

Department of Sustainability and Environment

**Monitoring
Annual Harvesting Performance**

in Victoria's State forests

2004-05

**Central Gippsland Forest
Management Area**

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Central Gippsland FMA Technical Report

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Central Gippsland FMA Technical Report

Monitoring Annual Harvesting Performance (MAHP) is part of a government initiative to ensure that commercial timber harvesting operations are undertaken in Victoria's State forests on a sustainable basis.

This report covers the third year of an annual process to monitor the level of sawlog harvesting, report on the potential impacts on future estimates of sawlog resource availability, and measure the performance of predictive models for area and volume.

In August 2004, VicForests was established as a state owned enterprise, responsible for the harvest and commercial sale of timber in the forests of eastern Victoria. DSE identifies timber resources available to VicForests through an Allocation Order, which is based on a Sustainable Timber Resource Plan, which documents the data, processes and assumptions used to develop the Allocation Order. The reporting framework for 2004-05 has been revised to reflect the new management arrangements as a result of the establishment of VicForests, in particular, the monitoring of VicForests' performance against the Allocation Order.

This report for Central Gippsland Forest Management Area (FMA), is one of a series of MAHP technical reports prepared for FMAs in which commercial sawlog harvesting operations took place in 2004-05. Key results and proposed recommendations from the individual FMA MAHP reports have been brought together into a Statewide Summary Report. The reports monitor the level of harvesting against current estimates of sawlog availability and provide a mechanism for feedback on the accuracy of models used to predict the volume and area potentially available for harvesting when developing new Sustainable Timber Resource Plans.

A total of 54 coupes covering 594 ha were harvested. Of these coupes, 27 were completed. In total, 122,739 m³ gross of sawlog and 249,753 m³ gross of residual log were harvested from the Central Gippsland FMA. No sawlog and residual log was harvested as a result of salvage operations.

1. VicForests Harvesting Performance 2004-05

This section reports on the area and yields for all coupes harvested in 2004-05. Refer to Section 6 for the details of harvested coupes.

1.1 Allocation Order Compliance

The Allocation Order (AO) is the legal instrument by which VicForests are given access to timber resources and permission to undertake authorised activities. The requirement for an AO is defined by Section 13 of the *Sustainable Forests (Timber) Act 2004*. The purpose of the AO is to:

- allocate timber in State forests to VicForests for harvesting and selling, or harvesting or selling timber resources
- permit VicForests to undertake associated management activities in relation to that allocated timber
- specify the conditions with which VicForests must comply.

VicForests are allocated timber in the forest stands defined in the AO, and are permitted to harvest up to the area specified in each of three 5-year periods of the AO. The AO must be reviewed at least every five (5) years.

Section 9 of the *Sustainable Forests (Timber) Act 2004*, requires that VicForests monitor and report on authorised operations undertaken, including demonstrating that harvested coupes comply with the AO. This section reconciles the area harvested in 2004-05 with the AO, and compares the area remaining with the area allocated for each forest stand.

Clearfall/Seedtree Harvesting

Table 1 and Figure 1 below summarise the harvest levels in 2004-05 by the strata or forest stands in the Allocation Order. A total of 552 ha of allocated forest stands were harvested, which represent 9% of the allocated area for Period 1 of the AO.

An additional 32 ha were harvested in areas outside the Allocation Order, however all these areas were approved on the 2004/05 Wood Utilisation Plan and were approved as part of the gazetted Allocation Order.

An Allocation Order period is made up of five years and the 2004-05 season was the first year. Hence it would be expected that approximately 20% or less of each stratum would be harvested. Figure 1 illustrates this is indeed the case. 19% of ash stands (28% - Alpine ash, 16% - Mountain Ash/Shining Gum), and 5% of mixed species stands were harvested. Only three small strata, Alpine Ash Mature, Alpine Ash 1940s and Alpine Ash 1960s exceeded 20 percent. These problems resulted due to:

- the Allocation order being developed from the Estimates of Sawlog Resource dataset that contained a benchmark error. Large areas of 1939 regrowth were mapped as 1950s and 1960s. This problem will be overcome by the correct benchmarking of these stands in the subsequent AO and the removal of these erroneous strata; and
- small strata being difficult to manage and coupes on the TRP not necessarily correlating with the AO. This problem will be overcome by the amalgamation of these strata into larger groups eg 1930s/1940s Alpine Ash when the subsequent AO is prepared in 2006.

The higher than average level of Alpine Ash harvesting will need to be balanced over the period of the Allocation Order. Shortages of Mountain ash seed have seen a scheduling of more alpine ash, where there is ample seed available.

The low level of mixed species harvest reflects the continued focus on highly productive stands. The new allocation order will be developed using a new merchantability model, and corrected benchmark data and will focus on 1930s and the mature resource. This narrower focus on the mixed species resource will see the allocated area reduce but harvesting levels and timber supply remain at a similar level.

Table 1: Harvest levels in 2004-05 by Allocation Order strata

Allocation Order Forest Stand	Total Allocated Area (ha) - Period 1 ¹	Mapped Allocated Area (ha) Harvested 2004/05 ²	Additional Area (ha) Harvested 2004/05 ³	Total Area (ha) Harvested 2004/05	Period 1 - Area (ha) Remaining	Period 1 - % Area Harvested	Period 1 - % Area Remaining
	Alpine Ash - Mature	40	18	0	18	22	44%
Alpine Ash - 1920s	10	0	0	0	10	0%	100%
Alpine Ash - 1930s	300	49	0	49	251	16%	84%
Alpine Ash - 1940s	10	8	0	8	2	80%	20%
Alpine Ash - 1950s	80	6	0	6	74	8%	92%
Alpine Ash - 1960s	80	33	0	33	47	41%	59%
Mountain Ash - Mature	50	2	0	2	48	4%	96%
Mountain Ash/Shining Gum - 1930s	1710	254	0	254	1456	15%	85%
Mountain Ash/Shining Gum - 1940s	200	25	0	25	175	12%	88%
Mountain Ash/Shining Gum - 1950s	10	0	0	0	10	0%	100%
Mountain Ash/Shining Gum - 1960s	10	0	0	0	10	0%	100%
Mixed Species - Mature	2580	124	0	124	2456	5%	95%
Mixed Species - 1930s	730	28	0	28	702	4%	96%
Mixed Species - 1940s	80	3	0	3	77	4%	96%
Mixed Species - 1960s	10	2	0	2	8	17%	83%
Mixed Species - 1970s	130	0	0	0	130	0%	100%
TOTAL AO Strata Area (ha)	6030	552	0	552	5478	9%	91%
WUP Areas Outside AO Strata ⁴	N/A	N/A	N/A	32	N/A	N/A	N/A
Non-Allocated Stands > 1ha ⁵	N/A	N/A	N/A	0	N/A	N/A	N/A
Non-Allocated Stands < 1ha ⁶	N/A	N/A	N/A	0	N/A	N/A	N/A
TOTAL Area (ha) Harvested				584			

1 Period 1 refers to the start of 2004-05 until the end of 2008-09.

2 Allocated area harvested refers to harvested stands mapped as an allocated forest stand in the Allocation Order (AO).

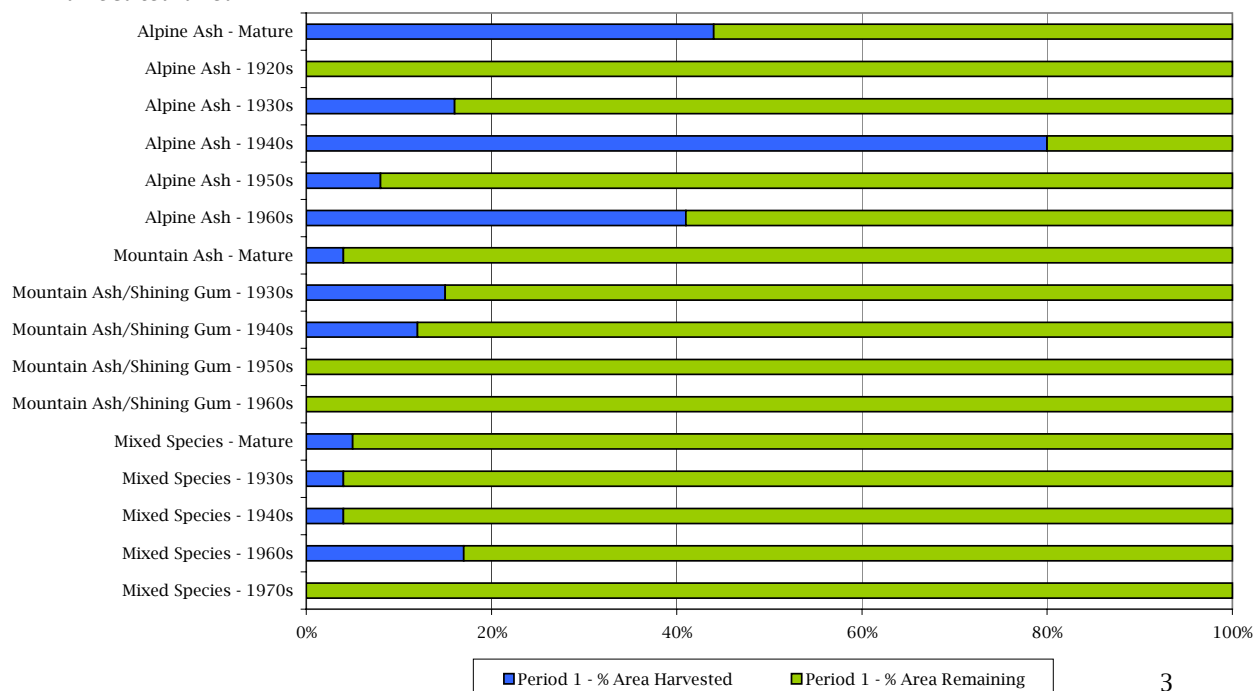
3 Additional area harvested refers to harvested stands that are mapped as outside the AO that were subsequently assigned to an allocated forest stand through the post-harvest exceptions report.

4 WUP areas outside allocated stands refer to coupes identified on an existing Wood Utilisation Plan approved (category 1, 2, 2a or 2b) by the Secretary before the commencement of the 2004 Allocation Order, that fall outside allocated forest stands identified in the AO.

5 Non AO stands refer to areas outside AO forest stands that were not part of an existing Wood Utilisation Plan approved (category 1, 2, 2a or 2b) by the Secretary, and cannot be assigned to an allocated stand. These areas are identified in the post-harvest exceptions report.

6 Non AO stands less than 1 ha in size do not need to be reported on by VicForests, but are reported here to determine the total area harvested.

Figure 1: Harvest levels in 2004-05 by Allocation Order strata as a percentage of the allocated area



Thinning/Selection/Partial Harvesting

Thinning activities also need to comply with the Allocation Order. Table 2 below shows the harvest levels for thinning activities in 2004-05.

No area was allocated in the first period of the Allocation Order. This may change when the Allocation Order is reviewed in 2007. The areas thinned were those approved on the 2004-05 Wood Utilisation Plan. This coupe was a DSE coupe managed by VicForests. Ideally there should have been allocated area for VF included on the Allocation Order.

Table 2: Thinning harvest levels in 2004-05 by Allocation Order strata

Allocation Order Strata	Total Allocated Area (ha) - Period 1 ¹	Mapped Allocated Area (ha) Harvested 2004/05 ²	Additional Area (ha) Harvested 2004/05 ³	Total Area (ha) Harvested 2004/05	Period 1 - Area (ha) Remaining	Period 1 - % Area Harvested	Period 1 - % Area Remaining
Ash - thinnings	0	0	0	0	0	N/A	N/A
Mixed Species - thinnings	0	0	0	0	0	N/A	N/A
Total AO strata Area (ha)	0	0	0	0	0	N/A	N/A
WUP areas outside AO strata ⁴				1.4			
TOTAL Area (ha) Harvested				1.4			

1 Period 1 refers to the start of 2004-05 until the end of 2008-09.

2 Allocated area harvested refers to harvested stands mapped as an allocated forest stand in the Allocation Order (AO).

3 Additional area harvested refers to harvested stands that are mapped as outside the AO that were subsequently assigned to an allocated forest stand through the post-harvest exceptions report.

4 WUP areas outside allocated stands refer to coupes identified on an existing Wood Utilisation Plan approved (category 1, 2, 2a or 2b) by the Secretary before the commencement of the 2004 Allocation Order, that fall outside allocated forest stands identified in the AO.

For harvesting in 2005-06 and beyond, retained basal area (for thinning and selection coupes) and damage (for thinning coupes) will also be reported on.

Key Issues:

For clearfall and seedtree harvesting, Alpine ash is being harvested at higher than average levels, although ash species as a whole is under the average

Small strata are difficult to manage

Recommendations:

Ensure that a plan is prepared to ensure that alpine ash harvesting occurs within limits outlined in Period 1 of the Allocation Order

Amalgamate small strata into larger logical groups in the subsequent Allocation Order.

Allocation Order Exceptions

All stands harvested were from allocated stands or stands within previously WUP approved coupes. There were no exceptions that required reporting on.

Key Issues:

The exclusion of 2004-05 WUP areas from consideration as exceptions has meant that there were no exceptions to be reported. This will not be the case in the future as new TRP coupes begin to be harvested.

Recommendations:

Continue to monitor and report on exceptions.

Ten Year Trends

This section summarises the past ten years of harvesting, and discusses any trends that may be apparent. Note that VicForests only became responsible for the harvest and commercial sale of timber in the forests of eastern Victoria in August 2004.

Clearfall/Seedtree Area and Yields

Figure 2 details the area harvested in 2004-05 and compares this with the previous nine years of harvesting. Only coupes with a silvicultural system of clearfell or seedtree have been included. Note that the definition for ash and mixed species used in Figure 2 refers to that recorded in the logging history.

The total area harvested has declined as a result of the reduction in licences. Levels of alpine ash harvesting have remained relatively constant reflecting the small size of much of the resource. Harvesting prior to 2003-04 had concentrated on the mountain ash and shining gum 1939 regrowth to meet existing licences. With the departure of these licences the level of harvest of this strata has reduced. It is a similar the case for mixed species.

Figure 2: Area harvested by forest type by year

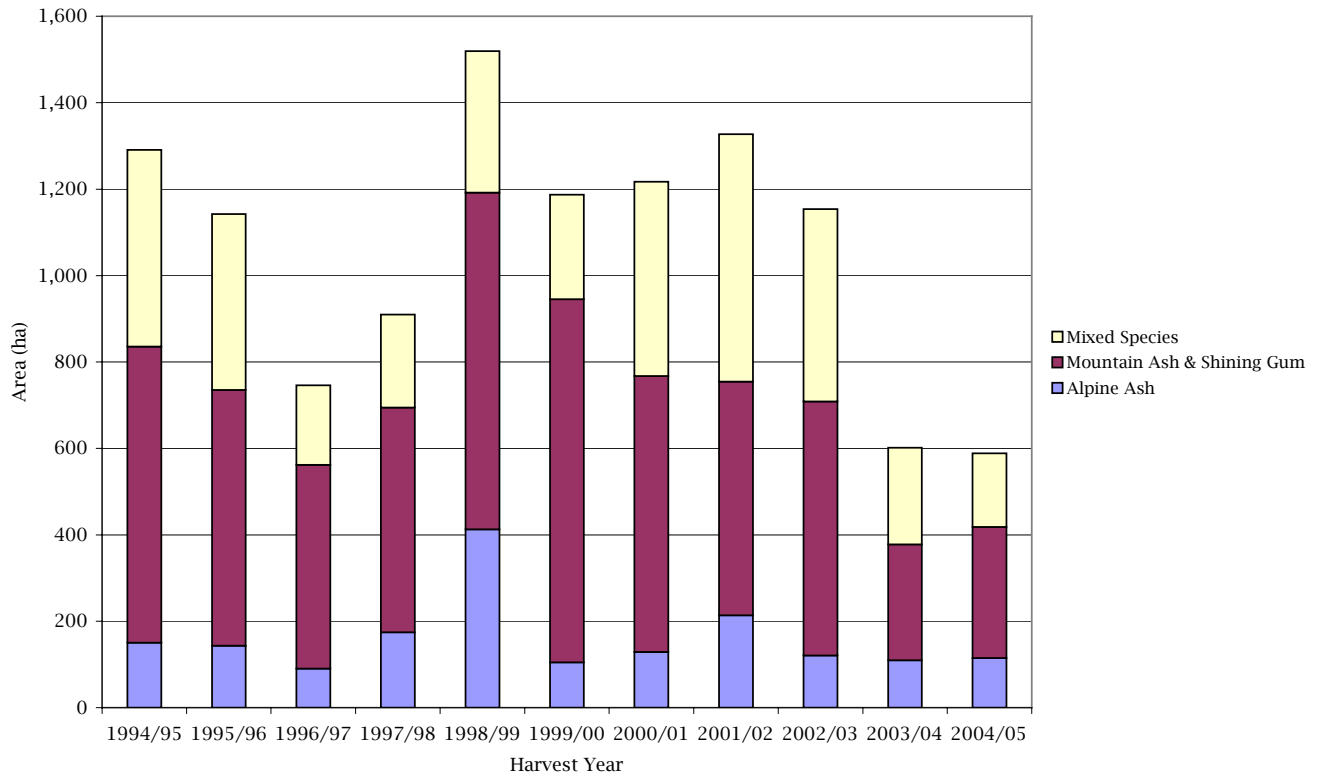


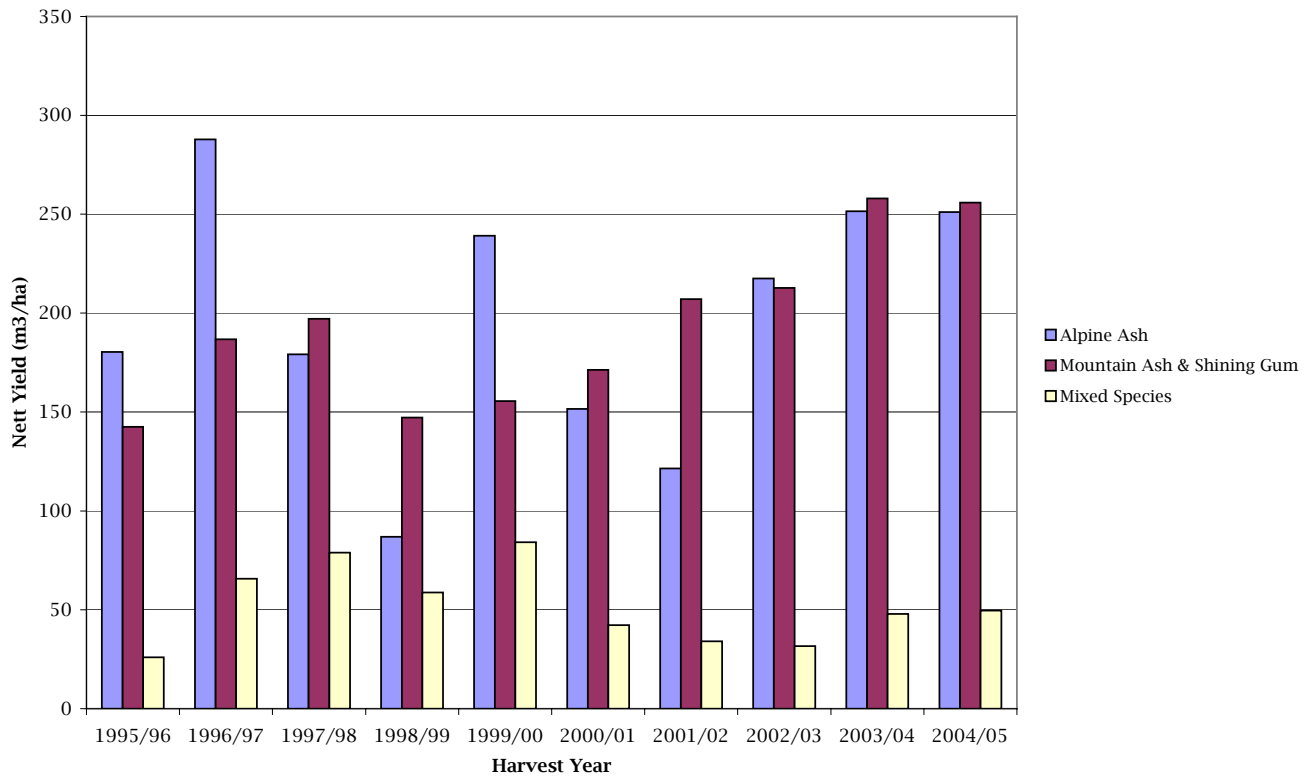
Figure 3 shows the yield by forest type for coupes harvested from 1995-96 to 2004-05.

Yields of all strata have generally increased since 2001-02 and yields for 2004-05 are very similar to 2003-04. The high levels in the last two years may have resulted due to:

- a significant reduction in licence level may have allowed better coupe selection
- a higher proportion of sawlogs coming from the more productive timber catchments (Thomson and Tarago)
- the trees are continuing to grow and may be at the steepest gradient of their yield curve. ie they are now putting on clear wood as diameter rather than growth being expressed as height.
- increasing efficiency of recovery and log grading.

A similar increase in sawlog yield over the same period has been observed Dandenong FMA. These two FMAs share the same management of contractors and same SFRI volume modelling approach for volume prediction. Thus the trends may be related.

Figure 3: D+ sawlog yields by forest type by year

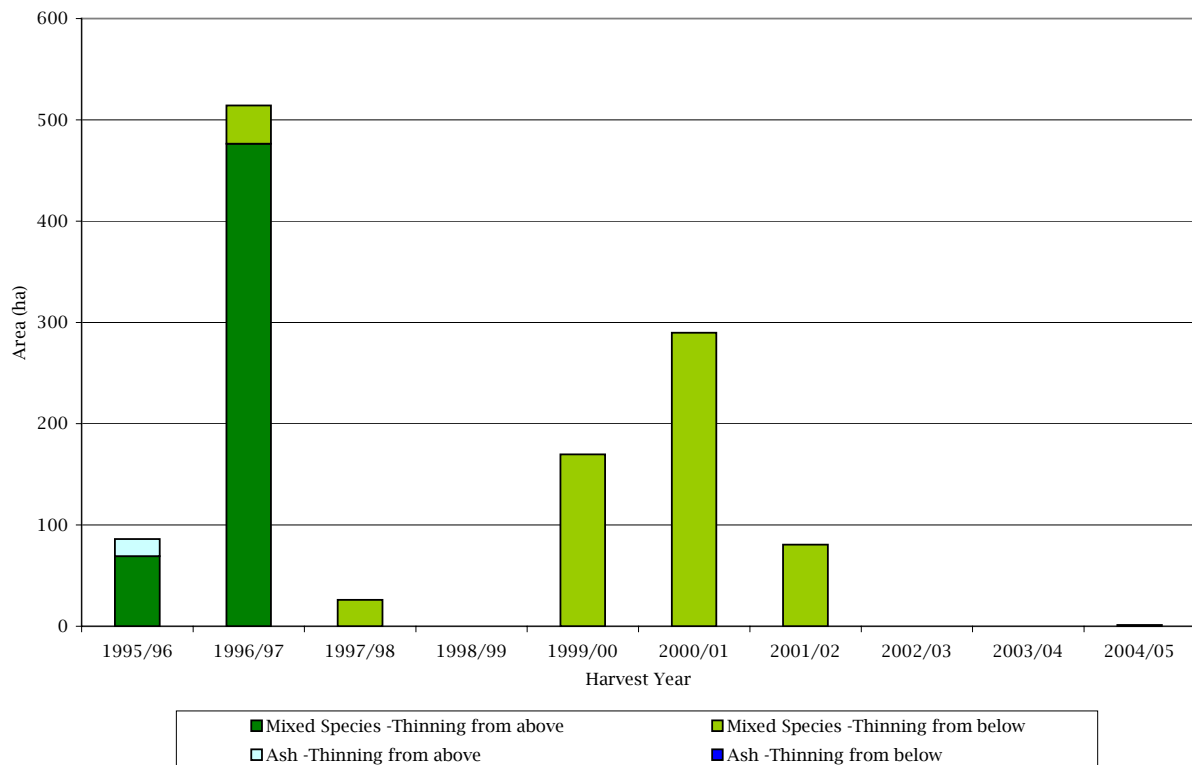


Thinning/Selection/Partial Harvesting Area

Figure 4 details area summaries for partially harvested stands completed over the past ten years. Areas are shown by forest type, and type of thinning as recorded in the logging history.

Low levels of thinning have occurred in the Central Gippsland FMA. The only areas available on the allocation area are those approved on the 2004-05 Wood Utilisation Plan and included in the gazetted Allocation Order. This is due principally to the age structure of the forest. Areas of 1950s and 1960s regrowth were thinned prior to ten years ago and large areas of 1980s regrowth remain too small to thin presently. VicForests are currently preparing a thinning strategy which will identify suitable areas in 1930s and younger mixed species and slower grown 1930s alpine ash and 1980s ash regrowth. Partial harvesting is also being examined in mixed age alpine ash stands in the Heyfield district and also in uneven aged mixed species.

Figure 4: Area thinned by forest type and type of thinning



Key Issues:

Low levels currently occurring, however this will be reviewed as part of the development of a VicForests Thinning strategy.

Recommendations:

Continue to monitor and include impacts of a thinning or partial harvest strategy in the next Allocation Order

2. Analysis of DSE Data and Models

This section compares the volumes and areas predicted to be harvested with actual results. The Allocation Order is derived from volume and area models so it is important to monitor and review these models.

To enable analysis of volume and area modelling performance, only coupes where harvesting has been completed in 2004-05 are included in this section of the report. This includes coupes in which harvesting commenced in a previous year. As a result, there is a difference between these figures and the total annual area harvested as reported in Section 1, which included both complete and incomplete coupes. Section 7 contains a full list of the coupes used in this report.

2.1 Comparison of Predicted and Actual Coupe Volumes

The volume predictions below have been made based on Statewide Forest Resource Inventory (SFRI) stand predictions, which will be used in the development of the revised Allocation Order in 2006. The SFRI stand predictions are based on data collected using remote sensing and field measurement, records of fire and harvesting events, and modelling of environmental and other variables. Spatial and temporal modelling was used to make predictions across the landscape and into the future, forecasting the growth and development of forests in addition to describing the current extent.

Volume predictions used in IFPS by DSE and in *Woodstock* by VicForests use simplified versions of these stand predictions. These analysis tools may only contain limited numbers of curves. The appendix contained in section 7 examines 3 years of harvesting and compares the differences in stand and IFPS yield class yields. No comparison has yet been undertaken with those yields used in *Woodstock*.

Although the analysis contained below compares strategic level predictions with operational scale coupe harvesting results, general trends should be evident between predicted and actual volumes.

Table 3 and Figure 5 show the predicted stand and actual volumes by coupe type for coupes completed in 2002-03 to 2004-05 at a forest stand level. The analysis classifies coupes as ash - 95% or more of the area is dominated by an ash species, other species - 5% or less of the area is dominated by an ash species, or as mixed coupes - a mixture of ash and other species.

The total volume harvested from the completed coupes was 110% of the SFRI predicted volume.

A total of 130 completed coupes have now been examined. The majority of the mixed coupes are dominated by ash species. The results found continue a trend observed in previous years, ash estimates appear conservative and mixed species yields are well below predictions.

Table 3: Comparison of predicted and actual volumes by forest type from completed coupes from 2002-03 to 2004-05

Coupe Type (>95%)	No. of Coupes	Predicted Volume (m ³ gross)	Actual Volume (m ³ gross)	% of Predicted Volume
Ash	57	203649	236750	116%
Other Species	23	31388	22494	72%
Mixed coupe	50	147226	161652	110%
Total	130	382263	420895	110%

Figure 5 indicates that the predicted and actual volumes are similar as generally, the orientation of the data points is in the same direction as the 1:1 relationship line, suggesting a positive linear relationship between the predicted and actual volumes. This means that as volume predictions increase so do harvested volumes.

In general, most ash and mixed coupe data points fall above the 1:1 relationship line. This suggests the SFRI models tend to under-estimate harvested volumes. Conversely, most other

species coupe data points fall below the 1:1 relationship line. This suggests the SFRI models tend to over-estimate harvested volumes

The implications of these results for ash species are that when this data is used to prepare an Allocation Order there is a risk that the available volume will be underestimated or that too much area will be allocated. This is of particular importance as in this FMA harvesting levels are transitioning down to a sustainable level. Any reduction in area that can be achieved now will enable more volume and area to be available in the next periods of the AO. Care should be taken in interpreting these results. There are some strata such as slower grown alpine ash and mixed age alpine ash that will form the majority of the resource to be harvested in 10 to 15 years that we currently have very little actual harvesting data with which to compare the predictions.

The implications of these results for other species are that estimates of available volume may be too high and not enough area may be allocated. As in the case of the ash, care should be taken in interpreting these results, as there is large variation in the mixed species resource. 55% of the harvesting has occurred in forest mapped as mature mixed species and these estimates appear too high. This continues the trend observed in past years. Another area of concern is the heavy coupe selection bias in regrowth mixed species stands. This has concentrated the harvesting on the highest yielding regrowth stands and although SFRI predictions are reasonable for these sites it is felt that on lower productivity sites that the estimates will be well under actual standing volume. This will not be determined until these stands are ready to be harvested in 10 to 40 years time.

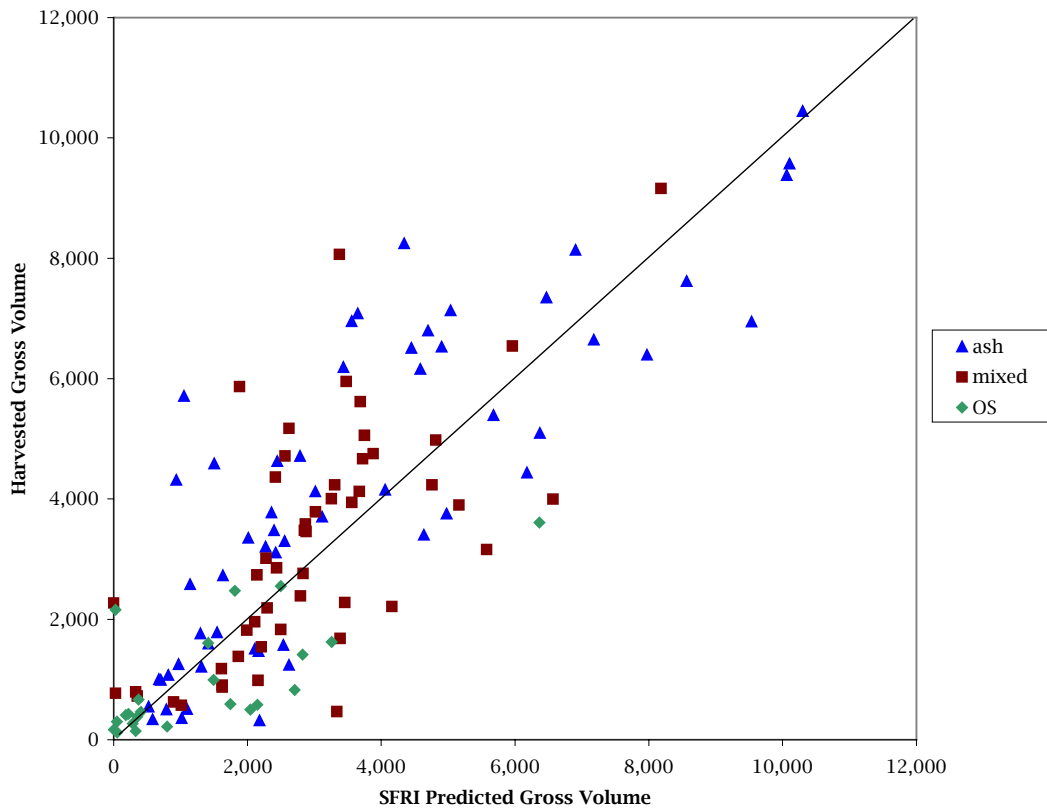
These results continue the trends observed in previous years and it will be important to consider the significant results in IFPS estimates and preparation of the Allocation Order. To do this formalised feedback and inputs into IFPS will need to be developed.

To assist this, an alternative methodology has been used to analyse yields in Section 7. It differs in the following ways

- harvesting is examined as individual years rather than as completed coupes,
- sawlog, residual log and total merchantable volume is examined rather than just sawlog,
- both stand volume estimates and amalgamated yield class estimates are compared to each other and actual volumes
- strata is classified as mixed species and ash rather than coupe types

This alternative methodology aims at providing a yield adjustment to be fed back into IFPS an *Woodstock*. This will provide an alternative estimate based on actual data. The use of Coupe Type makes this difficult if not impossible. It also may mask the performance of the individual mixed species and ash models. Appendix 1 in section 7 shows that for the three years mixed species strata was 58% of predicted volume and for ash actual volumes were 127% of predicted volumes. These are from a slightly different source (completed coupes vs actual years of harvesting) but it highlights there is a difference.

Figure 5: Comparison of predicted and actual volumes by forest type from completed coupes from 2002-03 to 2004-05



Key Issues:

Actual yields from Other Species are 72% of SFRI estimates

Actual yields from ash are 116% of SFRI estimates

The use of Coupe Type as an analysis unit may generalise results

Recommendations:

Continue to monitor ash yields to see if current trends continue.

Critically examine mature mixed species yields, use IFPS reduction, continue to monitor regrowth - report on separately if possible

Transition from using coupe type to an ash and mixed species specific yield analysis

2.2 Monitoring of Area-Based Resource Elements

Net Area Study Results for 2004-05

Monitoring of the accuracy of spatial modelling is undertaken through a process known as Net Area Study. A Net Area Study (NAS) was conducted on all completed coupes to compare the datasets that are used to model the areas expected to be available for harvesting with the areas actually harvested. The study is conducted annually with the aim of building up a reliable analysis dataset that can be used to assess the effectiveness of area models.

Table 4 and Figure 6 illustrate the results of the NAS analysis for 2004-05. Overall 76% of the area in the NAS was modelled correctly. In Central Gippsland FMA there was an 2% loss compared with modelled area, that is, the difference between the area modelled as available but not harvested (13%) and the area modelled as unavailable but harvested (11%). Analysis on the average yields for the incorrectly modelled areas showed that generally the area lost (modelled as available but not harvested) had a higher (168 m³/ha) predicted sawlog yield than the area gained (modelled as unavailable but harvested) (144 m³/ha).

Of the harvested area, 19% was modelled as unavailable. The reasons for it being harvested appear to be related to poor base data (stream and slope area not where predict them to be) and resultant modelling of code exclusions. Table 4 also highlights that some areas modelled as small and isolated were in fact harvested. These small areas rely on slope and stream mapping to determine them and if these are incorrect then the small areas are likely to be as well. They also do not consider proximity of roads which may also determine availability.

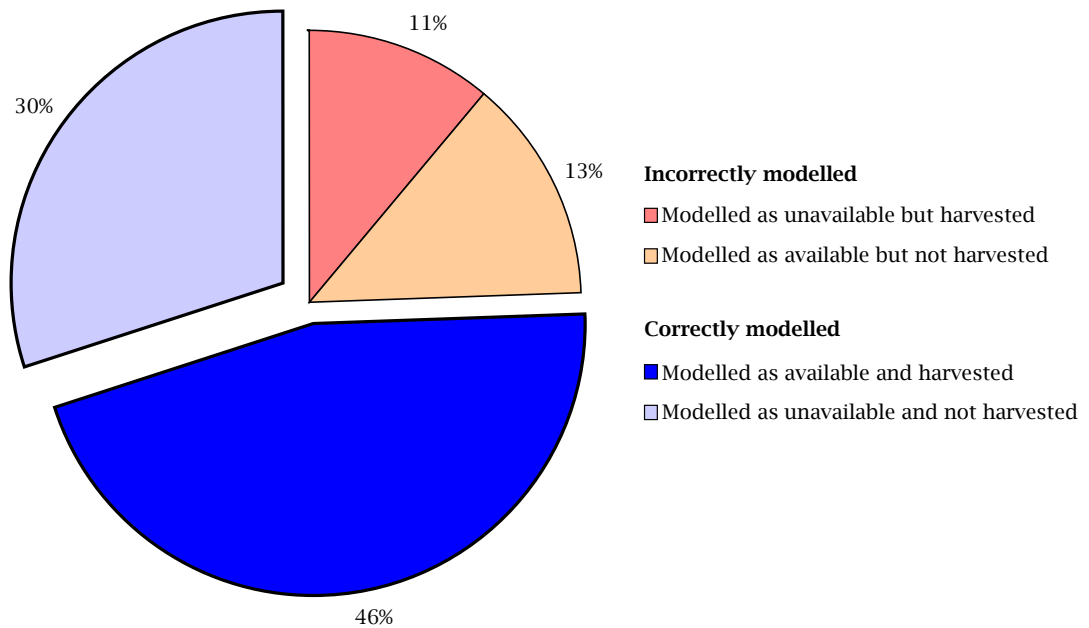
Of the unharvested area, 30% was modelled as available. As in the case of harvested areas, stream and slope mapping is often spatially inaccurate. Further to this is the interaction of slope and stream that exclude areas. Other losses in area in 2004-05 completed coupes appear due to additional rocky areas, rainforest buffers, historic and cultural reserves, and special management zone landscape buffers.

IFPS modelling now attempts to correct these errors. In Central Gippsland FMA now uses Net Area Study factors to correct area estimates and take into account base data and modelling errors. It also makes allowances for Special management Zone availability.

Table 4: Comparison of modelled and actual resource elements for 2004-05

	Modelled						
Actual	Available	Code	Code & Zoning	Zoning	Small and Isolated	Unproductive/ Understocked	Total
Harvested	393	64	0	0	14	17	488
Not Harvested	114	188	20	11	18	22	374
Total	507	252	21	11	32	39	862

Figure 6: The results of the Net Area Studies for 2004-05



Net Area Study Results (Accumulated)

This section provides an overview of Net Area Study results accumulated since the MAHP process commenced in 2002-03. The 129 coupes in this analysis cover 4721 ha.

Cumulative results of the NAS for 2002-03 to 2004-05 are illustrated in Figure 7 and Table 5 and show that on average, 76% of the area was correctly modelled and that there was a 10% over prediction of the area available for harvest.

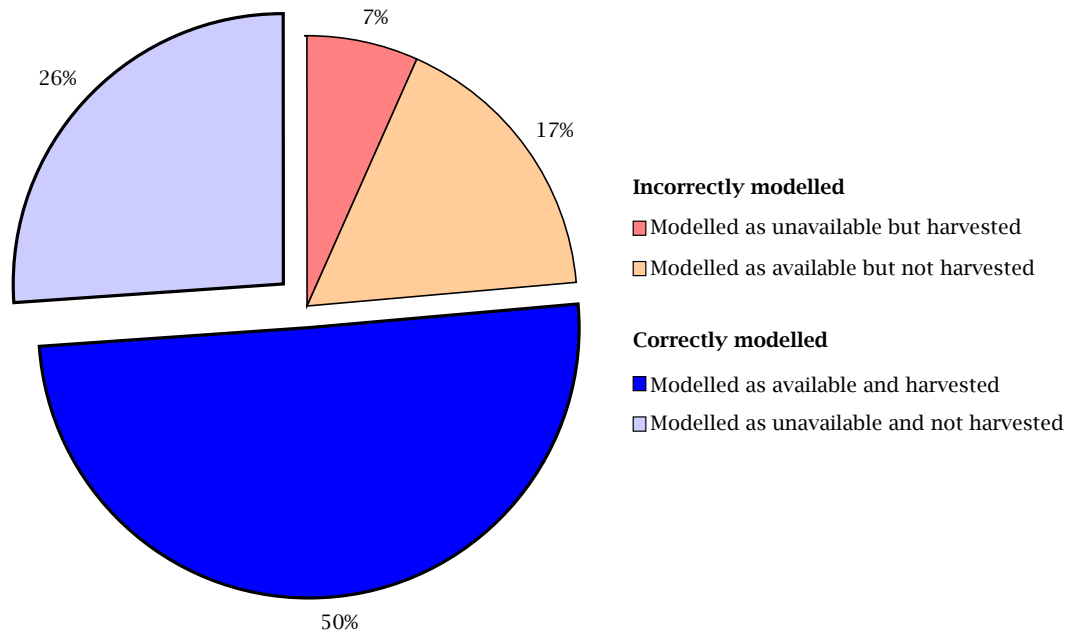
These differ markedly from the 2004-05 results. Differences are reflective of coupe selection and variation is expected from year to year.

As with the 2004-05 data Table 5 highlights modelling of the code (even with variable width buffers and more detailed slope models) was poor and many areas were harvested.

Table 5: Comparison of accumulated (2002-03 to 2004-05) modelled and actual resource elements

	Modelled						
Actual	Available	Code	Code & Zoning	Zoning	Small Isolated	and Unproductive/Understocked	Total
Harvested	2147	226	5	24	14	17	2433
Not Harvested	717	669	201	210	18	22	1838
Total	2864	895	206	235	32	39	4271

Figure 7: The results of the accumulated Net Area Studies for 2002-03 to 2004-05



Merchantability Results for 2004-05

Merchantability models consider the marketability of wood products and use parameters from the SFRI dataset to define this. Merchantability has been monitored separately from the Net Area Study due to potential changes in market conditions that occur on a regular basis. Assessment of merchantability is inherently difficult as the sample of completed coupes is biased by the selection of coupes that are likely to be more merchantable. Unmerchantable coupes will be excluded by a process of local knowledge and field reconnaissance.

Table 6 shows that of the total 489 ha harvested, 65 ha (13%) were modelled as unmerchantable, unproductive or unstocked. As in previous years ash models performed well and mixed species performed less well. No unmerchantable ash was harvested yet over half of the mixed species harvested was modelled as unmerchantable..

Table 6: Comparison of merchantability models and actual harvesting for 2004-05

Forest Type	Harvested					Total
	Merchantable	Unmerchantable	Unproductive	Understocked	Undefined	
Ash	381	0	0	3	0	384
Other species	43	46	11	1	0	101
Undefined	0	0	4	0	0	4
Total	424	46	15	4	0	489

Table 7: Examination of unmerchantable stands harvested for 2004-05

		Dominant Eucalypt Species				
Decade	Height Class	E. cypellocarpa	E. obliqua	E. radiata	E. sieberi	Grand Total
1930s	28.0 - 33.9m	0			6 ¹	6
	40.0 - 45.9m	11 ²				11
1960s	34.0 - 39.9m	1				1
Mature	28.0 - 33.9m		16 ³	0	0	16
	34.0 - 39.9m	5 ⁴			7 ⁵	12
Total		17	16	0	13	46

The following footnotes explain why the stands were classified unmerchantable;

- E. sieberi regrowth was considered too short and not growing and likely to be on a poor site.
- The stand was comprised of 38% E. cypellocarpa, 10% E. obliqua and 10% E. radiata. E. radiata is unmerchantable and the remaining components of the stand were 1 now less than 50% merchantable.
- 49% E. obliqua mature and short combined with 27% E. sieberi mature and short usually highly defective.
- Mature stands of E. cypellocarpa are highly defective
- E. sieberi mature and short and comprising 35-38% of stand. Other components either E. obliqua (10%) or a combination of E. radiata/E. cypellocarpa

The harvesting of these stands does not necessarily mean that they were merchantable, the areas have generally been small per coupe and harvesting may have been logical when associated with adjacent merchantable stands.

The merchantability model used in Central Gippsland for mixed species is not perfect, however it is difficult to see how it can be improved.

Merchantability Results (Accumulated)

Table 8 shows that of the total 2430 ha harvested from 2002-03 to 2004-05, 407 ha (17%) were modelled as unmerchantable, unproductive or unstocked. Compared to 2004-05 (87% of the harvested area being modelled as merchantable), the accumulated modelled merchantable percentage is lower (83%). Ash models performed well whereas mixed species models may have underestimated the merchantable stands if the fact that they were harvested meant that they were merchantable. This is not always the case thus it is difficult if not impossible to conclusively show that non -merchantable stands contained a minimum volume of sawlog.

Further work on the merchantability model may be possible, however it will only be as good as the base data. It will also be influenced by other external factors such as other stands in the coupes, markets for residual log and seasonal suitability of coupes (low quality timber/very low sawlog operations such as timber stand improvement).

Table 8: Comparison of accumulated (2002-03 to 2004-05) merchantability models and actual harvesting

Forest Type	Harvested					Total
	Merchantable	Unmerchantable	Unproductive	Understocked	Undefined	
Ash	1558	13	0	26	0	1597
Other species	464	253	59	31	1	808
Undefined	0	0	25	0	0	25
Total	2022	266	84	57	1	2430

Key Issues:

10% of the total area harvested is unmerchantable.

Ash models appear to work well.

Mixed species merchantability model may be able to be improved.

Recommendations:

Consider reconstruction of merchantability model using detailed local knowledge and then assess against actual harvesting if model assumptions are correct.

2.3 Resource Information Regarding Regeneration

DSE maintain the forest resource information. As part of the Statewide Forest Resource Inventory (SFRI), the base resource data were collected from aerial photograph interpretation (API), representing a snapshot in time. Consequently, the currency of the SFRI data must be maintained. This is undertaken by annual “benchmarking” of the data, which uses disturbance history (such as harvesting and significant bushfire events) to update the SFRI data.

Harvest and fire mapping record where and when the disturbance event occurred and provide some detail on the intensity of the disturbance. For example, harvest history includes the silvicultural system used and fire disturbance may include fire intensity based on crown scorch information. However, something that has not been included in the benchmarking process is information concerning regeneration after disturbance, and therefore this information is not incorporated in the SFRI data.

In addition to the areas harvested since the capture of the aerial photography, the condition of stands harvested just prior to the photography may not have been interpreted or the interpretation may be uncertain. This is because the coupe was in between harvest and regeneration stages, or because stands were young, making species and height interpretation difficult.

In undertaking estimates of sustainable harvest levels, it is necessary to model the growth of the forest. Therefore, assumptions must be made for the stands lacking regeneration information. Currently, SFRI assumes that regeneration of harvested or burnt areas results in a fully stocked stand. These stands are referred to as “assumed stocked”.

The stands with uncertain API due to the age of the forest are part of a larger category called “young growing stock”. It is almost impossible to know which of the “young growing stock” stands the API is unreliable for, but it could be assumed that any stand younger than 10 years old at the time of the photography may have uncertain interpretation.

The SFRI aerial photographs in Central Gippsland FMA were acquired between 1991 and 1996. This means about seven years of disturbance history has been incorporated in the Resource analysis dataset via the benchmarking process and a further three years of harvesting has occurred since the RA dataset was prepared. Table 9 provides the area of “assumed stocked” and the younger “young growing stock” stands in comparison to stands where stocking is known or more certain from the API. Table 9 shows that 41% (12,764 ha) of ash and 14% (3,952 ha) of mixed species are considered “assumed stocked”. Also, 4% (1,154 ha) of ash and 4% (1,071 ha) of mixed species is younger “young growing stock”.

Table 9: Harvestable area (NAS corrected¹ ha) by condition class benchmarked to June 2005²

Forest Condition	Ash area (ha)	Mxs area (ha)	Ash % of total	Mxs % of total
Assumed Stocked	12,764	3,952	41%	14%
Young Growing Stock < 10 years old at date of photography	1,154	1,071	4%	4%
Young Growing Stock >10 years old at date of photography	1,850	3,805	6%	13%
Understocked Regrowth	0	0	0%	0%
Cutover Stocked	714	2,996	2%	10%
Other	14,558	16,984	47%	59%
Total Harvestable Forest	31,041	28,808	100%	100%

1 NAS corrected areas were developed through a NAS, which compares the area harvested in completed coupes and the surrounding unharvested areas with the models that predict area availability.

2. Excludes Baw Baw Frog habitat areas

Results from regeneration surveys for regeneration activities undertaken in the years 1993/94 to 1996-97 indicate that in Central Gippsland FMA, in areas managed using even-aged silviculture, an average of 84% of the area (4,260 ha total harvest area) was found to meet minimum stocking standards (DSE, 2003). For a coupe to be considered adequately regenerated, 65% of the plots undertaken in the regeneration survey must contain eucalypt seedlings. While this provides an indication of successful regeneration in relation to DSE’s standards, it is difficult to interpret. It is unclear whether this translates to a stand with stocking similar to current mature forest at stand maturity. In the preparation of the 2006 Allocation Order Review, sensitivity analyses should be undertaken to assess the risk associated with the assumption that all of the “assumed stocked” stands are fully stocked.

Table 10 below, provides a breakdown of the “assumed stocked” stands by year of regeneration. This provides an indication of how the issue of assumed regeneration could be addressed.

Table 10: Assumed stocked area by year of regeneration and regeneration issues to consider(NAS corrected)¹²

	Pre-1985	1985-1995	1995-2005
Ash area (ha)	190	4,717	7,857
Mxs area (ha)	0	138	3,815
Issues	Surveys may be available but area is small.	Many surveys are probably available.	Surveys are available to 2003/04.

1 NAS corrected areas were developed through a NAS, which compares the area harvested in completed coupes and the surrounding unharvested areas with the models that predict area availability.

2. Excludes Baw Baw Frog habitat areas

It is significant that 45% of the ash resource has limited stocking information and is assumed to be fully stocked and will yield the average of stands harvested in the previous rotation. Results from 1993-94 - 1996-97 show that alpine ash coupes were regenerated with >65% stocking for 95% of the area and mountain ash and shining gum coupes only achieved a >65% stocking on 80% of the area.

Interim data for the period 1996-97 to 2001-02 indicates that the stocking for surveys completed on

- 675 ha of alpine ash coupes resulted in 78% of the area being satisfactorily stocked
- 2037 ha of mountain ash coupes resulted in 93% of the area being satisfactorily stocked
- 737 ha of mixed species coupes resulted in 79% of the area being satisfactorily stocked.

Only about half the area required to be surveyed had been entered into the required spreadsheets or databases. Surveys may or may not have been completed. Additional works and second surveys may also have been conducted on some sites.

There is likely to be significant unregenerated area and it is also possible that a 65% stocking may not eventuate in forest of similar yield and quality compared to that which is assumed in current models. Work needs to be undertaken to need to determine a link between stocking and regeneration survey results.

The standard of storage regeneration survey results requires improvement. Current paper and spreadsheets need to be given a spatial context. A GIS layer developed showing the following;

- The area regenerated by year and by species group (ash species/mixed species),
- A recording of the stocking per polygon,
- External boundaries that coincide with logging history

Key Issues:

Information on regeneration is not kept at a sufficient data standard and many records are incomplete or not collated.

41% of the ash and 14% of mixed species area is assumed to be stocked. It is highly probable that this is not the case.

Recommendations:

Develop GIS Regeneration database and data standards

Ensure all VF activities are recorded to this standard via the Coupe information system

DSE to undertake analysis of all Assumed Stocked stands and place in the GIS regeneration database

Develop links between regeneration standard and future coupe yields.

Use this information to undertake improved resource estimates using IFPS.

3. Monitoring of VicForests' Activities

As the “regulator”, DSE has the responsibility to audit VicForests' activities, including logging history and regeneration. Additional, more detailed parts of the auditing and monitoring program such as planning and operational audits will be reported elsewhere.

3.1 Auditing Logging History

It is planned that satellite imagery will be used to audit VicForests logging history information. Imagery collected from October to February will be used to audit the information provided by VicForests by September 30 each year. A summary will be provided in future MAHP reports and the library logging history information updated.

3.2 Monitoring regeneration

Under the terms of the Allocation Order, VicForests is responsible for the rehabilitation and regeneration of coupes following harvesting. VicForests will undertake stocking surveys for all coupes (except thinning coupes) harvested by VicForests from 1 August 2004. This will include coupes harvested using uneven-aged methods (such as group selection) as well as coupes harvested using even-aged silviculture.

For even-aged coupes, established seedling surveys (ESS) are required to be carried out 18-30 months after sowing/seedfall. Uneven-aged coupes are surveyed 18-36 months after sowing/seedfall.

Future MAHP reports will include a summary of VicForests regeneration activities.

4. Progress on Recommendations from 2003-04 MAHP Report

This section reviews progress made on recommendations arising from the previous 2003-04 MAHP reports. Detail on progress is provided below.

2003-04 Recommendation	Analysis/Results	Current Status
VicForests and DSE to clearly state how the issue of harvesting above the ESR level will be resolved. Options include reducing harvesting levels as a matter of priority by transfer, further buy backs or by allowing licences to expire and accepting that future levels will be significantly less than the forecast ESR.	Both DSE and VicForests are undertaking analysis to allow a transition to sustainable levels to occur. The outcomes of this will be reflected in the Sustainable Timber Resource Plan and Allocation Order planned for June 2007.	Ongoing
DSE to clearly enunciate policy position for where and when areas within the Baw Baw Frog Habitat envelope may be harvested.	DSE has clearly indicated the habitat envelope will be managed as a Special management Area and that no harvesting will occur until the results of research are known. No areas will be considered for inclusion in the preparation of the STRP and subsequent Allocation order in 2007	Complete
DSE to incorporate Nett area study factors and methodology into IFPS models for Central Gippsland FMA	This has occurred and is reflected in both IFPS and <i>Woodstock</i> models	Complete
Given the significance of the results of the retrospective Net area study, DSE and VicForests should undertake similar studies in all FMAs.	This is continuing.	Partially completed
DSE and VicForests to prepare a Sustainable Timber Resource Plan to confirm the impact of harvesting above ESR level on future sawlog availability.	DSE has used IFPS and Vicforests have used <i>Woodstock</i> and results have confirmed the potential impact forecast in the 2003/04 report. Levels of harvest <u>may</u> fall to 70,000m ³ /annum once existing commitments expire. There remains some uncertainty to the result depending on the type of transition to lower levels and adjustments to yields based on observations in MAHP.	Ongoing

2003-04 Recommendation	Analysis/Results	Current Status
VicForests planners to prepare a longer term plan for timber harvesting in each of the Thomson and Maffra/Heyfield timber catchments and this be reflected in the next Sustainable Timber Resource Plan (STRP).	This is continuing and will be reflected in the next Sustainable Timber Resource Plan	Ongoing
Ensure timber harvesting in the Tarago and the Thomson continues to consider the impact on water yield, DSE should relay this information to Melbourne Water and other key stakeholders.	The Government's White Paper, <i>Securing Our Water Future Together</i> outlines a commitment to investigate the impact of timber harvesting on water yield within catchments that supply water to Melbourne. As part of this is a project titled ' <i>Harvesting in State Forests Supplying Water to Melbourne</i> ', that will supply data to assist in constructing a sustainable long-term management plan for Melbourne's catchments in relation to timber harvesting. Melbourne Water and other stakeholders are involved in this project.	Partially complete
DSE to prepare plan to acquire laser altimetry for stream and slope mapping in high value forest types	Opportunities to link with current projects were examined, however, existing data was considered adequate for the purposes of the project.	Ongoing
SFRI to prepare analysis datasets specifically for MAHP. These need to be benchmarked prior to the analysis period and have current growth and yield data	This is progressing and is expected to be completed in 2006	Ongoing
DSE to prepare a plan for refinement of SFRI mixed species datasets.	No work undertaken. Opportunities for funding such work need to be examined and who shall be responsible (DSE or VF)	Ongoing
Formalise feedback loops between MAHP, FRI and VicForests	A workshop considered these and there remains more work to do. Roles of each organisation also need better definition	Ongoing
DSE and VicForests regional staff to further analyse new merchantability model, determine the extent of the forecast large scale reduction of the area of mixed species resource, and investigate implications to VicForests	Merchantability model is being used for modelling in IFPS and <i>Woodstock</i> .	Ongoing

2003-04 Recommendation	Analysis/Results	Current Status
DSE, VicForests and GIS staff to develop procedures to improve timeliness for logging history and collect data with GPS (see Attachment 5 for example). Explore further implications of late and incomplete logging history with respect to regeneration and silvicultural activities	Processes were developed and implemented. A verification process using satellite imagery is still required for 2004/05 logging history	Completed
DSE and VicForests staff will undertake analysis unable to be completed in this report and include it in the 2004/05 report	More detailed analysis of merchantability in areas completed in 2003/04 was not undertaken. It is being undertaken in 2004/05 by VicForests and will be examined for previous years	Partially completed

5. Conclusions and Summary of Recommendations

The 2004/05 MAHP report for central Gippsland FMA has examined and evaluated the datasets that are to be used to prepare the Sustainable Timber Resource Plan. This new process will replace the Estimate of Sawlog Resource and result in a revised Allocation Order to VicForests. The data used in preparing the estimates may be adjusted in IFPS to take into account the results obtained in the last three years of MAHP. This is currently occurring with respect to the results of net area studies, but may yet need to be included to take into account differences between observed and actual yields, and the incomplete stocking in “assumed stocked” stands.

The following recommendations are made to address these issues. New issues and recommendations arising from 2004-05 reporting are marked with a star (★). Some recommendations made from the 2003-04 process are still relevant as they have an ongoing role.

Recommendation	Status
Small Allocation Order strata to be amalgamated in the next allocation order. ★	New recommendation
Develop GIS Regeneration database and data standards. All VF activities are recorded to this standard via the Coupe Information System. DSE to undertake analysis of all Assumed Stocked stands and place in the GIS regeneration database. ★	New recommendation
Develop links between regeneration results and future coupe yields and use in IFPS. ★	New recommendation
Undertake yield analysis using species groups, by year and using yield class instead of completed coupes, stand volumes and coupe type. ★	New recommendation
Use yield analysis results to improve estimates of sawlog and residual volumes ★	New recommendation
DSE to prepare a STRP that shows that the area allocated can meet existing commitments, harvest is less than growth and that in the near future there will be a non-declining yield achieved	Ongoing

6. Total Coupes and Completed Coupes Harvested in Central Gippsland FMA 2004-05

Full description of coupes harvested in 2004-05

Total Coupes 2004-05						Completed Coupes					
Coupe Address	Coupe Name	Silvicultural System	Organisation	Area (ha) harvested in 2004-05	Completed 2004-05	Total area (ha) for completed coupes	Coupe Type (>95%)	Coupe Type% single sp	Logsales Volume Total (D+ m3 gross)	SFRI predicted Volume (D+ m3 gross)	Actual Volume as % of SFRI predicted
457-501-0002	The Triangle	CFE	VF	4.5	no						
458-502-0009	Sucklings Road	CFE	VF	18.1	no						
458-508-0007	Mount Gregory	CFE	VF	6.3	no						
459-501-0012	East Tanjil	CFE	VF	12.2	no						
459-507-0006	Hope Creek	CFE	VF	13.7	no						
460-506-0017	Costins Link Rd	CFE	VF	13.1	no						
460-508-0019	Rowleys	CFE	VF	9.6	no						
460-511-0017	Long Spur	CFE	VF	9.8	no						
460-511-0020	Rowleys Ridge	CFE	VF	13.2	no						
462-506-0013	Blackwood Spur	CFE	VF	17.1	no						
462-510-0025	Christians Road	STR	VF	19.4	no						
463-503-0008	Lower Bennies	CFE	VF	7.9	no						
464-505-0047	Forbidden Thinning	THB	DSE	1.4	no						
465-503-0008	Ryson Creek	STR	VF	2.6	no						
467-502-0008	Wild Track	STR	VF	12.2	no						
467-506-0002	Snake Creek	STR	VF	11.9	no						
479-505-0013	Deep Creek 1	STR	VF	9.7	no						

Total Coupes 2004-05						Completed Coupes					
Coupe Address	Coupe Name	Silvicultural System	Organisation	Area (ha) harvested in 2004-05	Completed 2004-05	Total area (ha) for completed coupes	Coupe Type (>95%)	Coupe Type% single sp	Logsales Volume Total (D+m3 gross)	SFRI predicted Volume (D+m3 gross)	Actual Volume as % of SFRI predicted
480-508-0000	Tramline Road RDL	RDC	VF	0.6	no						
480-511-0023	Middle Whitelaw	CFE	VF	17.3	no						
480-512-0006	Loop Rd West 2	CFE	VF	5.2	no						
481-503-0010	Rojoes Road	CFE	VF	7.8	no						
483-501-0002	Buddy's Start	STR	VF	11.3	no						
483-505-0016	Spurwood Extension	CFE	VF	10.8	no						
484-501-0038	Faith Ck 38	STR	VF	11.2	no						
484-501-0044	Webbs Tk	STR	VF	9.8	no						
524-501-0009	1 in 10	CFE	VF	34.9	no						
538-503-0002	Mt Ewen	CFE	VF	16.3	no						
460-508-0016	Approx Track	CFE	VF	13.6	yes	34.4	mixed coupe		3,900	5,162	76%
460-508-0020	Rowleys	CFE	VF	6.6	yes	22.9	mixed coupe		2,738	2,140	128%
460-511-0019	Leesons Bend	CFE	VF	4.0	yes	4.0	ash	re	1,074	816	132%
461-503-0011	Baw Baw Rd.	CFE	VF	21.0	yes	29.4	ash	re	4,438	6,179	72%
461-511-0016	Mundic Ck North	CFE	VF	14.5	yes	14.5	ash		3,777	2,358	160%
462-506-0014	Boundary Road	CFE	VF	35.2	yes	35.2	ash	re	8,248	4,341	190%
462-510-0018	Montane Road	CFE	VF	14.5	yes	14.5	mixed coupe		5,617	3,685	152%
462-510-0038	Montane Road	CFE	VF	0.3	yes	20.6	mixed coupe		4,125	3,674	112%
462-512-0010	Peacocks Hill	STR	VF	8.1	yes	28.7	other species		2,552	2,499	102%
463-503-0005	New Turkey	CFE	VF	14.4	yes	14.4	ash	re	6,192	3,436	180%

Total Coupes 2004-05						Completed Coupes					
Coupe Address	Coupe Name	Silvicultural System	Organisation	Area (ha) harvested in 2004-05	Completed 2004-05	Total area (ha) for completed coupes	Coupe Type (>95%)	Coupe Type% single sp	Logsales Volume Total (D+m3 gross)	SFRI predicted Volume (D+m3 gross)	Actual Volume as % of SFRI predicted
463-505-0005	New Turkey Salvage	CFE	VF	5.5	yes	6.5	ash	re	321	2,181	15%
464-501-0021	Sisters Creek	CFE	VF	30.2	yes	30.2	ash	re	9,380	10,063	93%
464-502-0014	Spion Kopje	CFE	VF	3.9	yes	37.2	ash	re	10,444	10,301	101%
464-507-0018	Silvertop Ridge	CFE	VF	4.4	yes	26.2	mixed coupe		4,666	3,723	125%
479-504-0016	Holmedale	STR	VF	7.8	yes	7.8	other species		407	181	225%
480-503-0018	Bells Link Rd	CFE	VF	4.1	yes	4.1	ash		509	1,097	46%
480-505-0003	Alstergrens Rd	CFE	VF	6.8	yes	6.8	ash		1,765	1,296	136%
480-508-0004	Little Boys Spur	CFE	VF	17.7	yes	17.7	ash		4,590	1,505	305%
480-508-0005	Little Boys	CFE	VF	17.5	yes	17.5	mixed coupe		5,172	2,622	197%
480-511-0023	Middle Whitelaw	CFE	VF	17.3	yes	25.9	ash	de	8,138	6,904	118%
480-512-0018	Loop Rd West	CFE	VF	9.2	yes	10.0	ash	de	5,713	1,051	543%
481-503-0015	Rojoes-Talbot Ck	CFE	VF	6.9	yes	23.1	ash		6,956	3,557	196%
483-503-0001	Christmas Ck Rd N	CFE	VF	7.3	yes	7.3	ash		993	703	141%
483-503-0016	Christmas Creek Rd	CFE	VF	9.9	yes	16.5	ash	re	3,355	2,012	167%
484-501-0040	Webbs Tk	STR	VF	2.2	yes	19.9	mixed coupe		1,382	1,866	74%
490-509-0001	Matthews Quarry ¹	CFE	DSE	5.1	yes	5.1	other species		121	53	229%
519-501-0001	Helipad	CFE	VF	10.2	yes	10.2	mixed coupe		908	1,624	56%
524-501-0011	S1 ¹	RDI	VF	3.8	yes	3.8	ash	de	339	580	58%
Grand Total				610.4		494.4			107,820	85,609	126%

¹ - These two coupes were not included in the Nett area study or merchantability analysis. An additional area of 2.5 ha is also examined in the NAS analysis This was part of a DFMA coupe that was in the CGFMA dataset

7. Appendices

Appendix 1: - Comparison of Stand and IFPS Yield Class Sawlog Residual and Total Merchantable Volumes

This analysis differs to that used in section 2.1 of this report which examined stand volume for completed coupes by coupe type. It examines the performance of both yield class and stand volume estimates for individual years, by categorising stands as ash or mixed species. It also examines estimates for sawlog, residual and total merchantable volume (TMV). TMV is the sum of residual and sawlog volumes.

Yield classes were developed to group productive forest stands of similar current volume and future growth. These yield classes are used in scheduling stands for timber harvesting and grouping stands for determining the allocation of timber resources in the Integrated Forest Planning System (IFPS).

Separate yield classes were developed for each FMA. This allows FMA specific resource estimates, planning, and monitoring of the timber resource.

For each yield class an area-weighted average is calculated for of the yield parameters for the individual stands within each class. Using these parameters, a yield table is produced with average yield predictions for each yield class for both gross D+ sawlog and residual roundwood volume in the current and the next rotation.

Data in Central Gippsland FMA is such that it can be reported on by logsales/SFRI species groups by individual years. Logsales records the species of sawlog produced and SFRI can be used to determine an area statement for the dominant species in each polygon. This species link is not completely accurate however it represents a significant improvement on using coupe type. Data obtained is able to be obtained per season as logging history is collected close to the June 30th date and there is a seasonal closure for nearly all coupes. VicForests are planning to ensure that all log history is captured at the June 30th cut off date for external and internal reporting.

Table 1a: Actual and Predicted D+ Sawlog for 2002-03 to 2004-05.

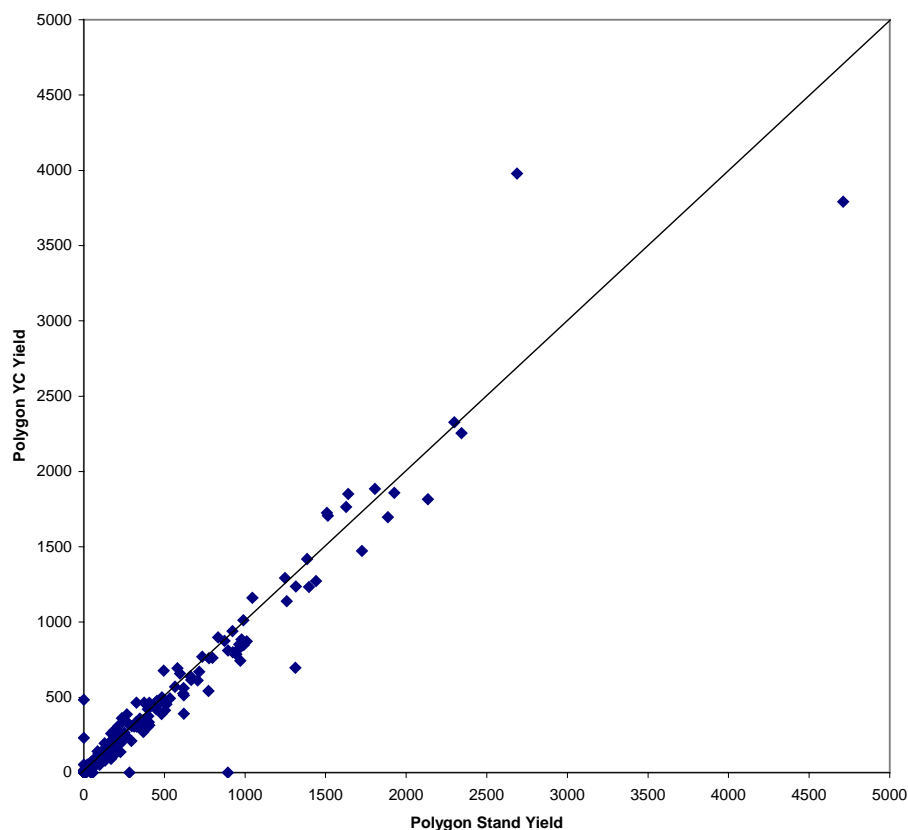
	D+ Sawlog Volume				Actual as a % of predicted			
	2002-03	2003-04	2004-05	All Years	2002-03	2003-04	2004-05	All Years
Ash Actual	159,345	102,628	113,311	375,283				
Ash YC Prediction	131,120	71,925	81,537	284,582	122%	143%	139%	132%
Ash ST Prediction	139,380	74,004	81,323	294,707	114%	139%	139%	127%
MxS Actual	14,948	11,992	8,422	35,361				
MxS YC Prediction	27,513	16,107	10,206	53,826	54%	74%	83%	66%
MxS ST Prediction	30,625	17,121	13,376	61,122	49%	70%	63%	58%
Total Actual	174,292	114,620	122,739	411,651				
Total YC Prediction	147,730	88,032	91,743	327,505	118%	130%	134%	126%
Total ST Prediction	170,006	91,124	94,699	355,829	103%	126%	130%	116%

An analysis of sawlog data contained in Table 1a highlights the following

- There are differences between yield class estimates and stand volume estimates for both ash and mixed species, however for one year of the ash they were the same. Generally Yield class predictions were lower than stand predictions.
- Ash yield class and stand volume estimates were consistently less than observed yields. They are significantly less, particularly over the past two seasons.
- Mixed species yield class and stand volume estimates were consistently greater than observed yields
- There is variation from season to season, highlighting the inherent variation in both the resource and estimates

Figure 1a shows individual polygon yields for both stand volumes and yield classes for coupes harvested in 2004-05 and shows the impact of amalgamating the individual stand yields into yield classes. Yields fall above and below the line but are generally close to it.

Figure 1a: 2004-05 Stand vs YC Yields for individual polygons



An analysis of residual log data contained in Table 1b highlights the following:

- There were no differences between yield class estimates and stand volume estimates for ash.
- There are differences between yield class estimates and stand volume mixed species. Generally yield class predictions were lower than stand predictions.

- Ash yield class and stand volume estimates were consistently less than observed yields. This is consistent with results with sawlog yields
- Mixed species yield class and stand volume estimates were consistently less than observed yields. This differs from the result with sawlog yields
- There is variation from season to season, highlighting the inherent variation in both the resource and estimates.
- There is a slight trend towards greater differences between estimates and actual volumes in more recent years. This may reflect a greater proportion of coupes in better quality satand in the Tarago and Thomson timber catchments that occurred in the last season.

Table 1b: Actual and Predicted Residual Log for 2002-03 to 2004-05.

	Residual Volume				Actual as a % of predicted			
	2002-03	2003-04	2004-05	All Years	2002-03	2003-04	2004-05	All Years
Ash Actual	300,464	178,519	210,620	689,603				
Ash YC Prediction	278,671	157,174	171,279	607,125	108%	114%	123%	114%
Ash ST Prediction	279,226	156,327	171,291	606,844	108%	114%	123%	114%
MxS Actual	87,295	41,458	39,133	167,886				
MxS YC Prediction	64,315	35,244	24,815	124,374	136%	118%	158%	135%
MxS ST Prediction	62,050	36,100	22,008	120,158	141%	115%	178%	140%
Total Actual	387,758	219,977	249,753	857,488				
Total YC Prediction	342,986	192,418	196,094	731,498	113%	114%	127%	117%
Total ST Prediction	341,276	192,427	193,299	727,002	114%	114%	129%	118%

Total merchantable volume was also analysed. It is the sum of the sawlog and residual log volumes or estimates. It is hoped that this analysis will provide some information on if estimates are biased toward sawlog or residual log, and perhaps highlight a grading bias or increased levels of defect than predicted.

An analysis of total merchantable volume data contained in Table 1c highlights the following:

- There were only minor differences between yield class estimates and stand volume estimates for ash, mixed species and total volume. These differences varied between 0 and 5 percent.
- Predicted ash, mixed species and total volumes were less than observed yields. This may reflect a conservatism in the estimate or may be the result of a biased sample
- It may be inferred that because the mixed species sawlog estimate is higher than actual volumes, and the residual log estimate is lower than actual volumes that may be greater defect that is reducing sawlog yields than has been predicted.

- There is variation from season to season, highlighting the inherent variation in both the resource and estimates. There is a slight trend towards greater differences between estimates and actual volumes in more recent years or may be influenced by improved grading and recovery.

Table 1c: Actual and Predicted Total Merchantable Volume for 2002-03 to 2004-05.

	Total Merchantable Volume				Actual as a % of predicted			
	2002-03	2003-04	2004-05	All Years	2002-03	2003-04	2004-05	All Years
Ash Actual	459,808	281,147	323,931	1,064,886				
Ash YC Prediction	409,791	229,100	252,816	891,707	112%	123%	128%	119%
Ash ST Prediction	418,606	230,331	252,614	901,550	110%	122%	128%	118%
MxS Actual	102,242	53,450	47,555	203,247				
MxS YC Prediction	91,828	51,351	35,021	178,200	111%	104%	136%	114%
MxS ST Prediction	92,676	53,220	35,385	181,281	110%	100%	134%	112%
Total Actual	562,050	334,597	372,492	1,269,139				
Total YC Prediction	490,716	280,451	287,837	1,059,004	115%	119%	129%	120%
Total ST Prediction	511,282	283,551	287,998	1,082,831	110%	118%	129%	117%

Key Issues:

This alternative analysis provides an improved assessment of SFRI model performance and highlights that there

may be small differences between yield class and stand yields

may be more defect in mixed species sawlog than modelled

is a general trend that estimates are conservative.

Recommendations:

Analysis using coupe type is replaced by this method

Further data should be collected and analysed. The aim should be to produce timber catchment and species specific yield class adjustment that can be used in IFPS and *Woodstock* that is based on a rolling average of the past 5 years worth of data.

Use this information to undertake improved resource estimates using IFPS and *Woodstock*.

Appendix 2: – Water Catchment Harvesting Rates

The Statewide Management procedures (DSE, 2005) section 4.7.2 Special water Supply catchments contains prescriptions that set harvesting limits in the Thomson and Tarago water catchments. These prescriptions were introduced in October 2005

Thomson Catchment

Prescription: Annual rolling average commencing 1 July 2004 must not exceed 150 ha of ash eucalypt and 15 ha of mixed species

Season ending June 30	Ash (ha)	Mixed Species (ha)	Other (ha)	Total (ha)
1988	29	8	0	37
1989	155	0	4	158
1990	255	7	3	266
1991	202	4	0	207
1992	93	0	0	93
1993	108	0	0	108
1994	212	24	3	238
1995	226	19	5	250
1996	157	15	6	178
1997	148	11	3	162
1998	148	4	2	154
1999	43	15	1	58
2000	94	5	2	101
2001	101	10	0	111
2002	96	15	0	111
2003	85	24	1	110
2004	117	8	0	125
2005	118	4	0	122
Total	2387	173	30	2589

Performance: For the prescribed period the rolling average is 118 ha of ash and 4 ha of mixed species. This harvest level is below the prescribed limits.

Tarago Catchment

Prescription: Annual rolling average commencing 1 July 2004 must not exceed 55 ha of ash eucalypt and 23 ha of mixed species

Season ending June 30	Ash	Mixed Species	Other	Total
1996	59	24	0	83
1997	19	34	0	53
1998	81	29	2	112
1999	42	52	2	96
2000	71	45	2	118
2001	56	28	0	84
2002	69	23	2	93
2003	64	50	0	114
2004	32	23	0	55
2005	37	2	0	39
Total	530	310	8	847

Performance: The rolling average for ash is 37 ha/annum and for mixed species is 2 ha/annum. This harvest level is below the prescribed limits

8. Glossary

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

Allocation Order The legal instrument by which VicForests are given access to timber resources and permission to undertake authorised activities.

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

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

Coupe Information System (CIS) A web based program which enables textual and spatial attributes to describe coupe information.

Clearfelling A silvicultural system used to harvest and regenerate particular forest types. The system involves harvesting a coupe whereby all merchantable trees, apart from those retained for wildlife habitat are removed.

Estimates of Sawlog Resource (ESR) Prepared as part of a licence renewal process established by the Minister for Environment and Conservation in March 2001.

Exceptions Report Report prepared by VicForests to identify and explain reasons for variation between proposed TRP coupes or harvested areas and allocated forest stands.

Expert Data Reference Group (EDRG) A group appointed by the minister to review the ESR data used to estimate the available volumes.

Filter strip A narrow strip of ground retained either side of a drainage line or temporary stream. In the strip, trees may be felled subject to certain conditions and machinery entry is only permitted in certain circumstances.

Forest Management Areas (FMAs) The basic units for forest planning and management in Victoria. Currently Victoria is divided into 14 FMAs.

Forest Management Plans (FMPs) A plan developed to address the full range of values and uses in State forest by Forest Management Area.

Forest Management Zone An area of similar physical capacity of forest value to which a particular NRE strategy and specific prescription may apply. There are three zones: the Special Protection Zone (SPZ), Special Management Zone (SMZ), and the General Management Zone (GMZ).

Forest Stand Used to define areas in the Allocation Order, defined in the *Sustainable Forests (Timber) Act 2004* as “a group of trees within a State forest that share common characteristics relating to eucalypt species, composition and age”.

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

Full Extent (FE) Spatial Dataset Spatial dataset of gross area available for modelling resource availability that defines the legal extent of area in which VicForests can operate for the 15 year duration of the Allocation Order.

General Management Zone (GMZ) Delineates the area to be managed for the broad range of forest values available in the area.

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.

Global Positioning System (GPS) A system of satellites, computers, and receivers that is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from different satellites to reach the receiver.

Integrated Forest Planning System (IFPS) A spatially-based modelling system used to evaluate the impacts of alternative management strategies on future forest condition and to estimate resource availability.

Logsales The department's accounting and recording system for logs and some other invoiced forest produce.

Logging History The department's recording system for area harvested.

Merchantable Used to describe trees suitable for processing into forest produce and for which a market exists.

MONAP the Merchantable, Operational, Nett Available Productive area used in the ESRs.

Montréal Process The Montréal Process is the working group formed in Geneva, Switzerland, in June 1994, to develop and implement internationally agreed criteria and indicators for the conservation and sustainable management of temperate and boreal forests.

Net Area Study A process based on historical logging history records to compare predicted and actual harvested areas.

Residual Log Wood that does not meet the quality specifications for sawlogs because it is too knotty, crooked, rotten or small to be sawn.

Resource Analysis (RA) Spatial Dataset Spatial dataset for strategic level IFPS modelling used as the basis to determine area allocation to VicForests. It includes adjustments for "operational factors", low merchantability species and small isolated areas.

Sawlog A log that is suitable for sawing into widths and lengths for use in such things such as house frames and furniture. Depending on quality they are graded from A to D.

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

Single Tree Selection A silvicultural system used to harvest and regenerate particular forest types. Trees are harvested singly at relatively short intervals indefinitely. Regeneration is established continually in the gaps produced and an uneven-aged stand is maintained.

Special Management Zone (SMZ) Delineates an area to be managed to maintain specified values, such as flora and fauna habitat or catchment values, while catering for timber production under certain conditions.

Special Protection Zone (SPZ) Delineates an area to be managed for the conservation of natural or cultural values and where timber harvesting will be excluded.

Statewide Forest Resource Inventory (SFRDI) The strategic level inventory of forest resources on State forest in Victoria.

SFRImap An SFRI dataset that contains a range of data describing the forest in relation to its eucalypt composition, forest stand structure and disturbance events.

Sustainable Timber Resource Plan (STRP) Summary of data, processes and assumptions used to develop the Allocation Order, developed by DSE in conjunction with VicForests.

SYSS (Sustainable Yield Spreadsheet) A spread sheet computer model used for the majority of the ESR estimates to develop woodflow schedules and to determine future sawlog availability.

Thinning The removal of trees in a forest stand for a given silvicultural objective.

Timber Release Plan (TRP) Developed by VicForests to identify the location and timing of proposed timber harvesting coupes and the location of any associated access roads.

Undercut The remaining volume of timber available to be harvested in subsequent years where a licensee has not harvested the total annual licence allocation in a given year. Undercuts can be accumulated and harvested over the remaining years of the licence providing the 5-year rolling average harvest level does not exceed 110% of the annual licence allocation.

VicForests Commercial entity with the responsibility for the harvesting and sale of timber resources from public native forest and for associated management activities.

Wood Utilisation Plan (WUP) Details the area to be harvested and the type of wood to be produced from an FMA in any one year and provisionally for the succeeding two years, together with the allocation of timber to licences.