ENVIRONMENTAL PROTECTION AUTHORITY

A REVIEW OF THE DONNYBROOK SUNKLAND PROPOSALS FOR AFFORESTATION WITH PINES

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Introduction

This paper has been prepared following a study of the Forests Department's *Statement of Intent*[1], and other relevant documents issued by the same Department, principally the *General Working Plan No 86 of 1977*[2], and *A Perspective for Multiple Use Planning in the Northern Jarrah Forest*[3]. An inspection of the area was also carried out with Dr F. McKinnell, who has been responsible for much of the research and planning for the project.

The Donnybrook Sunkland project involves the afforestation with pines of significant areas at present occupied by native hardwood forest. The 60,000 hectares to be planted over a thirty year period represent :

- 4 % of the total area of Jarrah forest in State Forest Western Australia
- 21 % of the Jarrah forest in the Sunkland
- 25 % of the Jarrah forest in the Sunkland outside reserves and MPA's
- 33 % (approximately) of the Jarrah forest in the Sunkland north of the Blackwood River.

Thus the planting "cells", shown most clearly in Forest Focus 16/1975[4], which all lie north of the Blackwood River, will occupy one third, at a conservative estimate, of that area of State Forest, which is already surrounded on three sides by privately owned land. It will provide two thirds of the pine plantation area of 90,000 hectares called for between now and the year 2010 by the Forest Department's Working Plan No. 86 of 1977[2].

Some Characteristics of the Area

The area is one of low relief, lateritic ridges occupy the highest parts, separated by shallow smooth sided valleys with infertile sandy soils, often waterlogged in winter. The native Jarrah forest

is of poor quality overall, but the best stands are found on the lateritic ridges.

The Statement of Intent presents a map of the present extent of dieback disease. This is clearly associated with the valleys and drainage lines. The areas to which it is expected to spread , again the moister valley situations, are also shown. Only the well drained sites of the lateritic ridge tops are shown as "protectable" and this corresponds to some degree with "unplantable" areas.

The extent of dieback infection varies from cell to cell. The two north-western ones, in the catchment of the Margaret River are worst affected, and only a very small proportion of the forest is shown as protectable. The central south cell, at the other extreme, appears to have about 80% of its area occupied by healthy, protectable forest.

A major drainage divide traverses the area from south west to north east; to the south of it all streams drain to the Blackwood, to the west to the Margaret, and to the north to the Vasse and other coastal plain rivers. In the case of the Margaret and the Blackwood, hydrologic changes following planting may be important for reasons outlined below.

Distribution of Planting Areas

The plantation cells occupy eight large discrete and continuous areas with broad corridors of native forest to be left between them (see Forest Focus 16/75[4]). Within the cells, "unplantable" areas, 24% of the total, occupy the ridge tops and wetter drainage lines. The former carry the better quality jarrah, and the latter form "prime fauna refuges" according to the 1975 Statement of Intent (p.10)[1].

The landscape which will result when the scheme is fully implemented will therefore be one in which the native forest will remain on ridge top and valley floor, with plantations on the intervening

Thus it should be possible for plantation boundaries to follow the natural contours of the country. In each cell, when lly established, a quarter of the area will be occupied by trees

under ten years old, assuming that a rotation of 40 years is adopted.

With longer rotations, a smaller proportion of the area of each cell will be in the younger age classes, e.g. a 60 year rotation would put one sixth of the area in the under ten year age class. While the boundaries of planted areas are likely to follow natural lines, the boundaries of cutting coupes and the areas subsequently replanted might be rectilinear. Thus management could have considerable effects on aesthetic and amenity aspects of the man-made landscape which the project will create.

Establishment and Management of Plantations

The project depends on the successful establishment of Pinus radiata. Up to now successful plantations of this species have been established only on the deep, red, friable soils found to a limited extent in the valleys of the Darling Range and more extensively in the Blackwood River Valley between Nannup and Bridgetown. The Sunkland sites have more difficult soils, grey infertile sands, some of which have intractable clay sub-soils which cause problems of drainage and root development. On the other hand the cooler and moister climate should be more favourable than in areas further north, e.g. at Mundaring, where P. radiata plantations have been successfully established, grown and harvested.

Thus the Sunkland project is to be established in an environment where experience with pines is limited, the oldest satisfactory experimental plantings of P. radiata dating from 1969 and 1970. However, some small areas were planted earlier and also larger areas of P. pinaster. The experiments have shown that nutritional deficiencies can be remedied, and that with good site preparation, establishment and early growth are extremely satisfactory. It is the professional opinion of the Forests Department's experienced officers, which has to be respected, that this satisfactory growth will continue. In any case, early rates of establishment will be low, 200 hectares in 1977, but increasing yearly. The full operational rate of 2,000 hectares per annum will not be reached until 1980, by which time another three years' experience will have been gained.

A novel feature of the establishment procedures is the growth of legume based pastures grazed by sheep and later cattle between the rows of young trees. This is expected to improve growth of the pines due to increased soil fertility and to give better control of regrowth of native species. (A conservationist might argue that it also contributes to the development of the "ecological deserts" that the plantations are supposed to be). If the technique is widely adopted, the result could be up to 7,500 hectares of pasture carrying trees less than 5 years old (assuming a 40 year rotation) when the project is fully established.

There are two further aspects of management which require some comment. First, there is the question of fire control practices, both in the pine plantations themselves and in the jarrah forest immediately adjacent to pine cells. At present the forest is subjected to aerial controlled burns on an approximately 6 year cycle, but the development of intensive pine stands will undoubtedly require an alternative strategy of fire control.

Second, the management of people within the pine plantation cells and surrounding jarrah forest needs further consideration. Just as exotic tree species are objectionable to some sections of the community, to others they form an attraction for recreation and on account of their aesthetic appeal.

The Forests Department should therefore provide outlines of its proposed policy towards public use of plantation cells both in the short term and in the long term.

Management of the Jarrah Forest

The hardwood forest outside the cells is to be managed in the same way as Jarrah forest elsewhere, with hygiene measures to prevent spread of dieback, fire protection, and presumably extraction of commercial timber where possible.

A substantial proportion of the hardwood forest to be retained is classed as "protectable" according to the Statement of Intent.[1]

Nevertheless, there is a considerable area of dieback affected and "not protectable" forest in the corridors between the pine planting cells. Rehabilitation in the form of planting of introduced dieback resistant eucalypts is proposed. No doubt the increased activity associated with the project will contribute to the more rapid spread of the disease and a corresponding increase in area requiring rehabilitation by replanting. Thus the area of native forest to be replaced by plantation of one sort or another may be considerably greater than indicated above (page 1), and could, eventually affect a substantial proportion of the Sunkland hardwood forest area north of the Blackwood River, perhaps as much as 50%.

Environmental Effects

Important considerations under this heading include :

Hydrologic Effects
Effects on the Native Forest
Effects on Conservation Values

Hydrologic Effects

Since 1975 the Forests Department has been monitoring salinity levels (TDS) in the run off from the 19 catchments in which the planting cells lie. Some results are presented in the Statement of Intent[1], and are discussed more fully by McKinnell[5]. Several gauging stations in the same area are operated by the Public Works Department, all established since 1970 with the exception of one station on the Blackwood at Darradup which has operated since 1956. The Margaret River was also gauged during two periods in the past, 1939 to 1948 and 1958 to 1968.

The weighted TDS contents of the streams do not generally exceed 200mg/l even where a large proportion of the catchment has been affected by dieback, and clearing for agriculture in neighbouring areas to the west has not resulted in significant rises in the salinity of streams.

It can therefore be concluded that the clearing of native forest prior to planting will not result in even temporary increases in salinity. Increases in turbidity due to mechanised operations can be minimised by careful planning and supervision.

However there is another aspect to be considered, since pines are notorious for the large amounts of water which they can transpire. According to B.A. Carbon (priv. comm.) 15 year old pines on the sands of the Swan Coastal Plain transpire more water than the native forest they replace, and also deep drainage is "markedly reduced...". Reference was made earlier to the extent of planting in catchments draining to the Margaret and Blackwood Rivers, and potential effects on water yield to these rivers and their significance must now be considered.

In the case of the Margaret, which has some water supply potential, roughly a third of its catchment above the gauging station lies within plantation cells. There is the possibility therefore of a decrease in water yield as the pines develop.

In the case of the Blackwood, yield of fresh water from tributaries rising in native forest in the Sunkland is an important contribution to the flow of the main river, which drains into Hardy Inlet. Upstream of Nannup the run off from the lower rainfall agricultural areas is of a high salt concentration, which is markedly reduced by the fresher water from the Sunkland forested areas downstream. Roughly four fifths of the proposed plantation area, i.e. 48,000 hectares, drains to the Blackwood downstream of Nannup, so that there may be an increase in transpiration compared with that of the original forest. It is an open question as to whether increased water use by the pines will cause a significant reduction in water yield, and therefore decrease the "freshening" effect on the Blackwood. The question needs to be considered in conjunction with a possible similar effect due to existing pine plantations in the Blackwood Valley between Nannup and Bridgetown, and an opposite effect as dieback disease affects greater areas of native forest.

Effects on the Native Forest

Figures given earlier show that there will be a massive effect in the clearing of 60,000 hectares of native forest, though much of this is already affected by dieback disease. Further, this amounts to approximately 33% of the forest area in the Sunkland north of the Blackwood River. The concentration of the planting cells in this area must mean an increase in traffic, and consequently an increased risk of the spread of die-back disease to at least the "not protectable" areas. This leads to further plantations of eastern Australian eucalypts, as a rehabilitation measure. Thus, as suggested already, the area of native forest affected in the Sunkland may amount in total to something of the order of 50% of the area north of the Blackwood River.

Effects on Conservation Values

The Statement of Intent, backed by EPA's recommendations accepted by Cabinet for System 1, proposes reservation of 42,900 hectares (15%) of the Sunkland forest for conservation and recreation. Certain reservations are for the protection of unusual or particularly attractive forest types or species (e.g. the Whicher Range, or Milyeannup Block,) so that these are not intended to provide for representation of the range of Sunkland habitats for flora and fauna. However, other areas, such as Layman Block, and the reservations along the Blackwood westwards from Milyeannup, do appear to provide this representation, together with the areas of State Forest to be retained under hardwoods. This conclusion, in the absence of surveys of habitats as such, is based on an examination of the soil surveys by Smith[6] covering an area south of the Blackwood, by Morison[7] in the Chapman area, and by an interpretation of the maps and plans in the Statement of Intent. These show that there is a full range of soil and landscape types outside the plantation cells.

Thus it cannot be argued that the pine plantation project itself is a *direct* threat to the conservation of native forest habitats. There may be an *indirect* effect due to increased dieback infection, and this will be concentrated north of the Blackwood, since there are no plantation cells south of it.

The view that the plantations constitute some sort of "ecological desert" is held in some conservationist circles. The mono-culture of pines does indeed change the assemblage of flora and fauna on the sites affected in a drastic manner, but as the plantations establish themselves over time they will develop new ecological relationships with associated animal, plant and soil organisms and microorganisms.

On the other hand, the project may be seen as a contribution to meeting a demand for timber at present supplied mainly from native hardwood forest . Unless current demands for timber and timber based products are reduced, which seems un-likely, and unless an alternative source of supply is developed it is inevitable that the present high level of cutting in native forest will continue. The pine plantations provide such an alternative supply, and thus can be seen as an important conservation measure for native forest elsewhere. This is an important factor influencing the Forest Department to develop the project.

Social and Economic Considerations

These receive only brief treatment in the Statement of Intent. According to the General Working Plan No. 86 of 1977, the project is justified essentially on predictions of increased demands for sawlogs based on the Borrie population projections for Western Australia.

The following general statement is made (page 15) : -

"There are sound economic and social reasons why a high degree of self-sufficiency should be maintained for wood products. Because of previous overestimations of hardwood volumes acceptable to the market, the allocation of areas containing merchantable timber for non-wood production purposes, the impact of dieback disease and inherent slow growth of hardwoods, it is necessary to reduce the hardwood sawlog cut. It is planned to increase the rate of harvesting and planting of softwoods at a rate which will balance the reduction in hardwood availability by the turn of the century. This will maintain adequate supplies of wood on the market from local sources, and continue stability of the timber industry and associated employment".

No doubt this is a good argument, provided the rate of consumption does not decrease. Some writers (e.g. Routley and Routley[8]) suggest that it should decrease from what they consider the present extravagent levels.

Further detail is given on pages 53 and 59 of the Working Plan, from which the following details of the supply and demand for sawlogs in the year 2010, assuming present rates of pine planting, are taken :

Demand $m^3 \times 10^6$	Supply $m^3 \times 10^6$			Shortfall $m^3 \times 10^6$
	Hardwood	Softwood	Total	
1.222	.315	.687	1.002	.220

The Working Plan proposes that the rate of establishment of pine plantations should be increased to 3,000 hectares per annum to meet the predicted shortfall. 2,000 hectares per annum of this will be provided by the Sunkland project, the remainder by State planting elsewhere (500 hectares) and by private plantations (500 hectares).[2]

The project will involve (page 71 of the Working Plan) transferring workers *"... into the developing pine processing industry, but not necessarily at those centres currently occupied by the hardwood industry"*. Consequently there will be changes in the need for educational and other social services in the areas affected, perhaps

a decrease at Manjimup, and a corresponding increase at Margaret River or other centres in the Sunkland. The magnitude of these changes and their costs are not estimated in the Statement of Intent.

Summary and Conclusions

A significant area of native forest will be affected, concentrated north of the Blackwood River where approximately one third of the area of State Forest is to be planted.

- Nevertheless it appears that the range of habitats (as interpreted from soil, landform and other maps) will be represented outside the cells, and thus conservation of flora and fauna assured in State Forest, Forest Parks and other reserves.

- There is potential for landscape design in the project to create an aesthetically pleasing landscape. The Forests Department should ensure that expertise in landscape architecture is employed or consulted not only in the design of plantation boundaries (internal and external to the cells) but also in planning the operational procedures, particularly in relation to size, shape and distribution of cutting coupes and replanting areas.

- It is clear that the Forests Department has been successful in developing establishment techniques, and it is likely that the good early growth will continue. The pasture phase of establishment will give rise to areas for grazing by stock which are relatively small, and likely to be scattered through the forest area. The Department of Agriculture should be consulted as to whether the pasture available can in fact, be readily utilised commercially by the existing farming industry.

- The creation of large plantation areas will necessitate new fire control strategies both within cells and in adjacent areas of native forest. These should be described.

will undoubtedly be an attraction to some of the community for both recreation and aesthetic appeal. The Forests Department should, therefore, foreshadow its policy towards public access to plantation cells and surrounding native forest.

The project is unlikely to cause increases in salinity of streams and rivers. However, it may decrease the contribution of fresh water from the Sunkland to the Margaret River, which may be required for water supplies in the future, and to the Blackwood River, where there may be a diminution of the "freshening" effect of the sunkland streams. Consultation with Public Works Department is needed to ensure that the gauging network is adequate to detect any such changes in the long term, with a view to modifying water consumption by the plantations through management, if and when it becomes necessary. If such water consumption proves to be considerable, then the relationship of the pine planting cells to the intake areas for the important underground water resources of the Sunkland will require investigation.

- The project can, it appears, be reasonably presented as a means of conserving hardwood resources by reducing the level of cutting, while meeting expected future demands to a greater extent from the more productive softwood plantations.

- The magnitude of social and demographic changes (both positive and negative) which will be generated by the project should be estimated. If significant, they could be important considerations in planning regional developments in south Western Australia.

REFERENCES

1. Forests Department of W.A. *Afforestation with Pines in the Donnybrook Sunklands.* Statement of Intent, Sept, 1975.

2. Forests Department of W.A. *General Working Plan No 86 of 1977.*

3. Forests Department of W.A. *A Perspective for Multiple Use Planning in the Northern Jarrah Forest* (undated).

4. Forests Department of W.A. *Sunklands Multiple Use Land Management.* *Forest Focus No 16, Dec 1975.*

5. McKinnell, F.H. 1976 *Water Quality in the Donnybrook Sunkland (Blackwood Plateau)* W.A. Forests Department Res. Pap. No 24

6. Smith, R. 1951 - *Soils of the Margaret River - Lower Blackwood River Districts.* W.A. CSIRO (Aust) Bull No 262

7. Morison, I. 1958 Soil Map of the Chapman Forest.

8. Routley, R. & Routley, V. 1975 *"The Fight for the Forests" (Aust. Nat. Univ.) 3rd Ed.*