STATE OF THE FORESTS AND THE RECOVERY CHALLENGE

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Recurrent fire + logging = 77% loss of old growth since 1995

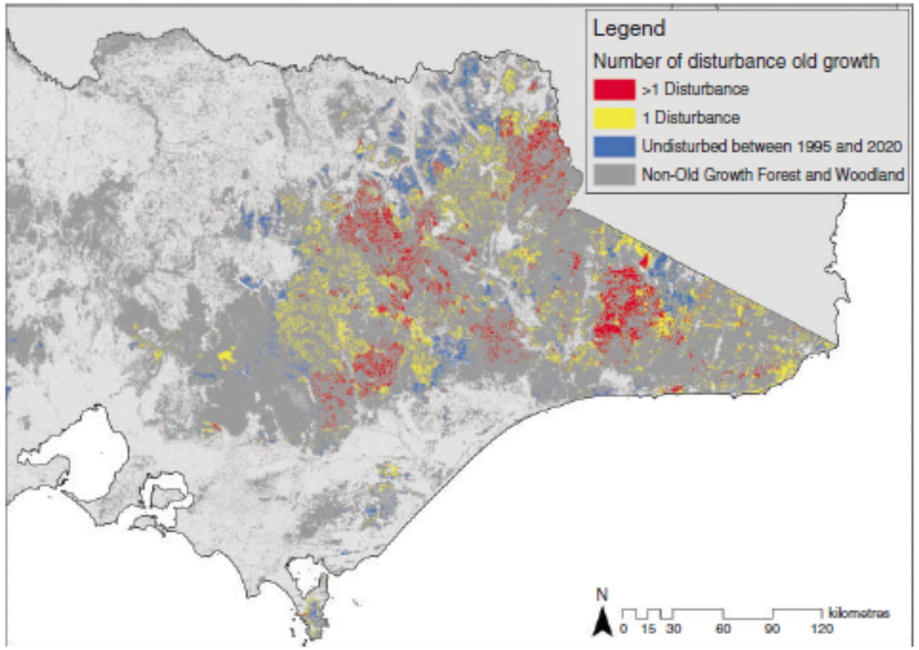


Fig. 3. Disturbance by wildfire, logging or a combination of both in Modelled Old Growth Forest and Woodland between 1995 and 2020.

Lindenmayer and Taylor, Pac. Cons Bio. 2020

Widespread regeneration failure – post fire and post logging

Lindenmayer et al. 2022 Plant Ecology

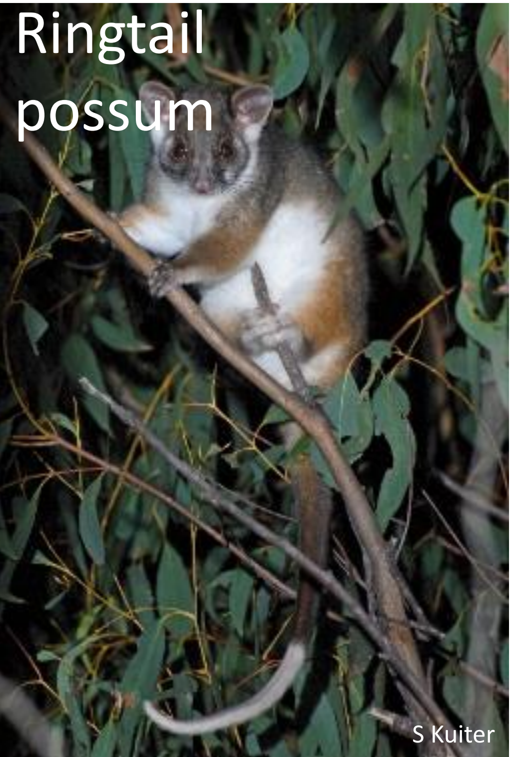

Feathertail glider


Eastern pygmy possum
S Kuiter


E Beaton
Sugar gliders

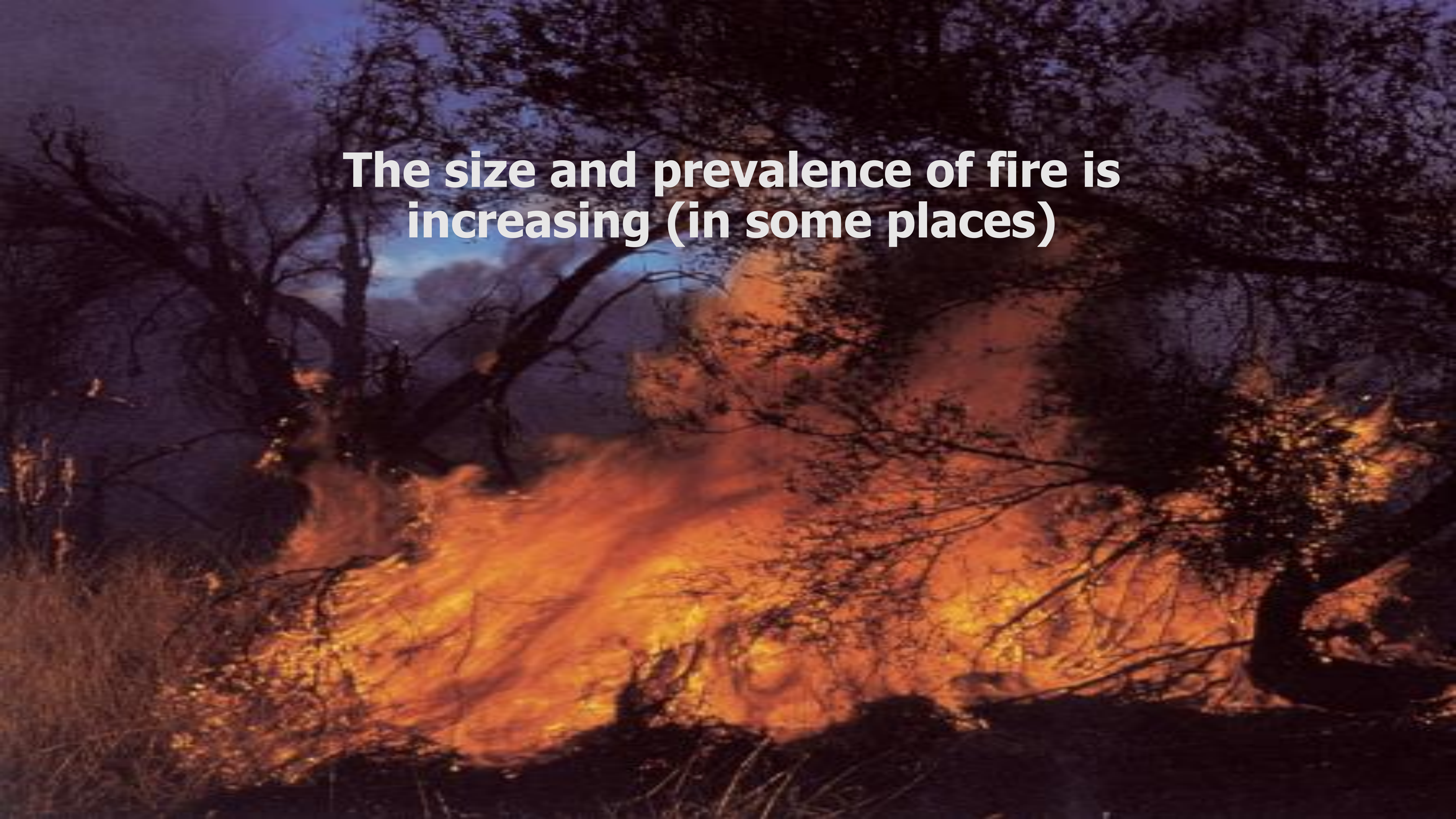

Mountain brushtail Possum
S Kuiter

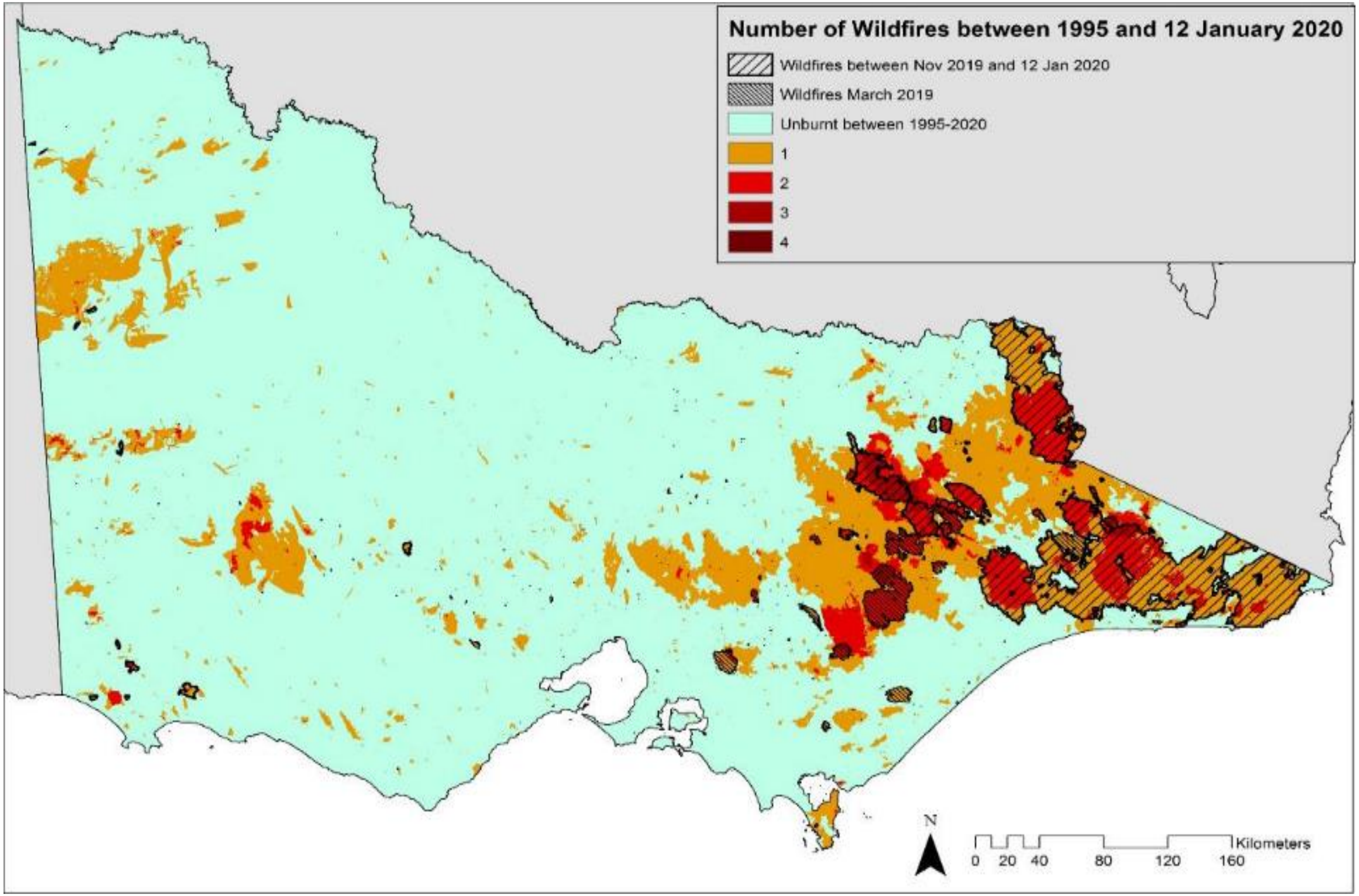

E Beaton
S Kuiter
Leadbeater's Possum


Ringtail possum
S Kuiter


Greater gliders
www.estherbeaton.com


E Beaton
Yellow-bellied Glider

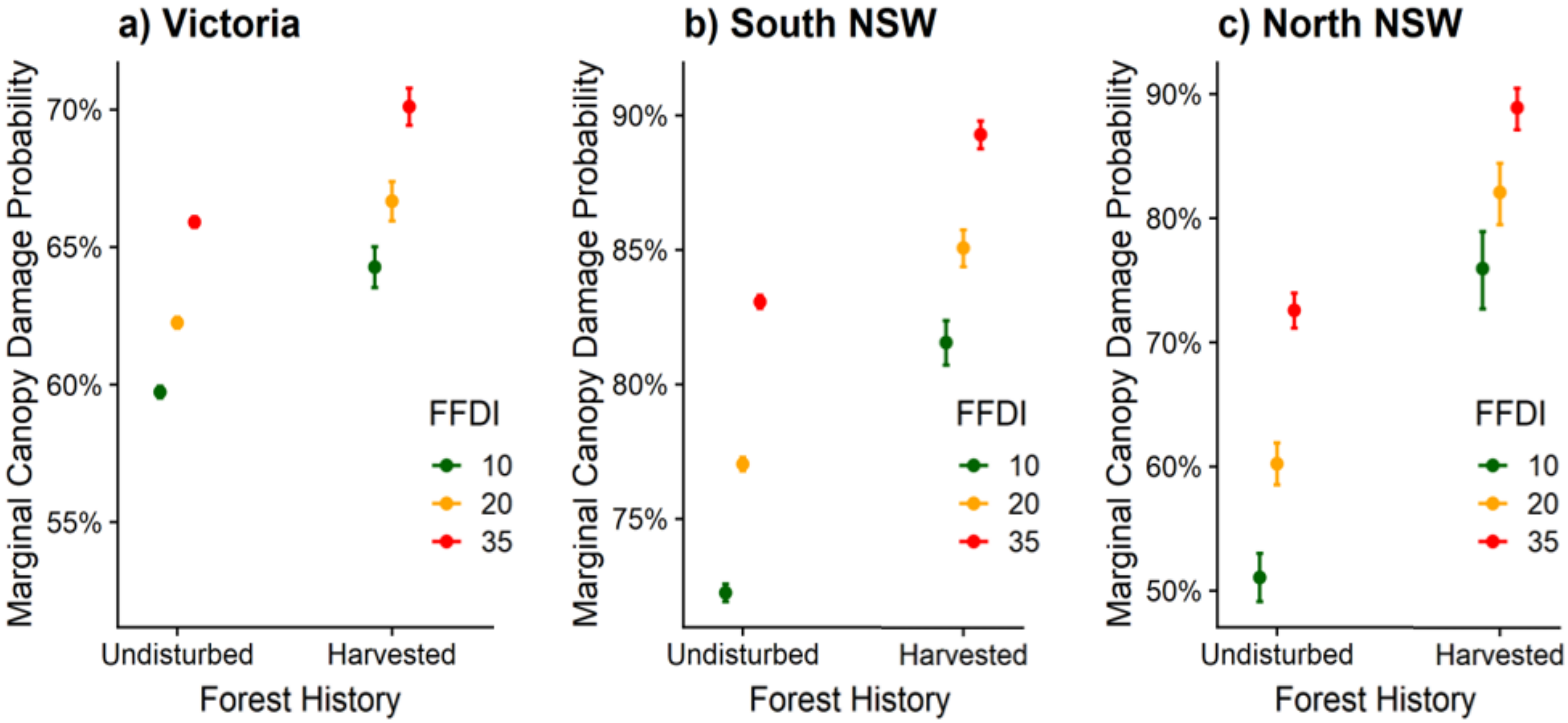

The size and prevalence of fire is increasing (in some places)



Lindenmayer & Taylor (2020) (PNAS), Lindenmayer et al. 2023 Ecosphere

The forest has become more flammable

- Due to a changing climate – climate is THE KEY DRIVER OF fire conditions
- Due to logging
- Possibly due to Hazard Reduction Burning



Lindenmayer et al., 2022 – Nature Ecology & Evolution

Two key take-home messages

- Logged forests **ALWAYS** burn at higher severity

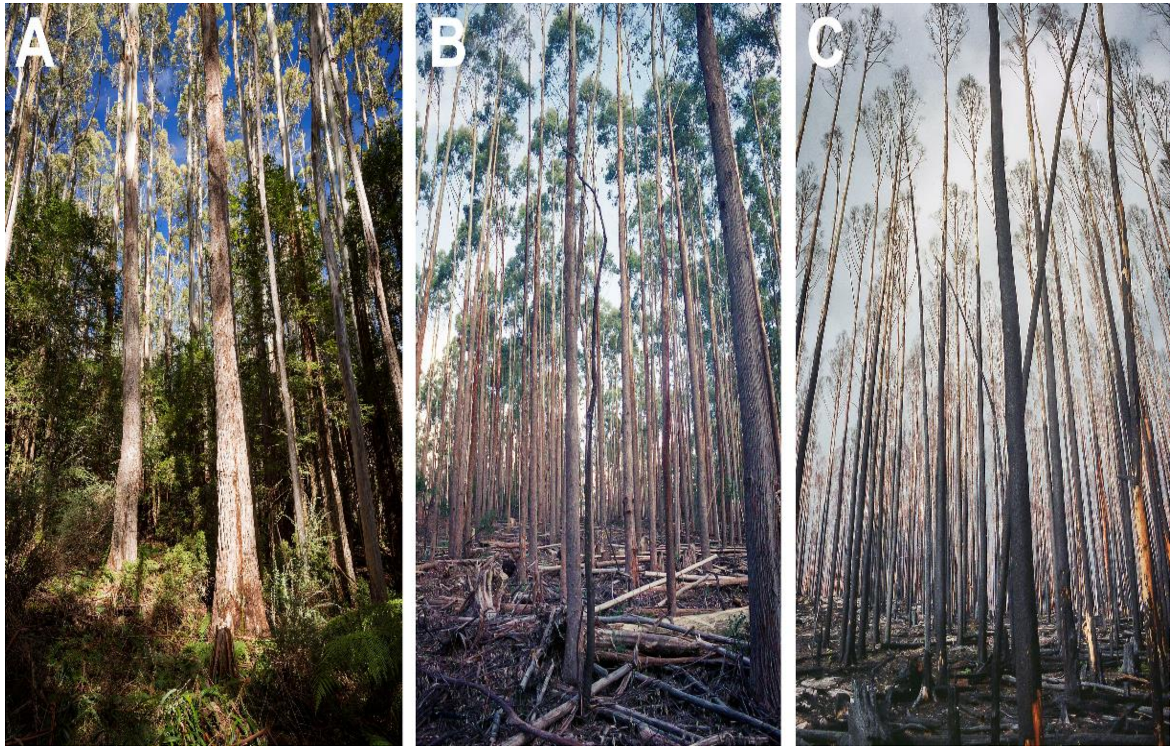
- Logged forests burning under moderate fire weather burn at higher severity than intact forests burning under extreme conditions

Lindenmayer et al., 2022, NEE

What are we going about extensive flammable forest?

Will thinning help reduce fire severity?

- Analysis 2009 fire,
- Analysis 2019-2020 fire



ANSWER

- Generally no
- Some cases thinning = greater high severity fire

Taylor et al. 2020 (Cons. Letters); Taylor et al. 2021 (Austral Ecol)

ENVIRONMENTAL RESEARCH
LETTERS

LETTER

Self-thinning forest understoreys reduce wildfire risk, even in a warming climate

CrossMark

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Keywords: ecological controls, climate change, wildfire, flammability, positive-feedback switches, alternate stable states, self-thinning

Supplementary material for this article is available online

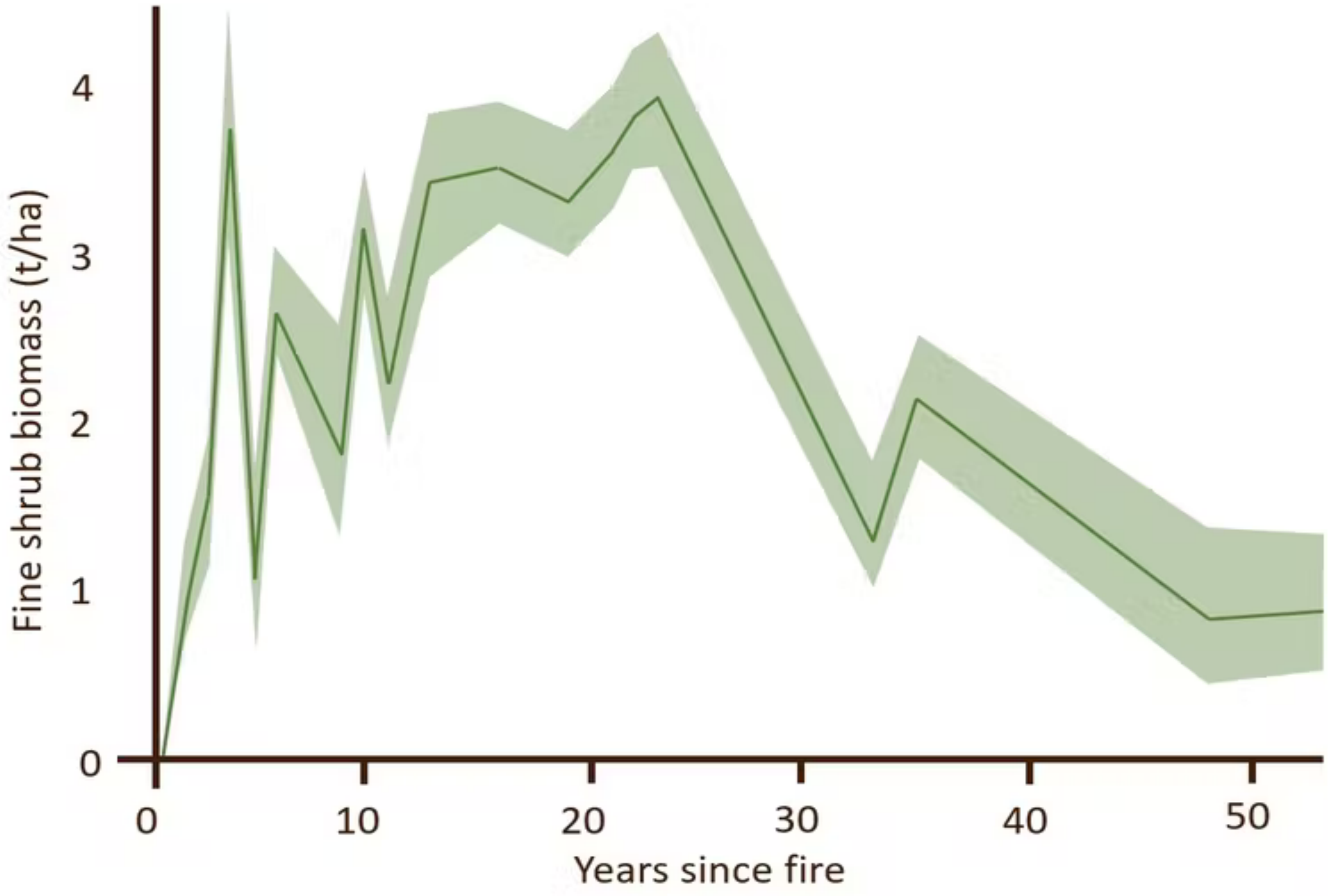
Abstract

As climatic changes continue to drive increases in the frequency and severity of forest fires, it is critical to understand all of the factors influencing the risk of forest fire. Using a spatial dataset of areas burnt over a 65 year period in a 528 343 ha study area, we examined three possible drivers of flammability dynamics. These were: that forests became more flammable as fine biomass (fuel) returned following disturbance (H1), that disturbance increased flammability by initiating dense understorey growth that later self-thinned (H2), and that climatic effects were more important than either of these internal dynamics (H3). We found that forests were unlikely to burn for a short 'young' period (5–7 years) following fire, very likely to burn as the regrowing understorey became taller and denser (regrowth period), then after a total post-disturbance period of 43–56 years (young + regrowth periods), fire became unlikely and continued to decrease in likelihood (mature period). This trend did not change as the climate warmed, although increases in synoptic variability (mean changes in synoptic systems per season) had a pronounced effect on wildfire likelihood overall. Young forest and regrowth forest became increasingly likely to burn in years of greater synoptic variability and the time taken for forests to mature increased, but in years with the most severe synoptic variability, mature forests were the least likely to burn. Our findings offer an explanation for fire behaviour in numerous long-term studies in diverse forest types globally and indicate that, even in the face of a warming climate, 'ecologically-cooperative' approaches may be employed that reinforce rather than disrupt natural ecological controls on forest fire. These range from traditional indigenous fire knowledge, to modern targeting of suppression resources to capitalise on the benefits of self-thinning, and minimise the extent of dense regrowth in the landscape.

KEY FINDINGS

- Prescribed burns are somewhat effective for 5-7 years, as previously thought
- Then <u>increased</u> fire risk for 4-5 decades
- Affected forests are <u>7 times</u> more likely to burn than older forests
- In the worst climatic conditions, older forests were <u>3 times less likely</u> to burn than recent prescribed burns

In other words, burning made forests on average seven times more flammable for 43 to 56 years.



Zylstra et al. 2022 Env. Res. Letters

Hazard Reduction Burning

- Quality not quantity
- < 1 km from infrastructure
- Done every few years
- Distant burning to hit targets = limited effectiveness
- Does not always work – Marysville
- Wrong to say “if only we had done more HRB” – wrt risk reduction (especially under extreme conditions)

(Gibbons et al. 2012 – PLOS One)

THE CHALLENGE

- Regrow the old growth estate
- Regrow forest in areas where regeneration has failed
- Restore the natural fire regime – which means limiting fire in tall, wet forests and Gondwanic rainforests
- Focus HRB where it matters
- Recover populations of key and iconic species

Lindenmayer et al., 2019 – New Forests

Recovering the Southern Greater Glider

The Greater Glider

- A true “sentinel” species
- Vulnerable to:
  - Land clearing
  - Logging
  - Wildfire
  - Hazard Reduction burns (kills animals, removes big trees)
  - Climate change (they are heat sensitive)
  - IT IS NOW ENDANGERED!! (was once most common)

Lindenmayer et al. 2011, Biological Conservation

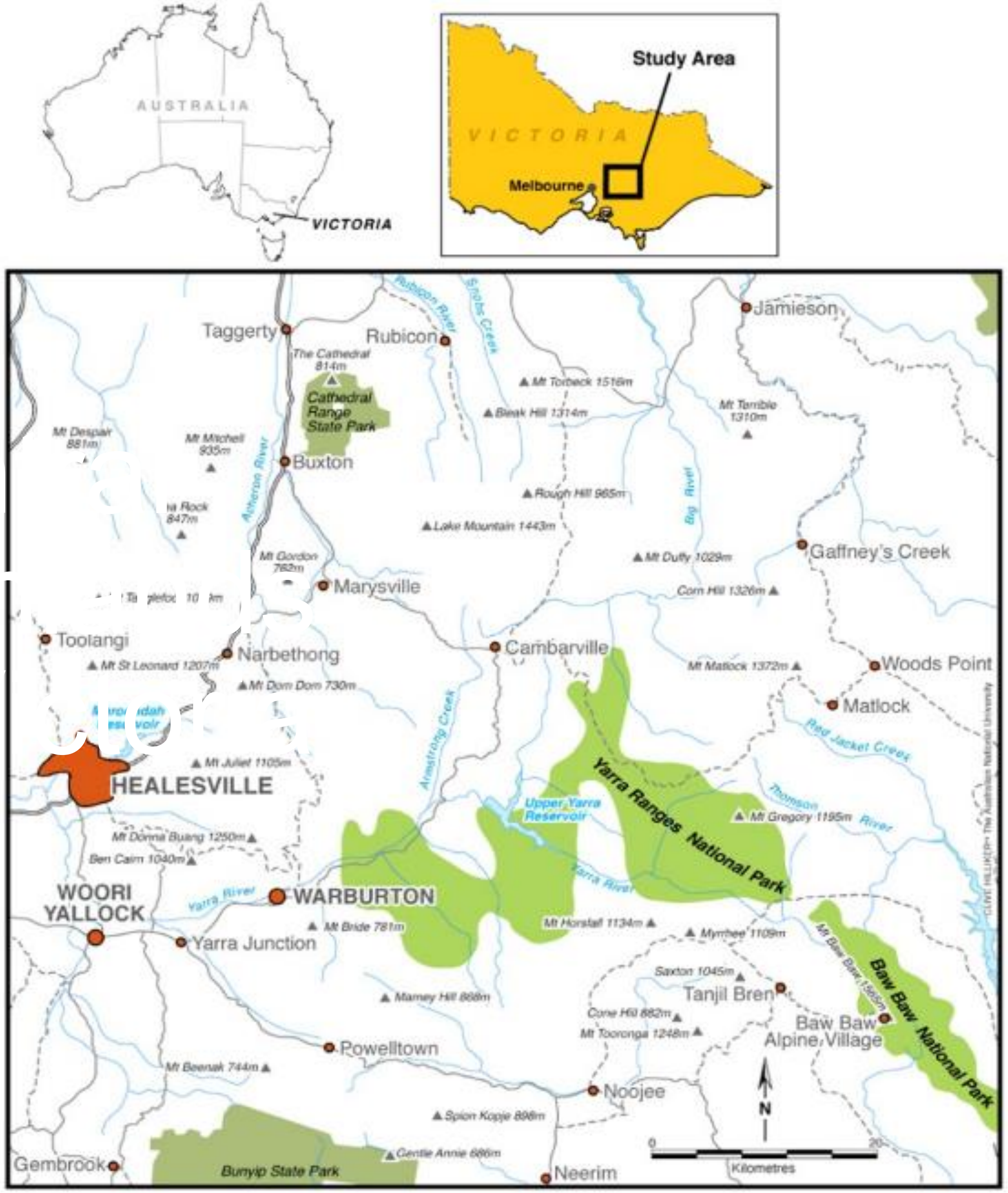

Greater Gliders do not
survive on logged sites

THEY DO NOT LIKE WILDFIRE

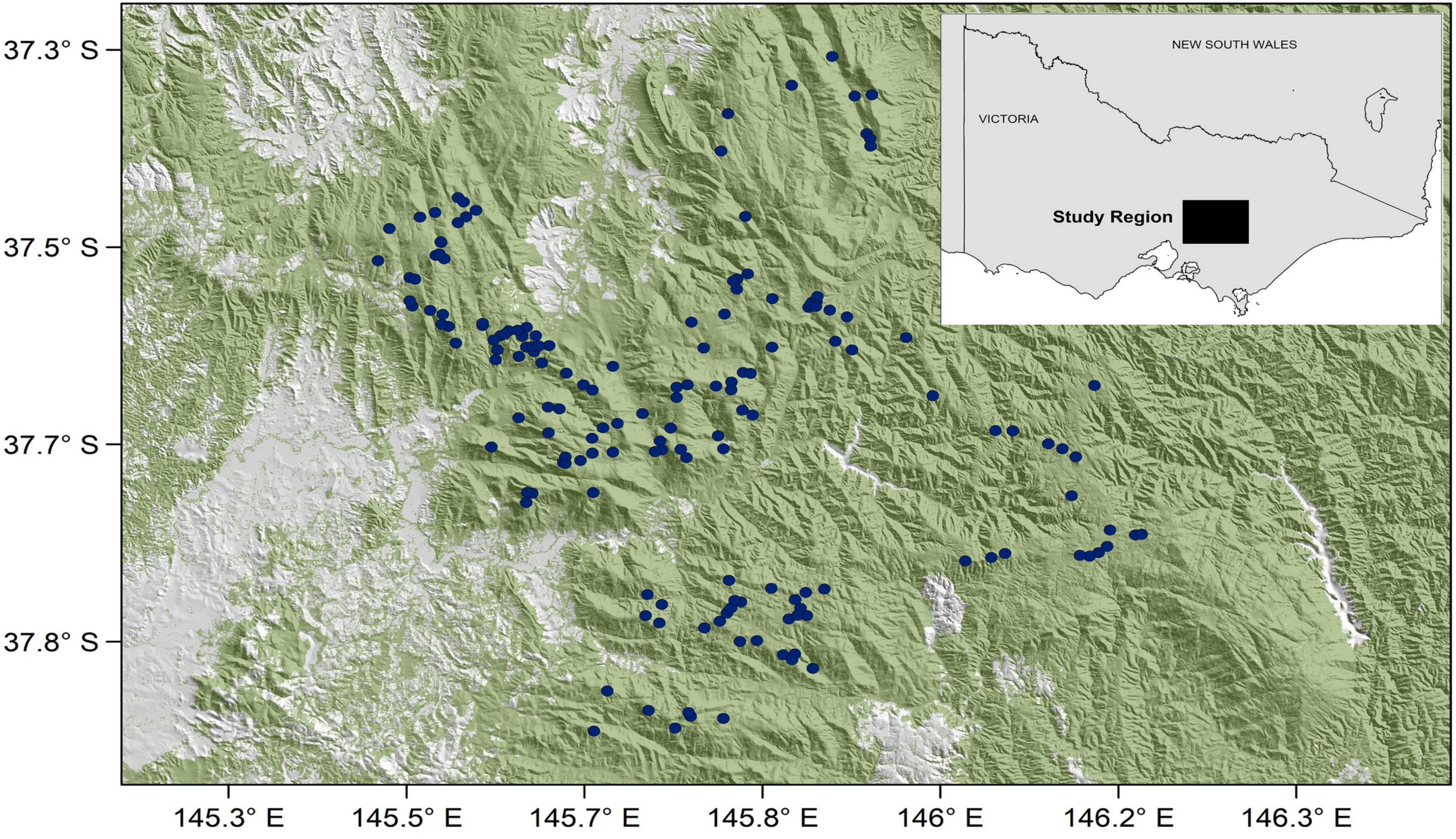
DECLINE IN TREE HOLLOWS

Prescribed burns also have major negative effects on Greater Gliders

Central Highlands forests



AUSTRALIA
VICTORIA
Study Area
VICTORIA
Melbourne
Jamieson
Taggerty
Rubicon
Rubicon River
The Cathedral 814m
Cathedral Range State Park
Mt Torbeck 1516m
Bleak Hill 1314m
Mt Terrible 1310m
Mt Despair 881m
Mt Mitchell 935m
Buxton
Acheron River
Rough Hill 965m
Big River
Lake Mountain 1443m
Mt Duffy 1029m
Gaffney's Creek
Mt Gordon 762m
Marysville
Corn Hill 1326m
Toolangi
Narbethong
Mt St Leonard 1207m
Cambarville
Mt Matlock 1372m
Woods Point
Matlock
Mt Dom Dom 730m
Armstrong Creek
Red Jacket Creek
Mt Juliet 1105m
HEALESVILLE
Yarra Ranges National Park
Upper Yarra Reservoir
Thomson River
Mt Gregory 1195m
Mt Donna Buang 1250m
Ben Cairn 1040m
Yarra River
WOORI YALLOCK
WARBURTON
Mt Bride 781m
Mt Horsfall 1134m
Myrrhee 1109m
Yarra Junction
Saxton 1045m
Tanjil Bren
Baw Baw National Park
Mamey Hill 868m
Cone Hill 882m
Mt Tooronga 1248m
Baw Baw Alpine Village
Powelltown
Mt Beenak 744m
Noojee
N
Spion Kopje 898m
0
20
Kilometres
Gentle Annie 686m
Gembrook
Bunyip State Park
Neerim



Lindenmayer et al. 2020 (Animal Conservation)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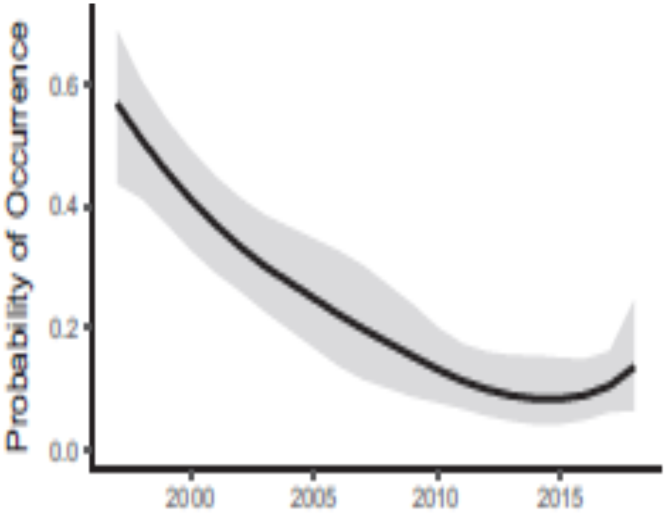
Greater Glider – 64% of sites in 1997 to ~14% of sites in 2022-23



Lindenmayer & Sato 2018 PNAS, Lindenmayer et al. 2022 (PLOS One), Lindenmayer et al. 2020 (Animal Conservation)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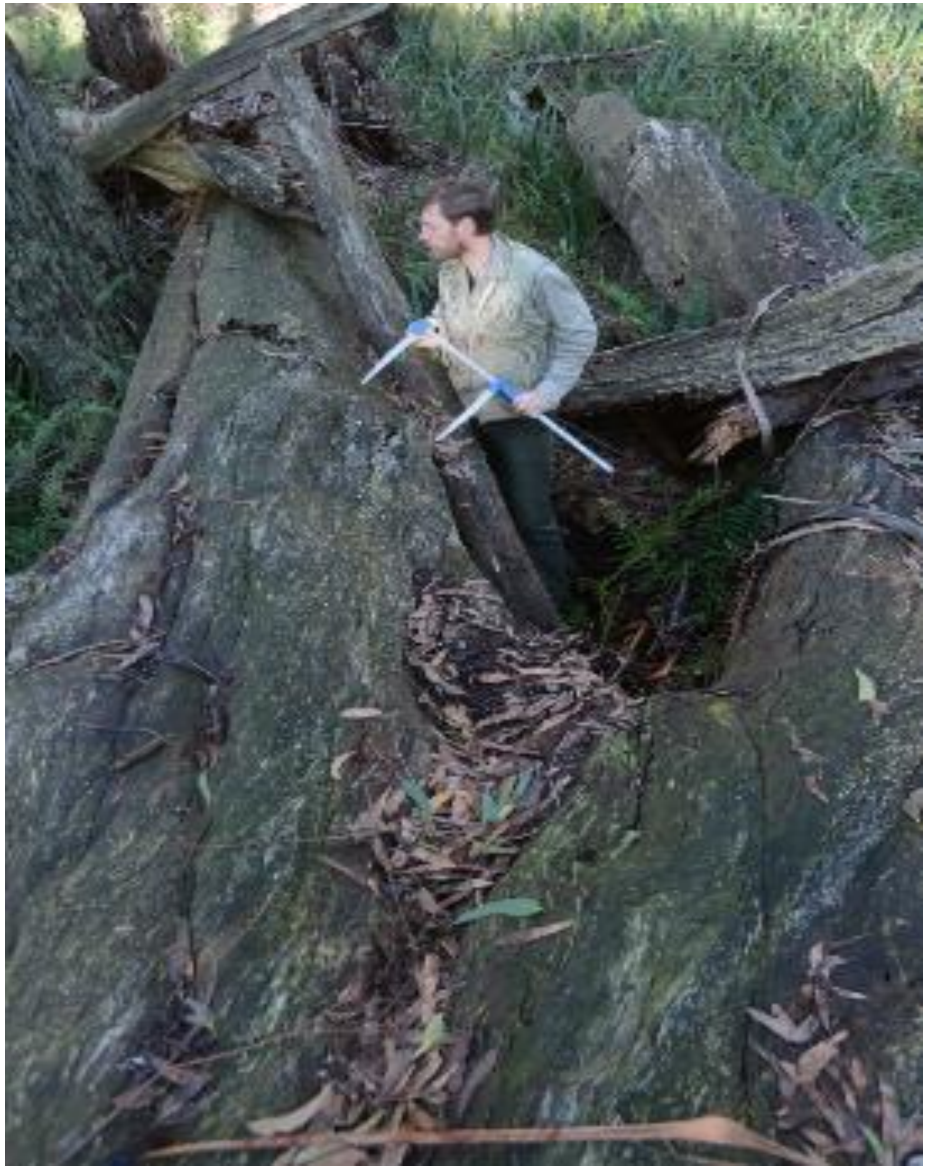

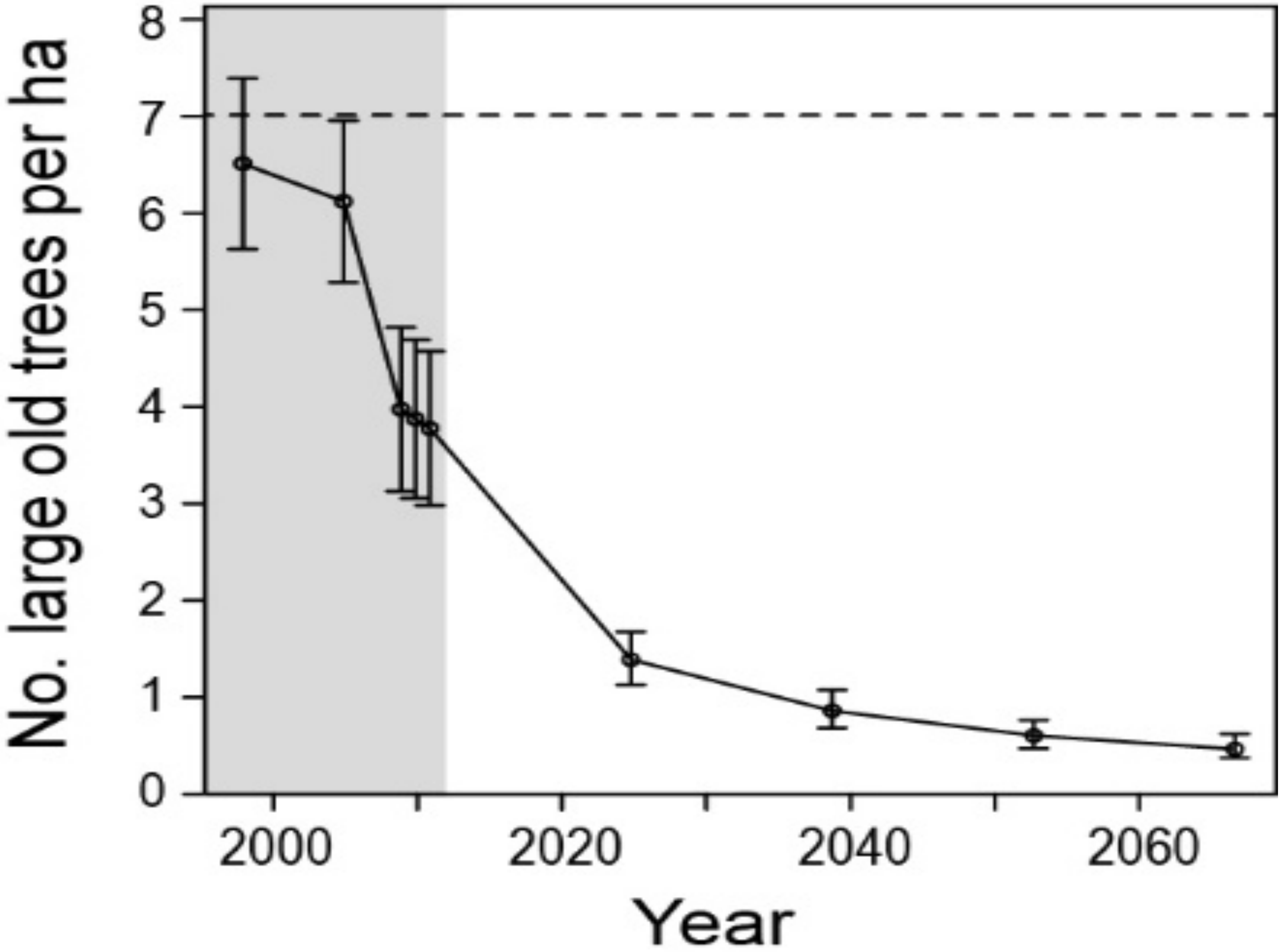

No. large old trees per ha
0
1
2
3
4
5
6
7
8
2000
2020
2040
2060
Year

Overall decline in tree hollows

- HBT = 90% decline in total abundance by 2035
- Old growth (where HBT most abundant) declined by 95-97% of "background" levels (1/30th-1/60th)
- Old growth Mtn Ash = 1.16% of estate; Alpine Ash = 0.47% of estate

Recovering the Greater Glider

PLOS ONE

RESEARCH ARTICLE

Elevation, disturbance, and forest type drive the occurrence of a specialist arboreal folivore

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Abstract

Quantifying the factors associated with the presence and abundance of species is critical for conservation. Here, we quantify the factors associated with the occurrence of the Southern Greater Glider in the forests of the Central Highlands of Victoria, south-eastern Australia. We gathered counts of animals along transects and constructed models of the probability of absence, and then the abundance if animals were present (conditional abundance), based on species' associations with forest type, forest age, the abundance of denning sites in large old hollow-bearing trees, climatic conditions, and vegetation density. We found evidence of forest type effects, with animals being extremely uncommon in Alpine Ash and Shining Gum


We know where gliders
used to be

Where is in the landscape it is coolest

New generation nest boxes and artificial hollows


THANKYOU