12.

FORESTFOCUS

NUMBER 12, DECEMBER 1973

MARRI WOODCHIP PROJECT

Marri tree (single)

◀ *The best developed marris are usually found in the area south of the Blackwood River. This specimen, 3·2 km west of Pemberton, in a farmer's paddock, has a height of 61 m, a bole of 22 m, a girth at breast height of 6 m and a log volume of 34 m³. A second large tree 32 km south-west of Collie has the following measurements: 54 m, 30 m, 5·4 m, 37 m³.*

Front cover

Mature karri/marri forest photographed at 5 o'clock on a midsummer morning. In the background is a 100-year-old pure karri stand regenerated after a fire in what was once a farmer's paddock. (Brian Stevenson)

Back cover

Good quality karri seed trees retained for the seeding of a new forest.
(Brian Stevenson)

▼ *Virgin marri forest south of Pemberton.*
(Government Photographer)

FOREST FOCUS

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(unless otherwise credited).

Production forestry is an important part of the State economy, and the logical land use in the State Forest—which was reserved by previous populations specifically for the purpose of timber production.

Of approximately 6 500 000 hectares of original land surface suitable for hardwood production in the South-West, only 1 800 000 hectares remain available for this purpose. The encroachment of mining into State Forest areas and the incidence of jarrah root rot disease which decrease the potential of this valuable species, justify maximising production of karri, marri and jarrah, within the the license area, to meet population demands for wood products.

FOCUS on The Marri Woodchip Project

After a century of virtually no utilisation as a timber species, marri, the South-West's most widespread eucalypt, is now providing the foundation for the biggest advance in the forest products industry in recent times.

The Manjimup woodchip industry will bring benefits to the community through decentralisation; increased revenue; improved utilisation of existing facilities and new works such as railways, community and harbour services; and further consolidation of the State's timber industry as a stabilising influence on the region's economy. Among other advantages, marri and cull karri logs and sawmill waste will be put to a useful and economic end rather than merely creating silvicultural problems in the regeneration of the State's karri and jarrah forests.

It demands no dramatic alteration of present cutting and regeneration practices—other than the fuller utilisation of the forest resource. The project can be carried out with no serious long term impairment to tourist, recreational, floral and faunal values which State Forests provide as a by-product of productive forestry. These aspects have been and continue to be adequately researched and promoted by the Forests Department.

Manjimup to benefit most

The estimated work force directly employed in the chip mill and associated additional forest service staff is 429. By using a workforce-to-population ratio of 3:1, this represents an increase in population for the Manjimup/Pemberton area of approximately 1 300 people. This is about one-third of Manjimup's population and would involve a considerable expansion of essential services, housing, schools and so on.

The increased workforce represents an estimated minimum direct cash injection into the area from wages and salaries of $2·6 million a year. To this would be added rail freights, Bunbury Port Authority charges and Forest Department royalties, which provide the State economy with an annual figure estimated to be more than $4 million.

Capital expenditure of $11 million on mill equipment plus railway rolling stock and harbour works will also have its impact on the State economy and the regions concerned.

NATURAL RANGE OF MARRI (OR REDGUM)

The extreme range of marri (*E. calophylla*) stretches from Port Gregory, 64 km north of Geraldton, to Cape Riche on the south coast, and some 48 km east of Narrogin. In prime jarrah forest mature marri grows to over 30 m high, while in the wetter karri regions they frequently attain heights in excess of 46 m, with the largest recorded being 61 m.

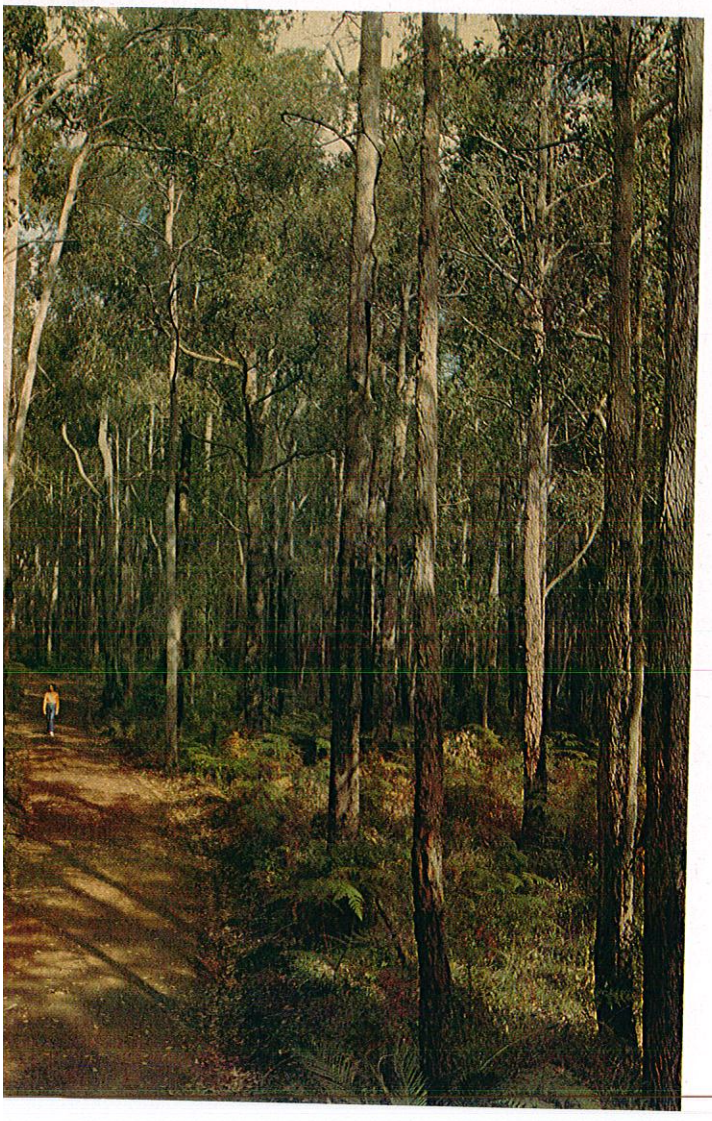

INDIAN
OCEAN
SOUTHERN
OCEAN
SOUTH WESTERN HIGHWAY
BUNBURY
HIGHWAY
SOUTH
BUSSELL
BUSSELTON
VASSE
River
Blackwood
HWY.
BROCKMAN
AUGUSTA
BRIDGETOWN
WESTERN
HWY.
MANJIMUP
PEMBERTON
Perup
River
Warren
HWY.
R
Tone
R
MUIRS
River
HWY.
Lake
Muir
Frankland
WALPOLE
LEGEND
Wood Chip License Area
Wood Chip Mill
State Forests
Parks & Reserves
Vacant Crown Land
Cutting 0-15 years
Possible Salt Sensitive Area withheld from cutting
Wandoo Gullies
Proposed South Coast Reserve
Management Control Area (Fauna & Flora Priority)
SCALE
0
20
40
60
80
Kilometres

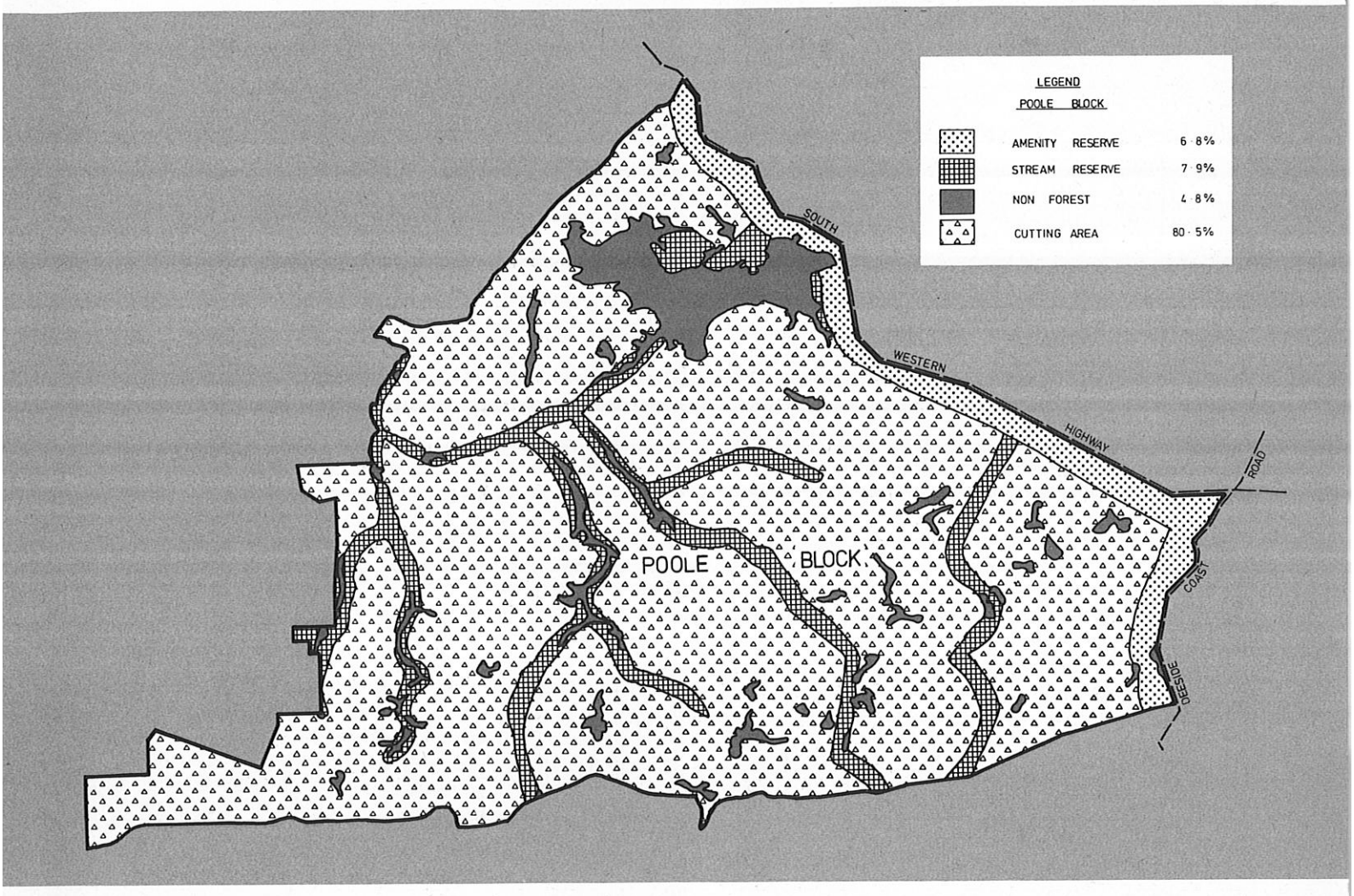
▲ *Six-month old karri regeneration showing the typically good germination on ashbed conditions.* (Brian Stevenson)

Good karri regeneration just over four years old, on an ashbed. ▶

Karri regeneration, 30 years old, near the Rainbow Trail. ▶

▼ *Good marri regeneration about 40 years old.*





▲ *Poole block provides a typical example of the planned areas to be reserved from cutting, and shows how uncut forest will form corridors to assist recolonisation. In practice, only small portions of the cutting area will be utilised at any one time.*

The project will lead to possible economies in integrated logging, milling, and road and rail transport through greater volume. The export value will be about $12 million a year.

Proposed action

The chipwood project involves the utilisation of marri from a specified license area (see page 4) in State Forests surrounding Manjimup. Logs, together with limited sawmill waste, will be chipped at a site between Manjimup and Pemberton, railed to Bunbury and exported.

The agreement proposes that 680720 tonnes green weight of chips a year will be exported over a 15-year period. Although this tonnage is based primarily on the mature marri resource which has previously been non-utilisable, karri in the form of sawmill waste, as cull trees too defective for sawmilling, as top logs from trees cut for milling, and as small thinnings, is acceptable to the purchaser.

Karri is the preferred pulp resource and will constitute from 5-20 per cent of the supply. Jarrah is not acceptable for chipping at this stage.

Within the 490000 hectare license area marri will be extracted in conjunction with sawmilling operations in stands of jarrah and karri, with which it grows in mixture. Removal of the previously non-commercial competitor trees from the mixed stands will permit the most efficient and economic regeneration procedures to maximise commercial forest values for the future.

About 11000 ha will be cut over and regenerated each year—less than half of which will use a clear cutting technique. The utilisation of marri for profit is a key to maximum productivity in the southern forests.

The extraction of all material from the forest will be controlled by

the Forests Department, within the authority of a Forest Produce (Chipwood) License.

Major land use objectives

The major land use objectives—within an overall requirement for forest conservation, beneficial development, decentralisation and environmental values in the South-West are:

- To increase the productivity of southern forests.
- To utilise a wood resource which previously has had only *potential* commercial value, but the presence of which has presented silvicultural problems.
- To initiate development in the field of waste wood utilisation without which a fully integrated wood processing industry is impossible.

Logging units

The basic administrative unit is the forest block—an area of forest with defined natural or man-made boundaries. Each block is named for identification and usually has an area of 4000 to 6000 hectares.

The actual size of discrete areas or coupes cut over within each block in a year depends on type of forest cut, the number of logging operators working in the particular area, silvicultural and environmental considerations.

In the jarrah/marri forest where trees will be selectively cut (thinned) an annual coupe of 800 ha is favoured as the maximum to satisfy practical requirements for management and environmental protection.

In the karri/marri forest where the operation will be clear cutting using karri seed trees for regeneration, a maximum coupe size of 200 ha is desirable. The karri type forest is already being cut-over in this manner for sawmill logs, and the chip requirements will be taken at the same time or in a following operation.

Factors affecting the location of coupes are:

- The need to supply both sawmill and chipwood requirements from the one logging operation, or to follow sawmill logging in karri-marri areas with the chip operation within three years.
- The environmental desirability of dispersing logging operations within a year and between years as much as possible.
- The obligation to compromise dispersion with economies in roading and logging by reducing the number and increasing the size of coupes and reducing haul distance of logging operations.

Bush operations, chipping

Conventional logging methods will be used. Trees will be fallen with chain saws and snigged to bush landings.

Throughout the operation, sound marri logs suitable for saw-milling will be directed to sawmills from the loading dump as the market allows. Sound logs can only be ascertained following falling and at present the market is negligible. Current royalty for marri saw logs is $1·20 m^3 compared to 74c m^3 for chip logs. The marri sawlog royalty is under revision along with other hardwood royalties.

The sawn marri market is expected to increase over the contract period and falling for chipping allows for selection of mill logs with no waste.

Log defects in this species are such that approximately three "apparently sound" trees need to be fallen to obtain one millable tree. Falling for chipping will allow selection of saw logs from the available stems without wasting the resource. Removal of the uncertainty in falling to obtain mill logs should lead to royalty increases from this type of produce.

Integration of sawmilling and chipping leads to efficiency of forest produce operations.

Chip logs will be hauled by road to the mill site where they will be debarked and fed through a chipper, then loaded bulk into waiting rail wagons for transport to storage facilities at Bunbury.

Karri sawmill waste from appropriate mills in the region will be either chipped on the spot and transported to the chip millsite, or transported unprocessed to the chipper.

Waste at the chipping mill will comprise mainly bark which will either be burnt (leaving little residue) in an acceptable incinerator, or returned to the forest.

The chip mill site has been located so as to be removed from settlement and tourist impact.

Regeneration

Extensive silvicultural experience and an intensive forest regeneration programme has shown that clear falling with slash burning is the most successful and natural regeneration practice in karri forest types. For jarrah forest types selection cutting is most effective.

Regeneration procedures have been proven over the years and the range of alternatives are demonstrated in special field research plots.

Pure marri stands of limited extent are found, and the total of these is estimated to be 2000 ha.

Despite its characteristic ubiquity, considerable areas within State Forest exist which do not contain marri—including pure karri; pure jarrah, which is limited in southern forests; swamps; and open peaty flats. Other areas which do contain marri but which will not be logged include low quality forest associated with shallow soils, steep topography, rocky outcrops and certain stream edge communities. Areas devoid of commercial forest represent 7 per cent of the area planned for utilisation within the license period of 15 years.

◀ *Mixed karri/marri regeneration, four years old.*

It is proposed that areas of forest adjacent to creeks, together with roadside reserves of 200 m, be withheld from cutting for environmental purposes. These areas, together with those mentioned above, should total about 20 per cent of any forest block.

For the purposes of regeneration operations, three forest types are distinguished.

- Karri/marri—including all mixtures of the two species from pure karri to almost pure marri.
- Jarrah/marri—also including all mixtures of the two species.
- Pure marri.

Of the 11000 ha to be cut-over each year, 42 per cent will be in the karri/marri forest type and will be concurrent with—and aid—the necessary process of clear felling with seed trees required to manage karri. Its inclusion in the chip project therefore, leads to no increase in environmental commitment.

The karri/marri type. The silvicultural system of clear felling with seed trees has been proven effective for many years. The method involves retention of five to seven superior seed trees per hectare while all other saleable timber species are removed. The understorey species (scrub species) are rolled to permit access by fire fighting crews and as soon as routine sampling has shown abundant seed in the tree crowns, an intense regeneration burn is started which removes competing scrub, provides an ash bed for karri seedlings and stimulates the fall of seed from the seed trees. Conditions are then ideal for the germination and rapid growth of karri seedlings after the first autumn rains.

This system is intended to favour karri, though it is not intended,

◀ *Mixed jarrah/marri regeneration, two years old.*

▲ *Karri cleared for group settlement farming. No salinity changes are apparent.*

nor practicable, that marri be eliminated. Marri, like jarrah, has the ability to form "advanced growth" beneath its own canopy and numerous lignotubers can be found in all forest types containing marri. Marri also grows into tree form direct from seed. Even with no marri seed source, there is a plentiful supply of lignotubers to maintain a marri presence.

The replacement crop will therefore still be a karri/marri mixture, though with an increased karri component. Trials to prove the efficacy of this and other techniques have been completed for some years. Stands thought to be formed in a similar but natural fashion may be found up to 50 years old. One stand 100 years old regenerated from a burnt-out farm paddock (see front cover).

Flexibility in falling and burning in these stands will be provided by annual plantings of karri seedlings, as necessary.

The jarrah/marri type. This will be cut under a heavy selection system to remove all saleable marri and jarrah, except for vigorous and well formed jarrah stems in the smaller diameter classes. Unsaleable cull trees will then be removed and the area will be subjected to a top disposal burn.

The primary objective of a top disposal burn is to dispose of slash, though it also has the effect of stimulating advance growth and assists seed germination on ash beds.

Lignotubers and coppice of both marri and jarrah will supply the stocking for the next crop. In southern forests it is usual for marri regrowth to dominate in number of stems.

This system is essentially the same as that practised for many years with jarrah sawmill cutting, and by farmers who attempt to clear but neglect to follow up. Many fine marri and jarrah pole stands can be seen as a result.

The marri type. This will be treated in similar fashion to karri/marri, but

with a marri seed source retained. Pure marri forest will result. In practice it is expected that the few isolated examples of pure marri will be reserved from cutting.

Fauna

Research on fauna in W.A. State Forests is virtually restricted to that carried out by specialist officers of the Forests Department. Information is only currently available as internal reports, except for Information Sheet Nos. 5 and 12, Research Paper No. 11 and *Forest Focus* Nos. 7 and 10.

The dry sclerophyll (lower rainfall jarrah and wandoo) forest is a good fauna habitat. In the license area some 26 native mammal species, including 16 marsupials, several bats, two rodents and the dingo, occur. Seven species of introduced mammals are also present.

The eastern fringes, where wandoo occurs along the gullies (see map, page 4) are particularly rich in fauna. Most marsupials and the rodents are associated with gullies and require hollow logs and trees for shelter.

The wet sclerophyll (karri forest) supports some 11 species of marsupials, at least three bats, two species of native rodent plus six introduced species. Distribution is more even than in the jarrah forest although flats and gullies still tend to be richest in species.

A total of some 165 species of birds has been recorded within State Forest. Of these, 127 occur in dry sclerophyll forest and 74 in the wet. They can be roughly grouped into broad habitat categories as follows:

These categories are not exhaustive, but indicate the numbers associated with various canopy strata and other major habitats. Some birds are migratory and others, like the purple-crowned lorikeet which follows the eucalypt blossom, are seasonal.

There are also over 30 species of reptiles, about 8-10 snakes and about 20 skinks and geckoes. These are most common in the dry sclerophyll, especially in the eastern sector and near rocky outcrops.

A dozen species of frogs and toadlets probably occur, but their distribution is poorly documented. Very little information is available on insects and other microfauna, although preliminary investigations of litter fauna have been completed.

The map on page 4 shows the fauna-rich area in the north-east is excluded from operations of the woodchip license.

In addition, "corridor" reservations from cutting for both saw and chip logs now apply to an average of 20 per cent of each forest block.

Fire

As in all native Australian eucalypt forests, fire is an integral part of the ecosystem. Not only have plants natural adaptation to survive fire, but many depend upon it for their continued survival. Hard coated seed requiring fire to germinate, woody seed capsules, dramatic and permanent growth responses to ashbed, lignotubers and strong coppicing ability are all adaptations which testify to the long presence of fire in the vegetative community.

Forest type	*Swamps, open water and streams*	*Open areas and settlements*	*Birds of prey*	*High canopy species*	*Low canopy species*	*Undergrowth and ground species*
Dry Sclerophyll	25	17	15	14	40	16
Wet Sclerophyll	14	7	7	10	29	7

The fauna, likewise, has adapted.

It is the experience of the Forests Department that any attempt at land management of the wet and dry sclerophyll forests in W.A. which attempts to exclude fire, is destined to failure. The cumulative build-up of inflammable litter, an unfailing recurrence of fire danger days within regular dry hot summers, coupled with an uncontrollable source of ignition in the form of lightning, add up to a situation in which fire exclusion is guaranteed to give rise to periodic holocausts.

Accordingly the department has adopted a system of prescribed burning, by which midsummer wildfires are held in check through the control of fuel. Mild fires lit in spring and autumn (according to conditions) cause no damage to standing trees, yet prevent the massive damage of the midsummer wildfire.

Fire is used not only as a protection tool, but also to promote regeneration in cut-over karri stands. In this operation intense fire is used. This results from extensive research and approximates the natural process of cataclysmic fire which regenerated whole karri forests in the past.

ENVIRONMENTAL IMPACT

Climate

No significant change in the climate can be expected to result from the replacement of mature forest cover with regrowth stands of varying ages. At the most we could expect some temporary alteration of wind speeds. This could not be assessed due to the existence of large areas of previous forest cleared permanently for agriculture. In comparison to the "million acres a year" agricultural clearing programme of several years ago, the area of forest clear falling is somewhat insignificant and temporary.

Commercial forest

The conversion from mature stands to fully stocked regrowth stands would represent a big increase in productivity, perhaps up to five-fold in certain localities. Two factors are involved:

- Replacement of mature, slow growing trees with vigorous, fast growing young stems.
- Removal of degraded cull overstorey—which releases more land for commercial forest production.

Even-aged regrowth stands lend themselves to further silvicultural operations such as thinning, which in turn increases value productivity.

The change from a mature wood resource to regrowth represents an increase in value with regard to pulpwood. Young wood of all W.A. species has superior qualities in yield and strength.

In the foreseeable future the sawmilling industry will change from using a predominately mature log resource to one comprising mainly regrowth logs. This change will come regardless of a woodchip industry. Except in that a woodchip industry will make the regrowth sawmill resource larger and be available sooner, no difference to the sawmilling industry should result in the near future.

Expanded bush logging operations will increase the risk of spreading jarrah root rot in the jarrah/marri forest, despite strict observance of forest hygiene. Both marri and karri are tolerant to disease and are therefore unlikely to be affected. At present there seems no alternative to the programme of reducing the rate of artificial spread of the disease and replanting infected areas with resistant species. The difference is essentially one of rate of development, not the introduction of new changes which will alter susceptibility.

A woodchip operation may have the effect of speeding up the replacement and salvage programme.

Vast quantities of smoke have been injected into the atmosphere in the past by natural wildfires resulting from lightning fires, agricultural clearing burns, prescribed burns and, in earlier days, native hunting fires. No apparent ill effect to man or the environment has resulted. It is difficult to envisage that an increase in slash burning is going to make much difference.

Soil erosion

Increased soil erosion will be a distinct possibility. The degree of risk will vary with topography, soil type, geology, rainfall, roading characteristics and type and timing of the snigging operation.

The relatively gentle slopes encountered over the majority of the license area will enable most extraction patterns to minimise erosion problems.

Winter logging with track laying vehicles will pose the greatest risk in the snigging operation and use of rubber tyred loggers will be encouraged. They are expected to be used increasingly, except in the heaviest karri forest, where large log size may require more powerful tracked vehicles.

Elsewhere, logging roads have been known to account for the greatest proportion of erosion resulting from a logging operation. Control of this aspect will be the key to the successful control of erosion. Use of plans depicting erosion risk will be a valuable aid to the planning of logging roads to reduce this risk.

The use of fire to remove debris and establish regeneration will increase erosion risk by removing soil cover for a limited period. This aspect only applies to the 4000 to 5000 hectares a year clear felled and relates to the karri sawlog requirement rather than the chip operation which merely combines with (or follows) the sawlog operation—prior to the regeneration burn.

Increased erosion is a short-term risk. It will disappear soon after regeneration establishes. Karri regeneration studies have shown that erosion following treatment is contained within acceptable limits. Actual erosion resulting from controlled operations involving temporary removal of cover would not be significant, in the long term, when compared to that prevalent within the 169000 ha of private property in the license area permanently cleared for agriculture.

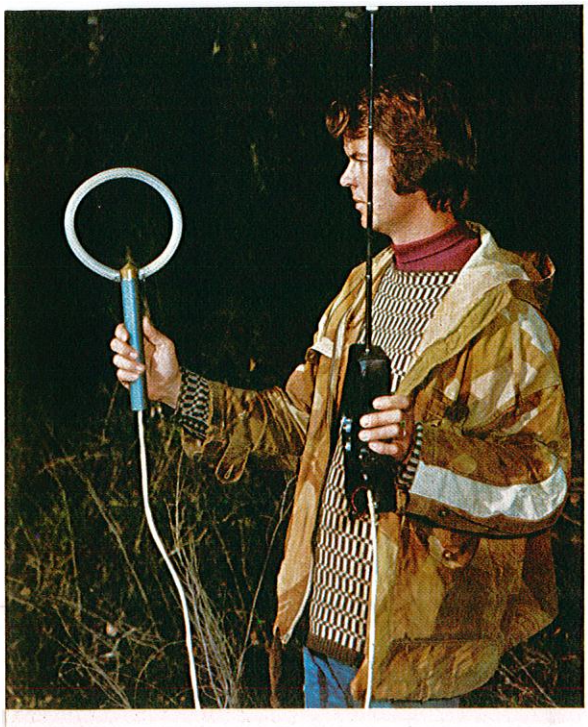
Salinity

Ground water salinity problems are unlikely where the annual rainfall exceeds 1000 mm. Though most previous investigations refer to watersheds further north in the Darling Scarp, there seems to be no reason why a similar situation should not exist around Manjimup.

The amount of salt in underground water is not dependent entirely on total annual rainfall—salt levels exceeding 2000 ppm have been found in deep profiles in rainfall zones as high as 1200 mm a year. The amount of dissection and depth of profile are important factors. However, the fact that agricultural clearing in the southern 1000 mm zone has not resulted in dangerous rises in salt content suggests that an increased clear falling programme with the temporary removal of tree cover will not change this situation.

The karri and karri/marri areas are, for the time being, classified as safe, with regard to salinity.

The situation in the drier jarrah/marri areas requires extreme caution. These are entirely within the watershed of the Warren River and include the catchments of the Wilgarup and Perup Rivers—*both of which have gone salty following agricultural development.* The catchments are a

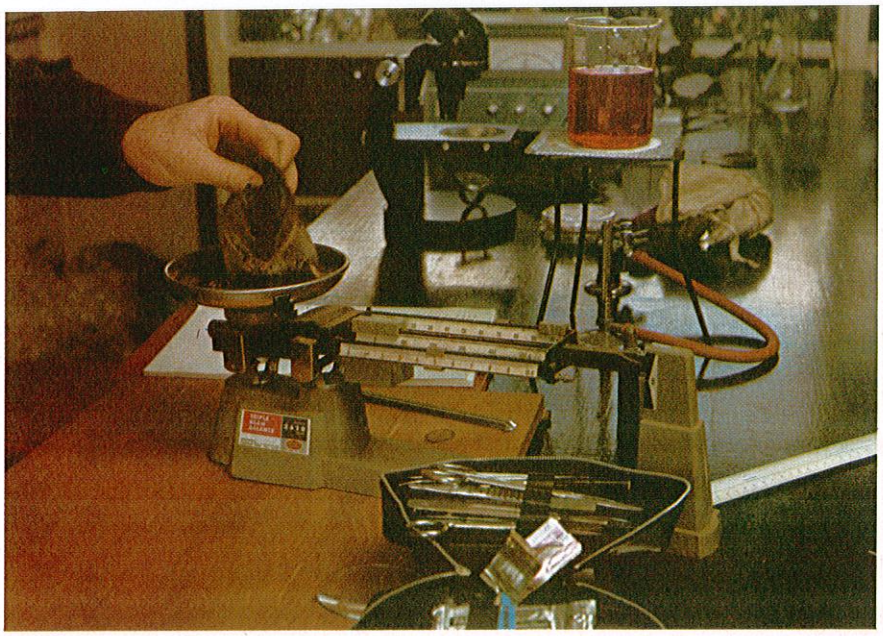


▲ *Radio tracking equipment for fauna surveys was made by Forests Department Radio Branch after consultations with Fisheries and Fauna Department research officers.*

mildly undulating plateau with mostly deep lateritic soils, and the annual rainfall ranges from 1 000 mm to 760 mm. As such they resemble the Helena River catchment east of Perth, except that the forest cover is denser and higher. Salt accumulation in the profile is likely to be high at depth. Under forest, evapotranspiration balances rainfall, and little lateral flow of water occurs at depth. Partial removal of the vegetation by selection cutting in this zone must result in at least a temporary increase in ground water and movement of salt concentrations into drainage lines. This has happened following the limited agricultural clearing.

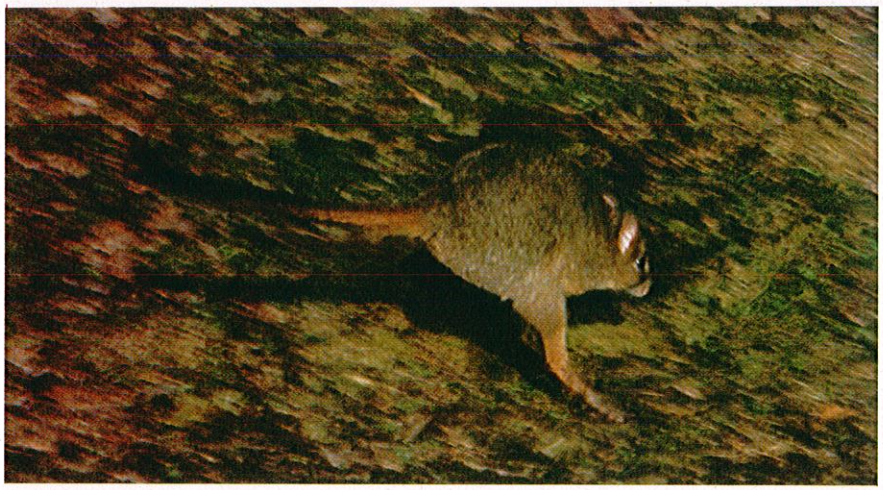
The stable situation will be restored on cut-over areas when the regrowth crops take hold.

The scale of possible salinity increases is not known, and therefore whether the increase, spread over the whole Perup and Wilgarup Rivers catchment will be significant is not known. Whether the salinity of the Warren River, into which both streams flow, is worth concern

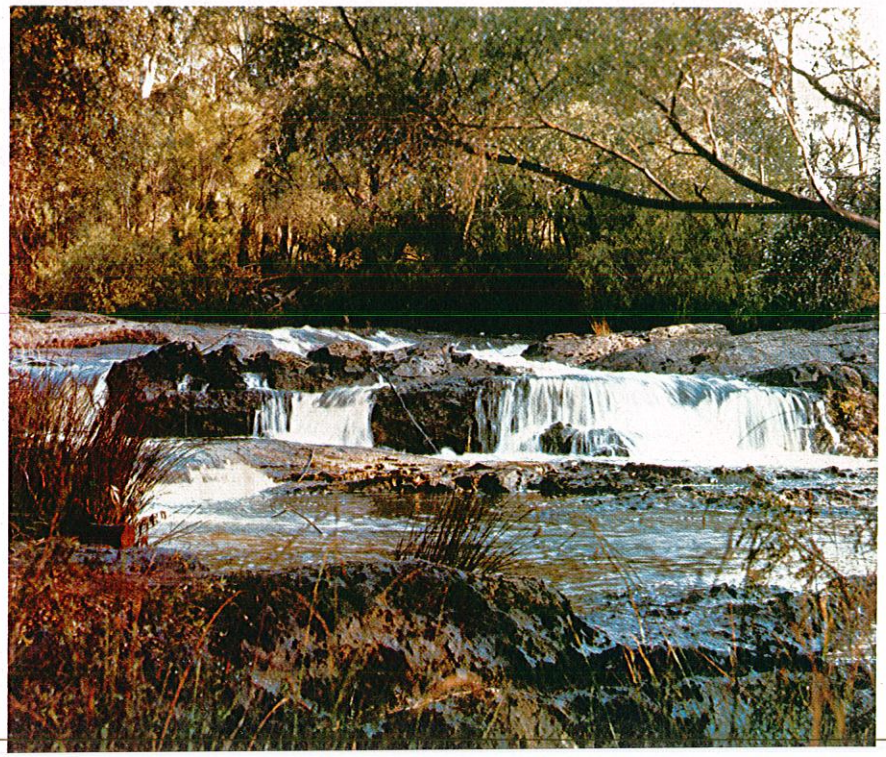


▲ *A southern bush rat "doing his bit" for fauna research.*

▼ *A woylie in hurried retreat after his vital statistics had been recorded for posterity in survey.*



▼ *Tourist and recreation values receive consideration in forest management.*
(Brian Stevenson)



▲ *The eastern wandoo woodland—home of the numbat.*

is open to question. Its average salinity level at present borders on the upper limit of potability. Extensive and increasing agricultural development in its upper reaches must result in increasing salinity, so that the critical level for potability must soon be exceeded. On the other hand, the Warren is the major stream in the region, and this resource, with salinity reduced by dilution with water from fresher forest streams, may be required for the eventual development of any major industrial venture in the lower South-West.

The department will restrict cutting in the north-east sector of the license area until detailed research has defined the impact of further logging on stream quality.

Flora

The scrub and herb species are unlikely to suffer, either through the logging operations or the burning. Experimental evidence is available, particularly on the effects of burning, which indicates that no direct detrimental effects should result.

The understorey will undergo successional changes similar to those observed after a fire. This also is unlikely to affect the environment in the long term, and short term habitat diversity will probably prove beneficial.

From a purely botanical point of view there is no reason for limiting the size or intensity of the operation. All the species of plants possess adaptations which will enable them to survive the operation. Oddly, karri is the one exception which will require seed trees to be left for its regeneration.

Jarrah root rot is a major problem. In the long term this will result in the destruction of a large portion of the native flora within the jarrah/marri forest. This destruction is

inevitable—whether or not a chipwood industry is introduced. However, chip log extraction will hasten the process.

Fauna

Felling and burning produce an inhospitable habitat within the coupe, with the result that some fauna are removed. Some small mammals such as rodents, marsupial mice, undergrowth birds such as wrens, reptiles and amphibia survive the felling and adapt to the new environment. However, after the burn these, too, may temporarily disappear as the open areas offer no protection from predators.

Very few animals are able to live on bare burnt areas. Some of the species that previously lived there are able to adapt by moving to nearby uncut forest areas. Studies on native rodents and small marsupials have shown that although they survive logging and fire, they are somehow unable to transfer their home range to nearby unburnt or uncleared land, if the animal population there is already high, and so fall easy prey to predators.

However, studies have also shown that cut-over and burnt areas are recolonised very quickly by mainly young fauna from adjacent areas. This takes place in a successional series as the young regrowth forest develops through its seral stages to maturity. Each stage favours a certain community of animals, so the fauna of the clear cut and regenerating areas will continue to change, throughout the forest's development, until the mature forest stage is once again reached.

In order to make sure that recolonisation takes place quickly and to ensure the survival of all species within the area, certain sectors must be reserved in an uncut state.

Sections of non-forest or flats form suitable areas from which recolonisation can take place. These areas are generally rich in fauna.

However, blocks of non-forest are in themselves too small a percentage of the area to be sufficient. Therefore a further percentage of the forest needs to be reserved from cutting.

This is best achieved by leaving strips of forest along rivers, streams or gullies so as to form a continuous network of uncut forest throughout the entire area. The wide variety of habitats along streams and gullies are the best fauna refuges in the forest and there are also many other reasons for preserving streamside vegetation.

A fringe of vegetation will also be reserved around all rocky outcrops, swamps and lakes. It will be attempted to tie these areas in with the stream reserve system which will be left in such a way as to form continuous uncut forest corridors. Stretches of cut-over forest between the corridors will not exceed three to five kilometres.

A further percentage of each area will be left along major highways and tourist routes so that the total of uncut forest in any block will comprise some 20 per cent of the area. The reserves will be protected from slash and regeneration burns.

The stream reserves will also ensure a favourable habitat for marron and trout. Without these provisions the removal of streamside vegetation and tree canopy would certainly be most undesirable for trout, as the water temperature would rise and the fish would be under extreme stress during summer.

Wherever possible no cutting will be done adjacent to a previously cut block for at least four to five years. This will allow time for some of the smaller birds and animals which favour early seral stages to re-establish themselves.

With the stream, roadside amenity and non-forest reserves left untouched and as the regrowth establishes, the fauna will recover both in number and species.

For some time those species which frequent the tree canopy and those needing holes in trees for breeding will remain severely reduced. This includes all the parrot family, possums and some other animals.

Species that favour dense undergrowth and regrowth stands will increase in numbers—this includes birds like wrens and animals like the native bush rat.

There are a few species of animals which would not survive the operation even if provided with the reserved areas—among these are the numbat (*Myrmecobius fasciatus*) and the woylie (*Bettongia penicillata*). These species which have a restricted distribution in the easternmost part of the area require large home ranges and cannot survive the chip operations. *It is therefore intended that the eastern areas, especially those having some wandoo, be left alone entirely. The Perup River Fauna Priority Area (see "Forest Focus" No. 10) of 40000 hectares, has been established to favour and study these species, and will not be influenced by the chip project.*

It therefore appears that although numbers of some species will be temporarily reduced, no species will be wiped out and most will eventually recolonise cut-over country as it grows to maturity.

There will be a short term loss of honey and pollen production over the initial stages. Marri is one of the staple regular honey producers of the forest. In the long term it is expected that the situation will improve above the original level as vigorous regrowth stands establish. Marri flowers at a very early age and should be producing honey and pollen again after six or seven years.

For a period of a few years each area as it is clear fallen or selectively cut will be aesthetically unacceptable. Until regrowth becomes well established (four to eight years) the amenity value of these forests will

be low. As stands grow, the forest environment will be restored, as will its amenity value.

If not taken into account, the tourist and recreation values for the region could fall sharply.

A considerable area of forest will be retained in uncut condition along all main tourist routes. Where a forest habitat is to be retained along a road, not less than 100 m each side should be retained to provide for adequate floral representation. The major proportion of the well used roads, as well as good picnic sites, river edges and good landscapes will be withheld from cutting and developed as required for recreation.

Research and experience within the department indicates that it has the infrastructure and desire to cater for this social impact.

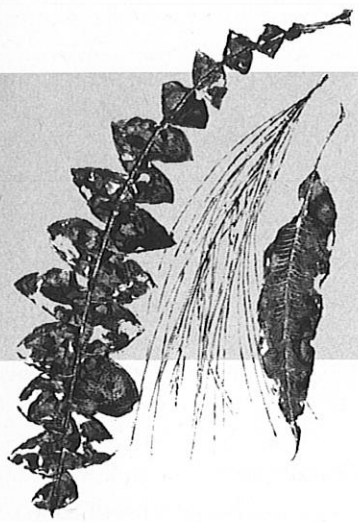
The department also plans to increase the uncut park area in the region to the extent of some 6500 ha to include karri/marri, karri, jarrah/marri and jarrah types. *It has recommended complete reservation of the coastal areas as National Park in a report submitted to the Conservation Through Reserves Committee of the Environmental Protection Authority. This planning is independent of the chip project but made more essential by this new development.*

National Parks and other parks and reserves within the license area also will not be cut over.

OMISSION

Due to an oversight, several photographers contributing to *Forest Focus* No. 11 were not credited.

Photographs on pages 5 (top), 8 (bottom right) and 13 (bottom) by Brian Stevenson; page 6 (bottom) by Dick Perry; page 9 (bottom left) by the Government Photographer; and pages 4 (top), 9 (top), 11 (middle, right) and 12 (bottom), by unknown photographers.



INFORMATION SHEET 2

FORESTS DEPARTMENT WESTERN AUSTRALIA — PRODUCTION, PROTECTION, RECREATION, CONSERVATION

▲ *A reduced size leaf print made from bull banksia, sheoak and marri leaves is the identifying symbol for the information sheets, and is incorporated on the left hand side of the heading on each leaflet.*

New Information Series

A new information series is now being written by Forests Department officers and is intended to cover a wide range of topics connected with forestry—including bushfire survival; forest animals, birds and insects; some historical information; and other general forestry subjects.

The information sheets are produced in the form of simple leaflets —some of which are illustrated— varying from one to seven pages in length.

The sheets published so far include:

1. Tall Trees
2. Bushfire Survival
3. Pine Plantations of Western Australia
4. Jarrah Root Rot
5. Mammals of Western Australian Forests
6. Eucalypts—A Simplified Key to 17 Species
7. Fire Lookout Towers
8. The Jarrah Leaf Miner
9. Pit-sawing in Western Australia