FORESTS DEPARTMENT

WANNEROO DIVISION

C O N T E N T S

THE ESTABLISHMENT - June 1978

Area of State Forest	- 58,000 ha
Proposed Additions	- 10,000 ha
Area Planted to date	- 18,000 ha
Total Potential area Plantable	- 40,000 ha
Normal staff strength	- 12 plus 5 clerical
Labour force	- 82
Houses	- 45
Equipment - Tractors	- 16
Treevers	- 3
Utes and Trucks	- 37

The most significant difference from other divisions is the high proportion of the workforce working under piecework conditions. Excluding workshop and overseers at present 76% of the workers are on piecework. This reduces and controls job costs and yields the worker a higher return. However, labour turnover is relatively high presumably because of the go ahead type this system encourages and the opportunities of the metropolitan area.

MWB DEVELOPMENT

Utilisation of underground water has recently extended north of Gnangara Road into State Forest. Bores have been established and 24km of pipelines constructed in State Forest. 58km of limestone roads have been constructed along existing and proposed pipelines. These are of considerable value to this Department. However, accompanying the underground pipelines are overhead powerlines for which 60m wide openings in the plantations are necessary. This results in premature felling of pines or leaving potential plantation unplanted. The first claims for compensation are being calculated.

No further extension of pipelines is anticipated until:

1985	Pinjar scheme	- 29km
1986	Yeal scheme	- 24km
1990	Barragoon scheme	- 26km

MWS have established hydrants on the pipelines where required for our fire fighting purposes and also allow the Department to pump from observation bores.

Since the start of activity, co-operation in planning for our mutual benefit has been of a very high order.

DROUGHT DEATH

Pinus pinaster is a drought tolerant species. It is able to survive an extended drought period by the closure of stomata (pores) to prevent water loss. With severe drought, needles are shed and in the extreme, the trees may die.

Scattered pine deaths are a generally accepted feature of unthinned pine stands growing on weakly leached yellow sands, shallow to limestone. Extensive drought death is uncommon.

There are two instances of extensive drought death. The first in Autumn 1950, and the second in Autumn 1977. The incidence of this was the result of dry seasons and a lowering of the ground water table. Pumping apparently had no effect on this. Excessive pine stand density was the primary cause, and the lack of any Summer - Autumn rainfall was the contributing cause of the drought death.

Plantations on the yellow sands, and particularly those shallow to limestone are the most susceptible. On the grey sands, the older pine stands growing on soils with water table close to surface, probably with an impervious coffee rock, are also susceptible. Generally, the more leached, deeper sand profiles will remain unaffected.

Prescriptions have been prepared that will enable the treatment of all pre - 'prescription 70' stands on yellow sands by April 1979. These pine trees are 15 to 19 years age. Treatment adopts thinning to a higher number of trees and a lower utilization standard than is desired. There is also a necessary non-commercial thinning in some younger 'prescription 70' stands on the yellow sands. Both operations had to be accepted because of a present, and foreseeable, very low demand by industry for small size logs.

Plantations must be thinned to meet departmental objectives, and to safeguard the investment made in the high pruned crop trees.

PINUS PINASTER TREE BREEDING

Planting at the Gnangara plantation commenced in 1926 using all sources of the P. pinaster species. Races, or provenance trials to compare trees from forest centres scattered over the natural range of the species were established annually between 1929 and 1939. As the result of this investigation, since 1940 all seed used in the states pinaster afforestation program has been of Portuguese (Leiria) origin.

Testing has shown the Portuguese provenance as the most suitable for the climate and edaphic conditions concerned. This provenance displays exceptional vigour, has acceptable wood properties but is of poor to marginal form. Variation in both form and individual tree vigour is excessive.

A breeding program to improve the stem form, while at least maintaining the current level of vigour in the provenance was implemented in 1957. The first seed orchard (Joondalup) was completed in 1963, and has provided an improved seed source for all planting since 1972.

A highlight of the program was the extremely successful importation of breeding material from Portugal.

Mr. D.H. Perry of the Forests Department selected 85 plus trees from the native stands, and introduced 79 into the breeding program. This venture will have profound effects on afforestation in Southern Australia, and in South Africa.

Results

(1) Tree form - from detailed analysis of 28,000 trees.

	ORCHARD	ROUTINE	IMPROVEMENT
% 'acceptable' straight	74	47	+57%
% 'perfect' straight	11	4	+175%

(2) Branching - there is an increase of approximately 70% in the number of trees with smaller branches, for the orchard population. Branch angle (56^{o}) was not effected.

(3) Vigour - considering all trials, there has been a general increase of 15% height growth above the routine plantation seed source.

Increases in volume production have ranged from 20 to 90 percent.

IMPACT ON PLANTATION MANAGEMENT

Using an unimproved seed source, it was necessary to plant 2 to 3000 seedlings per hectare to give adequate selection for the 100 final crop trees. This can be achieved with orchard stock planting of less than 1000 seedlings per hectare. Three of every four seedlings planted will produce trees of acceptable form.

Cost-benefit analysis for orchard P. pinaster shows internal rate of return of 6.5%, which contrasts with a return of 2.5% for un-improved P. pinaster.

PINE LOG RESOURCE AND PRODUCTION (CUBIC METRES)

PRODUCT	RESOURCE 1977-83/YEAR	CURRENT SUPPLY PER YEAR	SEMI TRAILERS/ DAY
Particle Board	43,000	16,000	3
Case	17,000	18,500	4
Mill	3,000	3,700	1

Kelmscott and Mundaring divisions can supply the deficit in demand for case and mill sizes.

Deliveries are made to:

Particle Board - Wesply Kewdale

Case - CPI, Western Case, Morley Case

Mill - Whittaker, Mazzega

Pine fencing material - Bunnings (about 32,000 posts or 640 cubic metres per year)

Workforce:-

Falling and delivery to roadside - about 21 men all on piecework.

Hauling - Contractor (W. Holbrook)

Problems:

(1) The variable and unpredictable demand for particle board logs by Wesply.

(2) The vast oversupply of particle board sizes.

To avoid undue delay in thinning this has been partly overcome by a reduction in utilisation per tree.

(3) Reliable access to limestone deposits for roading is required. This is satisfactory at present but competition is anticipated in the future.

BALANCE BETWEEN PINE TIMBER PRODUCTION AND UNDERGROUND WATER PRODUCTION

Management objective for S.F. No. 65 is defined as quality sawlog production and production of potable water from the Gnangara ground water aquifer. The two forms of land use are compatible, as both require an open stand development.

There is conflict if the plantation is not managed to maximize individual tree growth. On shallow to water table grey sands of the Bassendean system, there is the possibility of pine deaths if pumping imposes a severe drawdown of the ground water table, where as on the deep yellow sands of the Spearwood dunes pumping and a lowering of the water table should not influence pine tree survival and growth. However, the pine stand can have a significant affect on water recharge to the aquifer. If it is a dense stand, there may be no recharge.

This conflict can be removed by thinning. Management to optimize both objectives will be reliant on growing pine stands at a density where by water use by the native woodland is simulated.

Canopy interception of rainfall is a critical factor. Up to 30% of the incident rainfall may be intercepted by leaf and stem surfaces in a dense pine forest. This is a direct loss to the soil moisture reservoir.

Studies have shown no wetting below a depth of 5 metres in dense pine stands, even in the wet rainfall years. In open, park-like stands, interception may account for up to 10% of the rainfall. Situation is similar for the native woodland where soils wet at comparable rates. Only in the extreme low rainfall year is the soil moisture reservoir not completely recharged.

PROTECTION

PRESCRIBED BURNING This is all done manually.

Native forest: - Burned on about 4 yearly cycle.
approximately 3000 ha/year.

Plantations: - Approximately 1500 ha/year.

The pine burning technique has developed over 13 years with cost reductions almost equal to inflation. Fixed belts are burned in rotation and also debris from utilisation and any particularly high risk areas.

FIRE SUPPRESSION The 1961 fire (48ha) was the only serious fire in the history of the plantations. Lightning causes as many fires as all other agents together. The greater risk caused by increasing public use has to date been overcome by burning high risk areas.

Suppression equipment:- 7 Heavy duty units
2 light duty units
1 relay pumping outfit
2 fireline ploughs

The above backed up by a large and relatively young labour force is adequate.

Detection:- Three lookouts are at present adequate. Aerial spotters could not replace lookouts because of the RAAF at Pearce. However, the latter are planning detection assistance by means of their own towers and aircraft.

Due to the large area of plantation this division is geared to rapid knockdown with a highly mechanised force.

Issues

(1) The reduction of natural forest and the burning to protect plantations is contrary to the interests of apiarists. However, liaison is maintained and efforts made to protect their interests where possible.

(2) Liaison with the Bushfires Board and Shires is most important. In this regard help from the former has increased markedly in the last year or two. The Wanneroo Shire in particular is commended for its responsible attitude and high degree of co-operation.

(3) Adjoining plantations it is important that high fire hazards do not exist and it is preferable that this Department controls an adequate buffer. In this respect National Parks are bad neighbours despite a spirit of co-operation when fires occur.

LAND USE

A Land Use Management Plan is in the process of compilation.

Following the success of research 12 years ago suitable P. pinaster plantation areas can be selected by vegetation mapping. Most of the unplanted State Forest has been mapped where there is doubt concerning its suitability.

There is virtually no pressure for alienation of land but urban expansion is having the following effects:

(1) Increasing subdivision into hobby farms resulting in a great increase in the number of our neighbours.

(2) Increased demands to allow all sorts of recreation in the forest.
Fortunately these have not proved seriously incompatible with forest management. It is also fortunate that present and planned residential expansion is west of Wanneroo Road in the North-West Corridor Plan.
The Wanneroo Shire is facing similar demands for recreation land and it is possible that this Department may consider leaseing unplantable land to be controlled by the Shire for this purpose.

(3) As a trial 1300 ha of plantation at Gnangara has been made available for recreation and remainder of the plantation 'closed' to the public.

(4) There is pressure for expansion of National Parks and for further Wildlife Reserves.
Four areas, Melaleuca, Ridges, Wabling and Caraban (total 12,464ha) are designated as Management Pricrity Areas for conservation of flora, fauna and landscape.

(5) Increasing intrusion of services such as water supply, power lines, gas lines, and roads.

The only active mining is for limestone. There are many claims for use as building stone, roadmaking and future cement resource. It has been necessary for this Department to protect its future road building requirements (about 500,000 cubic metres) by having selected areas designated for this purpose by the Mines Department.

CURRENT ISSUES

(1) The leasing of unplantable State Forest in a piecemeal fashion to recreators such as gun clubs or to a Shire which is in a better position to control them and has staff for this purpose.

(2) Acquisition of crown land for planting. Negotiations for part of the Commonwealth Bombing Range have been proceeding since 1967 and for other adjoining State Forest since 1971. The MWB is keen to see this completed.

(3) Finding a compatible balance between water production and pine yield.

(4) There is a large resource of small size pine suitable for particle board and this should be removed as a thinning. Since the opening of the Dardanup plant, demand has decreased and prospects are not bright. This has forced the Department to commence thinning non-commercially to avoid drought effects and obtain optimum growth for sawlogs.

(5) The need for a co-ordinated approach in the establishment of services such as water and gas pipelines, powerlines and roads.

(6) Manpower. Flexibility of numbers to meet constantly fluctuating workloads is required. Wood using industries have the advantage that we always have reserves of fallers to meet demands and ~~of~~ other work if demand is slack. The Department must be able to expand its workforce for non recoupable works when demand is low, or it will fail to meet increases in demand.

(7) Although the current planting rate has been reduced from 1000 to 500 ha/year maintenance on previously planted large areas is expanding. The net result is expansion of work load. Thus both staff and workforce need ability to expand.

GROWTH DATA

(1) Provenances of Pinus pinaster

Bassendean sands, age 13.

	Diameter	Height	Basal Area	Volume
Leiria	16.7 cm	10.7 m	5.0 m^2/ha.	32 m^3/ha.
Lucca	15.9	10.2	4.8	28
Landes	13.0	7.3	3.3	14
Corsican	13.4	7.5	3.4	15
Italian	12.0	6.5	2.8	11

(2) Improvement of Leiria P. pinaster

Pedigree is the mean of 27 families, and is representative of the seed from the Joondalup orchard.

(a) Grey sand, mean tree at age 4 and 8.

	Age 4	Age 8			
	Height	Height	Inc.	Diameter	Volume
pedigree-Leiria	2.2 m	7.2 m	5.0 m	10.3 cm	0.039 m^3
routine-Leiria	1.9	6.4	4.5	8.9	0.026
difference	0.3	0.8	0.5	1.4	0.013
%	15	13	11	16	50

(b) Yellow sand, mean tree at age 4 and 8

pedigree-Leiria	3.0	8.2	5.2	12.0	0.060
routine-Leiria	2.6	7.3	4.7	11.0	0.044
difference	0.4	0.9	0.5	1.0	0.016
%	14	13	11	9	36

(3) Pinus radiata and Pinus pinaster (orchard and routine)

Pinjar P 1971, yellow sand
Early growth of P. radiata was much superior to the P. pinaster. This difference was 1.4 m (33%) in height and 1 cm (14%) in diameter at age 5 years. At age 7 years, P. radiata is taller, though the diameter difference is diminishing.

CROP TREE	DIAMETER			HEIGHT		
Age	5 yr.	7	inc.	5	7	inc.
Pinus radiata	7.9 cm	11.3	3.4	5.9	8.4	2.5 m
P. pinaster-orchard	6.9	10.5	3.6	4.5	6.5	2.0
P. pinaster-routine	5.8	8.8	3.0	4.0	5.9	1.9

Older plantings also demonstrated the better early growth, particularly height of the P. radiata. By the age of 10 years this difference was negligible. Diameter growth, and consequently volume production of the pruned log, for P. pinaster was favoured.

P. radiata is more susceptible to sun damage of the tree bole, is less drought tolerant and has a higher fertilizer requirement on these sites.