SIMULATING THE EFFECTIVENESS OF PRESCRIBED BURNING AT ALTERING WILDFIRE BEHAVIOUR IN TASMANIA

bushfire&natural HAZARDSCRC

James M Furlaud[1], Grant J Williamson[1], David MJS Bowman[1]

[1] School of Biological Sciences, University of Tasmania

INTRODUCTION

Prescribed burning is a widely accepted wildfire hazard reduction technique, however knowledge of its effectiveness remains limited.

We used the Phoenix Rapidfire model to run large-scale fire behaviour simulations across the state to investigate three questions:

- Under a null scenario, with no prescribed burning, what fire intensities are possible and how do they vary among Tasmania's vegetation types (figure 1a)?
- How does a maximal prescribed burning scenario reduce wildfire spread and intensity?
- How effective are 12 hypothetical, more realistic scenarios in reducing the spread and intensity of wildfires?

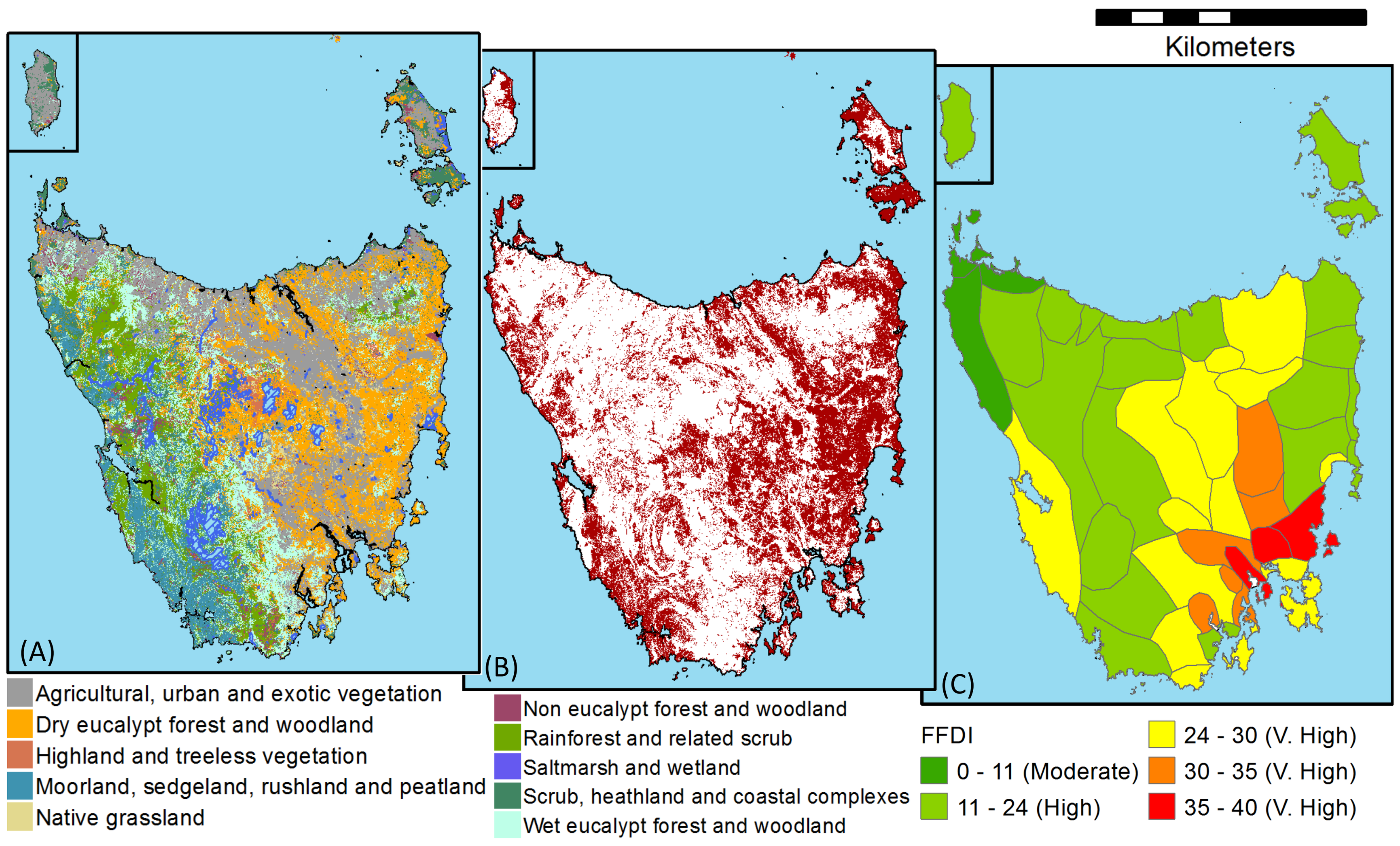

FIGURE 1: MAPS OF POTENTIAL DRIVERS OF FIRE BEHAVIOR: (A) TASMANIAN VEGETATION TYPES (B) AREA TREATED UNDER THE MAXIMAL SCENARIO, AND (C) 99TH PERCENTILE FFDI

METHODS

We simulated 11,059 fires across Tasmania using a uniform ignition grid, under typically bad weather conditions (99th percentile FFDI, figure 1b) and three prescribed burning scenarios: (i) a null scenario, with no prescribed burning, (ii) a maximal scenario (figure 1c), with the most possible prescribed burning given ecological and social constraints, and (iii) 12 hypothetical plans, designed to be realistic and measurable using science-based management principles. For more detailed information on these simulations, and for results of risk-reduction analyses, see the "Bushfire in Tasmania" technical report (2014).[1]

We analysed the effect of the null and maximal scenarios qualitatively, using maps, and quantitatively, using generalised linear models (GLMs). To analyse the effectiveness of the hypothetical scenarios, we calculated area burnt leverage: the reduction in area burnt by unplanned fires resulting from one unit of area treated. We also calculated intensity leverage: the reduction in mean fire intensity in burnt areas resulting from one hectare of prescribed burning.

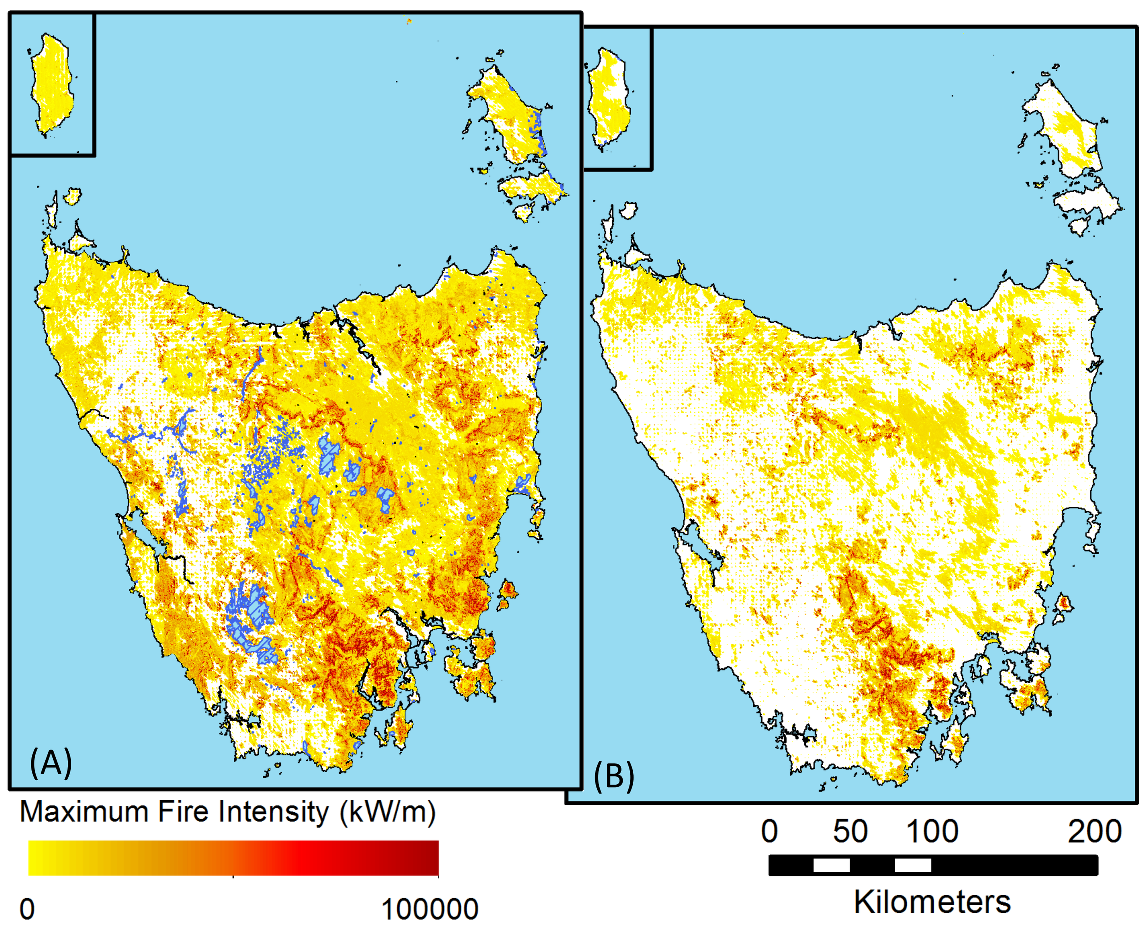

FIGURE 2: MAPS OF MAXIMUM SIMULATED FIRE INTENSITY UNDER THE (A) NULL AND (B) MAXIMAL TREATMENT SCENARIOS

RESULTS AND DISCUSSION

Null Scenario

Under the null scenario, maximum simulated fire intensities varied greatly: from 0 kWm^{-1} in some inflammable vegetation types, to well over 100,000 kWm^{-1} in wet sclerophyll forest (figure 2a). Vegetation type was found to be the best predictor of fire intensity and spread probability. Indeed, the highest intensities seem to occur in the wet sclerophyll forests in the state's southeast.

Maximal Scenario

The maximal prescribed burning scenario significantly reduced the probability of fire spread in every vegetation type (figures 3a, 2), but only significantly reduced maximum intensity in the five treated vegetation types (figures 3b, 2). This suggests that prescribed burning has the ability to reduce fire spread probability, but not fire intensity, in untreated vegetation types.

Hypothetical Scenarios

The more realistic, hypothetical scenarios had a more limited effect on fire behaviour than the maximal scenario. Area burnt leverages for the maximal scenario, estimated from the GLMs to be 0.5-1 (not shown), suggested that the maximal scenario was roughly twice as effective as the hypothetical plans (figure 4) at reducing fire spread. Intensity leverage was essentially negligible in all vegetation types.

CONCLUSION

This research suggests that close to a maximal scenario, treating nearly 30% of the state, would be needed to achieve aggregate reductions in fire behaviour. This underscores the need for targeted, risk-reduction based prescribed burning regimes, and for more research into alternatives to prescribed burning.

ACKNOWLEDGEMENTS

We would like to thank Rochelle Richards, Sam Ferguson, Kylie Kornish, and Sandra Wight at the Tasmania Fire Service for supporting this project and for setting up the simulations.

This poster presents the findings of a paper currently in review with the *International Journal of Wildland Fire* and will form a chapter of the PhD dissertation of James Furlaud, contactable at **james.furlaud@utas.edu.au**.

[1] RICHARDS R, FERGUSON S, CORNISH K, WHIGHT S, WILLIAMSON G. BUSHFIRE IN TASMANIA: A NEW APPROACH TO REDUCING OUR STATEWIDE RELATIVE RISK. STATE FIRE MANAGEMENT COUNCIL, 2014.

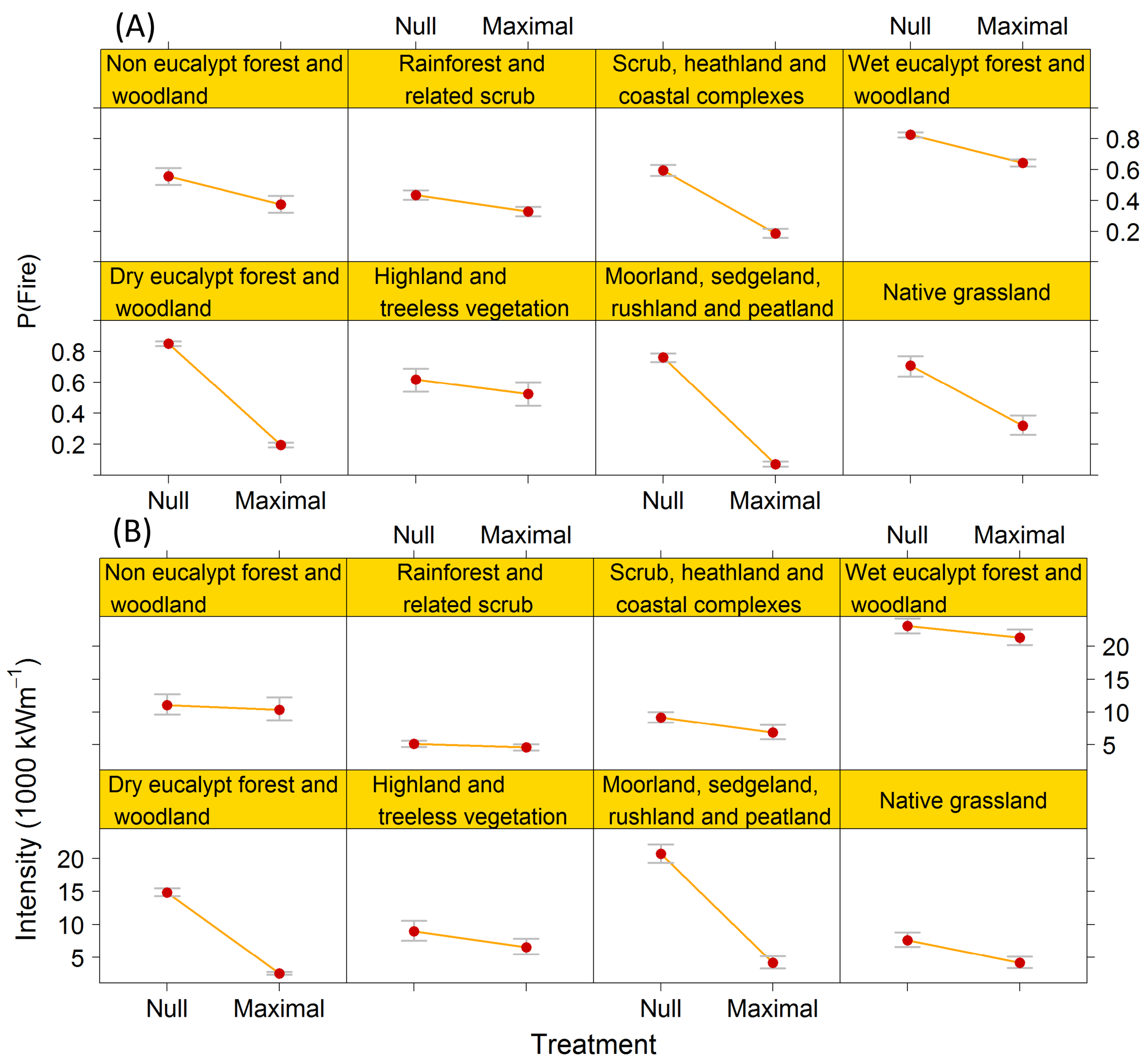

FIGURE 3: MEAN EFFECTS OF VEGETATION TYPE AND TREATMENT TYPE ON (A) THE PROBABILITY OF FIRE SPREAD AND (B) MAXIMUM FIRE INTENSITY, BASED ON THE GLMs. GRAY BARS REPRESENT ONE STANDARD ERROR

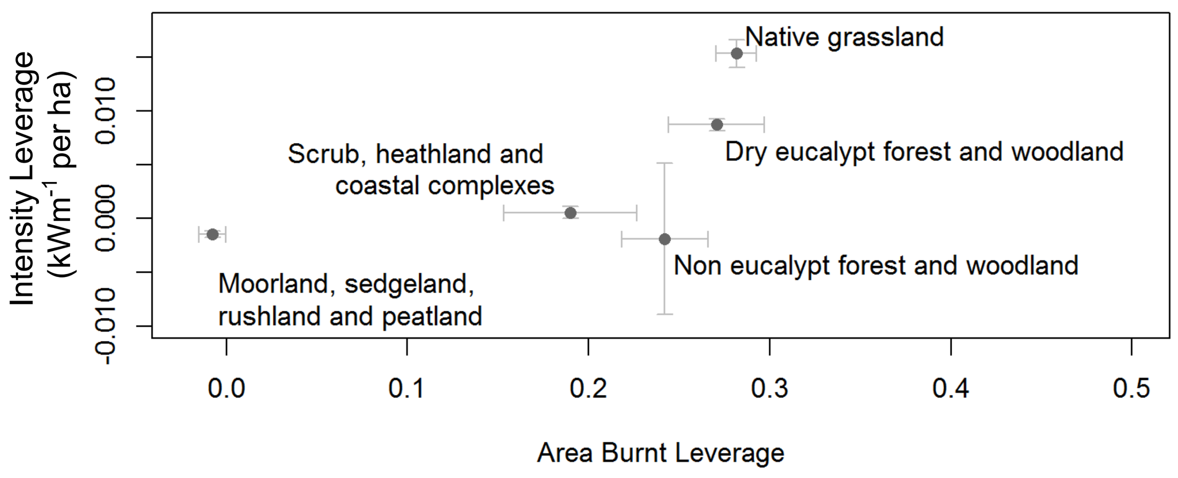

FIGURE 4: AREA BURNT LEVERAGE AND INTENSITY LEVERAGE ESTIMATES FOR THE FIVE TREATED VEGETATION TYPES OBTAINED FROM SIMULATIONS PERFORMED UNDER THE HYPOTHETICAL SCENARIOS. GRAY BARS REPRESENT ONE STANDARD ERROR

Australian Government Department of Industry, Innovation and Science | Business Cooperative Research Centres Programme

Tasmania Fire Service

UNIVERSITY of TASMANIA — School of Biological Sciences

SFMC STATE FIRE MANAGEMENT COUNCIL

bnhcrc.com.au