FIRE RESEARCH IN WESTERN AUSTRALIA

by

G.B. Peet.

The past decade has introduced a number of changes in fire control techniques for West Australian forests. Two of the most obvious were aerial burning and burning under pines. Some impetus for these changes came from an expanding fire research programme after the 1961 fires, and a change in the attitude of foresters towards large-scale controlled burning.

By Australian standards, the W.A. fire research group is a big one, also an increasing volume of work on fire ecology and operations is coming forth from other research and administrative personnel. This represents a considerable effort on fire research. What is it likely to produce, and will it be enough for future demands?

The first priority for the fire research group still remains problems in operations. Most of these problems stem from an inability to forecast fire behaviour. There is a decade of experience to show that these forecasts must be based on measurements; personal judgment is too often unreliable and inaccurate.

The fire research programme falls into two broad categories: relatively short-term fire behaviour studies which take 60 to 70 per cent of time, and longer term studies of fire effects on the forest.

Problems in operations still abound despite the progress which followed aerial burning. The quality of controlled burning in Karri forests is quite unreliable because there's no fire behaviour tables for this complex fuel. The quality of burning under pines is generally good, but the costs and production rates vary considerably from place to place. The techniques need considerable upgrading if the future protection demands of an expanding plantation area are to be met. Is there any chance at all the buffer system will continue to work? It seems to inherit all the problems of the old 5-chain breaks. The quality of some Jarrah burning is suspect, indicating that weaknesses still exist in planning. Problems in aerial burning technique, evident in 1967, have yet to be worked on properly.

There's no doubt at all one of the main problems for future operations will be upgrading the quality of controlled burning. The issues of conservation and studies on fire ecology will demand it. After all, what hope is there of implementing a valid plan for management of forest fauna and flora, until a real control over fire is achieved? In this harsh fire enviornment this means fires occur by prescription and not by chance, since exclusion is impractical and not necessarily desirable anyway.

The longer term studies of fire effects on the forest will help in drawing up fire management plans. The fire group's contribution in fire ecology relates to studies of girth growth and bole damage, and structural changes in scrub understorey.

SHORT-TERM PROJECTS

The forecasting of research results and how they can be woven into operations has definite pitfalls. However, there is some merit in setting objectives in the hope of filling them.

No new fire behaviour tables have been produced since 1965, except some modifications to the Jarrah tables to provide temporary information on pines and Karri. There are a number of reasons for this, apart from the section's early involvement with aerial burning.

Firstly, fire behaviour tables are fairly useless unless they form part of a fire management plan. The compiling of aids for these plans, e.g. controlled burning, required a number of offshoot studies such as litter accumulation, hours of burning time etc., most of which were summarized in Forest Fire Danger Tables. These requirements became evident over several years as the Jarrah tables were put into practice.

For Karri and pines it was immediately obvious that a lot of work was necessary on fuel classification before any sort of fire management plan could be envisaged.

At present a system for classifying litter and tops fuel has been developed for Maritime pine plantations, (McCormick, 1970), and should be fairly easily adapted for Monterey pine.

Substantial progress has been made with classifying the complex scrub and litter fuels in Karri forest (Sneeuwjagt, 1970).

In both forests it seems much more detailed fuel-type mapping will be necessary to ensure fires occur by prescription and not by chance. The broad descriptions used in present prescriptions are not adequate, particularly for Karri.

One of the major problems in compiling any fire behaviour table is defining rates of drying and day to day fluctuations in the moisture content of litter. Problems with rainfall correction factors in the Jarrah tables are well known. The reasons are quite simple, litter beds are never even in depth, disposition, composition, or exposure. This introduces a considerable variation into any average drying rate used for prediction purposes.

For Karri forest, and to a much lesser extent pines, the variations are so large during the controlled burning season, that average values are fairly meaningless unless adequate adjustments are provided.

Measurements have been made of "edge drying" effects in pine compartments and adjustments made for within compartment rates.

Four different sites were measured in Karri types last summer differing in topography and scrub cover (van Didden, 1970). A formula for predicting moisture changes in one of these types has been worked on, and seems more reliable than the analyses used for the Jarrah table.

Sufficient fires have been measured in unthinned Maritime pine for rate of spread tables to be drawn up. Worked started last year on unthinned stands. It has been necessary to confine this data to controlled burning conditions.

An excellent range of fire information was collected in Karri last summer, ranging from very mild creeping fires to extremely intense ones which consumed the whole mass of dense 12 feet-high scrub. Unfortunately the data was confined to one fuel age, although six scrub types were covered. It will be necessary to extend the information into very heavy and very light litter before comprehensive prediction tables can be compiled. The heavy litter will be this season's programme.

Providing fuel mapping and planning is upgraded, and reliable prediction tables are produced, there seems no fire behaviour reason why Maritime pine cannot be burnt on a much broader scale, at much less cost than is done at present. This does require the slow and careful development of lighting technique, the same as was done for Jarrah forest; (this is an important prerequisite.) This species seems much more resistant to fire in winter than was thought a few years ago, and trials are underway to find out what intensities pole sizes can stand.

Unlike pine, the grid pattern of lighting for controlled burning will never be very successful for Karri. The influence of fuel change dominates too much to produce anything like even fire behaviour. Future lighting should be in a sequence where distinct fuel and topographic types are burnt out separately. Defining these types and the sequence is one of the main problems at present.

New concepts for basic fire hazard have been developed (Table A) using overnight changes in relative humidity, as well as daily trends (Sneeuwjagt, 1970). These analyses were guided by the work of Hatch (1969) who showed fire hazard predictions were improved by including a measure of overnight conditions. The experimental methods for these experiments were modelled on Canadian work for their forest fire weather index (McCormick, 1969).

LONG-TERM STUDIES

Since 1963 a number of trials have been established measuring girth growth responses to fire. About 700 trees are measured each month. So far there has been little or no significant response to mild controlled burning.

It is unfortunate that all the early treatments were mild. This showed properly burnt-under trees were unaffected, but did not indicate the upper limit of acceptable risk. It was shown that pines scorched to less than 10 feet of green tip, lost girth growth.

This year a range of fire intensities were used on two large trials in Maritime pine at Ludlow. Monterey pine at Grimwade was burnt under more intensely than had been tried previously. Intensities of more than 30 B.T.U. per sec. per ft. created some butt damage in Monterey pines of pole-size.

Heavy fuels made burning under 20 feet high Karri quite risky. Thirty per cent were killed by 30 B.T.U. per sec. per ft. while smaller ones were nearly all killed. On the other hand, Jarrah under 20 feet high has been burnt under without apparent damage.

These trials are providing a basis for prescribing fire intensities that protect timber values during controlled burning. In the future, it is likely other values such as regeneration of understorey scrub and the fate of fauna will assume an increasing importance in fire management plans. The first small trials on scrub structure started in Dwellingup during 1965, and at Manjimup in 1967. Recently this work has been considerably expanded by Per Christensen in the southern forest and plans are afoot for a large trial near Dwellingup.

REFERENCES

Hatch, A.B. (1969). – The estimation of fire hazard in West Australia. Forests Dept. Bull..77

McCormick, J. (1969, 1970). – Fire Research Report. Unpublished. W.A. Forests Dept.

Sneeuwjagt, R. (1969, 1970). – Fire Research Reports. Unpublished. W.A. Forests Dept.