

Defining the fire trap

Extension of the persistence equilibrium model in mesic savannas

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1 Appendix S1

2 Three datasets from the Northern Territory of Australia were used in our case study.
 3 These datasets were subsetted so that analysis was performed only on the species and fire
 4 treatment combinations outlined in the Table S1. Subsetting was based on the three most
 5 replicated eucalypts (*Eucalyptus* and *Corymbia*) and three most replicated pantropical non-
 6 eucalypts across each dataset.

Table S1: Summary of species, fire treatments and datasets used in the case study. Numbers are counts of observations.

	Fire Treatment	Dataset			Total Count
		Tiwi	Williams	Werner	
Myrtaceae:					
<i>Corymbia porrecta</i>	Early Dry Season	0	560	325	885
	Late Dry Season	0	465	713	1178
<i>Eucalyptus miniata</i>	Early Dry Season	164	158	123	445
	Late Dry Season	0	507	479	986
<i>Eucalyptus tetradonta</i>	Early Dry Season	158	364	320	842
	Late Dry Season	0	672	882	1554
Lecythidaceae:					
<i>Planchonia careya</i>	Early Dry Season	145	355	0	500
	Late Dry Season	0	380	0	380
Combretaceae:					
<i>Terminalia ferdinandiana</i>	Early Dry Season	82	228	0	310
	Late Dry Season	0	245	0	245
Fabaceae:					
<i>Erythrophleum chlorostachys</i>	Early Dry Season	87	470	0	557
	Late Dry Season	0	274	0	274

7 Methods - Tiwi Dataset

8 The Tiwi Carbon Study was established on Melville Island (11.6969° S, 130.8779° E) in
 9 2008 to investigate the biophysical potential of prescribed burning to contribute to greenhouse
 10 gas abatement and livelihood opportunities for the Tiwi people. Site descriptions and study

11 design are described in detail by Richards et al. (2012). The Tiwi Carbon Study is comprised of
12 18 permanent plots marked as 200 m long transects at six sites spanning a rainfall gradient.
13 Three fire treatments have been implemented at the site of each plot since 2008: annual early dry
14 season fires, triennial early dry season fires and fire exclusion (unburnt).

15 The Tiwi dataset used in our case study is drawn from a sub-study of the Tiwi Carbon
16 Study conducted by the primary author. Juvenile and sapling trees (up to 5 cm diameter
17 measured at 0.5 m above-ground) were tagged at annual fire and unburnt sites only in May 2014.
18 Individuals of 12 tree species were randomly sampled around the 200 m transects established by
19 CSIRO with the aim of sampling 10 individuals per size class per species (where possible).
20 Three size classes were sampled: resprout (<0.5 m tall), juvenile (<1.5 m tall) and sapling (>1.5
21 m tall but less than 5 cm diameter at 0.50 m above ground). Twelve species were sampled in this
22 study: *Eucalyptus miniata*, *Eucalyptus tetradonta*, *Corymbia nesophila*, *Planchonia careya*,
23 *Terminalia ferdinandiana*, *Erythrophleum chlorostachys*, *Alphitonia excelsa*, *Grevillea*
24 *heliosperma*, *Brachychiton megaphyllus*, *Buchanania obovata*, *Acacia latescens* and *Acacia*
25 *leptocarpa*. Top height of each individual was recorded at the start and end of each dry season,
26 around May and November for 2 years from 2014 to 2016. Data used in our case study represent
27 annual height growth (May to May) for each individual. As such, each individual is represented
28 twice in our graphical analysis (one data point for each time period from pre-fire height to
29 HeightNext).

30 **Methods – Williams Dataset**

31 The Kapalga fire experiment at Kakadu National Park (12.34°S, 132.22°E) was a
32 landscape-scale fire study established to explore the ecological effects of different fire regimes.
33 Fire treatments were implemented between 1990 and 1994. To investigate tree demography,

34 Williams et al. (1999a) established six 20 × 50 m permanent plots in each fire treatment: annual
35 early dry season fires, annual late dry season fires and fire exclusion (unburnt). All trees >3 m
36 were tagged in each plot, and in three plots per fire treatment all trees <3 m were tagged in a 5 ×
37 50 m sub-plot. The combined dataset of >3 m and <3 m trees used in our case study contained
38 annual height measurements for five years. As such, each individual is represented four times in
39 our graphical analysis (one data point for each time period from pre-fire height to HeightNext).
40 Site descriptions and sampling design are described in detail in Williams et al. (1999b),
41 Andersen et al. (2003) and Prior et al. (2010).

42 ***Methods – Werner Dataset***

43 The Werner dataset was drawn from a study of juvenile tree response to fire season at
44 Kapalga in Kakadu National park, conducted between 1988 and 1990. Fire treatments were early
45 dry season, late dry season, wet season and unburnt. Fires were lit once during the course of the
46 study, between late 1988 and early 1989 according to the relevant treatment season. In the late
47 and early dry season treatments used in our case study, individuals of the genera *Eucalyptus*,
48 *Corymbia* and *Xanthostemon* were tagged by walking along 1 m transects in each of eight 30 ×
49 30 m plots until 100 individuals per plot were encountered. Height measurements of each
50 individual were taken before the fires, after first fire recovery, and at the end of one full growing
51 season. In our case study pre-fire height refers to the initial height measured before fire and
52 HeightNext is the height at the end of one full growing season. As such one year of data (pre-fire
53 height to HeightNext) for each individual is represented in our graphical analysis. Site
54 descriptions can be found in Andersen et al. (2003) and detailed descriptions of the study design
55 in Werner and Franklin (2010). The trees contained in the dataset are the same as those described
56 in Werner and Prior (2013b) and sourced from Werner and Prior (2013a).

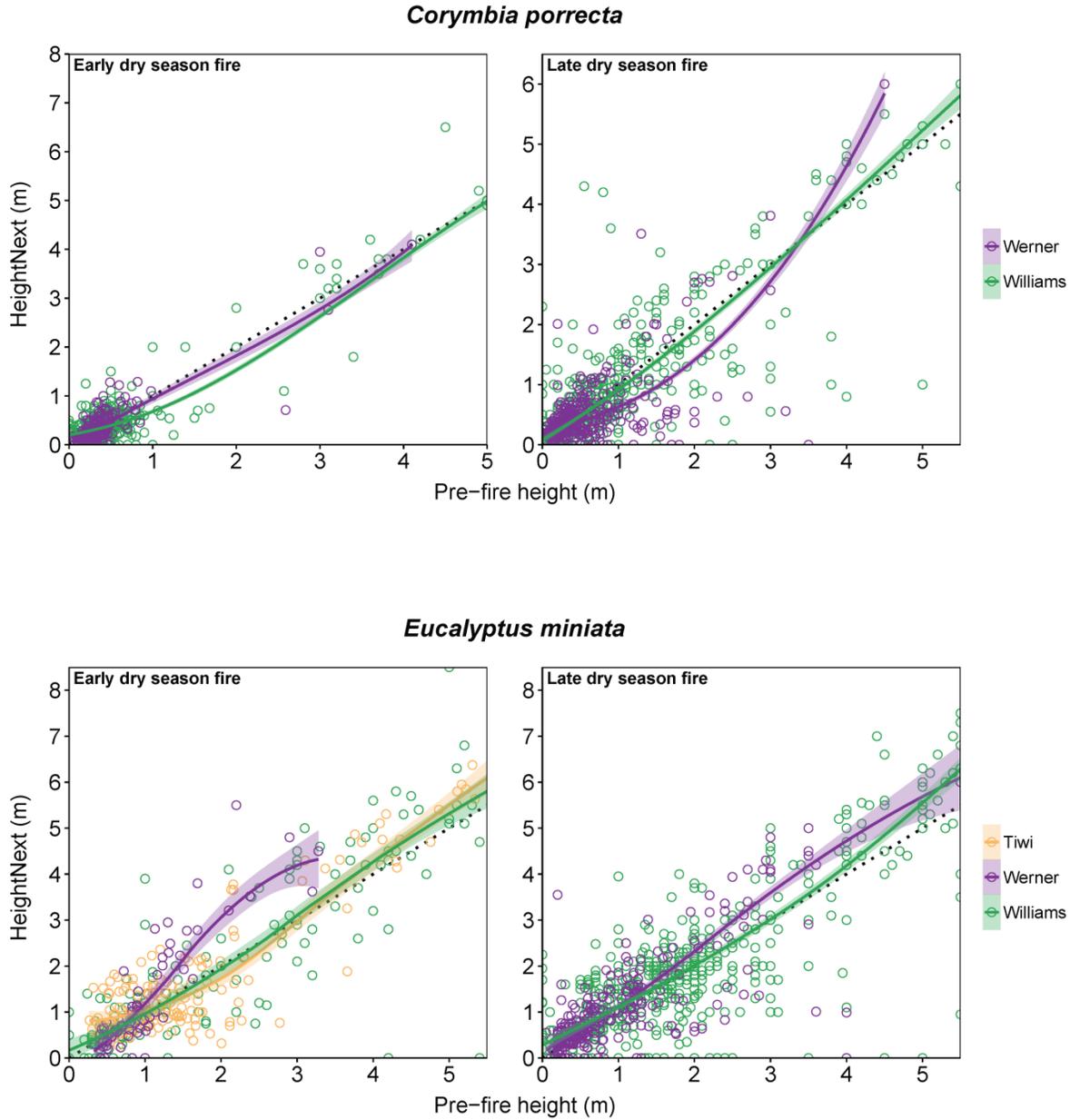
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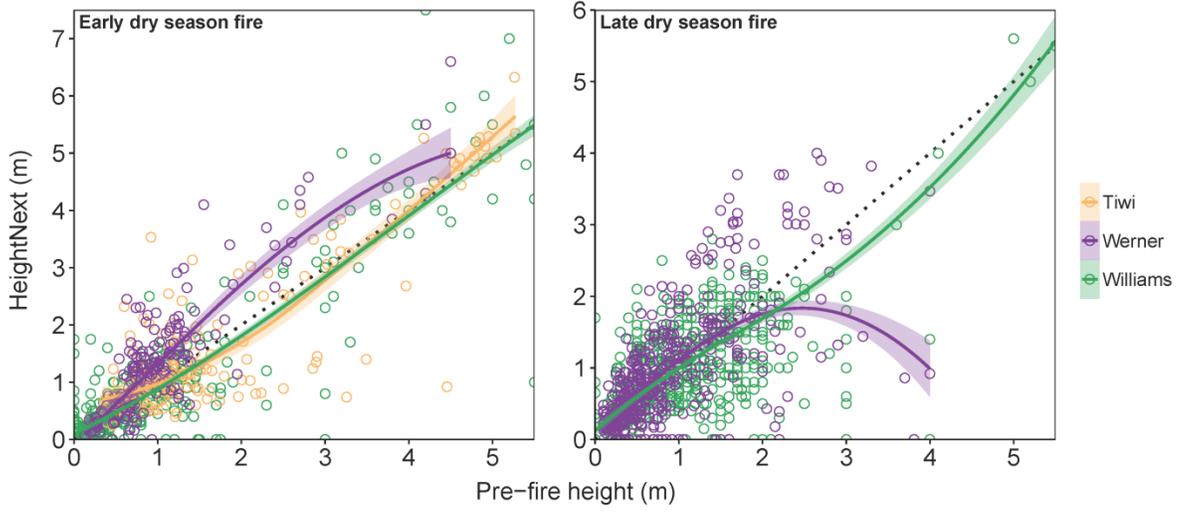
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Appendix S2

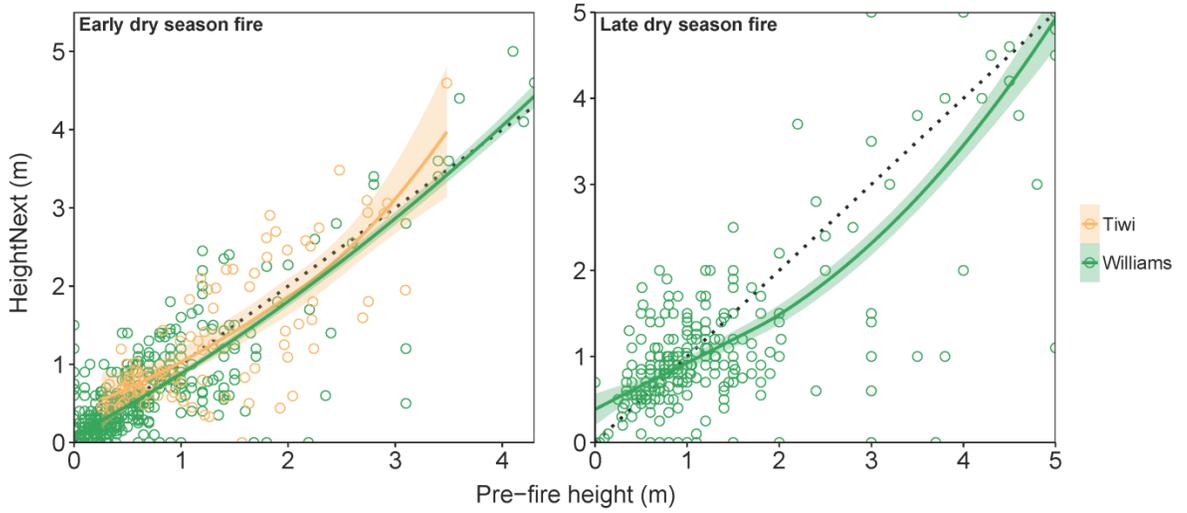
Figure S2: Resprout curves of the relationship between pre-fire height and height before the next fire (HeightNext) for the six species included in our case study. Resprout curves have been fit to each dataset as defined in the figure legends. Fire treatments were annual early dry season burning and annual late dry season burning. Each data point (○) represents the height growth response of one individual within one inter-fire period. Curves are robust loess smooths with 95% confidence intervals.



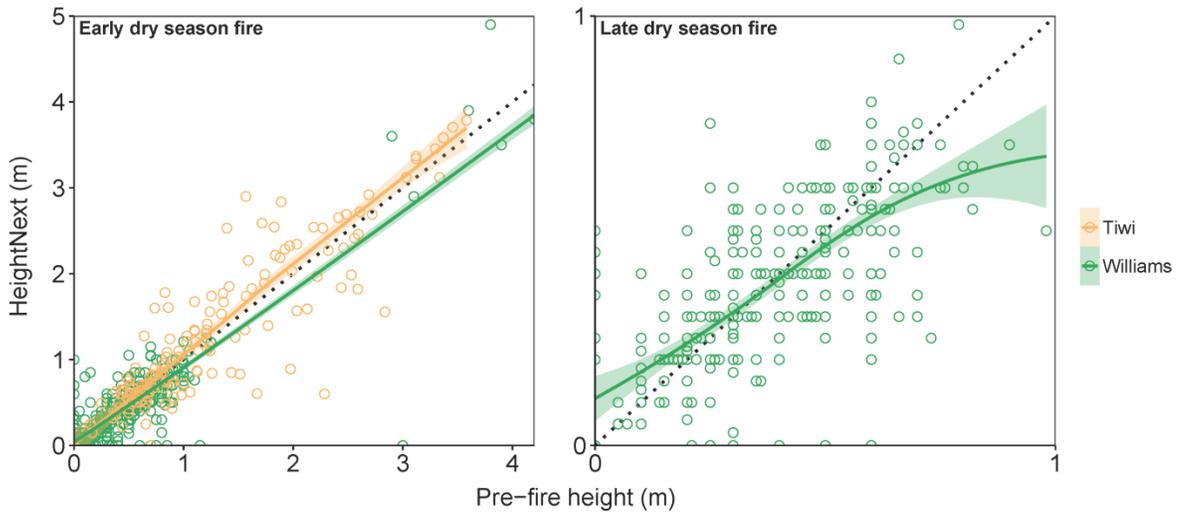
Eucalyptus tetradonta



Erythrophleum chlorostachys



Planchonia careya



Terminalia ferdinandiana

