Quantification of inter-regional differences in risk mitigation from prescribed burning across multiple management values

Research Forum / **2018**

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bushfire&natural HAZARDSCRC

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme


Credit: Beth Koperberg
1) Project
2) Approach
3) Results

From hectares to tailor-made solutions for risk mitigation

From hectares to tailor-made solutions for risk mitigation

Problem Summary

- There is ‘no one size fits all solution’ because PB effectiveness is related to biophysical underpinnings and human context
- The role for PB in risk mitigation is poorly quantified
- Underpinnings and context are changing

From hectares to tailor-made solutions for risk mitigation

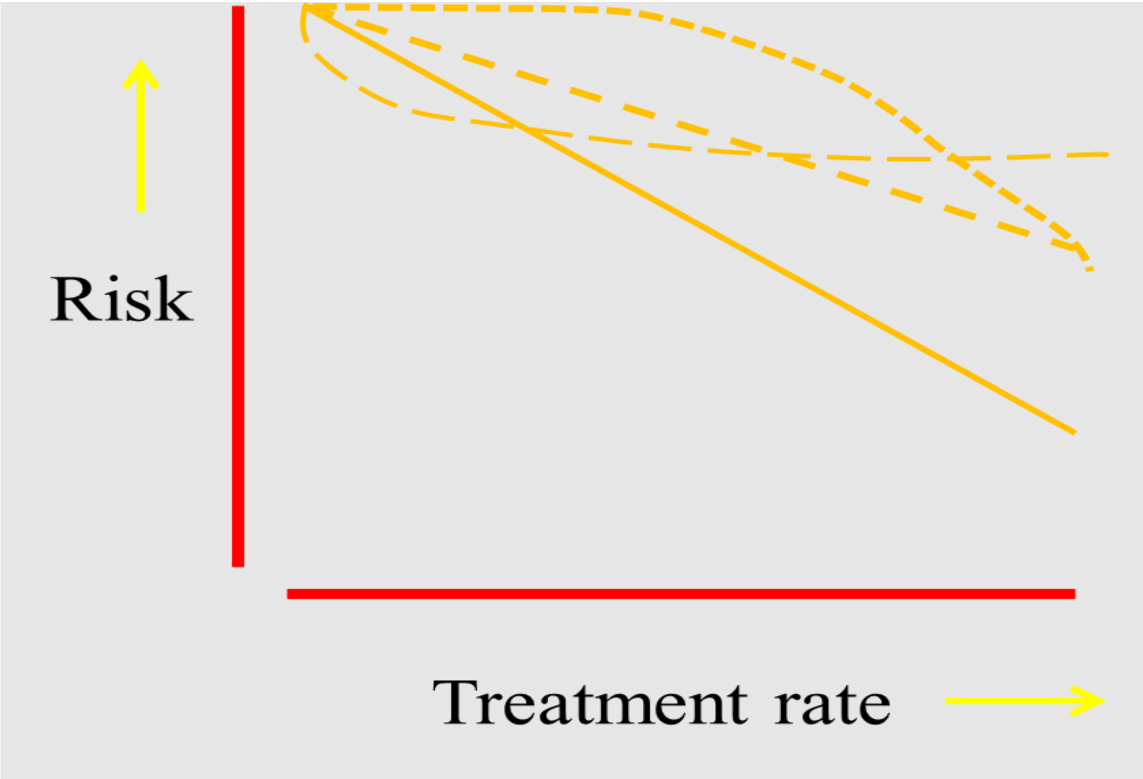
The Solution

- The solution is a set of solutions that explicitly account for the range of biophysical influences and human context found in southern Australian Bioregions

The Prescribed Burning Atlas

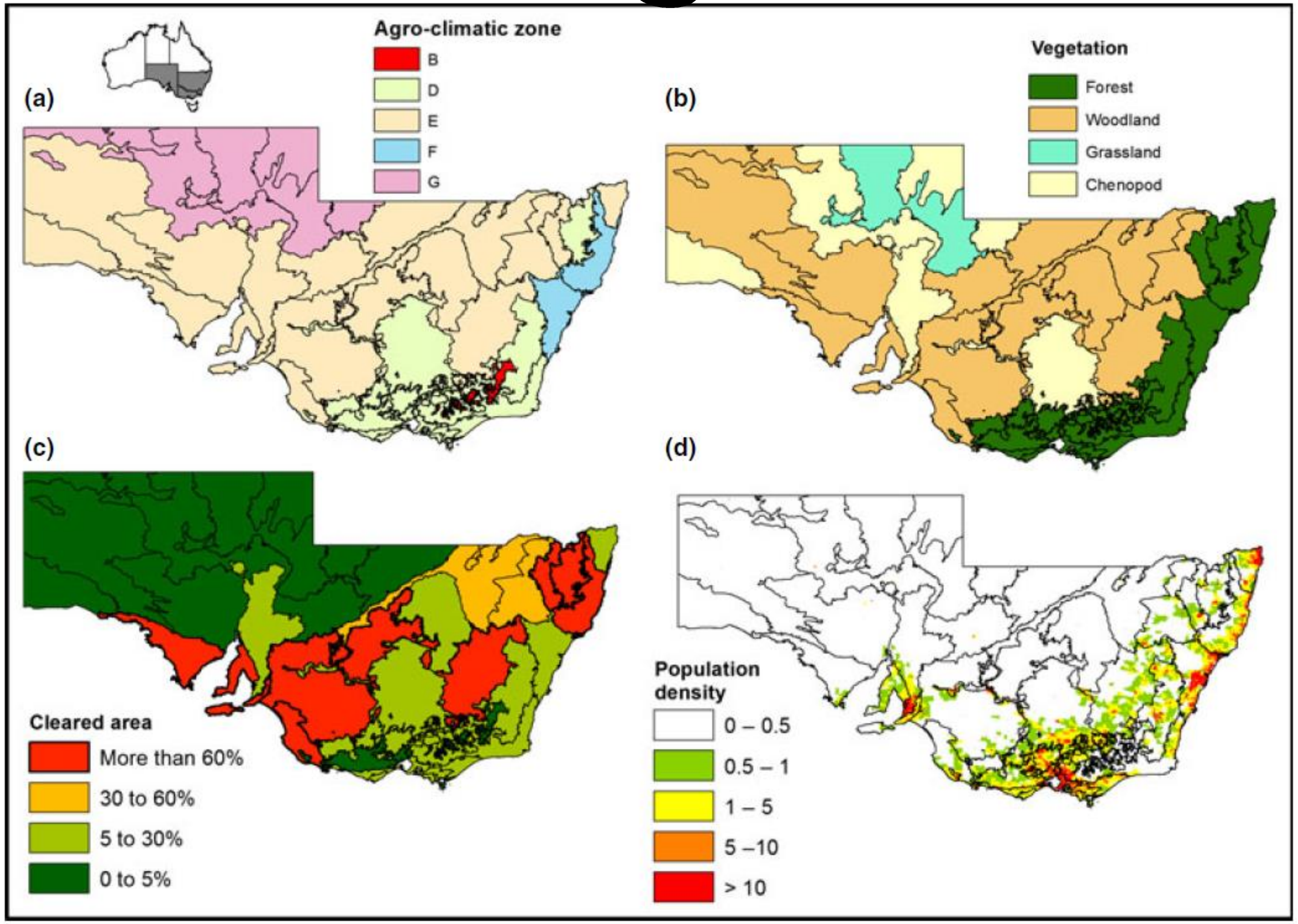
The Prescribed Burning Atlas

COMPARATIVE PERFORMANCE OF DIFFERING PRESCRIBED BURNING STRATEGIES IN REDUCING RISK TO MULTIPLE VALUES



The Prescribed Burning Atlas

CAPACITY TO DERIVE FIRE REGIME CHARACTERISTICS & RISK SOLUTIONS FOR INDIVIDUAL BIOREGIONS



Bradstock et al. (2014) *Global Change Biology*

The Prescribed Burning Atlas

PRESENT AND FUTURE PROJECTIONS

ACCESSIBLE INTERFACE

AMENABLE TO UPDATES

COMPATIBLE WITH INTERNATIONAL INITIATIVES

Today's challenge

Can we quantify …
inter-regional differences in …
risk mitigation from prescribed burning…
across multiple management values?

Key methods

Fire behaviour simulations

- Phoenix RapidFire
- Multiple weather streams

Key methods

Management decisions

- Prescribed burning
- 0, 1, 2, 3, 5, 10% p.a.

Key methods

Impact estimation

- Calculated from model output and loss functions
- House loss, life loss, road & powerline length loss, area burnt below tolerable fire interval

Key methods

Impact estimation

- House loss
- $= f$ (ember density,
  flame length,
  convection,
  house density)
- Tolhurst & Chong 2011

Key methods

Impact estimation

- Life loss
- $= f$ (house loss,
  population density)

- Harris et al. 2011

Key methods

Impact estimation

- Road/ powerline damage
- $= f$ (road density / powerline density, >10,000 kW/m

Key methods

Impact estimation

- Area burnt below TFI
- $= f$ (area burnt,
  TFI mapping)
- Amount of time between fires required for native vegetation to reproduce, maintain biodiversity

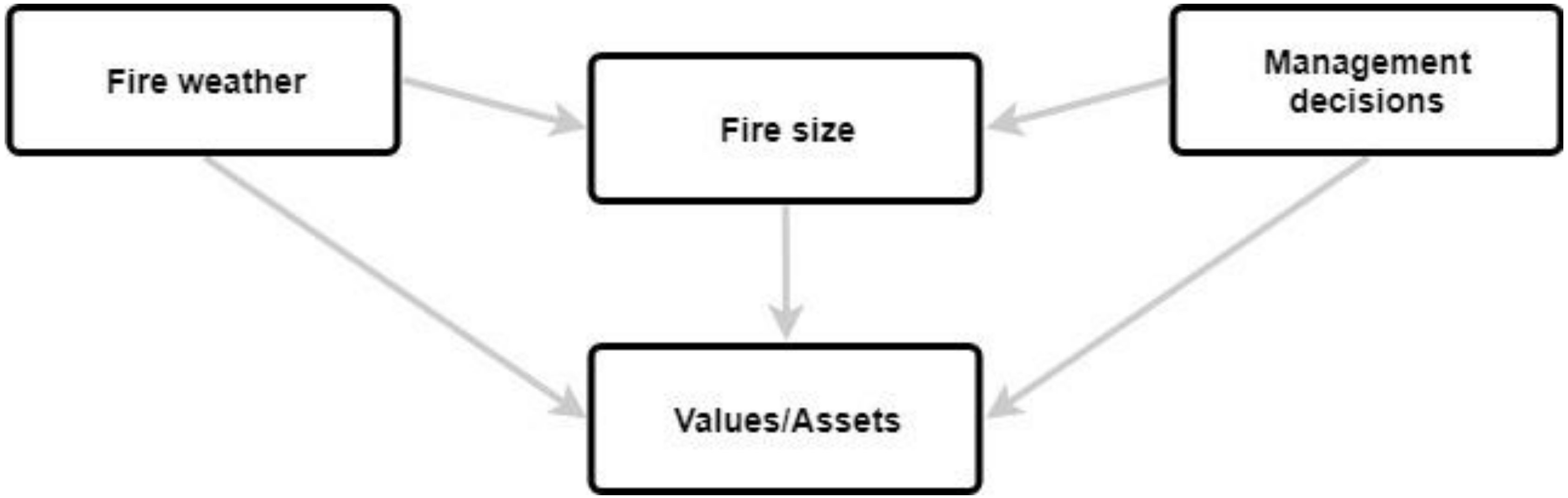
Key methods

Risk estimation

- Bayesian network
- Summarises results
- Controls for weather difference between sites
- Level playing field

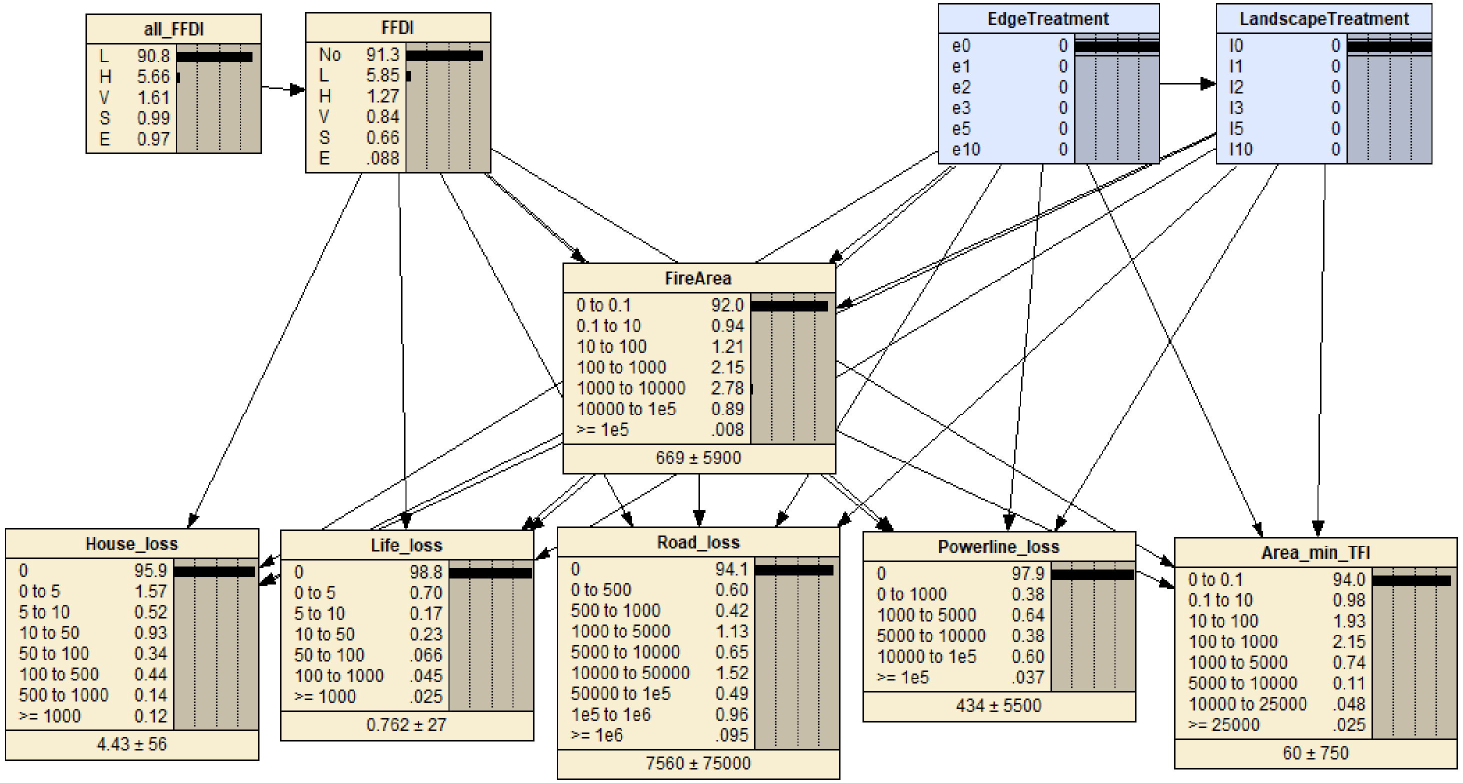
Risk estimation

Key methods



Risk estimation

Key methods



Key methods

Fire behaviour simulations

- Phoenix RapidFire

Management decisions

- Prescribed burning 0, 1, 2, 3, 5, 10% p.a.

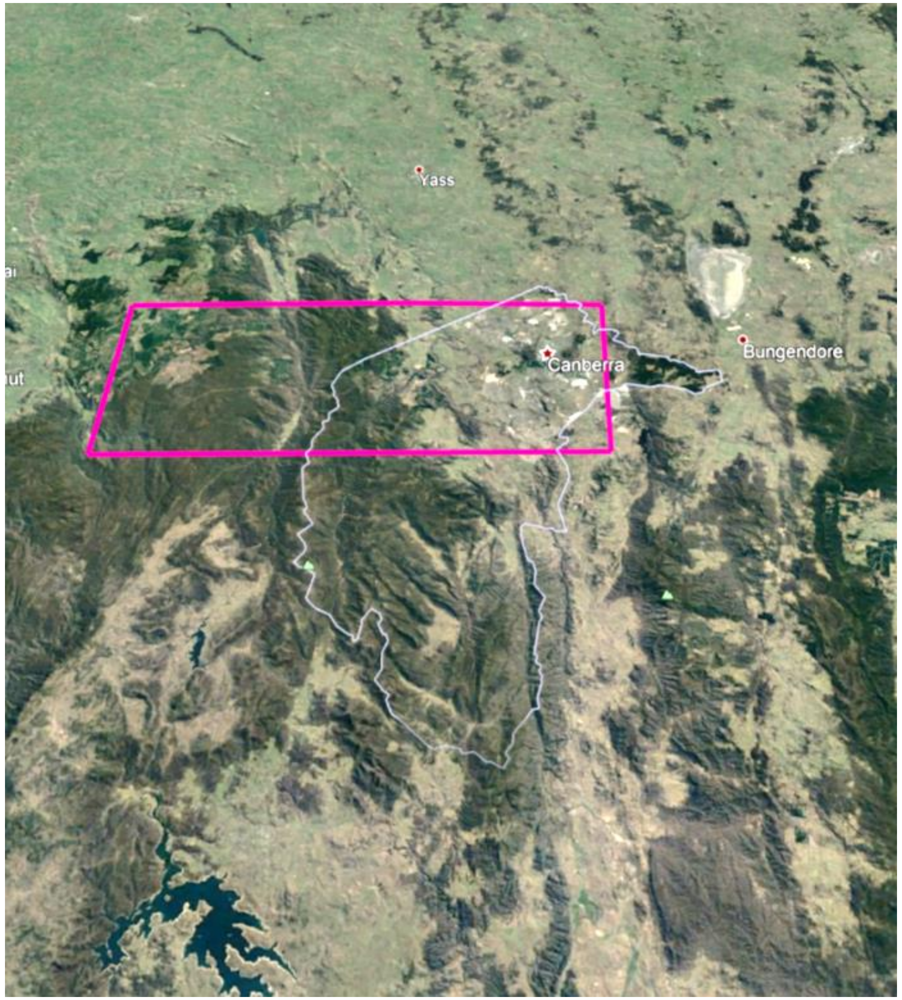
Impact estimation

- Life loss, house loss, road & powerline damage, area burnt below TFI

Risk estimation

- Bayesian network

Tasmania case study landscape



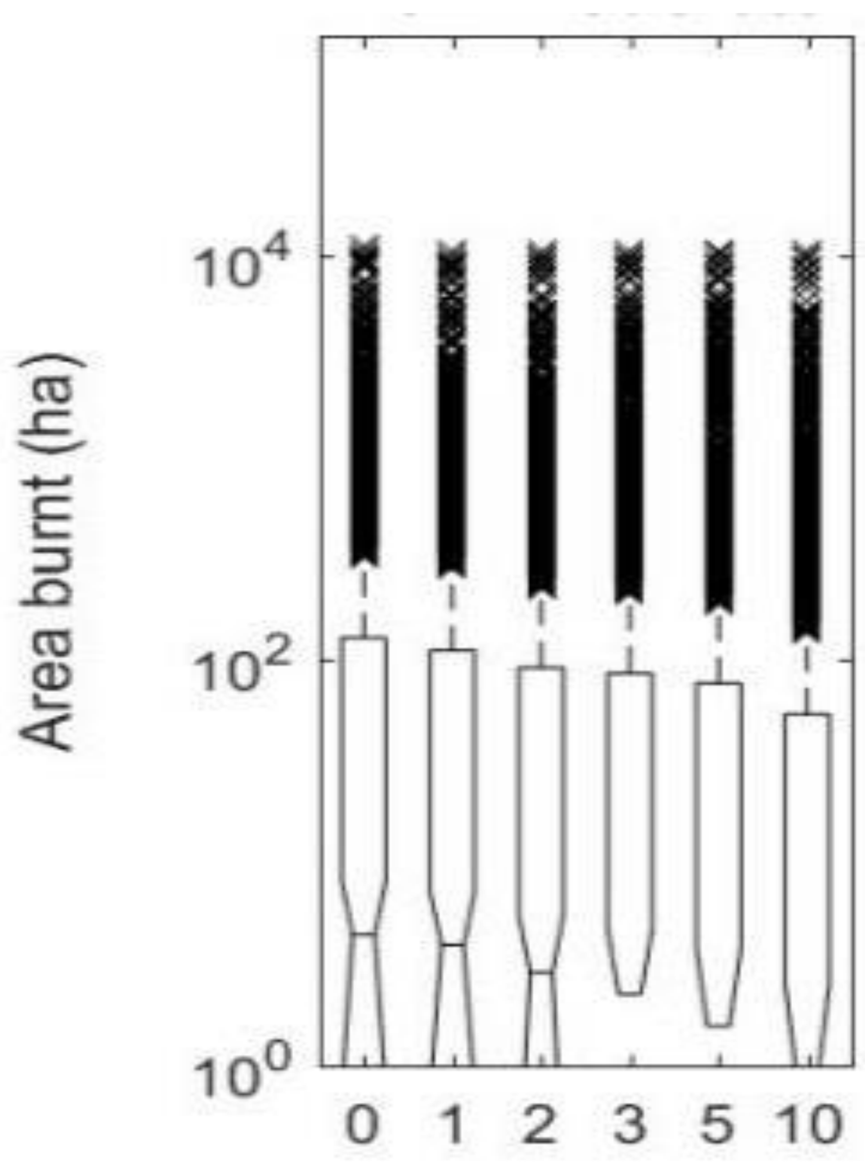
ACT case study landscape

Impact estimation

Raw output

Each data point represents a single fire (n ~ 90,000)

Treatment rate affects area burnt

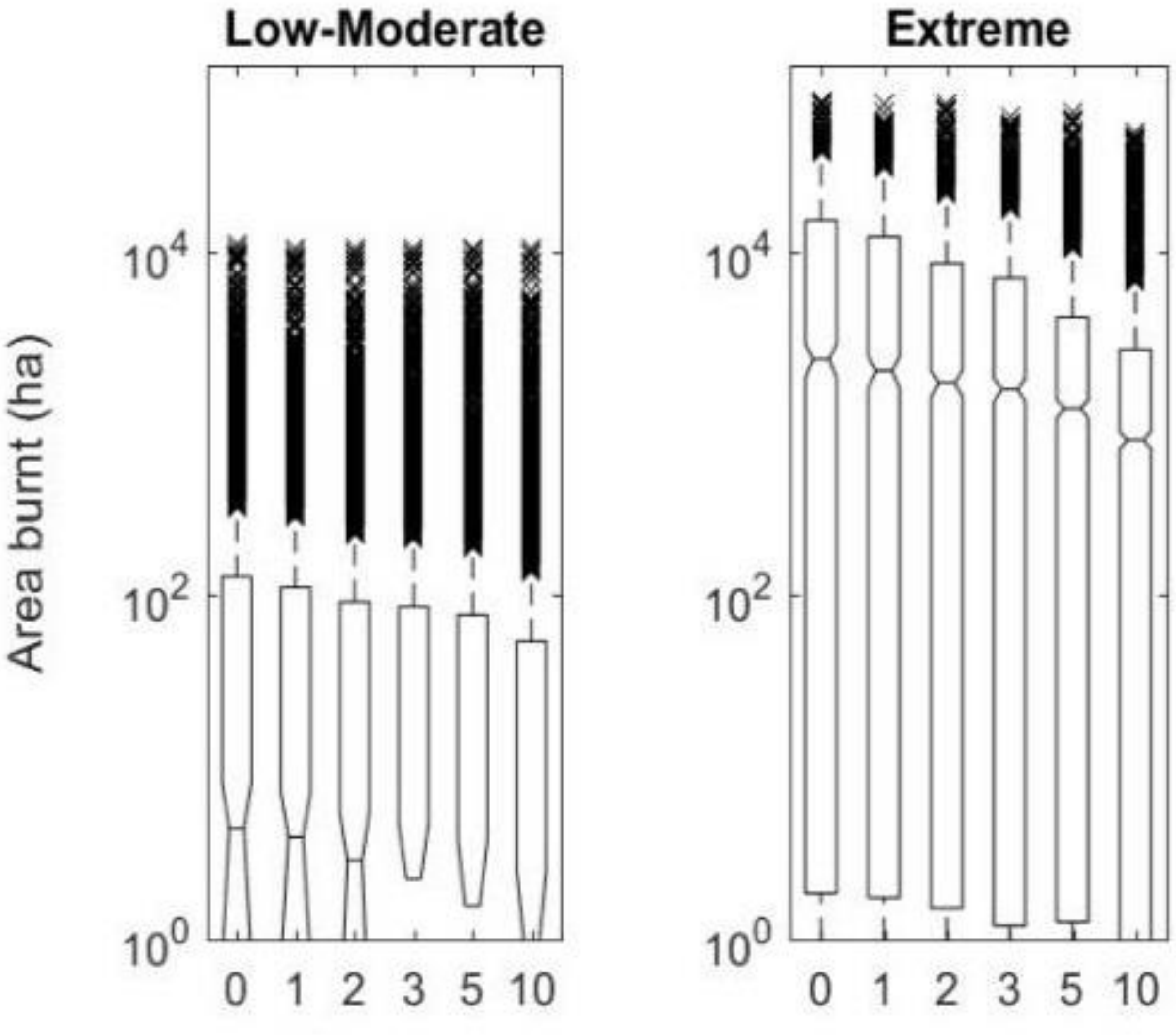


Treatment rate (%)

Impact estimation

Fire weather category affects area burnt

Low-Moderate, High, Very High, Severe, Extreme

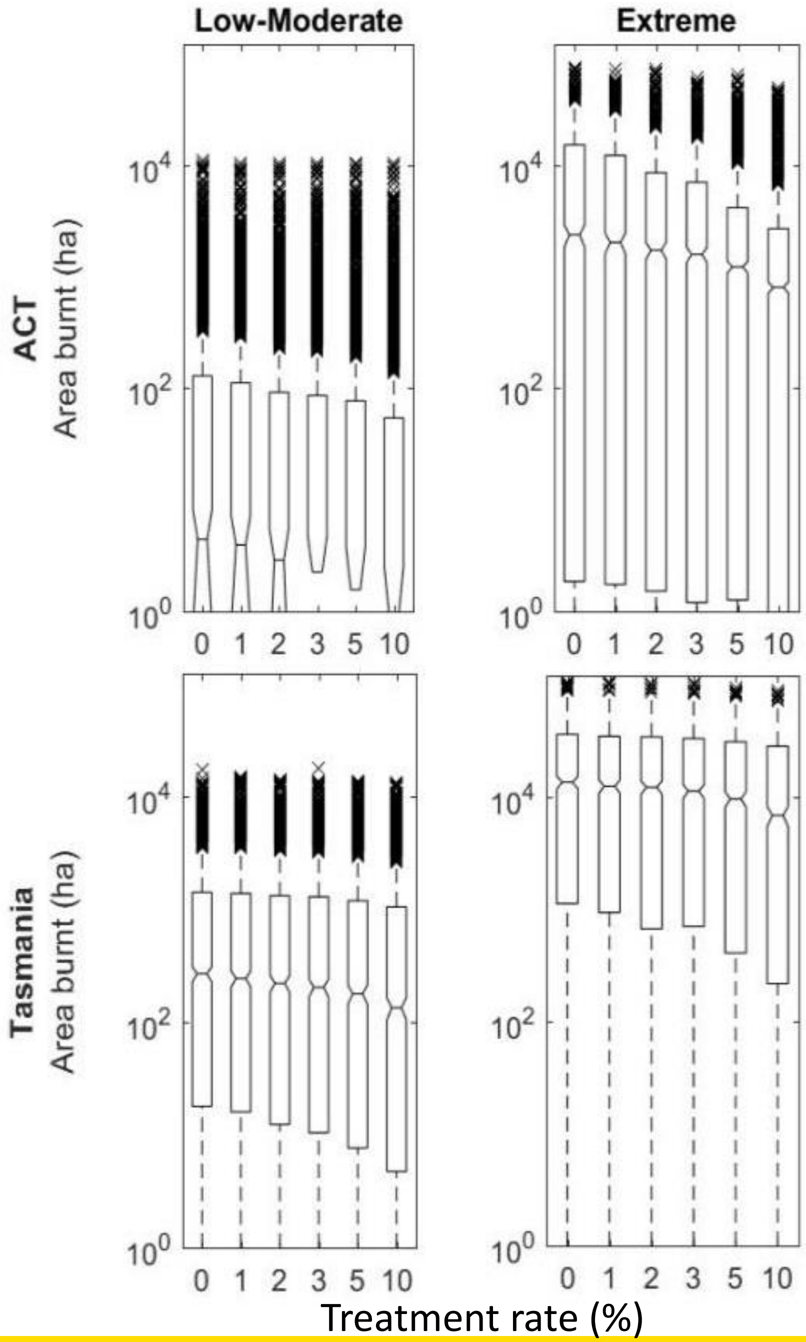


Treatment rate (%)

Impact estimation

Variation due to treatment, fire weather, location

Also house loss, life loss, powerline & road length loss, area burnt below TFI

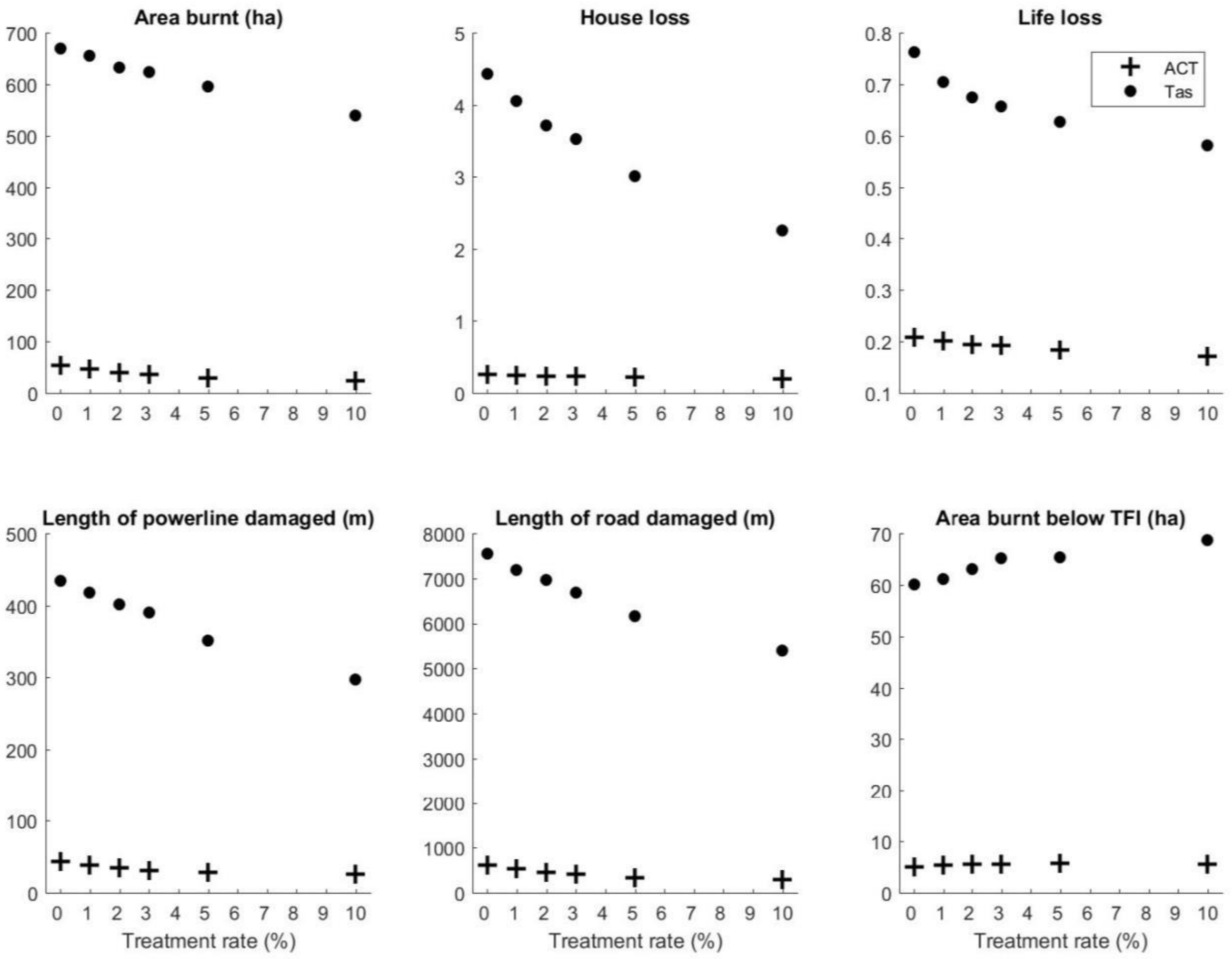


Risk estimation

Summarises raw output

Reflects local fire weather distribution

Level playing field

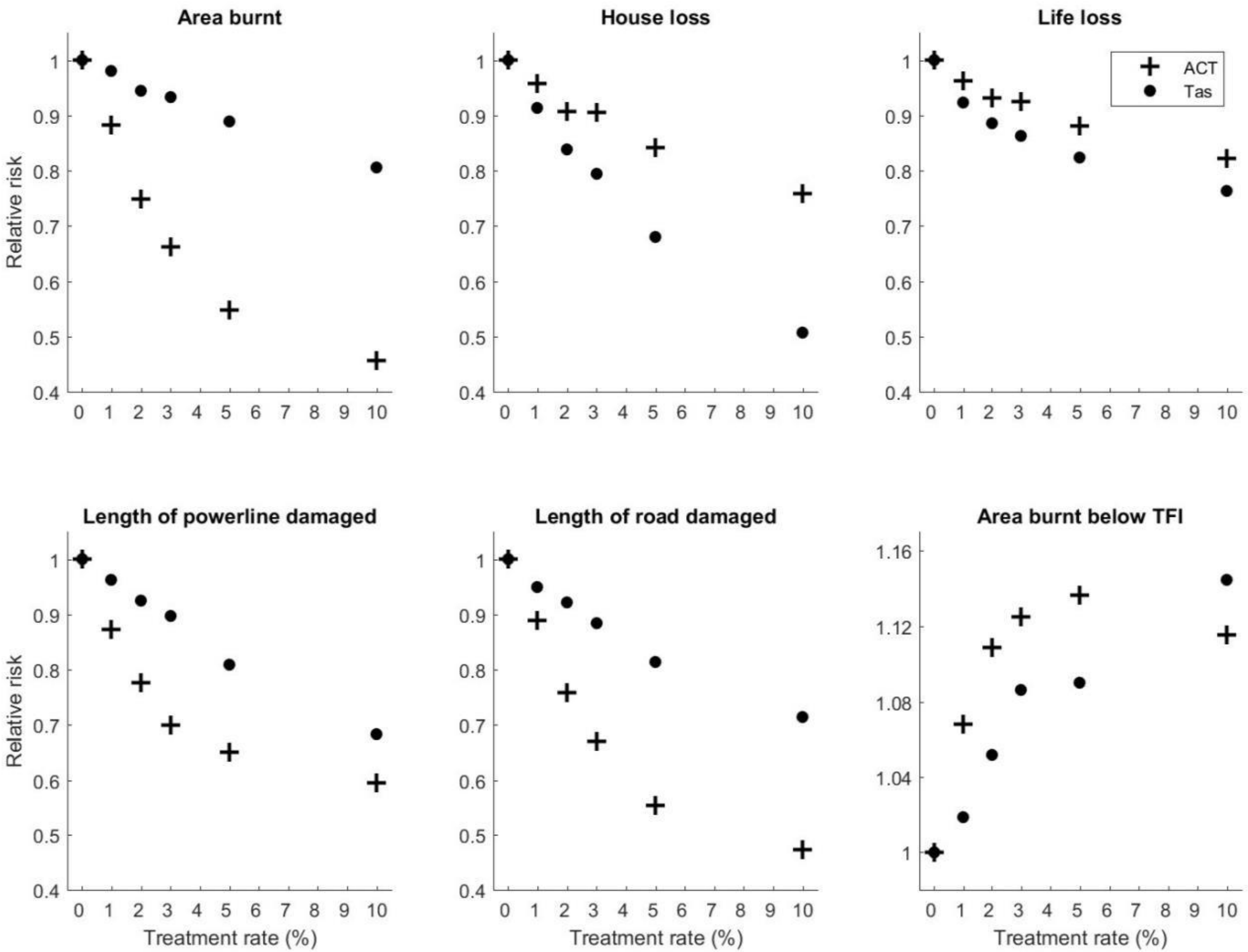


Relative risk

Change in risk due to treatment

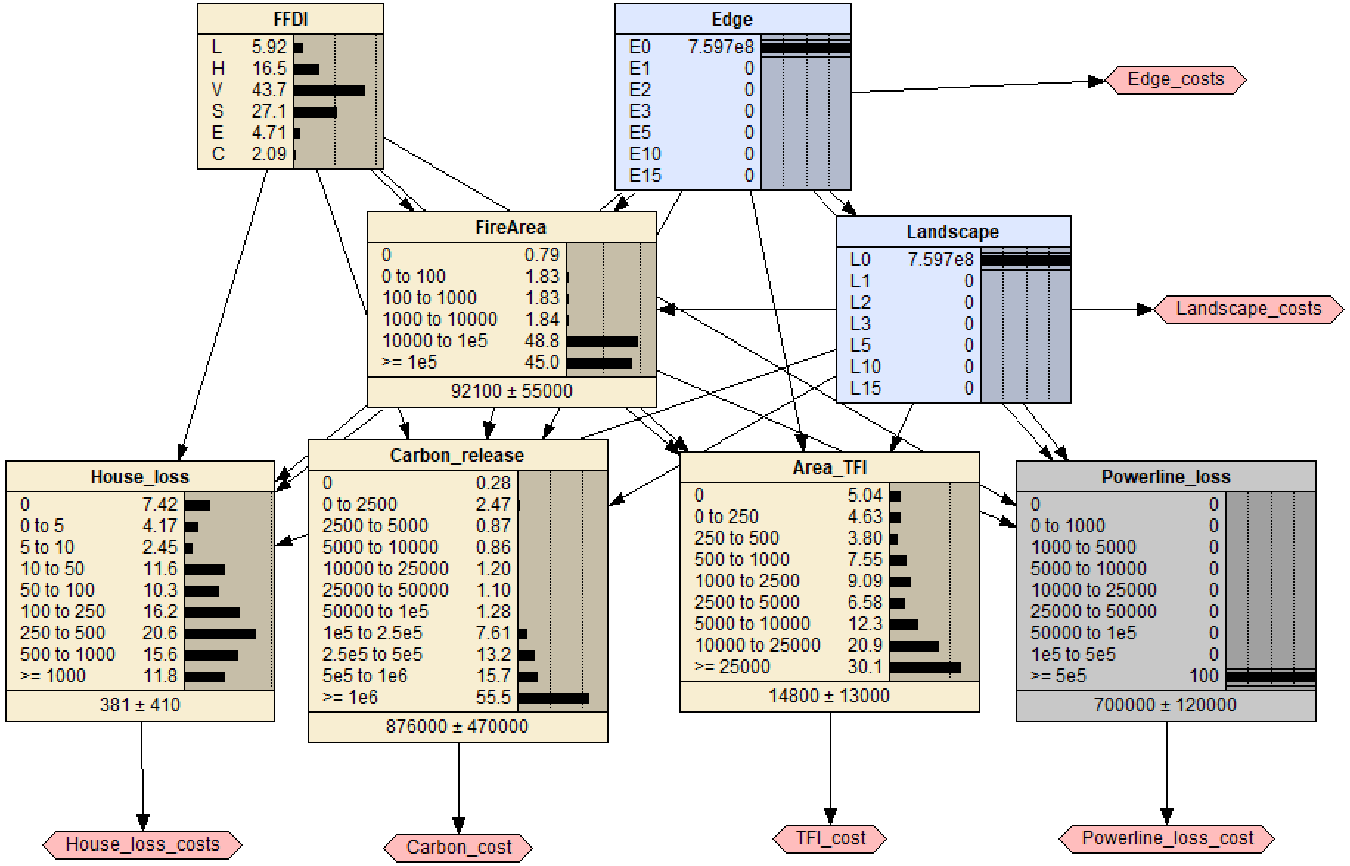
Set zero treatment = 1

Nb different Y axis for area burnt below TFI

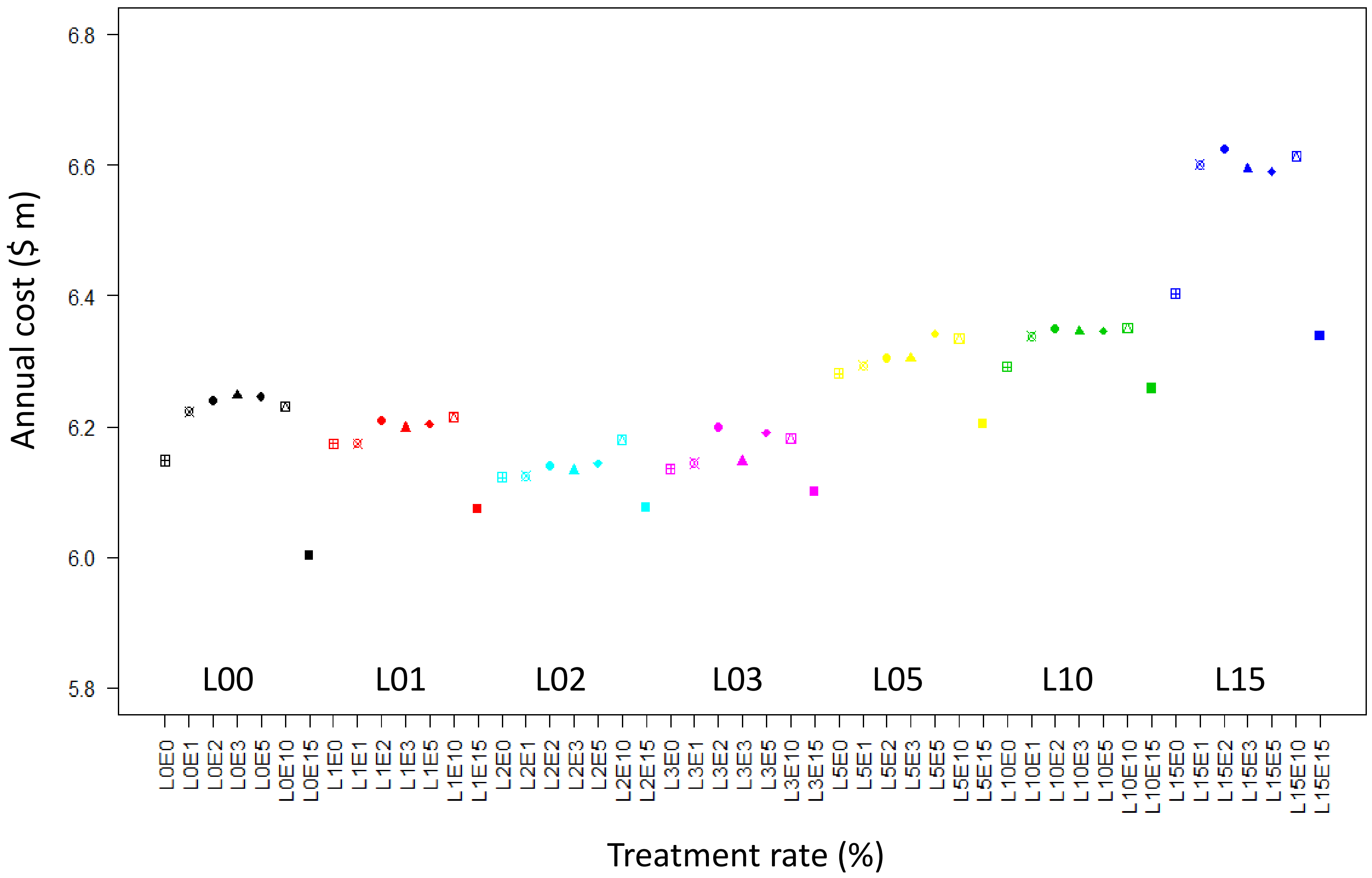


Risk estimation

Cost



Cost



Penman & Cirulis (submitted)

Conclusions

Overall, the effectiveness of prescribed burning at mitigating area burnt by wildfire and other key values varied considerably across landscapes and values

Conclusions

A given rate of prescribed burning did not deliver the same degree of risk mitigation for all values, and the results differed between study landscapes.