Bushfire risk at the rural–urban interface – T2-A5

Bushfire behaviour and mitigation strategies

Dr Grant Williamson
Senior Research Fellow, School of Natural Sciences, University of Tasmania

Project Overview

Natural Hazards Research Australia

T2-A5 Bushfire Risk at the Rural-Urban Interface

Biophysical
Plant flammability
Garden/ Landscape-
Hazard Mapping

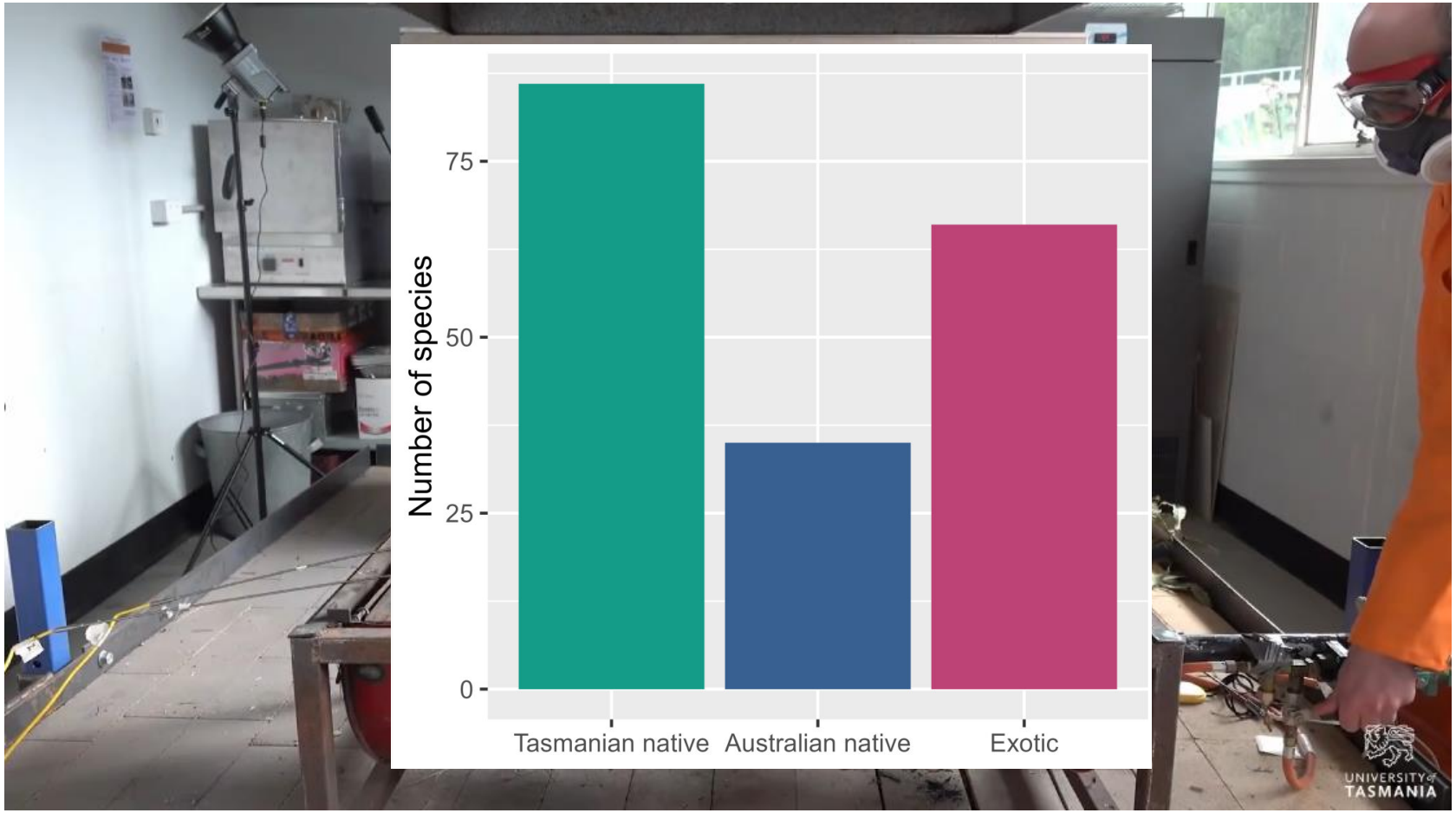
Geospatial
House Loss Models
Embers
Multi-scale Hazard Mapping

Social
Perceptions
Attitudes/Values
Barriers

- **Tools**
- **Integration**
- **Communication**

Prof David Bowman
A/Prof Owen Price
Dr Grant Williamson
Dr Stefania Ondei
Dr Amila Wickramasinghe
Dr Anna Gjedrem
Dr Sharon Campbell

Biophysical – Plant Flammability



Biophysical – Defensible Space

npj | natural hazards

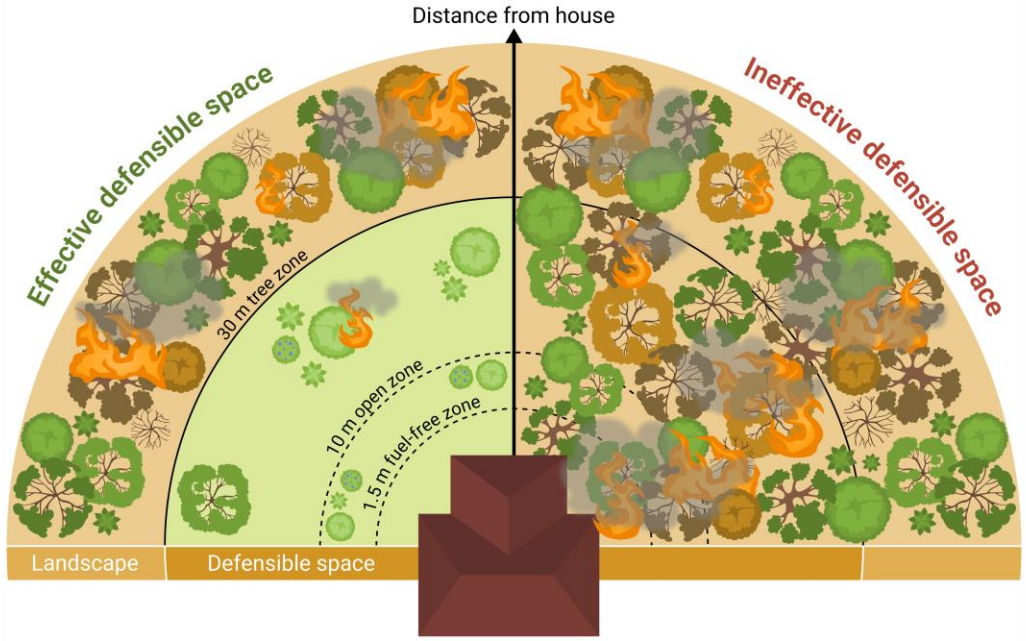
Review article

https://doi.org/10.1038/s44304-024-00012-z

Garden design can reduce wildfire risk and drive more sustainable co-existence with wildfire

Check for updates

Stefania Ondei ✉, Owen F. Price & David M.J.S. Bowman

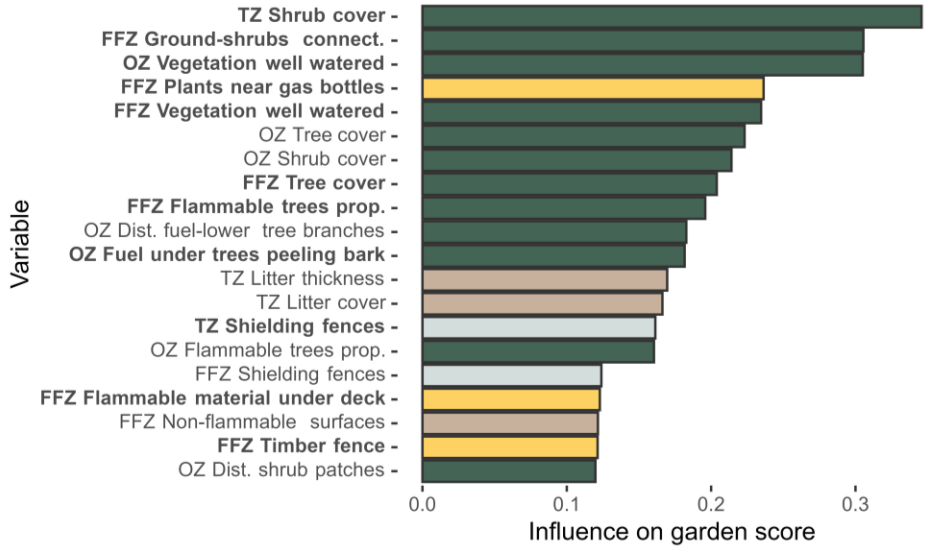


Biophysical – Garden Design/Assessment

International Journal of Disaster Risk Reduction
Volume 121, 15 April 2025, 105424

An expert system to quantify wildfire hazards in gardens and create effective defensible space

Stefania Ondei [a b], Grant J. Williamson [a b], Scott Foyster [a b], David M.J.S. Bowman [a b]



Tree cover

Not present (0%)	Low (1-15%)	Moderate (16-30%)	**High (31-50%)**	Very High (51-75%)	Extreme (76-100%)

Advice:

Tree cover in this zone is high (30-50%). It is best to avoid planting trees in this zone. If reduction or removal are not possible, ensure they do not overhang the roof, do not fill the gutters with litter, and are located away from windows.

Proportion of flammable tree species

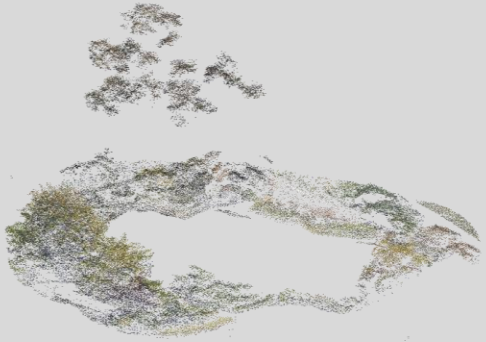
Not present (0%)	**Some (1-40%)**	Half (40-60%)	Most (>60%)

Advice:

Although only some of the trees in this zone are highly flammable, they can still constitute a risk due to the promixity to the house. Consider moving them or pruning back branches, if the crown of trees planted in a different zone extends into this.

Biophysical – LiDAR Assessment

High resolution



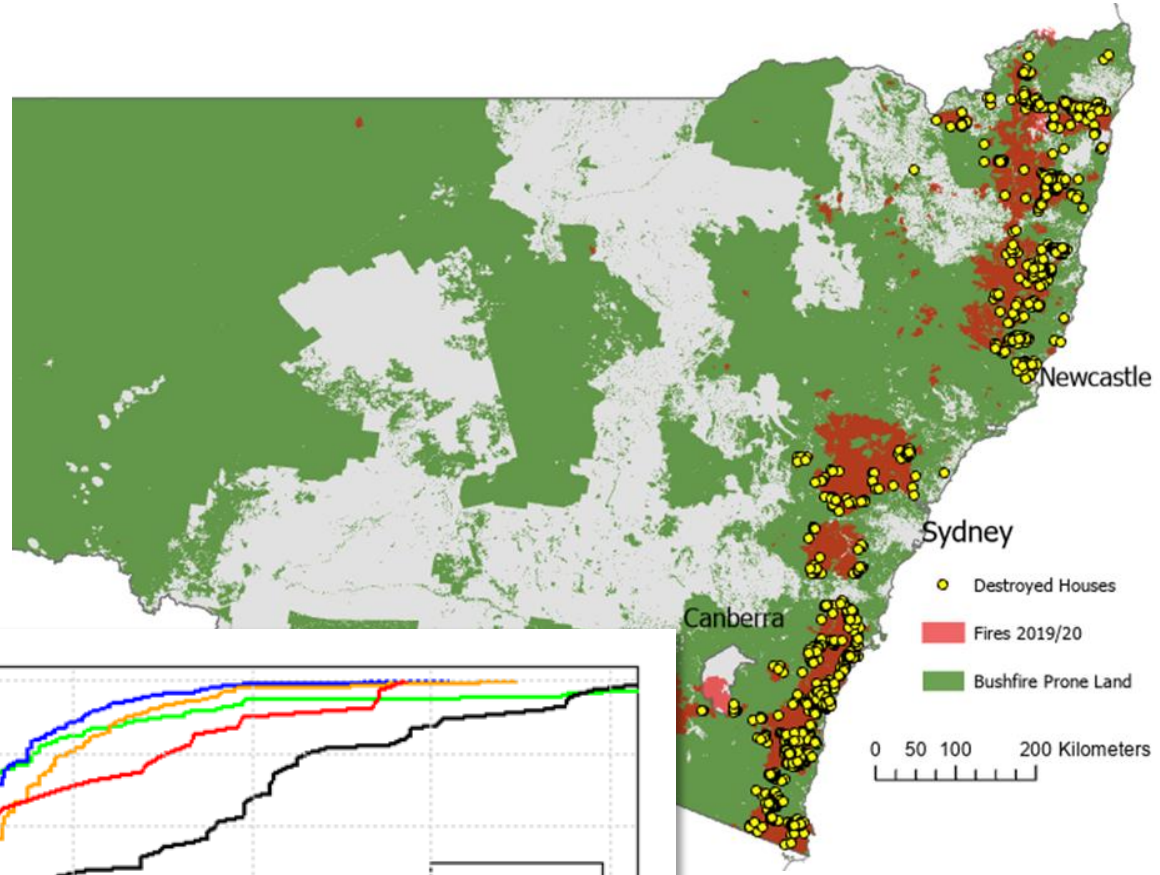
Low resolution

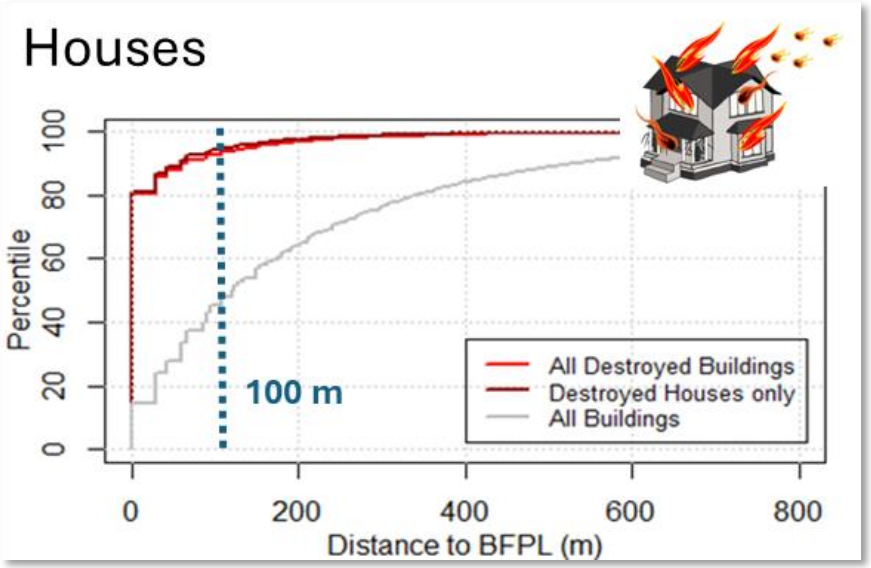
- Investigate the suitability of LiDAR data to estimate garden fire hazards
- Compare results from high- and low-res LiDAR
- Can we support/replace on-ground assessment?

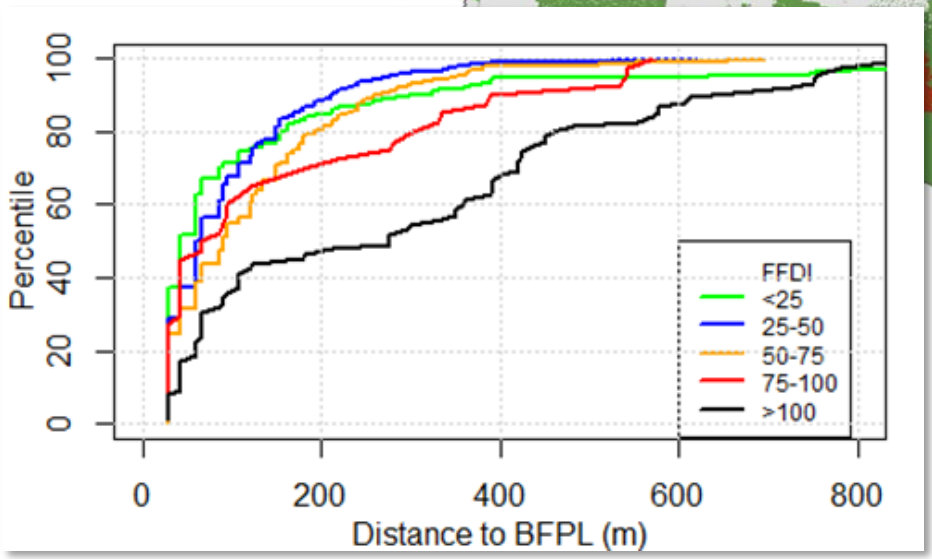
Geospatial – House Loss

Data

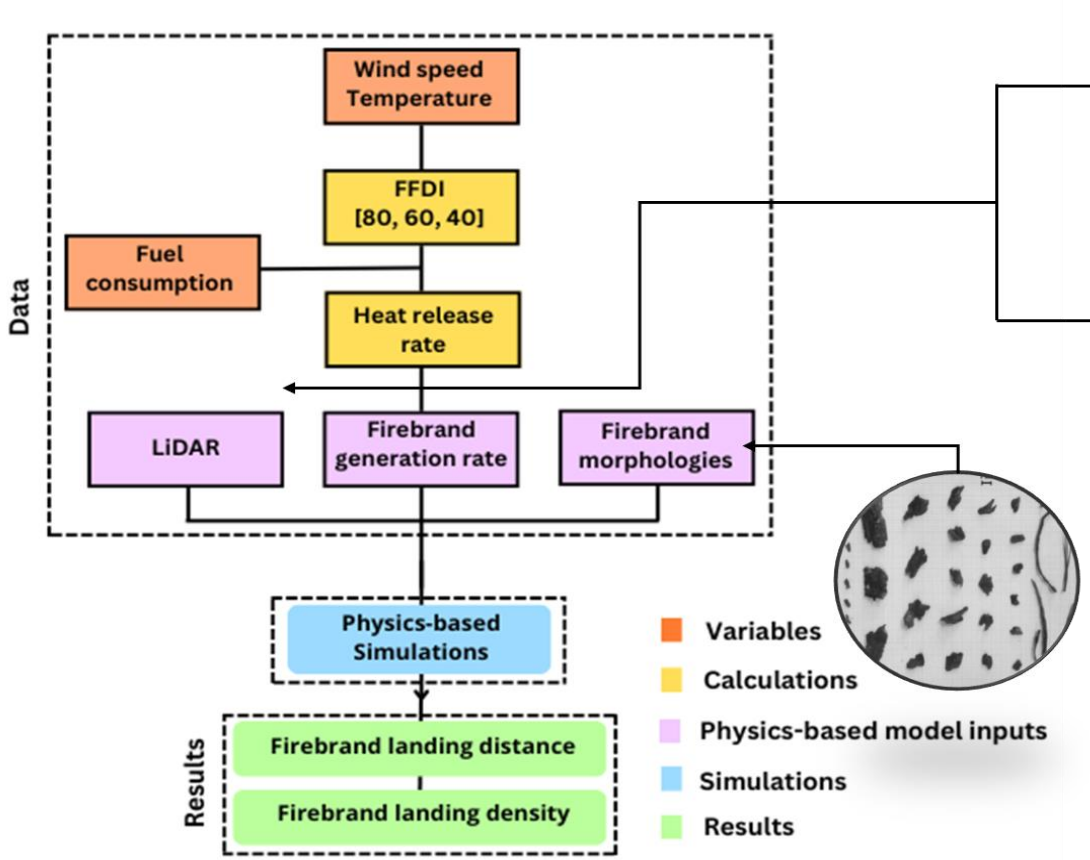
- 2574 houses destroyed across NSW
- Attribute with weather from time of fire progression
- Attribute with distance from Bushfire Prone Land

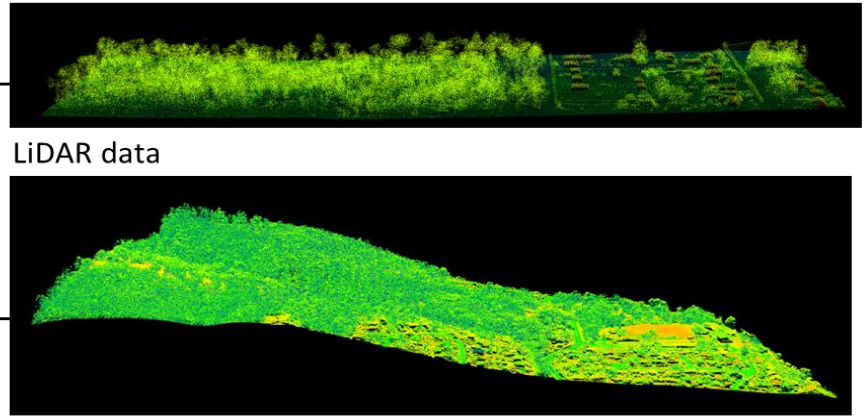






Geospatial – Ember Modelling





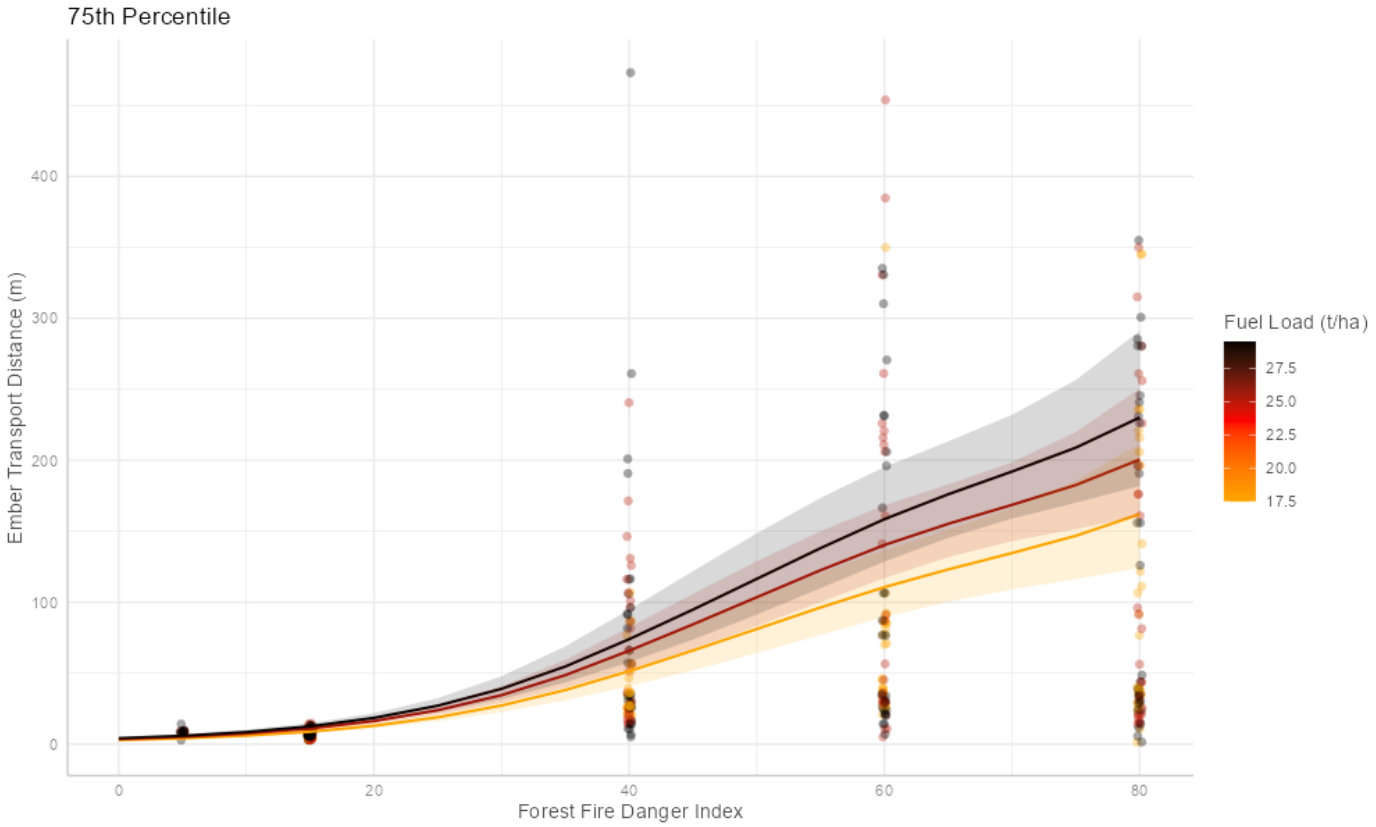
LiDAR data

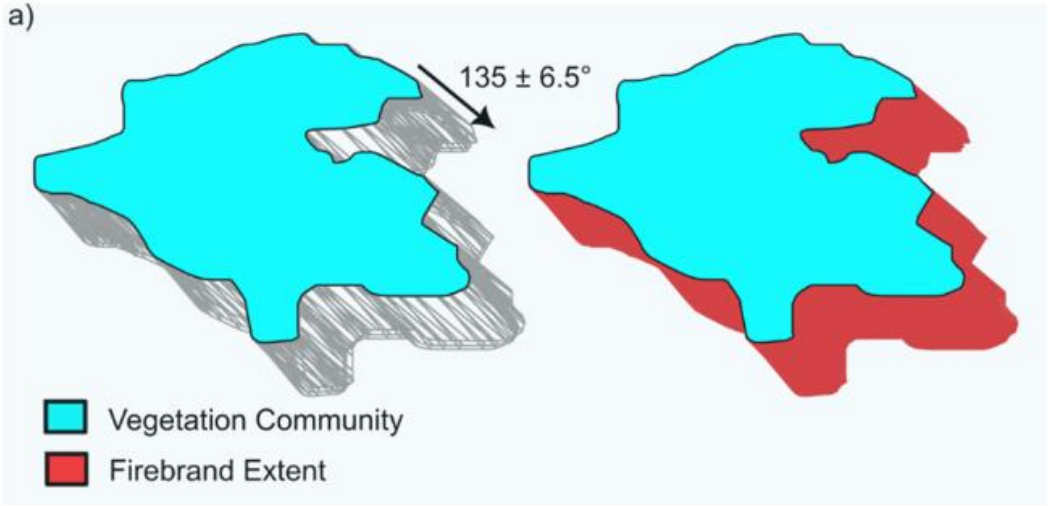
Physics-based numerical simulation of ember storms:

- Includes LiDAR-derived vegetation, terrain, and house layout.
- Simulated under a range of weather conditions (temperature, wind, FFDI)
- Simulates wind with eddies and turbulence.
- Output ember density informs empirical model

Geospatial – Ember Hazard

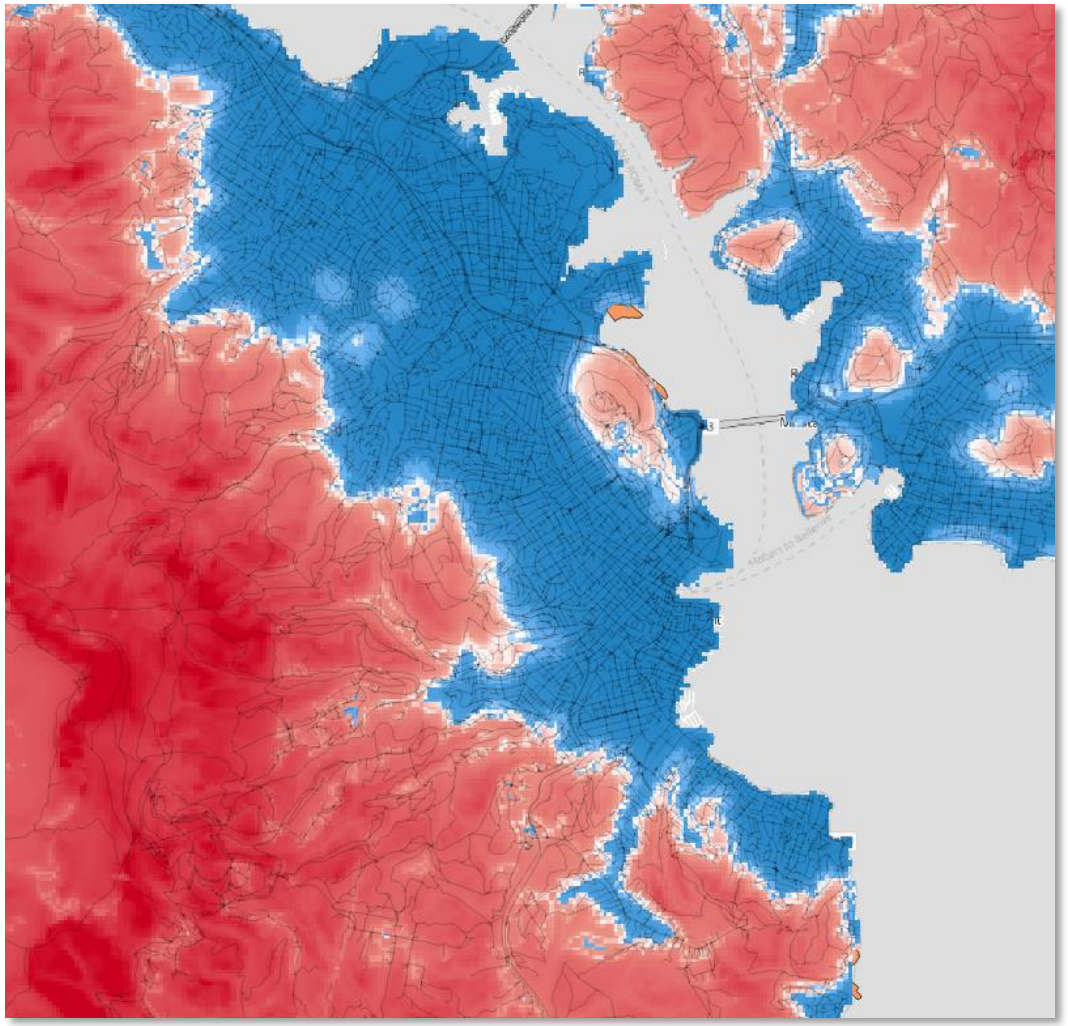
- Quantile regression of ember simulation data as function of fuel load and fire danger
- Transform into geographic space





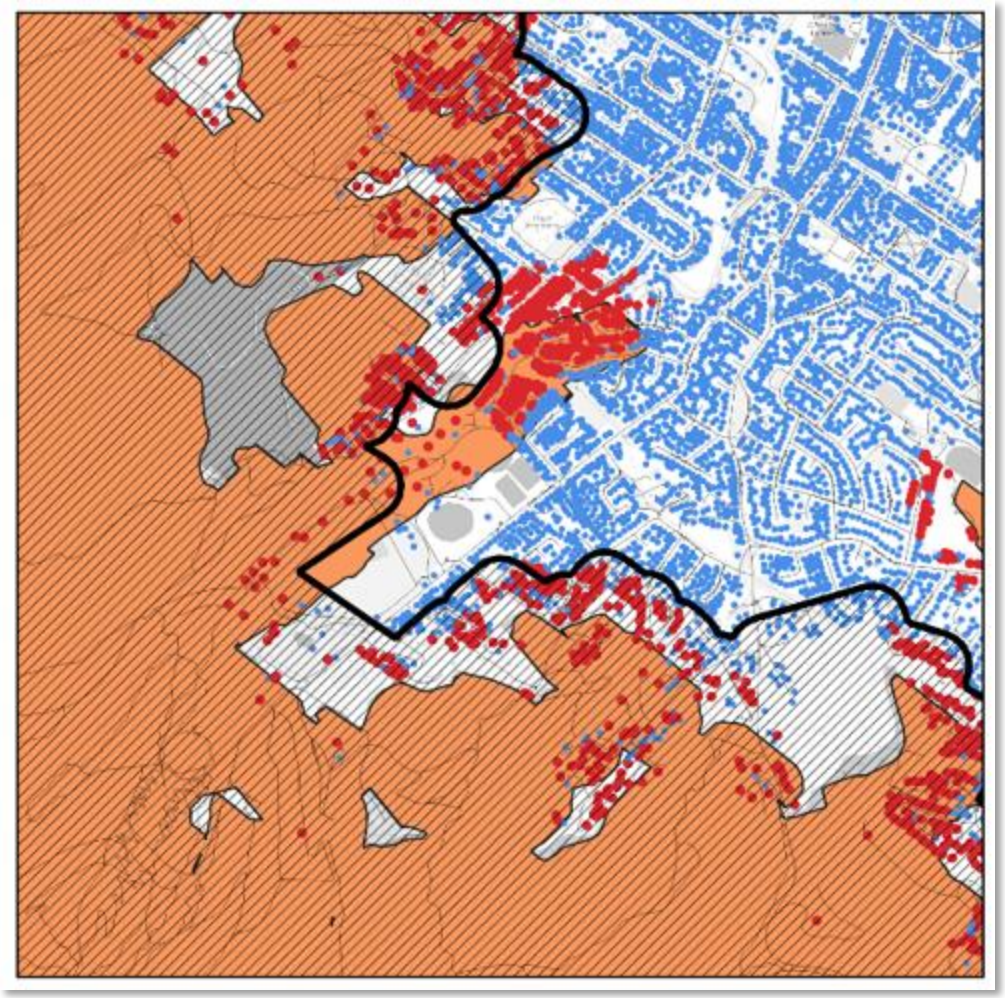
Geospatial – Radiant Heat Hazard

- Radiant heat – modelling of *safe* distance from fireline (for given vegetation, fuel load, weather) for building to withstand BAL 12.5
- Compared to actual distance of building from vegetation
- Accounts for topography, fire run, multiple approach directions



Geospatial – Radiant Heat Hazard

- Bushfire Impact Zone (100m) and Bushfire Prone Land do provide reasonable estimates
- Firebrand and radiant heat modelling identifies local areas of concern
  - Topography
  - Firebrand extending into urban areas
  - Wet forests
- Embers and heat risk encapsulated in R library



Residential bushfire adaptation

Stay Tuned…

Dr Anna Gjedrem