Experimental methodology for testing effects of variation in naturally structured fine fuel loads on fire intensity

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Write your abstract here.

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INTRODUCTION

1. Fuel characteristics - load (mass), structure, type, moisture, particle size - drive fire intensity and severity.

2. Studies in fire ecology that experimentally manipulate fuel characteristics often only change the fuel load and/or type of fuel, sacrificing some realism in fuel structure.

3. We present a methodology for maintaining realism in fuel structure in experiments where fine fuels with typical vertical structure, e.g. grasses, are manipulated.

4. We demonstrate how the Fire Aboveground Biomass Incineration Organizer (FABIO) maintains realistic fuel structure while experimentally manipulating other fuel characteristics. It can also be deployed in the field or in a more controlled "laboratory" setting. Using the exotic invasive cogongrass, we illustrate how changing the fuel structure can substantially alter flammability characteristics.

Compare Temperature Metrics to Bowman et al. 2017

(Bowman 2017) *Differential demographic filtering by surface fires: How fuel type and fuel load affect sapling mortality of an obligate seeder savanna tree.*

In this study, "Grass fuels had to be laid horizontally rather than standing vertically." The context provided is that the native sorghum flattens easily after it dries and does not remain vertical throughout the dry season.

- This reads like a response to a reviewer comment, which might indicate a gap that the FABIO methodology can fill.
- Average flame height was measured "when the fire was within 15cm of the tree stem using a metal grid placed verically against a steel picket placed next to the stem."

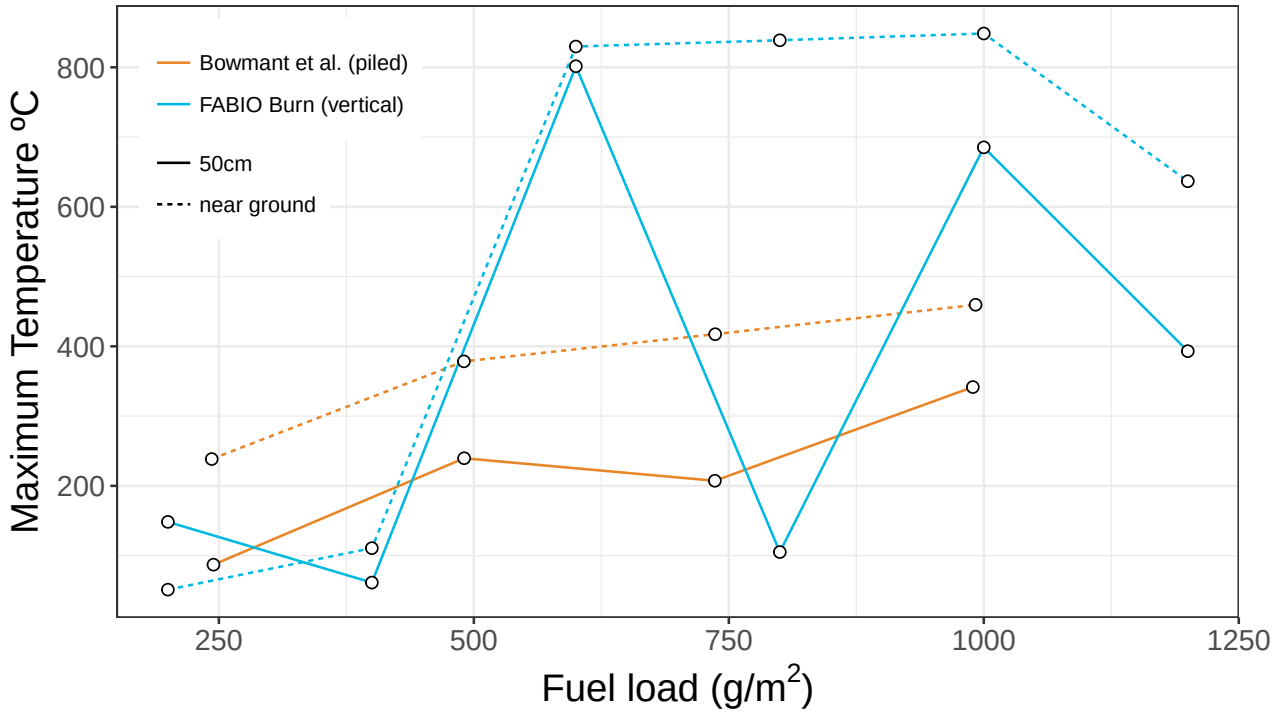
Additional references given where fuels have been laid flat when testing flammability:

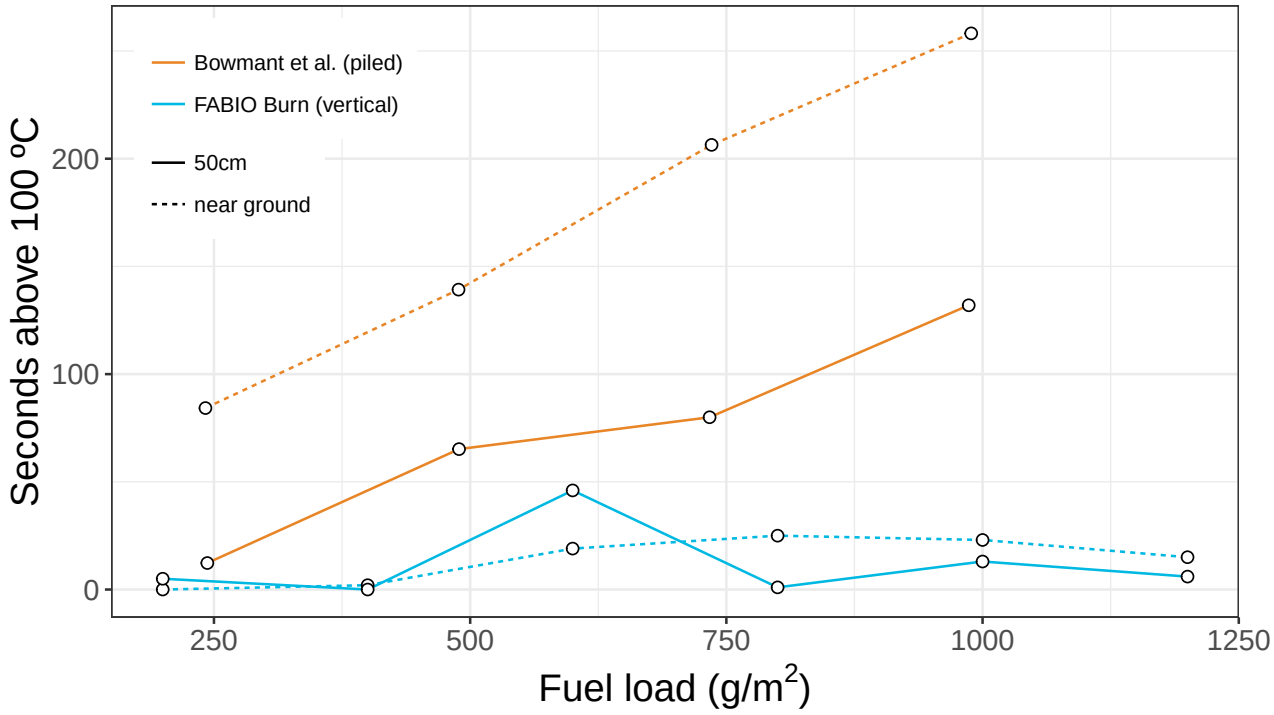
1. (JAUREGUIBERRY et al. 2011)
    - Built the Bar-B-Q apparatus to fill a need to quantify flammability of whole plants of many species
    - Quantified flammability characteristics of 34 species using "whole plant"
    - Fuels are still burnt horizontally, so no vertical structure
    - Length of fuel limited by size of burning surface
2. (Simpson 2016)
3. (Conard et al. 2016)

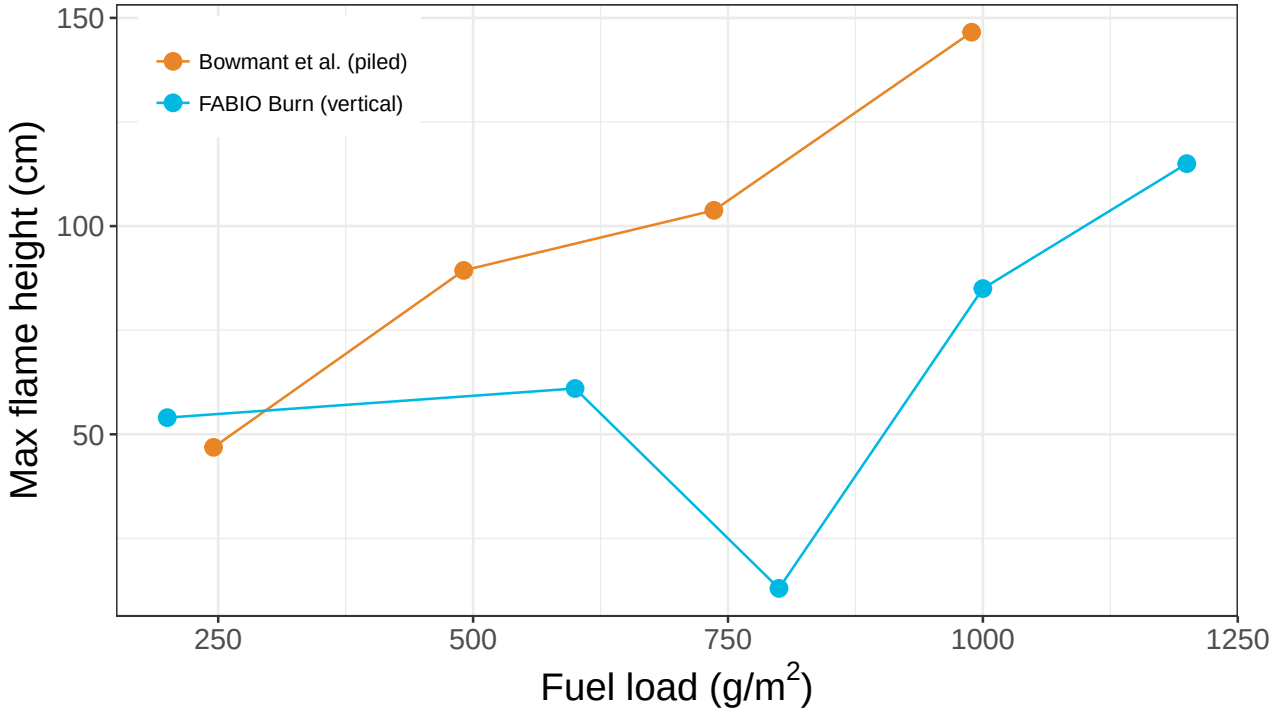
All of these studies assessed flammability of multiple species, or multiple fuel complexes.

Temperature metrics are influenced by fuel structure. In general, fuels with greater vertical arrangement will achieve higher maxium temperatures, but will also burn faster. Faster burning should

result in less exposure above temperature thresholds that cause tissue damage to plants. We show these differences in maximum temperature and time above 100 ºC for standing and piled fuels.







Write your introduction here. You can cite bibliography like this (Yan and Gerstein 2011, Sutherland et al. 2011), if you provide a `BibTeX` file with references. See http://rmarkdown.rstudio.com/authoring_bibliographies_and_citations.html for more information. Or you could also use knitcitations or RefManageR to fetch bibliographic metadata automatically from the web. For example, citing a paper can be as easy as providing its DOI (Clark and Gelfand 2006) or even just a few keywords (Ricklefs 2008). They will then automagically appear in the list of cited references.

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METHODS

Study Area

We worked in a **beautiful** place with lots of trees, like *Quercus suber* and *Laurus nobilis*.

Data collection and analysis

We applied a linear model where

$$y_i = \alpha + \beta * x_i$$

We used the statistical language `R` (R Core Team 2017) for all our analyses. These were implemented in dynamic rmarkdown documents using `knitr` (Xie 2014, 2015, 2017) and `rmarkdown` (Allaire et al. 2017) packages. All the multilevel models were fitted with `lme4` (Bates et al. 2015).

RESULTS

Trees in forest A grew taller than those in forest B (mean height: 25 versus 13 m). And many more cool results that get updated dynamically.

DISCUSSION

Discuss.

CONCLUSIONS

ACKNOWLEDGEMENTS

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List of Tables

Table 1: A glimpse of the famous *Iris* dataset.

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa

Table 2: Now a subset of mtcars dataset.

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4

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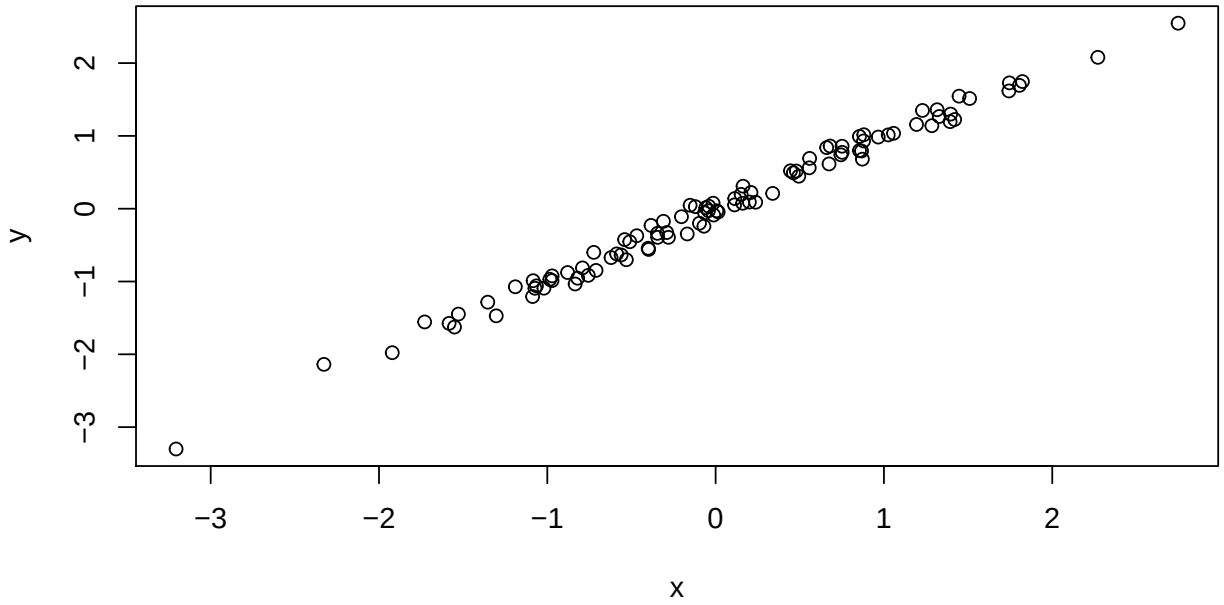

Figure 1: Just my first figure with a very fantastic caption.

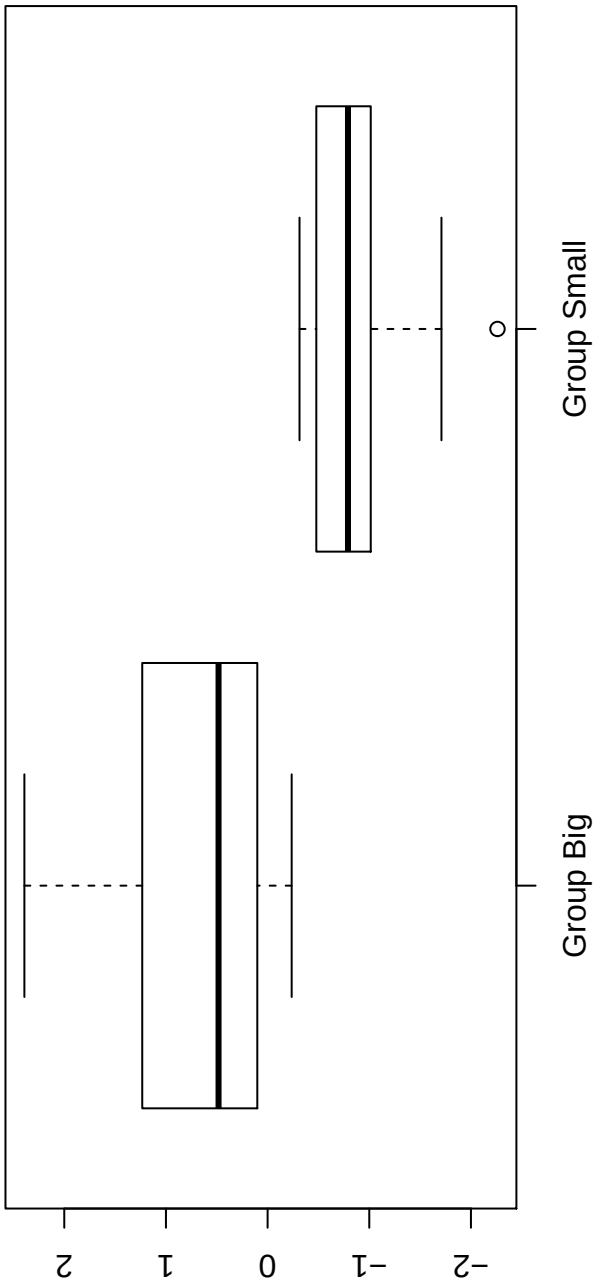

Figure 2: Second figure in landscape format.