CONTROLLED BURNING IN THE FORESTS OF WESTERN AUSTRALIA

by

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1967

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PERTH
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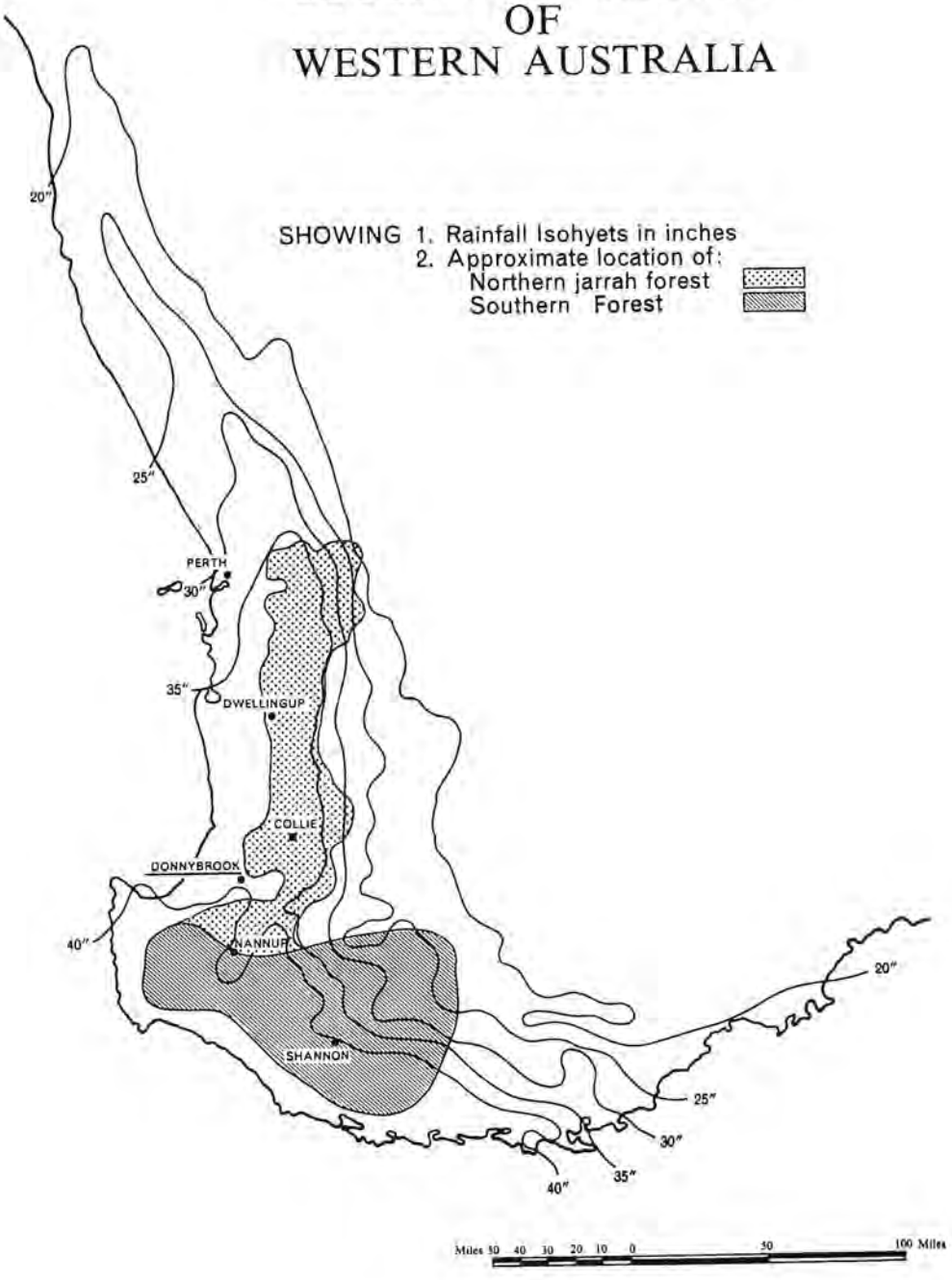
SOUTH-WEST REGION OF WESTERN AUSTRALIA



SUMMARY

Since 1954, controlled burning of eucalypt forest has been a standard preventive measure for fire control in the south-west region of Western Australia.

This paper discusses the historical developments which led to the present policy of controlled burning over large areas, and the methods by which controlled burning programmes are planned and executed.

A fire danger standard, incorporated into a controlled burning guide, is used for both planning and execution of controlled burning. This standard is used for prescribing an acceptable fire intensity cover for fuel classification in each forest area included in an annual programme. It is also used for selecting daily programmes and for determining suitable lighting patterns which match with the weather conditions on that day.

1. INTRODUCTION

The term "controlled burning" implies that fire is applied to a forest at an intensity which minimises damage to the forest crop. This objective can only be fulfilled by providing standards for preliminary planning, and for selecting suitable weather and lighting patterns.

This paper discusses the standards used for controlled burning in the forests of the south-west region in Western Australia.

This region includes three main forest types. These are: the northern jarrah (*Euc. marginata*) forest; the southern forest, including karri (*Euc. diversicolor*); and pine plantations of *P. radiata* and *P. pinaster*.

For the northern jarrah forest both planning and execution of controlled burning can be based on the standards provided by the controlled burning guide for the northern jarrah forest (Peet, 1965). Controlled burning of both the southern forest and pine plantations has not developed to the stage reached in the northern jarrah forest but trial procedures have been adopted for these forests.

The controlled burning guide for the northern jarrah forest includes part of a fire danger rating representing suitable fire intensities for controlled burning.

This fire danger rating uses the rate of forward spread of the headfire as a measure of fire intensity. The range of forward spread in this rating is broken into nine fire danger classes designated by a colour code.

These are:

Fire Danger Class	*Rate of Forward Spread Feet per minute*
Red	Greater than 20.0
Pink	16.1 to 20.0
Orange	12.1 to 16.0
Yellow	7.1 to 12.0
Brown	3.1 to 7.0
Blue	2.1 to 3.0
Green	1.1 to 2.0
Purple	0.6 to 1.0
White	less than 0.6

Three of the lower fire danger classes covering a range of forward spread from 0.6 to 3.0 feet-per-minute represent suitable fire intensities for controlled burning in jarrah forest.

These three fire danger classes are Purple, Green and Blue and to each is assigned a maximum scorch-height of tree crowns. These scorch-heights range from 15 to 30 feet for the spring months and from 27 to 45 feet for the autumn months and form the basis for prescribing a fire danger class for controlled burning of individual areas within annual programmes. For each of these areas the prescribed fire danger class represents an acceptable fire intensity for the smaller crop trees in that forest.

In addition the controlled burning guide recommends a lighting pattern to be used to achieve the desired scorch limits.

2. PAST FIRE HISTORY

As background for this discussion on controlled burning it is of interest to review the findings of Harris and Wallace, 1959. These authors studied the past fire history of the south-west-region in Western Australia and the developments in this history which led to the present policy of controlled burning over large areas of forest.

Early records of Western Australia indicate that fires were common in, or near, the forest areas prior to European settlement. Records of fires were shown in the log-books of early Dutch explorers who sailed along the west coast, namely, Pelsart (1629), Jonck (1658), Volkerfen (1658) and Vlaming (1697).

With the advent of European settlement, in 1829, reports of fires in the forest region became more common. Aborigines were acquainted with the use of fire for cooking and hunting, and moved continuously over the forest areas in search of food. Under these conditions it is inconceivable that accidental fires did not occur, to which must be added the risk of fires which started from lightning strikes.

These early fires were probably periodic, and undoubtably covered large areas, but it is doubtful if they achieved the intensity of fires which followed forest and land utilization.

With the advent of European settlement, exploitation of the forests resulted in the accumulation of masses of felling debris. This debris supported conflagrations which increased in intensity as utilization progressed.

Early records indicate that both utilization and fire resulted in marked changes in the stand structure. Utilization caused gaps in the forest canopy which produced a heavier growth of scrub and understory species. This increase in ground fuel supported intense fires which reached into the canopy causing severe crown damage.

The intense fires which followed forest and land utilization led to severe and widespread forest damage in the ninety years preceding the passing of the Forest Act, by State Parliament, in 1918. This damage affected about one million acres of forest at that time.

The early foresters were alarmed by the extent of this damage and attempted to implement a policy which almost entirely excluded fire from the cut-over forest. Policy at that time required light advance and top-disposal burns, before and after a trade operation, after which the area was protected to permit regeneration to develop. The areas were protected by surrounding

them with a regularly burnt fire-break, usually of about five chains in width, and maintaining an efficient fire suppression force.

By 1953 fires occurring with increasing frequency in these long protected areas were beyond the capacity of the fire suppression force to control and, with litter accumulations up to 15 tons per acre, these fires caused serious damage to the forest crop. Complete protection could no longer be economically maintained and a complete review of the factors involved led to a drastic change in fire control policy in 1954 (Wallace 1965).

In 1954 fire control policy in these forests changed from virtually complete protection to controlled burning over large areas.

Broadly the new policy aimed at systematically checking the fuel build-up by rotational controlled burning over the whole forest, except for those portions where young advance growth temporarily precluded this practice.

Controlled burning would be carried out in the mild weather of spring and autumn when damage to the forest was negligible. Summer wildfires starting in, or burning into these fuel reduced areas would be relatively easy to control, and would burn at a lower intensity resulting in less damage to the forest.

This policy called for controlled burning over half to three-quarters of a million acres of forest each year.

At this time the number of Forests Department personnel with sufficient experience of controlled burning to tackle this immense task was very small. Consequently the programme fell behind for several years. It became clear that different methods would have to be adopted whereby the work would be done faster and cover larger areas, and for this to be done safely would require further measured data on fire behaviour.

Since 1961, efforts have been made to collect the fire behaviour data and to developing lighting techniques which provide maximum area coverage within specified limits of fire intensity. The techniques for collecting fire behaviour information are similar to those developed by McArthur (1962).

Most of the northern jarrah forest except for those portions which include young regeneration is now control burnt on a three- to five-year rotation.

A wide variety of fuel types, and access problems, has prevented rotational controlled burning over a large part of the southern forest. It is likely that recent lighting techniques, developed for aircraft, will permit the extension of rotational controlled burning over most of this remaining hardwood forest area.

3. CLIMATE

The climate of the south-west-region of Western Australia is typically Mediterranean, with hot, dry summers and cool, wet winters.

The average annual rainfall isohyets for this region are shown on map 1 (see frontispiece), but some localities along the Darling Scarp average more than fifty inches of rain per year, e.g. Dwellingup.

Climatic averages for Donnybrook, which is typical of the forest region are given in Table 1. This data was taken from the Bureau of Meteorology's publication "Climatic Averages Australia", 1956.

Table 1.

Donnybrook 33°33′ S, 115°49′ E, 208 ft. A.s.l.

Factor	No. of Yrs.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Tot.
1	30	86.1	86.0	81.2	75.6	67.3	62.6	61.1	62.6	65.8	69.1	76.9	82.3	73.0
2	30	56.0	56.0	53.8	49.7	45.9	43.3	41.6	42.3	44.7	46.7	50.4	53.8	48.7
3	30	71.0	71.0	67.5	62.7	56.6	52.9	51.4	52.4	55.2	57.9	63.6	68.0	60.9
4	10	44	45	51	56	62	67	67	68	68	58	51	48	56
5	30	48	73	115	183	557	791	801	644	457	314	117	68	4168

where:

Factor 1 = average daily maximum temperature °F.
Factor 2 = average daily minimum temperature °F.
Factor 3 = average daily mean temperature°F.
Factor 4 = index of mean relative humidity.
Factor 5 = monthly and yearly rainfall in points.

4. FOREST TYPES

Controlled burning is practised in both the hardwood forest and pine plantations of Western Australia.

While this operation has become established practice in the hardwood forest, where large areas are covered every year, controlled burning in pine plantations is at present carried out on an experimental basis only.

(a) Pine Plantations.

Controlled burning in pine plantations is generally confined to buffer strips bordering areas of high risk. The main part of this controlled burning is in coastal *P. pinaster* plantations, and the amount programmed for a particular plantation depends on evidence of fire risk.

Fuels in these plantations are deep needle beds which weigh up to twenty-tons-per-acre. The older sections of these plantations hold additional fuel from thinning and pruning operations. A small proportion of these fuels are burnt during winter months when the whole fuel profile, except the surface needles, is soaking wet. The objective is not complete fuel removal but rather burning of the surface flash fuel leaving the compacted duff layers and heavy groundwood intact.

Both fire danger and extra fuel moisture limits have been prescribed for controlled burning in pine plantations.

(b) Hardwood Forest.

Fuel types in the hardwood eucalypt forest divide naturally into those in the northern jarrah forest and those in the southern forest region.

(i) Northern Jarrah Forest.

The northern jarrah is a dry sclerophyll forest. It is normally associated with a sparse scrub cover, undulating topography and lateritic soil types. With the exception of moist or fire damaged sites scrub is usually sparse (covering 10 to 50 percent of the forest floor), low (2 to 4 feet in height) and readily

inflammable. Scrub, as in the southern forest, is composed of a wide variety of species mainly from the families *Proteaceae, Myrtaceae, Mimosaceae* and *Papilionaceae.*

In the prime jarrah forest the two most common tree species are jarrah (*Euc. marginata*), and marri (*Euc. calophylla*). Both these species have a rough outer bark which ignites readily during the dry summer months.

Litter accumulation in the jarrah forest is roughly half to one-ton annually under a sixty percent canopy cover.

(ii) Southern Forest.

The southern forest includes a wide variety of fuel types which range from open, tree-less flats to dense karri (*Euc. diversicolor*). These fuels can be divided into four main types.

Karri Forest: Karri approximates a wet sclerophyll forest type. Canopy cover in prime forest is generally higher than sixty percent, and dense scrub is common on the forest floor. The scrub often exceeds ten feet in height, is dense, and forms a major fuel component. Rate of litter accumulation is higher than in jarrah forest and fuel beds weighing more than twelve-tons-per-acre are quite common.

Jarrah-Marri Forest: This forest type usually borders the karri and supports a less dense but more inflammable scrub type. The rate of litter accumulation is similar to that for jarrah forest.

Jarrah Forest: In this forest type fuels are similar to those described for the northern jarrah forest.

Flats and Plains: These areas are either tree-less or supporting scattered jarrah and marri of poor quality. The main fuel component is scrub which is often dense and highly inflammable.

Intense fires which develop in flats and then spread into the surrounding forest are a problem in controlled burning of the southern forest.

5. TYPES OF CONTROLLED BURNING

The following five types of controlled burning are practised in the forest of Western Australia.

(a) Burning of buffer areas or firebreaks around areas of high risk.

(b) Burning of buffer strips or firebreaks around areas of high value.

(c) Prescribed burning of large areas on a rotational system.

(d) Advance burning prior to logging operations.

(e) Top disposal burning for both regeneration and fuel reduction, following logging operations.

6. PRELIMINARY PLANNING FOR CONTROLLED BURNING

(a) Master Plans.

For the purpose of Management the forests in the south-west-region of Western Australia are broken into a number of divisional areas. Each division is required to prepare a master plan of controlled burning. This plan shows proposed annual programmes for the next five-years, but is subject to revision after each season's work has been completed. Records of past controlled burning and wildfires are kept on separate plans.

Wherever possible, controlled burning is allocated in long strips through the forest, rather than in a patch-work manner. These strips are about one mile in width when ground crews are used for lighting, and three to five miles in width when lighting from aircraft. Several strips totalling about eighty-thousand-acres would represent a typical annual programme for a hardwood division of four-hundred-thousand acres.

For preliminary planning, annual programmes are broken into unit areas which represent a day's work for either ground crews or aircraft, depending on which is to be used for lighting.

(b) **Prior Inspection.**

A prior inspection is made of each unit area in the annual programme. This inspection is made with four main objectives. These are: to assess the condition of perimeter roads, to specify necessary edge burning for perimeter control, to classify fuels and finally to prescribe a fire danger class for lighting of that area.

(i) Roads.

Perimeter roads are inspected and the necessary roadwork is listed to make them easily trafficable and useful firebreaks.

(ii) Edge Burning.

Prior edge burning is prescribed where heavy fuels in adjacent forest are likely to present problems in perimeter control.

Edge burning is done in the early spring or late autumn when duff layers in the litter profile and heavy groundwood are both damp. This minimises the danger of the edge re-lighting before the main burning has been completed. Lighting of edges is confined to the Purple fire danger class.

(iii) Fuel Classification.

Due to mixtures of types, fuel classification is more complicated in the southern forest than in the northern jarrah forest and satisfactory classification procedures are still being investigated.

Fuels in the northern jarrah forest are classified by the weight of litter on the forest floor. Litter weight is related to the number of annual leaf falls since the last burn and to canopy cover. Tables which have been compiled to assist with fuel quantity classification in the northern jarrah forest are shown in appendix 1 and 2.

The southern forest fuels are classified into four main types: karri, jarrah-marri, jarrah and finally flats or plains. For areas which include several forest types more than one lighting is often necessary to keep fire intensity within prescribed limits over the whole area. In addition, lighting must be planned to avoid igniting the flats while fuel in the forest is inflammable. This can be achieved by lighting the flats on a White fire danger class for the forest or waiting until the forest has been burnt before placing fires into adjoining flats.

The procedure for fuel classification in the southern forest is firstly separation into fuel types, and secondly definition of fuel quantity and scrub density within those types.

For jarrah fuels in the southern forest, fuel quantity is classified to the standards of the controlled burning guide, and for karri fuels to the fuel quantity loadings provided in the preliminary karri fire danger tables.

(iv) Prescribed Fire Danger.

As mentioned earlier each of the fire danger classes used for controlled burning of eucalypt forest, i.e. Purple, Green and Blue, have a maximum scorch height specification for spring and for autumn. These scorch specifications form the basis for prescribing a fire danger class for lighting of a particular forest area.

The acceptable scorch height for a forest area is assessed from the crown height of potential crop trees there. This crown height is determined from field inspection aided by aerial photos and records of past logging.

In better quality forest a twenty-feet-square spacing of potential final crop trees is accepted as full stocking. The lower crown height of trees filling this spacing defines the acceptable scorch height for that area. The acceptable scorch height is then compared with the scorch specifications for each of the three fire danger classes. The fire danger class and season prescribed for lighting of the subject area are those whose scorch specifications match with the acceptable height.

The results of the prior inspection are recorded on a standard report form (see appendix 3).

(v) Recording.

After prior inspections are completed the job numbers of individual areas, their acreage, fuel classifications and prescribed fire dangers are listed in an index table (see appendix 4). This index table is used for selecting daily programmes of controlled burning.

7. DAILY PLANNING

(a) Fire-Weather Forecast.

Selection of a daily programme of controlled burning is based on an 0745 hours fire-weather forecast. This is a general forecast for a forest region. This forecast includes an estimate of fire hazard for both the jarrah and karri forest regions. Forecasted fire hazard forms the basis for calculating local fire danger.

Fire Hazard, as the term is used here, is a measure of litter moisture content. It is estimated from the moisture content of three *Pinus radiata* hazard rods and from a consideration of trends in daily weather (Wallace 1936).

Fire hazard covers a scale of 0 to 10 which is broken into 7 descriptive classes as shown below.

Fire Hazard Scale	*Fire Hazard Class*
0.0 to 1.0	Nil.
1.1 to 4.0	Low.
4.1 to 6.0	Moderate.
6.1 to 7.0	Average Summer.
7.1 to 8.0	High Summer.
8.1 to 9.0	Severe Summer.
9.1 to 10.0	Dangerous.

Fire Hazard is loaded with local measures of rainfall and fuel quantity to predict fire danger for particular forest areas.

Predicted local fire danger is then compared with the prescriptions for individual areas as recorded in the index table. The day's programme is selected from areas where the two fire dangers match.

Predicted local fire danger is checked at regular intervals during the day with actual weather conditions. This is done to ensure that fire danger is as predicted, and that fire intensity remains within acceptable limits.

(b) **Method of Lighting.**

The controlled burning guide is designed for lighting across the wind direction. This technique is commonly employed for lighting of eucalypt forest by both ground crews and aircraft. The alternative of lighting into the wind is sometimes used for steep topography.

The controlled burning guide provides an estimate of the correct width to use between the lighting strips. These strips are oriented across the wind direction, and spot-fires are placed along the strips at half the strip-width, (Peet 1966).

The method of lighting a controlled burn influences both the cost of that burn and the resulting forest damage. If the lighting is over intense, numerous junction zones and extended lines of fire will cause excessive scorch. If the lighting is insufficient, the burn will be patchy and of little protection value. The method of lighting from aircraft is similar to that used by ground crews. Further reference to aircraft methods is available in recent publications by Baxter, Packham and Peet, 1966, and Packham and Peet, 1967.

The suggested procedure to be followed by ground crews engaged on controlled burning is as follows:

(i) All members of the crew must be familiar with the results of the inspection report, particularly the location of hazardous areas.

(ii) Fuel classification for the area, and the day's fire hazard must be given to the officer or overseer supervising the burn.

The fire danger calculations commences with fire hazard which is a measure of fuel moisture content.

(iii) To avoid confusion the boundary tracks are defined by a drag or scraper towed by truck and the crew are taken around the perimeter to familiarise them with the limits of the area to be burnt.

(iv) Wind velocity and direction is obtained prior to the commencement of lighting, usually from a near-by fire lookout tower. This information is used to orientate strip direction, and in conjunction with the controlled burning guide to calculate the width between lighting strips. Strip-width is recalculated at least every two hours during lighting, and spot-fires are placed along the strips at half the strip width.

(v) Lighting commences against the down-wind edge of the area which is secured by a back-burn or a previous edge burn.

(vi) Lighting strips are oriented across the wind direction and start at one width up from the down-wind edge.

(vii) The crew lights in echelon formation and maintains direction with either a compass or sun-dial direction finder. Gang organization is controlled by the requirements listed in "Safety in Controlled Burning" 1963.

Both weather and fire behaviour during the burn are recorded on a standard report form, (see appendix 5).

The method of lighting is shown diagrammatically on Figure 1.

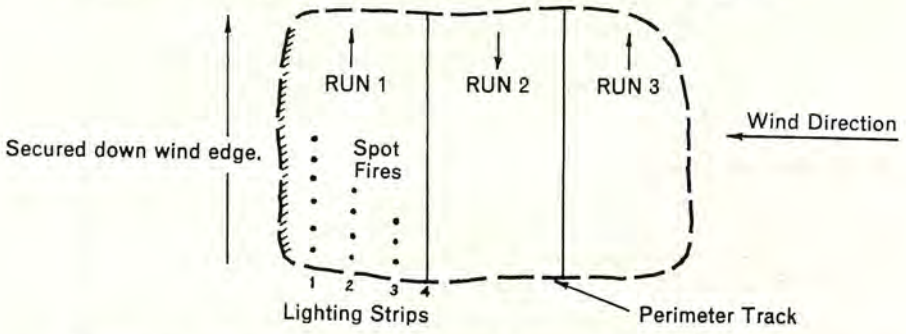


Figure 1. "Across Wind" Lighting Method for Ground Crews.

8. FINAL INSPECTION

After an area has been controlled burnt it is inspected to ensure that the prescriptions have been filled. If fire intensity failed to meet prescribed limits an investigation is made to determine the reason. The commonest sources of error are inaccurate fuel classification or fire danger calculations.

The quality of the burn is recorded on a fire-plan and on the standard report form (appendix 5). Fire plans are revised as areas are re-burnt by rotational controlled burning, or with the advent of wild-fires.

The inspection reports are filled as they provide valuable reference for prescribing when next that area is listed for controlled burning.

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APPENDIX 1

Average quantity (tons—oven dry weight) of fire fuels per acre for average canopy cover and varying ages of leaf fall.

No. Annual Leaf Falls	CANOPY COVER — PER CENT									
	10	20	30	40	50	60	70	80	90	100
1	0.0 1.0	0.0 1.0	0.0 1.0	0.0 1.0	0.0 1.0	0.0 1.0	0.0 1.0	1.1 1.5	1.1 1.5	1.1 1.5
2	0.0 1.0	0.0 1.0	0.0 1.0	0.0 1.0	1.1 1.5	1.1 1.5	1.1 1.5	1.6 2.0	1.6 2.0	2.1 2.5
3	0.0 1.0	0.0 1.0	1.1 1.5	1.1 1.5	1.6 2.0	1.6 2.0	2.1 2.5	2.1 2.5	2.6 3.0	2.6 3.0
4	1.1 1.5	1.1 1.5	1.6 2.0	1.6 2.0	2.1 2.5	2.1 2.5	2.6 3.0	3.1 3.5	3.1 3.5	3.6 4.0
5	1.6 2.0	1.6 2.0	2.1 2.5	2.1 2.5	2.6 3.0	3.1 3.5	3.1 3.5	3.6 4.0	3.6 4.0	4.1 4.5
6	1.6 2.0	2.1 2.5	2.6 3.0	2.6 3.0	3.1 3.5	3.6 4.0	3.6 4.0	4.1 4.5	4.6 5.0	4.6 5.0
7	2.1 2.5	2.6 3.0	3.1 3.5	3.1 3.5	3.6 4.0	4.1 4.5	4.6 5.0	4.6 5.0	5.1 5.5	5.6 6.0
8	2.6 3.0	3.1 3.5	3.6 4.0	4.1 4.5	4.6 5.0	5.1 5.5	5.6 6.0	6.1 6.5	6.6 7.0	7.1 7.5

FUEL QUANTITIES FOR AGE AS EXPRESSED IN JARRAH FOREST FIRE DANGER RATING, AND CONTROLLED BURNING GUIDE.

(See 60% Canopy Cover in Table)

Annual Leaf Fall		Tons Per Acre
Less Than 1 Year Old	=	Less Than I.T.P.A.
1	=	1.1 1.5
2	=	1.6 2.0
3	=	2.1 2.5
4	=	2.6 3.0
5	=	3.1 3.5
6	=	3.6 4.0
7	=	4.1 4.5
7+	=	4.6 +

APPENDIX 2

FUEL QUANTITY KEY FOR CONTROLLED BURNING INSPECTIONS

Fuel Age Years = No. of Leaf Falls	Fuel Quantity tons/acre E.O.D.W.	% Ground Cover	Fuel Depth Inches	Comments
1	1.0 - 1.50	50	$\frac{1}{2}$	Patchy cover of leaf litter.
2	1.6 - 2.0	75	$\frac{1}{2}$	Patchy litter, fresh charcoal on bark, green scrub.
3	2.1 - 2.5	100	$\frac{1}{2}$ - 1	Full cover of leaf litter.
4	2.6 - 3.0	100	1 - $1\frac{1}{2}$	Full cover of leaf litter, blackened bark sloughing off.
5	3.1 - 3.5	100	$1\frac{1}{2}$ - 2	Full litter with depth. Grey bark inflammable scrub.
6	3.6 - 4.0	100	2 - $2\frac{1}{2}$	Well developed duff layer.
7	4.1 - 4.5	100	$2\frac{1}{2}$ - 3	Some dead scrub, e.g., ferns, well developed duff, thick bark.
				N.B.—All fuel quantities based on 50 to 70 per cent. canopy cover.

APPENDIX 3

PRESCRIPTION AND BURNING REPORT

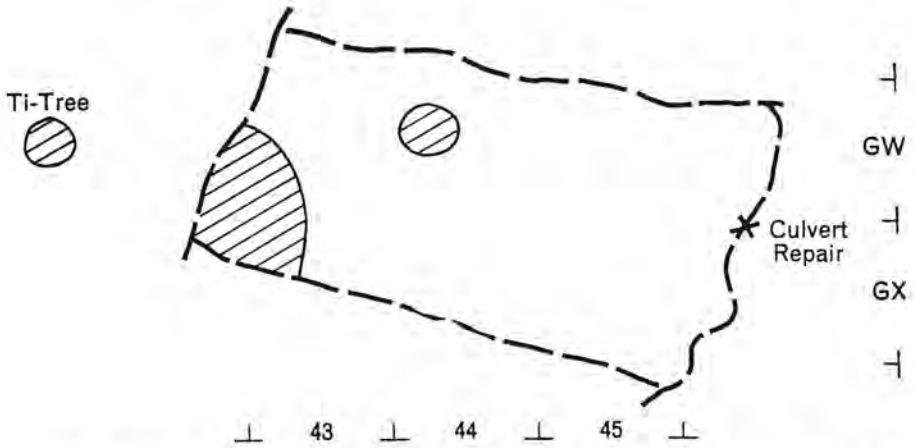
Division..... Job No. 1

Location..... Ref. Squares G.W. to G.Y. 43 to 46

(1) PRIOR INSPECTION.

(a) Plan of area.

Scale: 80 chains equals one inch.



(b) Description of area.

Litter age Averages 4 tons per acre

Slope Generally flat with S.E. slope on southern boundary

Scrub Patches of ti-tree

Forest type Jarrah Marri poles and mature trees

(c) Suggested conditions for burning.

Season Spring

Fire Danger Rating Green

(d) Suggested method of burning.

Across wind preferably with S.E. Wind. Prior lighting of ti-tree areas under White to Purple fire danger for the forest.

(e) Remarks.

All edges require prior burning with flame thrower in early spring and Purple fire danger.

All tracks require grading and culvert repair as shown on plan above.

G. B. PEET Officer Prescribing.

Office Use

APPENDIX 4

Index Table showing job number, prescribed fire danger and fuel classificiation.

SPRING

Fuel Age Fuel wt. tons/ac.	Purple				Green				Blue			
	4 2.5 to 3.0	Area Acres	5 3.0 to 3.5	Area Acres	4 2.5 to 3.0	Area Acres	5 3.0 to 3.5	Area Acres	4 2.5 to 3.0	Area Acres	5 3.0 to 3.5	Area Acres
Job Number	1	500	2	200	3	1,000	4	1,100	41	2,000	45	2,100
	5	600	6	300	12	1,500	12	1,200	47	1,500	57	1,500
	7	400	8	500	13	1,200	22	700	52	2,500	55	2,000
	10	700	11	700	16	800	24	800	34	2,300	36	2,200
	15	500	17	400	28	700	29	1,200	42	2,200	19	2,300
	21	300	25	600	31	1,200	35	1,500	43	2,000	20	2,000
	26	200	18	500	40	1,100	37	1,000	44	2,100	58	1,500

APPENDIX 5

(2) OVERSEERS BURNING REPORT.

Office Use

Job Number 1

Date Burnt 27/11/66

(a) Daily Weather.

Wind Direction S.E.

Wind strength 10 to 12 m.p.h. tower wind

Estimated hours of burning from 10 a.m. to 6 p.m.

(b) Fire Behaviour.

Average headfire flame height 3 feet

Average flankfire flame height 16 feet

Estimated f/spread headfire at 1 p.m. 24 chns/hr.

Time when strips joined 6.30 p.m.

(c) Method of Lighting.

Strips across or into the Wind Across

Strips width 8 chain decreasing to 4 in p.m.

Spot distance 4 chain decreasing to 2 in p.m.

Number of Men 5

Time of lighting from 10 a.m. to 4 p.m.

(d) Remarks.

Green-scorch limits achieved. Prior burn in ti-tree areas was successful.

(3) DAILY WEATHER—OFFICE RECORDS.

Maximum temperature 76°F.

Minimum relative humidity 45%

Forecast fire hazard (local) 5.7 moderate

Forecast fire danger (local) Green

Amount of last rain 10 points

Number of days since rain

Average daily temp. in drying period 65°F.

Cloud cover Average $\frac{3}{8}$ Cu.

(4) INSPECTION OF THE BURN. Date Insp. 10/12/66

Patchy or clean? Clean

Duff layer burnt? No

Height of bark blackening 4 feet

Classification White Purple Green Blue Brown

Further action required Satisfactory—No further action required

G. PEET Inspecting Ofifcer.