An Analysis of Judy Clark's Softwood Sawlog Yield Predictions for Western Australia

By the

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EXECUTIVE SUMMARY

Judy Clark has published five estimates of softwood sawlog availability in Western Australia. She has claimed that it would be possible to immediately produce 800,000 cubic metres of softwood sawlogs per annum and sustain this level of production from public and private plantations and that there is a softwood sawlog surplus "stockpile" of 1.2 million cubic metres available from State-owned plantations.

Increases in sawlog production from State-managed plantations have been programmed to progressively increase for more than a decade. Current projections are from 277,000 cubic metres in 1998/99 to 616,000 cubic metres per annum by 2004. But the softwood sawlogs produced from State-managed plantations, apart from sawlogs which will be produced from plantations located in the Albany region (these plantations are still immature), are fully committed under contracts or cabinet direction to local manufacturing facilities. There is no surplus stockpile of softwood sawlogs. CALM's softwood resource projection methodology and the resource projections have been independently reviewed by internationally recognised consultants.

Judy Clark's methodology is simplistic and she has used data which is either incorrect or has no scientific justification. For example:

- Judy Clark has failed to understand that the volume of sawlogs which is being produced from trees that are older than their nominal rotation age has already been factored into CALM's supply projections. If the resource contained in these trees was harvested immediately, there would be a significant reduction in softwood sawlog availability in later years. Judy Clark appears to be advocating the "mining" of the softwood resource which would result in unsustainable softwood sawlog production levels.

- Judy Clark has used growth rates and sawlog yields for the public and private estate which are either incorrect or unsubstantiated.

- Judy Clark has used a simplistic system of stratification of plantations which ignore variations in stocking and growth rates within plantations. Judy Clark has used at the most six yield schedules whereas CALM's projections use a minimum of 500 different yield schedules.

- Judy Clark has calculated the annual sustainable yields by averaging over periods in excess of 20 years – a method which cannot adequately allow for the variation in annual sawlog production resulting from the irregular age class distribution of the plantation estate.

- Judy Clark's own analyses vary markedly. For example, her estimates for softwood sawlog availability in the year 2000 range from 681,000 cubic metres to 800,000 cubic metres. Her estimates of the private resource of softwood sawlogs range from 201,000 cubic metres to 310,000 cubic metres per year in the year 2000.

CALM does not have access to detailed inventory and growth data of privately-owned plantations. But it is estimated that of the 18,067 hectares of private plantations only

5,712 hectares have uncommitted resource, are within economic haulage distances of processing facilities or are at the stage of development where they can produce sawlogs. Based on yield data from private plantations that are managed by CALM it is estimated that between 50,000 to 60,000 cubic metres of softwood sawlogs per annum may be available. It is questionable, however, whether this level of resource production will be sustained in the long-term because private softwood plantation establishment has been negligible over the past several years. If Judy Clark's estimates of softwood sawlog resource from the private plantation are correct it is difficult to understand why this resource is not being sold into existing processing centres or that new processing facilities are not being established because there is no legal or policy impediment to that occurring. The average softwood sawlog production from private plantations was 52,000 cubic metres over the last four years.

The Western Australian Government has directed CALM to establish 150,000 hectares of maritime pine on farmland over the next ten years. Seven thousand hectares have already been established and it is planned to establish 10,000 hectares in the year 2000. In the short-term, however, Western Australia must depend on plantations and tree crops that have been established (principally by the State) more than twenty years ago for its supply of softwood sawlogs. The softwood sawlog resource from publicly owned plantations is fully committed for at least the next decade.

INTRODUCTION

Judy Clark (Visiting Fellow, Centre for Resource and Environmental Studies, Australian National University) has published a number of papers and made a number of public statements claiming that the Department of Conservation and Land Management's (CALM) projections of softwood sawlog supply from State-managed plantations in Western Australia grossly underestimate the actual volumes available now and in the future. She has claimed that "Western Australia's public and private softwood plantations can supply a sustained yield of 800,000 cubic metres [of sawlogs] per annum" (Clark 1999). She has also claimed there is a "stockpile" of 1.2 million cubic metres of softwood sawlogs that is available immediately for processing (Clark 1998). Recently Judy Clark has made public statements that unemployment resulting from closure of native hardwood production facilities could be compensated by processing the "surplus" of softwood logs that she claims are available (Attachment 1).

Judy Clark has been invited to discuss with CALM officers the inadequacies of her approach to estimating the softwood sawlog resource available in Western Australia but she has never taken up this offer. This report documents the deficiencies of her approach and outlines the basis for CALM's projections of softwood sawlog supply in relation to industry supply contracts in Western Australia.

THE JUDY CLARK METHODOLOGY AND PROJECTIONS

Judy Clark has made five attempts to predict the potential yield from all Western Australian softwood plantations. Her 1995 report, commissioned by the State Conservation Councils, provided a national view of the available plantation resource. It was followed in Clark and Morris (1995) by a State by State analysis of each plantation estate, two estimates of the available resource in WA and the potential for the establishment of new industry based on that resource. Subsequently in 1997 and 1999 Judy Clark has updated her estimates. On each occasion she has used a different methodology and different estimates of softwood sawlog availability.

CLARK 1 (Clark and Morris, 1995)

Method

To calculate the potential plantation yield Judy Clark used three types of data:

1. Plantation area

Plantation areas were sourced from public documents. Judy Clark then divided WA's plantations into three groupings; publicly-owned *Pinus radiata,* publicly-owned *Pinus pinaster,* and privately-owned *Pinus radiata.* Albany plantations managed by CALM were not included in her calculations as they did not yield significant sawlog volumes until 2015.

2. *Productivity*

Judy Clark nominated the average productivity of plantations. Productivity was designated by the average growth rate over the life of the plantation (Mean Annual Increment – MAI). For CALM-managed plantations Judy Clark claimed she used information derived from a letter from CALM in response to her request for information on growth rates from Western Australian State-owned plantations in 1991. Judy Clark also used as a basis for her assumptions about growth of *P. pinaster* information derived verbally in 1995 from a CALM tree improvement research officer who advised her of the estimated mean annual increments of *P. pinaster* **research plots** of trees that had been the outcome of an intensive tree breeding program. Judy Clark assumed an MAI of 10.5 cubic metres per hectare per annum.

Judy Clark used data derived from an assessment made by the Resources Assessment Commission in a survey of private plantations for her growth data used to estimate sawlog production from private plantations in Western Australia (Resources Assessment Commission Forest Resource Survey 1992). The growth figures derived by the Resources Assessment Commission were the averages of what a number of private growers believed were the growth rates of their plantations.

3. *Management regime*

Judy Clark used yield schedules (that is, the nominal quantity of log products estimated to be available at certain ages in the life of a plantation – see Attachment 2) for broad categories of the *P. radiata* and *P. pinaster* estate.

Judy Clark prepared her own yield schedule for private plantations which incorporated yields of sawlogs which are significantly higher than CALM yield schedules. Judy Clark does not cite the source of these yield schedules.

4. *Estimation of sawlog production*

Judy Clark then determined the softwood sawlog yield by multiplying the area for each nominated year by the appropriate generalised yield scheduled for each category of species and productivity. (For example, if at age 24 a *P. radiata* plantation is predicted to be thinned and yield 25 cubic metres of sawlogs and there are now 1000 hectares of 10-year old *P. radiata* plantations, then in 14 years time those plantations are forecast to yield 25,000 cubic metres of sawlogs). The total yield for each year and product was then determined by summing the plantation yields for each grouping.

Results

Table 1: Resource projections (private and public resource) – Clark 1

Log Product	Year	
	2000	2005
Sawlogs	681 000	784 000
Small logs	146 000	not provided
Chiplogs	362 000	not provided
Total	1 189 000	

CLARK 2

Clark and Morris (1995) also provided a second yield scenario.

Method

As for Clark 1, except in this scenario Judy Clark assumed the productivity of the *P. pinaster* plantations was increased from an MAI of 10.5 to 13 m^3/ha/yr apparently in part to take account of genetically improved stock available since 1972. This increase in yield was assigned to all plantations, not just those planted post-1972. At that time, however, post-1972 plantations (the only plantations that were established with trees which had been genetically improved) accounted for only 46% of the plantation area and these plantations do not contain the most advanced genetically improved trees. Under this scenario small log production from *P. pinaster* plantations was assumed to now be sawlog.

Results

Table 2: Resource projections in cubic metres (private and public resource) – Clark 2

Log Product	Year	
	2000	2005
Sawlogs	786 000	964 000
Small logs	86 000	not provided
Chiplogs	347 000	not provided
Total	1 219 000	

CLARK 3 (Clark, 1997)

In 1997 the National Plantation Inventory published its findings and Judy Clark produced a revised estimate to directly compare her estimates with those of the NPI. She extended her projections to 2024, and provided an estimate of sawlog and chiplog yield over five year intervals.

Method

Judy Clark used a similar methodology to her 1995 report (see Clark 1). She updated her area database to include information in CALM's 1995/96 Annual Report and appears to have included the plantations which had been established in Albany. She simplified her yield estimation by using three plantation productivities and yield schedules. For the publicly-owned *P. radiata* Judy Clark blended the productivity regimes into a single yield schedule. She used an average productivity of 15 m^3/ha/yr. For *P. pinaster* an average productivity of 11.25 m^3/ha/yr was used. These *P. pinaster* yield schedules are shown in Attachment 3, and are significantly higher than CALM yield schedules.

In addition to the logs produced in accordance with the yield schedules, Judy Clark added in a quantity of sawlogs for those plantations that were older than the scheduled nominal clearfell age - for *P. radiata* plantations older than 30 years, and for *P. pinaster* plantations older than 40 years. This constituted the so-called stockpile of "surplus" sawlogs which were assumed to be immediately available. Those plantations were assumed to have the same volume of sawlogs as the clearfell volumes, however no such addition was made for chiplogs.

Results

Table 3: Annual Resource Available – Clark 3

	Sawlogs (cubic metres)	Chiplogs (cubic metres)
'Stockpile'	918,000	
1995 – 1999	412,000	481,000
2000 – 2004	747,000	464,000
2005 – 2009	971,000	491,000
2010 – 2014	670,000	418,000
2015 – 2019	834,000	482,000
2020 – 2024	686,000	492,000
Sustainable from Clark (1998)	**800,000**	**470,000**

In her 1998 (Clark 3a) analysis, (Clark, 1998), claimed that 800,000 cubic metres of sawlogs and 470,000 cubic metres of chiplogs could be sustained from 1998 to 2024. Her method of calculation of this sustained supply was not explained, however it is assumed to be determined by adding the "stockpile" to the total yield of logs until 2024 and calculating an average annual quantity.

For this calculation Clark (1998) revised her estimate of the "stockpile" to be 1,200,000 cubic metres of sawlogs by including an increased area of plantation past nominal commercial harvest age.

CLARK 4 (Clark, 1999)

Method

- All WA plantations were grouped into either publicly-owned *P. radiata*, publicly-owned *P. pinaster*, or privately-owned *P. radiata*. The total area of each was sourced from publicly available data.
- An average growth rate (mean annual increment) was assigned to each of the three plantation groups. These are shown in Table 4 and are the same rates as used in Clark 3.
- The proportion of the total growth that would yield sawlogs was nominated. For *P. radiata* 65% of the total yield was nominated to be sawlogs. For *P. pinaster* 44% was used. These percentages are consistent with yield schedules used in Clark 1.
- The average annual yield of sawlogs was calculated by the product of the total plantation area, the average growth rate and the proportion of sawlogs. Judy Clark nominated this to be the sustainable sawlog supply from the first rotation.
- Judy Clark again updated her estimate of the stockpile to 970,000 cubic metres of sawlogs using CALM's 1997/98 Annual Report.

Results

Table 4: Resource projections in cubic metres (private and public resource) – Clark 4

Plantation type	Area (hectares)	Mean annual increment (m^3/ha/yr)	Proportion of sawlogs	Sustainable supply (m^3/ha/yr)
Public *P. radiata*	45,000	15	65%	439,000
Public *P. pinaster*	27,000	11	44%	131,000
Private *P. radiata*	16,300	19	65%	201,000
Total	88,300			771,000

Note: In her 1999 paper Judy Clark states that public and private plantations can supply a sustained yield of 800,000 cubic metres "now and can be sustainably supplied over the next 30 years". However, in Table 4 the total sustained sawlog yield is shown as 771,000 cubic metres per annum.

CALM PROCEDURES FOR SOFTWOOD RESOURCE PROJECTION PROCEDURES

CALM maintains resource estimates for the plantations which are owned or sharefarmed by the State and those private plantations where CALM has management agreements with landowners (2,677 hectares). This amounts to approximately 80% of the State's plantation resource by area. The basic components of CALM's system are described by Turner (1998). Turner is an acknowledged independent national expert in this field and is a Reader, Department of Forestry at the Australian National University.

"Land information

The plantation estate has recently been remapped using 1:10 000 photography with boundaries validated against digital orthophotomaps. Boundaries are then digitised and incorporated into CALM's Arc/Info database where it can be overlaid with cadastral, management and topographic data. A resource stratification, based on top height and stocking, has also been extracted from the photography. This information has been used to review the net productive areas of plantation, as well as for inventory stratification. This level of photographic detail in conjunction with the use of GIS to validate the digitising will ensure accurate statistics of net areas.

Stand history records are being transferred to GIS and will be linked to Oracle database. This new system is now known as the Plantation Geographical Information System. The transfer provides the opportunity to check the veracity and accuracy of the information previously recorded only on paper maps.

Inventory

In the past, inventories have been by stratified variable radius permanent plots at an intensity of 1 per 2-4ha. This has now been varied to a system of temporary plots at variable intensities on an as-needed basis. Tree measurements vary depending on the purpose of the inventory. Inventory of a subset of stands is done every year over approximately 10% of the stands. This inventory is focused on those stands that are least understood or their predicted volumes are significantly different from actual removals from a particular thinning.

Growth estimation and projection

The primary growth projection system used by CALM for pine plantations is the Plantation Operations Thinning Schedules (POTS) system which simulates a regime over a rotation using growth models derived from permanent plot data. The method is described by Vanclay (1994). This has recently been augmented by the Plantation Inventory Product Determination system which grows and thins individual trees which can be subdivided into product classes. New measurement data is acquired as necessary to incorporate new species, sites and silvicultural regimes. Wood flows are generated from a combination of POTS and actual removal data obtained though the Logging Operations Information System (LOIS)....

Yield regulation and scheduling

Harvest scheduling is performed with the Pine Scheduling System (PINESCHED) which is an Oracle-based simulator. It can generate short-term logging plans or strategic plans and can be linked to the GIS....

Monitoring

The LOIS (Logging Operations Information System) *is used to monitor all removed product volumes and regime data are reviewed annually."* Turner (1998).

CALM's softwood resource projections are therefore based on:

1. Detailed stratification of the plantation and tree crop estate which is broken up into unique management units. For example, Figure 1 shows the stratification of the Gnangara *P. pinaster* plantation estate. Each of these units has a distinct growth rate and stand characteristic profile which is identified in the computer system. For example, stands growing on similar sites, with the same potential growth increment, may have different stocking levels (number of trees per hectare) and therefore markedly different yields of sawlogs. An example of the data for different management units is shown in Attachment 4. Thus yield schedules can be derived based on the actual growth and actual stand characteristics. CALM currently has 2050 such management units in Pinesched. CALM's computer scheduling uses more than 500 individual yield schedules. This is in contrast with Judy Clark's approach which is based on at most six yield schedules.

2. The growth rates of stands are constantly monitored and adjustments made to projected growth where necessary.

3. The actual yields from stands which are harvested are recorded and compared to projected yields and, where necessary, modification to the yield predictions are made.

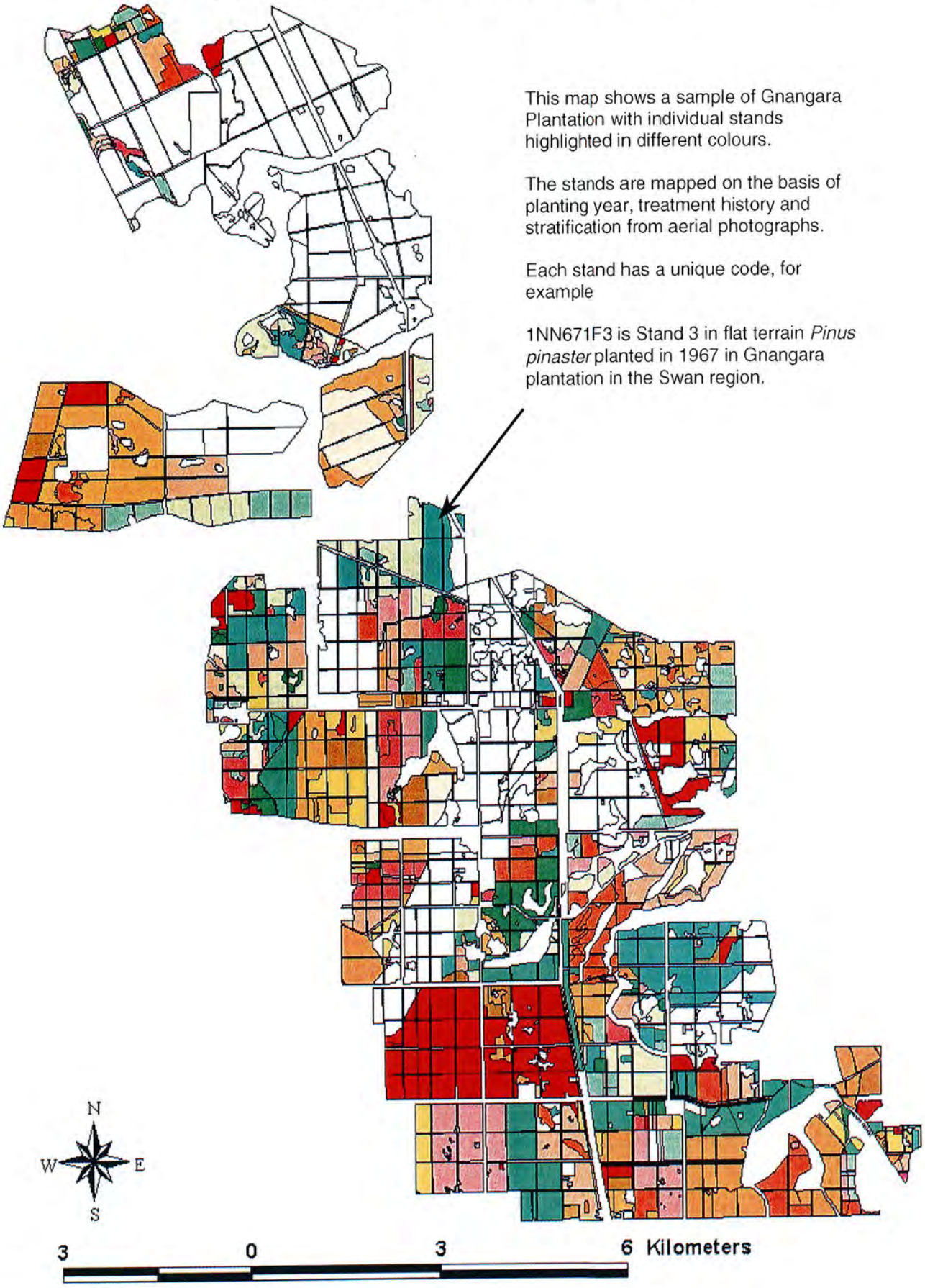
4. The system enables detailed scheduling of harvesting plans to accommodate the commitments to softwood industry units. For example, it is essential to "smooth" resource supply to industry units to ensure that their processing is not disrupted. These complex models are also used to optimise the mix of products to different industry units and minimise log haulage distances.

PROJECTED SUPPLY

The projected supply of sawlogs from CALM managed estates and CALM's contracted commitments to local softwood industry manufacturers is shown in Figure 2. This graph also identifies the contribution of *P. radiata* stands which are more than 30 years of age and *P. pinaster* stands which are more than 40 years of age to the projected softwood sawlog supply.

GNANGARA STRATIFICATION

Figure 1



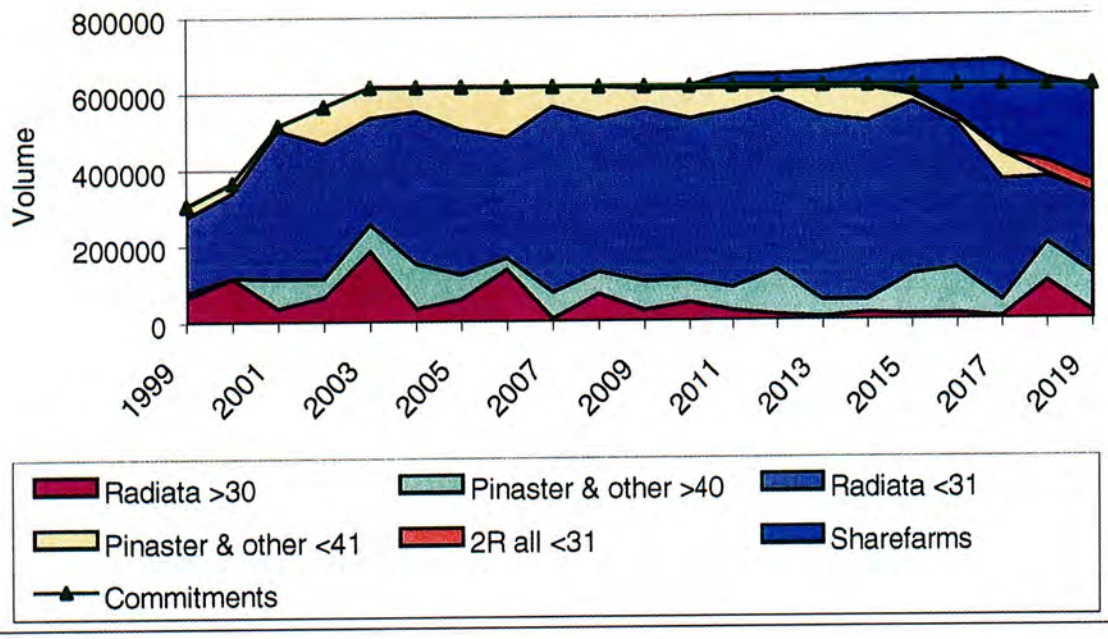
This map shows a sample of Gnangara Plantation with individual stands highlighted in different colours.

The stands are mapped on the basis of planting year, treatment history and stratification from aerial photographs.

Each stand has a unique code, for example

1NN671F3 is Stand 3 in flat terrain *Pinus pinaster* planted in 1967 in Gnangara plantation in the Swan region.

Figure 2: Projected Supply of Sawlogs from CALM-managed softwood plantations



COMPARISON OF RESULTS

1. SUMMARY OF JUDY CLARK'S ESTIMATES

Judy Clark has produced the following estimates for sawlog yield in the years 2000 and 2005.

Table 5: Clark's various estimates of sawlog yield (private and public resource) for 2000 and 2005

	Report Date	2000 (cubic metres)	2005 (cubic metres)
Clark 1	1995 scenario 1	681,000	784,000
Clark 2	1995 scenario 2	786,000	964,000
Clark 3	1997	747,000	971,000
Clark 3a	1998	800,000	800,000
Clark 4	1999	771,000	771,000

Table 6: Clark's various estimates of sawlogs in plantations older than nominal clearfell age

	Clark (1997)	Clark (1998)	Clark (1999)
Quantity of sawlogs in plantations older than nominal harvesting age (cubic metres)	918,000	1,200,000	970,000

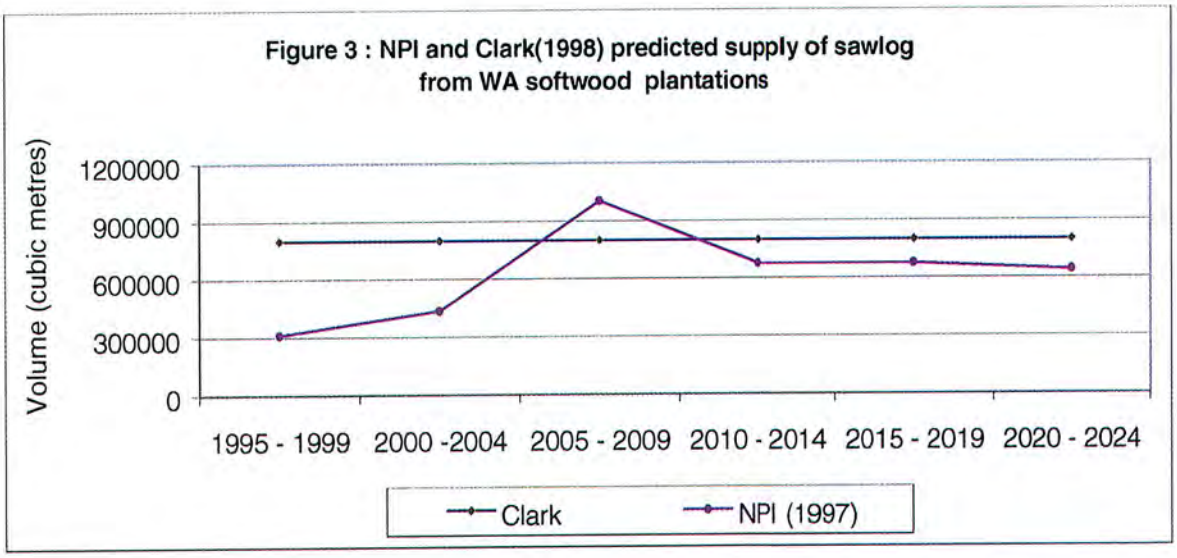
Judy Clark's estimates of softwood sawlog supply vary markedly in her various papers.

2. THE NATIONAL PLANTATION INVENTORY

The National Plantation Inventory (1997), prepared by the Commonwealth Government's Bureau of Resource Sciences, assessed the potential of all Western Australian Plantations. That is, the public and private plantation resource. The methodology used in the National Plantation Inventory assessment is described in Attachment 5.

A comparison of the resource predictions of Clark (1998) and the NPI are shown in Figure 3 below.

Figure 3 : NPI and Clark(1998) predicted supply of sawlog from WA softwood plantations



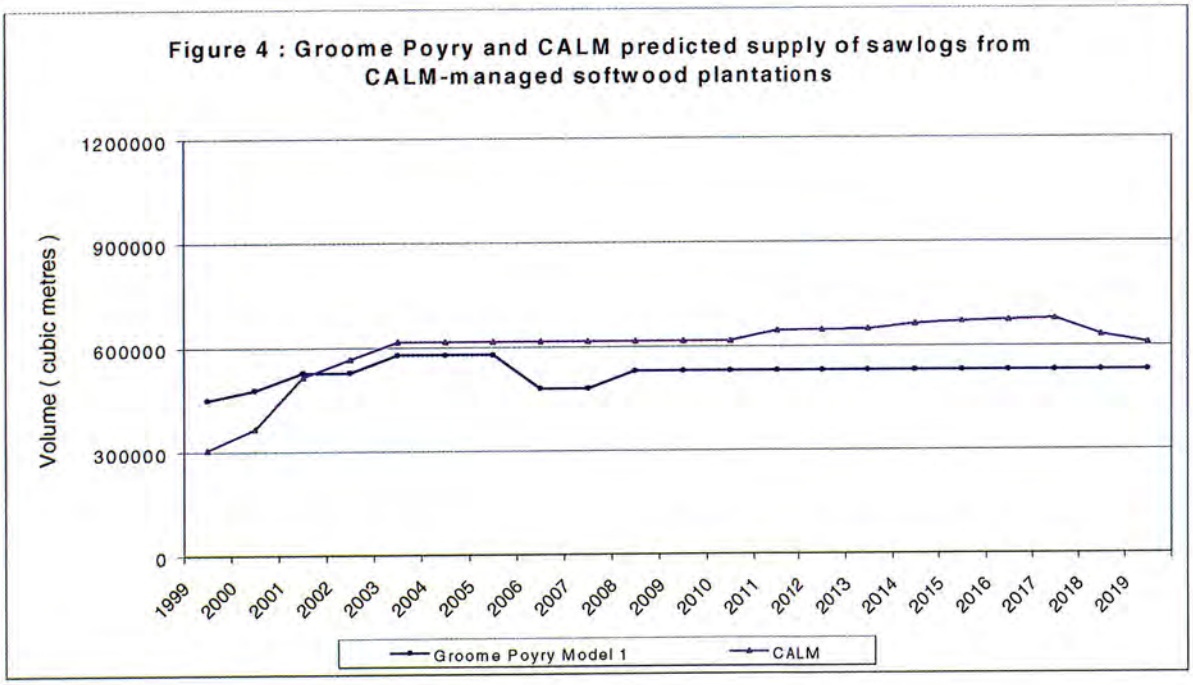
Clark's (1998) estimates are her most recent comprehensive analysis and indicate a sustainable yield that is 28% higher for sawlogs and 58% higher for chiplogs than the average of the NPI's yields. The largest difference between the NPI and Judy Clark is for the years leading up to 2005, for that period Judy Clark exceeds the NPI by 83% for sawlogs.

3. COMPARISON OF GROOME POYRY ESTIMATES WITH CALM'S RESOURCE ESTIMATES

An independent assessment of CALM's softwood resource projections was undertaken in 1997 by Groome-Poyry - an internationally recognised forestry consulting company. This review was undertaken on behalf of Wespine and Wesfi as part of a due diligence process, which was a prerequisite to further major investments in softwood processing in Western Australia.

Groome Poyry used advanced modelling systems and CALM's yield regimes to calculate the potential to meet sawlog commitments. They ran several models to examine options of achieving the supply goal. The supply shown in Figure 4 (below) is their base case. Groome Poyry did not include the Albany resource, hence the difference in projections between Groome-Poyry and CALM widens after 2014.

Figure 4 : Groome Poyry and CALM predicted supply of sawlogs from CALM-managed softwood plantations



* (Note the base Groome-Poyry case results in a higher projected yield than the CALM projections in the year 1999 to 2001 but at the expense of a reduction in yields relative to CALM's predicted yields in the periods 2005 to 2009. CALM and Wespine are currently working to derive a yield scenario that ensures the long-term maintenance of stable annual yields by examining various "smoothing" options.)

4. COMPARISON OF JUDY CLARK'S ESTIMATES OF THE PUBLIC SOFTWOOD RESOURCE WITH CALM'S ESTIMATES

Clark (1999) has separated her estimates of softwood sawlog resource from the private and the public sector. Table 7 provides a comparison between CALM's projections of sawlog availability and Judy Clark's various estimates.

Table 7: Comparison of Sawlog Yield Estimates for 2000 and 2005

	2000			2005		
	Public	**Private**	**Total**	**Public**	**Private**	**Total**
Clark 1	371,000	310,000	681,000	444,000	340,000	784,000
Clark 2	476,000	310,000	786,000	624,000	340,000	964,000
Clark 3	437,000	* 310,000	747,000	631,000	* 340,000	971,000
Clark 3a			800,000			800,000
Clark 4	570,000	201,000	771,000	570,000	201,000	771,000
CALM	366,000			616,000		
Groome-Poyry	478,300			578,300		
NPI			436,000			1,005,000

* Clark 3 did not separate public and private resource. It is assumed to be the same as Clark 1 as she uses the same productivity figures.

THE PRIVATE PLANTATION RESOURCE

CALM does not have access to any detailed inventory and growth data on privately-owned plantations in Western Australia. The information provided to the National Plantation Inventory from private growers was subject to a confidentiality clause.

Clark (1999) states that "Western Australia's public and private softwood plantations can supply a sustained yield of 800,000 cubic metres per annum". In the same paper, in Table 1, it is stated that the calculated average annual sawlog supply (first rotation) of privately-owned *P. radiata* plantations is 201,000 cubic metres per year. In previous papers she had estimated the private sustainable resource to be 310,000 cubic metres per annum in the year 2000 and 340,000 cubic metres per annum from the year 2005.

While detailed information on the capacity of private plantations to produce a sustainable supply of softwood sawlogs is not available to CALM, it is possible to make an assessment of the potential sustainable softwood log production from private plantations which is surplus to existing commitments by examining land areas, ownership, the age class distribution, and the response of the private growers to opportunities provided for processing their resource.

1. Accurate area stand age data is available from the National Plantation Inventory. An analysis of the area of private plantations potentially available for softwood sawlog production revealed:

The National Forest Inventory accurately identified the area of private plantations as	18,067 ha
Private plantations managed by CALM where the resource is already committed to Wespine	2,677 ha
Plantations owned by Bunnings and Wesfi which are committed to Wespine or Wesfi	5,633 ha
Plantations north of Perth and not readily accessible to existing manufacturing centres (estimate)	1,852 ha
Plantations east of Lake Muir and not readily accessible to existing manufacturing centres	623 ha
Balance potentially available to existing manufacturing centres	7,282 ha
Stands less than 18 years old at year 2000 and thus not producing significant quantities of sawlogs	1,982 ha
Potential area of plantations available for sawlog supply at year 2000	5,300 ha
Plantations less than 18 years of age at 2005	1,570 ha
Plantations potentially available for sawlog supply before 2005	5,712 ha

Note (1) Of the plantations nominated as being available for additional softwood sawlog resource, a proportion is currently being used to supply sawlogs to Wespine.

Note (2) A proportion of the plantations are being managed on shorter rotations for the production of poles and posts.

2. A measure of the capacity of the existing private softwood plantations to supply sawlogs can be obtained by examining the rate of private softwood sawlog production to existing manufacturing plants over the last four years (Table 8).

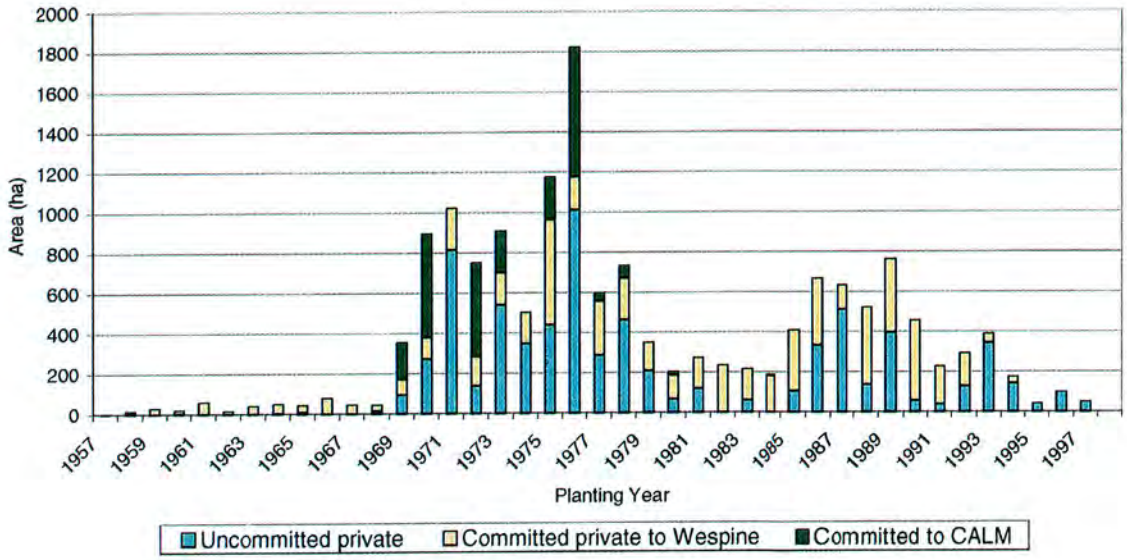
Table 8: Private property pine sawlog production (cubic metres) 1995-1998

1995/96	45,192
1996/97	42,944
1997/98	56,847
1998/99	63,053
Average	52,009

There are no Government restrictions on the sale of softwood sawlogs to existing manufacturing plants. In fact, CALM would welcome the contribution of private owners to the supply of softwood sawlog resource to existing manufacturing plants because it would assist CALM by relieving the current tight supply situation. CALM has also received several requests from private companies for additional softwood sawlog resource over and above their existing contracts. CALM has not been able to fulfil these requests because it is fully committed with existing contracts. If there is a potential to supply more than 300,000 cubic metres of softwood sawlogs from private resource it is difficult to understand why this resource has not been sold to private companies who, based on their requests to CALM, wish to purchase significant quantities of softwood sawlogs. Alternatively, if this quantity of sawlogs was available there is no legal or policy constraint on this resource being used to supply a new sawmill.

3. The National Forest Inventory does allow access to the age class distribution of private plantations. The age class distribution of plantations located within 150 kilometres of Bunbury (which is the major manufacturing centre for softwood and which is the region which contains the largest proportion of private softwood resource) is shown in Figure 5 below:

Figure 5: Private Pine Resource Age Structure within Economic Haul Distance to Bunbury



This graph demonstrates the significant proportion of private resource which is already committed. It also illustrates the spasmodic characteristics of private plantation establishment in Western Australia. There has been minimal establishment of softwood plantations by private growers in the last several years and no evidence that existing plantation owners are committed to re-establishing pine plantations after clearfelling.

As the rates of return on investment in short rotation (10 years) hardwoods grown for the production of wood fibre for paper pulp is approximately twice the rate of return on investment in softwoods, it is possible that private growers will not re-establish softwood plantations after they have been clearfelled.

4. Judy Clark, in her assessment of the productivity of private softwood plantations in Western Australia has assumed an MAI of 19 m^3/ha/yr. This figure is derived from a Resources Assessment Commission (1992) estimate which resulted from a survey of growers. There is no evidence that the estimate of MAI of 19 m^3/ha/yr was based on any measurements. Judy Clark also used yield schedules (Attachment 2) which projected significantly higher yields of sawlogs than those obtained from CALM-managed plantations but she does not cite the source of this data.

General observations on the private plantations estate in Western Australia indicate that many of the plantations have not received optimal thinning, pruning and fertiliser treatments.

CALM manages 2,677 hectares of private plantations on behalf of private owners. Table 9 below shows the average projected yields of softwood sawlogs per hectare from harvesting operations provided by a private plantation manager. These yields reflect the actual condition of these plantations. The yields of sawlogs determined from actual measurements (250 cubic metres) is significantly lower than the yield of sawlogs that Judy Clark has assumed of 363 cubic metres (Attachment 2).

Table 9: Projected private softwood yields (cubic metres per hectare)

	Age	Sawlogs	Industrial wood & pine rounds	Total
First thinning	15 - 18	0	80	80.0
Second thinning	23	21.5	52.8	74.3
Third thinning	27	51.9	35.0	86.9
Clearfell	31	176.7	38.0	214.7
		250.1	205.8	455.9
			MAI	14.7

Note: Based on private property harvesting plan prepared by independent manager, first thinning yields are CALM's estimate.

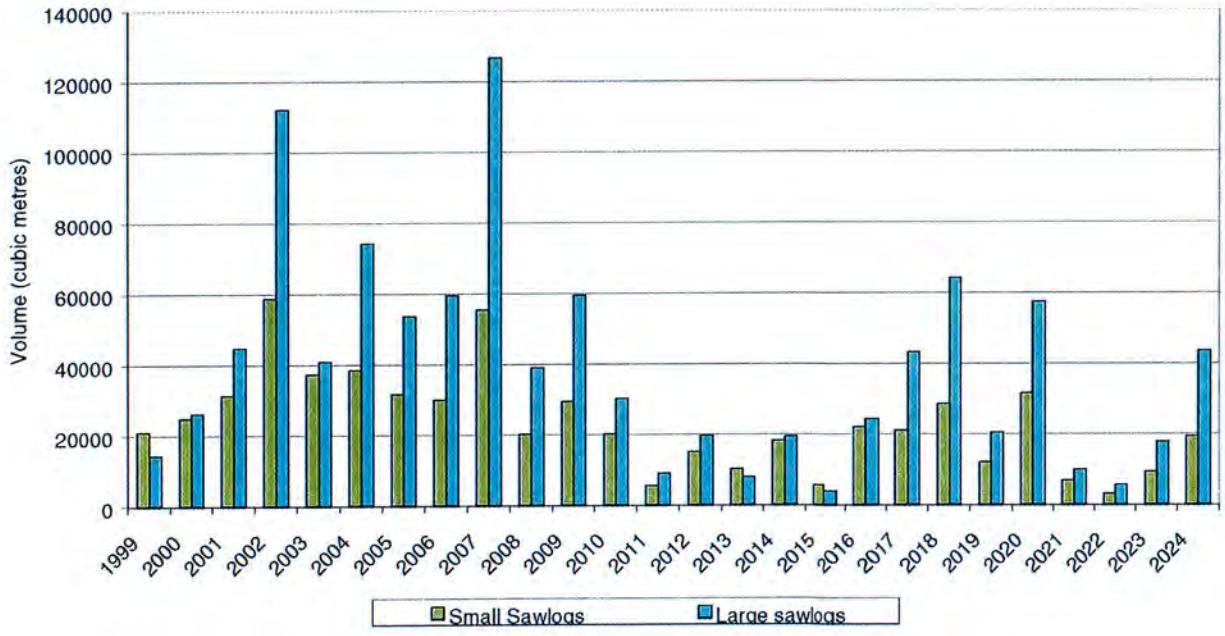
5. When Whittakers' softwood sawmill, which was located at Greenbushes, was operational its maximum intake was approximately 80,000 cubic metres per annum. Forty thousand cubic metres of this intake was supplied from publicly-owned plantations managed by CALM. The owners of the mill were constantly requesting additional resource from CALM. Hence it is reasonable to assume that they had exploited the availability of softwood sawlog resource from private plantations to the maximum.

6. A consortium of private growers recently proposed that they could access a continuous supply of pine log resource within 100 kilometres of Greenbushes at a rate of 60-70,000 cubic metres per annum as part of a proposal to re-establish a pine sawmilling facility at the Whittakers' Greenbushes mill which is in receivership. However, when the manager of the consortium was asked to verify this claim he was only able to identify with certainty 20,000 cubic metres, a proportion of which may already be committed to Wespine. The proponent also confirmed that this level of supply could only be sustained for six or seven years.

7. The same consortium was unable to access 18,000 tonnes of softwood chiplogs from the private estate to meet a requirement to fill a boatload of woodchips. CALM was requested to supply up to 10,000 tonnes to fill the amount contracted.

8. If the uncommitted private plantations in the Dardanup supply area were collectively managed and yielded the timber quantities shown in Table 9, the projected sawlog yield would be as shown in Figure 6.

Figure 6: Projected annual yield of small and large sawlogs from uncommitted private plantations (7,282 hectares) in the Bunbury supply area 1999 - 2024



SUMMARY

While it is not possible to precisely estimate the softwood sawlog production capacity of private plantations it is probable that the maximum production is in the range of 50-60,000 cubic metres per year. A proportion of this resource is already being supplied to existing manufacturing centres.

It can be seen from both the age, area distribution (Figure 5) and volume projections (Figure 6) that there has not been sustained planting of private pines. Currently private pine plantation establishment is negligible and it is uncertain whether existing plantations will be re-established after final harvesting. Therefore it is questionable whether the level of softwood sawlog supply which could be produced from private plantations will be sustained for periods sufficient to attract investment in processing facilities.

DEFICIENCIES IN JUDY CLARK'S ANALYSIS OF SOFTWOOD LOG RESOURCE PROJECTIONS

Judy Clark has made a number of serious technical errors in her analysis of the availability of softwood sawlogs in Western Australia.

1. **The "stockpile"** The most serious and simple error that Judy Clark has made is to assume that all trees must be harvested at the nominal rotation age and that if they are not they constitute a surplus of resource which is immediately available. This ignores the fact that it is essential to provide a uniform supply of softwood sawlogs of sufficient size and quality for periods in excess of ten years to softwood manufacturing centres if the investment in such centres is to be justified. Consequently it is essential that the annual supply of softwood sawlogs is smooth to achieve a stable sustainable long-term sawlog yield.

   Figure 2 shows how this has been achieved for the public pine plantation resource in Western Australia. In this figure the contribution of stands which are older than the nominal harvest age are shown. This clearly demonstrates that no surplus of softwood sawlogs exists in Western Australia because the contribution of those stands which are older than the nominal rotation age are **already** factored into the resource projections. It is also important to note that pine trees do not stop growing at their nominal rotation age.

   It is of concern that Judy Clark, who is a Visiting Fellow of the Centre for Resource and Environmental Studies at the Australian National University, appears to be advocating a non-sustainable approach to softwood plantation management. She appears to be advocating that the plantation be mined for short-term gains. If CALM was to adopt Judy Clark's approach there would be a significant increase in softwood sawlog production in the next two or three years but this would be at the cost of significant reductions in softwood sawlog production in latter years.

   Smoothing of the year-to-year resource availability would not be necessary if there was a regular progressive planting program. In the case of public softwood plantation estate irregularities in year-to-year planting rates in part resulted from variations in the

availability of public finance. But strong opposition to the establishment of softwood plantations from some elements of the community (including elements that today are criticising CALM because of its perceived inability to supply softwood sawlogs) was another factor which made it difficult to sustain a regular softwood planting program. For example, in 1984 a paper widely distributed in the south-west of Western Australia made many adverse comments on the Government's softwood plantation establishment program.

"Throughout the south-west there is an immense quantity of marri which could be considered as a prospective resource. Old forest trees would be suitable for the composite technique outlined above. Young trees could be grown in plantations. The timber is an attractive pale colour, and works comparatively easily for a hardwood.

If we were to make the effort to increase our hardwood timber availability, the need for investment in softwood plantations would be greatly diminished. Of course it will always be desirable to produce a certain quantity of pine for those timber needs for which the native hardwoods are unsuited.

Yet generally speaking it would be better to give preference to native forest because:

* *native forest has conservation value*
* *it is cheaper to use our present forest to full capacity than to buy land for pines*
* *pine plantations compete with agriculture for the most valuable farming land in WA.*
* *native forests can survive bush fires and pose less danger to local communities."*

Andrew Thamo and Christine Sharp (1984)..

There was even significant opposition from some individuals and community groups to CALM's innovative timber sharefarming scheme which has been one of the reasons why there has been a massive expansion in the establishment of tree crops on farms in Western Australia (Attachment 7).

2. Judy Clark has used growth rates for both public and private plantations that are in error or have been used without any citing of the scientific basis for them. For example, in her analysis of *P. pinaster* plantations she has used mean annual increment figures of between 10.5 and 13 cubic metres per hectare per annum. Her justification for the use of 13 cubic metres per hectare per annum for *P. pinaster* plantations appears to be based on verbal advice from a CALM research officer who made it clear to her that the figure he was providing related to research plots which contained trees which were the result of an intensive tree improvement program. CALM is confident that these rates of growth can be applied in its current plantings but a large proportion of existing *P. pinaster* plantations have trees which have not been genetically improved.

The mean annual growth of 19 cubic metres per hectare per annum that Judy Clark has applied to private plantations was based on surveys. There is no evidence provided to substantiate the yield schedules she has used for private *P. radiata* plantations and they are significantly higher than those used by CALM for publicly-owned plantations and yields calculated independently for private plantations.

3. Judy Clark has used a very simplistic stratification of the plantations when predicting yield. Judy Clark acknowledges this in her letter to CALM of 6 March 1991 which requested the data on which she subsequently claims is the basis for her resource projections which have been used to advocate a major increase in softwood sawlog processing capacity in Western Australia:

"I am seeking <u>average</u> data for State P. radiata and P. pinaster plantations which could be derived by either averaging the information for each plantation region or providing details for a region which CALM considers is an average yielding plantation. I <u>understand the limitations of this approach</u> but I think this level of aggregation will be satisfactory for my exercise. If you consider there is little difference in the yield and management practices of P. radiata and P. pinaster then I have no problems with aggregating the information if this makes it easier." (our emphasis)

Notwithstanding the "limitations of this approach" Judy Clark has applied nominal yield schedules which can be, and more frequently, are different from the actual yield that is derived from particular areas of plantations. For example, until 1989 there were few markets for small size logs in the northern *P. pinaster* plantations. As a consequence of the need to thin plantations to improve growth and to accommodate the need to reduce stand densities to increase water through-flow to the Gnangara underground water mound, significant areas of this plantation were thinned to densities significantly lower than what would achieve optimum wood production. By applying a limited number of schedules (six) over the whole plantation estate Judy Clark ignores these variations in stand conditions which have a major impact on sawlog yield. In contrast, as described above, CALM's projections are based on detailed stratification of the plantation estate (see Attachment 4) which takes into consideration not only variations in growth but variations in stand characteristics. CALM's computer scheduling use more than 500 individual sawlog yield schedules.

Similarly Judy Clark has not allowed for the variations in stand characteristics within the private plantation estate. A significant proportion of these plantations are overstocked and many are committed to yield schedules designed to produce short rotation fencing material, not sawlogs.

4. Judy Clark's simplistic "whole of plantation approach" also ignores the importance of species and log quality mix and the effect of transport distance on the delivered cost of wood.

5. Judy Clark's method of calculating the average long-term sustainable yield for plantations is simplistic in the extreme. Given the irregular age class distributions of both the public and particularly the private estate, it is not possible to obtain a realistic long-term sustainable sawlog production figure by a simple averaging process.

6. If investments in major softwood processing facilities are to be achieved, growers must be able to demonstrate the capacity to sustain the supply of resource for periods in excess of 20 years. This requires a commitment to sustained planting and/or replanting of plantations. Judy Clark's analysis of the private plantation resource does not provide any evidence of new private plantings or a commitment of private owners to the re-establishment of pine plantations after clearfelling.

SOFTWOOD SAWLOG COMMITMENTS TO CURRENT AND FUTURE PROCESSING UNITS

Attachment 6 lists the current softwood industry units in Western Australia which have contracts with CALM to supply softwood sawlogs and residue logs.

The major softwood processing facility in Western Australia is located at Bunbury and is owned by Wespine. More than a decade ago a decision was made by the Government to favour the establishment of a large internationally competitive softwood sawmill. This decision was made in the knowledge that wood is now an internationally traded commodity and that any local processing facility would have to compete with large softwood sawmills in New Zealand and Australia which, because of their scale would be highly competitive. Consequently CALM has been focussed on progressively increasing the intake to the Wespine mill to the prescribed contracted amount (which is backed by State legislation) to ensure that this mill will be internationally competitive. In the near future it is expected that Wespine will commit to another major expansion of the mill which will have significant local benefits to south-west communities. However, even though intake to the mill will be progressively increased it is not anticipated that there will be significant increases in employment in the mill. This is because the mill is designed to be highly mechanised to achieve the efficiencies necessary to compete on the world market.

As a consequence of the Government's decision to progressively convert the Gnangara pine estate to a regional park over a period of 25 years and its concurrent decision to commit to a major expansion of CALM's *P. pinaster* tree crops on farms program three years ago, sufficient resource to provide the feedstock requirements for a Laminated Veneer Lumber plant became available. CALM has been negotiating for three years with a major overseas forest company (who is in the process of forming a joint venture with a Western Australian company) to establish a Laminated Veneer Lumber plant in Western Australia. This will result in an investment of $60-80 million and will employ between 120 to 150 persons. The Western Australian Government has authorised the commitment of resource to this project.

The only unallocated softwood resource in Western Australia is located in the Albany region. This resource was established by CALM in the mid-1980s to demonstrate the capacity of this region to support a major tree crop industry. The resource is still immature but some stands have reached the first thinning stage. In 1996 CALM attempted to attract a major investment from an overseas company into an Oriented Strandboard Plant based on this resource and to be located at Mt Barker. The strategy was to continue the development of forestry and a forest industry in the Albany region which has developed into a major tree crop area. This initiative failed principally because there was insufficient resource to justify the large investment required.

A further attempt was made to attract a processing industry to Albany in 1997 via a public tender process. A number of companies expressed interest in the resource but it was judged at the time that all of these proposals would not have maximised the value-adding potential of the resource. Consequently further attempts to attract industry have been deferred until the program to establish a large maritime pine resource north of Mt Barker is more advanced. When this occurs it is more likely that a major factory can be attracted to process softwood resource in the Mt Barker/Albany region because a proponent will be confident that a long-term (>20 years) resource will be available.

In contrast, Judy Clark has claimed that there is sufficient resource available immediately to initiate a major expansion of softwood processing facilities in Western Australia (Clark 1998) -

"Plantation processing opportunities

Western Australia's maturing plantation estate presents a major manufacturing industry growth opportunity. From a wood resource perspective this output expansion is possible now. The estimated 1.2 million cubic metre plantation sawlog stockpile (equal to four years plantation sawlog harvesting at the current level) can be progressively drawn down by 2005 when plantations will be fully on stream.

The existing plantation estate could support all of the opportunities, in aggregate (they are not either/or options), listed below. Which projects are realised will depend largely on commercial factors and the investment environment created by government.

- *Wespine radiata pine plantation sawmill at Dardanup expands to its planned 400,000 m^3 per annum log input.*
- *New radiata pine sawmill with 180,000 m^3 per annum log input – producing speciality sawntimber for further processing and possibly integrated with new 80,000 m^3 per annum veneer and LVL mill.*
- *New pinaster plantation sawmill processing 140,000 m^3 per annum of logs.*
- *Hardwood plantation sawmill (in existing native forest mill) – processing 24,000 m^3 per annum of logs.*
- *Wesfi particleboard plant wood input increased by 80,000 m^3 per annum to bring to world scale.*
- *New high density fibreboard plant processing 230,000 m^3 per annum of softwood and hardwood plantations (may need additional plantation supply of about 3,000 hectares in total to bring the plant to world scale)" Clark (1998)."*

CALM is committed to the establishment of major timber industry manufacturing facilities in Western Australia. An essential prerequisite to the establishment of new or expanded timber manufacturing industries in Western Australia, however, is the provision of a long-term secure and sustainable log resource. Judy Clark has not provided any evidence that would be accepted by any company or private individual that there is resource available to supply the new industrial processing facilities she is proposing. Nor has Judy Clark demonstrated she has any understanding of industry structure, composition and existing contractual arrangements in Western Australia.

FUTURE SOFTWOOD ESTABLISHMENT

Currently there is minimal investment by the private sector in softwood plantations. This contrasts with investment in short rotation *Eucalyptus globulus* plantations which has resulted in the establishment of a *Eucalyptus globulus* estate in excess of 105,000 hectares in less than ten years. A significant reason for the success of the *Eucalyptus globulus* tree crop industry was the decision by CALM to establish extensive tree crops on farms in the 1980s and its success in attracting major Japanese and Korean end users of *Eucalyptus globulus* wood fibre to invest in Western Australia.

In 1994, the Western Australian Government endorsed a program by CALM to extend the concept of the "tree crops on farm" program to the drier regions (400-600 mm) of the agricultural regions as part of the major State Salinity Strategy. The Western Australian Government has given formal approval to CALM to establish 150,000 hectares of *P. pinaster* (maritime pine) on farms in this rainfall zone over the next decade. Seven thousand hectares of *P. pinaster* have already been established on cleared farmland. It is anticipated that this program will be expanded, if private sector funding can be attracted to achieve a planted area of maritime pine in excess of 600,000 hectares by the year 2020 (Shea 1998). CALM's recent success in attracting major resource and energy company investments in the planting projects as part of the greenhouse amelioration strategies has significantly increased the probability that private investment into softwood tree crops will form a major component of the softwood plantations program in Western Australia (Shea *et al.* 1998). CALM will this year complete a several million dollar expansion of its Manjimup nursery. It is anticipated that 40 million tree seedlings will be produced in this nursery in 2000. The nursery will have the capacity to produce more than 50 million seedlings, making it one of the largest in the world.

CALM is confident that these planting targets are achievable and are in fact being achieved. Over 30,000 hectares of new tree crops are being established each year in Western Australia by the public and private sectors. CALM will establish 10,000 hectares of *P. pinaster* (maritime pine) on cleared agricultural next year. If these planting rates are sustained by the year 2020, in excess of 13 million cubic metres of wood fibre per annum will be produced on a sustainable basis in Western Australia.

In the short-term, however, the State must depend on plantations and tree crops that have been established (principally by the Government) more than 20 years ago for its supply of softwood sawlogs. All of the existing softwood sawlog production (except that from plantations in the Albany region) over the next 20 years from the public estate is committed.

CONCLUSION

Judy Clark's analysis of the availability of softwood sawlogs within Western Australia is seriously flawed. Her different analyses of softwood sawlog availability are contradictory. Her method of analysis is simplistic (which she acknowledges) in the extreme and contains serious errors of fact. There is no stockpile of "surplus" softwood sawlogs in Western Australia and Judy Clark's estimate of sawlog supply are grossly exaggerated. All of the existing supplies of softwood sawlogs from publicly owned plantations (except for plantations in Albany) are fully committed.

CALM's method of projection of softwood sawlog resource has been independently reviewed and is one of the most sophisticated inventory systems in Australia.

Judy Clark's projections of the availability of softwood sawlogs from Western Australian private plantations does not accord with reality and is also based on simplistic methodology. If the level of softwood resource that Judy Clark projected is available from private plantations it is difficult to understand why the owners of these plantations have not been able to either organise their own manufacturing facility or sell into the existing market for softwood sawlogs which, based on requests that CALM receives for softwood resource, is under-supplied.

It is regrettable that the projections that have been made by Judy Clark have been used to discredit CALM's management of the public sector resource and to raise the hopes of unemployed timber workers that there will be readily available jobs in the softwood industry because of the existence of surplus sawlog resource.

Judy Clark has been invited to discuss the deficiencies in her analysis and to examine CALM's data and modelling system. She has never taken up these offers. Alternatively, as Judy Clark, who has no formal training in forest mensuration or yield regulation, could have been alerted to the deficiencies in her analysis if she had walked across the Australian National University campus and discussed her methodology with the experts that are employed on the academic staff in the University's Department of Forestry.

Given the serious and obvious deficiencies in the papers that Judy Clark has published, questions must be asked about the peer review process that operates in the Centre for Resource and Environmental Studies at the Australian National University.

REFERENCES

CALM, (1996). *1995/1996 Annual Report.* Department of Conservation and Land Management, Western Australia.

CALM, (1998). *1997/1998 Annual Report.* Department of Conservation and Land Management, Western Australia.

Clark, J. (1995). *Australia's Plantations: Industry Employment Environment.* Environment Victoria Inc., North Melbourne.

Clark J. and Morris, P. (1995). *Western Australia – Plantations and processing industry.* Working Paper.

Clark J. (1997). *An Appraisal of the NPI wood supply projections for WA.* Unpublished report.

Clark J. (1998). *Investment in plantation processing – The overriding goal for the wood and wood products industry.* Presentation notes.

Clark J. (1999). *Resolving the differences between CALM and Clark on Western Australia's softwood plantation sawlog supply.* Unpublished report.

Groome-Poyry (1997). *Wesfi: Update of Resource Strategy Study.* Unpublished report

National Plantation Inventory (1997). *National Plantation Inventory of Australia.* Bureau of Resource Sciences, Canberra.

Resource Assessment Commission (1992). *A survey of Australia's Forest Resource.* Australian Government Publishing Service, Canberra.

Shea, S.R. (1998). *Western Australia's Development and Future Prospects for Tree Crop Industries.*

Shea, S.R. *et al.* (1998). *The Potential for Tree Crops and Vegetation Rehabilitation to Sequester Carbon in Western Australia.*

Thamo, A. and Sharp, C. (1984). *Trees for the Future.* A discussion on pine plantations, native forests and farm tree plantings.

Turner, B. (1998). Extracted and adapted from *An appraisal of methods and data used by CALM to estimate wood resource yields for the South-West Forest region of Western Australia.* Commonwealth and RFA Steering Committee Report.

Vanclay (1994). *Modelling Forest Growth and Yield: applications to Mixed Tropical Forests* Oxford, England, CAB Int.

Transcript

Station:	ABW2	Date:	20/08/99
Program:	NEWS	Time:	1900
Compere:	ALISON HEMBROUGH	Slip ID:	P59950003

Item: **CLAIMS THAT THOUSANDS OF HECTARES OF MATURE SOFTWOOD ARE BEING LEFT ON THE GROUND WHEN THEY COULD BE BEING USED TO REVITALISE WA'S TIMBER INDUSTRY.**
INTV: JUDY CLARK, ANU ECONOMIST
INTV: CHERYL EDWARDES, ENVIRONMENT MINISTER

Demographics:	Male 18+	Female 18+	All people	ABs	GBs
	0	0	0	0	0

Alison HEMBROUGH: There are claims tonight thousands of hectares of mature plantation softwood are being left in the ground when the timber could replace 80% of WA's hardwood requirements.

A Canberra based economist says such a move would create 800 new jobs but the Government says the academic's figures are wrong.

Tom BADDELEY: Last month before he's about turn on the Regional Forest Agreement Premier Richard Court sought the advise of Australian National University Economist, Judy Clark.

Ms Clark has remained silent throughout the debate until yesterday when her credibility came under public fire.

Wilson TUCKEY: She is using arithmetic to prove her prejudice, she's an economist and has nothing of a technical background in forestry.

BADDELEY: Ms Clark claims 320,000 cubic metres of softwood saw logs are produced in WA plantations each year but more than double that is available, enough to replace 80% of the State's hardwood requirements.

Judy CLARK: There's - there's something in the order of 800 jobs potentially available from pro - processing the existing softwood plantation resource in - in Western Australia, and as I said, that resource is sitting there now.

BADDELEY: Ms Clark says the Government has been guilty of propping up the native timber industry and must help develop plantation alternatives.

CLARK: It's just a sensible policy position. I'm calling for a very significant increase in investment to process that plantation resource.

BADDELEY: But the Environment Minister rejects the claims.

Cheryl EDWARDES: We don't have that amount of timber that's available, we wish we did. It's a differentiation on how much resource you can actually get out of one tree.

BADDELEY: However, Ms Clark is standing by her research.

CLARK: Absolutely nothing have I received to suggest any revisions downwards whatsoever in the wood volumes that I'm projecting.

Tom Baddeley, *ABC News*.

* * END * *

Yield schedules used in Clark 1 (from Clark and Morris, 1995)

1. Publicly–owned *P. radiata* Yield (cubic metres per hectare)

Site	Activity	Sawlogs	Small Logs	Chiplogs
High quality blackwood	First thinning	0	0	90
	Second thinning	40	20	40
	Clearfell	300	25	20
	Total	340	45	150
Average quality blackwood	First thinning	0	0	80
	Second thinning	25	20	40
	Clearfell	250	20	20
	Total	275	40	140
Steep slopes	First thinning	0	0	110
	Clearfell	360	25	30
	Total	360	25	140
Sunklands & coast	First thinning	0	0	30
	Second thinning	5	5	25
	Third thinning	25	20	20
	Clearfell	200	30	25
	Total	230	55	100

2. Publicly-owned *P. pinaster* Yield (cubic metres per hectare)

Site	Activity	Sawlogs	Small Logs	Chiplogs
ALL SITES	First thinning	0	0	85
	Second thinning	0	44	36
	Third thinning	14	28	28
	Clearfell	86	29	100
	Total	100	101	249

3. Privately-owned *P. radiata* Yield (cubic metres per hectare) – data source unknown

Site	Activity	Sawlogs	Small Logs	Chiplogs
	First thinning	0	0	96
	Second thinning	43	21	43
	Clearfell	320	27	21
	Total	363	48	160

Yield schedules used in Clark 2, *P. radiata* schedules as for Clark 1

Publicly-owned *P. pinaster* Yield (cubic metres per hectare)

Site	Activity	Sawlogs	Small Logs	Chiplogs
	First thinning	0	0	90
	Second thinning	50	0	40
	Third thinning	50	0	30
	Clearfell	160	0	100
	Total	260	0	260

Yield schedules used in Clark 3 (from Clark 1997)

Publicly-owned *P. radiata* Yield (cubic metres per hectare) – average of CALM data

Site	Activity	Year from Planting	Sawlogs	Chiplogs	Total
	First thinning	12	0	70	70
	Second thinning	20	27	53	80
	Clearfell	30	265	35	300
	Total		292	158	450

Publicly-owned *P. pinaster* Yield (cubic metres per hectare)

Site	Activity	Year from Planting	Sawlogs	Chiplogs	Total
	First thinning	14	0	86	86
	Second thinning	21	42	36	78
	Third thinning	29	42	28	70
	Clearfell	40	116	100	216
	Total		200	250	450

CALM Yield schedules on a stand - by - stand basis

Year of operation	District	Plantation	Planting Year	Species code	Terrain	Operation planned	Area of operation	Stand code	Initial stocking	Stocking after operation	Vol/ha for S1 sawlogs	Operation volume for S1	Vol/ha for S2 sawlogs	Operation volume for S2	Vol/ha for S4	Operation volume for S4	Volume/ha for industrial wood	Operation volume for industrial wood
2002	WANNEROO	GNANGARA	1971	0	F	T1	0.9	1NN710F1	600	400	4.2	3.8	11.3	10.1	13.1	11.8	8.9	14.1
2007	WANNEROO	GNANGARA	1971	0	F	T2	0.9	1NN710F1	400	200	4.3	3.8	8.8	7.9	10.2	9.2	5.9	9.9
2010	WANNEROO	GNANGARA	1971	0	F	T3	0.9	1NN710F1	200	100	4.6	4.1	7.5	6.8	8.8	7.9	4.2	7.5
2015	WANNEROO	GNANGARA	1971	0	F	CF	0.9	1NN710F1	100		9.3	8.4	14.0	12.6	16.4	14.7	6.2	12.3
2004	WANNEROO	GNANGARA	1971	1	F	T2	37.1	1NN711F1		150	4.5	167.0	11.1	411.8	13.0	481.4	8.5	314.4
2010	WANNEROO	GNANGARA	1971	1	F	T3	37.1	1NN711F1	150	75	5.2	192.0	9.4	347.8	11.0	406.2	5.8	214.3
2022	WANNEROO	GNANGARA	1971	1	F	CF	37.1	1NN711F1	75		11.3	420.2	17.0	631.6	19.9	737.4	8.0	297.7
1998	WANNEROO	GNANGARA	1971	1	F	T1	7.2	1NN711F2	510	350	3.2	22.7	12.2	88.0	14.3	102.6	11.2	80.5
2004	WANNEROO	GNANGARA	1971	1	F	T2	7.2	1NN711F2	350	150	4.2	30.2	10.4	75.1	12.2	87.5	8.0	57.2
2010	WANNEROO	GNANGARA	1971	1	F	T3	7.2	1NN711F2	150	75	5.3	37.8	9.5	68.6	11.1	79.9	5.9	42.7
2022	WANNEROO	GNANGARA	1971	1	F	CF	7.2	1NN711F2	75		12.1	86.9	18.2	130.7	21.2	152.8	8.6	62.1
1998	WANNEROO	GNANGARA	1971	1	F	T1	5.2	1NN711F3	730	350	0.0	0.0	0.0	0.0	25.8	134.2	20.2	157.8
2004	WANNEROO	GNANGARA	1971	1	F	T2	5.2	1NN711F3	350	150	6.4	33.2	15.9	82.7	18.5	96.3	12.2	112.5
2010	WANNEROO	GNANGARA	1971	1	F	T3	5.2	1NN711F3	150	75	7.0	36.3	12.8	66.3	14.9	77.2	7.9	78.6
2022	WANNEROO	GNANGARA	1971	1	F	CF	5.2	1NN711F3	75		14.9	77.2	22.4	116.2	26.0	135.3	10.6	117.5
1998	WANNEROO	GNANGARA	1971	1	F	T1	10.7	1NN711F4	500	350	1.7	17.7	6.5	69.0	7.5	80.3	5.9	62.6
2004	WANNEROO	GNANGARA	1971	1	F	T2	10.7	1NN711F4	350	150	2.7	28.9	6.6	70.6	7.7	82.7	5.0	53.8
2010	WANNEROO	GNANGARA	1971	1	F	T3	10.7	1NN711F4	150	75	3.7	39.3	6.7	71.4	7.8	83.5	4.1	44.1
2022	WANNEROO	GNANGARA	1971	1	F	CF	10.7	1NN711F4	75		9.0	96.3	13.5	144.5	15.8	168.5	6.4	68.2
2004	WANNEROO	GNANGARA	1971	1	F	T2	1.3	1NN711F9			5.1	6.6	12.8	16.6	14.9	19.3	9.8	12.7
2010	WANNEROO	GNANGARA	1971	1	F	T3	1.3	1NN711F9			6.0	7.8	11.0	14.3	12.8	16.7	6.8	8.9
2022	WANNEROO	GNANGARA	1971	1	F	CF	1.3	1NN711F9			13.6	17.6	20.3	26.4	23.7	30.8	9.6	12.5
2004	WANNEROO	GNANGARA	1972	1	F	T2	0.3	1NN721F1		150	5.5	1.6	14.6	4.4	17.1	5.1	11.6	3.5
2010	WANNEROO	GNANGARA	1972	1	F	T3	0.3	1NN721F1	150	75	7.3	2.2	14.1	4.2	16.4	4.9	9.2	2.7
2023	WANNEROO	GNANGARA	1972	1	F	CF	0.3	1NN721F1	75		17.9	5.4	27.0	8.1	31.5	9.5	13.6	4.1
1998	WANNEROO	GNANGARA	1972	1	F	T1	16.2	1NN721F2	537	350	4.1	65.6	17.9	290.4	20.9	339.0	16.9	273.4
2004	WANNEROO	GNANGARA	1972	1	F	T2	16.2	1NN721F2	350	150	5.3	86.3	14.3	230.9	16.6	268.5	11.3	183.5
2010	WANNEROO	GNANGARA	1972	1	F	T3	16.2	1NN721F2	150	75	6.4	103.3	12.4	200.5	14.4	233.3	8.0	130.0
2023	WANNEROO	GNANGARA	1972	1	F	CF	16.2	1NN721F2	75		15.2	246.6	22.9	370.6	26.7	432.5	11.5	185.9

Attachment 4

WOOD FLOW ESTIMATES

This report provides the most comprehensive up-to-date broad wood flow forecasts for plantation timber, by major species and product class, at the national and regional levels, for the period 1995 to 2039. The figures, provided in five-year forecast intervals, are based mainly on growers' estimates of expected wood flows from their plantations and their expectations of their future planting rates.

Approximate and broadly average wood flows for each region, based on grower information:

- enable comparisons to be made between regions;
- allow individuals to compare their productivity with the average; and
- provide a range of users and investors with some standardised estimates of the yield coming from each region.

The NPI does not attempt to identify all details that affect wood flow, nor provide wood flow details of individual growers.

The forecasts are reported at the national level by softwood/hardwood and product, and at the regional level by major species and product, on pages 79 to 94. Wood flow estimates were not available for the Northern Territory region.

The national figures indicate the forecast wood flow for softwood to gradually increase from approximately 10.5 million cubic metres a year in the 1995-99 period, to 13.2 million cubic metres a year by 2035-39. For softwoods, the national figures indicate the production of pulpwood is forecast to be around 4.8million hectares a year in the 1995-2004 period, and then plateau at around 3.8 million hectares a year from 2005 until 2039, the end of the forecast period. Softwood sawlog production will steadily increase from five and a half million cubic metres a year, to plateau between approximately 8.5 and 9 million cubic metres a year from 2020 to 2039. Softwood veneer is forecast to increase from 175,000 cubic metres a year to around 340,000 cubic metres a year in the 2030s.

The national wood flow estimates for hardwood indicate a steep increase in yield over the 45 year forecast period. While 692,000 cubic metres a year are forecast in the 1995-99 period, nearly 10.5 million cubic metres a year are forecast in the final five-year period, 2035-39. The forecast production of hardwood pulpwood will increase 15-fold over the duration of the forecast period from 687,000 cubic metres a year to 10.3 million cubic metres a year. Hardwood sawlog volumes are forecast to increase 24-fold from 5,000 cubic metres a year in the 1995-99 period to 120,000 cubic metres a year in the 2010-14 period, and are then expected to plateau until 2039.

Method

To enable regional wood flows to be calculated, growers were asked to provide estimates of future yield from their resource by product class (saw log, pulp log, veneer log) together with an outline of their broad management intentions including proposed new (first rotation) plantings. Academics from the Department of Forestry of The Australian National University acted as independent consultants in the preparation of forecast wood flows. While almost all major growers and many medium sized growers provided wood flow forecasts (representing approximately 80 per cent of the resource (B.J. Turner personal communication, 1997, Australian National University)), most small growers otherwise contributing to the NPI were unable to do so. To resolve this data gap, the consultants derived Indicative Yield Tables (IYTs) using yield information supplied to the NPI, in conjunction with independent information, professional judgement and consultation with appropriate regional industry contacts. A number of likely management regimes and yields were provided in the IYTs for most regions.

Comments were sought from major growers on how well the IYTs matched their own plantation yield estimates and their broader knowledge of the region. In conjunction with actual wood flow figures provided to the NPI, the refined tables were used with planting figures current to 1994, to estimate regional wood flows.

In calculating the yields, the consultants tried to incorporate market conditions and silvicultural regimes used in the regions.

Assumptions and Limitations

The wood flow forecasts provided by growers were produced in early 1996. They are based on the growers' respective assumptions which related to existing and perceived markets, wood prices and to the silvicultural management of the growers' respective plantations. Thus, it must be recognised that wood flow estimates are indicative and based on a snap-shot in time.

In general, calculated wood supply from each

region is dominated by the large owners who supplied their own forecasts. The consultants accepted that the owners knew best what their forests can produce. The consultants therefore used these estimates without modification. In some cases, where the estimates did not cover the full time period of this report, they extended them up to 2039. This was with the assumption that past trends will continue.

The figures incorporate the owners' current plans for expansion of their estates but do not take into account potential expanded planting rates through government initiatives such as the Plantations 2020 Vision (Anderson 1996), which has the objective of trebling the area of plantations by the year 2020.

In calculating the additional, and in some cases significant, supply from smaller owners the consultants believed the following gave the most realistic estimates:

- the consultants assumed thinnings would be carried out on time; and
- the consultants attempted to keep the clear felling age as close as possible to the optimum age stated by forest owners in the region, although some deviation from the ideal yield pattern was allowed where age distributions were highly irregular. This was based on the assumption that it is desirable for yields to occur in more or less regular quantities in each time period, generally increasing in future years as demand increases with time.

The regional wood flow estimates provided in this report present only one scenario. Others scenarios based on a number of defined management strategies are also possible. For this study the consultants recognised that information to do this was not available at a level of accuracy comparable with the owners' own calculations.

Reliability

The reliability of the forecasts is difficult to determine. The NPI was not provided with error estimates by those growers who used their own growth models to produce the predicted future volumes. Where only area and age-class information were provided, and a mix of existing yield models and expert knowledge were used to estimate volume forecasts, error estimates were not possible.

Further information is available in the report 'Forecasting of Wood Flows from Australia's Plantations' (Turner and James 1997).

Current Contracts and Supply for Softwood Products and Projected Supply in 2010

Customer	Product	Planned 1999/2000 supply from CALM (cubic metres or tonnes)	Current Contractual supply (cubic metres or tonnes)	Expiry Year	Projected supply at 2010 (cubic metres or tonnes)
Wespine	Autoscan logs	200,000	5.5 – 6 million cubic metres over 20 years	2012	380,000
Wesfi	Industrial wood	175,000	4.5 million cubic metres over 12 years (includes sawmill residue)	++ 2000	200,000
Wesfi	Pine chips	70,000		++ 2000	110,000
Pinetec	Second grade sawlogs	2,500	2,500	2009	2,500
Pinetec	Small sawlogs	52,500	52,500	2006/2009	52,500
Western Case and Joinery	Small sawlogs	5,000	5,000	2004	5,000
Pempine	Second grade sawlogs	6,000	6,000	2009	6,000
Pempine	Small sawlogs	10,000	10,000	2009	10,000
Timber Treaters	Pine rounds	* 5,000	1,200	1999	5,000
Koppers Timber Preservation	Pine rounds	* 7,000	5,000	1999	5,000
Bunning Forest Products	Pine rounds	* 7,000	5,000	1999	5,000
Whittakers	Industrial logs	0	30,000	1999	0
Western Pine Associates	Sawlogs	# 0	20,000	2000	0
Under negotiation	LVL logs	+ 0	** 160,000	-	160,000

Note: These projections extend beyond the term of some existing supply contracts and are not intended to infer anything about future contracts.

* currently being retendered
\# in resource projection 20,000 cubic metres was included but now not being supplied due to closure of mill
\+ originally projected to commence operations in 2000 (subject to negotiation)
** Cabinet directive
++ currently being renegotiated

BUSSELTON/MARGARET RIVER TIMES - 1 FEBRUARY, 1990

CALM sharefarming plan 'financial disaster': Shultz

THE Conservation and Land Management Department's new sharefarming scheme has been labelled a financial disaster for taxpayers.

Dr Beth Shultz, WA Conservation Council vice-president, said the emergence of CALM as a commercial entrepreneur should set alarm bells ringing.

"CALM has shown it has little business sense or commercial expertise," Dr Shultz said.

"For example, last year it sold most of the State's first grade karri sawlogs worth $75 per cubic metre for $25 per cubic metre; and it was willing to sell first grade sawlogs to the big companies for less than it gets from small sawmillers for second grade logs.

"Under the share-farming scheme CALM offers farmers annuities well above anything offered by commercial companies.

"How much is CALM committing itself to pay out over the next 30 years and is this amount commercially justified? Has anyone outside CALM looked at the economics of the scheme?"

Dr Shultz said that on the information she had, the scheme would be a financial disaster for taxpayers.

"The public has the right to know about all this wheeling and dealing because it will have to foot the bill," she added.

"We were told WA Inc was dead. It has been resurrected in a green shroud."

In reply, CALM executive director, Dr Syd Shea said he wondered what his department had to do to satisfy Dr Shultz.

"Dr Shultz's major purpose in life seems to be knocking CALM," Dr Shea said.

He accused Dr Shultz of ignoring the fact CALM had planted 13 million trees on cleared agricultural land.

"In addition to the proven huge economic impact the scheme will have a big impact on the environment," Dr Shea said.

"The scheme has been subject to detailed analysis from sources outside the industry and so far $2 million has been invested from the private sector."

Dr Shea said that on the one hand Dr Shultz wanted to reverse environmental degradation yet on the other she was critical of CALM's conservation.

Yet, he said, CALM's scheme would reverse degradation and increase diversification of hardwoods.

"I, and I am sure many South Western Times readers, are tired of Dr Shultz's personal campaign of denigration and wish she would move onto something else."