increased over the entire planning period, to the year 2150.

## 6.2 Resource Profile

Table 4 provides a simple representation of sawlog resource within a uniform statewide format. Volumes are indicative only. This profile is to be read in conjunction with the accompanying comments on each resource element. Differences between previous estimates of volumes and areas and those shown in the Table 4 are explained in the Appendix.

**Table 4. Profile of Resource Elements for East Gippsland FMA**

No.	RESOURCE ELEMENT	Note	Area (ha)	Annual Volume (m <sup>3</sup> nett/yr)
	<b>STATE FOREST (INCLUDING SOME HISTORIC AREAS)</b>		636,700	
	<b>Code and Forest Management Plan (FMP) elements:</b>			
1	SPZ & proportion SMZ		164,300	
2	Code slope & stream buffer exclusions		52,265	
3	FMP prescriptions			
4	Unmapped streams and soaks not considered in Code buffer exclusions			
5	Standard Statewide Forest Resource Inventory unproductive stands		110,106	
	<b>BIOLOGICAL SUSTAINABLE YIELD</b>		310,029	185,000
	<b>Operational elements:</b>			
6	Further unproductive stands		59,396	2,000
7	Slopes additional to Code exclusions		4,059	3,000
8	Areas not harvested near stream buffers		21,919	15,000
9	Small and isolated areas		14,146	10,000
10	Rocky areas			3,000
11	Harvesting losses			
	<b>Management elements:</b>			
12	Landscape buffers			
13	Fire losses			2,000
14	Disease losses			
15	New flora, fauna and cultural site reservations			
16	Temporal and spatial constraints			7,000
	<b>Remaining element:</b>			
17	Economically Accessible Resource		210,509	143,000
	<b>Potential issue elements:</b>			
18	Changed residual log markets	1		
19	Changed minimum log diameter specification			
20	Changed silviculture system	2		
21	Additions to the forest estate			
22	Reforestation of unstocked stands			

1: See section 6.3.18 for the range of possible outcomes.

2: See section 6.3.20 for the range of possible outcomes.

Note: Elements 6 to 16 and 18 to 22 may alter, increasing or decreasing the economically accessible resource element 17

## **6.3 Resource Elements**

### **6.3.1 Special Protection Zone and Proportion of Special Management Zone**

All the Special Protection Zones (SPZ) and 50% of the Special Management Zones (SMZ) are unavailable for timber production.

### **6.3.2 Code Slope and Stream Buffer Exclusions**

The *Code of Forest Practices for Timber Production* (NRE1996) requires the exclusion from harvesting of slopes steeper than 30 degrees, 20 metre stream buffers and rainforest buffers.

### **6.3.3 Forest Management Plan Prescriptions**

SMZ plans will determine how much of the SMZ is available for Timber Production. SMZ plans tailored to SMZ site attributes have not been developed for all East Gippsland FMA SMZ sites. An estimate has been made of the area available for timber production in the remainder of SMZ based on the site attributes to be managed.

### **6.3.4 Unmapped Streams and Soaks Not Considered in Code Buffer Exclusions**

An allowance of 5% has been made for the area unavailable for timber production due to unmapped streams and soaks.

### **6.3.5 Standard Statewide Forest Resource Inventory Unproductive Stands**

The forest stands which are excluded in the East Gippsland FMA on the basis of being non-productive are those dominated by *Eucalyptus gonicalyx* (Long-leaved Box) and *E. gummifera* (Bloodwood) and all stands that are generally not capable of attaining heights greater than 28 metres.

### **6.3.6 Further Unproductive Stands**

The following species have been identified by industry as species that maybe considered unproductive in the future negotiations. These were pure or dominant stands of:

- *E. considiniana* (Yertchuk)
- *E. cypellocarpa* (Mountain Grey Gum)
- *E. elata* (River Peppermint)
- *E. smithii* (Gully Gum)

These species are expected to reduce the economically accessible resource by 2,000m<sup>3</sup> nett D+ per year. All other species/stands are currently considered productive in this estimate.

### **6.3.7 Slopes Additional to Code Exclusions**

Harvesting history shows that not all slopes less than 30 degrees are harvested. To evaluate the extent of productive forest that could be operationally unavailable to industry, a 25-30 degree slope availability model has been developed.

The methodology applied to slope to reflect the operational situation is as follows:

- less than 25 degrees included in the timber resource as available
- 25 to 30 degrees included in the timber resource as available dependent on adjacent slopes [Geographic Information System (GIS) analysis used]
  - available if adjacent slopes less than 25 degrees
  - unavailable for 100m, if adjacent slopes greater than 30 degrees (and larger than 5ha) and greater than 50m from road
  - unavailable for 100m if adjacent to permanent streams and greater than 50m from road.
- all slopes greater than 30 degrees are excluded.

### **6.3.8 Areas Not Harvested Near Stream Buffers**

Operationally stream buffers on slopes are often greater than the minimum 20m which is commonly prescribed by the *Code*, since slopes often dictate that trees cannot be fallen without entering the buffer. To account for the loss of area, a model was used in which all mapped streams were buffered 30m on either side. A more complex model was also investigated, where buffer size was slope dependent. This more complex model resulted in only a 5% area difference from the modelled 30m buffer width. Therefore, the modelled 30m buffer was used to determine the economically accessible resource area.

### **6.3.9 Small and Isolated Areas**

Small areas are isolated patches of available productive forest, below a minimum size that are considered uneconomic to harvest. These were defined as stands of less than 7 hectares, which were surrounded by unproductive, economically unviable or unavailable forests. These small areas have been identified and excluded from the analysis.

### **6.3.10 Rocky Areas**

An allowance of 3,000m<sup>3</sup> nett per year has been made for the areas that may be unavailable for timber harvesting due to rocky outcrops.

### **6.3.11 Harvesting losses**

Harvesting loss is accounted for by the use of yields based on actual coupe harvesting yields.

### **6.3.12 Landscape Buffers**

It is considered that buffers placed on visually sensitive ridgelines, roads or private property boundaries in the GMZ can be managed temporally, or are not significant.

### **6.3.13 Fire Losses**

An allowance of 2,000m<sup>3</sup> nett per year has been used for all forest types in the FMA (based on MIRA consultants limited 1992 analysis).

### **6.3.14 Disease Losses**

Future losses due to *Phytophthora cinnamomi* root rot fungus are considered unlikely in the productive area.

### **6.3.15 New Flora, Fauna and Cultural Site Reservations**

Further SMZ and SPZ may be created around future sites identified for cultural, historic, flora or fauna significance, or as part of the Draft Quoll Action Statement occurring in GMZ areas within the East Gippsland FMA. Under the East Gippsland Regional Forest Agreement and the Forest Management Plan if additional SPZ are required over areas that were previously GMZ or SMZ, land of equal value can be swapped from the current reserve system, so there is no nett loss of productive area.

### **6.3.16 Temporal and Spatial Constraints**

Fuel Management Zones may also impact on the area available for harvesting as the current Fire Protection Plan states in regard to Zone 1 and Zone 2:

*Zone 1* - timber harvesting by clearfelling techniques will generally not occur in this zone.

*Zone 2* - the area scheduled for harvesting in any one year should not exceed 1% of the total area of the zone, averaged over a five-year period.

It is assumed that Zone 1 is not available for sawlog harvesting and Zone 2 is available for sawlog harvesting and a volume allowance of 7,000m<sup>3</sup> nett per year is made for the expected difficulty in resolving these and other temporal prescriptions

It is assumed that there is no loss of area due to an Apiary Management Plan (in preparation).

### **6.3.17 Economically Accessible Resource**

The area of economically accessible resource is estimated based on current harvesting practices and management. The volume of this element is the proposed level for licensing.

### **6.3.18 Changed Residual Log Market**

It is assumed that residual logs would be used to bring all stands up to a minimum of 80m<sup>3</sup> gross per ha total product (with an average of approximately 100m<sup>3</sup> gross per ha total product). To achieve this, a residual log market of approximately 100,000m<sup>3</sup> gross per year would be required. This is about half of the current sales level and reflects the level based on secure reliable markets.

Stands containing a minimum of 80m<sup>3</sup> gross per ha total products have been assumed to be unproductive. Table 5 shows the volumes that maybe available from these low yielding stands.

*Table 5. Sawlog volumes from low yielding stands*

<b>Yield Class (D+ nett per ha)</b>	<b>Area (ha)</b>	<b>Standing Volume (m<sup>3</sup> nett D+)</b>	<b>Approximate non declining yield (m<sup>3</sup> nett per year)</b>
20-25	12,914	240,796	4000
15-20	12,687	194,665	3000
10-15	9,246	97,086	1000

Opportunities will be investigated to sell these additional volumes depending on future sawlog and residual log markets, harvesting techniques and silvicultural systems.

### **6.3.19 Changed Minimum Log Diameter Specification**

This element is not relevant or significant in this estimate for this FMA.

### **6.3.20 Changed Silviculture Systems**

The forest in East Gippsland FMA has been classified into three different age classes and eight different condition classes as shown in Table 6 and 7.

*Table 6. East Gippsland age class descriptions*

<b>Age Class</b>	<b>General Description</b>
Mature/ Overmature	Stands dominated by mature/ overmature tress but with less than 10% regrowth
Uneven-aged	Stands dominated by mature/ overmature trees but with more than 10% regrowth
Regrowth	Stands dominated by regrowth trees

*Table 7. East Gippsland condition classes*

<b>Condition</b>	<b>Planned Treatment Description</b>
Thinning	Thinned from below (THB)
Understocked Disturbed	Has a harvest (other than Thinned from Below - THB) or fire record in treatment or regeneration and cover less than 50%, pre 1983 origin
Assumed Stocked	Has a harvest (other than Thinned from Below - THB) or fire record in treatment or regeneration and cover less than 50%, post 1983 origin
Understocked	No recent regeneration or treatment record and cover less than 50%
Cutover – Stocked	Not regrowth but has a harvest (other than Thinned from Below - THB) record in treatment or regeneration and Cover greater than 50%
Fire Affected	Has a fire treatment or regeneration record and cover greater than 50%
Normal M/OM	Other Mature, Overmature or Uneven-aged stands
Normal Growing Stock	Other regrowth

Planned treatments for each forest type differ, based on the age class and condition.

Most mature/overmature stands have been assigned a volume and are modelled on a seed-tree silvicultural system. The understocked stands have been assigned no volume and will be part of a reforestation program (approximately 200ha/ year).

The regrowth stands have no current volume assigned and have been allocated a Mean Annual Increment and are grown to at least the minimum harvest age nominated.

The uneven-aged forest in East Gippsland FMA is made up of Fire Affected stands, cutover–stocked stands and normal stands. It is assumed that without thinning: this forest is not growing; approximately 10% of these stands are suitable for thinning; and approximately 90% will be harvested under normal operations, yielding the modelled volume.

The level of thinning in East Gippsland FMA could be critical in accelerating the growth of stands to enable harvesting to fill the expected gap in availability in 30-40 years time. Based on current levels of operations it may be possible to thin approximately 1,000ha per year, building up to 2,000ha per year in five years time. Based on market demands, thinnings could be built up to 3,000ha per year in three years time, however this is dependent on a number of operational considerations. Considerable expenditure would be required for infrastructure and investment by industry would be needed.

### 6.3.21 Additions to the Forest Estate

This element is not relevant or significant in this estimate for this FMA.

### 6.3.22 Reforestation of Unstocked Stands

There is an assumed 200ha per year of reforestation work to bring unstocked stands back into production.

## 7 Resource Outlook

### 7.1 Sawlog levels without thinning

A sawlog level without allowance for potential improved yields from thinned stands results in a steady supply of 143,000m<sup>3</sup> nett D+ per year until 2040 from which time there is a steady increase in the available volume.

The contribution to this level from each forest type is provided in table 8.

*Table 8. Volume available by forest strata for East Gippsland FMA*

<b>Forest Strata</b>	<b>Volume (m<sup>3</sup> nett per year)</b>	<b>Proportion of Total (%)</b>
Ash	1,900	1
Alpine MS	2,400	2
Mountain MS	35,100	25
Foothill MS	96,100	67
Coastal MS	4,500	3
AAS	3,000	2
<b>Total</b>	<b>143,000</b>	<b>100</b>

## 7.2 Sawlog levels with thinning

The sawlog levels available under a thinning scenario of approximately 1,000, 2,000 and 3,000 hectares per year are shown in Table 9.

*Table 9. Volume available under a non-declining yield*

<b>Hectares per year thinned</b>	<b>Sawlog Level</b>
1,000	149,600m <sup>3</sup> nett per year
2,000	160,600m <sup>3</sup> nett per year
3,000	171,600m <sup>3</sup> nett per year

The increased levels from thinned stands are due to expected increases in growth rates and earlier rotation ages. The Expert Data Reference Group (EDRG) indicated that the factors used in these calculations were largely unquantified and should not be used as the basis long term decisions. Further work on quantifying the factors is required before any additional sawlogs could be sold on the basis of increased productivity from thinned stands.

## 8 Data Standard

The EDRG has provided an independent assessment of data and methods used in the development of Estimates of Sawlog Resource. The EDRG has used a one to five star rating to classify data quality and methodological rigour in terms of three fundamental parameters and their relationship to forecasting long term allocation levels:

- area,
- woodflows, and
- yield.

One star indicates data inadequacy and five stars indicate data excellence for the basis of issuing long term licences at the proposed allocation level. An overall score is also given, based on the weakest of the three fundamental parameters.

In the East Gippsland Forest Management Area, area was given three stars, yield, one star, woodflows, three stars. This has resulted in an overall one star rating.

This rating will be considered in determining future licensing arrangements within a risk management framework.

## 9 Conclusion

The forests of the East Gippsland FMA available for sawlog harvesting are dominated by mature and overmature forests that are growing very slowly. The area available for harvesting has been reduced from previous estimates due to the inclusion of operational constraints not previously measured and the availability of new data on the area of forest. The Expert Data Reference Group considers the growth and yield data inadequate. Revised estimates are expected in 2004. There are insufficient sawlog resources to maintain current licence levels so they will be reduced by 43% to 143,000m<sup>3</sup> nett D+ per year.

There are opportunities to increase this level over time based on improved growth from thinned stands and from the harvesting of low yielding stands. These opportunities are conditional on thinning yields being confirmed and new reliable markets being developed for residual logs.

## 10 References

NRE (1996) *Code of Forest Practices for Timber Production*, Revision No. 2, Department of Natural Resources and Environment, Melbourne

NRE (1996): *Review of Sustainable Sawlog Yield: East Gippsland FMA*. Forests Service Technical Report 96-2

CNR (1995): *East Gippsland Forest Management Plan*. Department of Conservation and Natural Resources, Victoria.

CNR (1993): *Hardwood Timber Resources in the East Gippsland Forest Management Area*. Resource Assessment Report 93/01. Department of Conservation and Natural Resources, Victoria.

MIRA Consultants limited. (1992) *Fire Protection Risk Management Study for the Department of Conservation Natural Resources*. Department of Conservation Natural Resources.

Government of Victoria (1986) *Victorian Timber Industry Strategy*. Victorian Government Printing Office, Melbourne.

## 11 Glossary

**“A” Grade Sawlog** A sawlog with a minimum small end diameter underbark of 50cm which has no defective quarters and maximum defects on exposed end of: one-quarter diameter lengths of all gum vein or gum pockets, light stain, and maximum angle of sloping grain of 1:10 along the length of the sawlog.

**Advance Growth** (Advance Regeneration) Any established seedlings, saplings or poles which are present in a forest when some form of forest treatment is planned to obtain regeneration.

**Age Classes** Stands of timber originating at a defined time ie. wildfire or harvesting disturbance.

**Agreement** An arrangement for harvesting and removal of forest produce authorised by specific legislation.

**Annexures** Additions to licences that specify target volumes for sawlog grade or species.

**Annual Allocation** The annual quantity of timber specified in schedule 1 of a Long Term Licence, and which the Secretary is to make available from time to time under Condition 11 of the Licence Conditions.

**“B” Grade Sawlog** A sawlog with a minimum small end diameter under bark of 35cm which has maximum allowable defects on exposed ends of: one-quarter diameter length of loose gum veins/pockets and shakes, one diameter length of tight gum vein more than 3mm in width, two diameters length of tight gum vein less than 3mm in width, light stain, 1:10 angle of sloping grain along the sawlog axis, and a maximum of 105cm squared of pipe in an exposed end.

**Block** A major division of a forest, delineated for management purposes and bounded by natural features such as ridges and streams. Usually comprises a number of compartments.

**Buffer** A protective margin of vegetation abutting a stream, spring, wetland, body of standing water, swampy ground, private property, road, landscape feature, valued area or an area of rainforest, which protects it from potentially detrimental disturbances in the surrounding forest. Buffer width is defined as horizontal distance from which various operations are excluded.

**“C” Grade Sawlog** A “C” grade sawlog is considered to be any sawlog with a minimum small end diameter under bark of 30 cm which has maximum allowable defects on exposed ends of: one diameter length of loose gum veins/pockets and shakes, seven diameters length of tight gum vein more than 3mm width, unlimited lengths of tight gum veins less than 3mm width, dark stain, maximum sloping grain angle of 1:8 along the length of the sawlog, maximum of two defective quarters, and maximum of 112 cm square pipe on exposed end.

**Code of Forest Practices for Timber Production** A set of operational principles and, in some cases, minimum performance standards for the conduct of timber harvesting and associated works in forests in Victoria, referred to as the Code.

**Comprehensive, Adequate and Representative Reserve System** A reserve system to conserve all native forest types as well as the plants and animals that depend on them. Comprehensive: the full range of forest communities recognised by an agreed national scientific classification at appropriate hierarchical levels; Adequate: the maintenance of the ecological viability and integrity of populations, species communities; Representative: those sample areas of the forest that are selected for inclusion reserves which should reasonably reflect the biological diversity of the communities.

**Continuous Forest Inventory Plots** (CFI Plots) Plots established throughout the forest on which tree growth information is measured. The plots are measured periodically (at five- or ten-year intervals, for example), and growth on the plot can be determined from the difference between measurements.

**Coupe** An area of forest of variable size, shape and orientation from which logs for sawmilling or other industrial processing are harvested.

**“D” Grade Sawlog** A “D” grade sawlog is considered to be any sawlog with a minimum small end diameter under bark of 25cm which has maximum allowable defects on exposed ends of: two diameters length of loose gum veins/pockets or shakes, 10 diameters length of tight gum vein more than 3mm width, unlimited length of tight gum vein less than 3mm width, dark stain, maximum sloping grain angle of 1:8 along the length of the sawlog, maximum of three defective quarters, and maximum of 120cm square of pipe defect on exposed ends.

**D+ Sawlog** Sawlogs of grade D and better ie. Including C, B, and A grades.

**DBHOB** Diameter breast height over bark (breast height = 1.3m).

**Ecologically Sustainable Forest Management** The management of forests on all land tenures to maintain the overall capacity of forests to provide goods, protect biodiversity, and protect the full suite of forest values at the regional level.

**Even-aged forest/stand** Forest predominantly of the one age. Usually originating as a result of an intense burn or harvesting activity.

**Evergreen Licence** A sawlog licence with a provision for renewal before the fifth year of the licence, if the licensee has proposals for significant capital expenditure.

**Expert Data Reference Group (EDRG)** A group appointed by the Minister to review the data used to estimate the available volumes. Consist of Professor J. VanClay (Southern Cross University), Professor B. Turner (ANU).

**Fauna** A general term for animals (including reptiles, birds, marsupials and fish).

**Fuel Management Zone** Modification of fuels by prescribed burning or other means. (There are 5 Fuel Management Zones).

**Flora** A general term for plants of a particular area or time.

**Foothill Mixed Species Forest** Forest with a mature stand height of less than 40m and generally occurring on mid range elevations.

**Forest 25** A GIS spatial data set at 1: 25000 scale derived from detailed aerial photography interpretation assessments of ash and mixed species forests, and broad structural vegetation mapping for other mixed species forests.

**Forest Coupe Plan** A Forest Coupe Plan is a plan that must be prepared for each harvesting operation in public native forest and will contain a map identifying the area and a schedule incorporating the specifications and conditions under which the operation is to be administered and controlled. The Forest Coupe Plan will be prepared prior to the commencement of utilisation and will specify the matters set out in Section 2.3.1 of the Code of Practice.

**Forest Management Area (FMA)** The basic units for forest planning and management in Victoria. Currently Victoria is divided into 15 Forest Management Areas as defined in the *Forests (Timber Harvesting) Act* 1990, however, the Wangaratta and Wodonga FMAs are managed as the North East FMA.

**Forest Management Plan** Forest management plans are developed by the Department of Natural Resources and Environment to address the full range of values and uses in Forest Management Areas which have been designated as the units for planning forest management activities. Forest Management Plans will be prepared according to the guidelines set out in Section 2.1 of the Code of Forest Practices for Timber Production.

**Forest Management Zone** An area of similar physical capability or forest value to which particular Departmental strategy and specific prescriptions may apply. There are three types of zones: the Special Protection Zone, Special Management Zone and General Management Zone.

**Forest Product Licence** Authority to harvest and remove Forest Produce issued under section 52 of the *Forests Act* 1958. Document giving official permission to remove Forest Produce from designated areas of Public Land in the State of Victoria. Licences are issued in various forms depending on the type and quantity of produce, period of licence and method of payment (eg. The Forest Produce Licence and Receipt form is used for small quantities of produce with payment made in advance of removal).

**Forest Type** A classification of forests according to their life form and height of the tallest stratum, and the projected foliage cover of the tallest stratum.

**FORPLAN** A computer program that can be used to apply forest values (including financial) to forest stands. It is currently used in conjunction with GIS and models for timber, water and wildlife to estimate the response of these values over time for the whole forest for various management strategies.

**General Management Zone (GMZ)** Delineates the area to be managed for the broad range of forest values available in the area. The GMZ is divided into two sub-zones: 'Timber Production' where timber harvesting under standard conditions is one of the main uses and 'Other Uses' where the forest is unsuitable for sawlog production but where other activities are permitted.

**Geographic Information System (GIS)** A system which holds spatially referenced data which can be classified, overlaid, analysed and presented in map, tabular or graphic form.

**Grade** A measure of the quality of a hardwood log. The grade of a sawlog can be A, B, C, D, E or ungraded. The grade is determined using the Hardwood Sawlog Grading Card. Logsales also uses grade to identify product groups such as residual logs, pulpwood and firewood.

**Gross Area** The total estimated area of a coupe, forest or block.

**Gross Volume** The volume of a log inclusive of all defect i.e based only on the external dimensions.

**Group Selection System** All trees in a small patch are felled, with the gaps created scattered over the forest compartment. Gap size is no more than about two tree-heights in diameter, so that natural (or induced) seedfall from surrounding trees can be used. An uneven-aged system, as the fellings are done every 10-15 years.

**Habitat Tree** A tree that has been identified as providing important habitat for wildlife and which is given additional protection during forest operations.

**HARIS** (Hardwood Resource Information System) This system has been in operation since the late 1970's and forms the Statewide timber resource database for native forest on public land in Victoria.

**Height Class** Height class refers to a specified range of tree heights. The height classes used by the Statewide Forest Resource Inventory are:

Height Class 1a: 60m<	Height Class 1b: 51.1-60m
Height Class 2a: 46-51m	Height Class 2b: 40-45.9m
Height Class 3a: 34-39.9m	Height Class 3b: 28-33.9m
Height Class 4a: 22-27.9m	Height Class 4b: 15-21.9m
Height Class 5a: 10-14.9m	Height Class 5b: 5-9.9m
Height Class 6: <5m	

**High Elevation Mixed Species (HEMS)** Mixed species forests above 750m elevation but also some forests in frost hollows and on wetter aspects greater than 600m act as HEMS. Successful regeneration generally occurs from spring germination.

**Integrated Forest Planning System (IFPS)** Victoria has developed a system of linked computer-based tools collectively called the Integrated Forest Planning System (IFPS). The IFPS provides a means of modelling the growth, development and harvesting of forest stands as well as a range of other forest values.

**Log Grading** Assessment of the quality of a sawlog.

**Log Length** The length of a log is the shortest distance from end to end along the log. This is measured to the backward 0.1m but is normally considered in multiples of the backward 0.3m when discussing log lengths for grading purposes.

**Long Term Licence** A licence issued under the *Forests Act* 1958 for a period of more than 3 years and up to 15 years.

**Long Term Sustainable Yield (LTSY)** The theoretical rate of harvest that can be maintained in perpetuity.

**Low Elevation Mixed Species (LEMS)** These forests are usually below 750m elevation except for some forests in frost hollows and on wetter aspects between 600-750m which act as High Elevation Mixed Species. Most successful regeneration occurs from autumn germination.

**Management Prescriptions** Management Prescriptions detail specific conditions or standards that are to apply to forest operations in the vicinity of certain threatened flora or fauna. More detailed prescriptions are established at the local level and are reflected in Wood Utilisation Plans.

**Mature Forest** Forest at or beyond nominal rotation age but before it reaches the overmature stage. (Generally 60-150 years).

**Mean Annual Increment (MAI)** The total increment up to a given age divided by that age; average annual increment to that age (m<sup>3</sup>/ha).

**Merchantable** Trees, which are suitable for processing into, forest products and for which a market exists.

**MESSIM** (Messmate Simulator) A computer model developed to forecast the growth of messmate forests at Portland.

**Minor Forest Produce** Produce harvested from State forest other than sawlogs or residual logs. Minor Forest Produce is often collected by small operators or individuals and includes products such as sleepers, posts and poles, craftwood, firewood, honey, extractives, and eucalyptus oil.

**Mixed Species Forest** Forest, which has two or more eucalypt species commonly found within the canopy. Generally consisting of peppermint, messmate, gum or stringybark species. Does not include ash, red gum or box ironbark forests.

**Nett Area** The total estimated area of the coupe (to the nearest hectare). This area is to be determined from the calculated gross area less exclusion areas.

**Nett Volume** The volume of a log which can be converted to sawn timber. It is equal to the gross volume less the defect volume. Accounts are no longer issued in terms of nett volume however some licences are monitored in nett volume and sustainable yields are usually calculated in nett volume.

**Non-declining** Volumes, which do not decline over time, but may increase.

**Old-growth Forest** Forest which contains significant amounts of its oldest growth stage - usually senescent trees- in the upper stratum and has been subjected to any disturbance, the effect of which is now negligible.

**Overmature** A growth stage of a forest stand or individual tree that is characterised by declining crown leaf area and irregular crown shape due to loss of branches and epicormic growth.

**Overwood** Standing mature trees remaining after harvesting. Can refer to seed trees, habitat trees, culls or retained merchantable trees.

**Periodic Annual Increment (PAI)** The average annual increment for any defined short period, such as five years.

**Productivity Class** An area of forest that is considered for the purposes of yield estimation to be relatively uniform.

**Public Land** Unalienated land of the Crown managed and controlled by the Minister for Conservation and Land Management, the Minister for Agriculture and Natural Resources, or the Secretary of Natural Resources and Environment, whether or not occupied under a licence or other right (but not including land occupied under a lease, or land vested or leased by the Victorian Plantations Corporation or its successor in law).

**Pulpwood** Timber sold for the purpose of conversion to paper, pulp or other product which requires it to be chipped.

**Reforestation** The re-establishment of a stand of trees by planting or sowing with species native to the locality (unless an adverse microclimate requires the use of alternative native species for survival and growth) on previously cleared or poorly forested land.

**Regional Forest Agreement (RFA)** An agreement about the long-term management and use of forests in a particular region between the Commonwealth and a State Government.

**Regrowth Forest** Forest stands regenerated either naturally or by seeding following death or removal of the forest overstorey. A growth stage of a forest stand or individual tree in which the crowns have a narrow conical form and where trees are actively growing. A forest originating from fire, disturbance or harvesting actively below the nominal rotation age (Generally 1-60 years).

**Residual Log (RL)** Logs, not of sawlog quality, produced as a consequence of a sawlog harvesting operation. Unlike pulpwood the end-use of a residual log is not specified.

**Retained Trees** Trees retained on a coupe during a harvesting operation because they are unmerchantable, are to serve as seed trees or wildlife habitat trees, or have been selected to grow on after thinning.

**Roundwood** A log before it has been cut to produce sawn timber, veneer or woodchips.

**Salvage Logging** Logging to recover a resource that would otherwise be lost through damage by fire, pests or disease.

**Sawlog** Any length of merchantable log suitable for conversion to sawn timber which: is at least 2.7m in length, has a small end diameter under bark of 25cm or greater, does not have a sweep or crook which exceeds 1/5 of the diameter from a 2.4m straight edge, is of Grade D standard or better. Log suitable for conversion to sawn timber.

**Seed Tree System** All live trees are felled apart from a number of uniformly distributed trees retained to provide seed, and those required for environmental purposes. The seed trees would comprise 10-15% of the basal area of the original stand. An even-aged system.

**Seed Tree** A tree left standing following harvesting to regenerate the site by release of seed contained in the crown.

**Selection System** Silvicultural systems used to harvest and regenerate particular forest types. Trees are harvested either singly or in small groups at relatively short intervals indefinitely. Regeneration is established continually in the gaps produced and an uneven-aged stand is maintained.

**Senescent** See Overmature.

**Statewide Forest Resource Inventory (SFRI)** A strategic level inventory of forest resources on State Forest Victoria.

**Shake** A shake is a partial or complete longitudinal separation between adjoining layers of wood due to causes other than drying.

**Shelterwood System** A silvicultural system used for harvesting and regenerating particular forest types. It consists of the removal of a proportion of the mature trees to allow the establishment of essentially even-aged regeneration under sheltered conditions, followed by later felling of the remainder of the mature (seed) trees.

**Silviculture** The theory and practice of managing forest establishment, composition, and growth, to achieve specified objectives.

**Single Tree Selection** The felling of scattered mature individual trees, at intervals (generally 10-15 years) over the rotation. Regeneration is largely from lignotubers and coppice.

**Site Index** The relationship between the heights and ages of the dominant and co-dominant trees in a stand at a particular age, used as a measure of the amount of timber that could be produced from the stand.

**Site Quality** The potential of the site to grow timber. A function of soil quality, rainfall and aspect.

**Size Class** A range of log diameters. One product can have many size classes (or none). Size classes are used mainly for the application of royalty rates.

**Small End Diameter Under Bark (SEDUB)** The diameter is measured by averaging two diameter measurements taken at right angles to each other across the small end of the log, or by using a diameter tape placed around the circumference of the small end of the log. Bark thickness must be allowed for if using a diameter tape on an unbarked log. Diameter is expressed as the backward whole centimetre.

**Smash** That proportion of sawlogs that is lost due to damage that occurs when trees are harvested.

**Soaks** Springs and wet areas where the ground water table intersects with ground surface.

**Special Management Zone (SMZ)** The Special Management Zone will be managed to conserve specific features, while catering for timber production under certain conditions. These include areas where timber must be harvested in a different manner than is normal to protect particular values; for example in areas where accelerated tree senescence is being induced.

**Special Protection Zone (SPZ)** The Special Protection Zone will be managed for conservation, and timber harvesting will be excluded. It will include areas of special significance of flora and/or fauna, areas for protection of water quality and other values (such as rainforest, riparian vegetation), and other areas of special significance (like special landscape and historic value). Such areas will be linked to the parks and reserves system where appropriate.

**Stand** A group of trees in a forest that can be distinguished from other groups on the basis of age, species composition, condition etc.

**Stand Condition** The health, age and size class distribution, and stocking of a forest stand.

**Standard Licence** A sawlog licence that is renewable within five years of its expiry date.

**STANDSIM** A computer model developed to forecast the growth of even-aged stands of Ash, Silvertop and Messmate.

**Stumpage** The value of timber as it stands in the forest.

**Sub-dominant** A sub-dominant crown is one where the area occupied by the tree crowns of the upper stratum occupies 11%-30% of the total crown cover of the stand.

**Sustainable Yield** The sustainable yield of a forest is the maximum level of commercial timber which can be maintained in perpetuity under a given management regime. In Victoria sustainable yield is specified in legislation as the rate of harvest that can be maintained for a defined period (usually 10 years).

**SYSS** (Sustainable Yield Spreadsheet) A computer model developed to schedule woodflows and determine yields of sawlogs into the future.

**Thinning** The removal of part of a forest stand or crop, with the aim of increasing the growth rate and/or health of retained trees.

**Thinning From Above** (THA) Removing the larger and well developed stems from a stand allowing the smaller stems to increase their growth.

**Thinning From Below** (THB) Removing the smaller and poorly formed stems from a stand and allowing the larger better formed stems to increase their growth.

**Timber Resource Analysis** An analysis of the timber availability prepared for the RFA process.

**Uneven-aged Stand** Forest stand which contains a continuum of age classes as a result of more or less continuous regeneration within the stand over a number of years.

**Unmerchantable** Trees which are not suitable for processing into forest products and for which market exists.

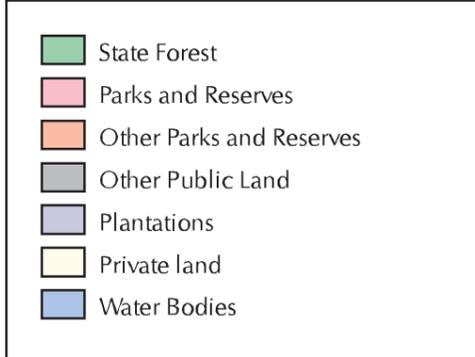
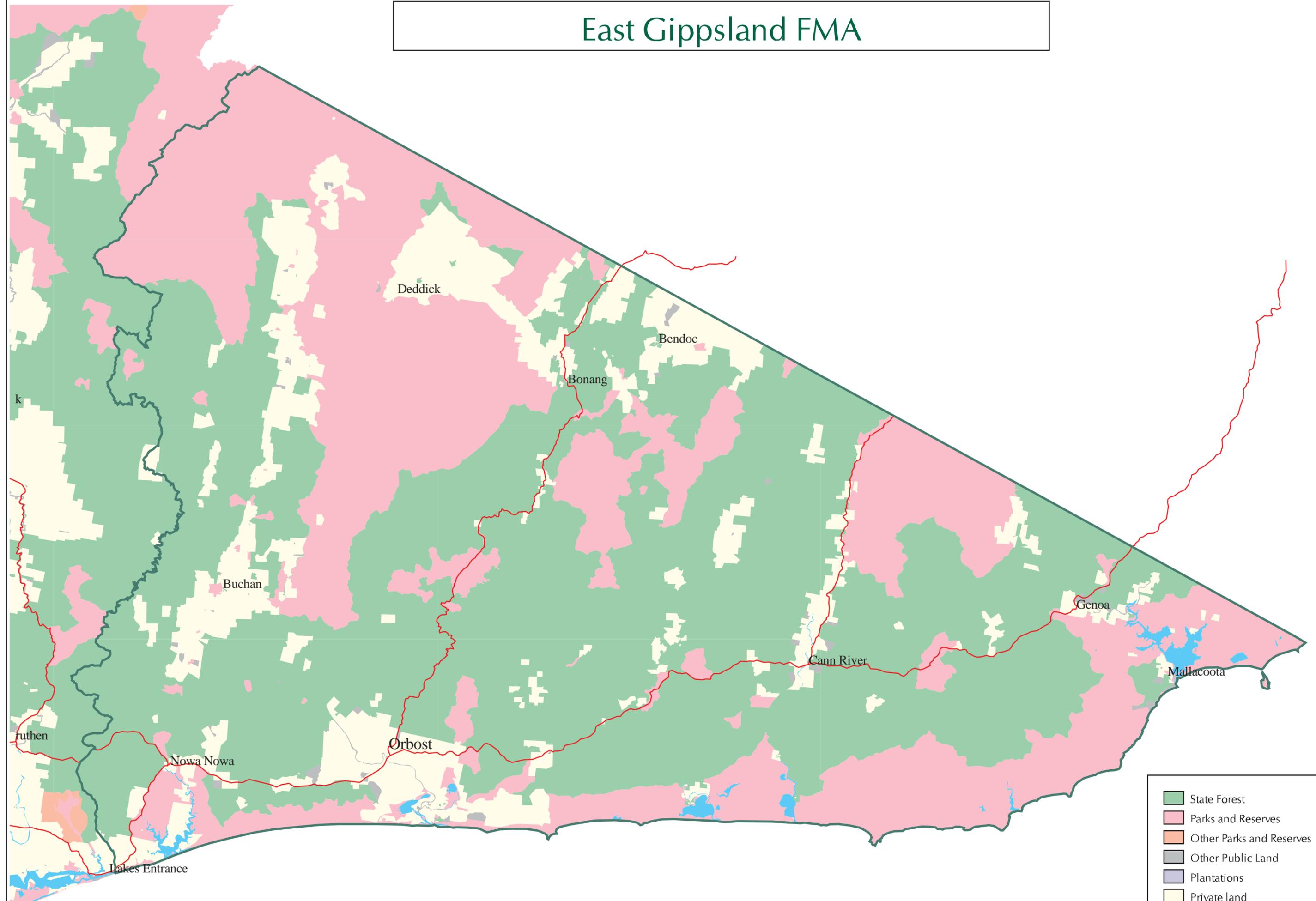
**Value Adding** An economic term which describes how a raw product is processed into a product which is of more value than the material in its raw state. In the forest and wood industry context, examples of this include the kiln drying of sawn timber and the manufacturing of wood veneers.

**Waste** See Smash.

**Yield Curves** A yield curve defines the volumes of logs available (in a particular forest type and productivity class) at different ages for a particular silvicultural regime.

**12 Map 1 East Gippsland FMA.**

# East Gippsland FMA



## **Appendix- Differences Between RFA Timber Resource Analysis and ESR Resource Elements**

Table 1 contains details of changes in areas that have resulted since the 1996 sustainable yield review for the East Gippsland FMA used for the East Gippsland RFA.

Area, volume and age class changes have resulted from:

- New SFRI area data allowing Geographic Information System analysis of areas and exclusions,
- Consideration of operational constraints,
- New SFRI volume data at a stand rather than forest type or stratum level,
- Revised and updated logging history,
- Definition of small and isolated “islands” as less than 7ha,
- New slope models and assumptions,
- New stream exclusion models and assumptions,
- Spatial analysis of forest management zone and fuel reduction burning zone exclusions,
- Definition of non-merchantable stands using species and yield,
- Redefinition of forest types using land systems and species composition to better represent growing potential of individual stands,
- Redefinition of regrowth, growing stock and areas suitable for thinning,
- New thinning response prediction,
- Conversion of growth predictions from straight line Mean Annual Increment’s to yield curves,
- Consideration of minimum sawlog and total product yields.

**Table 1. Comparison of some key parameters between ESR and 1996 Sustainable Yield Review**

Parameter	Study	AAS	ASH	MMS	FMS	AMS+ CMS	Total
Economically Accessible Area (ha) <sup>1</sup>	ESR	4,118	3,637	38,802	137,075	27,151	210,783
Nett Productive Area (ha)	1996 SY	4,587	2,338	81,001	148,799	107,971	344,696
Standing Volume (m3 nett D+) <sup>2</sup>	ESR	62,496	62,220	1,326,029	4,720,156	460,462	6,631,363
Standing Volume (m3 nett D+) <sup>2</sup>	1996 SY	95,000	142,000	2,969,000	3,437,000	1,333,000	7,976,000
Average yield (m/om) (m3 nett D+ per ha) <sup>3</sup>	ESR	124	102	101	58	44.4	65.1
Average yield (m/om) (m3 nett D+ per ha) <sup>3</sup>	1996 SY	123.9	178.2	62.7	33.7	17.8	35.4
Regrowth area (ha) <sup>4</sup>	ESR	3,211	2,591	23,924	53,529	14,040	97,295
Regrowth area (ha) <sup>4</sup>	1996 SY	3,820	1,541	33,663	46,875	33,249	119,148
Growth rate - PAI at age 65 (m <sup>3</sup> nett D+ per ha per year) <sup>5</sup>	ESR	2.43	2.97	2.25	1.55	0.49	
Growth rate - PAI at age 65 (m <sup>3</sup> nett D+ per ha per year) <sup>5</sup>	1996 SY	2.57	3.30	2.40	1.80	0.6	
Thinning target per year (ha) <sup>6</sup>	ESR	103	33	610	1,615	500	2,861
Thinning target per year (ha) <sup>6</sup>	1996 SY <sup>7</sup>	0	0	0	455	0	455

Note:

<sup>1</sup> Definition of forest types has changed. Some areas of Coastal Mixed Species and Mountain Mixed Species are now classified as Foothill Mixed Species in the ESR.

<sup>2</sup> Approximately 2,000,000m<sup>3</sup> harvested between ESR and Sustainable Yield Review

<sup>3</sup> Low yield areas are excluded from the ESR

<sup>4</sup> Approximately 22,000 hectares harvested between ESR and Sustainable Yield Review

<sup>5</sup> Foothill Mixed Species thinning growth rates:

ESR 2.03

SY Review 2.18

<sup>6</sup> Data for thinning resource outlook at 3000 ha per year

<sup>7</sup> SY assumed all thinning would be Foothill Mixed Species