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Manjimup Fire Research

Inspector G.E. Peet

COMO WA 6252

14th September, 77

RESEARCH BURNING IN PINES.

N. D. BURROWS 1977

Below is an outline of a proposed study to aid in the compilement of pine burning behaviour tables.

AIM:

(1) To relate needlebed moisture content and fire intensity. Intensity will be measure by the actual air temperature experienced in the crowns of trees and by ROS. It is hoped that a temperature profile can be established for various fuel moisture contents, other factors being equal.

(2) To relate these temperatures and ROS with the drying affect on the needles in the tree crown.

(3) To determine a relationship (for various intensity fir fires) between the rate of recovery of the needles moisture deficit following a fire and the soil moisture content.

(4) The ultimate aim is to be able to predict, knowing the soil moisture content and the fuel moisture content, the drying affect of a fire (of a particular intensity) and whether or not this drying will adversely affect the tree and if so, for how long.

METHOD:

The study is to be undertaken in the Lewana plantation compartment AG. (see map). This is a 16 year old unthinned P. radiata stand. The fuel is needlebed only (approx. 10t/ha)

Five plots will be burnt. Each of these plots will be 40m x 40m and separated by a 10m strip (see plot layout diag.) The plots will be burnt at weekly intervals to give a range of fuel and soil moisture contents. Each burn will consist of;

selecting four trees in each of which four chemical series will be placed at the following height intervals, 1m, 10m, 15m, 20m. The chemical series consist of 8 chemicals with melting points ranging from 40° to 300°c. The chemicals will be placed (where possible) about 0.5m out fron the tree stem (on branches). Where these chemicals are placed, needle samples will be taken to determine their moisture deficit before the fire. Samples will also be taken from the control plot. Soil samples, down to 15cm will be taken to determine moisture content. Drying curves for soils in this area have been constructed so the pF can be found. Needlebed PMC and SMC will also be measured before the fire and a weather station will be manned during the burn.. The plot will be lit (with a line of fire) from the bottom edge. ROS and flame height will be monitored. After the burn, the chemical thermometers will be recovered and needle samples taken for moisture deficit determination. Needle samples will be taken from both the burnt plot and the control. This will continue until the moisture

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deficit fo both samples is equal. Soil moisture samples will also be taken.

FOLLOW UP WORK:

This study will be followed up by 'laboratory' fires. The study is based on the philosophy that the amount of damage done to a stand following a fire is because of the heat. Rate of spead alone is not a sufficient gauge of fire intensity, especially when different fuels are considered. Temperatures experienced in fires will fall in a finite range.
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Through these studies, it is my intention to classify temperatures into ranges dependent on the extent of dehydration to needles. This, together with recovery rate of the tree (which will be a fuction of the temperatures experienced by the needles and soil moisture content) will give a basis of predicting fire effects in pine stands. Each temperature range will be dependent on fuel types, amount, moisture content and fire weather factors. Various combinations which will generate the same or similar temperatures (and therefore dehydration of needles). Once this is known, a soil sample to determine soil moisture content will give a good indication of whether or not the trees are capable of handling and recovering from a particular intensity fire. Studies done to date indicate that there is a strong relationship between needle moisture deficit and soil pF.

Follow up work in the laboratory sense will mean numbers of small 'bench' fires which can be extrapolated to the field situation. For example, the influence of wind on fire can be discovered to some extent using a bench (say 2m x 0.5m) covered with a needlebed of known depth and moisture.content. From these proposed field studies, it may be found that under no wind condition, with a needlebed of 15% mc and 2.5cm depth, temperatures of 180°c are experienced 15m up the stem.

This same fire may have a ROS of 200m/hr. In the laborotory situations the similated fire (with needlebed 15% mc and 2.5cm deep) may generate a temperature of 200°c at a height of one metre above the bench, and a ROS of only 100m/hr. This can then be correlated to the field results: i.e.

For m.c. 15%; needlebed 2.5cm and wind 0;
field fire = 180°ct and 200m/hr ROS

laboratory fire = 260°ct and 100 m/hr ROS.

Therefore 180°c & 260°c
200°c & 100°c

By varying either one of mc, needlebed depth or wind; a laboratory fire might yield;

temp. 300°c ROS 110m/hr

the field temperature then, will be;

180°c & 260°c
X & 300°c

X = 207°c

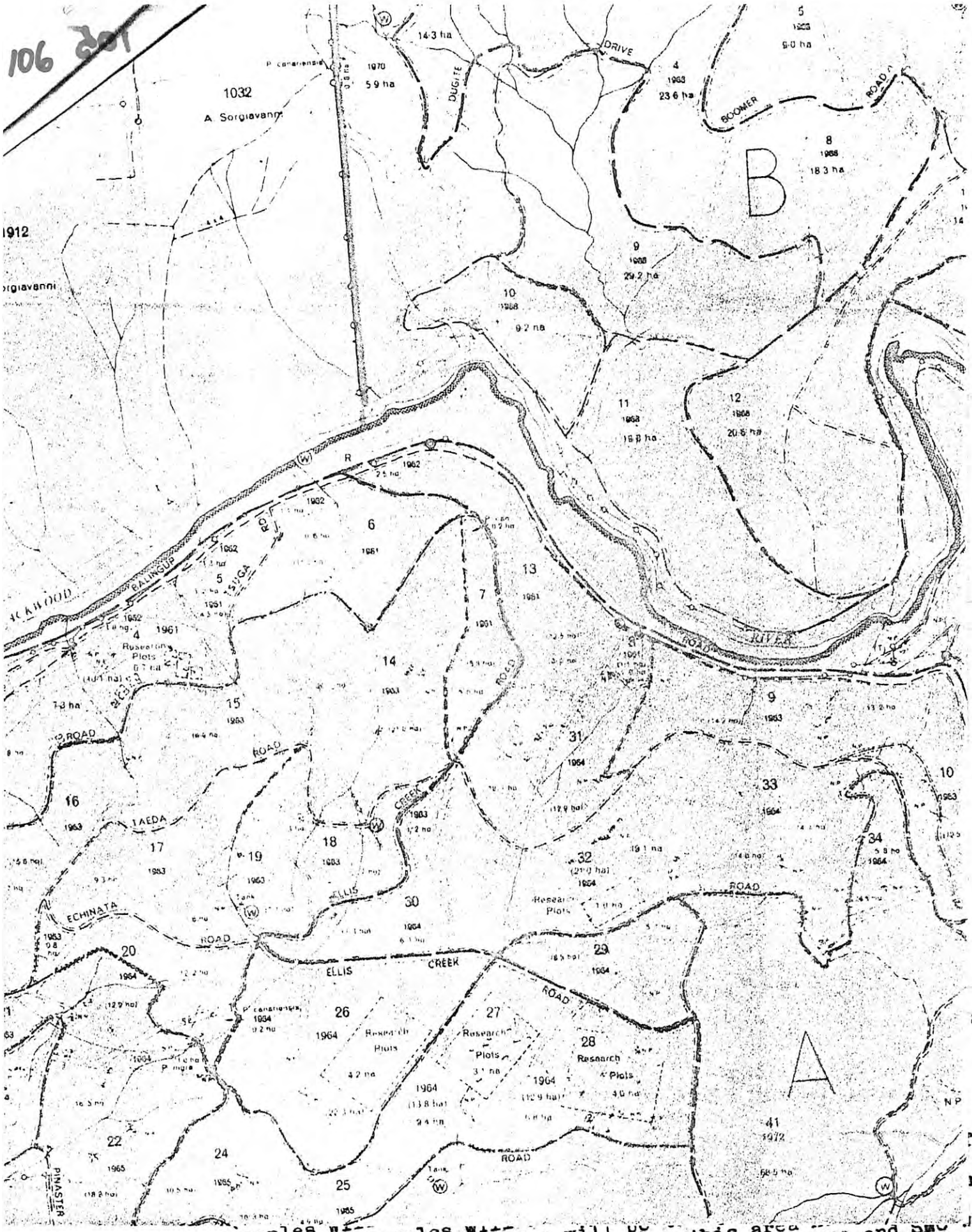
Obviously this technique will not give an accurate field prediction but considering the difficulties involved in working in this field it is hoped that results will be acceptable.

I hope this brief summary has given you some idea of what I am trying to do and why it is important that a number pf field fires be monitored.

Please find attached the original 'philosophy' of my approach to the study.

Neil Burrows

A.D.F.O. FIRE RESEARCH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