Facing fire in a changing world: Reducing Vulnerability of People and Landscapes by Integrated Fire Management

Early-dry season prescribed burns used for fire management maintain woody vegetation structure in Cerrado open savannas

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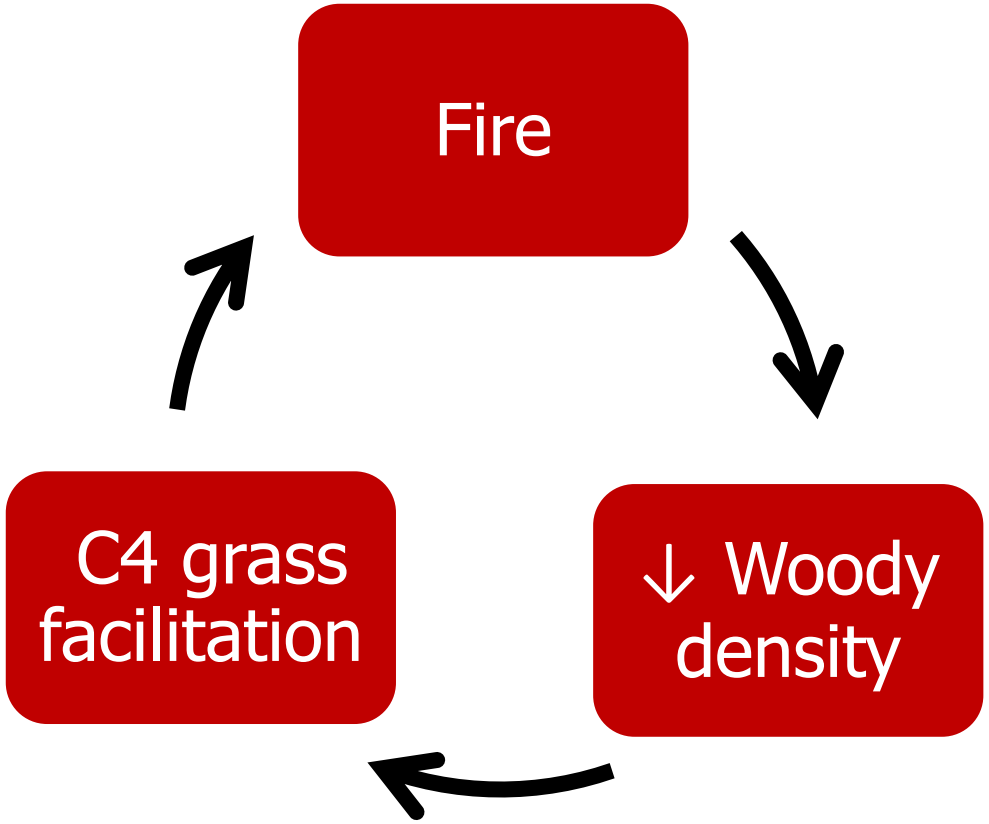
Fire - an ecological driver in the Cerrado

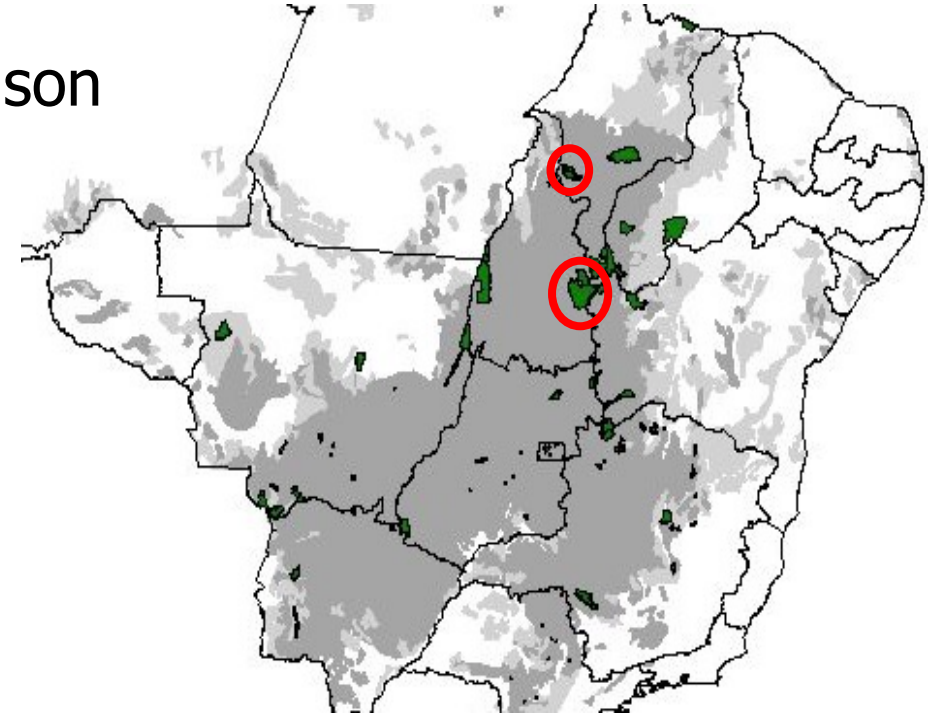
Estimated return interval: 1-9 years



(Beerling & Osborne 2006; Miranda *et al.* 2010)

IFM in the Cerrado

- First implemented in Northern Cerrado
- Prescribed burns – rainy and early/mid-dry season



Knowledge gaps

- Effects of prescribed burns on the vegetation
- Effects of fire in Northern Cerrado

Isabel B. Schmidt

Objectives

i. Assess the effects of distinct fire regimes on the woody vegetation in two PA that adopted IFM
   - EDS/MDS fires
   - LDS wildfires
   - Fire exclusion
ii. Contribute to IFM decision-making

Hypothesis

EDS/MDS fires:

↓ damage to plants
↓ changes in woody vegetation structure

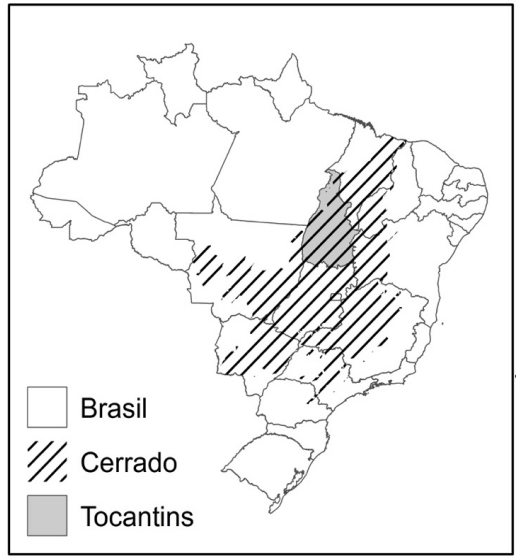
than LDS wildfires

Study area

Jalapão, Tocantins state, Brazil

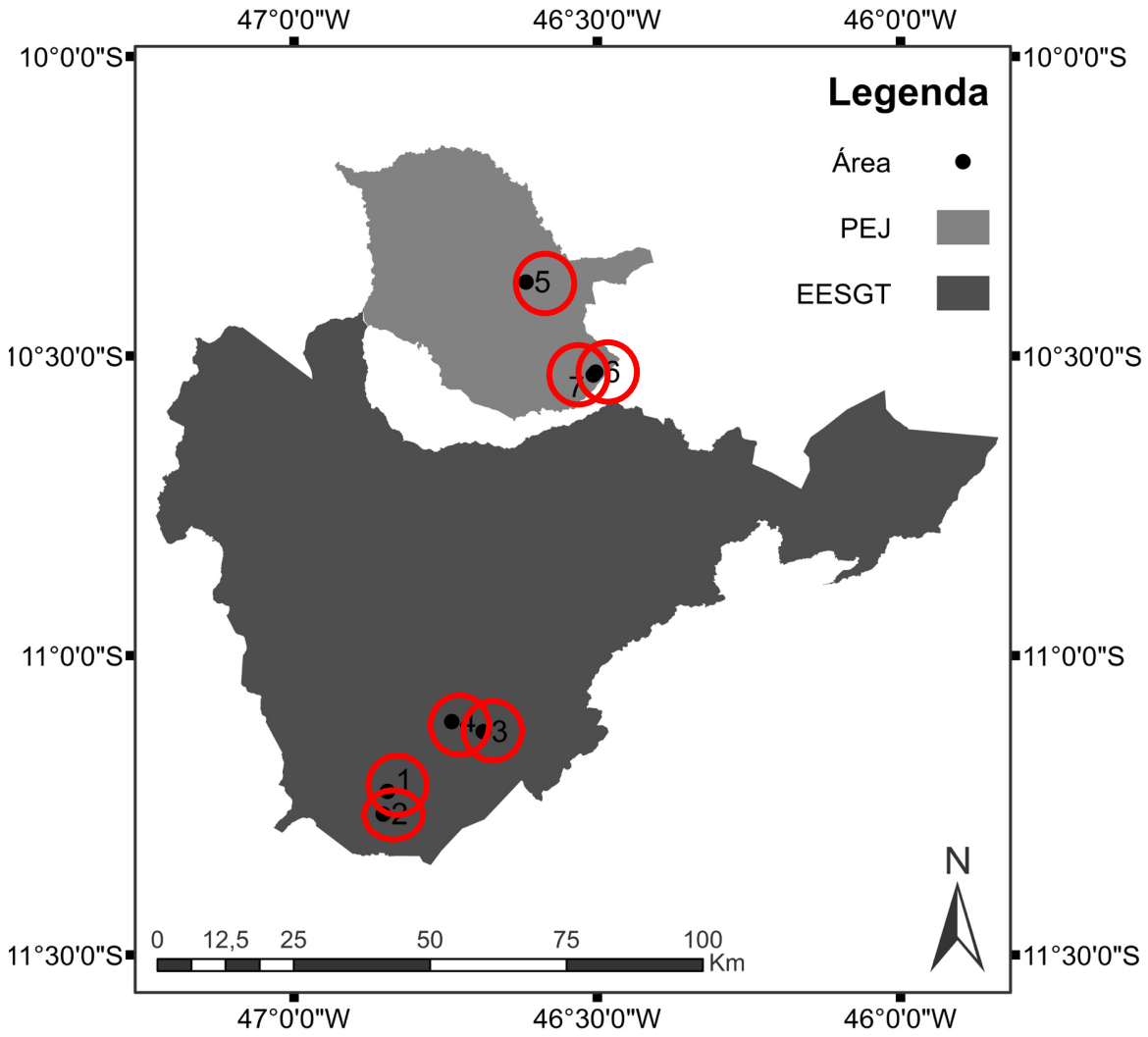
- Serra Geral do Tocantins Ecological Station
- Jalapão State Park
- Mumbuca Quilombola Community

- Open savanna
- Sandy soils
- Shorter plants



(ICMBio 2014; SEPLAN 2013; Franke *et al.* 2018)

Experimental design



7 areas → 42 plots

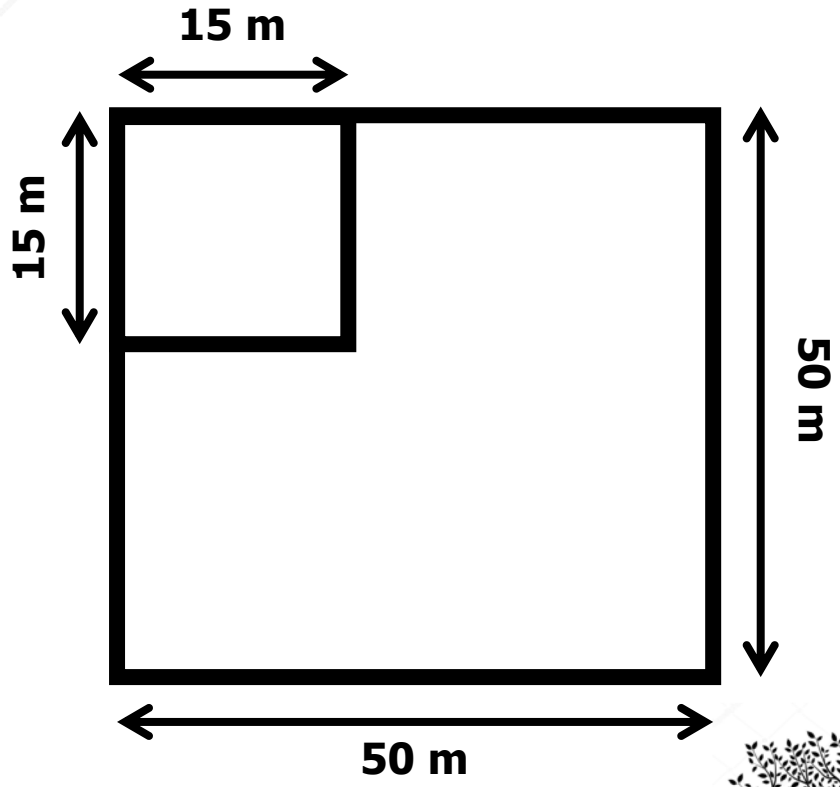
- Biennial EDS/MDS Management Fires (**MF**)
- Biennial LDS Fires (**LF**)
- No fire (**Control**)

- Participation of PA managers
- According to ongoing actions
- Fires lit in 2015 and 2017

Data sampling

- Repeated yearly

Saplings: 1 cm ≥ diameter ≥ 5 cm



Trees: diameter ≥ 5 cm

Data sampling

- Vegetation structure
  - Stems.ha^{-1}
  - Total basal area (m^{-2}.ha^{-1})

- Plant responses to treatments
  - Epicormic resprouting
  - Basal resprouting
  - Epicormic and basal resprouting
  - No resprouts
  - Topkill
  - Plant death

Statistics

- **Woody vegetation structure → LMMs**

Stem density

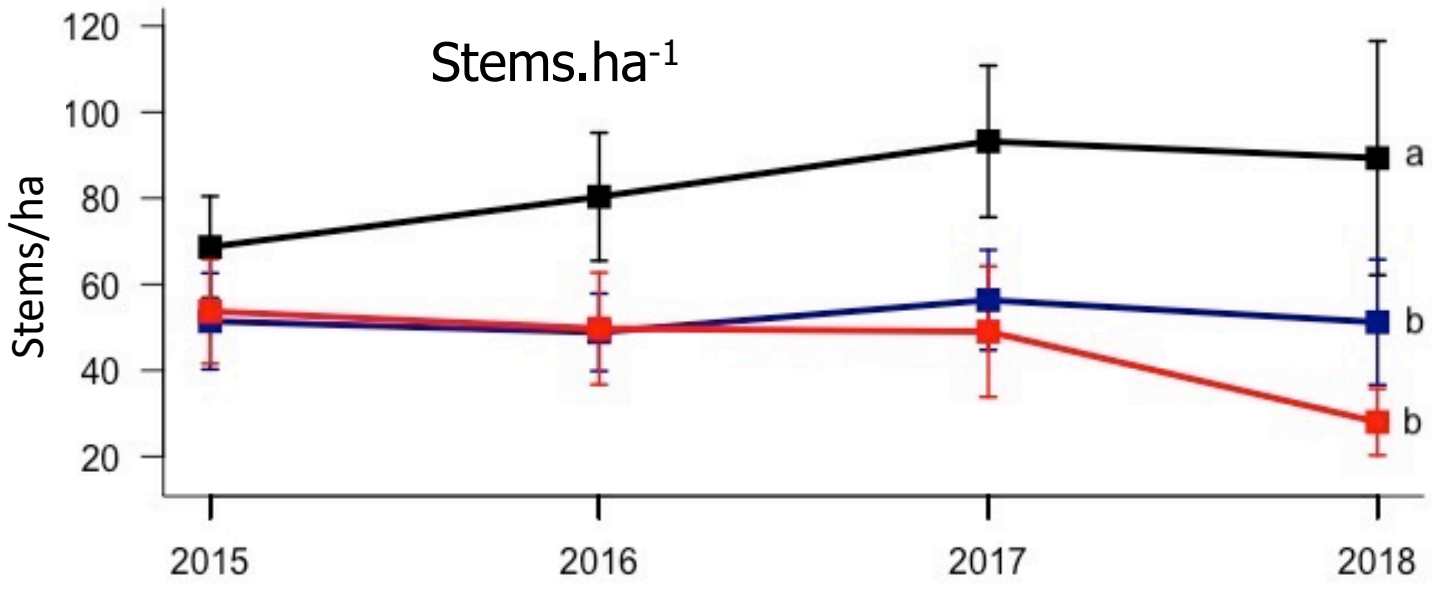
Basal area

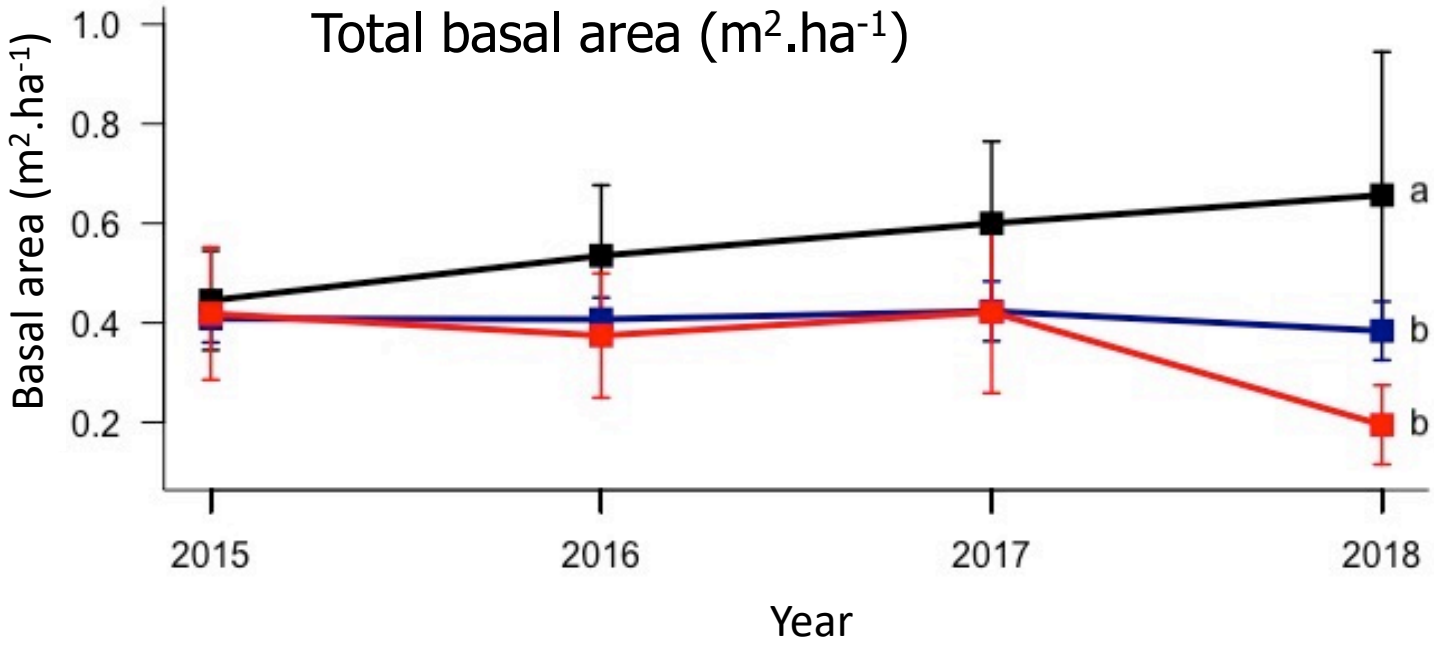
$$\sim \text{ treatment} + \underbrace{(\text{experimental area}) + (\text{time})}_{\text{Random effects}}$$

- **Plant responses to treatments → GLMs** (1 for each sampling year)

$$\text{Plant responses} \sim \text{treatment}$$

Vegetation structure



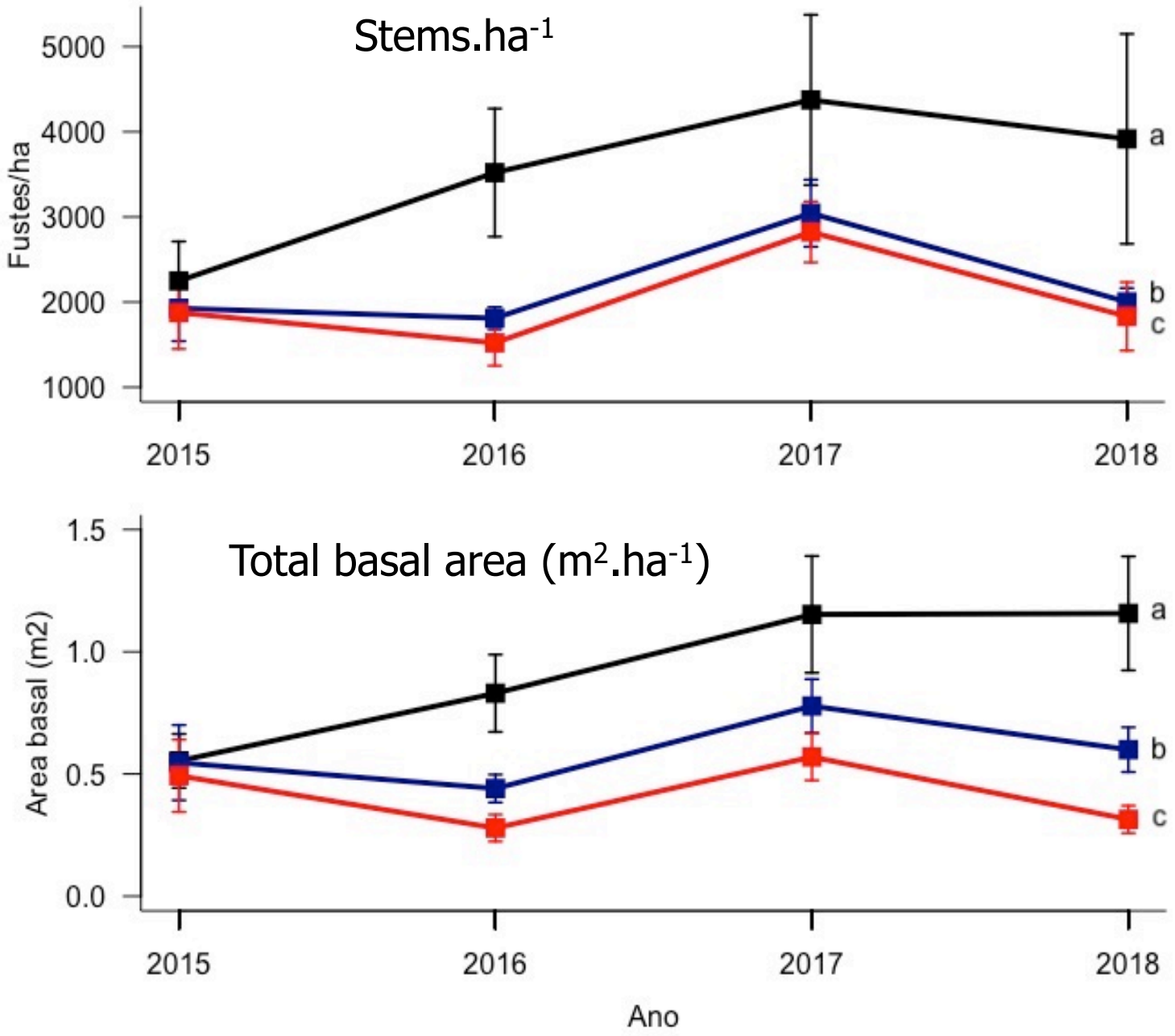


Trees

- **MF:** stable
- **LF:** ↓ after 2nd fire
- **Control:** ↑

Control
MF
LF

Vegetation structure



Saplings

- **MF:** stable after 2nd fire
- **LF:** ↓ after 2nd fire
- **Control:** ↑ until 2017 then stable

Control
MF
LF

Vegetation structure

- **Maintained by MF**
- Changed by LF:

  Saplings: stem density 2018 ≈ 2015 but ↓ basal area → thinner stems

  - All stems replaced up to 2y after the fires

  Trees: failed to recover previous size after 2 biennial fires

Vegetation structure

MF

LF

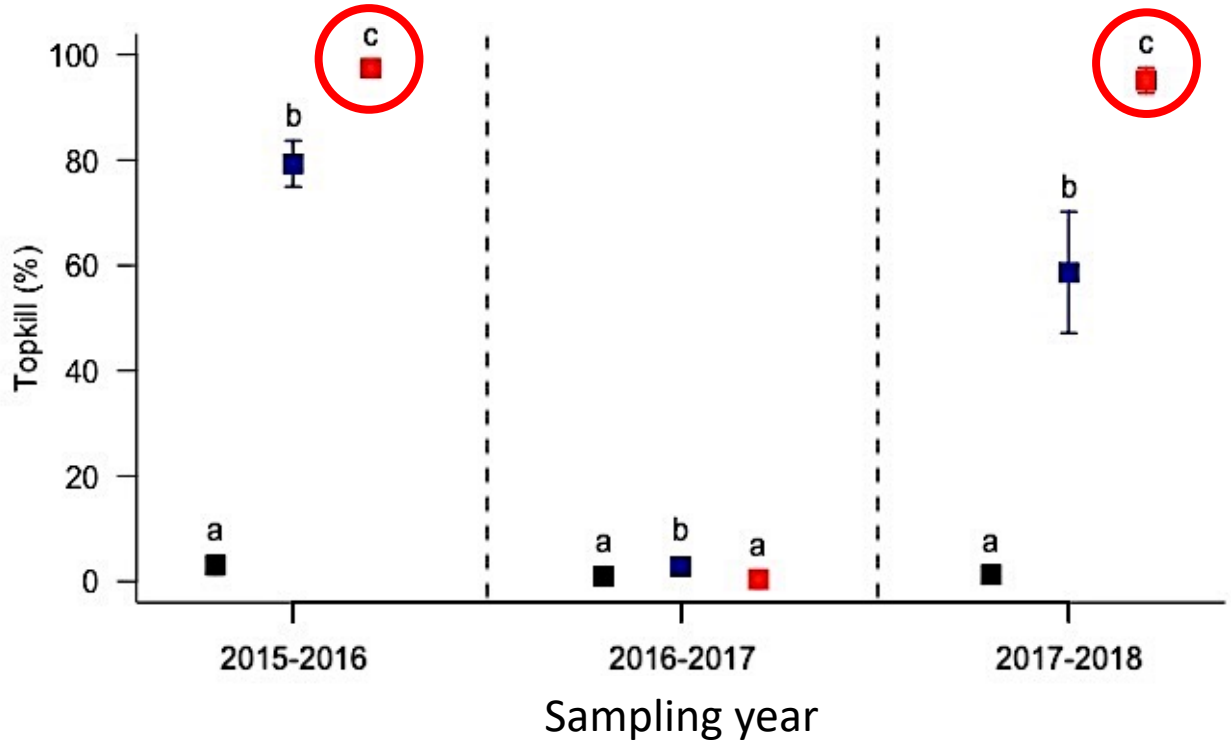
Control

Plant responses

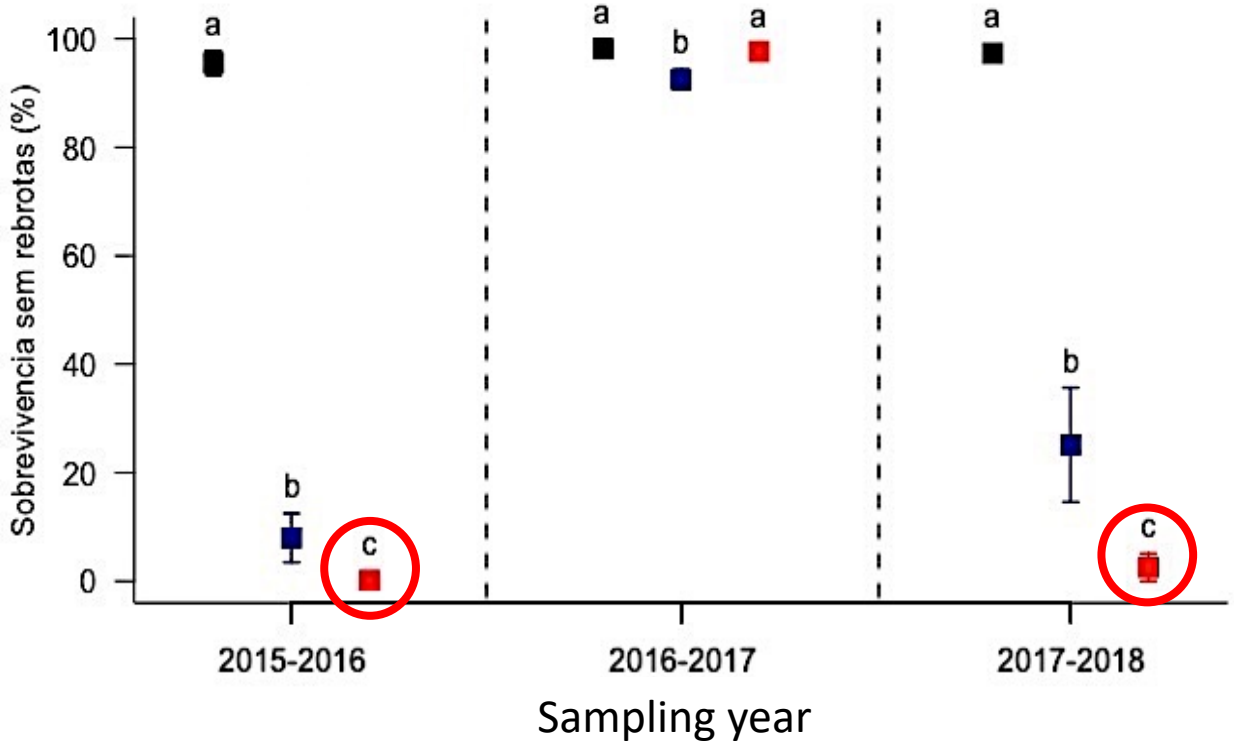
- **Trees:** no differences between MF and LF
- **Saplings:**

Control
MF
LF

Topkill (%)



No resprouts (%)



Plant responses

- **Saplings:** LF more damaging than MF
  - Resprouts: ↑ after MF
  - No resprouts: 25% individuals after 2nd MF → light damage
  - Topkill: ↑ after LF → severe damage
- MF → lower intensity, heat released and burn efficiency

Patchy fire/lower intensity → ↑ Reserve storage → ↑ Resprout vigour → Fire trap escape

(Miranda *et al.* 1993, 1996, 2010; Sato *et al.* 2010; Moura 2018; Santos 2019; Ana Carla dos Santos & Samuel R. Montenegro, unpublished data)

Conclusions

- Management Fires are less severe than Late-dry season Wildfires and maintain woody vegetation structure
- Late-dry season Wildires are more severe and help decrease woody plant cover
- Fire regimes should allow for plant reserve and protecting tissue recover

IFM prescribed burns do so

- IFM is **efficiently conserving** open Cerrado woody vegetation

Wildfire 2019 BRAZIL

CNPq
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