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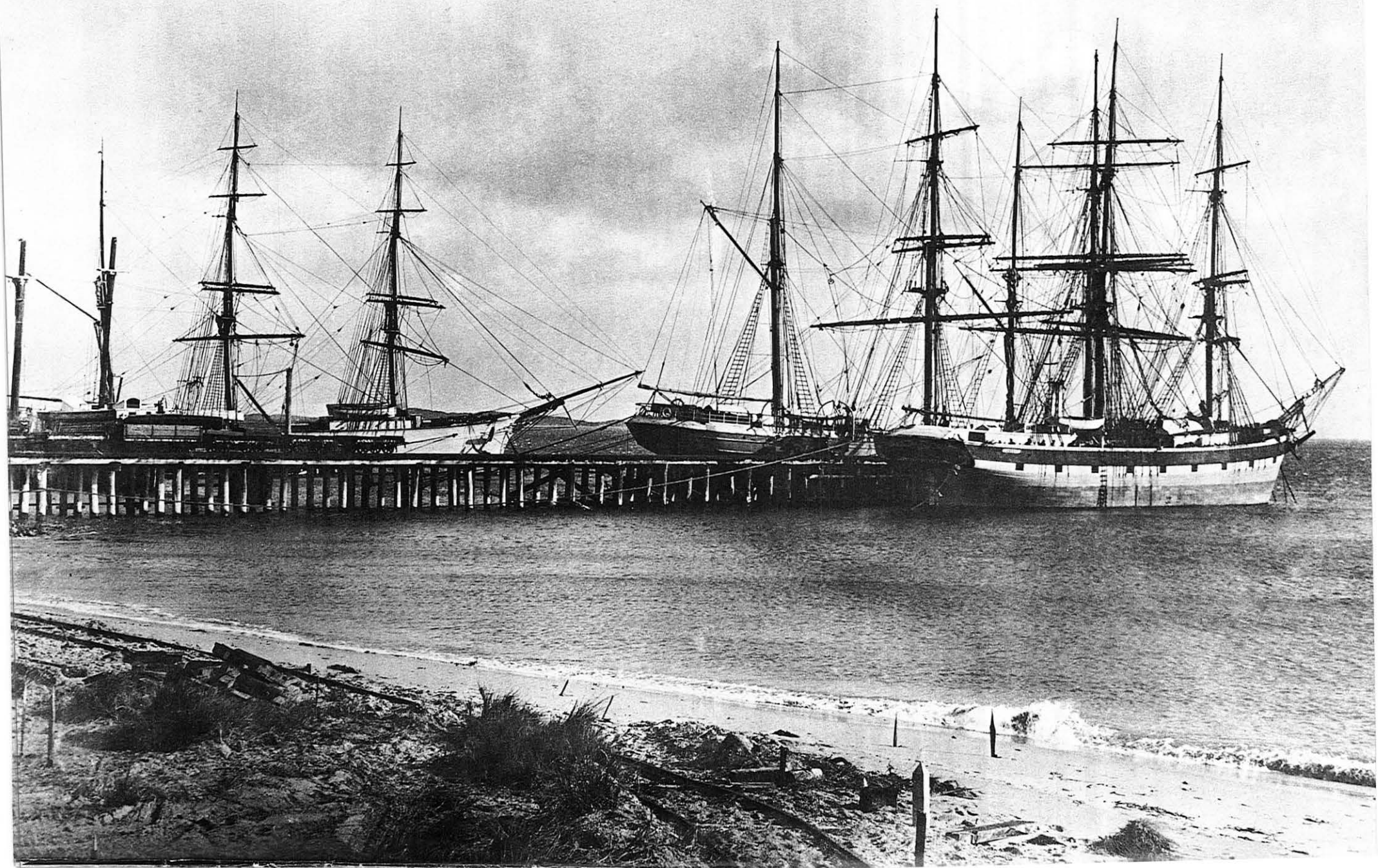
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BIRDS OF THE JARRAH FOREST—JARRAHDAL CENTENNIAL





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FISHERIES AND WILDLIFE



FOREST FOCUS

Number 7, April 1972



Early History of JARRAHDALE

by Librarian ED. WILLIS

Published for Mr. D. W. R. Stewart, Conservator of Forests, Forests Department of Western Australia, 54 Barrack Street, Perth.

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Front cover

Red-capped parrot (Purpureicephalus spurius) photographed at the Zoological Gardens, South Perth.

Back cover

The Christmas Tree Well, see "Forestscapes", page 15.

Historic photographs

Acknowledgement is made to Millars Aust. Pty. Ltd. for the use of historic photographs appearing in this edition.

With the centenary celebrations of Jarrahdale taking place in May 1972 it seems an appropriate time to recount the early history of this important timber centre.

Jarrahdale's history begins in October 1869. The struggling colony of Western Australia had just received a new governor. Governor Weld had been appointed in the hope that he would be able to infuse some vitality into the colony's flagging economy. There were barely 24,000 people living in the colony at the time and its progress lagged considerably behind the eastern colonies. Weld had earned a good reputation in New Zealand as a cabinet minister with progressive views on the use of local resources.

Attracting capital

He took the initiative in offering attractive conditions to capitalists in the hope they might be persuaded to invest in the colony. The main difficulties the timber companies had to contend with was the distance of transport to the port of shipment. This necessitated the laying down of railways entailing the expenditure of large amounts of capital. The lack of local capital precluded any extensive local initiative but several eastern Australian companies became interested in the forests of Western Australia as a suitable source of timber for public works, mainly harbours and railways. Between 1869 and 1871 there were three separate infusions of capital into the local timber industry. Jarrahdale was to be the largest of these undertakings.

Negotiations for the Jarrahdale project commenced on 26 September, 1870, when William Wanliss wrote to the Colonial Secretary suggesting a timber concession in the Cockburn Sound district. These discussions

were concluded successfully and the approval of the home government obtained. The major backers of the project were from Ballarat, Victoria.

The original syndicate did not last long and a new company was founded in June 1871 by several Ballarat businessmen. Under the terms of the agreement the syndicate was granted a concession of 250,000 acres of excellent jarrah forest at a peppercorn rental. The new company called itself the Rockingham Jarrah Timber Company Limited. The concession was originally granted for only 13 years but it was renewed subsequently on several occasions and did not in fact expire until late 1929. The company enjoyed exclusive rights of exploitation.

A port was to be established at Rockingham (one of several built by the company) and connected to a mill at Jarrahdale by rail. In the agreement the company also had to supply and maintain a steam tug for the use of general shipping at Rockingham.

Little time was lost in getting things under way. As there was no railway from Perth to Bunbury at this time, or roads of any consequence, the transport of equipment to the mill site was extremely difficult. The mill machinery was taken to a point 35 miles from Perth on the Albany road and 10 miles from the mill site. A track was then cut through the forest to Jarrahdale. A Thomsons road steamer, a large and cumbersome traction engine, was brought in to transport the heavier machinery.

(Continued on page 10)

◀ Nos. 1 and 2 jetties, Rockingham, before the turn of the century. The ship on the far right was from Grimstad, Norway. Wooden rails can be seen in foreground.



▲ *Western rosella*

Photographed at Zoological Gardens



▲ *New Holland honeyeater*

L. Harman



▲ *Red-winged wren*

Courtesy Tourist Development Authority



▼ *Purple-crowned lorikeet*

Photographed at Zoological Gardens



▲ *Yellow-tailed thornbill*

P. Kimber



▲ *Red-eared firetail*

L. Harman

▼ *Splendid or banded blue wren*

P. Kimber



Birds of the Jarrah Forest

by Silviculturist PETER KIMBER

The number of bird species represented in different vegetation types in different parts of the world has been studied fairly thoroughly. In broad terms, forests and woodlands support a larger number of species than low vegetation types and grasslands. The drier the forest however, the greater the species representation. Numbers are also greater in tropical than in temperate forests.

Orians, writing in *Ecology* Vol. 50, pp. 783-96, gives information for Central and North America, and he quotes the following numbers of species by forest type:

- Lowland tropical wet forest (Panama)—40 species.
- Lowland tropical dry forest (Costa Rica)—67 species.
- Temperate maple-beech-hemlock (New York)—27 species.

The jarrah forest grows in a Mediterranean type climate which may be classified as falling between a temperate and a tropical type.

How do the number of bird species in the jarrah forest compare with similar forests elsewhere? I have set out to produce evidence that jarrah is as rich in bird species as any comparable forest type in spite of occasional criticism heard to the contrary. Such criticism stems from two main aspects of the jarrah forest. Firstly a lack of diversity in vegetation is quoted; secondly the regular controlled burning practised in the forest is thought to be detrimental to bird populations.

I will first deal with diversity in the vegetation.

The jarrah forest gives a general impression of uniformity due to one species dominating the upper storey of trees. Three or four other species of eucalypt are present, generally in mixture with jarrah but these others frequently dominate small areas which are unsuited to jarrah. Examples are blackbutt (*E. patens*) on moist red loams and bullich (*E. megacarpa*) in silty gulleys.

The ground vegetation presents a different picture. Ecological studies

have revealed over 20 well defined plant communities in the forest. This figure does not include swamp habitats. Swamps, or flats, cover roughly one-tenth of the ground within the jarrah forest. They are dominated by a range of plant species ranging through blackboys, tea-trees and acacias, banksias or paperbarks depending on their location, soil and configuration.

Other habitats attractive to a wide range of birds are the forest edges adjacent to farmland, and the large reservoirs maintained for metropolitan water supplies and irrigation. Within the forest proper, forest management has created a wider habitat range than existed in the virgin forest. Uncut or virgin forest is characterised by a preponderance of large mature trees with a high general canopy level. The jarrah forest, when compared with many other forest types, carries only a sparse understorey of small trees and large shrubs. It has been the policy to manage the forest in an uneven-aged condition over the past 50 years. Under this system the forest consists of a mosaic of trees of all ages and sizes from small saplings to giant veterans. This in turn ensures a patchy leafy canopy extending almost to the ground. This type of cover appears to be greatly appreciated by those bird species which forage and nest below the main large-tree canopy. A range of birds seem to benefit; this includes the western warbler, golden whistler, spinebill and fantail.

Habitat diversity, therefore, is not lacking in the jarrah forest. There exists both a natural diversity due to

soils and topography, and a man-induced diversity achieved as a by-product of forest management.

Fire in the forest is the second reason sometimes put forward as a factor inimical to its bird population. There is no doubt that severe, uncontrolled fires do considerable harm, both by direct injury to the birds and indirectly by temporarily disturbing their habitat. There is strong evidence that the jarrah forest has been subjected to fire for a period of at least 7,000 years. Hence we may assume that fire is not a new experience to the bird population, and that it may have adapted to it to some degree.

The most efficient method of reducing the frequency and the intensity of wildfires is to prevent the build-up of the large quantities of fuel, in the form of dead leaves and twigs, necessary to support an intense fire. This is achieved in the jarrah forest by burning the litter with a mild, closely controlled fire every five years or so. Such fires cause minimal destruction of habitat. They destroy almost entirely the existing ground vegetation. But this regenerates within a few months from under-ground root-stocks and reaches its original size and conformation within two years. Swamps, which take longer to recover, are burnt on a rotation of 10 to 15 years.

It will be realised that only transient disturbance of the majority of habitats available in the forest is caused by burning operations; only the ground vegetation is removed and this recovers in a relatively short period. How important, then, is this disturbance to the forest birds?

Probably as a result of the long

association of the forest with fire, ground inhabiting species are almost absent. There are no true nightjars in the forest, quail are local and concentrate round swamp edges, and the mallee-fowl occasionally wanders into the more eastern sectors of the forest. Emus are resident but not common.

The remainder of the bird population is primarily dependent on the foliage cover of saplings, understorey species, and the main tree canopy for foraging and nesting. Recent studies have been made on the response of these populations to burns of two intensities.

Two 40-acre areas of forest were burnt in late November, early December. One was a very mild burn, typical of the prescribed fires used in controlled burning. Approximately 70 per cent of the ground vegetation was consumed and leaves of the understorey (mainly *Banksia grandis*) were slightly scorched to a height of

6 ft. The experimental area was covered systematically by two or three observers for 16 visits each of roughly three hours duration; eight were before the fire and eight after. No changes were found in the number of birds or in the number of species recorded. Two disused nests, of a brown thornbill and an unknown species of honeyeater, were destroyed by the fire. Fourteen other nests including those of brown thornbill, spinebill, western yellow robin, golden whistler, rufous tree-creeper, goshawk and squeaker were unaffected.

The second area was intentionally burnt with a more than usually severe fire. The ground vegetation was entirely consumed. The understorey, again mainly of *B. grandis*, up to 25 ft. high, was almost completely scorched over three-quarters of the study area. A similar series of observations was made to record numbers and species of birds.

Only one species appeared to be seriously affected. The brown thornbill, inhabiting the lower understorey, was reduced in numbers by 40 per cent after the fire. As no evidence of death could be found, it was assumed that the birds had left the area. The number of grey fantails was also down after the fire.

Some species remained within the study area but moved from heavily scorched to more lightly scorched forest. This was particularly noticeable with the western warbler and to a lesser extent the golden whistler. The western warbler inhabits the lower part of the main tree canopy and being a late-nester, could well have suffered more serious disturbance than most other species which had almost finished nesting at the time of the fire.

The other most numerous species in the area were apparently unaffected and no change occurred in their numbers. These included the

Birds identified in State Forest within 15 miles of Dwellingup

C=common O=occasional R=rare

A. Birds of the jarrah forest growing on gravel soils. (Sparse understorey and ground vegetation.)

1. Emu, O
2. Whistling eagle, C
3. Goshawk, C
4. Collared sparrowhawk, O
5. Little eagle, C
6. Wedgetailed eagle, C
7. Little falcon, C
8. Brown hawk, C
9. Mallee fowl, R
10. Common bronzewing, C
11. Brush bronzewing, O
12. Purple-crowned lorikeet, O
13. White-tailed black cockatoo, C
14. Red-tailed black cockatoo, C
15. Smoker parrot, O
16. Western rosella, C
17. Red-capped parrot, C
18. Twenty-eight parrot, C
19. Elegant grass parrot, O
20. Pallid cuckoo, O
21. Fantailed cuckoo, C

22. Narrow-billed bronze cuckoo, O
23. Golden-bronze cuckoo, C
24. Boobook owl, C
25. Tawney frogmouth, C
26. Owlet nightjar, C
27. Laughing kookaburra, C
28. Sacred kingfisher, O
29. Bee eater, C
30. Welcome swallow, O
31. Tree martin, C
32. Black-faced cuckoo-shrike, C
33. White-winged triller, R
34. Western warbler, C
35. Brown thornbill, C
36. Western thornbill, C
37. Yellow-tailed thornbill, C
38. Weebill, C
39. Scarlet robin, C
40. Grey fantail, C
41. Golden whistler, C
42. Western shrike-thrush, C
43. Black-capped sitella, C
44. Rufous tree-creeper, C
45. Spotted pardalote, C

46. Red-tipped pardalote, C
47. Brown honeyeater, C
48. White-naped honeyeater, C
49. Brown-headed honeyeater, C
50. Spinebill, C
51. Red wattle bird, C
52. Little wattle bird, C
53. Dusky wood swallow, C
54. Squeaker, C
55. Raven, C

B. Birds preferring the low dense vegetation of swamps, jarrah forest on red-loam soils, and riverside forest.

1. Brown quail, C
2. Spotless crane, C
3. Little grass bird, R
4. Banded blue wren, C
5. Red winged wren, O-C
6. Spotted scrub wren, C
7. White-breasted robin, C
8. Silveryeye, C
9. New Holland honeyeater, C
10. Red-eared firetail, C

C. Birds of clearings and forest edges.

1. Black-shouldered kite, R
2. Swamp harrier, O
3. Kestrel, O
4. Australian pipit, C
5. Willy wagtail, C
6. Magpie lark, C
7. Grey butcher-bird, O
8. Western magpie, C

D. Birds of the rivers and dams.

1. Little grebe, O
2. Black cormorant, O
3. Little black cormorant, C
4. Little pied cormorant, O
5. Darter, O
6. White-faced heron, C
7. White-necked heron, R
8. Black bittern, O
9. Black swan, R
10. Black duck, C
11. Maned goose, C
12. Blue-winged shoveler, O
13. Musk duck, C
14. Dusky moorhen, R

red-tipped pardalote, black-capped sittella, spinebill, white-naped honey-eater, tree martin, rufous tree-creeper, western shrike thrush and red-capped parrot.

Further work is to be done to investigate the effect of fire on nesting success. Over 30 nests were located in the two study areas, but most were out of use at the time of the fires. Those that were occupied, three nests of the western yellow robin including one in the severely burnt area, were apparently unaffected and young were raised from each one.

Now to consider the range of species represented in the jarrah

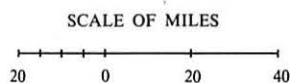
forest and their numbers. A checklist has been made of the birds observed within a 15-mile radius of Dwellingup—a settlement within the high-rainfall jarrah zone. Eighty-seven species are recorded. Of these, eight can be associated with large clearings and forest edges, and 14 with water in the form of rivers or dams. This leaves a total of 65 species associated with the forest proper. The mixed species eucalypt forest of the Trentham/Daylesford region of Victoria, similar in many respects to the jarrah forest, has 56 species represented. The jarrah forest thus seems to be well endowed as far as numbers of bird species are concerned, and

compares favourably with similar forests in Australia and South America.

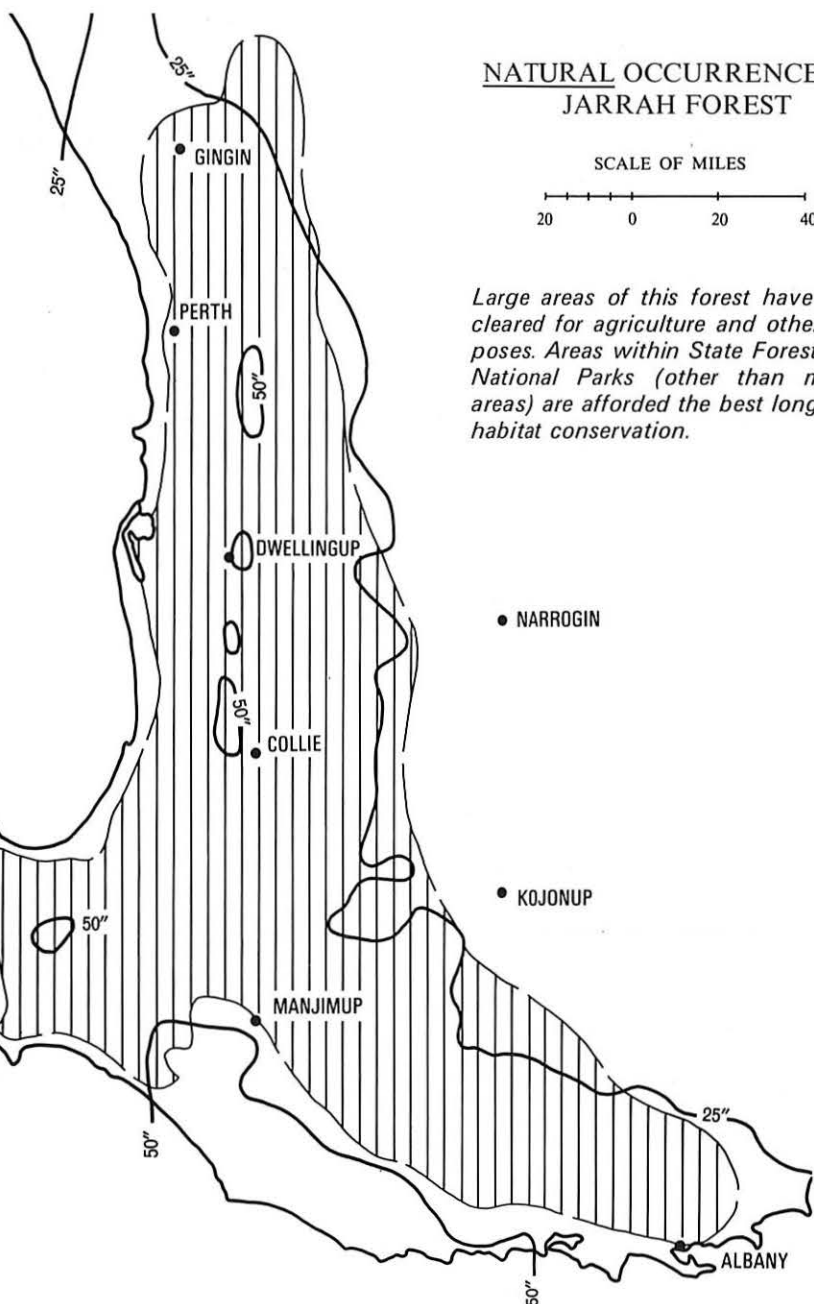
The final point of interest is just how many birds are there in the forest; what is the population density? Some data on this subject is available from the fire study mentioned earlier. The study only covered forest on gravel soils and was confined to the hours of daylight. Hence both species preferring thick cover, and nocturnal birds, are not included. The number of birds assessed as resident in the two areas, totalling 80 acres, is shown in the following table.

| <i>Species</i> | <i>Number of residents per 80 acres</i> |
|------------------------|---|
| Brown thornbill | 56 |
| Red-tipped pardalote | 40 |
| Western warbler | 30 |
| Golden whistler | 26 |
| Spinebill | 24 |
| Western yellow robin | 22 |
| Western thornbill | 18 |
| White-naped honeyeater | 16 |
| Tree martin | 16 |
| Grey fantail | 10 |
| Rufous tree-creeper | 10 |
| Others | 49 |
| Total | 317 |

NATURAL OCCURRENCE OF JARRAH FOREST



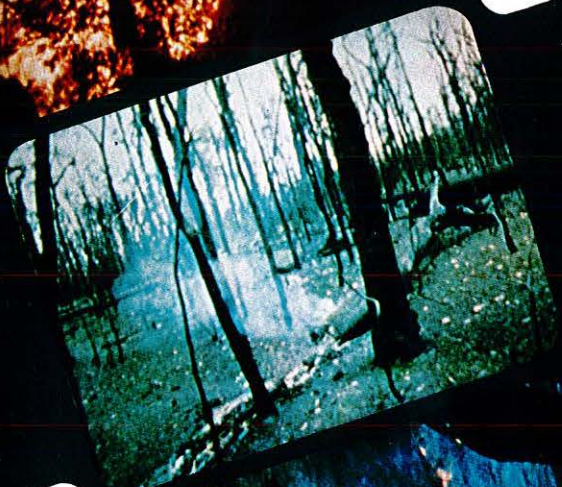
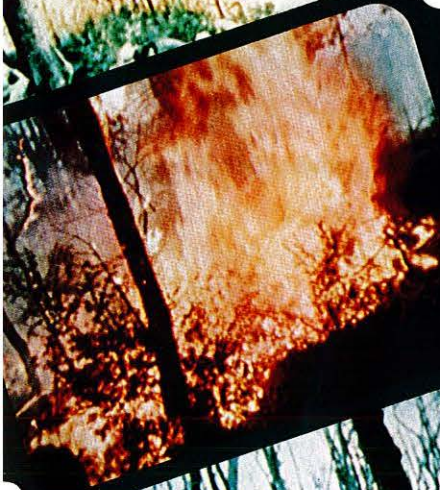
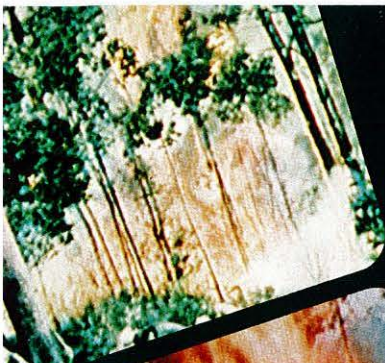
Large areas of this forest have been cleared for agriculture and other purposes. Areas within State Forests and National Parks (other than mining areas) are afforded the best long-term habitat conservation.



This estimate of 317 residents in 80 acres is likely to be on the low side due to observers missing some birds.

Those who wish to see the birds are advised to visit the forest in the early morning or late afternoon when their activity is at a peak. Also, it is more rewarding to sit down and wait for birds to appear rather than walking around which causes some disturbance. Do not expect to see large numbers in one visit. The maximum number of birds seen on any one of a total of 32 visits to the two study areas was less than one-quarter of the total population of the area.





FLIGHT LINE ONE

A new 28-minute colour film titled *Flight Line One*, produced by the C.S.I.R.O. Film Unit, has recently been released.

Early Australian fire history, background research into forest fires by the Bushfire Research Section, C.S.I.R.O., and forest wildfire and prescribed burning research by the Forests Department of Western Australia are briefly explained in the film.

Viewers are also taken through the sequences of the stringently controlled operations employed by the W.A. Forests Department in prescribed burning programmes.

The film is available on short-term loan to organised groups from Forests Department, Institute of Forest Research and Protection, Como; and the Audio Visual Branch, Education Department.

The following article provides some background material on the subject.

PRESCRIBED BURNING IN W.A. FORESTS

by Fire Research Officer GEORGE PEET

A recent Fire Protection Association of U.K. survey put Australia ahead of 13 other countries for fire losses expressed as a percentage of gross national product.

Early W.A. records indicate that fires were common in, or near the forest areas prior to European settlement. Aborigines were acquainted with its use and moved continuously over the forest area in search of food. Under these conditions it is inconceivable that accidental fires did not occur, to which must be added fires starting from lightning strikes.

These early fires were probably periodic, and undoubtedly covered large areas, but it is doubtful if they achieved the intensity of fires resulting from forest and land utilisation following European settlement. As masses of debris resulting from utilisation and clearing increased, so conflagrations increased in intensity. These led to severe and widespread forest damage, affecting about one million acres in the 90 years pre-

ceding the passing of the Forests Act in 1918.

Alarmed by the extent of this damage, early foresters attempted to implement a policy which almost entirely excluded fire from cut-over forest. This could not be sustained and after 15 to 20 years, accumulated fuel on the forest floor was such that even heavy expenditure on men and equipment failed to contain fires burning under the worst summer weather conditions.

These problems were highlighted by the disastrous Dwellingup fires in 1961, which blackened 361,000 acres of forest and practically obliterated three small townships.

A new policy introduced in 1954 aimed at systematically checking the fuel build-up by rotational burning over the whole forest, except in recently cut-over areas where small saplings were regenerating.

Prescribed burning would be carried out in the mild weather of spring and autumn when damage to the forest trees was negligible. Summer fires starting in, or burning into these fuel-reduced areas are relatively easy to control and burn at a lower intensity with less damage to the forest environment.

This policy called for prescribed burning over half to three-quarters of a million acres annually.

At this time, personnel with sufficient experience to tackle this immense task was very limited and consequently the programme fell behind for several years. Difficulties had been experienced for many years in the southern forest in particular, where dense scrub and limited roading prevented access by teams of men to carry out the burning. It became obvious that different methods allowing faster work and coverage of larger areas would have to be adopted, and for this to be done safely a major research effort on fire behaviour was required.

Fire research over the past 10 years has concentrated on providing reliable guides for prescribed burning and on developing lighting techniques which allow larger areas to be covered. Much of this work is now in operational use, permitting most of the forest areas to be rotationally treated every four to six years.

There can be little doubt that increases in prescribed burning over the past decade have effectively

(Continued on page 14)

◀ *Random clips from the film, indicating the disastrous effect of wildfires on the forest; research and development to help overcome this ever-present threat; aerial prescribed burning operation; and forest after a prescription burn.*

This was received with delight by all, especially the youngsters, in the white community but terrorised the aborigines when they saw it puffing along spewing sparks and steam. The aborigines declared it must be "Jingey", meaning the devil.

Wooden rails

The first mill was quite a large one for those days, with an 80 h.p. engine, two large marine boilers, an output of 21,000 super feet a day and employed 200 men, many of them from the eastern colonies. The mill came into operation in May 1872 and the railway to Rockingham was completed by November 1872. The line was built of sawn jarrah rails spiked to sleepers and joined with iron plates at the curves to prevent derailments. Its total length was 23 miles. The locomotive to be used on the line had already arrived in December 1871, and as a tribute to the governor was named the "Governor Weld". This was the second locomotive in the colony.

Exports

Increasing interest in Western Australian timbers is reflected by the expanding income from the export of timber from the colony. Export earnings from timber grew from £14,274 in 1869 to £82,052 in 1890. The figures in the table are from the Western Australian yearbook for 1890 and indicate the nature of Jarrahdale's contribution to the timber trade.

During 1894-5 some 30,000 loads were exported to London and other markets, and over 10,000 loads supplied to the local market during the same period.

Jarrahdale in 1882

A correspondent of the Perth newspaper *The Inquirer* visited Jarrahdale in May 1882 and was most impressed with what he saw:

Starting from Rockingham where two or three ships may often be

| <i>Loads (1 load=50 cu.ft.)</i> | <i>Exported to</i> | <i>Purpose for which exported</i> |
|-------------------------------------|------------------------|--|
| 2,674 | Port Adelaide | Building scantling, bridge and wharf building. |
| 1,025 | Melbourne | Harbour Trust work. |
| 637 | Natal | Harbour work, etc. |
| 2,770 | London | Paving streets, bridges and harbour works. |

seen loading railway sleepers for the southern colonies, one is struck with the ease and rapidity with which timber can be shipped from the Rockingham jetty. The station at Jarrahdale is 23 miles distant and is reached by the company's railway.

Jarrahdale is situated on either side of a running brook, the place is dotted with numerous little cottages, the residences of the sawyers, all clean and comfortable. The manager has a large and comfortable residence, and there are the usual offices and stores.

There is a school house and a Good Templars lodge room built by them at their own expense. This room is also open during the week as a reading room, the charge for membership being moderate. The library contains 100 volumes and a similar number is about to be added. By coach mail a large number of English and colonial newspapers and periodicals arrive, the list of which would be creditable to any literary institute.

Every effort has been made to banish the vice of drunkenness and gambling, the Good Templars exercising a moral influence over the station which is happily encouraged by the manager Mr. Rigg but it is regretted visits by the clergy are few and far between. They will perhaps awake someday to the fact that about 300 souls have been without a spiritual adviser.

By 1890 the residents' spiritual welfare was being well catered for with the establishment of Anglican and Wesleyan churches.

Railway line upgraded

The original syndicate folded in 1889 and a new company, the Neil McNeil & Company, Jarrahdale Timber Station, was formed by several prominent Melbourne businessmen. Neil McNeil was the managing director of the company. Increasing business prompted the syndicate to upgrade the railway line, and the wooden line was replaced by steel rails joined by fish-plates and dogged to sleepers in the normal way. Two extra locomotives were also brought in.

The Perth-Bunbury government line had to cross the private Jarrahdale-Rockingham line near Mundijong at right angles and it was the only known "H" crossing in Australia. This type of crossing, not normally permissible in railway construction, was allowable only because the private line was built first.

Mundijong was the main stacking area for the mill output. Jarrahdale's proximity to Perth brought it a large and profitable local trade. Mundijong's location at the rail junction made it a busy centre where the mill products were either directed to Perth, or to Rockingham for export.



▲ One of the early Jarrahdale mills, photographed about 1901.

▼ Locos "Pioneer" and "Samson No. 2" double banked with a rake of logs.







◀ Taken near the turn of the century, this shows huge jarrah trees and quality of forest early sawmillers cut over. Effective conservation controls to ensure permanent life for sawmills were introduced with the passing of the Forests Act in 1918.

▲ Pay day, 1900.

▼ A whim drawn by some of the 140 horses.



A. C. Munro was a key figure in Jarrahdale's development. He first arrived there in 1887 to relieve the manager while he was on holiday. The original mill had burnt down and Munro was responsible for replacing it. Upon the return of the manager Munro went back to Victoria but was recalled as manager in 1892. Under his energetic leadership Jarrahdale prospered.

Jarrahdale in 1896

J. Ednie Brown, the first Conservator of Forests, visited Jarrahdale in 1896 on a tour of inspection. In his official report he wrote:

The operations were begun here some 20 years ago, with one mill only. Other mills have been added from time to time, so that at present there are five upon the property in full working order in the forests, besides a very fine planing and grooving mill at Jarrahdale Junction (Mundijong).

There are generally about 120 hands employed in and about the mills, and some 200 otherwise engaged upon the estate in connection with its working.

To keep these works going, 140 horses and 100 bullocks are required.

The tramway system here is very extensive and amounts to over 60 miles in length. The railway from the mill yard to Rockingham is well laid and very serviceable, both for passenger and goods traffic.

I understand from Mr. Munro, the energetic manager, that the out-put of timber from these mills is about 2,500 loads (1 load=50 cubic feet) monthly; and that this large quantity has been the monthly return during the last couple of years.

The timber is disposed of locally and by export in about equal parts. Considerable quantities are sent to the other colonies, and large shipments are made to England in connection with the street-paving trade.

Mr. Munro estimates that at least 260,000 loads of sawn stuff have been turned out here since the works began.

The forest consists of jarrah principally with the usual intermixture of red gum and occasional clumps of blackbutt. Upon the low-lying portions and foot hills of the range of the concession there is a fair sprinkling of wandoo of good character.

The jarrah forest produces timber of good quality. There are some very fine belts or masses of the tree, and it is not uncommon to come across specimens containing from 5 to 10 loads each.

It is estimated that some 70,000 acres of the property have been cut over to date, but upon this there is still a large quantity of good timber yet available. The area cut over is said to have produced so far, about five loads of sawn timber per acre.


The recuperation of the forest where it has been cut out is going on satisfactorily by natural regeneration, and its permanency as a forest may be safely predicted, if care be taken over the young crop.

A word of commendation is due for the excellence and general arrangements of the jetties at Rockingham. The structures have been well built and are serviceable in every way.

A large new jetty has recently been built which accommodates two very large ships at once, and the total berthing accommodation is now sufficient for five ships at once.

In March 1892 there was a further reorganisation of the Jarrahdale concern when a new company was floated which was later known as the Rockingham Railway and Jarrahdale Timber Company. Due to the expansion of business in the 1890s it was decided to incorporate the company in London, and it was registered there as the Jarrahdale Jarrah Forests & Railway Limited on 25 October, 1897. Business was carried on under this name until the company amalgamated with eight other companies to form Millars Karri & Jarrah Forests Company Limited in 1902.

Jarrahdale has continued as an important timber centre but with the advent of the deeper Fremantle harbour to cater for steam vessels, allowing for a faster delivery and return of ships, the busy little port of Rockingham began to languish and finally finished exporting in 1902 shortly after the amalgamation.

The Jarrahdale-Rockingham line remained unused for many years but was kept open by sending one train each year to the jetty until the upkeep became too costly. The rails between Mundijong and Rockingham were finally pulled up in 1952. The section between Jarrahdale and Mundijong was not removed until 1960. 

(Continued from page 9)

reduced the incidence and spread of summer wildfires.

It is difficult to foresee a practical alternative for prescribed burning in maintaining effective control over summer fires in these forests. A large and well-equipped force of fire-fighters is insufficient to contain very intense fires burning in heavy fuels during the worst summer days.

Considerable research effort has been expended to ensure prescribed fires are lit under conditions when damage to flora and fauna of the forest is negligible, while significantly reducing the fuels (see "Birds of the Jarrah Forest", this issue).

There are reasonably clear indications that prescribed burning in spring is considerably less damaging to the forest environment than burning in autumn. There is also the suggestion that the abundance of ground flora suffers if fire is excluded from the forest altogether.

Damage can only be avoided if prescribed burning is done with mild fires which consume only the lighter "flashy" fuels such as litter and dead scrub. This type of burning must be done when heavy fuels such as logs and branchwood are too damp to burn, thereby providing one of the

main refuges for small forest fauna such as insects, reptiles and small animals.

Heavy fuels are damp for many weeks after winter rains, giving sufficient time to carry out a major prescribed burning programme. There is insufficient suitable weather in autumn *after the first soaking rains*. In dry autumn conditions logs catch alight easily, destroying the refuge and—in all possibility—the sheltering fauna.

New leaves form in the crowns of jarrah and karri trees each summer. If part of the crown is scorched during a spring burn (a limited amount of scorching is inevitable) new leaves will replace the scorched ones within a month or two. After an autumn burn this replacement must wait until the following summer.

Understorey scrub in these forests is easily killed by even the most mild fires. About 75 per cent of scrub species regenerate after fire from subterranean rootstocks. In this way they are well adapted to a fire environment.

Most forest scrub species produce a flush of new foliage in spring. After a spring burn new shoots appear within several weeks. However, after an autumn burn, shoot development is delayed until the next spring, and therefore the ground is quite bare during winter.

New shoots are attractive food for large animals such as kangaroos and wallabies, and surveys have shown these animals congregate, during the evening, on recently burnt areas. Spring burning regenerates this food supply in as short a time as possible.

In spring the soil and lower parts of the litter layer are damp. In these moist conditions rarely does more than 70 per cent of the forest area burn out from prescribed fire. The remaining unburnt islands help create the diverse habitat so necessary for abundant fauna. This patchy burn-

ing is by no means as easy to achieve in the dry conditions of autumn when fires will continue to spread until the whole area is burnt out.

In the main forest there is evidence to suggest mild burning in spring will promote the greatest abundance of scrub species. Most of these re-seed within four years of the fire and providing prescribed burning is not too frequent, the species will be maintained.

Scrub which regenerates after a summer fire is quite commonly dominated by dense fireweeds—principally acacias. In areas long protected from fire the scrub has a moribund appearance and species are less abundant.

The subject of fire ecology is extremely complex and cannot be covered adequately in a few paragraphs. It cannot be denied there is considerable further research to be

done before full and comprehensive answers are found.

Once the Forests Department had done the basic research on proper weather conditions and lighting techniques, a joint project with the Bushfire Research Section of C.S.I.R.O. yielded an entirely new technique for using aircraft to light prescribed burning. This involved dropping small incendiaries from the aircraft at pre-determined intervals. The spacing is controlled by mobile radio beacons which guide the flight-path of the aircraft.

The aircraft method lights at a very fast rate, requiring a high degree of training and co-ordination between ground and air crews.

Forests Department personnel are now well experienced and burning with aerial methods grew from 50,000 acres to 600,000 acres in the five-year period from 1965 to 1970. (T)

Back cover

Forestscapes

Christmas Tree Well, 45 miles from Perth along the Brookton Highway, is a spot not many people would see during the summer blossom time of Christmas trees (*Nuytsia floribunda*).

An interesting point here is the number of tree species represented within a very small area.

Included on a forest recreation map for the Kelmscott and Mundaring Forest Divisions, Christmas Tree Well is normally visited during the cooler months of late autumn, winter and early spring.

Because of the general search for a better quality of life, the present day insistence on conservation of the environment and the expected increases in demand for wood and wood pulp products, the role of forestry in modern society will become more and more important.

Recreation needs of the future are

likely to rise steeply and these requirements have to be gauged with great care. The forests, hills and coasts are the areas most suited for recreation purposes. State Forests near the metropolitan area in particular, have always provided recreation facilities, and some are managed partially to this end.

Today's management problems involve not only a need for more accurate and detailed estimates of future recreation needs, but also an evaluation of the potential offered by different types of forest. Account must be taken of the need to safeguard the surroundings and avoid having forest areas spoilt by a concentrated heavy influx of visitors.

Too great a recreational pressure on the forest leads to even more problems, not the least being unfortunate changes in the habitat. (T)

