FIRE CONTROL.

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Two schools of thought may be recognised among Australian foresters of the present day. There are those who believe that the problem of fire control can be solved by clearing up the forest floor and then setting a running fire as frequently as possible. There may be parts of Australia where this is sound forestry, but it strikes one as a questionable method of evading a difficult problem. It makes no provision for regeneration. It discounts the value of humus and soil bacteria against all established principles of forestry. It ignores the unseen damage done to the finer portions of the root system by any surface fire. If it is impossible to control fires, then the existing crop may be protected very often from serious damage by frequent ground fires, but to accept this practice in Jarrah and Karri forests of Western Australia would be tantamount to acknowledging that forestry is impossible.

Absolute control of all fires in and around the forests is the first and biggest step towards the establishment of forestry in the prime timber region of Western Australia. It can be done with a comparatively small expenditure of funds, but the success of the fire control measures depends on the whole-hearted conviction of the staff that they are engaged on a work of vital importance. Each man must believe that the success of the whole organisation depends on his individual efforts and efficiency, and he must be prepared to do his job day or night.

Fire prevention is cheaper and more effective than *fire suppression*. The causes of fire in the Jarrah bush of Western Australia may be classified as follows:—

1. *Locomotives*:
   (a.) Government railways.
   (b.) Timber lines.

The efficient spark arrester for locomotives has not yet been introduced into Western Australia. It still remains for legislation to force all locomotives running through the forest to be equipped with spark arresters for five months of the year, or the company working them will have to establish and maintain a wide break on either side of the line.

In the wheat-producing areas of Western Australia railway companies are required by law not only to burn a fire break sixty-six feet wide on each side of the railway line, but also to equip every engine with an approved form of spark arrester during the fire season. This principle needs to be extended to railway lines in the timber country, so that the same protection may be afforded to the great national asset which is being built up by the Forests Department as is given to private property.

This season's experience has shown that locomotive engines are the most serious cause of fires to be contended with, and the fact that thousands of locomotives are working all the summer with spark arresters attached in other parts of the world indicates that there is no reason why legislation should not compel their use, where necessary, in Australia. Experiments are being conducted with local and imported spark arresters.

2. *Persons working in or travelling through the bush*:

(a.) Timber workers and wood cutters.
(b.) Persons owning stock running in the bush.
(c.) Persons travelling along roads and tracks.
(d.) Kangaroo hunters.
(e.) School children.
(f.) Campers and picnickers.

The foundation of successful fire protection is the education of the bush worker and the bush dweller. I regard this popular education of the people who live in and around the forest as sufficiently important to warrant the creation of a special branch of the Forests Department to deal with it.

Ignorance and apathy have to be overcome chiefly by personal appeal. The most successful method of appeal to the dweller in the bush is a simple talk illustrated by lantern slides. Advertising by poster and through the Press on ordinary commercial lines will form part of the campaign.

It is important that all extraction of forest produce and grazing be controlled under permit. These permits on areas over which fire control is being organised contain a clause rendering the permit liable to cancellation without compensation in the event of a fire occurring on the permit area, unless the permit holder can show that the fire was started by causes beyond his control.

3. *"Burning off" on private property and allowing the fire to escape on to Crown land*:

The present "Bush Fires Act" of Western Australia prohibits the burning of any scrub or bush during certain months fixed by *Gazette* notice for various subdivisions of the State. This system is unsatisfactory, as the only practical method of clearing certain timbered country is by burning the logs and stumps during the dry months. Within declared Forest Working Circles no burning of scrub or forest land should be allowed, except under permit from the Forests Department.

The forester with a proper knowledge of his bush will be able to reduce fire hazards in the spring each year. For example, during the past year the Department was not in a position to carry out regeneration operations on certain bush which had been heavily cut during the previous two years. The dead tops, if left until the fire season, would have been a serious menace, but during the first two weeks in October one man with a fire stick was able to light all these tops so that all the inflammable material was burnt up before the surrounding vegetation was sufficiently dry for the fire to spread.

Natural phenomena are not responsible for one per cent. of the fires occurring in Western Australia, so that efficient fire prevention measures will reduce the fires occurring to a very small number each year. The "bogey" of the fierce fires that will destroy the countryside when a forest has been protected for a number of years is greatly overrated. Happily in Western Australia we have little to fear from lighted bark being carried by the wind. A few fire-protected areas of Jarrah bush which are known show that, after three or four years, the undergrowth ceases to grow higher or denser and rather tends to diminish as the canopy becomes thicker and regrowth springs up in the open spaces. In the best regulated forest, fires will occasionally break out, and the efficiency of the fire control organisation must never be allowed to slacken.

FIRE SUPPRESSION.

It is intended to divide the Jarrah forest up into Districts containing 500,000 acres of prime Jarrah forest. Each District will be subdivided into ten blocks of 50,000 acres, controlled by a resident forester. The following is a brief account of a fire control scheme which has been inaugurated over the greater part of three blocks comprising some 140,000 acres in the Jarrah forest of the Mundaring District.

In order to test the efficiency of the principles involved, this scheme had to be inaugurated on a large scale, and it was expected that various modifications and amendments would be necessary from time to time. The success of the scheme has been such that no major alterations are contemplated.

Preliminary propaganda work was carried out and the scheme was drawn up on the safe assumption that the quicker a fire is reached the easier is the suppression.

The first work put in hand was the subdivision of the area into compartments of approximately 500 acres. Although a very great help in unmapped country, there are many forests in which this preliminary expense might be saved. In a forest being systematically worked, the division will be necessary for the purpose of general orientation apart from fire control. The cost of the subdivision by plane-table carried out by men with no previous training was found to be 1.75 pence per acre approximately. The lithograph which forms Appendix 1 to this paper was the result of this survey. A large amount of more detailed sub-compartment work than is shown on this lithograph was actually carried out.

Other works carried out prior to the fire season were:—

1. Erection of two fire lookouts.
2. Erection of two temporary forest stations to form the headquarters of Blocks.
3. Arranging of temporary District Head-quarters.
4. Erection of 25 miles of telephone line linking lookouts, forest stations, and District Head-quarters.
5. Training of foresters and forest workmen in Morse code and heliograph work.

Fire Lookouts commanding a big expanse of country make a cheap and efficient fire control possible. In the Jarrah forests an occasional hill is found several hundred feet higher than the average hill in the vicinity. On two prominent hills of this nature, some 14 miles apart, lookout platforms ten by ten feet square and thirty feet above the ground have been erected. These structures are constructed chiefly of round timber cut in the vicinity. They have a galvanised iron roof, and provision is made for an opening in one corner to permit of heliograph signalling being carried on at any hour of the day. Near each tower a hut for the accommodation of the lookout man has been built, and this is fitted with bush furniture and camp utensils, so that all the lookout man needs to carry with him are blankets and food necessary for the period of his vigil.

The lookout towers are fitted with—

1. An obsolete theodolite for reading horizontal angles. A cheap instrument carrying a telescope could be constructed for the purpose.
2. A table carrying a compartment plan of the district.
3. A heliograph fitted on a permanent stand.
4. A telephone instrument.

The cost of erecting and equipping a complete lookout station, including hut and tower, was found to be £270.

The cost of construction of the telephone line, using No. 8 gauge galvanised iron wire and porcelain "goose neck" insulators, with twenty-foot poles four chains apart, was found to be £28 per mile.

Method of Suppression.—When fire risks commenced, the following organisation was prepared and has been working with a large measure of success during the season.

Foresters were appointed to the two Blocks on which Forest Stations had been fixed. At each Forest Station a camp of forest workmen, who were required to find themselves with horses, was established. One lookout station was placed under the control of each forester.

During the fire season, which in the Jarrah bush extends over about five months, a fire lookout man is kept constantly on the lookout every day of the week.

During the first fire season one patrol must traverse different beats on each Block every day.

A properly organised Block, which includes a fire lookout station, needs at least three men besides the forester. In rotation the three men perform for seven-day periods the duties of—

1. Lookout man.
2. Patrol.
3. Spare man.

Lookout man.—The lookout man ascends his tower at 8.30 a.m. and remains there until 5 p.m. He makes a final inspection and report for the night to District Office by telephone at 6.30 p.m.

A log book is kept showing all signals and messages sent and received. If no fires are sighted, "all clear" signals are exchanged with the other lookout every half-hour.

In the event of suspicious smoke being sighted, the bearing is taken and communicated to the other lookout. The other lookout takes a bearing and these two bearings are ruled on a plan, thus locating the fire with fair precision. The location of the fire is checked and information is then sent to District Office. The lookout stations, however, are still responsible for communicating the location of the fire to patrols or others in the bush by heliograph as rapidly as possible.

A lookout man must never leave his post until the end of seven days, when the relief arrives with his pack-horse.

Our experience has tended to show that in the Jarrah bush lookouts are necessary on prominent hills from 15 to 20 miles apart. They spot fires on hills and sides of hills when fires are less than half an acre in extent, but a fire in the bottom of a valley may spread to two or three acres before the volume of smoke rising is sufficiently dense to be seen by a distant lookout. Lack of precision to the extent of a mile or more may be occasioned by smoke floating up a gully before rising and becoming visible. A stationary railway engine is easily located when eight to ten miles distant.

If full benefit is to be derived from an efficient lookout service, a means of rapid communication with a mobile fire fighting force in the bush must be constantly maintained.

One *Patrol man* to every 50,000 acres is necessary during the first fire season. The patrol man, at the beginning of the fire season, delivers notices concerning the provisions of the Bush Fires Act to farmers and orchardists in and around the forests. His presence is a constant warning and reminder to bush workers. The beats on which he works are

regulated by the fire hazards to be guarded against. He patrols according to a given programme, and the times at which he is due to call at certain fixed heliograph stations are known to the lookout man. Heliograph stations are clearings marked on the plan from which some specified lookout station is visible. In undulating or mountainous country the heliograph is an instrument which will prove of great service in fire protection work. The British Army type has been found most satisfactory, being easily portable and simple to work. To expedite the sending of messages a special code has been drawn up (a copy is attached as Appendix 2 to this paper). After the first few months, even in the first fire season, it has been found the patrol work can largely be reduced and the forest workmen kept employed on productive work. The problem of keeping men employed in the forest in constant touch with lookout stations is one of the main difficulties of fire control work.

Fire breaks of any description are expensive to clear and to maintain. The extent and position of a fire break system depends entirely on local fire hazards and the inflammability of the forest.

In the Jarrah forest certain boundary breaks, fire breaks along main roads, and an internal system to provide lines from which to burn back in cases of extreme emergency, will be required. As the management becomes more intensive a cleared break system will be gradually developed, but fire control in the Jarrah bush can be successfully inaugurated without fire breaks. The first fire breaks will be prepared by clearing tracks some six feet wide down either side of a strip a chain or more wide, and burning the intermediate ground cover early in the fire season by means of a controlled fire.

In very many cases where there is a natural break on one side of the strip to be burnt, the clearing of a narrow track even may be found unnecessary if the burning is done at the right time with sufficient men present.

Fire fighting is a local problem which must be studied for each type of forest. It is found that on a hot afternoon it is often impossible to approach the head fire of even a small conflagration in the Jarrah bush, but the tail fire can be suppressed and the side fires prevented from spreading and even narrowed down. In the early part of the night, however, the wind always dies down for an interval, and then the head fire of a fire extending over many acres can easily be suppressed by one man. The Jarrah bush is largely waterless during the summer months and, consequently, direct beating is the only available means of suppressing a fire.

ADMINISTRATION.

Administration has been systematised by introducing a number of printed forms which cover all the reports and correspondence which are required of a forest workman. The forms are printed on sheets which fit a standard size loose leaf note book. A note book, mounted plan, pocket compass, water bottle, wallets, saddle and bridle, are issued at the beginning of each fire season to each man.

The fire control work proceeds seven days a week, and the duty roster is so arranged that each man is employed as spare man every third or fourth week. This enables him to be given three or four days' leave, which he has accumulated by working as patrol or lookout on Saturday afternoons and Sundays.

Matters of finance and the keeping of summarised records are attended to in the District Office.

FUTURE FIRE CONTROL.

A few months' experience has been sufficient to show that cheap and efficient fire control is possible in the Jarrah forests.

Local propaganda will lay the foundation to successful fire control.

Efficient legislation regarding locomotives and the burning off of adjoining private property by agriculturists and graziers will soon be recognised as necessary provisions for the protection of a public asset.

Constantly manned fire lookouts will be the chief protective measure, and every gang working in the bush, whether engaged on sylvicultural or exploitation operations, and whether paid by the State or by private individuals, will be a potential fire fighting force. The sympathy of settlers in and around the forest who profit by the immunity from bush fires is readily obtained, and these men are able to give valuable help in times of emergency.

The problem of keeping lookouts in touch with each other and with fire fighting forces will be solved by three means:—

1. Heliographs.
2. Telephones (permanent and portable).
3. Small wireless sets.

Heliographs and wireless telegraphy have the advantage of requiring an observer to be watching or "listening in" constantly. This disability will be overcome by employing boys, chiefly forest apprentices, during the summer months as observers attending to instruments in the neighbourhood of large gangs of men.

When it can be said that fire control has been established throughout the prime timber country of Western Australia, then will Nature begin to renew the vast store of wealth which the forests have proved to Western Australia. Until this is brought about, all efforts at forestry must be puny and spasmodic.

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