8TH INTERNATIONAL WILDLAND FIRE CONFERENCE

GOVERNANCE PRINCIPLES: Towards an International Framework

Fuel treatments: Do they work?

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Inov4Agro

Forestwise

Context

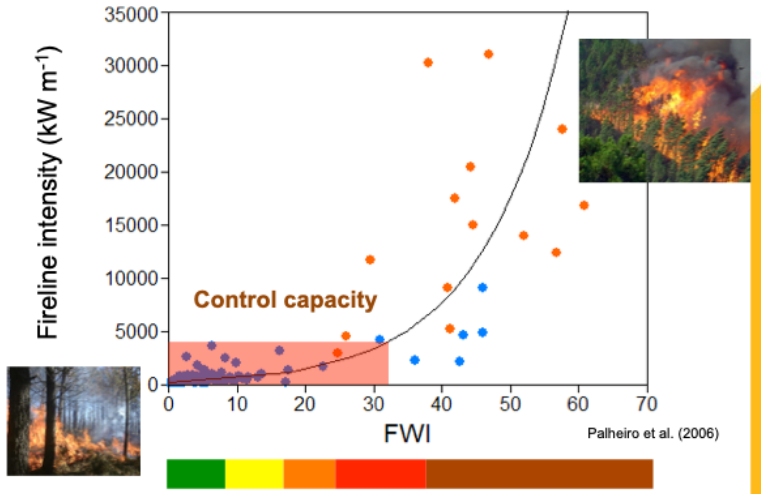
Fire disasters mitigation - Mediterranean and warm/hot temperate summer climates in general

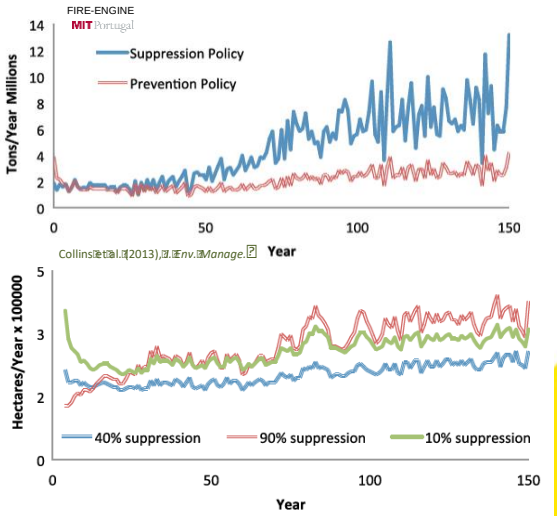
Why manage fuels?

- Fire behaviour potential:

  High fuel hazard “exposed” to high fire weather

- Wildfire control capacity depends on fire behaviour



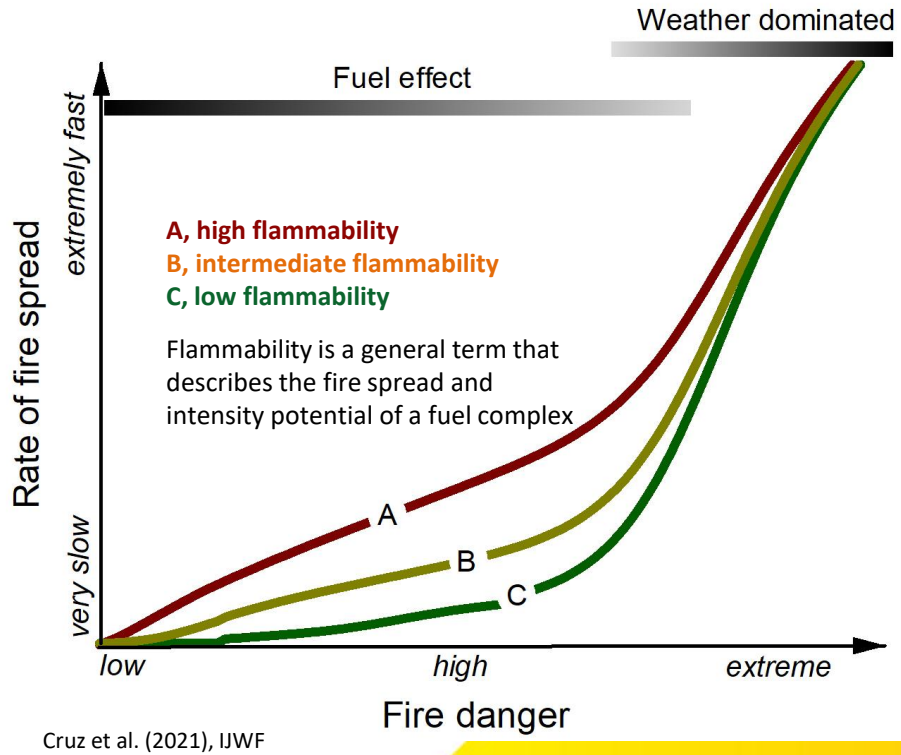


- Exacerbated by land management trends, fire control policies, and climate change

- Community protection is dependent on fuel hazard beyond the urban interface

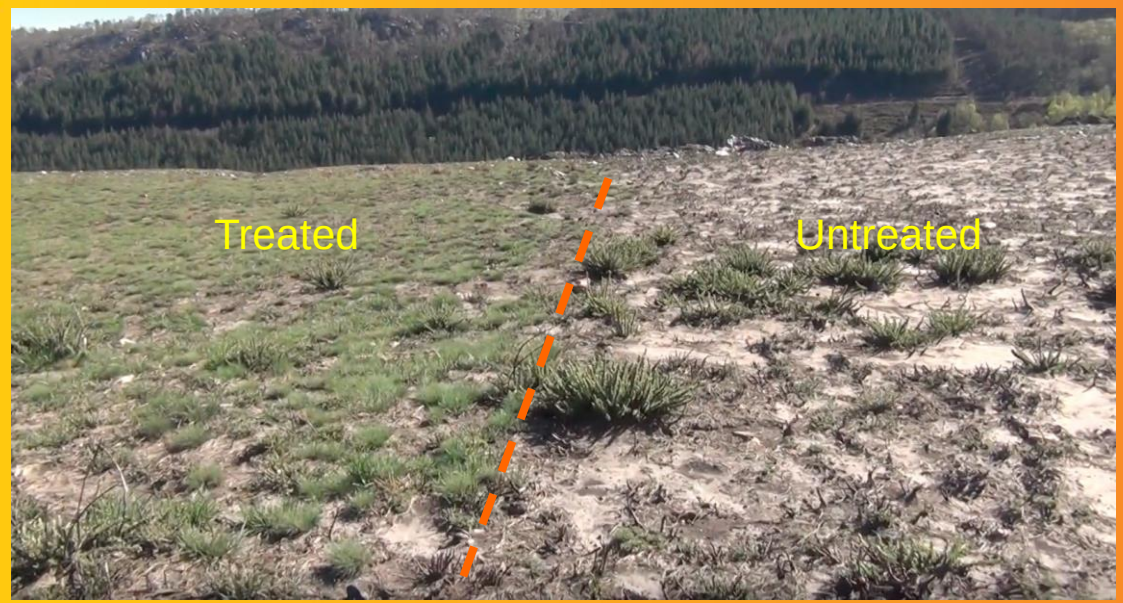
What are the expectations?

- **Decreased wildfire extent**
  - Actively – opportunities for effective fire suppression
  - Passively – slower growth



Cruz et al. (2021), IJWF

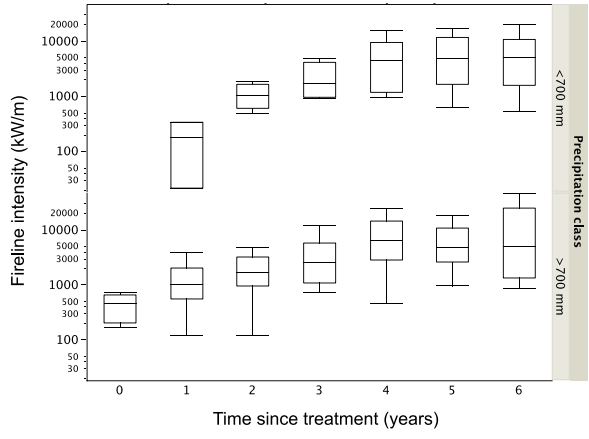
- **Decreased ecological (fire severity) and socioeconomic impacts**
  - Fire intensity / heat release directly proportional to fuel loading
  - Often unappreciated



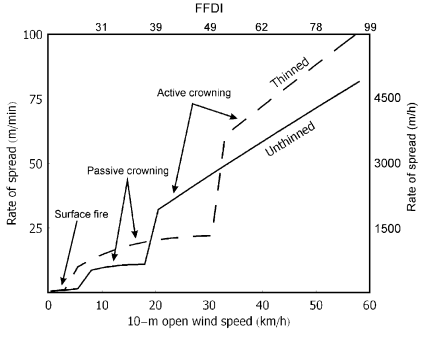
Assessing fuel treatment effectiveness

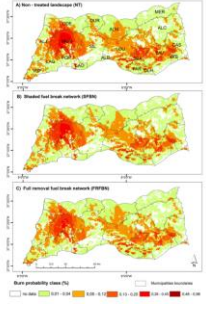
- **Observational studies are scarce**
  - Lack of interest?, e.g. effectiveness is assumed
  - Lack of data (policy-related)
  - Experimentation is difficult
- **Fire simulation**, from stand to landscape levels, and from individual events to regimes
- Inadequate models
- Unrealistic (optimistic) results

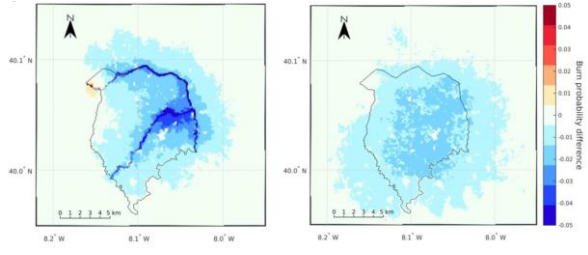
Assessment of implemented fuel treatment projects



Assessment of fuel treatment options (planning)







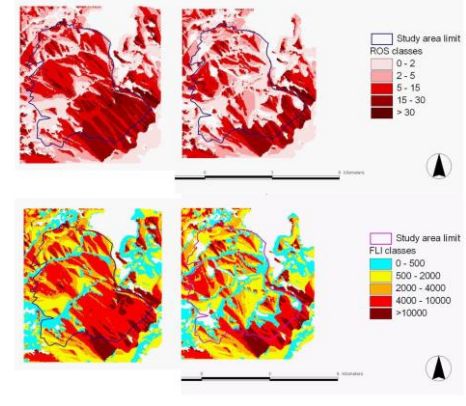
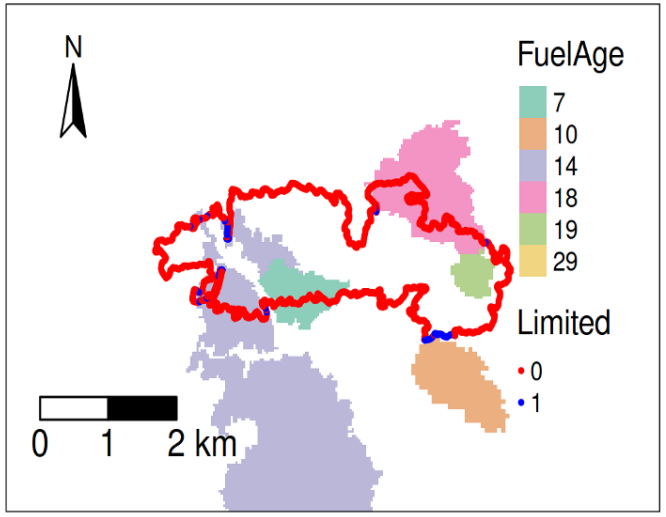


Figure 4. Classification of fire behaviour before (left) and after (right) the fuel treatment: rate of spread (top, m min^{-1}) and fireline intensity (bottom, kW m^{-1}).

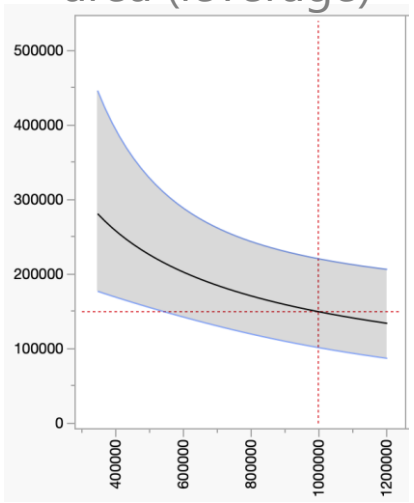
Assessing fuel treatment effectiveness

- **Inference: wildfires as fuel treatments**
  - The effects of treatments and wildfires on fuels are similar enough?
  - Compounded and confounded influences

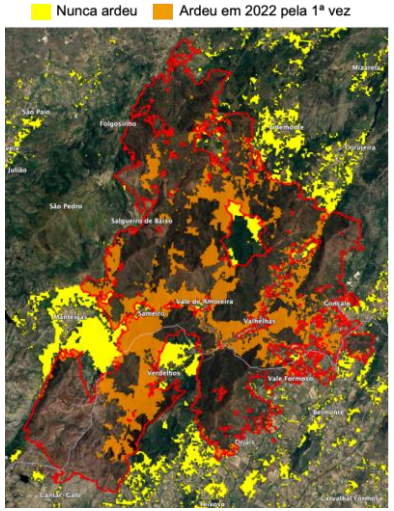
Fire-on-fire interactions:
Spread limitation by past fires



Effect of past wildfire extent on future burned area (leverage)



Preference/avoidance for old/young fuel



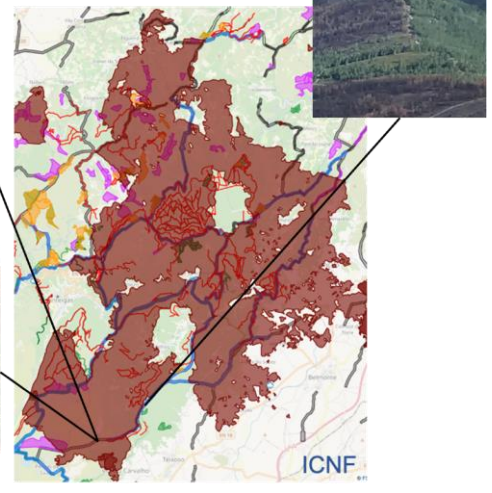
Pyrodiverse landscapes:
effect of pastoral burning

Evidence of fire-resistant forest structures

Assessing fuel treatment effectiveness

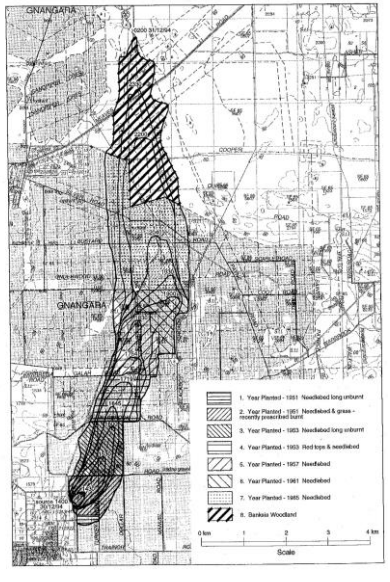
- **Observation**

  Anecdotal evidence (local effects)



Behaviour and some impacts of a large wildfire in the Gnangara maritime pine (*Pinus pinaster*) plantation, Western Australia

NEIL BURROWS, BRUCE WARD AND ALEX ROBINSON



BRÛLAGE DIRIGÉ

Historique des feux contrôlés au Portugal

*Témoignage de José MOREIRA da SILVA**

- **Incendie le 22 Août** qui a détruit 46 ha de pin maritime âgé de 30 ans sur le territoire de l'Administration de Cabeceiras de Basto, district de Braga.

Un feu contrôlé avait été réalisé le long du chemin forestier sur une largeur de près de 25 mètres au-dessus et au-dessous et par bandes de 50 mètres de chaque côté de diverses rivières.

Le feu avait pris naissance dans des propriétés privées, dans la partie la plus basse du versant et lorsqu'il a atteint le chemin forestier, il a diminué de vitesse et d'intensité, mais il a été impossible de l'arrêter en raison, manifestement, de la largeur insuffisante de la bande de protection établie en vue de rendre possible l'action des brigades d'attaque contre l'incendie.

- **Incendie le 9 Septembre** qui a détruit 38 ha de pin maritime âgé de 35 ans, et 20 ha de pin sylvestre sur le territoire de l'Administration d'Amarante, district de Porto.

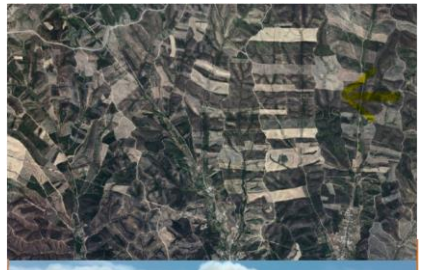
Avant de pouvoir mettre en place le système d'attaque contre l'incendie, ce dernier a dépassé une ligne de pare-feu que l'on avait débroussaillée dans la partie supérieure d'un peuplement de *Pinus sylvestris* peu développés et où l'on avait effectué un feu contrôlé

Photo 5 : Peu de combustible et des conditions optimales permettent d'effectuer des brûlages avec plus de facilité.

Photo J.M.S.

causé aucun dommage apparent. Jusqu'en 1985, avant le grand incendie qui a détruit plus de 3000 ha, on pouvait encore voir une frange verte marquant la zone où la biomasse combustible avait été réduite. Notons que les coûts de coupe et d'extraction manuelle des broussailles, à l'époque, tion) est 150 fois supérieur à celui du feu contrôlé.

- **Incendie le 15 Septembre** qui a détruit 7 ha de pin maritime, âgé de 30 ans, sur le territoire de l'Administration de Ponte de Lima, district de Viana do Castelo.



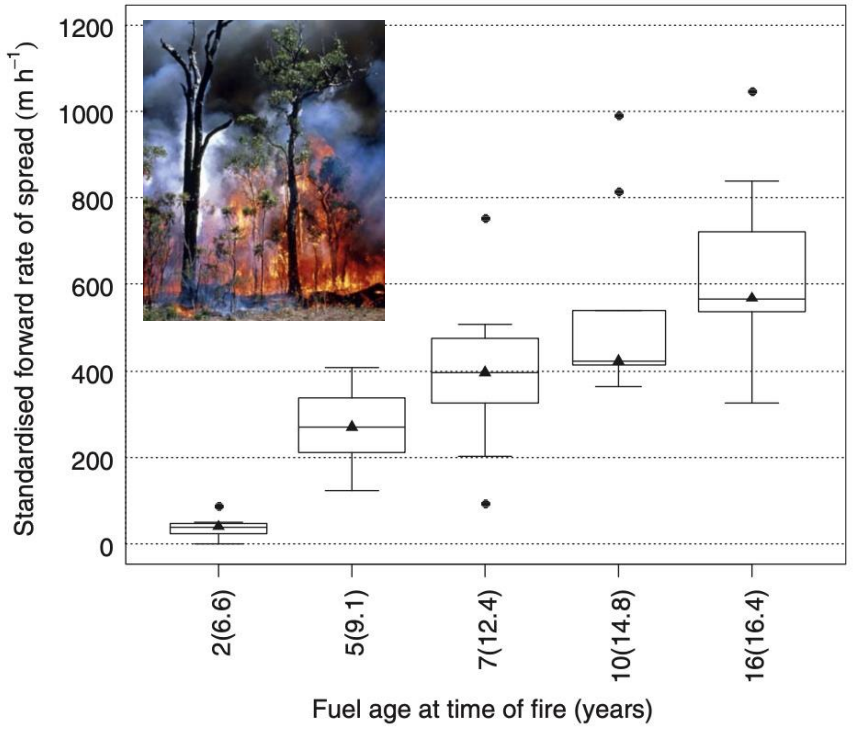
Assessing fuel treatment effectiveness

- **Observation**

  Experimental fires

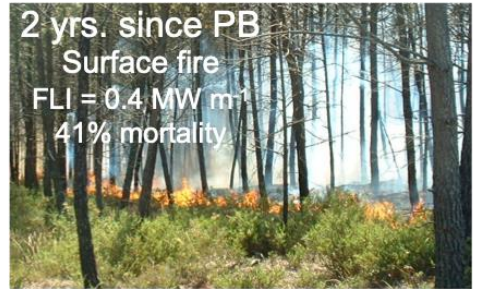
  - Limited by burning conditions

Dry eucalypt forest in SW Australia (McCaw et al. 2012)



Maritime pine forest in Portugal (Fernandes et al. 2004; Fernandes 2009)

Experimental fire behaviour variability: effect of time since PB

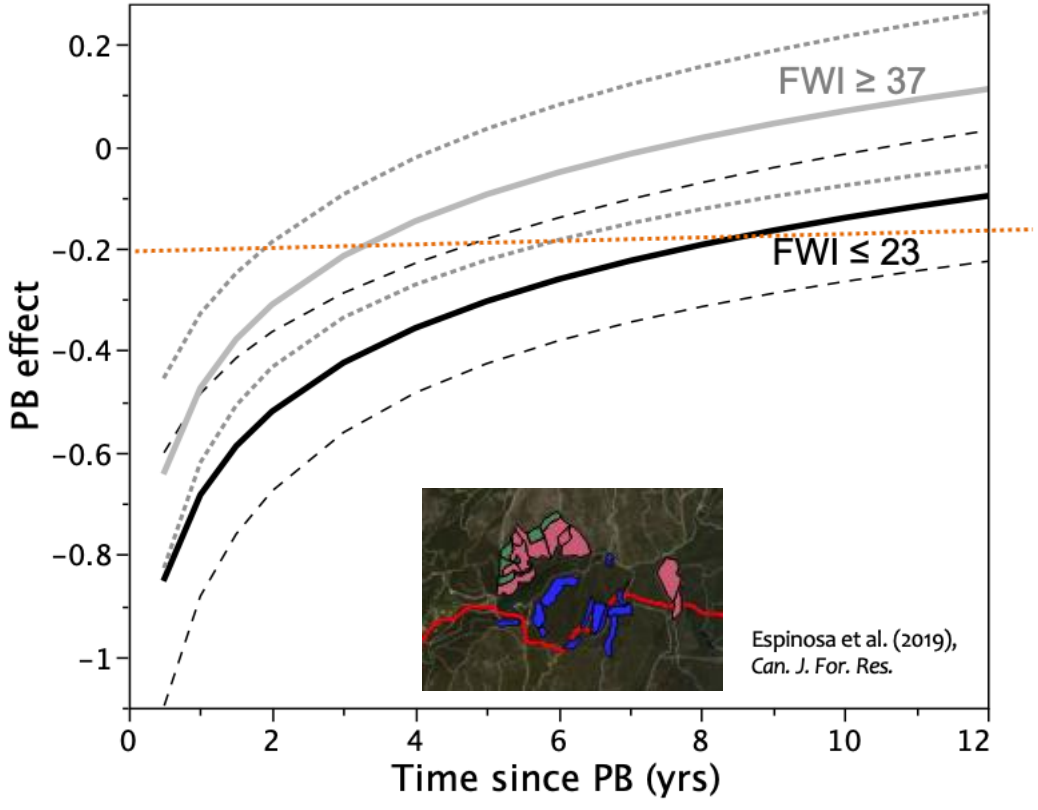


Assessing fuel treatment effectiveness

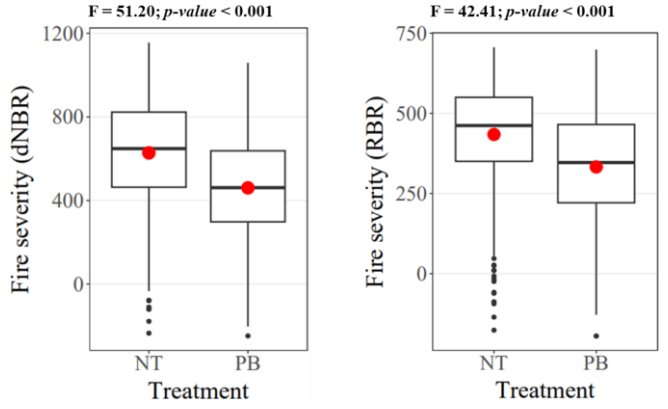
- **Observation**

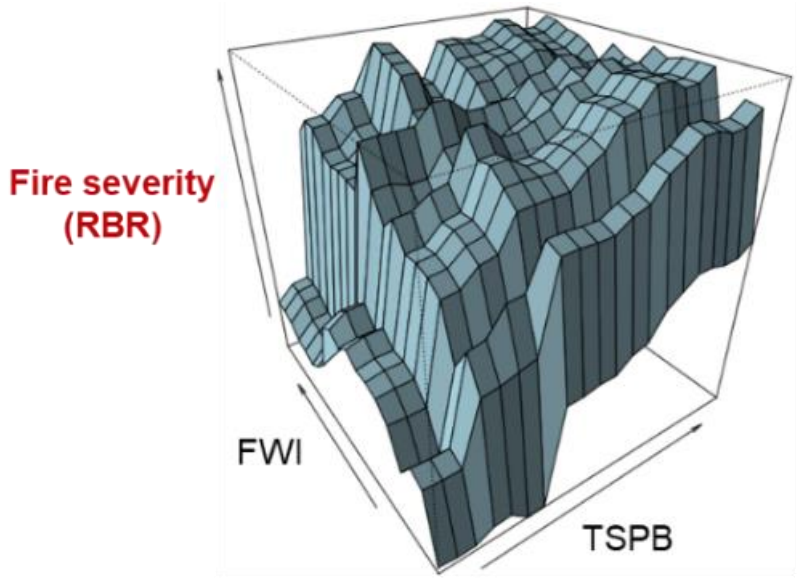
  Treatment interception by wildfire

Fire severity in maritime pine forest



Fire severity in shrubland



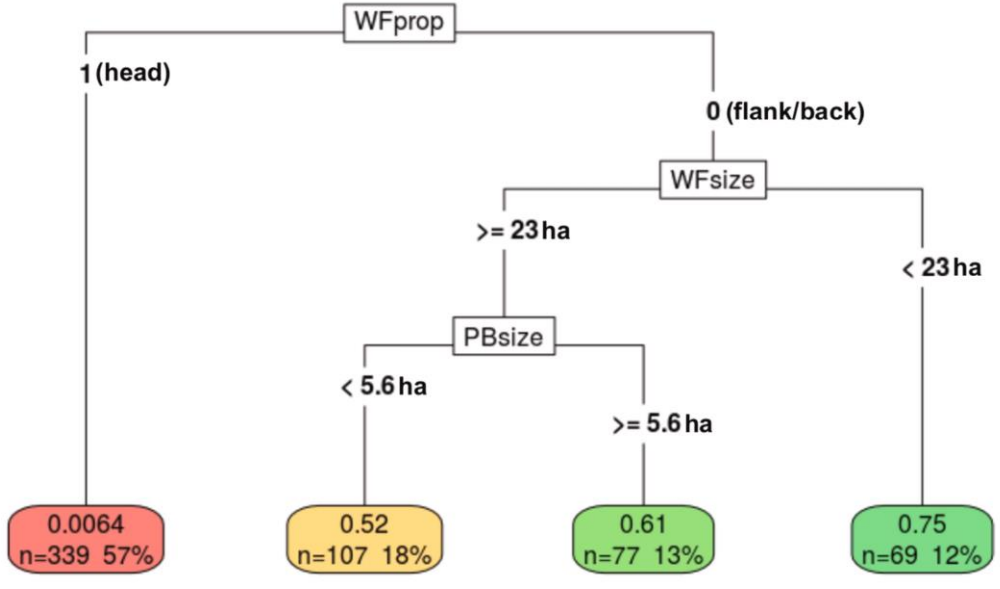


Assessing fuel treatment effectiveness

- **Observation**

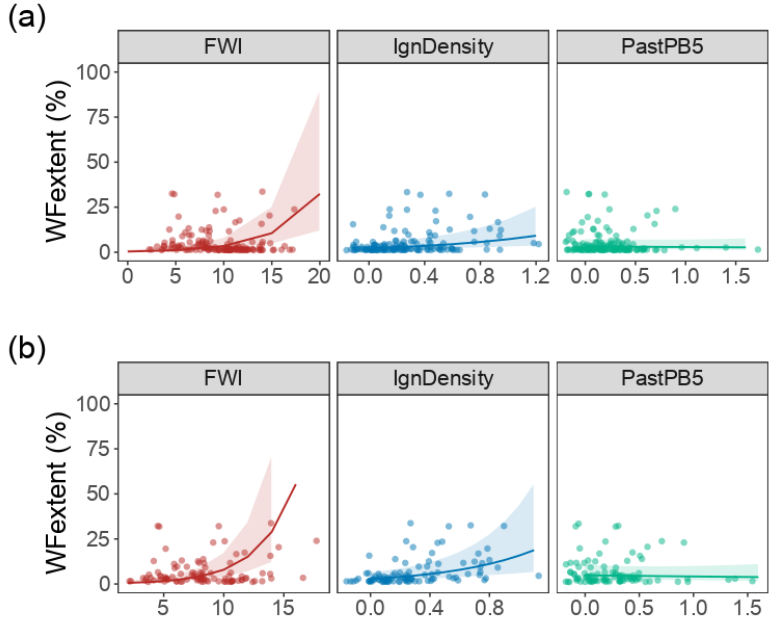
  Treatment interception by wildfire

Survival of prescribed-burnt areas to wildfire interception



Davim et al. (2021), *For. Ecol. Manage.*

Leverage effect of prescribed burning on wildfire extent

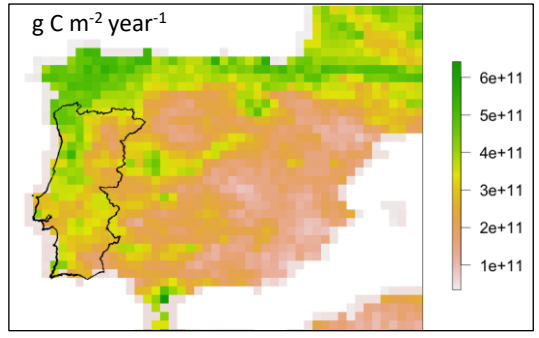


Davim et al. (2022), *For. Ecol. Manage.*

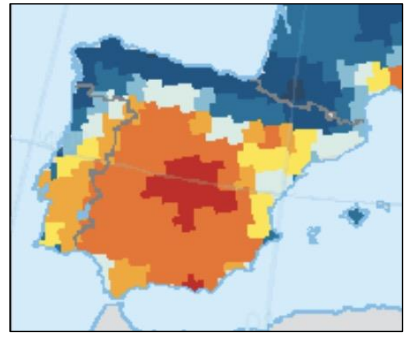
What do we know in a nutshell

- Wildfires are self-limiting: past fire constrains future fire
- More extreme wildfires coincide with older fuels
- Pyrodiverse landscapes (associated with pastoral burning) hinder large wildfire spread, even under extreme weather
- Fire-resistant conifer forest in frequent-fire locations, consistent with experimental fire data and wildfire-treatment encounters
- Treatment "survival" to wildfire dependent on wildfire characteristics, treatment size and time since treatment
- Unmanned fuel breaks are seldom effective
- Fuel treatments have lower leverage – worst case scenario = 5:1 – than wildfires (up to 1:1), even where interception by fire is frequent and occurs early
- Treatment longevity (different from steady-state fuel hazard) is limited by fuel dynamics / productivity

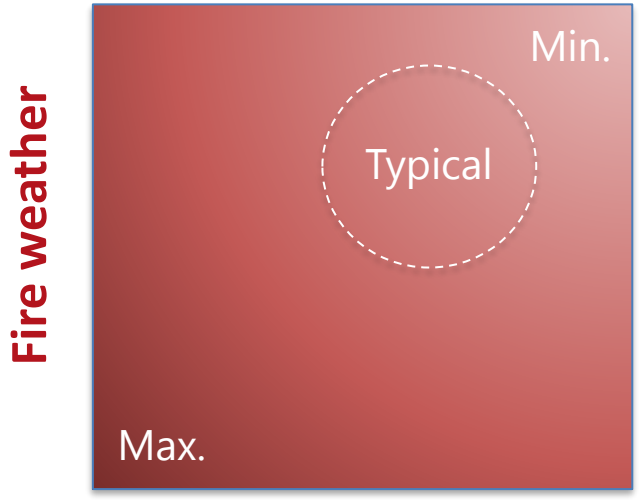
Productivity



Fire weather



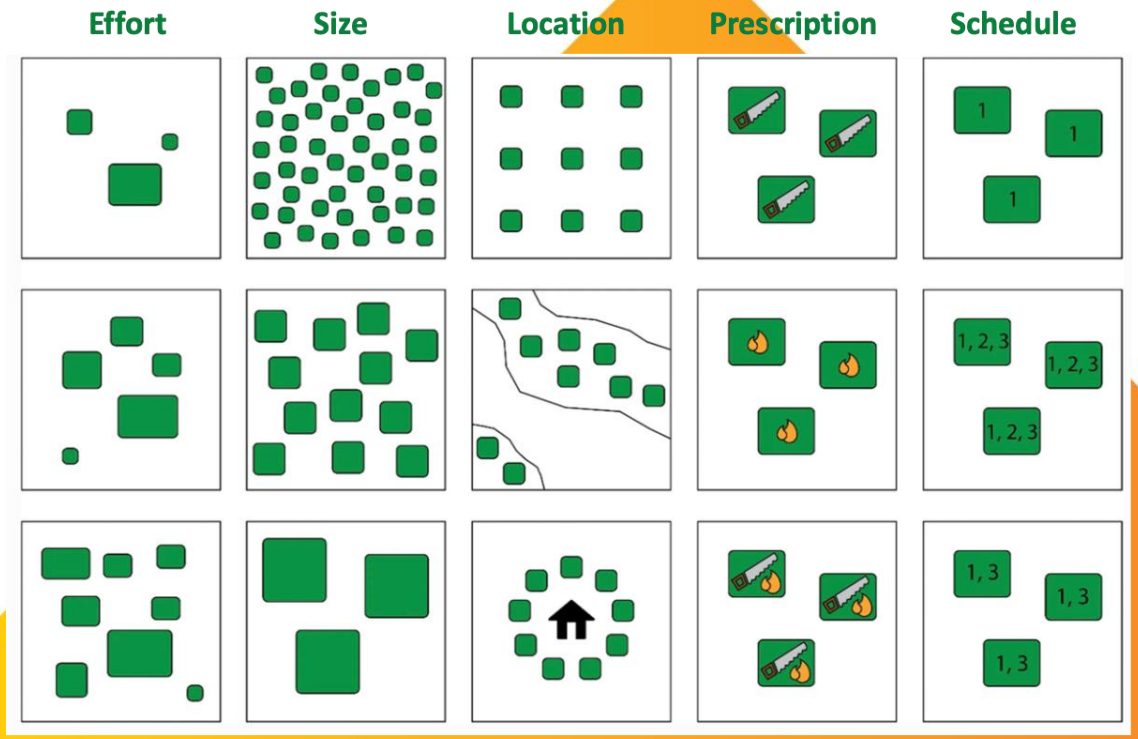
Fuel-treatment effectiveness natural trade-off



There are factors at play other than climate-related and with governance implications…

Fuel-treatment scale and planning

- Low treatment effort
- Spatial arrangement is random rather than strategic: small, disperse, non-redundant treatment units
- Linear rather than area-wide treatments



Ott et al. (2023), *Fire Ecol.*

Does fire suppression takes advantage of treatments?

- Many treatments not large enough to offer control opportunities
- Suppression resources absent or passive:
  - Scarcity and competition
  - Poor access or safety concerns
  - Unaware of treatments
  - Firefighting model (urban = road & water dependent)

Features of unbalanced fire-management systems, centered on emergency response but oblivious to natural resources management

Conclusion

- Prefer fires to fire modelling when assessing fuel treatments
- Scale-up fuel treatments and optimize their spatial arrangement
- Improve fire management planning in general, developing synergies between fuel management and fire suppression operations

Otherwise fuel treatments will be valuable to protect localized assets, but will not mitigate landscape-level impacts of wildfire

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