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SOUTHERN REGION

FIRE MANAGEMENT PLAN

- 1982 REVIEW -

Compiled by R/L R.J. Sneeuwjagt

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SOUTHERN REGION FIRE MANAGEMENT PLAN

SECTION 1 - PROTECTION VALUES

1. INTRODUCTION

This fire management plan deals with State Forest, Timber Reserves and other Crown Lands in the Southern Region Divisions of Manjimup, Pemberton and Walpole. It includes the Chipwood Licence Area (F.P.L. 1588) as well as Vacant Crown Lands to the east of the Frankland River.

Fire protection of the Southern Region is intimately connected with logging and reforestation as well as farming activities and community values that are spread throughout the Region.

Much of the production forest of the region will be cut over for sawlogs (mainly karri and jarrah). Chipwood (Marri, Karri and Jarrah) will be removed under a licence that operates from 1975 to 1990. Extension of this license beyond 1990 is subject to further review.

The young regrowth stands that are being established following logging are sensitive to fires of even moderate intensity and will require a period of full protection from fires for at least 15 years in the case of karri, and at least 10 years for jarrah. Heavy fuel accumulation during these periods will not only endanger the regrowth, but will also endanger adjacent forest values and adjoining private and community assets.

This fire management plan describes the Regional forest and community values requiring protection; outlines the protection objectives, and prescribes the protection strategies, by which satisfactory fire protection can be maintained at present and in the next 20 years.

2. DESCRIPTION OF THE REGION

The Southern Region covers 1,643,320ha. This comprises of 647,000ha of State Forest, Timber Reserves (Forest Act and Land Act) and Conservator of Forests Lands; 86,141ha of National Parks and Wildlife Reserves, 24,427ha of other Crown lands, 98,497ha Vacant Crown Lands and 663,417ha under private ownership.

The Chipwood Licence area covers a total of 714,300ha.
The State Forest within this licence area contains 392,217ha of predominantly jarrah/marri types, 146,745ha of Karri type, 776ha of pine plantations and plots, and 87,290ha of non-forest types. The boundaries of the WACAP license area are shown in relation to the Southern Region boundaries on Map 1.

Four townships (Manjimup, Pemberton, Walpole and Northcliffe) and seven small settlements (Tone River, Nyamup, Deanmill, Wheatley, Palgarup, Quininup and Jardee) are located in the area. The population of these settlements plus those on outlying farms total 10,000. The Manjimup Shire is located within the Region, whilst those of Nannup, Boyup Brook, Bridgetown-Greenbushes, Denmark and Plantagenet Shires have some overlap along the boundaries of the Region.

The forest is considerably broken up by intrusion of developed and undeveloped private properties. The Private Property interface with State Forest is estimated to extend for some 3,000 Km. This shared edge creates very large boundary effects, involves high fire risk and represents a major fire control problem.

In accordance with the Department's multiple use management policy, the State Forest in the Region has been zoned into a number of different land use management priority areas (MPA's) which are the basis for developing the appropriate fire management strategies. These MPA's are shown on the Southern Region L.U.M.P. plan (Map 1)

2.1 Wood Production M.P.A.'s

Some 252,637ha of the Region's State Forest is managed with the objective "to produce wood for community use while maintaining the other multiple use values of the site as far as is practicable." To meet this objective fire protection strategies must take full account of the complete range of fire sensitivities which vary from low (eg. mature jarrah stands) through moderate (eg. karri pole stands), to high (eg. young saplings less than 30 metres tall). The 766ha of pine plantations in the Region are also highly sensitive to fire.

2.2 Flora, Fauna and Landscape M.P.A.'s

A total of 105,347ha of the Region's State Forest is managed with the objective to maintain, and where possible, optimise landscape values of both the structure and speciation of representative forest ecosystems. These categories of the F.F.L. M.P.A.'s include the following types:

(a) Preservation areas eg. Wattle, Johnson, O'Donnell M.P.A.'s.

(b) Silviculture areas eg. Giants Block M.P.A.

(c) Management areas eg. Perup Fauna M.P.A.

Fire management of these M.P.A.'s is subject to a great deal more study. To date fire ecology research has indicated that no particular protection regime suits all components of the flora and fauna communities. Therefore, a conservative approach providing for considerable variability in fire intensity must be adopted, until it is possible to specify more precisely the particular fire regime relevant to each community.

2.3 Recreation M.P.A.'s

Some 3047ha have been set aside to meet the demand for forest based or forest oriented recreation. They are mostly related to point or line source requirements (eg. picnic spots, rivers, walk trails) and are often incorporated as secondary or tertiary uses within the other major priorities.

The recreational areas require special consideration in the overall protection plan as they are subject to frequent, regular use and are therefore the potential source of many wildfires.

2.4 Scientific and Education M.P.A.'s

A total of 20,476ha are to be managed with the objective to provide for the scientific investigation necessary for the practical development, maintenance or demonstration of effective forest management. Examples include a number of paired catchment study areas and the Iffley Dieback disease study area. Individual fire protection strategies are required here depending on the particular objectives for each M.P.A. These may range from complete protection (eg. Leaf Miner Study areas) to regular prescribed burns.

2.5 Protection M.P.A.'s

Some 294,237ha of State Forest and other crown lands are to be managed to regulate stream flow, maintain water quality, minimize erosion, stabilize drifting sands or exert any other beneficial forest influences. The main management objectives here are to allow for the maintenance or enhancement of forest cover without detriment to water yield and quality, soil stability or other significant biological characteristics. The fire regimes adopted must be compatible with these objectives.

2.6 Water Producation M.P.A.'s

This classification is applied to areas that have the greatest potential to yield fresh water and are currently gazetted as community water

catchments or reserves (eg. Scabby Gully M.P.A.).
The management objectives and burning regimes for these M.P.A.'s is to ensure that the yield and quality of water from the forested catchments are maintained and, where possible, improved.

2.7 National Parks and Wildlife Reserves

The 86,141ha of gazetted and proposed National Parks and Wildlife Reserves present certain difficulties to fire control, both to the Parks and the adjoining forest and private property.

The popularity with tourists and recreationists of the Pemberton Parks (Warren, Beedelup, Brockman) and the Walpole/Nornalup National Parks, mean that these areas require special protection measures to cover the higher risk and safety factors associated with these high usage areas.

Taking into account the management objective set down for the Parks by the N.P.A., a hazard reduction programme has been introduced into the Pemberton Park system under Interagency Agreement with the Forests Department. Part of the Walpole/Nornalup National Park has been brought under prescribed burning through a similar agreement, although a large portion of this park still contains heavy fuels which constitutes a continuing risk to Walpole townsite and surrounding farms.

The proposed D'Entrecasteaux Park, which will ultimately stretch along the coast from Walpole to immediately north of Lake Jasper, is closely associated with high value forests for much of its length. This area has a long history of devastating wildfires resulting from indiscriminant lighting in the coastal area over the past 100 years. The sources of these fires are unlikely to change and thus the present policy of hazard reduction burning through Interagency Agreement, needs to be continued to meet the protection needs of the park and surrounding values.

2.8 Vacant Crown Lands

Apart from the Vacant Crown Land along the South Coast, large tracts of V.C.L. occur east of the Frankland River in Walpole Division, and north of Denmark surrounding State Forest 64. These total some 210,000ha within the Region.

These areas are important to the Forests Department due to their proximity to State Forest and the consequential liability to involve substantial Departmental resources in the event of wildfires. To this end, an Interagency Agreement has been maintained between the Forests Department, the Bush Fires Board and local authorities, to ensure that the fuels on these lands are reduced by prescribed burning to the levels where wildfires can readily be contained under normal weather conditions.

3. CHANGES IN FIRE MANAGEMENT

3.1 Past History of Fire Protection

Fire management of the Southern Region has passed through a number of phases since the formation of the Forests Department in 1916. Each of these phases are reflected in the frequency and extent of wildfires recorded in the Department's fire records. Prior to 1916, uncontrolled sawmilling and the clearing of forest by settlers led to severe build-up of debris. The process of burning off this debris resulted in a high frequency of severe, damaging wildfires. These fires were often let to run unabated through the forest as there was neither the interest nor facilities to contain them, and indeed fires were often encouraged in order to assist with access and provide forage for livestock.

From 1923 to 1953, the Department implemented a policy of fire exclusion. Although partly successful at first in reducing the number of large fires each year, the combined build up of logging and clearing debris as well as natural forest fuels, made wildfire suppression progressively more difficult. The heavy fuels meant that fire suppression was not certain to succeed even on days of mild fire danger.

In 1954, the Department changed its policy to one of fuel reduction by prescribed burning. In the Southern Region, this was initially confined to handburning of jarrah forest areas and buffer areas surrounding town-sites, settlements, railway lines and major roads. The complexity of the fuels of the karri forest and the difficult access, meant that very little burning was attempted in these stands until the late 1960's and early 1970's.

The introduction of the aerial ignition system in 1965 provided the opportunity to economically and safely prescribe burn large areas under suitable conditions. Much of the jarrah forests were successfully burned in this matter, although it was not until the development of the karri fire behaviour prediction system in the early 1970's, that the complex karri fuels could be burnt to prescription with any confidence.

TABLE 1

WILDFIRE CAUSES IN SOUTHERN REGION

PERCENTAGE OF CAUSE OF FIRES ATTENDED BY DEPARTMENT IN SOUTHERN REGION

Causes	Decades		
	1950-59	1960-69	1970-80
1. Escape Private Property	26%	29%	27
2. Railways, Bush Locos	19	5	2
3. Escape Control Burns	10	14	18
4. Deliberate	5	14	19
5. Lightning	5.5	7	8
6. Mills, Rubbish Dump	3.5	2	3
7. Marroners, Travellers, Fishermen	12	12	10
8. Miscellaneous	11	8	7
9. Unknown	8	9	6
TOTAL	100	100	100
Average Annual No. Fires in Region	90	78	64

By 1976, nearly all forest area in the region had received at least one rotational aerial prescribed burn.

During the 1970's a number of major advances occurred which improved the efficiency of the Region's fire protection organization. These included the introduction of aerial surveillance, improved communications and modern fire fighting plant. This was coupled with the development of a wide ranging major roading network by the timber industry, which allowed for a rapid response to any wildfire emergency.

The improvements in fire control that have occurred in the Region can be traced from the wildfire history records taken over the past 30 years. (Table 1). These records were summarized into 3 ten-year periods from 1950-1980, and the wildfire location information was transferred on to maps 2(a to f).

In the 1950's fires were both frequent and large in extent. The three major causes were escapes from settlers' burns, government railways and bush locomotives, and ignitions by hunters, fishermen and travellers.

The Region's fire frequency was about 90 fires per year in the 1950's, but this dropped considerably during the 1960's to about 78 per year.

Escapes from private property burns continued to be the main source of fires during the 1960's. Considerably fewer fires resulted from bush locomotives with the demise of the steam engine and the increase in road transport. The beneficial effects of broad area hazard reduction burning as an effective means of halting major fire runs was becoming evident by the late 1960's.

The evidence for this can be seen from the fire history records of the 1970's. It is obvious that there has been a marked reduction in the frequency,size and severity of wildfires in this period as a result of the effects of broadscale fuel reduction burning programmes, and the improvements in the fire protection technology and facilities.

Although escapes from private property burns continued to be the main cause of wildfires in this decade, the absolute number of such fires was reduced. This can probably be attributed to the fact that most farms had become fully developed and less extensive clearing was undertaken during this period. In addition, public awareness of fire had improved through the efforts by the Bushfires Board, Forests Department and

local authorities in education and policing of the Bushfires Act following the 1961 Royal Commission.

During the 1970's the percentage of fires that escaped from control burning operations increased. This was not surprising given the substantial increase in the burning activities undertaken for hazard reduction, tops disposal, forest regeneration and associated buffer burning, and involving an annual perimeter of edge of about 1200Km. Nearly all escapes were contained to small areas with minimal forest damage because of the effects of previous hazard reduction burning.

Another significantly high source of fires resulted from the indiscriminant lighting on the south coastal belt by persons wishing to improve grazing for stock and for access to the numerous fishing sites along the coast. These fires were often large and caused severe damage to the fragile coastal areas and the adjoining forest lands and private properties. The establishment of a hazard reduction interagency agreement between the BushFires Board and the Forests Department in the mid-1970's has lead to some reduction in these fires since that time. A continuation of this agreement between the parties concerned is considered essential.

Fire records also show that forest travellers and recreationists have been a significantly high source of wildfires in the past. As it is certain that forest usage by these visitors will continue to increase, high activity and fire risk areas such as Recreation MPA's, picnic sites, tourist roads and major rivers must be given special consideration for protection.

3.2 Recent Changes in Fire Management

Whilst the past decade has witnessed a remarkable period of low wildfire damage, as compared with past periods, there is no room for complacency. The Department's renewed emphasis on multiple-use management and changes in land-use activities in recent years, have placed increased demands on the Region's protection system. Some of the major changes that have occurred are:

(a) the increase since 1975 of dispersed, fully-stocked karri-marri and jarrah-marri regrowth stands following regeneration of logging coupes cutover for both sawlogs and chipwood. As at 1982, the areas of these fire tender regrowth stands that await their first hazard reduction burn totalled some 19,570ha of karri,

and 4966ha of jarran, comprising of some 260 coupes. New areas of regrowth stands will continue to be established at a likely rate of 2500ha (karri) and 4000ha (jarrah) per year for another 8 years at least.

The increase in areas of unburnt, susceptible regrowth stands will be slowed considerably once the regrowth stands reach a size at which they can withstand a mild intensity hazard reduction prescribed burn. This stage of development is likely to be reached at varying ages of the regrowth, depending on the site quality. Indications are that karri regrowth must be at least 15 years old, and jarrah at least 10 years old before they can be safely burned. Thus, by the year 1990, the areas of unburnt regrowth is likely to have stabilized at about 39,000ha of karri and 36,000ha of jarrah.

(b) The revision of the forest policy in 1976 which emphasised the multiple-use management of State Forest. This has required a change in the traditional fire protection approach to accommodate multiple land-use and the recognition of other forest values such as conservation of soils, flora, fauna and landscape assets, water catchments and forest based recreation. Each of the various land use priorities is likely to require specific burn treatments, some of which may conflict with the current hazard reduction policies.

(c) The extension in 1978 of forest disease risk areas covering some 210,875ha in the Region, with associated limitations on access and fire suppression techniques. The need to delay planned burns in some of these areas for the purpose of accurate photography and disease mapping has affected the overall hazard reduction planning.

3.3 Future Impacts to Management

The impact of these changes is to increase the areas of forest requiring special fire protection whilst decreasing the areas available for regular fuel reduction burning.

At the beginning of this decade (1980-90) approximately 85% of the area was available for hazard reduction burning on a rotational basis. The major portion being covered by broad area aerial ignition in large regular shaped jobs of 2 - 5000ha in size. Hand burning was mainly confined to small isolated irregular shaped areas adjoining private property, townsites and other protective burn requirements.

The overall area available for hazard reduction burning is diminishing annually and will constitute approx. 50% of the area by the year 1990. As this overall area reduces, the individual burn jobs reduce in size and become very irregular in shape to the point where aerial ignition in much of the area becomes impossible, thereby increasing the hand burn component.

The small size & irregular shapes of these burns causes a sharp rise in the perimeter/area ratio with the inevitable steep rise in cost per ha. At the same time, the adjoining forest is changing from one of light to moderate fuels under rotational burning, to one of high value, fire sensitive, regeneration with rapid fuel accumulation. The task of protective burning adjacent to these fuels becomes more difficult as any escape is likely to have damaging consequences. Considerably tighter controls in planning, mop-up and patrol must be implemented.

In addition, the young regeneration poses a fire fighting problem of considerable complexity when it reaches a flammable stage from age 5 onwards. The dense understorey associated with the regrowth makes access by foot for fire attack a risky and extremely difficult operation. In this sense the young forest poses a more difficult fire suppression problem than mature forests and even much of the pine plantations.

These additional constraints on the burning and suppression operations will require greater planning inputs and further sophistication of protection technology to maintain effective protection for these future high value forest areas.

SECTION 2 - PROTECTION OBJECTIVES AND STRATEGIES

1. DEPARTMENTAL FIRE PROTECTION OBJECTIVE

The Forests Department fire protection objective as stated in the General Working Plan No. 87 (Pg. 55) is to provide a fire control system capable of protecting recognised forest values from damage. This system is to be compatible with the dominant land use in any area, with the cost of protection not exceeding the value of the loss prevented.

A set of objectives have been developed for each facet that make up the protection system, which include fire prevention, preparedness and suppression.

1.1 Fire Prevention

Fire prevention consists of the two areas of activity in Risk reduction and Hazard reduction. The Department's aims to minimize the risk of ignitions within and in proximity to the forest estate,by providing for public education, warning and control in relation to fire prevention. Furthermore, it aims to promote excellent relationships and encourage involvement with individual neighbours, bushfire brigades, shires, timber industry and other local fire protection organisations.

The objective of hazard reduction is to minimise the spread and damaging effects of wildfire within State Forest, and restrict fires spreading into and from adjoining Crown Lands, Private Properties, and settlements and towns, through a programme of rotational fuel reduction burning.

1.2 Fire Preparedness

To maintain a high level of preparedness through provision of fully equipped and trained fire fighting forces and an effective, rapid detection system and communications network, plus rapid access and adequate water supplies throughout the forest. Preparedness planning must also aim to promote a framework of mutual co-operation with Shire Authorities, Bushfire Brigades, Timber Industry, Other Government land managers and interested bodies so that in time of emergencies an effective and efficient fire fighting effort is assured.
Furthermore, it is the Department's policy to continue research programmes into the technological and managerial aspects of fire protection to ensure that the selected fire management regimes are cost-effective and appropriate for each and every major land use objective.

1.3 Fire Suppression

To maintain a fully equipped and trained fire suppression organisation capable of suppressing several simultaneous wildfires under severe summer conditions within the full range of forest fuels peculiar to the region. To be effective, the fire suppression organisation must not only rely entirely on the Forests Department's personnel and resources, but must also plan to anticipate an effective response and assistance from other competent fire fighting organisations to combat fires within State Forests and neighbouring lands.

2. PROTECTION ZONES

Fire protection objectives must be executed in a cost-effective manner so that the protection efforts and expenditure are commensurate with values being protected. To this end, the Region has been divided into three zones, indicating the degree and priority of fire protection required to preserve the forest values at risk.

2.1 "P" Zone

Consists of areas which are highly valued and are highly susceptible to fire damage due to their fire sensitivity or due to the accumulation of heavy fuel quantities.

These include:

- pine plantations and specified trial plots.
- fire sensitive karri and jarrah regrowth area carrying high fuel accumulations and awaiting the first hazard reduction burn.
- areas required for research and investigation (paired catchments, leaf miner study areas, fauna ecology trials).
- karri areas programmed for cutting within 3 years, plus recently cutover areas containing logging tops.

These areas are to be afforded the highest priority of protection. All fires within this zone are to be attacked when small by direct methods if possible and be given precedence for suppression over other fires. Despatch of fire fighting forces must be planned for automatic response and detailed in Divisional standing orders under the title of Red Action Orders.

The protection strategy for 'P' zone areas also includes the establishment of fuel reduced buffer systems surrounding the protected areas as a means of wildfires containment and minimization of damage. The buffer system considered appropriate for each 'P' zone will be outlined in the next main section.

2.2 "A" Zone

Contains the prime forest areas not included in the 'P' Zone. Some lower quality forest and non-forest types are included where fires pose a direct threat to high value areas. The main strategy will be the containment of multiple fires within discreet cells of 2,500ha in Karri forests, and 4,000ha in jarrah types. These areas which coincide with the average annual regeneration programme in the Region are regarded as the maximum acceptable loss areas for each forest type.

The protection will be achieved by surrounding each cell by a fuel reduced buffer of sufficient width to prevent spread into adjacent cells by intense spotting. Within each cell, narrower buffers will be used to aid fire fighting and provide safety refuge for suppression crews. Fires within "A" Zones will be attacked immediately they become known and high priority is to be given to preparedness planning and maintenance of ready access and water supply, and other appropriate pre-suppression measures.

2.3 "B" Zone

Contains mostly lower quality forest with generally low fuel accumulation rates, as well as certain areas of Vacant Crown Lands and Private Property adjacent to State Forest. Protection will be provided mainly by hazard reduction burning to maintain low fire hazards. Suppression action of wildfires may be delayed when commitments on Zone "A" and "P" require the postponing of immediate attack. The decision to delay attack will need to be reviewed where fires threaten life or property, or are likely to spread into "P" or "A" zone priority areas.

The protection strategies and prescriptions required to meet the fire prevention, preparedness and suppression objectives of the Region will be discussed for each protection zone in the following section.

3. HAZARD REDUCTION STRATEGY

3.1 Strategic Options

As the areas available for hazard reduction burning are decreasing at a substantial rate, it has become necessary to modify the recent strategy of broadscale prescribed burning to one which will allow the protection of the increasing areas of fire sensitive regrowth stands, and other special high value and high risk forest and community assets.

Three main alternative strategies present themselves:

Option 1

Permit logging to occur at random throughout the Region and curtail all hazard reduction burning in these areas so that fire protection is solely reliant on a rapid and effective suppression organisation. This is the approach followed in the Eden Woodchip Area.

Interstate and Overseas experience indicate that this approach would require a massive expansion of the suppression organisation, and that widespread damaging wildfires would still occur with regularity. This was amply illustrated by the inability of the well-equipped N.S.W. Commission suppression organisation at Eden to prevent an initiating wildfire from spreading through heavy fuels in November, 1980, and subsequently consuming 47,000ha of prime forest, including 11,000ha of young hardwood regrowth.

Option 2

Permit logging to occur at random throughout the Region, and plan for handburns of uncut areas between logged/regenerated coupes. This would provide some protection to the fire sensitive stands, but would be of very limited value in preventing major fires from spreading in large swathes through the Region. This approach would require a very large build up in manpower and equipment to develop an adequate suppression organisation and to enable the large programmes of difficult and costly handburns to be achieved each year. These serious shortcomings are the main reasons why this strategy option is not favoured here.

Option 3

Plan logging and regeneration to permit creation and maintenance of broad burning buffers that may be effective in containing large wildfires and which are sufficiently large to permit cost-effective aerial burning.

These buffers to be augmented with narrow, hand-burnt buffers to minimize spread of initiating wildfires to within defined areas. In addition, remaining large areas not programmed for cutting or regeneration to be prescribed burnt regularly to maintain low fire hazard. Although an efficient and effective suppression organisation will be needed to exclude fire from young regrowth stands and other special values, the organisation need not be built up to the massive proportions required to implement Options 1 and 2. For these reasons, Option 3 is the hazard reduction strategy now adopted for the Southern Region.

3.2 Criteria for Fuel Reduced Buffers

The protection strategy of hazard reduction by way of prescribed burning is based not on the aim to prevent forest fires, but to make their control easier and thus reduce potential damage. The frequency of burning rotations is based on the knowledge that our suppression organisation can be expected to control wildfires under normal summer conditions in fuels of 7 to 9 tonnes/ha in jarrah forest types, and 15 to 19 tonnes/ha in karri types. Thus, it has been the practice to carry out broadscale regular fuel reduction burns in all extensive areas available for cost-effective burning. This will continue to be a major objective throughout the Region, taking into account the dominant land-use objective of the area, and the practicality and cost-effectiveness of the burn implementation.

However, with the projected decrease in areas available for burning, the protection strategy must also provide for fuel reduction of strategically located buffer strips designed to minimize major fire runs, and permit the exclusion of fire from young regrowth stands and other special areas.

The effectiveness of fuel reduced buffers in containing wildfires depends on the severity of the fire and the strategic placement and width of the low fuel zone in relation to the direction of wildfire spread.

The most severe fires experienced in the Region occur during hot, dry days of high velocity winds blowing from the north west. Thus, to be of maximum strategic value, fuel reduced zones should be orientated across these NW winds.

Experience indicates that the effective width of a stategic fuel reduced buffer needed to contain a high intensity wildfire spreading at rates of 140 metres/hour or greater, is a minimum of 3 kilometres. However, where long-range spotting is likely to threaten life and property (eg. towns or settlements) the effective width needs to be increased to about 6Km.

The large majority of summer wildfires that are attended to,do not reach large size and extreme intensities. In more than 95 percent of cases, wildfires spread at rates of less than 140 metres per hour. Experience shows that such fires can be effectively contained by linking flank control lines in with fuel reduced buffers that are only 400 to 800 metres wide. These narrow buffers are also useful in confining the lateral spread of major fires, and if these are judicially located in relation to the broader buffers, they can be used to good effect to reduce the burning area, suppression costs, and damages to forest values. Both narrow and broad fuel reduced buffers may also provide refuge and safety for fire fighting personnel and equipment under hazardous conditions.

Where isolated logging and regeneration operations are planned alongside large private property areas or other high risk areas, and where the establishment of wide fuel reduced buffers are not feasible or suitable, consideration must be given to the placement of a minimum of a 100 metre wide fuel reduced buffer along the common boundary. This is considered the accepted maximum distance that sparks can be thrown from burning trees under normal burning conditions. Such a buffer must be shown to have strategic value as a line of defence from uncontrolled fires originating from the private property, or from hazard reduction burns on private property, or as a buffer during the regeneration slash burn following logging. The high costs of maintaining these narrow corridors make it imperative that these be confined to the most critical areas only where their benefits exceed the maintenance costs and temporary loss of timber resource.

The location of strategic buffers is determined with the objectives of confining major fires to maximum area of 2,500ha of karri, or 4,000ha of jarrah, which represents the area likely to be cut and regenerated annually. Other considerations also affect the final placement of the buffer boundaries. In order to minimize burning costs, buffers should be designed to permit aerial ignition wherever possible. Such buffers should be regular shaped with a perimeter to area ratio of less than 10 metres per ha. The area should be greater than 400ha although areas as small as 250ha may be acceptable in some cases.
For instance, wherever possible, buffers should be located within jarrah stands or along ridges where fuels dry first to permit easy, early burning. Also, existing roads should be used as buffer perimeters to minimize costs of construction and maintenance. In addition, the buffers should be strategically located to protect those areas with a history of frequent fires, such as major roads and high activity areas.

In order that the strategic buffers remain available for burning for the period required to protect the adjacent regrowth stands or other special values, no heavy cutting or regeneration operations will be permitted within the buffers. Some light selection cutting (eg. pole removals, or thinnings) may be carried out so long as resultant fuels can be managed in accordance with the hazard reduction objectives.

The buffers must be maintained until the adjacent strips of regrowth coupes are old enough to sustain fuel reduction burning. The original strategic buffers can then be logged and regenerated. The new regeneration will in turn be protected by the establishment of new buffers consisting of burnable regrowth stands. The two generations of strategic buffers will be referred to as First Stage and Second Stage Strategic Buffers, respectively.

3.2 Summary of Hazard Reduction Strategies

The various hazard reduction strategies and burning prescriptions recommended for each of the major land-use values are summarized in Table 2. These are listed within the 3 Protection Zones along with a suggested order of priority for their implementation.

3.3 Hazard Reduction Plans

Three levels of hazard reduction burning plans are required for the proper planning of the Region's Protection system. These plans consist of:

3.3.1 Current Burning Plan - sets out the proposed programme for the oncoming fire season on 1:50 000 plans with job numbers, areas and season of burn. These plans are used to provide Protection Branch and Mapping Branch with necessary information for preparation of flight plans, details required by Department of Agriculture for benefit of bee keepers, and notification for burning of lands other than State Forest.

The Divisions are responsible for preparing the Current Burn Plan, which will provide information for inspections, preparations and compilation of prescriptions of the annual burn programme. These will be submitted, after vetting by Regional Leader Operations, to the O.I.C. Protection Branch, by January each year, in time for the preparation of the annual estimates.

3.3.2 Single Rotation Master Plan - show the hardwood areas to be burnt, the rotation length, year of last burn, year and season of burn, and the areas requiring protection. The Master Plans will be compiled by R/L Operations in consultation with R/L Planning and the Divisional O.I.C.'s, so that all long and short-term forest operations that may affect protection planning are accounted for in the proposed Master Plan. See Maps 3a to 3f.

3.3.3 Strategic Burning Buffer Plans - show the location of first stage and second stage strategic burning buffers required to be established and maintained in the next 30 years or so. The first stage buffers are shown in orange hatching on Maps 4a to 4f, whilst the second stage buffer proposals are indicated in blue on a clear overlay.
Each of the second stage buffers are shown with two dates. The first date is the year when current cutting and regeneration within the buffer strip should be completed to allow the required period of full protection.

The second date is the earliest year when the new regeneration should be sufficiently developed to withstand a prescribed hazard reduction burn, and in turn become available as the future burning buffer. The period of full protection will vary from a min. of 10 years for predominantly jarrah regrowth area, to a min. of 15 years for karri regrowth.

In order that the first stage buffers become available for logging in the shortest possible time, it is necessary for logging and regeneration to be concentrated inside the recommended second stage buffers, given the constraint of maximum coupe dispersal spelled out in the Environmental Impact Statement of the Marri Woodchip Project.

The details of the requirements of the replacement of the first stage strategic buffers by the development of the second stage buffers are documented in a file titled "Second Stage Buffer Development" (Appendix IX). This document contains data sheets for each buffer strip located within each Sawmill Permit or Licence Area. The data recorded includes the following:

(i) Buffer label (code), location and reference plan.

(ii) Completion year of cutting and regeneration.

(iii) Areas and coupes within the second stage buffer yet to be cut.

(iv) Recommended options for cutting or other treatments to ensure proper establishment of buffer strip.

(v) Suggested earliest year of first hazard reduction burn of regrowth buffer.

(vi) Listing of adjacent first stage buffers and the dates when these are to be released for cutting.

(vii) Recommended roading requirements for protection of buffers.

A table has been compiled showing the coupes within each SMP that should be cut in each of the next 8 years to ensure proper development of the 2nd stage buffer plan. This table is shown in Appendix X

The R/L Operations is responsible for the complex task of developing and maintaining the Strategic Buffer Plans. These long term plans are interrelated with and may effect all other aspects of forest operations. It is therefore essential that a close liaison be maintained between the R/L Operations and R/L Planning, as well as between Divisional and Specialist OIC's in Research, I&P and A.P.&.I.

The impacts that the prepared hazard reduction strategies have on the Region's manpower, plant, funds and other resources will be examined in further detail later in this plan.

TABLE 2

HAZARD REDUCTION STRATEGIES, PRESCRIPTIONS AND PRIORITIES

P ZONE

SECTION	LAND-USE VALUE	HAZARD REDUCTION STRATEGY	BURN PRESCRIPTION	PRIORITY	REFERENCE
1.1	Towns and Settlements	Fuel Reduced Buffers (FRB) extending 6Km to North-west, 4Km to SW and NE, and 3Km to SE.	Special burn plan and prescription required for each population centre. Fuels to be maintained at less than 7 t/ha jarrah and 15 t/ha karri within 3Km of perimeter of town or settlement. Other areas in buffer zone to be maintained at less than 9 t/ha jarrah or 19 t/ha karri. Interagency agreement to be implemented for co-operative burning of these areas where applicable.	1	See Maps 4a to 4h
1.2	Pine Plantations	Fuel Reduced Buffers to be maintained around perimeter of plantations to a minimum depth of 800 metres.	Buffers to be burnt every 4 to 6 years or when fine fuels exceed 6 - 7 t/ha jarrah and 15t/ha karri.	1	eg. Strachan's Dombakup Maps 4c, 4d
1.3	Young regrowth cells carrying fire sustaining fuels and awaiting first hazard reduction burn.	Fire to be excluded from the regrowth stands. Protect by series of strategic buffers described here under Section 2.2.	See Section 2.2.	2	Maps 4a-4f
1.4	Special study areas.	Protection by maintenance of Fuel Reduced Burns surrounding perimeter to a minimum depth of 800m.	As for pine plantations.	2	See Maps 4a-f

TABLE 2

HAZARD REDUCTION STRATEGIES, PRESCRIPTIONS AND PRIORITIES

A ZONE

SECTION	LAND-USE VALUE	HAZARD REDUCTION STRATEGY	BURN PRESCRIPTION	PRIORITY	REFERENCE
2.1	Private Property (a) Large Groups	Provide Strategic Fuel Reduced Buffers with minimum width of 400m along vulnerable perimeters of large groups of private property to prevent fire spreading from or into adjoining forest areas.	Fuel Reduced Buffers to be burnt every 5 to 6 years or when fuels exceed 9t/ha jarrah, or 19t/ha karri. Stags to be felled to depth of 100 metres and perimeter access to be maintained.	3	Private Property Buffers shown on Maps 4a-4f.
	(b) Small Groups or Isolated Properties.	(i) Where regeneration is to be established upto fully developed private property, a 6 metre fire break is to be provided.	(i) Maintain 6m fire break every 3 to 5 years. Where applicable remove stags within 100m of common boundary.	4	Maps 4a-4f
		(ii) Semi-developed or undeveloped P.P. to be considered individually depending on cost-effectiveness, strategic value, and property future etc. of establishing and maintaining a buffer at least 100 metres wide.	(ii) Buffers to be regularly burnt to maintain fuels below 9 t/ha jarrah and 19 t/ha karri. Seek assistance from land owner for co-operative burning where applicable.	4	Maps 4a-4f
2.2	Wood Production MPA's	The hazard reduction strategy involves 3 buffer zone systems. 1. Broad Burning Strips suitable for broadscale hazard reduction to be left uncut or unregenerated and located strategically to prevent spread of major or multiple fires. These strips to be 3 to 6 Km wide and spaced to restrict large fires to an area not greater than 2500ha of Karri or 4000ha of Jarrah	Broad Fuel Reduced Buffers to be burned at 5 - 7 years or when fine fuels exceed 9t/ha jarrah or 19t/ha karri.	2	Strategic Buffers shown in orange hatching on Maps 4a to 4f

TABLE 2

HAZARD REDUCTION STRATEGIES, PRESCRIPTIONS AND PRIORITIES

A ZONE

SECTION	LAND-USE VALUE	HAZARD REDUCTION STRATEGY	BURN PRESCRIPTION	PRIORITY	REFERENCE
2.2 Cont.	Wood Production MPA's Cont..	2. Narrow Buffer Strips to be left uncut or unregenerated, and located strategically within the logging/regeneration aggregates to restrict initiating wildfires to less than 800ha karri or 1,500 ha jarrah. Internal buffers to complement and link up with broad buffers.	Wherever possible, internal buffers to be at least 400m wide and located along jarrah ridges. Existing roads to be used as much as possible. Internal buffers to be burnt every 5-7 years although timing will depend on timing of slash burns and fuel accumulation of adjoining regenerated cells.	2	Internal buffers shown with orange hatching on Maps 4a-4f.
		3. Broadscale Areas In large blocks where cutting and regeneration activities are not yet significant, broadscale burning by aircraft to be maintained on a regular basis to augment strategic buffer protection system.	Burn large blocks every 5 to 7 years depending on fuel accumulation rate so that fine fuels do not exceed 7 - 9t/ha jarrah or 17 - 19t/ha Karri.	2	Maps 4a-4f.
2.3	Flora, Fauna and Landscape MPA's. (a) Preservation Areas eg. Wattle, Johnston, O'Donnell etc.	Broadscale fuel reduction burning programme to be maintained until special management plans indicate otherwise. Burn regimes to be varied in frequency, intensity and season to ensure variability in fuel age, understorey structure and fauna habitat.	Master burn plans should ensure these MPA's and adjoining burn jobs are programmed to provide wide variation in fuel ages etc. Burn prescriptions to provide for a mosaic type coverage of 60 to 80 percent.	3	See Maps 4a-4f.
	(b) Silvicultural Areas eg. Giants Block, Keystone Tingle.	Separate fire management plans to be drawn up for each area. These will be based on regular broadscale hazard reduction burning wherever feasible; or systems of strategic FRB's to protect young regrowth stands and other special areas.	Burn rotations to be 5 to 7 years to maintain fine fuels below 9 t/ha jarrah or 19 t/ha karri. Burning to provide a mosaic pattern with 60 to 80 percent coverage.	3	Map 7 of Giants Block M.P.A.

TABLE 2

HAZARD REDUCTION STRATEGIES, PRESCRIPTIONS AND PRIORITIES

A ZONE

SECTION	LAND-USE VALUE	HAZARD REDUCTION STRATEGY	BURN PRESCRIPTION	PRIORITY	REFERENCE
2.3 Cont.	(c) Management Areas eg. Perup Fauna Study Area.	A special fire management plan has been developed for the Perup area which aims to satisfy the dual demands of the area: (i) to optimise fauna habitats for representative species and (ii) to protect other forest values and surrounding private property. Burning to be on broadscale as much as feasible with some strategic H/B buffers required to protect special areas and isolated private property.	Burning regimes to vary widely throughout entire MPA, ranging from regular 6 year rotation protective burns, through to variable frequency (7 to 15 years) and intensive Spring and Autumn burns, for habitat management. Fire to be excluded from 2 large 'control' areas designated as "P" zones.	3	Appendix IV and Map 6.
2.4	Scientific & Education. eg. Beavis, Giblett.	Until special management plans have been compiled, broad-area prescribed burns will be programmed for the bulk of these MPA's. Any regrowth stands or logging coupes planned within the MPA's will need to be excised from the burns and given special protection.	Burn rotation to be 5 to 7 years, to maintain fine fuels below 9 t/ha Jarrah or 19 t/ha karri. Burn to provide a mosaic pattern with 60 to 80 percent cover.	2	Master Plan Maps 3a.
2.5	Recreation MPA's (a) eg. One Tree Bridge, Brockman, Frankland, Muirillup.	These high usage, high risk areas require special protection to be considered individually on circumstances prevailing. It is aimed to meet dual objectives of hazard reduction and maintenance of aesthetic and recreational values.	Patch and narrow buffer burning at mild intensities to provide for variety in shrub and wildflower development and at same time ensure adequate fuel reduction.	2	Maps 3a-3f.

TABLE 2

HAZARD REDUCTION STRATEGIES, PRESCRIPTIONS AND PRIORITIES

A ZONE

SECTION	LAND-USE VALUE	HAZARD REDUCTION STRATEGY	BURN PRESCRIPTION	PRIORITY	REFERENCE
2.5 Cont.	(b) Road Reserves	Only one side of major public roads to be burnt in any one year. Where possible, roadside burning should be planned for minimum impact on wild-flower display. The high usage and high risk areas demand regular fuel reduction burning. This should be programmed as much as possible with regular broad area or buffer burning operations.	Burning to be prescribed at low to medium intensities to avoid scorch and butt damage to roadside trees. Consider autumn burns in some areas to maximise shrub community diversity.	3	Refer to Circ. 4/73, App. III
2.6	Protection MPA's (a) Catchment eg 'A' zone of PWD catchment zone.	Two burn strategies are required: (i) Where possible, rotational hazard reduction of broad areas. (ii) Hazard reduction of strategic buffers where regeneration or private property requires protection.	Burn at 5 to 7 years rotation to maintain fuels less than 9 t/ha jarrah or 19 t/ha karri. Burn under mild conditions to provide mosaic burn coverage of 60 to 80 percent.	4	Map 4b, 4d
	(b) Forest Values eg. Hawke, Charley Block.	Rotational hazard reduction burns of broad areas. Rotation ranges from 5 to 7 years depending on fuel accumulation rates.	Burn at 5 to 7 years rotation to maintain fuels to less than 9 t/ha jarrah, or 19 t/ha karri. Burn under mild conditions to provide mosaic burn coverage of 60 to 80 percent.	4	Map 4c

TABLE 2

HAZARD REDUCTION STRATEGIES, PRESCRIPTIONS AND PRIORITIES

B ZONE

SECTION	LAND-USE VALUE	HAZARD REDUCTION STRATEGY	BURN PRESCRIPTION	PRIORITY	REFERENCE
3.1	Wood Production MPA eg. Peak, Long, Rocky Blocks.	As for 2.2	These areas are all jarrah types so that burn frequency to be 6 to 8 years to maintain fuels below 9 t/ha jarrah.	4	Map 3d
3.2	Flora, Fauna and Landscape. Soho, Denmark, Hay Blocks.	As for 2.3	As for 2.3		Map ~~3g~~ 5
3.3	Scientific and Education. eg. Quindinillup and Table Hill Blocks.	Exclude fire from Quindinillup Block by maintaining hazard reduction of surrounding areas to fuel quantities of less than 9 t/ha jarrah. Areas to be burnt under Interagency Agreement with B.F.B. and local brigades.	Burn at 6 to 8 year rotation. Areas surrounding Quindinillup may be burned at varying intensity so long as burn coverage is greater than 60 percent.	4	Map ~~3g~~ 5
3.4	Protection MPA Forest Values and Catchment Protection. eg. Denmark River Catchment.	Broadscale hazard reduction burning on rotations of 6 to 8 years to provide protection to forest values and surrounding large groups of private property. Burning to be done in conjunction with adjoining landowners and authorities under separate Interagency Agreements with Department.	Combination of Spring and Autumn prescribed burns to maintain fine fuels below 9 t/ha jarrah.	5	Master Plans 3d, 3e, ~~3g~~ 5

TABLE 2

HAZARD REDUCTION STRATEGIES, PRESCRIPTIONS AND PRIORITIES

OTHER LAND USES

SECTION	LAND-USE VALUE	HAZARD REDUCTION STRATEGY	BURN PRESCRIPTION	PRIORITY	REFERENCE
4.1	National Parks	Specific co-operative burning arrangements to be maintained and upgraded where necessary to ensure adequate protections to forests and community values in proximity to N.P.A. boundaries. In the main the strategies being followed include: (a) exclusion of fire from designated areas within Parks (b) regular maintenance of rotational hazard reduction burning of strategic buffers along vulnerable boundaries, and (c) broadscale rotational burning of large blocks wherever possible. Continuation of co-operative burning between NPA and F.D. is vital in maintenance of adequate protection of these areas.	Pemberton NPA's (eg. Warren, Beedelup etc.) Current Interagency Agreement provides for burning of strategic F.R.B.'s to protect "pristine" areas inside Parks, and adjoining S.F. and private properties. Walpole/Nornalup NPA's. Current agreement allows for 2 large aerial burns to be done on co-operative basis. Other strip burning done by NPA. The current hazard reduction programme does not provide sufficient protection to about 60% of the Park as well as adjoining areas. D'Entrecasteaux NPA and Other Proposed Extensions. Hazard reduction burning on a 6-7 year rotation is currently conducted under Interagency Agreement with B.F.B. and will continue until new agreement is completed with NPA.	5 5 3	See Map 8(a) and App. V. for Pemberton NPA Master Plan and Interagency Agreement. See Map 8(b) for Walpole/Nornalup NPA Interagency Burn Master Plan. Map 9 for South Coastal Interagency Master Plan.
4.2	Vacant Crown Lands	Hazard reduction burning as per Master Plan and Interagency Agreements covering 3 main areas within the Region, including: Denbarker 1 Denbarker 2 and South Coast	Spring and Autumn burning at 6 to 8 year rotation to maintain fuel levels below 9t/ha in jarrah and 19t/ha in karri.	5	App VI for copies of Interagency Agreements. Map 35 is current Master Plan for Denbarker VCL areas.

4. FIRE RISK STRATEGY

Since 1970, some 86 percent of uncontrolled fires attended in the Region were associated with various activities of man. The most common fire causes have been identified to be:

(i)	Escapes from private property	27%
(ii)	Deliberate lit	19
(iii)	Escapes from prescribed burning	18
(iv)	Marroners, Travellers, Fishermen	10
(v)	Other Miscellaneous Man-related causes	12

Lightning fires and unknown causes make up 14 percent of the total.

The reduction of fires resulting from man's activities is most effectively achieved through public education, and enforcement of laws of the Bush Fires Act and Forests Act, which stipulate the sensible use of fire, and the close liaison with individual landholders, forest users, bushfire brigades, shires and other fire protection organisations.

Public education programmes must be designed to instill an attitude of acceptance and support of fire laws and regulations and to teach people how to take the necessary precautions to use fire effectively and safely. Such programmes must cater for the full range of current and potential forest users, and be tied to the prevention problems of the local areas.

The various groups and organisations requiring education on training include:

4.1 Schools and Youth Groups

The greatest long term benefits of a fire prevention education programme can be attained through the training of the younger members of society. Children are more receptive than adults, and are more likely to accept and pass on the doctrine of fire prevention. Thus, every opportunity should be created by Forests Department staff to address young people on forest management and fire prevention. Area O.I.C.'s and local staff should provide regular lectures and field trips to local primary and secondary school groups. Use should be made of fire prevention movies or slides, publications, posters and exhibits. Assistance should be sought from Department specialists in fire protection, research and extensions.

4.2 Individual Neighbours

Divisional staff must maintain regular personal contact with neighbouring land holders and local residents to discuss fire and forest management issues in order to enlist co-operation and understanding. To ensure that the information imparted is accurate, all staff must acquaint themselves with relevant sections of the Bush Fire Act and Regulation, the Forests Act and current forest management policies and objectives.

Pamphlets on fire management, fire efforts, Bush Fire Act etc. should be made available for distribution at the time of contact or in conjunction with notification to burning etc.

4.3 Bushfire Brigades

Divisional protection staff should attend as many brigade meetings as possible to share information on Forests Department and brigade burning & fire suppression activities. Wherever possible, brigades should be encouraged to assist in burning of lands adjoining S.F. and private properties. Such agreements should be confirmed in writing in the form of an interagency agreement setting out the various responsibilities and task functions. Discussions and exhibits of fire fighting equipment methods and plans should be held on a regular basis for the benefit of these groups. The Bush Fire Liaison Officer can play an important role in co-ordinating the protection plans and activities of the brigades and the Forests Department. It is important that this role is understood by all staff and employees, and that the Liaison Officer be given full co-operation.

4.4 Local Authorities

A close liaison between the various Shires and the Department is essential for satisfactory co-operation on fire control matters and fire law enforcement within the community. Every opportunity must be taken to discuss the Divisional protection activities with the Chief Bush Fire Control Officers and Shire Councillors. For example, mutual aid agreement should be established with the Shires on the responsibilities and tasks for the protection of towns and major communities in proximity to State Forest.

4.5 Travellers and Other Forest Users

Posters advocating fire prevention should be displayed at places throughout the forest frequented by the public. Fire weather forecast signboards provide an effective means of educating the travelling public of forest fire danger.

These signboards must be kept up to date, and conform to standard fire danger indices and colour codes.

Close liaison must be maintained with the various organisations active within the forest areas, including logging companies, S.E.C., M.R.D., Telecom, P.W.D. and Westrail. Discussions should be held regularly with operations manager, foremen and plant operators on the compliance of fire law restrictions, use of fire extinguishers and spark arresters, the legal use of fire, and the Department's prescribed burning activities.

4.6 Forests Department Personnel

The large prescribed burning programme undertaken each year to meet various forest management objectives in the Region, has lead to a relatively high frequency of fire escapes. Although most of these escapes in the past were contained to small areas, the potential for widespread damage is increasing with the increase in areas of protected fire sensitive regrowth stands. Thus, a concerted effort must be made to effectively reduce these burn escapes. To achieve this, training programmes for each level of the Divisional and Regional fire protection organisation must be continually upgraded and implemented to provide for proper understanding and application of standards in all fire control operation. Training emphasis must be given to methods of lighting, fire suppression, mop-up and patrol, and safety on the fire face.

4.7 Education and Training Programmes Implementation

The fire education, liaison and training programmes for each separate group listed above must be systematically planned and diligently implemented. Divisional O.I.C.'s and senior fire staff are responsible for the development, monitoring and regular update of the proposed plan of action, and must ensure that all staff and employees become aware of the importance of the programmes. Assistance with lectures, exhibits and field visits should be sought from Regional and Protection Branch Officers.

5. FIRE PREPAREDNESS STRATEGY

5.1 Introduction

Fire preparedness activities are carried out in advance of each annual fire danger period and include the planning, training and exercising of the various aspects of fire control organisation, and the maintenance of fire equipment and installation. The principles of fire preparedness have been well established and include the following separate functions:

(i) planning
(ii) manpower training
(iii) equipment
(iv) detection
(v) communication
(vi) access roading
(vii) water supplies

The basic requirements of each function of fire preparedness are clearly spelled out in the Forester's Manual Section 9, and therefore repetition here is unnecessary. However, there are some extra considerations important to the Southern Region which require highlighting.

5.1.1. Planning

The integration of all the fire preparedness functions must be planned at Divisional, Regional and Departmental levels. The Fire Control Working Plan (FCWP) is such a plan and includes the necessary maps, standing orders and inventories of each function in each Division. The format of this F.C.W.P. has recently been modified to provide a more complete and logical operating plan into which the separate functions are integrated. See Appendix VII.

The FCWP must be reviewed by end of October each year by the Area OIC and senior fire staff and submitted to the R/L Operations for checking prior to distribution to Protection Branch at State Headquarters by 15th November.

5.1.2 Manpower and Training

Training

We are fortunate to have within our organisation many men with a great deal of experience and skill in fire control techniques. However, we must face the fact that their age is increasing and their numbers are declining. In addition, the decline in the number of large wildfires that have occurred over the past 20 years, has resulted in an increasing number of staff and employees who have not had a great deal of experience of major wildfires. Furthermore, advances

in equipment and techniques and changes in fire management objectives have brought about a need for additional skills in using the equipment and techniques.

The objective of fire control training is to overcome these problems by making the know-how of experienced personnel available to other members of the protection organisation, and to ensure that every individual acquires the skill required for his particular task.

Fire control training programmes within the Region must be co-ordinated and extend to all levels in the Region's protection organisation. These levels include:

(a) Gang Training

- cover performance of fire control skills, and application of techniques. Programmes to be run by local staff to take account of local conditions and level of crew experience. Training should include extra Regional forces unfamiliar with fire control in the southern forest types.

(b) Inexperienced Field Staff Training

- cover fundamentals of fire control and fire line supervision. Programmes to be run by experienced fire control officers and should augment fire control courses (Basic and Intermediate) run by Protection Branch on a Departmental basis.

(c) Senior Divisional and Regional Staff

- cover training in leadership, command, effective communication and organisation development by way of exercises in problem solving. The programme to include duties and responsibilities of controllers, fire bosses, duty officers and specialist fire control officers within various fire emergency situations, ranging from normal day-to-day fire management duties to Red Action Orders and Large Fire Organisations. This training to be organised by Regional Leaders and Protection Branch staff. Programmes to augment Department-wide courses run by Protection Branch on Advance Fire Control, Fire Management and Supervisor Training.

Manpower Levels

Area O.I.C.'s must provide advance warning to Regional Leader Operations or his representative whenever Divisional manpower levels are insufficient to meet requirements for satisfactory fire preparednes due to commitments with fire emergencies or other essential tasks. The Regional Leader will endeavour to provide supplementary forces from within or outside the Region where this is considered necessary.

5.1.3 Equipment

The dozer and low loader fleet in the Region are normally heavily committed during summer months with preparations and implementation of hazard reduction and slash burns. Where possible the day to day deployment of these machines should take into account the location of areas of high hazard, high value and high risk to ensure an acceptable lapsed time from sighting to attack of fire in relation to the fire danger of the day.

On extreme days, multiple fires can occur which can overtax the resources of the Region. For this reason, an agreement has been developed between the Department and the local logging companies to make Industry machinery available to suppress fires in their proximity. These machines are spread throughout the Region and represent a valuable means of gaining prompt action for wildfire containment. The annual renewal of these arrangements is to be co-ordinated by R/L Operations at the start of each fire season.

5.1.4 Detection

Detection circuits and schedules should be planned to give priority coverage of all 'P' and 'A' Zone protection zones.
Spotter pilots must be given a thorough aerial and ground training on identifying and understanding fire behaviour and fire control problems associated with the heavy, mixed fuels of the Southern Forest.

To ensure that detection facilities are available under the worst weather and flying conditions, the nominated back-up towers must be maintained and fully equipped, and emergency towermen given regular refresher training in each Division.

5.1.5 Communications

The high incidence of wildfires involving private properties and Bush Fire brigade organisations makes it imperative that a close liaison is maintained with these groups. Effective co-ordination of fire fighting efforts of F.D. and Bushfire brigade forces can be greatly improved by provision of a common radio network. At present, Manjimup Division has been provided with radios covering the Boyup Brook and Cranbrook Brigade network. Future efforts will need to be considered for a similar link with other adjoining Shires, particularly Manjimup and Denmark Shire Brigades.

5.1.6 Fire Control Access

The road network must be rationalised to the minimum strategically located set of spatially safe roads necessary to achieve the objectives of fire protection, logging, forest management activities and essential services. The access to the forest should be regularly reviewed to provide a designated access plan catering for the various forest management demands. These maps should be distributed for copying by adjoining Divisions within and outside the Region.

Three types of roading are to be shown on the maps as indicated in Appendix XI.

1. Major Strategic Access

   These permit rapid access for dozer transporter, and are designed to surround cells of 2,000ha, in high value/hazard/risk areas such as young regenerated stands, special MPA's, and 'P' zone areas.

2. Secondary Access

   These permit ready access to fire fighting vehicles and are located to service cells of 500ha in high value/hazard/risk areas, and provide access into and surrounding isolated regenerated coupes.

3. Minor Access

   These are to be used only in special circumstances such as fire fighting or access for a particular works programme. Existing tracks such as log roads or coupe boundaries are to be selected which will divide cells into approximately 250ha cells containing regeneration on logging coupes.

Maintenance schedules for all roads must be planned and implemented according to the appropriate category and will vary from regular, full maintenance on major roads, to log removals only on minor roads.

Roads not required and not maintained must be closed and physically blocked and mapped accordingly.

The construction, maintenance and use of roads must follow the dieback hygiene guidelines spelled out in 'Jarrah 81' and 'Dieback Hygiene Manual'.

5.1.7 Water Supplies

The network of water points required for fire control are spelled out in paragraph 165 of the Fire Control Manual. Every opportunity should be taken to establish adequate water supplies at each new regenerated hardwood coupe, as well as at all other areas requiring full fire protectio

6. FIRE SUPPRESSION STRATEGY

6.1 Suppression Goal

Fire history records taken over the past 15 years in the Region indicate that roughly 11 percent of all fires escape initial attack, and that about 8 percent get larger than 200ha, and 2 percent get larger than 2,000ha.

Improvements in fire technology in recent times would suggest that a reasonable goal for suppression within 'A' and 'P' Zones is to contain fires with initial attack to less than 100ha, with a 95 percent probability, and that all fully developed major fires be contained to less than 2,500ha in karri, or 4,000ha in jarrah. To attain this goal, each fire suppression organisation must be well rehearsed on all the aspects of fire suppression listed in the Fire Control Manual.

6.2 Relative Values Affecting Fire Suppression Decision

In a wildfire, the safety of human life takes precedence over all other values, the safety of a group naturally taking precedence over the safety of an individual. In general, community assets such as habitable dwellings would carry next priority. Again, the safety of grouped dwellings in settlements taking precedence over the safety of isolated farm dwellings.

While accepting that life and property take precedence, the decision making process must discriminate between certain forest assets at stake, and the value of uninhabitable, or low value buildings or improvements. Thus, it may be more important to protect high value forest such as plantations or hardwood regrowth stands than, say, delapidated sheds or fencing etc.

Where simultaneous fires burn within forest lands only, the suppression priorities must consider the impact of fire damage on the primary forest values recognized for each area. For example, the potential for severe fire damage is likely to be greater in forest areas managed for wood production than for water catchments. In most cases, forest fire suppression priority will automatically follow the order of "P", "A" and "B" Zones, as discussed in part 2 of Section 2.

The decision making procedures for suppression priority are best laid out in the "Controller's Suppression Guide (F.D. 613). This fire appreciation form permits evaluation of the risks of dieback spread under each fire attack alternative.

All Controller's and Fire Bosses must become fully familiar with the guidelines so that these can be implemented in all fire emergencies.

6.3 Fire Suppression in Heavy Fuels

The inevitable growth of the dense, high hazard regrowth stands, and adjacent heavy fuel forests, will pose a difficult and hazardous problem to fire suppression crews in the future. It is necessary that a clear definition of acceptable risk for men and equipment suppressing fires in such heavy fuels be prescribed, and that techniques for the effective containment of such fires be developed and improved. One approach is to declare areas of fuels exceeding say, 25 tonnes/ha in Karri or 15 tonnes/ha in jarrah to be Restricted Fire Attack Zones in which fire attack is to be directed on flank and backfires only.

The development of additional safety precautions must be followed up with intense theoretical and practical training sessions for officers and crews throughout the Region.

6.4 The normal fire suppression instructions and requirements have been spelled out in the Fire Control Manual and amplified in each of the Divisional Fire Control Working Plans. All officers likely to be involved with any aspect of fire protection must be fully familiar with the relevant sections of these documents. This can be best achieved through regular training and field practice during prescribed burn and slash burn operations.

This training should be extended to those organisations that have been included in contingency plans to assist with fire control in certain circumstances. These should include timber industry machine operators, shire work crews and National Park staff.

SECTION 3 - PROTECTION RESOURCES INPUTS AND CONSTRAINTS

1. CONSTRAINTS OF PROTECTION STRATEGIES

The resources available within the Region required to implement the various protection strategies are limited and must be used wisely. This section describes these constraints and reviews existing work methods with a view to increasing cost effectiveness in each protection operation. Shortfalls in the necessary resources are indicated for discussion and further action.

1.1 Hazard Reduction Programme

The annual aerial burn programme that has been achieved in the Region over the past five years has averaged 80,000ha consisting of 24 separate jobs. Over the next 8 years to 1990, the area programmed for aerial ignition will shrink annually by approximately 4,500ha. The total number of jobs will remain constant at 18 to 20 per year by 1990. These changes will occur as broadscale burning is gradually confined to the broad burning buffers.

The Region's handburn programme over the past five years has averaged 7,500ha consisting of 38 jobs. This programme has fallen short of the desired total which has averaged 10,000ha. The shortfall is due to the fact that priority for burning has been given to aerial burning and regeneration burning, and so the handburn programme achieved has been highly dependent on the manpower, equipment and burning days available after the other burning operations have been completed.

It is estimated that the Region's handburn task in the next five years will increase to approximately 12,500ha, consisting of 60 jobs which will include prescribed burning for narrow fuel reduced buffers, advance and tops disposal, fauna management and research trials.

It is calculated that the changes in the aerial and handburning programme will result in an increase in the overall burning task. This will be discussed later in this section.

1.2 Burning Days Available

The prescribed burning programme achieveable in any one year is influenced by the number of burning days available outside holidays and Sundays. Burning records indicate that since 1975 the average number of days utilized annually by each Division were:

Manjimup	69 days
Pemberton	58 days
Walpole	50 days

These levels have increased significantly in the past 3 years or so as Divisions have gained approvals to extend the Restricted Burning Period into late January. This practice will need to be continued if the proposed burning porgrammes are to be realized. Further consideration may need to be given to extending this even further into February should this be necessary to complete the programme and if summer conditions sufficiently mild as they were in Summer 1981/82.

1.3 Manpower for Burning

The resident manpower level in the Region stands at 10 gangs (Overseer +5). An analysis conducted in 1980 of the manpower needed to achieve the future prescribed burning programme envisaged at that time indicated a shortfall of the order of 4 fire gangs in the Region. Since that analysis the perceived programme has been reduced as a result of the current strategy review and the reduction in the chipping of jarrah stands and subsequent reduction in jarrah regeneration burns.
A recalculation of the manpower requirement follows:

1.3.1 Desired Manpower Levels

Assume gang days needed to complete each job to be:

Aerial burns:	3 gangs x 3 days	= 9 gang days/job
Hand burns:	2 gangs x 2 days	= 4 gang days/job
Karri slash burn:	4 gangs x 2 days	= 8 gang days/job

The total desired manpower is determined by multiplying the number of burn jobs by the gang days per job.

Aerial burns:	20 x 9	= 180 gang days
Hand burns:	60 x 4	= 240 gang days
Karri Slash burns:	30 x 8	= 240 gang days
Total Manpower		= 660 gang days

1.3.2 Current Gang Capacity

The resident manpower level stands at 10 gangs, made up of 4 gangs each at Manjimup and Pemberton, and 2 gangs at Walpole.

By multiplying the number of burning days available by the number of gangs for each Division, gives the current manpower capacity. That is:

4 x 69 + 4 x 50 + 2 x 50 = 608 gang days

The shortfall amounts to 52 gang days.

These calculations do not take into account the man days used up during the available burning days on extra fire suppression activities or on other essential duties.

1.3.3 Manpower Shortfall

In the past 4 years, the shortfall has been partially made up by provision of an extra Central Region gang for 8 to 10 weeks each summer, plus the occasional provision of a Nannup or Kirup gang on a daily basis during emergencies. However, the latter gangs cannot be relied on as these are normally fully occupied on fire control in the Blackwood Valley plantations.

The remaining shortfall may be made up either by hiring an extra casual gang in summer, or arranging for the use of a Northern Region (or even another Central Region) crew on a semi-permanent basis over the duration of the fire season.

On the other hand, the Forests Department manpower requirement could be reduced if more of the handburn operations adjoining private properties can be partially taken over by the adjacent bushfire brigades or landholders. The extent to which this can be achieved will depend on the capability and enthusiasm of these individuals, and on the planning and organisational input to the Divisional officers. In recent years the proportion of handburns and aerial burns done on a mutual basis with non-Forests Department organisations has amounted to about 10 percent. It will be necessary to increase this even further to at least 20 percent in future. Any failure to make up the manpower shortfall, through any of the above options will result in a reduction in the annual burning programme considered necessary for the proper protection of the Region's values. It is important that any reduction be confined to the lower priority burn jobs as listed under Table 2 in Section 2. These jobs missed in the previous year(s) must be considered at a higher priority in the following year.

1.4 Equipment

The current complement of fire fighting equipment within the Region is listed in Table 3. With some important exceptions, this fleet is considered adequate to equip the resident gangs existing in each Division. However, it is true that whilst the gang trucks, dozers and low loader fleet are relatively new and in good condition, the heavy duty fleet is mostly aged and worn out. This situation is common throughout the Department and positive steps have taken place in the past year to replace the older heavy duty trucks with new Isuzu trucks. This replacement programme will continue over the next 2 years, finance permitting.

The Region does have a strong need for a modified rubber tyred loader of the Cat 930 class, for various fire management duties including fire suppression in jarrah forest and dieback affected forest; burn preparation and road clearing in Quarantine and other jarrah areas; and mop-up of burn boundaries. This highly mobile machine is considered very suitable for rapid fire attack on initiating fires in jarrah fuel types in particular. It is the long term plan to equip each Division with one of these versatile machines. The high desirability of rapid containment of initiating wildfires starting in proximity to high value/ hazard areas has lead to the demand for several small (400 litre) pumper units mounted on light 4 x 4 tray bodied vehicles (eg. Toyota Hilux) within the Region. These mobile units are highly suitable for cost-effective mop-up and patrols of smouldering burn perimeters whilst allowing the larger fire trucks to concentrate on more difficult fire control tasks. Current plans are to provide at least 2 of these small pumper units for each Division in the near future.

TABLE 3

Existing Protection Plant in the Southern Region (1982)

PLANT	WALPOLE	PEMBERTON	MANJIMUP	REGION POOL
1. Gang Trucks	2	4	5	1
2. Heavy Duties	3	5	4	
3. Light Duty Pumper Unit	1	0	1	
4. Dozers - D6 type	1	1	1	1
- D4	1	1	1	
5. Low Loader	1	1	1	
6. Grader	1	1	2	
7. Tractor (Wheelblade)	—	—	1	
8. Chamberlain Loader	1	0	1	
9. Rubber Tyned Loader(Cat 966)	0	0	0	
10. General purpose, flat-top trucks.	1	1	1	

1.5 Finance

Another major constraint on the Region's capacity to achieve the desired hazard reduction programmes in the high cost of burning effectively and safely. Costs of burning have increased dramatically over the past two years due to a combination of reasons. Firstly, burns are becoming increasingly smaller, more difficult, and more costly as a result of the increase in the number of cutting coupes and regrowth stands that must be excluded and protected within many of the burns. These complications will arise more often in future. Secondly, employee overtime awards and base wage rates increase substantially in 1980 and 1981, which have affected handburn costs in particular. Thirdly, the continued increase in fuel prices, plus recent large rises in plant hire rates have adversely affected aerial burn costs in particular.

The changes in unit costs compared with the annual prescribed burn programme achieved since 1975/76 season are shown on Figure 1. The areas include both hand and aerial burns.

The dramatic rise in unit costs highlights the necessity to maintain tight budgetary controls on all aspects of the operation by Divisional fire control staff. Only through the careful monitoring of actual unit costs in comparison with target costs can work methods causing overspending be identified and rectified. Cost targets can be estimated through the use of the "Guide to Aerial and Hand Burn Estimation", which is described in Appendix II. This guide was derived from a work methods, time and economy study during the 1981 burning season. As this can only be an approximate guide, Divisions must aim to improve unit costs through cost saving ideas and cost-effective methods such as:

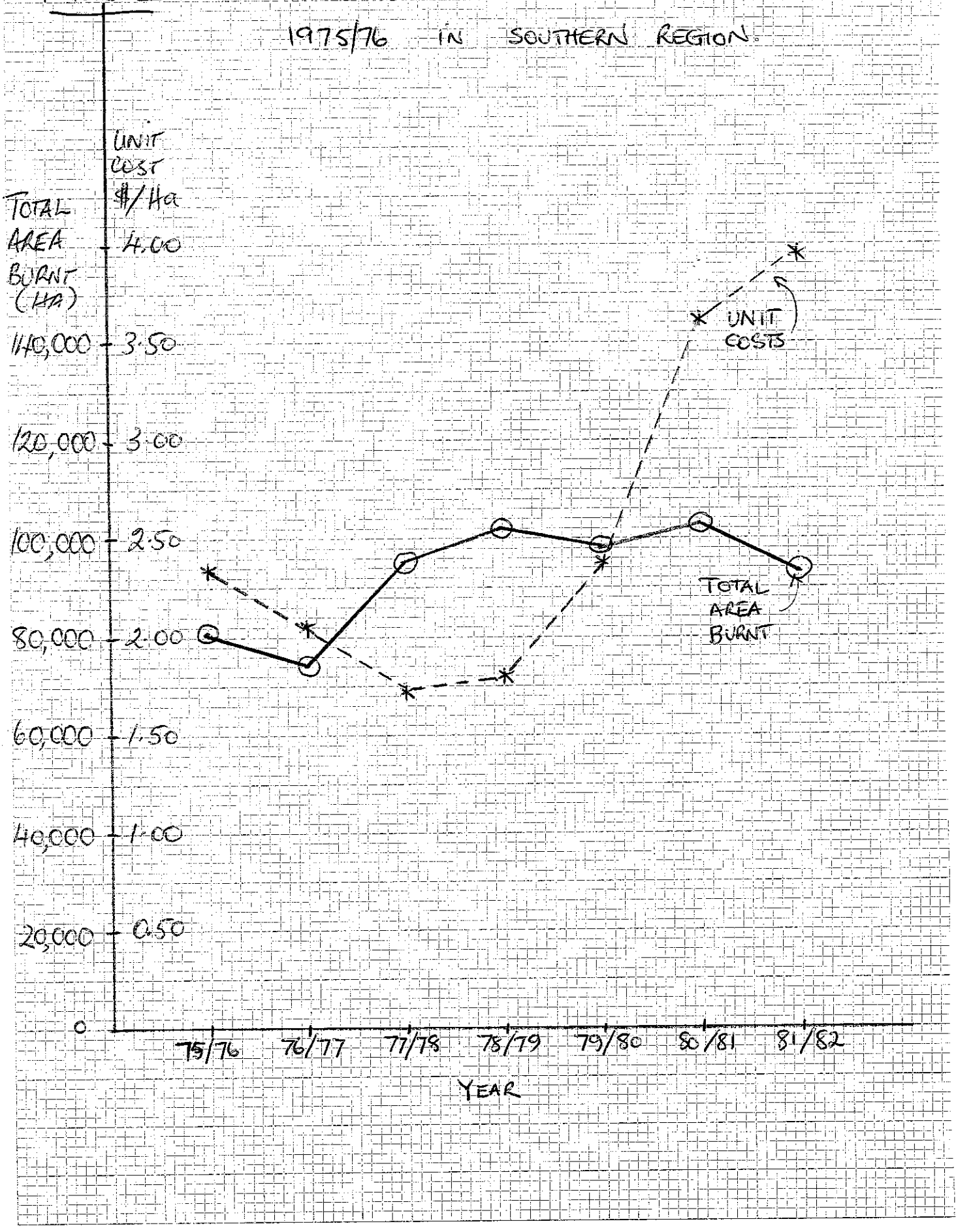
- early start each day to maximize ordinary time hours.
- retention of essential mop-up/patrol crews only following safe completion of ignition,
- retention of heavy plant at burns over night for use next day,
- maximisation of dozer production hours over down time hours (lunch, travel, repairs etc.)
- patrol of burn with small mobile pumpers, or by officers working in burn vicinity.

- minimization of mop-up costs through liaison with adjoining land holder and use of ploughed/burnt pasture as effective buffers.
- maximize use of aircraft over ground crews for ignition of burn areas greater than 200ha,
- accurate and diligent monitoring of fuel moisture contents to achieve burn objectives with a minimum number of lightings and control problems.

These and other cost saving ideas must be incorporated in the gang and field staff training programmes each year, and monitored regularly for their effectiveness.

Area O.I.C.'s must determine the annual burning programme for the following financial year by January in order to calculate the budget requirements for compilation of the financial estimates. Close adherence to the annual budget can be achieved if cost estimates are realistic and accurate. Thus, it is important that the 'Guide to Aerial and Handburn Costs' provided (Appendix II) be used for this task.

FIGURE 1 UNIT COSTS AND BURN AREAS ACHIEVED SINCE 1975/76 IN SOUTHERN REGION.



SECTION 4 - PROTECTION ISSUES

In this section are listed some of the protection issues requiring further investigation and resolution to enable effective implementation of the strategies proposed in this protection plan.

Proposals for the appropriate course of action and the officers responsible for this implementation are given.

These issues require regular review by Regional and Divisional Protection Staff, and will serve as a reminder for further thought and endeavour.

Protection Issues Requiring Investigation

PROTECTION ISSUE	PROPOSED COURSE OF ACTION	SECTIONS REQUIRED TO ASSIST
1. Fuel and Fire Behaviour within Karri and Jarrah young regrowth stands.	Fire behaviour studies to be conducted over range of Karri and Jarrah regrowth stands in varying sites, scrub types, ages etc. to develop specific burning techniques for prescribed burning in these stands.	Fire Research Branch.
2. Effects of mild fire on regrowth stands.	Fire damage and growth studies to be run in conjunction with above experimental fires.	Fire Research Branch.
3. Fire suppression methods and survival from fires burning in: (a) Karri and Jarrah regrowth stands. (b) Heavy fuels (Jarrah and Karri)	(a) Study of suppression methods may be possible in conjunction with above trials. (b) Practical experience may be possible in control of Karri slash burns. (a) & (b) Need for thorough training of staff and employees on major fire suppression by experienced officers.	Divisions & Fire Research. Senior Divisional Staff. Protection Branch and Regional Protection Officer.
4. Develop burning techniques to meet specific management objective eg. fauna habitat, flora diversity.	Small operational field trials to be conducted by Divisions following consultation and advice from Regional Protection staff and Research Branch.	Divisions, Regional, and Research Officers.
5. Cost effective methods of prescribed burning small, awkward burning buffers and "dirty pockets" by aircraft.	Operational trials using aircraft with new, fast-action incendiary machine required to determine effective lower limit of area and job shape that can be safely ignited aerially. Use of helicopter requires testing and costing.	Protection Branch in conjunction with Divisions.

Protection Issues Requiring Investigation

PROTECTION ISSUE	PROPOSED COURSE OF ACTION	SECTIONS REQUIRED TO ASSIST
6. Cost-effective methods of fuel management/hazard reduction of heavy fuels adjacent private property or other high value/high risk areas.	Test feasibility and effectiveness of various operational treatments, including: (a) heaping and/or ploughing within 100 - 400 metres of private property perimeter. (b) Ploughing/burning of narrow buffer inside private property boundary. (c) Silvicultural treatment of new stand - eg. creating close /widely spaced regrowth.	Divisional Trials. Divisions to test in conjunction with land owners; BFBLO
7. Improved co-operative burning and fire suppression arrangements with adjoining land holders.	Division to contact all land holders, brigade officers in proximity to State Forest areas planned to be burned in next 2 or 3 years.	Divisions, in conjunction with BFBLO
8. Evaluation of minimum levels of prescribed burning required for varying levels of protection of private properties and high value areas.	Cost benefit analysis of burning (Hand Burning in particular) operations and protection derived.	R/L Operations to instigate in fire season 1982/83
9. Test use of modified rubber tyred loader for hygiene and cost-effective fire control operations in southern forests, including: (a) burn preparation (b) track maintenance (c) fire suppression and mop-up	Field trials to be instigated in 1982/83 financial year by Divisions upon receipt of new Cat 930 to test effectiveness and costs for each of these 3 functions.	Divisions to monitor trials and report to R/L Protection. Protection Branch to be requested to do same on Departmental level.

APPENDIX 1 - ESTIMATION OF PRESCRIBED BURNING COSTS

1.1 Total Cost Estimation

Reliable estimates of total costs of the annual prescribed burn programmes can be obtained from the "Guide to Aerial and Hand Burn Cost Estimation". This guide provides basic and additional unit costs for 4 standard Aircraft Burns and 3 standard Hand Burns. These standard burns are categorized according to a number of operational constraints (e.g. area, shape, fuel type complexity, number of lightings etc.) which are described at the back of the Guide.

The basic unit costs were derived from a work methods, time and economy study conducted within the Southern Region during the 1981 spring burning periods. The Guide has proved a reliable estimation of unit costs of several other Southern Region burns not included in the original analysis.

This Guide is a useful tool in forecasting Regional and Divisional Protection budgets in future years. The steps in the calculation of the annual burning budget are as follows:

1. From the Master Plan obtain the number of aircraft burns and hand burns scheduled to be burnt in the year of interest. Categorize these within one of the standard burn types and total the burn areas in each category.
2. From the Guide, determine the Average Unit Cost for the average burn with each standard burn category by allowing for additions to the Basic Unit Cost.
3. Obtain total cost in each category (multiply Average Unit Cost by Total Category Burn Area) and sum these costs to give total burn operations budget.

Table 1 lists the Southern Regional Burning Budget required for the 1982/83 season.

TABLE 1 - REGIONAL ANNUAL BURN BUDGET FOR 1982/83

BURN TYPES	UNIT COST/HA	NO. OF JOB	AREAS (HA)	TOTAL COST
Aerial Burns				$
ACB - 0	.70	3	12 000	8,400
ACB - 1	2.45	9	27 000	66,100
ACB - 2	3.50	6	20 000	70,000
ACB - 3	6.10	5	15 000	91,500
	Sub Total (A/CB)	23	82 000	236,000
Hand Burns				
HB 4	7.80	18	5 000	39 000
HB 5	13.00	25	5 000	65 000
HB 6	29.00	12	1 200	35 000
	Sub Total (H/B)	55	11 200	138 000
Regional Total		78	95 000	374,000

1.2 Component Costs Estimation

Analysis of costs of past burns permits a further breakdown of the total costs into the various component costs for each of the burn types. The components shown in Table 2 and 3 below should prove very useful to Area OIC's in their annual Estimate calculations.

TABLE 2 - AIRCRAFT BURNS COMPONENT COSTS

JOB COMPONENTS	PERCENTAGE OF TOTAL COSTS FOR EACH COST COMPONENT				
	AERIAL BURN TYPES				"AVERAGE"
	0	1	2	3	
Preparation (a) wages	7	21	20	19	16
(b) plant	14	25	29	30	26
Burning (a) wages Ord.T.	24	31	18	20	24
(b) wages Over T.	8	8	6	6	6
(c) plant	45	13	22	20	25
Subsequent Patrol & Mop Up (a) wages	1	1	2	2	1
(b) plant	1	1	3	3	2
TOTAL %	100	100	100	100	100

TABLE 3 - HAND BURN COMPONENT COSTS

JOB COMPONENTS	PERCENTAGE OF TOTAL COSTS FOR EACH COST COMPONENT			
	HAND BURN TYPES			"AVERAGE
	4	5	6	
Preparation (a) wages	8	15	16	13
(b) plant	28	25	27	27
Burning (a) wages Ord.T.	30	26	27	27
(b) wages Over.T.	4	6	6	5
(c) plant	28	24	22	24
Subsequent Patrol & Mop Up (a) wages	1	2	2	2
(b) plant	1	2	2	2
TOTAL %	100	100	100	100

Appendix II

STANDARD AERIAL BURNS.

TYPE "0" (Elite)

1) Area greater than 4,000 ha.
2) Has even age fuel.
3) Has only one main forest type.
4) Shape is rectangular with generally straight, good quality perimeter roads requiring little or no maintenance prior to burn.
5) Perimeter - area ratio is 5 metres/ha or less.
6) Suitable for either autumn or spring edging.
7) Requires only one aerial ignition.
8) Not associated with private property.
9) Not effected by cutting proposals.
10) Within 20 km of H.Q.

TYPE "1" (Standard) Jarrah

(1) Area around 4,000 ha.
(2) Available fuel range does not exceed 5t/ha.
(3) 90% Jarrah type fuels.
(4) Shape generally rectangular. Access roads require only approximately 2 days of light machine work, with 4 days grading.
(5) Perimeter - Area ratio is not greater than 6 metres/ha.
(6) Suitable for autumn or spring edging.
(7) Requires average of 1.5 aerial ignitions.
(8) Not more than 5km of perimeter associated with private property.
(9) Not effected by cutting proposals.
(10) Within 20km of H.Q.

TYPE "2" (Standard) Southern Mixed

(1) Area around 4,000ha.
(2) Karri fuel types do not exceed 50% of area.
(3) Shape generally rectangular. Access roads require around 3 days of heavy machine work and 4 days with heavy grader.
(4) Scrub rolling required on not more than 15% of perimeter with 3 days for heavy machine work done between January - May.
(5) Perimeter - Area ratio is not greater than 8 Metres/ha.
(6) Edging mainly spring and day of burn.
(7) Requires 3 aerial ignitions.
(8) Not more than 5km of perimeter associated with private property.
(9) Not effected by cutting proposals.
(10) Within 20km of H.Q.

TYPE "3" (Standard) Karri Burn

(1) Area around 2,500 ha.
(2) Karri type fuels exceed 50% of area.
(3) Shape generally rectangular. Roading, scrub rolling and advance mop up require approximately 10 days with heavy machine. Heavy grader required for 4 days. Work carried out between January - May.
(4) Perimeter - Area ratio not greater than 10 metres/ha.
(5) Requires 3 aerial ignitions.
(6) Not more than 5km of perimeter associated with Private Property.
(7) Not effected by cutting proposals.
(8) Within 20kn of H.Q.

STANDARD HAND BURNS

TYPE "4" (Standard) Jarrah Hand Burn

(1) Area around 400 ha.
(2) Even age fuel.
(3) Mainly one forest type.
(4) Boundary roads require only 1 day with light machine & 2 days light grader.
(5) Requires only one lighting.
(6) Not more than 2km of perimeter adjoining private property.
(7) Within 20km of H.Q.

TYPE "5" (Standard) Southern Mixed Hand Burn

(1) Area around 200 ha.
(2) No heavy Karri type scrub.
(3) Does not require walking lanes.
(4) Requires not more than 2 days machine work on roading and scrub rolling. Approximately 2 days grading.
(5) Requires only one lighting.
(6) Not more than 2km of perimeter adjoing private property.
(7) Within 20km of H.Q.

TYPE "6" (Standard) Karri Hand Burn

(1) Area around 100 ha.
(2) Mostly Karri type scrub.
(3) Walking lanes required.
(4) Requires 4 days machine work for roading, scrub roll walking lanes. One day for grader.
(5) Requires only one lighting.
(6) Not more than 2km of perimeter adjoining private property.
(7) Within 20km of H.Q.

Appendix II

GUIDE TO A.C.B AND H.B. COSTS.

Where any of the conditions listed below are applicable, add the amount shown in the appropriate column (or col
to the Basic Unit Cost to obtain an estimated final cost per hectare.

BURN TYPES. (See over for details)

"0" A/B Elite Jarrah
"1" A/B Standard Jarrah
"2" A/B Standard Mixed Southern
"3" A/B Standard Karri (dom.)

"4" H/B Standard Jarrah
"5" H/B Standard Mixed Southern
"6" H/B Standard Karri (dom.)

BURN TYPE	COST PER/HA (BASIC)	For aerial burns, every 500ha less than the standard size.	For hand burns every 40ha less than standard size.	Where the perimeter/area ratio exceeds the standard by 1 metre/hectare.	For every 5 kilometres in excess of 20 kilometres from H.Q.	For aerial burns every 5km in excess of 5km private property association.	For hand burns every 1km in excess of 2km of private property association.	For every kilometre of coupe or plot requiring exclusion within or intruding in the burn.	Where roading, scrub rolling etc is not carried out between Jan. - May inclusive.	For each additional lighting above the standard.	For every kilometre above 2 kilometres requiring edging on day of the burn.	For every kilometre of edge adjoining tourist roads, highways, picnic areas etc.	For every extra machine day required on additional scrub rolling, walking la	ESTIMATE of UNIT COST
		AREA REDUCTION A/B	AREA REDUCTION H/B	PERIMETER/ AREA RATIO	DISTANCE FROM H.Q.	P/P ASSOCIATED WITH A/B	P/P ASSOCIATED WITH H/B	EXCLUDE COUPES PLOTS ETC	SEASON OF PREP.	NUMBER OF IGNITIONS	EDGING DAY OF BURN	PUBLIC AND SAFETY	EXTRA MACHINE DAYS	
"0" A.B.	60c				5c									
"1" A.B.	1·77	15c		5c	5c	8c		8c		20c			8c	
"2" AB	2·87	25c		15c	5c	10c		12c	14c	20c	6c	3c	8c	
"3" AB	3·48	30c		25c	7c	20c		20c	35c	22c	10c	5c	12c	
"4" H.B.	7·82		60c		25c		30c	38c					75c	
"5" HB.	12·25		2·00		38c		50c	75c	50c			50c	1·20.	
"6" H.B.	27·50		10·00		1·25		1·25	1·50	1·00			1·25	3·00	

Appendix V

National Parks Authority of Western Australia

HACKETT DRIVE,
NEDLANDS 6009

PHONE 386 8811

Mr. R.J. Sneeuwjagt,
R/L Operations,
Forests Department
Brain Street,
MANJIMUP W.A. 6258

Your ref: M21/3

NPA ref: 144/4 RA:SO

Dear Rick,

FIRE MANAGEMENT - PEMBERTON NATIONAL PARK

As per the meeting on Friday 18th July 1980 with yourself, Mr. George Peet and Mr. Gordon Styles attached is a completed and signed Inter-Agency Agreement plus relevent follow-up documents. Should any adjustments be required for the Master Burning Plan etc., please advise, as I may have missed some point during the course of our discussion.

Should this agreement be ratified the National Parks Authority undertake to -

In the case of hazard reduction:-

1. Pay Forests Department costs as calculated.
2. Upgrade firelines, water points etc where necessary.
3. Carry out tasks as stipulated on Inter-Agency Agreement on a lone or mutual basis.

In the case of wildfire within the Agreement area:-

1. Make first attack on fire.
2. Put maximum effort, with staff available into fire, if unsuccessful advise Forests Department, who will assist where possible.
3. Assist Forests Department, where possible during wildfires on their land as requested.

Hoping this covers everything as is required, and thanking you for your assistance and advice.

R. Anderson
Fire Management Officer

24th July 1980

4/8

JKS
FJB } any comments ?

Enc.

Agreement DEVELOPMENT CONTROL PARK FIRE PROTECTION PLAN

Area covered by Agreement Warren, Brockman, Pemberton, Beedelup and other N.P. areas within Pemberton Division.

Period of Agreement 1981/82 Financial Year

R.W.O. 107

Fire Control Task	Authority Responsible		Remarks
	Task	Cost	
1. Planning			
Master burning plan	NPA/FD	NPA	
Co-ord. of planning	NPA/FD	NPA	
Fire history plans	NPA/FD	NPA/FD	
Insurance cover	Self cover	all parties	
2. Burn Preparation			
Road work - new	NPA	NPA	
- min	NPA	NPA	
Dieback hygiene	NPA/FD	NPA	
Prescription & PAFSOU	NPA/FD	NPA	FD TO ASSIST.
Notifications - Radio	NPA	NPA	
- Other	NPA	NPA	
Extensions	NPA	NPA	
Buffer burning	N/A	N/A	
Edge burning	FD/NPA	NPA	
Water points	NPA	NPA	
3. Day of Burn			
Decision to burn	FD	FD	JOINT DECISION.
Ignition - Aircraft	FD	NPA	
- Markers	FD	NPA	
- Hand	FD	NPA	
Ground Control - SF	FD/NPA	NPA	COST SHARE TO BE ARRANGED MUTUALLY
- PP	FD/NPA	NPA	
- VCL	FD/NPA	NPA	
- Other	FD/NPA	NPA	
Communications	FD/NPA	FD/NPA	
Environmental stds.	NPA	NPA	USE FD 713 AS GUIDE.
Protection of property and facilities	NPA	NPA	
4. Mop-up and Patrol			
Edge patrol - SF	FD/NPA	NPA	COST SHARE TO BE ARRANGED MUTUALLY
- PP	FD/NPA	NPA	
- VCL	FD/NPA	NPA	
- Other	FD/NPA	NPA	
Mop-up - SF	FD/NPA	NPA	COST SHARE TO BE ARRANGED MUTUALLY
- PP	FD/NPA	NPA	
- VCL	FD/NPA	NPA	
- Other			
5. Declaration Burn Safe	NPA/FD	N/A	

Approved by: [signature] Date: 11.8.81

Comments: In case of wildfire within the agreement area, NPA to assume first attack role to maximum effort.
FD to provide back-up assistance if requested by NPA and depending on availability of FD fire fighting resources. [signature] 6/8/81

MASTER BURNING PLAN FOR PEMBERTON NATIONAL PARKS

PARK	CELL	YEAR OF BURN	ROTATION	REMARKS
WARREN	1	1980/81	7 years	REQUIRES NEW HAND CUT TRACK ON EAST SIDE DOWN RIVER SLOPES.
	2	1981/82	7 years	PROTECT P.P. AND YOUNG REGENERATION SOUTH OF ROGER ROAD. POSSIBLY INCORPORATE WITH F.D. ACB ON HAWKE BLOCK.
	3	1982/83	7 years	PROTECT YOUNG REGENERATION IN S.F. AND PRISTINE STRIP ALONG WARREN RIVER. NEW ROADWORK REQUIRED ON NORTH PERIMETER SOUTH OF LOCATION 2402.
	4	1983/84	7 years	PROTECT PRISTINE AREAS NORTH OF FISHING TRACK AND SOUTH OF MAIDEN BUSH.
	5	1985/86	6 years	INCORPORATE WITH F.D. HANDBURN AS DONE 1979/80.
BEEDALUP	1	1980/81	~~12~~ 7 years	TO BE INCORPORATED WITH F.D. ACB FOR CAREY BLOCK.
	2	1981/82	7 years	PROTECT REGENERATION TO SOUTH.
	3	1983/84	6 years	TO BE INCORPORATED WITH F.D. ACB FOR GIBLETT BLOCK.
	4	1984/85	7 years	FOR PROTECTION OF P.P. AND PRISTINE AREA.
	5	1987/88	~~10~~ 4 years	BUFFER STRIP BURN NORTH OF LOCATION 4360 TO PROTECT P.P. AND PRISTINE AREA- WILL REQUIRE TEMPORARY FIRELINE PRIOR TO EACH BURN.
PEMBERTON	1	1982/83	7 years	PROTECT P.P.
	2	1984/85	7 years	PROTECT P.P.
BROCKMAN	1	1982/83	7 years	TO BE BURNT IN CONJUNCTION WITH F.D. REGENERATION BURN TO SOUTH.
	2	1984/85	6 years	INCORPORATE WITH F.D. ACB OF BROCKMAN BLOCK.

The remainder of the very small blocks within this park to have mosaic burns by Ranger staff at suitable and selected times, taking into account:- protection of private property, overall park management and aesthetics.

Initial years and rotation years of burns are flexible in that they are to fit in with Forest Department programming, thereafter aligned to annual growth and safety but preferably no reduction in number of years between burns.

Appendix VI FIRE CONTROL - INTERAGENCY AGREEMENT

Title of Agreement: SOUTH COAST DISTRICT FIRE PROTECTION PLAN

Area Covered by the Agreement: Area bounded by South Coast between Donnelly River and Long Point Track south of roads Charley, Dunes, Yeagarup, Lewis, Richardson, Windy Harbour Chesapeake, Broke Inlet and S.W. Highway.

Period of Agreement: Until further notice

Fire Control Task	Authority Responsible		Remarks
	Task	Cost	
1. Planning			
Master burning plan	BB & FD	BB & FD	To be in accordance with plan.
Co-ord. of planning	BB	BB	
Fire history plans	BB & FD	BB & FD	
Insurance Cover	Self cover all parties involved		
2. Burn Preparation			
Road work			
New	BB	BB	Includes any SF
Maintenance	BB	BB	" " "
Dieback Hygiene	BB & FD	BB & FD	Check requirements
Prescription & PAFSOU	BB	BB	To be approved by vested authority
Notifications	BB	BB	FD for radio stations
Extensions	BB & FD	BB & FD	FD for SF and BB for VCL
Buffer burning	BB	BB	Alongside PP
Edge burning	FD	FD	
Water points	FD	FD	
3. Day of Burn			
Decision to burn	FD & BB	FD & BB	Consult with shire.
Aircraft	FD	FD	
Ground Control			
SF	FD	FD	Edge control and warning signs
PP	BB	BB	" " " " "
VCL	FD	FD	" " " " "
~~Other~~			
Communications	BB & FD	BB & FD	BB to coordinate as necessary.
Environmental stds.	BB & FD	BB & FD	Use FD 713 as guide(conservation etc.)
Protection of property and facilities	FD	FD	See PAFSOU
4. Mop-Up and Patrol			
Edge patrol			
SF	FD	FD	)
PP	BB	BB	)
VCL	FD	FD	) Arrange to mutual advantage.
Other	FD	FD	)
Mop-Up			
SF	FD	FD	)
PP	BB	BB	)
VCL	FD	FD	) ditto
Other	FD	FD	)
5. Declaration Burn Safe	BB & FD	BB & FD	

Approved by: [signature] Date: 30/7/79

[signature] 3/8/79.

Comments

N/L

FIRE CONTROL - INTERAGENCY AGREEMENT

Title of Agreement: DENBARKER DISTRICT FIRE PORTECTION PLAN NO. 1

Area Covered by the Agreement: Bounded by Northumberland Road, Hay River, Muir Highway and South Coast Highway.

Period of Agreement: Until further notice

Fire Control Task	Authority Responsible		Remarks
	Task	Cost	
1. Planning			
Master burning plan	BB & FD	BB & FD	Burns to be according to plan.
Co-ord. of planning	BB	BB	
Fire history plans	BB & FD	BB & FD	
Insurance Cover	Self all parties involved		
2. Burn Preparation			
Road work			
New	BB	BB	) To BB standards in VCL or FD
Maintenance	BB	BB	) standards in SF
Dieback Hygiene	BB & FD	BB & FD	Check requirements
Prescription & PAFSOU	BB	BB	To be approved by vested authority.
Notifications	BB	BB	To neighbours, radio warnings etc..
Extensions	BB	BB	(Of legal burning period) if required.
Buffer burning	BB	BB	As approved by vested authority.
Edge burning	BB & FD	BB & FD	To be agreed for each burn.
Water points	BB & FD	BB & FD	BB for VCL - FD for SF
3. Day of Burn			
Decision to burn	BB & FD	BB & FD	Consultation with shire
Aircraft	FD	FD	Includes marker crews, aircrews, materials
Ground Control SF PP VCL Other	BB & FD	BB & FD	Crews, equipment, warning signs for edge control to be co-ordinated through BB for mutual advantage.
Communications	BB & FD	BB & FD	BB to co-ordinate brigades and FD systems
Environmental stds.	BB & FD	BB & FD	Smoke pollution etc.
Protection of property and facilities	BB	BB	See PAFSOU
4. Mop-Up and Patrol			
Edge patrol			
SF	FD	FD	)
PP			) To be organised for mutual advantage.
VCL	BB	BB	)
Other			
Mop-Up			
SF	FD	FD	)
PP			) To be organized for mutual advantage.
VCL	BB	BB	)
Other			
5. Declaration Burn Safe	BB & FD	BB & FD	

Approved by: [signature] Date: 30/7/79.

Comments: [signature] Sgt. 3/8/79.

FIRE CONTROL - INTERAGENCY AGREEMENT

Title of Agreement: DENBARKER DISTRICT FIRE PROTECTION PLAN NO. 2

Area Covered by the Agreement: Area bounded by Frankland River, Muir Highway, Northumberland Road and South Coast Highway.

Period of Agreement: Until further notice.

Fire Control Task	Authority Responsible		Remarks
	Task	Cost	
1. Planning			
Master burning plan	BB & FD	BB & FD	All burning to be in accordance with plan.
Co-ord. of planning	BB & FD	BB & FD	
Fire history plans	BB & FD	BB & FD	
Insurance Cover	Self cover	all parties	involved.
2. Burn Preparation			
Road work			
New	FD	FD	Including VCL
Maintenance	FD	FD	" "
Dieback Hygiene	FD	FD	" "
Prescription & PAFSOU	FD & BB	FD & BB	To be approved by vested authority.
Notifications	FD	FD	Includes radio stations
Extensions	FD & BB	FD & BB	FD SF only
Buffer burning	BB	BB	VCL alongside PP only.
Edge burning	FD	FD	
Water points	FD	FD	
3. Day of Burn			
Decision to burn	FD	FD	
Aircraft	FD	FD	
Ground Control			
SF	FD	FD	
PP (adjacent to PP)	BB	BB	Brigades where possible.BB to coordinate
VCL	FD	FD	
Other	FD	FD	
Communications	BB & FD	BB & FD	BB coordinate where necessary.
Environmental stds.	FD	FD	Smoke pollution etc.
Protection of property and facilities	FD	FD	See PAFSOU
4. Mop-Up and Patrol			
Edge patrol			
SF	FD	FD	)
PP	BB	BB	)To be arranged to mutual advantage.
VCL	FD	FD	)
~~Other~~			
Mop-Up			
SF	FD	FD	)
PP	BB	BB	)To be arranged to mutual advantage
VCL	FD	FD	)
Other			
5. Declaration Burn Safe	FD & BFB	FD & BFB	

Approved by: D G Stiles Date: 30/7/79

Comments: Kim Kelly Sgt. 3/8/79

Appendix III

FORESTS DEPARTMENT,
54 BARRACK STREET,
PERTH, W.A., 6000.

14th May, 1973.

File: 453/72 PJMcN:KR

Circular No. 4/73

Officer in Charge
FORESTS DEPARTMENT
Manjimup

CONSERVATION IN MANAGEMENT PRACTICE

The following prescriptions set standards for environmental protection relating to the major activities of the department.

These standards will be implemented in all relevant operations and they must be thoroughly understood and frequently referred to by all officers in both the implementation and planning stages of all projects.

The environmental protection standards will be constantly reviewed as additional information becomes available, and in the meantime, all officers should bring to notice possible improvements as to both the scope and detail of the prescriptions which follow.

1. HARDWOOD OPERATIONS

1.1. Dieback Hygiene

All operations to be strictly in accordance with circular dated 20th February, 1969, which also covers most of the requirements for logging.

1.2. Prescribed Burning

1.2.1. Prescription

All areas requiring special treatment to be shown on Divisional Master Burning Plans and upon appropriate prescription plans.

1.2.2. Amenity

Strips fronting major tourist routes and surrounding tourist attractions not to be burnt during the main floral display of the wildflower season.

1.2.3. Specifications

Specifications set down in para. 73.2 of the Fire Control section of the revised Foresters' Manual will be applied on the basis of the map indicating Management categories accompanying General Working Plan No. 85, with the objective

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...uring maximum cost effectiveness of the ...cribed burn in relation to the prime manage- ... objective for the area concerned.

Smoke Dispersion

Prescribed burns, and particularly aerial burns in the vicinity of major towns, should not be carried out unless weather conditions are suitable for proper smoke dispersion. Appropriate warning signs must be set up without fail where smoke is likely to impair visibility for the traffic on roads through forest land.

1.2.5. Protection of Water Storage

Large scale aerial burning of the slopes adjacent to dams and reservoirs may result in undeceivable contamination of stored water by ash, particularly when water levels are low. Clearance for any such burns should be obtained from Chief of Division, Fire Control, before they are implemented.

1.3. Hardwood Logging

1.3.1. Dieback Hygiene

See 1.1. above. Special care should be taken to restricting logging operations on erosion prone areas adjacent to water storages to the dry season.

1.3.2. Logging Plans

To be prepared on a 5-year basis and revised annually taking into account balance of winter and summer cutting, road location, sources of gravel, etc., and areas requiring special treatment.

1.3.3. Snig Tracks and Landings

Drainage direct into water reservoirs to be avoided. Outlets to be barred to reduce erosion potential, and outflow diverted to the nearest natural watercourse.

1.3.4. Protection of Streams

1. Generally 20 metre strips to be reserved from felling other than stag removal on each bank of major rivers. 10 metre strips on each bank of permanent streams and such other strips as deemed necessary by the Officer in Charge for the protection of other watercourses.

2. Felling debris not to obstruct streams. No machines to work in stream beds other than as required for culvert installation or approaches. Temporary log fills to be removed from streams on completion of operations.

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Treemarking Specification

1.4.1. General Prescriptions

General prescriptions to be approved in advance by Inspectors. These prescriptions normally envisage clear felling with seed trees in karri, heavy treemarking in the A and B sizes classes with removal of occasional C class trees to enlarge gaps in jarrah.

1.4.2. Special Prescriptions

1. I.M.U.s

Special prescriptions to be drawn up for each working circle in conjunction with Senior Silviculturist.

2. Amenity

Amenity screens 100/200 metres in depth, depending on locality, and bordering roads or tourist attractions, to be created at the discretion of the D.F.O. These screens will be reserved from general cutting, although a light improvement cut accompanied by cull felling may be permitted in mature pole stands, and thinning by felling may be permitted in pole stands.

3. Areas covered by special prescriptions to be shown on the D.F.O.s wall map in each Division and on 5-year logging plans.

.5. Gravel

1.5.1. Location to be in accordance with dieback circular and to be screened from main public access except where required to provide turn-arounds, parking places or passing points.

1.5.2. Worked out pits to be left clean, tidy and self-draining. Banks not necessarily battered but smoothed to avoid irregular re-entrants and perched boulders likely to fall. Outflow to be diverted to nearest permanent watercourse. Topsoil preferably to be replaced. Pit bottoms ripped and planted with tree or shrub species where suitable. Alternatively pits may be developed as in 1.5.1.

ROADING - GENERAL (HARDWOOD AND PLANTATIONS)

2.1. Specifications

Roads and tracks to be installed to specifications set down in Foresters' Manual. Detailed specifications for

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C.A.R.G. projects to be agreed in advance with Divisional Engineer, Main Roads Department.

Clearing

The syster of clearing one summer ahead of forming to be adopted so that debris can be burnt on the cleared alignment rather than in unsightly and damaging heaps in adjacent forest.

2.3. Drainage

Proper provision to be made for surface drainage, either by channelling culvert outflow to the nearest natural watercourse, or by diverting it across filter strips of uncleared natural vegetation when adjacent to major watercourses, and water storages.

2.4. Construction and Maintenance

Dieback hygiene requirements to be strictly observed during construction and maintenance of all roads in the forest whether by Main Roads, Shires, the Industry or the Department.

ROAD VERGES - GENERAL (HARDWOOD AND PLANTATIONS

3.1. Control

Control of the verges of gazetted main roads is vested in the Commissioner for Main Roads, and control of verges of other roads including Important Secondary Roads (such as the Muir Highway) is vested in the Shires. These bodies are also authorised sign erecting bodies where approval is required for departures from current procedures in respect of erection of traffic warning and other signs along public roads.

3.2. Protection of Road Verges

3.2.1. No Clearing at Road Verges

In order to protect native flora, the Chairman of the Road Verges Committee has directed that there shall be no clearing or destruction by other means of vegetation on gazetted road surveys and adjacent to other important roads through land controlled by the Department.

3.2.2. Plantation Boundaries Adjacent to Public Roads

Clearing will not be permitted to encroach onto road surveys under any circumstances and in a number of cases, such as the Wanneroo Coastal plantations, an additional screen of uncleared native vegetation of about 200 metres in depth should be retained. The normal perimeter fire break will be established behind this screen where consideration will also be given to amenity planting of attractive broad leaved species.

3.2.3. Experimental Plots

Native vegetation on the road survey will not ...

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be disturbed when establishing experimental plots, which together with their perimeter fire breaks must be located entirely on forest land adjacent to gazetted roads.

PLANTATIONS

4.1. General

All proposals for conversion of native forest to pine plantation to be critically examined to avoid destruction of rare species or areas of particular scenic interest. All plantations to be designed with a view to their effect on the landscape with provision for amenity planting of other species where desirable to improve aesthetics.

These matters need to be considered in the initial planning stage at time of preparation of the Subdivision Plan. All special features and areas requiring special treatment to be shown by annotation on the Subdivision Plan. The extent of this treatment to be approved by the Superintendent Plantations, bearing in mind all cost factors.

4.2. Plantation Boundaries

4.2.1. Straight line boundaries across contours to be avoided where these boundaries are in general view. Boundaries of suitable soil types to be generalised to avoid tight salients, but to provide a general curvilinear effect by exclusion of minor pockets of suitable soil, and inclusion of minor pockets classed as unsuitable other than massive laterite at the discretion of the Superintendent.

4.2.2. Landscaping

Areas having steep slopes, shallow, rocky or marginal soils should be aggregated to provide uncleared enclaves to provide ideal habitat for fauna as well as in the interests of amenity. Straight line boundaries to be broken by planting clumps of ornamental species or commercial eucalypts. Other ornamental plantings to be established at strategic points to provide safe picnic spots. In uninterrupted areas of 600 acres or more consideration to be given to improving amenity by strategically located uncleared strips, or by establishing landscaped belts of commercial eucalypts.

Landscaping in coastal plantations is already met to some extent by the exclusion of unsuitable soil types. However, due attention must be given to the retention of uncleared belts, if necessary including some plantable soils adjacent to gazetted road surveys and elsewhere to provide attractively located belts for fire protection and amenity purposes.

4.2.3. Salient Features

Where possible the salient natural features to

be accentuated by properly designed subdivision incorporating access routes designed to give suitable views.

4.3. Reservoir and Watercourse Protection

4.3.1. Roads and Tracks

To be installed to specifications set down in Foresters' Manual. Proper provision to be made for surface drainage, culvert outflow to be diverted across filter strips of uncleared natural surface vegetation at least 20 metres wide before entering reservoirs or major watercourses.

4.3.2. Clearing

1. Windrows

To run along contours adjacent to streams. Stag removal from adjacent standing timber to be completed at the same time as general clearing.

2. Watercourses

Ground cover to be left undisturbed (see 2.3.4.) and watercourses not to be obstructed by clearing debris.

3. Reserved Areas

Marginal areas of shallow rocky soils and patches of unsuitable soil in hills plantations to be left uncleared except for stag removal.

4. Stream Protection

Filter strips at least 20 metres wide to be retained uncleared except for stag felling to protect the banks of major watercourses. Strips 10 metres wide to be retained as above to protect lesser watercourses. The precise strip width is a matter for local experimentation and will depend on ground cover and slope. But the principle of retaining sufficient width to allow deposition of silt and to avoid obstruction of streams with clearing debris must be rigorously enforced expecially adjacent to reservoirs and dams.

Ground vegetation to be left undisturbed and machines not to work in stream beds other than for culvert installation.

4.3.3. Prior approval must be obtained from local Engineer of M.W.D. or C.W.S. where any alterations to the shape, alignment or surface condition of major watercourses are deemed necessary to avoid the drainage of adjacent forest areas.

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4.4.1. General

The erosion control is of prime importance in hills plantations on gazetted catchments, but it is to be regarded as equally important from the viewpoint of sound land management on all other catchments.

4.4.2. Problem Areas

Difficult areas liable to landslip flooding or other natural disturbance must be detected at time of soil survey and recorded on soil survey and subdivision plans. Adequate treatment including reservation from clearing must be determined in advance and approved by the Superintendent before any clearing is carried out.

5. DRAINAGE AND RUNOFF CONTROL

5.1. Grade drains are to be established where necessary immediately after final clearing and before the first winter rains, according to specifications (see specs.)

5.2. Culvert outfalls to be directed over filter strips of adequate width adjacent to watercourses and under no circumstances to be allowed to enter reservoirs direct.

5.3. Cultivation

5.3.1. Cultivation in hills areas to be along the contour. Filter strips to be provided as in 4.3.2. Where slopes are so steep as to prevent contour ploughing, the area should not be cultivated, or if uncleared, consideration should be given to withholding it from development altogether. (see 4.2.2.) Particular attention to be given to breaking any furrows or depressions crossing the contour and diverting drainage along grade drains to uncleared ground.

5.4. Second Rotation Establishment

Erosion buffers adjacent to reservoirs and major watercourses to be established by heavy thinning to promote natural regeneration before the last of the final crop trees are removed. Where this is impracticable, hand planting to be used to restore vegetative cover with minimum disturbance of soil surface, fully recognising that loss of productivity is preferable to siltation of vital water storages.

6. ARBORICIDES

Use of arboricides must be strictly in accordance with circular letter dated 28th April, 1972.

7. FAUNA PROTECTION

The Department firmly believes that current management practices, including restrictions on the use of firearms, are fully compatible with the needs of fauna protection. Though incomplete,

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Departmental fauna studies are more comprehensive than those conducted by other organisations and they will be continued with a view to determining the need for any modifications to current practices. In the meantime, any apparent conflicts should be brought to notice for further investigation, and officers should co-operate fully with officers of the Department of Fisheries and Fauna, especially in connection with patrol activities.

W. H. Bachman

DEPUTY CONSERVATOR OF FORESTS

15th May, 1973.

DISTRIBUTION:

Officers in Charge of Divisions. + Districts

Inspectors Edwards, Hill and Williamson.

Superintendents Grace, Quain, Van Noort, Havel, Hewett and Campbell.

Chiefs of Division McNamara, Meachem, Campbell and Hopkins.

Appendix IV

ROUGH DRAFT

PERUP FAUNA PRIORITY MANAGEMENT AREA

FIRE PROTECTION PLAN - 1981 UPDATE

1. OBJECTIVES

Four objectives are defined to those standards shown below.

1.1 To enhance and conserve fauna habitat within the area through the application of a wide range of prescribed fire regimes.

Standard

Provide optimum conditions as recommended by Fauna Research Branch for 3 mammal species in particular (i.e. Woylie, Tammar, and Numbat), and at same time maintain suitable conditions to maintain viable populations of all other species known to be present.

1.2 To protect life and property within and surrounding the management area from wildfire damage, and conversely, to protect fauna areas from wildfire escaping from private properties.

Standard

All properties to be surrounded by a fuel reduced buffer of more than 400m depth carrying less than 8.5 tons/ha of litter fuels.

1.3 To restrict the potential spread of wildfire.

Standard

No fire shall be able to travel more than 5 km or cover more than 3,000 ha, before encountering a major buffer of more than 1 km width and carrying less than 8.5 tons/ha of litter fuels.

1.4 To provide rapid detection and rapid suppression attack on wildfire.

Standard

Detection of wildfires must be within 20 minutes of fire initiation. First attack to be within 1 hour of discovery time whenever possible.

2. PROTECTION MASTER PLAN (1981 edition)

2.1 General

Copies of the Master Burn Plan for Perup Management Area have been drawn on 1:63360 Perup plan and are available at Manjimup Divisional Office (2 copies), Regional Leader Operations (plan cupboard) and O.I.C. Research, Manjimup. A transparent overlay plan indicates the location of burn boundaries; the job number; season and year of burns planned in each block between 1981 and 2000; and the means of ignition (aerial or manual).

Approved by:

2.2 Update of Plan

The overlay plan is to be updated at the end of each autumn burning season to account for changes in the burning plan, incidence of wildfires, and possible changes in fauna values as determined by the Fauna Research Branch.

The update procedure will be the combined input of Fauna Research, Divisional Protection Officers and Regional Leader Operations. The plan is to be forwarded each year to the Protection Branch for final approval.

2.3 Protection Strategy

2.3.1 To ensure that the first objectives is met the following burn criteria must be followed:

2.3.1.1 Burn age differences between adjacent burn jobs must be at least 3 years (i.e. at least 3 summers).

2.3.1.2 Spring burns to be prescribed to consume litter and vegetation on the majority of upland sites, whilst leaving unburnt the majority of lowland sites containing heartleaf and melaleuca understorey. These burns to be lit under conditions of F.D.I. not exceeding 40 m/hr, with S.D.I. not exceeding 600. Scorch of overstorey must not exceed 10 percent of each burn area.

2.3.1.3 Autumn burns to be prescribed to consume the majority of lowland sites containing heartleaf or melaleuca understorey. Scorch of overstorey canopy is permitted, but should not exceed 40 percent of the burn area. Burn F.D.I.'s must not exceed 40 m/hr, whilst S.D.I.'s must exceed 1200.

2.3.1.4 Rotation period to vary from 6 to 12 years, although all areas adjacent to the surrounding farms to be restricted to rotation of 7 years or less.

Rotation period between successive autumn burns must exceed 12 years, except in designated experimental areas set aside for the Fauna Research Group.

2.3.1.5 Two unburnt control areas have been established and all reasonable effort must be made to exclude fire from them. Measures include maintenance of good perimeter access, and maintenance of buffer burns adjacent to these areas.

2.4 To meet the second objective the burn jobs adjacent to the private properties and bordering the Management Area are proposed to be burnt on rotations of 7 years or less, so the bulk of fuels will not exceed 8.5 tons/ha. These jobs are mostly large aerial burns which will provide a major barrier to wildfires. Fauna values within these blocks and must remain of high priority, so that the need for variations in season and burn conditions as listed under 2.3.1 still apply.

Properties located within the Management Area are surrounded by burning buffers of at least 400 m width, which must be regularly burned at 5 to 7 year intervals, to ensure that fuels do not exceed 8.5 tons/ha.

2.5 In order that the third objective be met, the location of burn boundaries and the fuel ages of adjoining areas must be such that the total area of adjoining heavy fuels (i.e. greater than 8.5 tons/ha) cannot exceed 3000 ha. This criteria, although not being met in 1981, should be reached by winter 1982 provided the 1981/82 burning proposals are completed.

2.6 In order to achieve the fourth objective, the Manjimup spotter detection circuit must be located to ensure full view of the entire management area. Spotter schedules must be related to Fire Danger Index as done for remainder of Division.

To ensure rapid first attack, all those major access roads shown on Data Plan 3 must be kept open and maintained in reasonable condition each year.

Despatch of the first attack unit must be implemented immediately following the fire alert.

Because of the long distance from Manjimup Headquarters, it will be necessary to arrange and expect fire suppression assistance from neighbouring Bushfire Brigades. To this end, close liaison with Brigade members must be ~~endangered~~ encouraged and maintained.

3. DATA MAPS

The following data maps provide basic information for the compilation of the Perup Protection Plan. They are all located at Manjimup Divisional Office.

Map 1 Perup 1:63360

Shows Tenure, Forest Blocks, Quarantine, Forest Type, Streams and Swamps, Water Points, Ramps.

Map 2 Fuel Age Plan

Perup 1:63360 plan showing year of last burn (or fire) end season within each burning job. Burn history to be maintained for fuels of upto 10 years old. Areas unburnt within burn jobs to be plotted after completion of job, and information to be retained for upto time of next burn. This plan to be updated annually at end of fire season by Manjimup Fire Officer.

Map 3 Access Roads and Travel Times

Perup Map (1:63360) shown in green, all those access roads which are being kept open and regularly maintained.
Travel times from Manjimup Division for light Vehicles, trucks and low loaders to strategic locations within the Management area are shown also.

This plan to be updated annually at end of fire season, by Manjimup Fire Officer.

Map 4 Fauna Population Plan - Plastic Overlay

Overlay showing main concentrations of Woylie populations. Other species of interest to be added whenever survey data is obtained by Fauna Research. Map to be updated by Fauna Research.

Appendix VII FIRE CONTROL WORKING PLAN FORMAT

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DIVISIONAL FIRE CONTROL WORKING PLAN

DRAFT 1 - Compiled 16.9.81

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PART A - OBJECTIVES

1. INTRODUCTION

Describe need and reason for the F.C.W.P. document, who should compile and update it and when. Where it is to be stored; who gets copies etc. Copy to be sent to R/L Operations and to Protection Branch, as well as neighbouring Divisions.

2. DESCRIPTION OF PROTECTION AREA

Divisional description of the area to be protected. Factors influencing the protection operation (eg. presence farms, or plantations, or mining areas etc.) Protection Zones (A,B,P, other) to be described. (eg. P Zone may include karri regeneration 6 to 15 years old; or various plantations etc.) Indicate where protection zones are to be shown. Refer to paras. 9,10, 11 and 12 of Fire Protection Section of Foresters Manual.

3. OBJECTIVES

3.1 GENERAL PROTECTION OBJECTIVES

State overall Divisional/Regional Objective eg. To minimize damage to Life, Property and Forest Values, caused by wildfire. Refer to Protection Manual, Para. 7.

3.2 SPECIFIC PROTECTION OBJECTIVES AND STANDARDS

The level of protection required varies throughout a Division, with change in values being protected. To facilitate planning, it is necessary to set specific objectives for the various values, and to set protection standards. Thus, the General Objective should be expanded as shown in following table.

Example: Specific Protection Objectives and Standards

OBJECTIVE	STANDARDS
1. To Protect Life & Property	No fire shall enter or threaten private property, towns or settlements within 3km of S.F. without being attacked by effective fire suppression forces within x minutes (or hours) of initia detection.

OBJECTIVE	STANDARDS
2. Restrict the Potential Spread of Wildfires. refer to Protection Zone Plan (1:50 scale plan could be included here.)	A Zone No fire shall spread more than xha (or x km) before encountering a fuel reduced barrier (< 85 t/ha in J, or <19 t/ha in K) B Zone Similar standards but allow more liberal fire losses P Zone More stringent standard (may also specify limits on first attack time - eg. ½ hour for Pine Plantation) Special Areas (eg. Perup Fauna MPA), Special MPA's, Rehabilitated Bauxite Pits, F.I.R.S. areas etc.

3.3 STRATEGIES

This section details the protection strategy needed to meet each of the specific protection objectives standards listed above.

3.3.1 Example To meet Objective 1 above, the protection strategy should cover the following aspects:

Prescribed burning of fuels adjacent to properties, settlement etc. to set standards of fuel quantity etc.

Provision of detection system which ensures rapid (time?) effective attack of wildfires threatening private property etc.

Assist and liaise with authorities responsible for fire control on neighbouring lands, on basis of mutual aid (eg. shires, brigades, B.F.B., other forest users).

3.3.2 Objective 2 Specify general strategies for fire protection in "A", "B", "P", (Also Special Areas such as Restricted Fire Attack Zones such heavy fuel areas similar to above.

PART B - PLANNING AND CONTROL

4. PLANNING

4.1 PROTECTION MASTER PLAN

4.1.1 The Protection Master Plan comprises of a Burning Master Plan showing the rotational burning jobs proposed for the entire Division over x years, for the protection of timber, flora, fauna or recreational values according to the strategies laid down in Section 3.3 of this document. Indicate who is responsible to prepare and update Master Plan; where it is located etc.

In the Southern and Central Regions, Regional Strategic Burning Buffer Plans have been prepared as part of the Overall Master Protection Plans for specific areas, such as the Woodchip Licence Area, Sunklands Project, Blackwood Pine.

4.1.2 Burning Plan for Current Year February (in time for Estimates)

This plan is to be taken each year from the Master Plan. It should be made out by 15th ~~May~~ each year, to show the complete Prescribed Burning proposals for the ensuing fire season.

The legend to be followed is laid out on P.71 of the Fire Protection section of Foresters Manual.

4.2 DATA MAPS

To facilitate in the preparation of the Master Plan, and the planning and execution of the various fire protection strategies, a number of data maps are required. The maps listed below are some of these. It is important to indicate where these maps are located and who is responsible for their preparation and update (and when).

(i) 80 scale or 1:50,000 maps showing Tenure, Forest Type, Roads, Topography features, MPA's, Quarantine etc.

(ii) Protection Priority Zones, B.F.B. Burning Zones, Weather Forecast Zones.

(iii) Fuel Age Plans, (Fire Hazard Plans)

(iv) Brigade Boundaries, Shire Boys

(v) Dieback Plans

(vi) Contour Maps (if any)

(vii) A.P.I.'s (1:25,000 or 40 scale)

(viii) Special Activity Maps - eg. Mining, FIRS, Cutting Areas, Regeneration Areas; Sunklands/Blackwood Valley protection maps.

(ix) Land Use Management Plan

(x) Plots (a Plot Register)

(xi) Spotter Flight Lines, Tower Location, Landing Strips.

(xii) Red Action Zones and Restricted Fire Attack Zones.

(xiii) Access Roads and Travel Times from Headquarters.

Some of the above data can be combined on the one map, or in the form of transparent overlays over the standard 1:50,000 Divisional maps.

4.3 DETECTION SYSTEM

Outline the Detection System to be implemented within Division. Include spotter circuits, and schedules; Tower usage and coverage; Ground patrols; other possible agencies. Indicate Officer (s) responsible for upkeep of each component, liaison and training of pilots, office staff etc. on all aspects including S.A.R. watch, Log Books etc.

4.4 COMMUNICATION SYSTEM

Outline communication network installed for Protection requirements. Include Repeater Stations, Portable repeaters; H.F., V.H.F., Mobile, R.T.'s, Shire/Brigade Radios; Other (eg. National Parks etc.)

Radio call signs to be listed under Inventory (Section 6.5)

4.5 TRAINING ~~AND SAFETY~~

Outline broad training needs (eg. Red Action Orders) for Officers, Office staff, crews, pilots, specialist sections etc. on protection aspects. State when this is to be done, by whom, how often etc.

4.6 LIAISON WITH OTHER PROTECTION ORGANISATIONS

Outline the type and frequency of contacts required with the Bush Fires organisation, local brigades, individual farmers, and Timber Industry and mining companies, to ensure good relations and mutual assistance in fire protection.

5. SUPPRESSION STANDING ORDERS

5.1 ACTION IN EVENT OF FIRE

This should closely follow the steps shown in the Controller's Fire Suppression Guide (F.D. 613 (77) page 1). The sequence shown below should be elaborated with relevant explanatory notes.

5.1.1 Plot Fire - Note Dieback Occurrence. Check values at risk and decide if suppression is required.

5.1.2 Initiate Despatch according to Red Action Order, or according to Despatcher Tables in Fire Behaviour Tables.

5.1.3 Complete Fire Appreciation (F.D. 613 (77). Confirm by field observation (PAFTACC). Decide on sequence of fire attack (head? flank? fail? Hand tools/Dozer?)

5.1.4 Initiate fire attack, and if necessary modify suppression strategy and despatch.

5.1.5 Notify Senior Officers (eg. Area O.I.C., R/L Ops.) and initiate recording system.

5.2 DESPATCH ACTION

In this section, standing orders for automatic despatch for the various protection priority zones should be detailed in sequence. Indicate officers responsible for Desparch orders and Red Action implementation, and where these orders are located for ready reference.

5.2.1 Red Action Orders

May need separate Red Action orders for Pine Plantation areas and for sensitive areas such as Karri Regrowth Stands.

5.2.1.1. R.A.'s within Division/Region

5.2.1.2. R.A.'s outside Division/Region

5.2.2. Despatch Orders for Hardwood Areas

Will need to spell out separate despatch orders for each Protection Priority Zone.

5.3 L.F.O. DESPATCH ORDERS

5.4 DUTY OFFICER RESPONSIBILITIES

Provide list of both "Day-to-Day" and "Fire Emergency" responsibilities of Duty Officers. An example of this list is attached.

Duties of 'On Call' Officer should also be spelled out.

5.5 FIRE SUPPRESSION PREPAREDNESS (Related to F.D.I.)

5.5.1 Deployment of Officers on week days and weekends.
Deployment of Gangs on weekdays and weekends.
Deployment of Equipment on week days and weekends.

5.5.2 Allocation of assistance to other Divisions (Staff, gangs, equipment)

5.5.3 Allocation of assistance to other Regions. (Staff, gangs, equipment)

5.5.4 Communications Schedules (Related to F.D.I.)

N.B. Divisional and Regional preparedness plans must specify the <u>minimum</u> staff and equipment to be retained within the Division/Region in relation to F.D.I. limits for safety of F.D. personnel and settlements.

5.6 FIRE DUTIES ROSTERS

5.6.1 Fire Staff Rosters
Divisional Roster
Regional Duty Officer Roster
Protection Branch Roster

5.6.2 Fire Gang Roster

5.6.3 Other Specialist Sections Roster
(eg. Regional Mechanics, Radio Branch, Navigators)

5.7 LARGE FIRE ORGANISATION

List with any relevant remarks the officers and employees and their reliefs, in order of priority, who will fulfil the Divisional L.F.O. functions set out in the L.F.O. Booklet on Staff Duties and Responsibilities. Where possible four officers should be nominated against L.F.O. positions at each level.

PART C - INVENTORY

6. INVENTORY OF MANPOWER AND EQUIPMENT

6.1 FORESTS DEPARTMENT

6.1.1 Officers - Name, Rank, normal duties, contact address.

6.1.2 Summary of gangs and equipment
- see P.68 of Protection Section of Manual.

6.1.3 Detailed Manpower Lists (See Manual P.69)

6.1.4 Detailed List - Vehicles and Chainsaws.

6.2 OUTSIDE SOURCES

6.2.1 Established Gangs (Defined Crews with training or experience and with nominated officer or foreman) eg. Bush Fire Brigades available within forest area; National Parks, gangs and Rangers.

6.2.2 Other Commitments (eg. Shire gangs, mill crews, B.F. Brigades in areas bordering forests).

6.3 SUPPLEMENTARY FIRE FIGHTING RESOURCES

Other sources of manpower and equipment which may be called upon. List names, phone number or other means of contact.

Includes Contractors for Bulldozers, Haulage, Low Loaders, and Tankers - Include contacts, hire rates, availability.

Tractors and Trucks
Fallers and power saws
Unorganised Manpower not already mentioned.
(eg. P.W.D., S.E.C., M.R.D., Sawmills) Include suitable vehicles and equipment)
Oil Company Depots; Water supplies(Ferry Tankers)

6.4 AUXILIARY SERVICES

List names and telephone numbers.
Local Authority - Secretary, Chief F.C.O., R.T.A., Police, Telecom, Army, Medical (Doctor, Hospital, Red Cross), Food Supply and Accommodation.

6.5 COMMUNICATION FACILITIES

6.5.1 Telephones - Divisional, Regional, Departmental, Other.

6.5.2 Radio Call Signs for Divisions, Regional, Departmental.

7. WORKING SHEETS AND CHECKLIST

List and indicate location of all relevant working sheets on checklists required for various aspects of fire control planning and implementation.

Examples:
- Controller's Fire Suppression Guide - F.D. 613 (77)
- Fire Appreciation Form F.D. 613 (77)
- L.F.O. Situation Report
- L.F.O. Checklist (in progress)
- Red Action Checklist (a la Central Region)
- Duty Officer's Checklist
- Fire Report Form
- Pilot Daily Worksheet

App. X Recommended Cutting Priorities for Strategic Buffer Development.

Logging lanes required to be cut as part of Protection Plan (FRE) for Chipwood licence — plan assumes chipwood removal + lanes as well as K, J sawlog removal.

YEAR → / ↓ SMP.	1982 K	1982 J	1983 K	1983 J	1984 K	1984 J	1985 K	1985 J	1986 K	1986 J	1987 K	1987 J	1988 K	1988 J
1193 (Millars)	Po 11 Po 6(N) Po 10 Su 13 Po 2/3	Po 12 Po 6(N) Po 2/3	Wc 1 Su 3 Po 15 Su 1 Cw 1 (E)	Wc 1 Su 3 Po 3 (S) Su 1 Cw 1 (E)	Cw 1 Su 7 Na 7 Mu 7	Cw 1 No 7 Su 10	Su 14 Su 4 Po 6	Su 14 Su 4 Po 6 (S)	Po 4 Mu 8 Su 19	Mu 8 Su 19	Na 3/4 Na 2 Po 11	Su 5 Po 11	Mu 7	Su 8 Po 4
1333 Pemb.	Do 7 Do 18 Br 11	Br 4	Cw 1 Cw 14 Do 13	Cw 1 Cw 14 Do 13	Br 8/13 Br 2 Br 5/3	Br 8/13 Br 2 Br 5/3	Do 11 Br 9 Cw 5 Cw 15 Br 13	Do 11 Br 9	Br 12 Do 21 Br 3 Collins (Cell IA)	Br 2 Do 21 Br 3	Do 22 Cw 12 Do 5 Na 4 Br 5	Do 22 Cw 12 Do 5 Na 4 Br 5	Do 18 & Collins (IA)	Br 8 Collins (IA) Cw 5 Cw 15
1332 Wildtype	Bo 2 Ga 2 Bab 1	Bo 2 Ga 2 1	Ga 3 Ga 4	Ga 3	Bab 4 Bo 10 Ga 2 (S) Ga 8	Ga 2 (S)	Bab 1/2 Muir (Cell F)	Ba 1/2	Bo 13	Bo 13 Ga 9	1	Ga 4 Muir (Cell F)		Ba 11 Ga E
1329 Shannon	We 2/14 We 4 We 1 We 10	We 2/4 We 4 We 1 We 10	We 7 OS 4 SL 3	OS 4 Sh 3	WC 1 (S) Wc 2	Wc 11 (S)	OS 3 Sh 2 (W) Ive 9 Ma 9	OS 3 Ma 9	Ma 10 (E) Sh 2 (E) We 13 Sh 4	Sh 4	Ma 11	Sh 1 Sh 3 Ma 11	Mu 5	We 7 We 2 Mu 4 We 14
Walpole	Da 1 2/3 ← Select from Cells B, C and Franklin 3, 4, 5, 6, 7 including Da 1, 2, 3, 4 → ← Choose cells A, D, F including Ordinance 1, 2; Keystone 1, Kingston 2, 3, 4	Da 1 2/3												
Whitlake			Th 3/4 do for Burning Walpole	Th 3/4	Na 11 Mo 2		Ne 14		Ma 11	Mo 2	Na 10	Na 10		Na 11
Wardley	Da 1		Da 1 do for Burning Walpole											
Deanmill	Cy 2 Bv 11 Ca 4/5 Lindsay (Cell N)	Le 4 If 3 Ca 4/5	If 7 Gy 3 Mu 1 Wh 4 Go 1 Ca 6	Ya 2 (S) Ya 1 (N) Gy 2 Knolls	Not 3 Go 2 Ne 8 Lindsay Cell N	Ya 3 Li 4	Gr 6 Ca 9	Go 1 Ya 2 (S) Ber 2	Bv 4 Lindsay (Cell N)	If 6 (2 Cells) Gy 1 Be 2/3 Ca 2	Mundy (Cell N)	If 7 Go 2 Be 13 Ca 3/4	Gr 5 Lindsay (Cell N)	Gr 5 Ca 6/9
Gandy's		Eg 6 Eg 1		Eg 6 Eg 1			Eg 2 Eg 1	Eg 2 Eg 7		Eg 3		Eg 4 Eg 3		Ca 11 (Cell 1)

...ologic Buffer Development.

...f Protection Plan (1986) for Chapman Quarry Area, ...maps as well as K, J county summaries.

	1986		1987		1988		1989	
	K	J	K	J	K	J	K	J
4	Ro 4	Mu 8	Na 3/4	Su 5	Mu 7	Su 8	No 10	Ro 4
	Mu 8	Su 19	Na 2	Po 11		Mon 9		No 2
(5)	Su 19							Bu 10
1	Br 12	Br 2	Do 20	Do 22	Br 8	Co [illegible]	Ja 6	Ro 6
	Do 21	Do 21	Cu 12	Cu 12	Collins	Collins		Cu 11
	Br 3	Br 3	Do 5	Do 5	(1A)	(1A)		Br 13
	Collins		Wa 4	Wa 4		Cu 5		Br 14
	(Cell IA)		Ja 5	Br 5		Cu 15		
2	Bo 13	Po 13		Ga 4		Ra 11		
		Ga 9	1	Muir		Ga 8		
				(Cell F)				
3	Ma 10(E)	Sh 4		Sh 1	Mu 5	We 7		Sh 5
	Sh 2(E)		Ma 11	Sh 3		We 2		We 1
	We 13			Ma 11		Mo 4	Ma 10(W)	Ma [illegible]
1	Sh 4					We 14		We 3
	← Change in cells A, D, F including Ordemans 1, 2; Keystone 1, Bennett (cell D), Keystone 2, 3, 4 →							
	Ma 11	Mo 2	Na 10	Wa 10		Wa 11		
	Br 4	If 6	Lundy	If 7	Gr 5	Gr 5		Gr 3
1/2	Lundy	(2 cells)	(cell N)	Go 2	Lundy			No 4
2	(cell N)	Gr 1		Br 13	(complete)	Ca 8/9		
		Br 2/8		Ca 3/4				
		Ca 6						
		Pg 3		Pg 4		Cl [illegible]		Cl [illegible]
1				Pg 3		(cell D)		[illegible]

App 5I

FIRE CONTROL - STRATEGIC ACCESS.

For the protection of regrowth hardwood forest in the Chipwood license area.

Three types of access will be used to achieve this objective:

(1) General Requirements For Access.

1.1 Main Access Roads:

1.1.1 This type of access will be designed to surround cells of up to 2,000 ha.

The cells may contain regenerated coupes of various ages, proposed coupes, reserves and other areas of uncut forest.

1.1.2 These roads will normally form part of the permanent and semi-permanent boundaries for hazard reduction burns of areas adjoining the cells.

1.1.3 The use of well established roads should form the basis of this network.

1.1.4 The standard of road must allow use by dozer transporter during the burning and fire season.

1.1.5 Maintenance to be planned and carried out on a regular basis to ensure access at all times.

1.1.6 Roads to be named and correctly signposted.

1.2 Secondary Access Roads:

1.2.1 Used generally to divide cells into areas up to 500 ha and for access into or around isolated coupes of regeneration.

1.2.2 Where suitable these roads may form part of permanent or semi-permanent burn boundaries.

1.2.3 Use established roads or tracks wherever suitable.

..../2

1.2.4 Maintenance of these roads should aim to provide access for fire fighting vehicles dependant on risk/ hazard for the particular area. Work proposals (ie. regen. burn) may dictate maintenance requirements for an area.

1.2.5 Roads to be named and signposted accordingly.

1.3 Minor Access Tracks:

1.3.1 Used only in special circumstances such as fire fighting or access for a particular works program.

1.3.2 Tracks to be selected to further divide cells into areas of up to 250 ha.

1.3.3 Use existing tracks where possible ie. log roads, coupe boundaries etc. Ensure only thru access is shown. All other roads and tracks to be blocked at entry.

1.3.4 No maintenance, other than to ensure tracks are open, after operations are completed. Some particular works program may dictate a maintenance requirement.

1.3.5 Road names are not essential. Signposting with 300mm x 100mm Red arrows to indicate point of entry is required.

(2) Road Work Proposals.

2.1 Selection:

2.1.1 Liaise with industry to ensure selection of log roads will provide benefit to future protection needs for the area.

2.1.2 If roads are to be constructed thru areas programmed for cutting in the future, selection should follow, where practical, proposed coupe boundaries.

..../3

2.1.3 Where coupes are not involved, maximize Jarrah types for ease of burning and roading.

2.2 Advance Mop-Up:

2.2.1 To be carried out where possible during new work or upgrading programs on roads proposed as permanent burn boundaries.

2.2.2 Where possible road clearing debris to be pushed into cells and heaped in openings if necessary.

2.2.3 Where roads are planned prior to logging, ensure any stag felling is carried out during logging ops to allow salvage of logs.

2.3 Maintenance:

2.3.1 On main access roads consider future maintenance of verges by mechanical slashing.

2.3.2 Ensure damage to roads by logging and other operations is repaired by those causing the damage.

(3) Plans and Records.

3.1 Map Requirements:

3.1.1 Division to maintain set of 1 to 25,000 scale maps covering areas involved with regeneration proposals.

3.1.2 Standard legend to be used as per App. I attached.

3.1.3 Each map to have a good quality transparent overlay for use as working copy on roading proposals etc. Only completed work to be shown on actual maps.

3.1.4 Maps to be designed for suitable storage and ensure overlay does not become detached.

..../4

3.1.5 Maps to be updated on regular basis (at least annually.

3.2 Cost Records:

3.2.1 Maintain unit costs for both new work and upgrading or roads.

3.2.2 Maintain costs of maintenance.

3.3 Regeneration:

3.3.1 Show on base map:

Established regeneration as per legend.
(Pale Green wash)

Show on Overlay:

Current and proposed cutting coupes.
(Orange border and diagonal hatch)

3.4 Private Property:

Show private property - use pale yellow wash.

H.G. STYLES
S.F.F.C.

27th April, 1982.

STRATEGIC ACCESS LEGEND

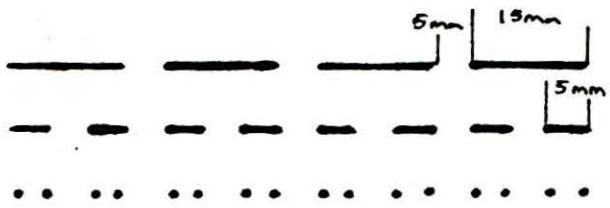
PART I

ESTABLISHED ACCESS - Show on base map only.
(Use Artline 70 Black)

MAIN ACCESS

SECONDARY ACCESS

MINOR ACCESS



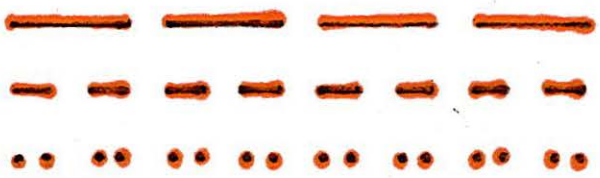
PART II

PROPOSED NEW & UPGRADING ACCESS - Show on overlay only.
(Use Artline 70 Orange)

MAIN ACCESS

SECONDARY ACCESS

MINOR ACCESS



PART III

REGENERATION:

ESTABLISHED REGEN. - (on base map)

(Pale green)

CURRENT & PROPOSED COUPES
(on overlay)

(Artline 70)
(Orange)

PART IV

PRIVATE PROPERTY
(On base map)

(Pale yellow)