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Suggestion for Further Studies in Young Karri

N. D. Burrows 1978.

FACT: (i) given the right moisture content, mature karri forest litter will burn readily.

(ii) even at low moisture contents, litter in young karri (~ < 12-14 years) is very reluctant to burn.

(iii) at high wind speeds and under severe fire weather conditions, young karri litter will burn. (Even iron will burn rapidly under the right conditions!)

FICTION (at the moment)

(i) The scrub species which develop with young karri, generate a litter bed with fuel physical & chemical characteristics not favourable for burning under most burning conditions.

(ii) This is a biological control against the devastation of young karri, by fire (at least it minimizes the risk).

(iii) Karri stands progressively develop a litter bed which will burn.

(iv) The rate of development of a "burnable" litter bed is a function of i) karri dynamics ii) understorey vegetation type.

(v) Karri stand dynamics are a function of i) site quality ii) stocking density.

(vi) A "burnable" litter bed is one which will burn under prescribed (mild) conditions. Such a litter bed will have physical characteristics similar to a mature stand. i.e.

(i) bulk density will be ~ 55-65 kg/m^3

(ii) porosity will be = etc.

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(iii) packing ratio will be = etc.

(iv) fuel load will be = etc.

i.e. examine the fuel physical and chemical characteristics of a mature karri litter and you have the threshold (or very near) magical fuel characteristics.

(viii) The next trick is to predict when a given block of regeneration will reach these major numbers.

(iix) The factors determining this have been discussed above.

(x) The litter bed will not burn (i.e. the numbers won't be right) until a significant proportion of the bed is karri leaf litter and twigs < 10 mm. The amount on the ground must relate to the amount in the crown. ∴ Total canopy volume might be a good place to start (i.e. height to crown break, height to crown top, ~crown diameter). This will probably relate to basal area, mean top height.

OTHER

Have a look at Rothermels model. It will give you a good idea of the

(i) conditions of wind and M.C.% that "below threshold" karri litter will burn at and

(ii) it will give you a good idea of how "flammability" changes with changing fuel structure and chemistry.

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• I think your report could have elaborated more on the hypothesis in your section on Disucssion - the elaboration could have included the points I have mentioned above - i.e. more discussion.

• For the project you had adequate time to examine briefly, a few more stands - e.g. 3 more with similar understorey but of different stand structure - you could then have compared and contrasted ⟶ more discussion ⟶ more or less creedance to the hypothesis.

• It would have been useful to have examined the stand characteristics of the 3 blocks mentioned - i.e. stocking, basal area, mean top height etc. You could then have attempted to relate this to litter bed qualities of the 3 stands and to the litter bed qualities of mature karri (after Sneeuwjagt.

• Could have been more discussion of results - e.g. the fact that the fuel depths on all stands were similar, fuel loads were similar - slightly higher in Warren; Could discuss the bulk densities in relation to mature karri stand; Could discuss large differences in packing ratio between mature jarrah, karri and the blocks studied. Could have discussed the fact that the porosity of Warren Block is about the same as for mature karri ... may almost be burnable, whereas the other 2 blocks are down (although aren't far away).

• Should discuss fuel bed characteristics not only singly, but collectively, as different combinations of porosity, packing ratio, load etc. will provide different flammabilities.

• Energy release rate for euc. litter is probably higher than for scrub. Combined with the very low packing ratio of the scrub litter, the high Si content and probably the high phosphorous content - this becomes relatively "unburnable" (see Rothermel). - I think it worthwhile to have

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H determined for scrub fuels - also P bud as this acts as a retardent. - I would like to discuss these points and the karri working plan with you sometime.

N. Burrows

TESTING THE HYPOTHESIS

1. Locate areas of regen. of ages 6 ⟶ 15 inclusive (one block/age).

2. Within each, locate (randomly but away from edges etc.) 3 plots each 20 m x 20 m.

TREATMENTS	BLOCKS 1	2	3
AGE 6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

3. On an annual basis, and in March, measure the following.

3.1 Litter Bed

3.1.1 • depth/weight - by destructive sampling some 10 (or whatever) .09 m^2 quadrats.

3.1.2 • determine SA/vol ratio of fuel particles.

3.1.3 • determine particle density.

3.1.4 • determine fuel bed porosity.

3.1.5 • determine fuel bed bulk density.

3.1.6 • determine fuel bed packing ratio.

3.1.7 • proportion by weight, of litter of more than one litter type.

3.1.8 • depth of laminations if present.

Stand

- height of top 10% tallest trees and (crown break and top height).
- diameter class frequency distribution.

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- basal area

Understorey

- dominant species.
- from outside plot, destructive sample vegetation to develop a relationship between stem basal area and biomass (at 1 m intervals).
- within plot, establish 5 x 1 m^2 vegetation plots and determine diameter/frequency distribution of live and dead stems (note dead stems.--Browns technique)

Trash

- Use a series of Van Wagner's line intercepts to determine the quantity of trash in 1 m height classes, by counting intercepts.

N. Burrows
DFO FIRE RESEARCH

* other

i) use litter trays
ii) break litter into a) Karri, b) scrub, c) twigs, d) other } separate out & weigh
iii) weigh on a 3 monthly interval