Protect Victoria's Forests: Great Forest National Park worth fighting for

Dr Chris Taylor

Research Fellow, Australian National University

Sarah Rees

Conservationist, Co-founder Great Forest National Park

Wed, Aug 25, 2021

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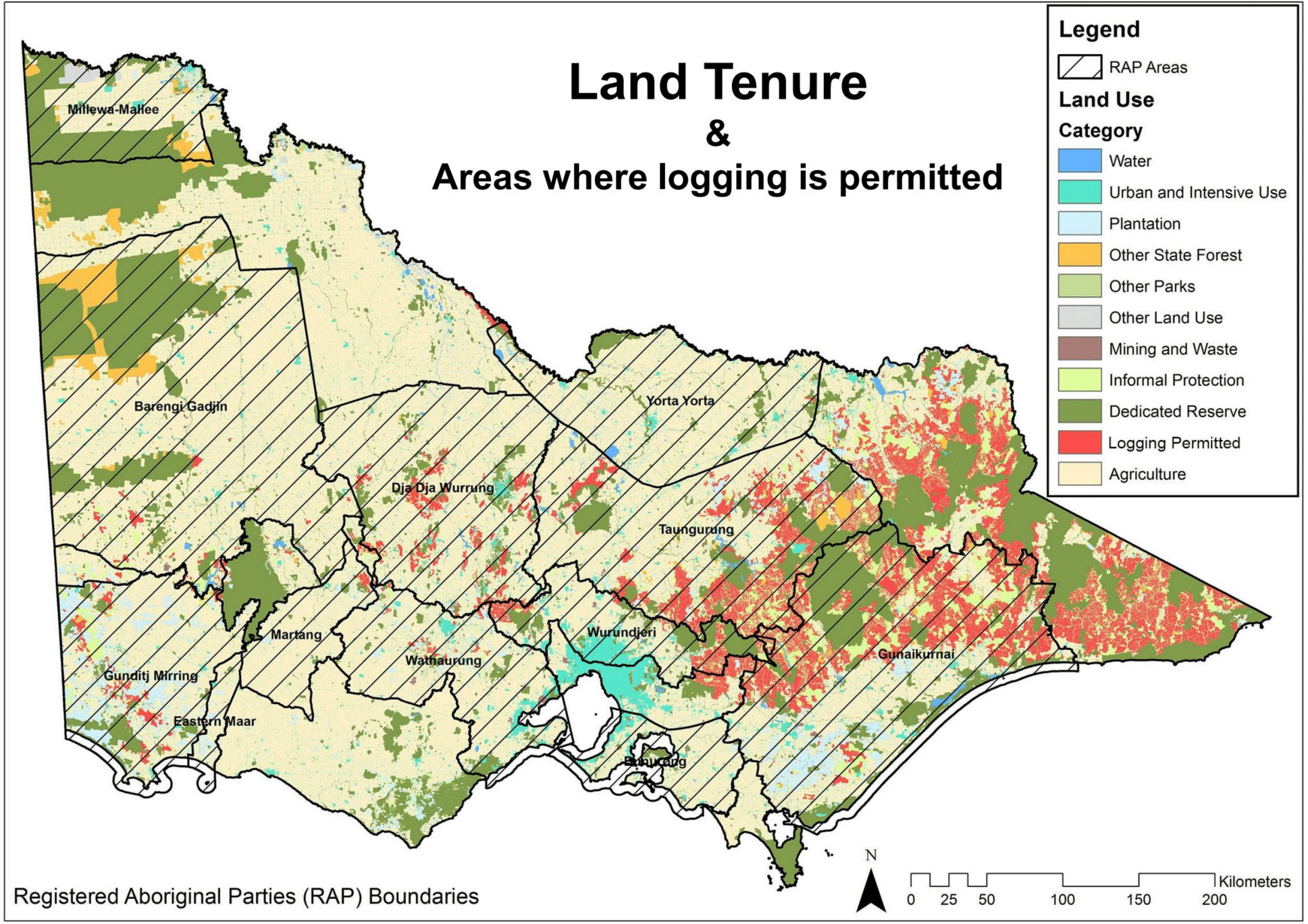
Research Fellow, Australian National University

Disturbance in the Ash Forests Update

Disturbance patterns in a critically endangered forest

Dr. Chris Taylor


Land Tenure
&
Areas where logging is permitted
Legend
RAP Areas
Land Use
Category
Water
Urban and Intensive Use
Plantation
Other State Forest
Other Parks
Other Land Use
Mining and Waste
Informal Protection
Dedicated Reserve
Logging Permitted
Agriculture
Millewa-Mallee
Barengi Gadjin
Yorta Yorta
Dja Dja Wurrung
Taungurung
Martang
Wurundjeri
Wathaurung
Gunaikurnai
Gunditj Mirring
Eastern Maar
Bunurong
N
0 25 50 100 150 200
Kilometers
Registered Aboriginal Parties (RAP) Boundaries

Austral ECOLOGY A Journal of ecology in the Southern Hemisphere

Austral Ecology (2019) 44, 1076–1090

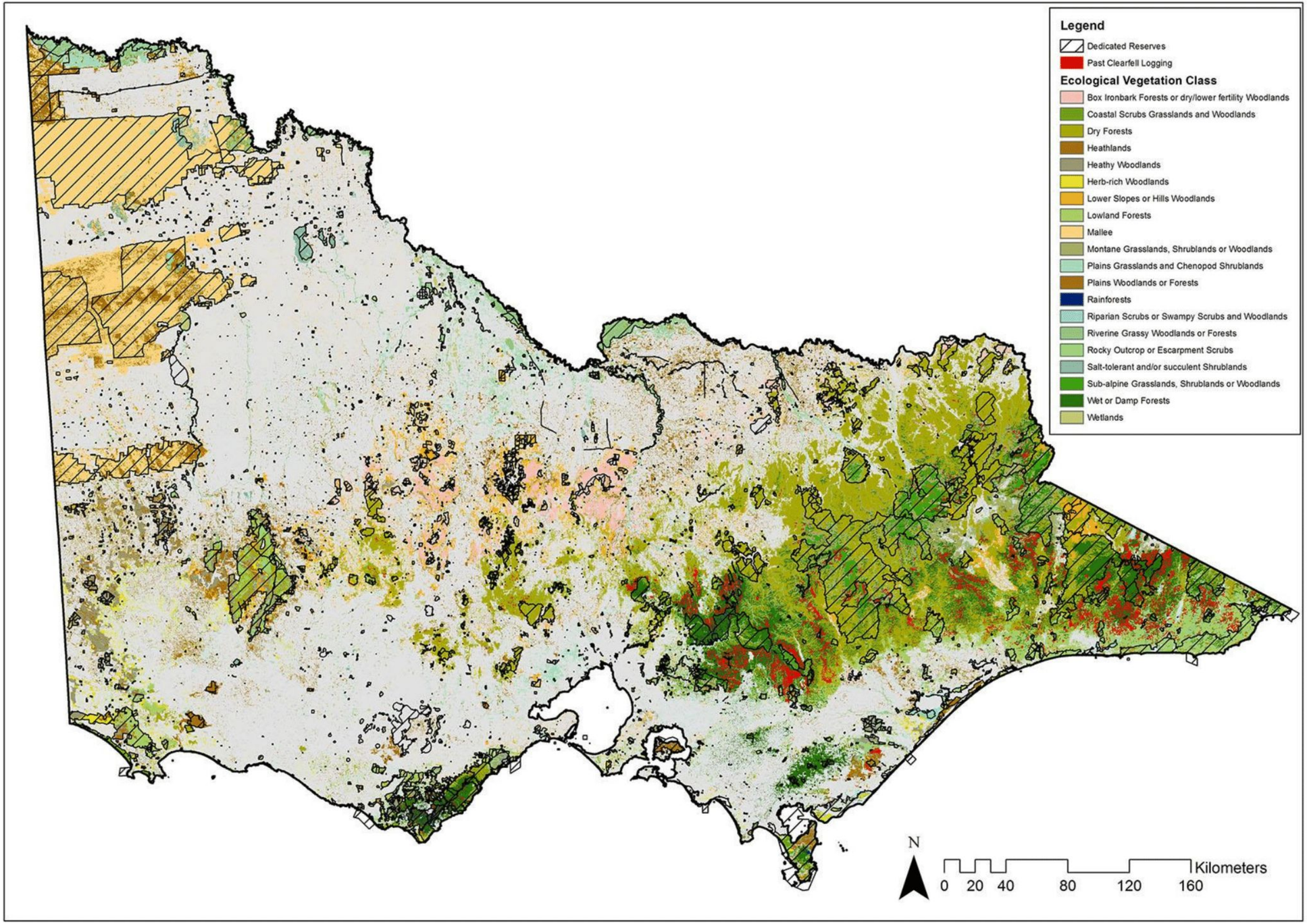
The adequacy of Victoria's protected areas for conserving its forest-dependent fauna

CHRIS TAYLOR[1] AND DAVID B. LINDENMAYER*[1,2]

[1]*Fenner School of Environment & Society, The Australian National University, 141 Linnaeus Way, Canberra, Australian Capital Territory, 2601 (david.lindenmayer@anu.edu.au); and* [2]*Threatened Species Recovery Hub, National Environmental Science Program, Fenner School of Environment & Society, The Australian National University, Canberra, 2601, Australian Capital Territory, Australia*

Abstract Networks of protected areas are a key component of efforts to conserve biodiversity. However, there are concerns about an uncritical focus on the percentage area of reserves without an assessment of how well formal reserves are actually protecting biodiversity. In response, we completed a spatial analysis of the formal reserve system in the Australian state of Victoria. We quantified how well the reserve system captured a crude surrogate for vegetation communities (viz: Ecological Vegetation Classes) as well as distribution models for an array of threatened forest-dependent species. We found evidence of a high degree of overlap between areas subject to intensive forestry (clearcutting) operations and the modelled distribution of a suite of forest-dependent species. A key outcome of our study was that areas around sites subject to past logging as well as new areas proposed for logging under the Timber Release Plan in Victoria had significantly higher values for threatened forest-dependent species (as determined by habitat distribution models) than areas that had not been logged. We found significant differences in the spatial characteristics of the dedicated reserve systems and informal protected area networks, with the latter featuring much of its area close to a tenure boundary where logging occurs. Our empirical analyses demonstrating the impacts of ongoing logging operations on areas with high environmental suitability for threatened species have important implications. In particular, the current reserve system is inadequate for a suite of forest-dependent taxa, including critically endangered Leadbeater's Possum *(Gymnobelideus leadbeateri)* and the vulnerable Greater Glider *(Petauroides volans)*. This suggests a high degree of conflict between areas of high value for conservation and areas targeted for wood production.

Key words: disturbance, logging, protected areas, threatened species, wet eucalypt forests.



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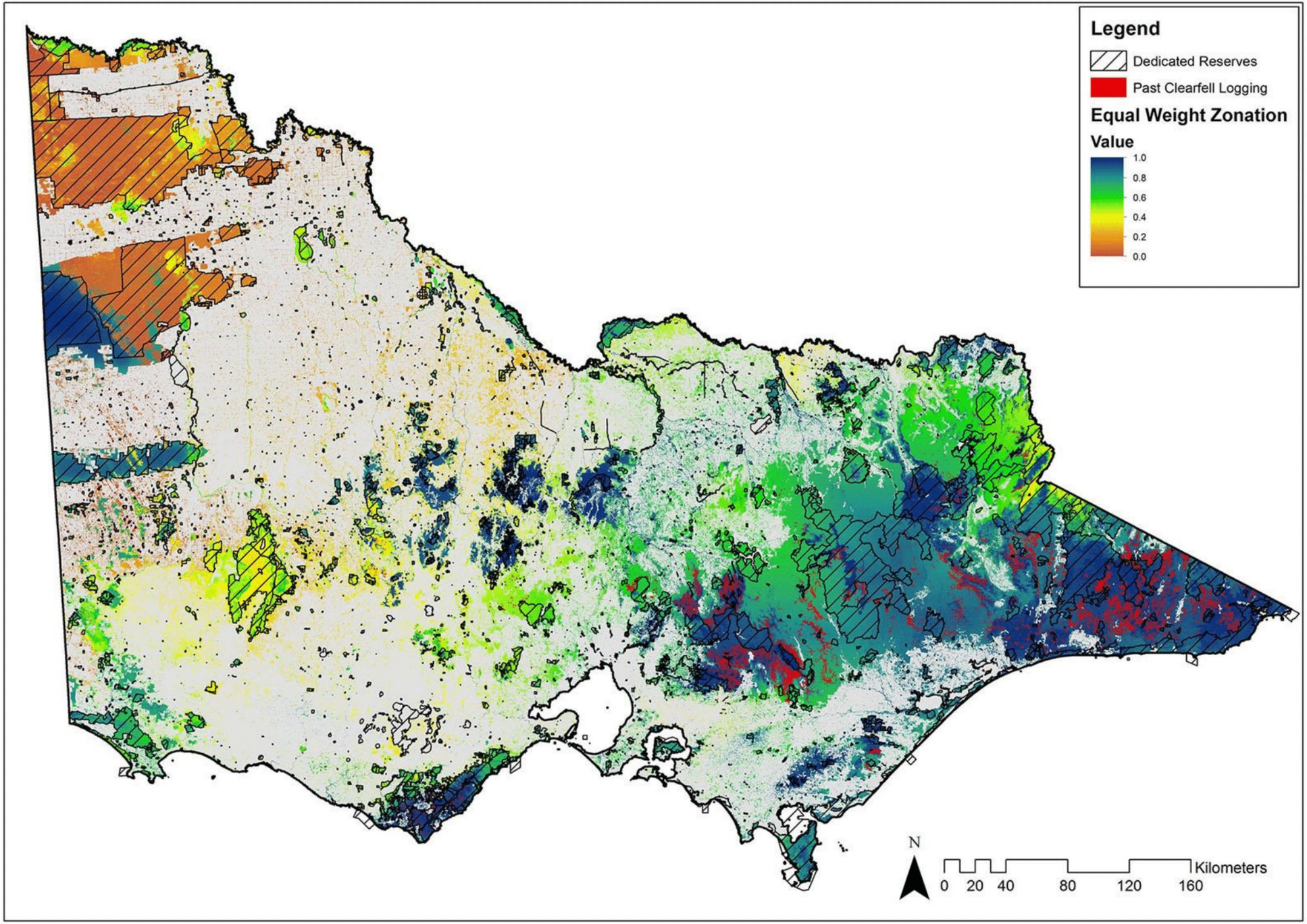

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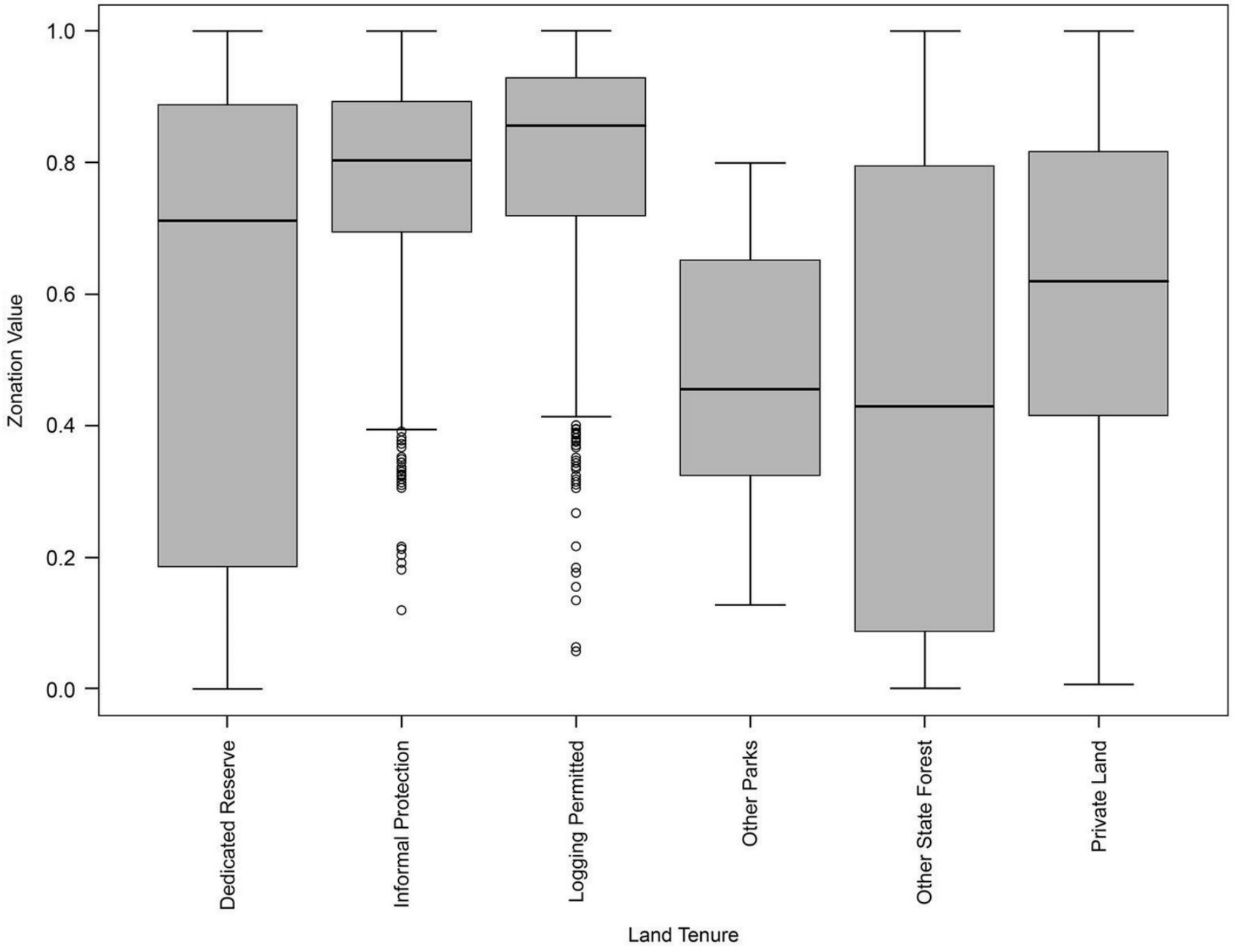

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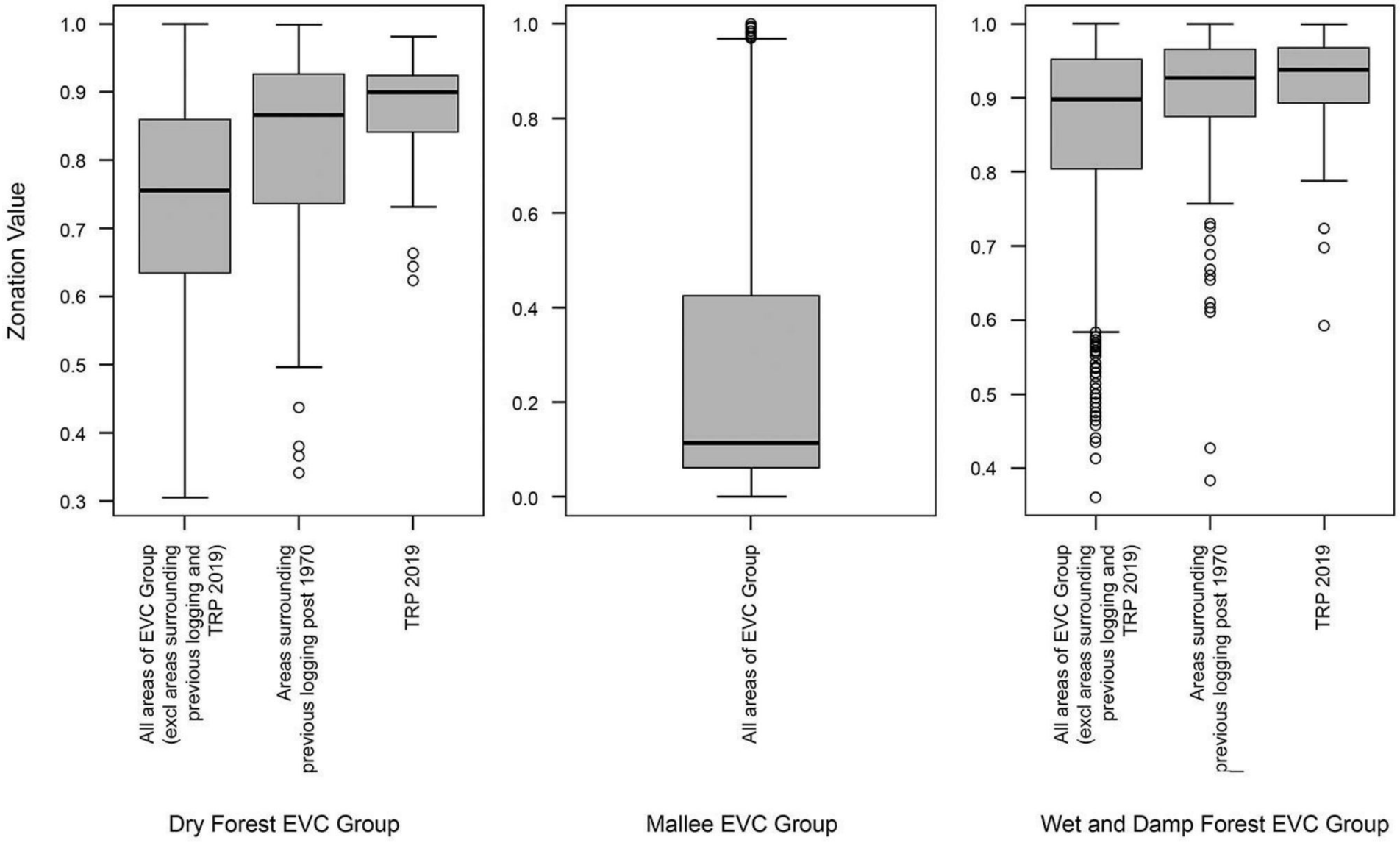

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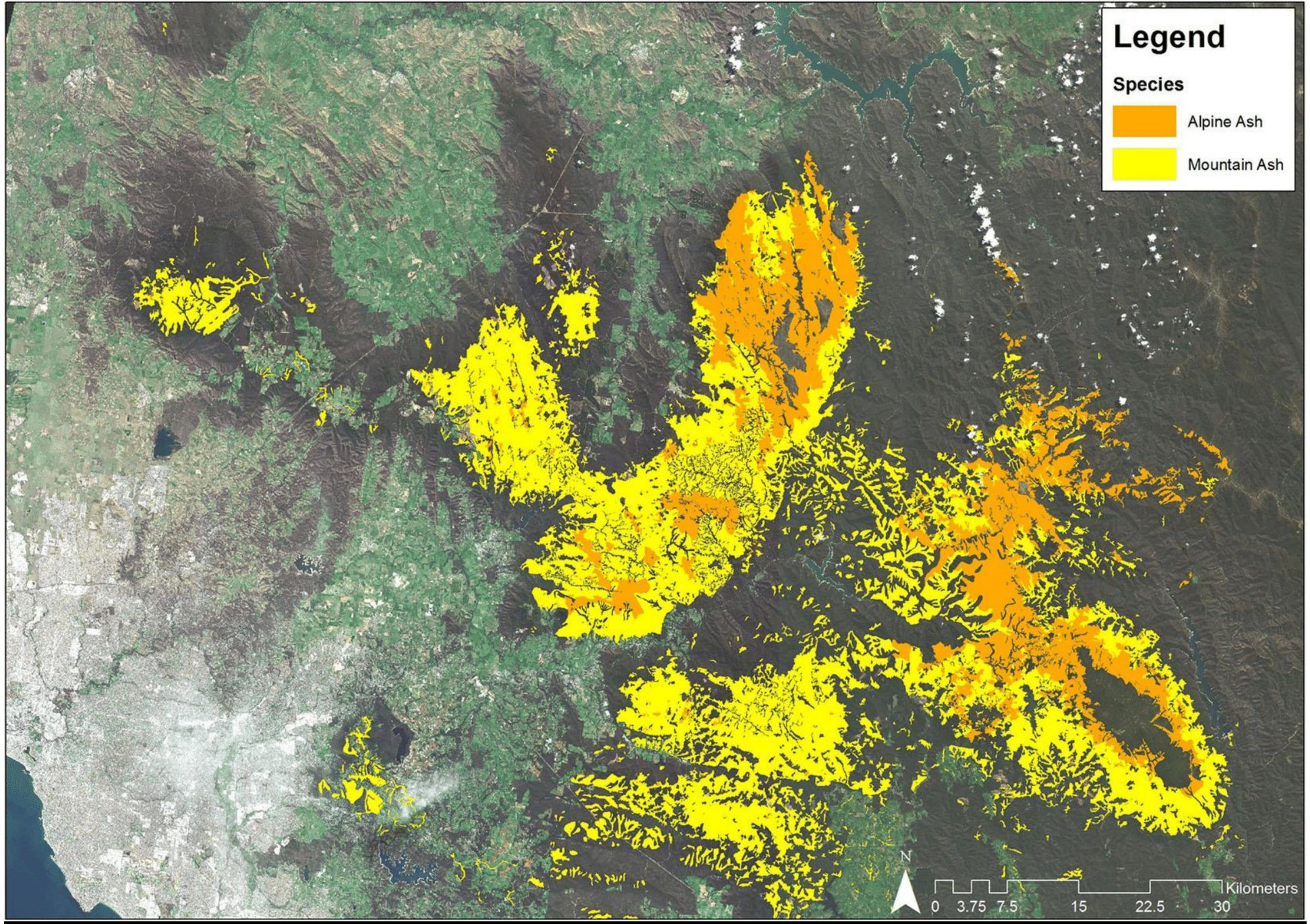

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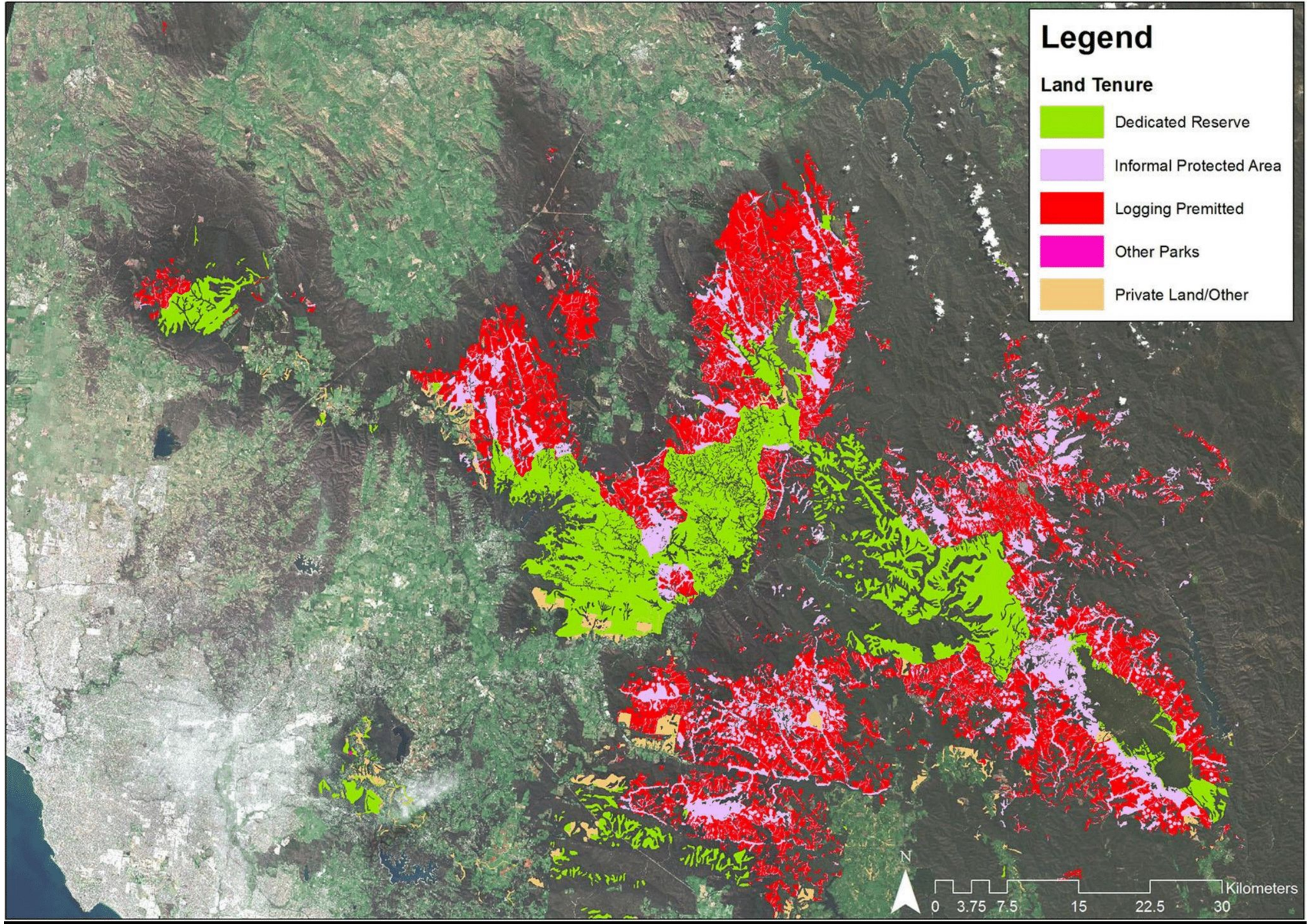

Source: Taylor and Lindenmayer 2020


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REVIEW

Nonlinear Effects of Stand Age on Fire Severity

Chris Taylor[1], Michael A. McCarthy[2], & David B. Lindenmayer[3]

[1] Melbourne Sustainable Society Institute, University of Melbourne, Parkville, Victoria 3051, Australia
[2] School of Botany, University of Melbourne, Parkville, Victoria 3051, Australia
[3] Fenner School of Environment and Society, The Australian National University, Canberra, ACT 0200, Australia

Keywords
Fire; fire severity; logging; forests; stand age; probit regression; south-eastern Australia.

Correspondence
David Lindenmayer, Fenner School of Environment and Society, The Australian National University, Canberra, ACT 0200, Australia.
Tel: 02 61250654; fax: 02 61250746.
E-mail: david.lindenmayer@anu.edu.au

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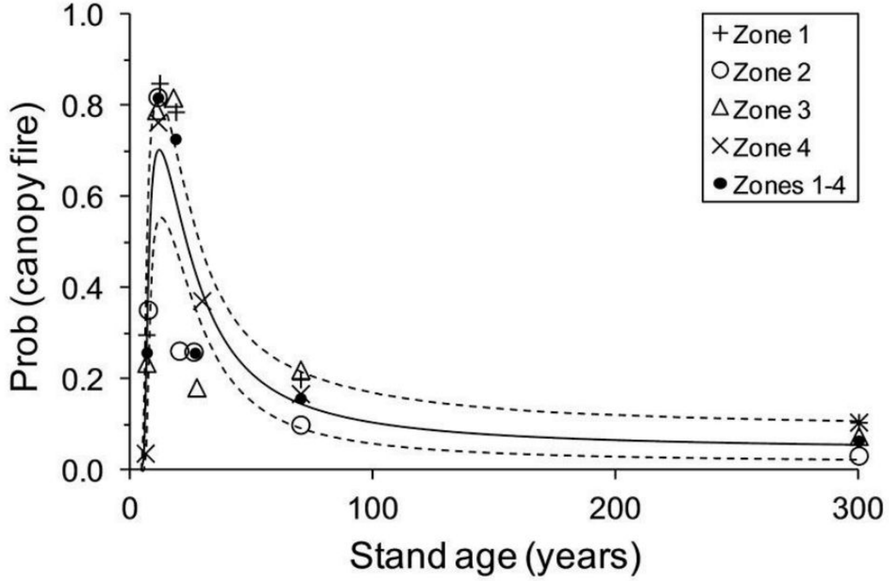
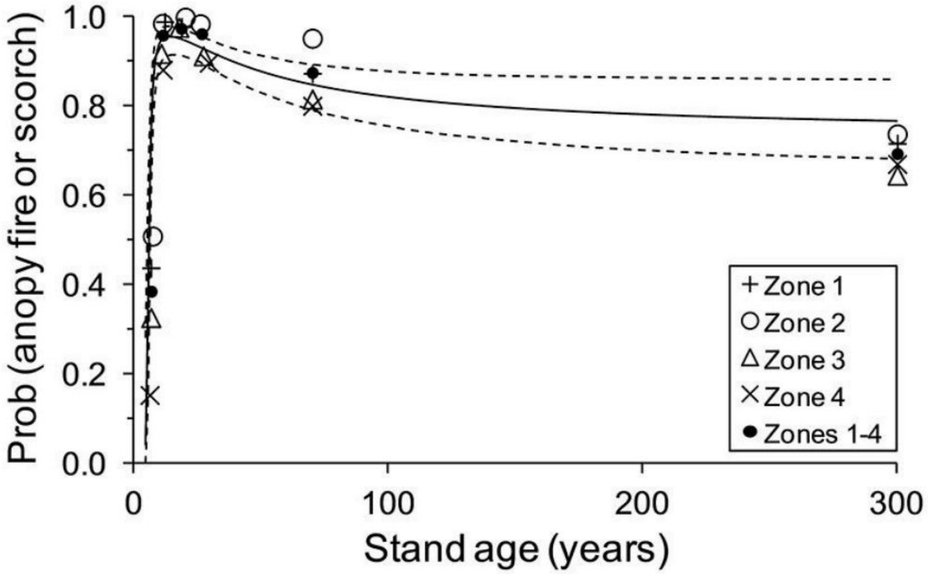
Abstract

We quantify the relationship between forest stand age and fire severity using a detailed case study of Mountain Ash (*Eucalyptus regnans* Muell) forest burned in south-eastern Australia in 2009. We focused on two important areas of Mountain Ash forest that feature a range of growth stages and disturbance histories. Using probit regression analysis, we identified a strong relationship between the age of a Mountain Ash forest and the severity of damage that the forest sustained from the fires under extreme weather conditions. Stands of Mountain Ash trees between the ages of 7 to 36 years mostly sustained canopy consumption and scorching, which are impacts resulting from high-severity fire. High-severity fire leading to canopy consumption almost never occurred in young stands (<7 years) and also was infrequent in older (>40 years) stands of Mountain Ash. We discuss the significant forest conservation and management implications of these results for Mountain Ash forests as well as other similar biomes, where high-severity fire is a common form of disturbance.

Fire Severity Patterns



Probability of Crown Fire



Probability of Crown Fire and Crown Scorch

Source: Taylor et al. 2014

esa ECOSPHERE

Empirical analyses of the factors influencing fire severity in southeastern Australia

David Lindenmayer,† Chris Taylor, and Wade Blanchard

Fenner School of Environment & Society, The Australian National University, Canberra, Australian Capital Territory 2601 Australia

Citation: Lindenmayer, D., C. Taylor, and W. Blanchard. 2021. Empirical analyses of the factors influencing fire severity in southeastern Australia. Ecosphere 12(8):e03721. 10.1002/ecs2.3721

Abstract. Fire severity is a key component of fire regimes, and understanding the factors affecting it is critical given the increasing incidence of wildfires globally. We quantified the factors affecting the severity of the 2019–2020 fires in Victoria, southeastern Australia. We constructed statistical models of relationships between fire severity (as reflected by two measures: Crown Burn and the composite measure of Crown Burn/Crown Scorch) and the main and interacting effects of five key covariates: fire progression zone (reflecting fire weather), time since previous major disturbance in the forest, forest type, slope, and aspect. The best supported models for the probability of a Crown Burn and the probability of a Crown Burn/Crown Scorch contained evidence of a three-way interaction between fire weather, forest type, and time since previous major disturbance as well as two-way interactions between (1) fire weather and slope, and (2) fire weather and aspect. There was an increase in the probability of Crown Burn and Crown Burn/Crown Scorch under more extreme fire weather in all forest types, with the effect especially elevated in dry forest. Our analyses also revealed a range of response curve shapes for the relationships between time since previous major disturbance and fire severity relationships and these varied by fire weather classes and forest type. Under severe fire weather conditions, we found that relationships between time since previous major disturbance and fire severity relationships often exhibited non-linear, negative polynomial shape with a peak around 10–40 yr, especially for Crown Burn, although there also were instances of this distinctive curve shape in our Crown Burn/Crown Scorch fire severity analysis. Our analyses also contained strong evidence that fire severity was higher on steeper slopes and on more exposed northerly aspects under extreme fire weather. Our analyses suggest that forests managed for timber production near settlements may be at increased risk of high-severity fire. This is because logging resets stand age to zero, after which there is a subsequent period of increased probability of high-severity fire, particularly under extreme fire weather conditions. Therefore, policies to maintain cover of older forest near settlements should be considered.

Key words: environmental variables; fire behavior; flammability; forest fire; forest types; southeastern Australia.

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† **E-mail:** David.Lindenmayer@anu.edu.au

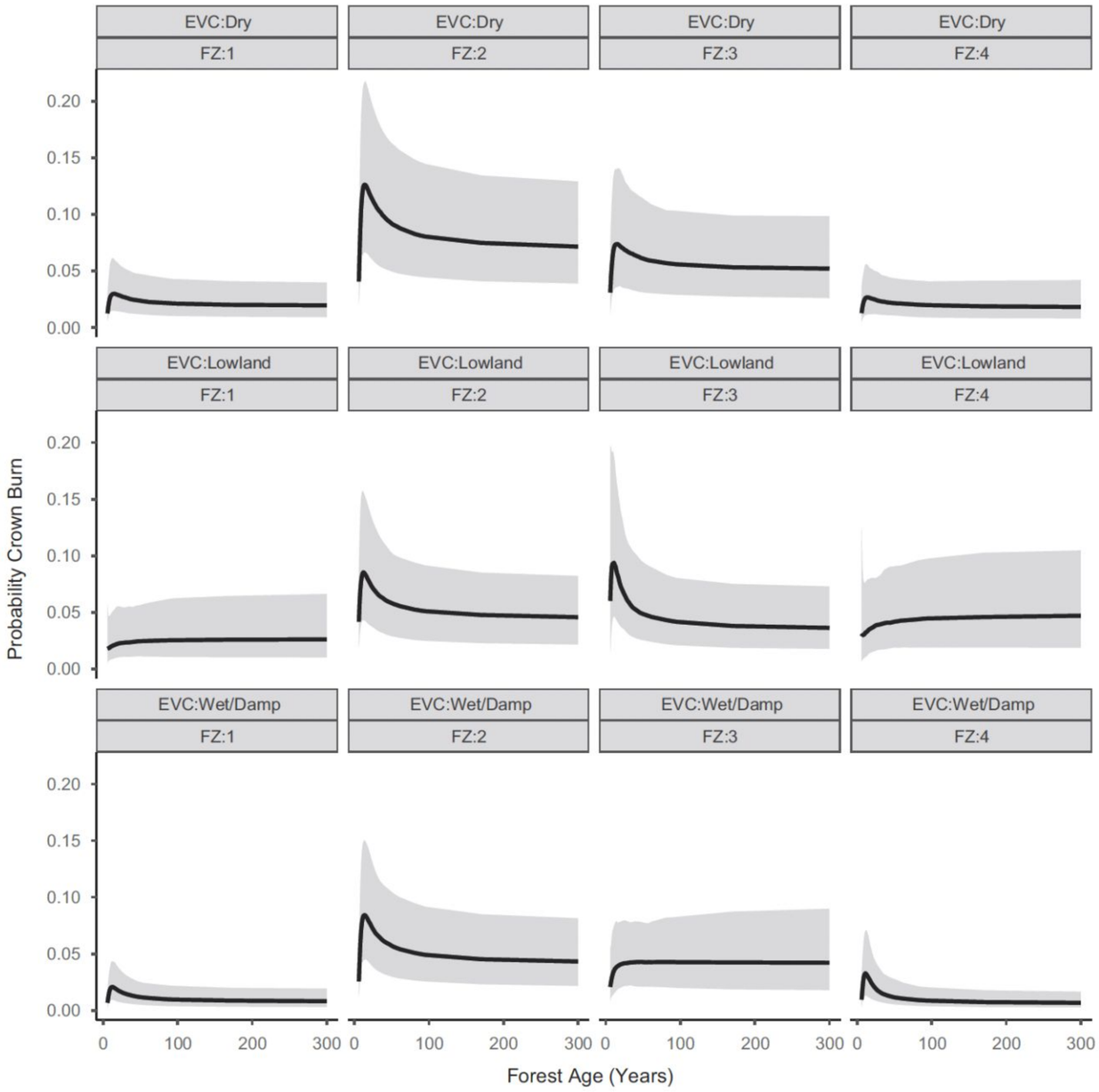


Fig. 4. Posterior mean estimates (solid black lines) and 95% credible intervals (gray shaded areas) for the three-way interaction between fire progression zone (FZ), forest (EVC) type, and the orthogonal inverse quadratic of time since previous major disturbance on the probability of Crown Burn. A magnified version of this figure is available at Appendix S1: Fig. S18.

Source: Lindenmayer, Taylor and Blanchard 2021

Austral ECOLOGY A Journal of ecology in the Southern Hemisphere

Austral Ecology (2020) ••, ••–••

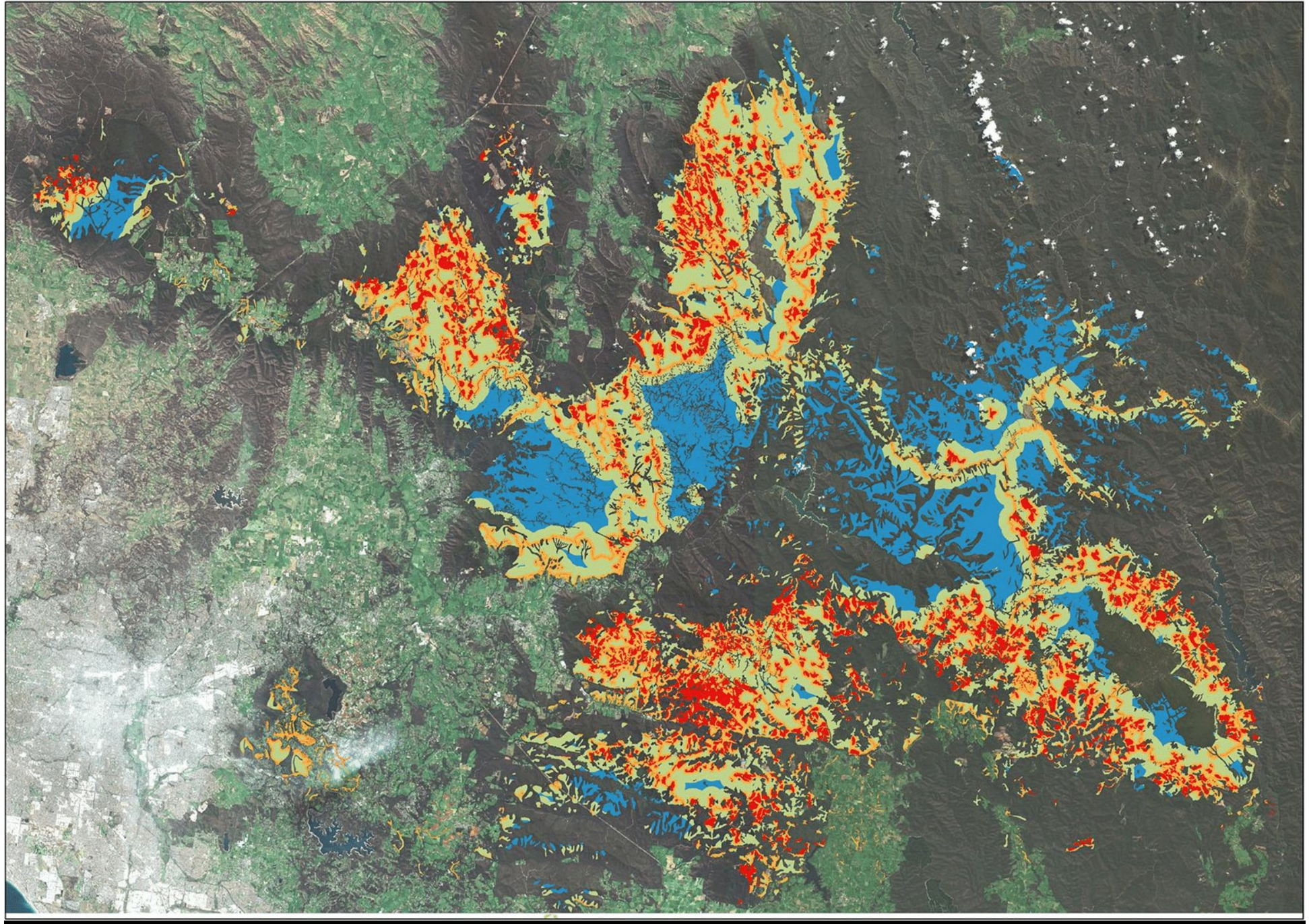
Temporal fragmentation of a critically endangered forest ecosystem

CHRIS TAYLOR[1] AND DAVID B. LINDENMAYER[1,2]*

[1]*Fenner School of Environment & Society, The Australian National University, 141 Linnaeus Way, Canberra, Australian Capital Territory, 2601 (Email: david.lindenmayer@anu.edu.au); and*
[2]*Threatened Species Recovery Hub, National Environmental Science Program, Fenner School of Environment & Society, The Australian National University, Canberra, Australian Capital Territory, Australia*

Abstract Landscape change and habitat fragmentation is increasingly affecting forests worldwide. Assessments of patterns of spatial cover in forests over time can be critical as they reveal important information about landscape condition. In this study, we assessed landscape patterns across the Mountain Ash (*Eucalyptus regnans*) and Alpine Ash (*Eucalyptus delegatensis*) forests in the Central Highlands of Victoria between 1999 and 2019. These forests have experienced major disturbance over the past 20 years through a major fire (in 2009) and extensive industrial logging. We found that around 70% and 65% of the Mountain Ash and Alpine Ash forest areas, respectively, were either disturbed or within 200 m of a disturbed area. Inclusion of planned logging increased these disturbance categories to 72% and 70%, respectively. We also found that the isolation of Mountain Ash core areas (patches of undisturbed forest >1000 ha) increased significantly ($P < 0.05$) over our study period, with the proximity between disturbed areas conversely increasing significantly ($P < 0.05$). This means that continued and planned disturbance through industrial logging will have an amplified adverse effect on remaining undisturbed ash forest patches, which will become smaller and more dispersed across the landscape.

Key words: Alpine Ash forest, disturbance, fire, fragmentation, logging, Mountain Ash forest.



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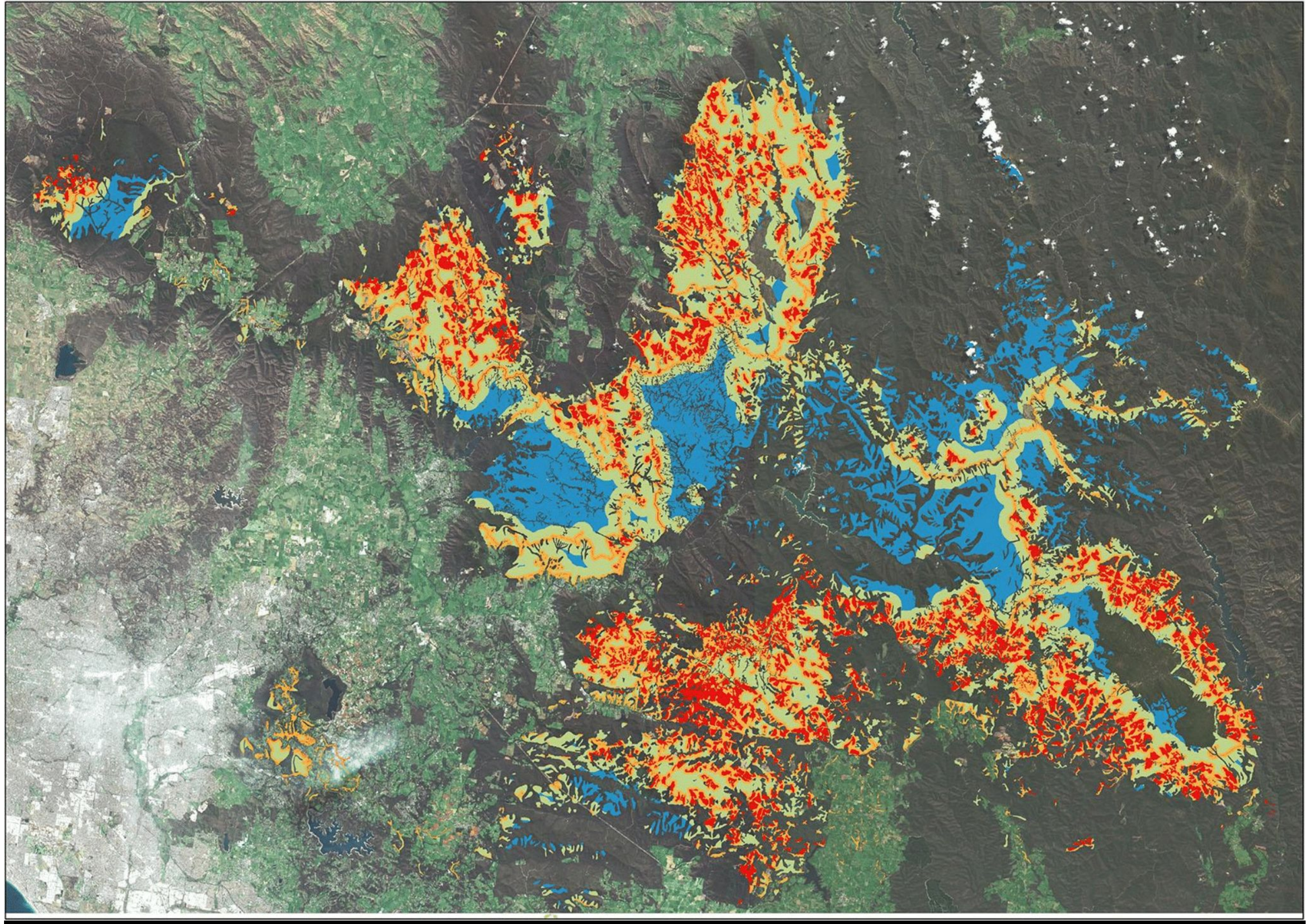

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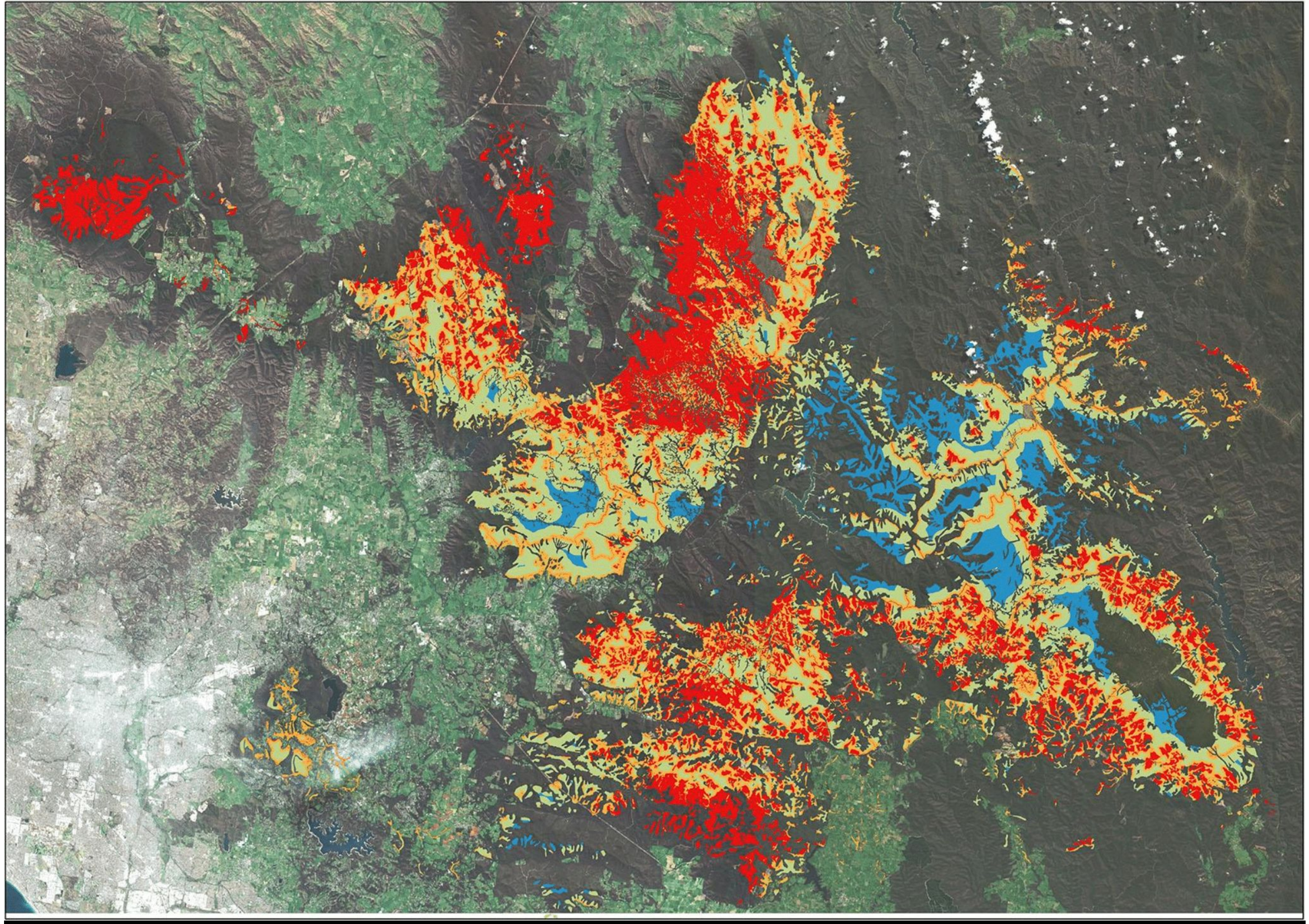

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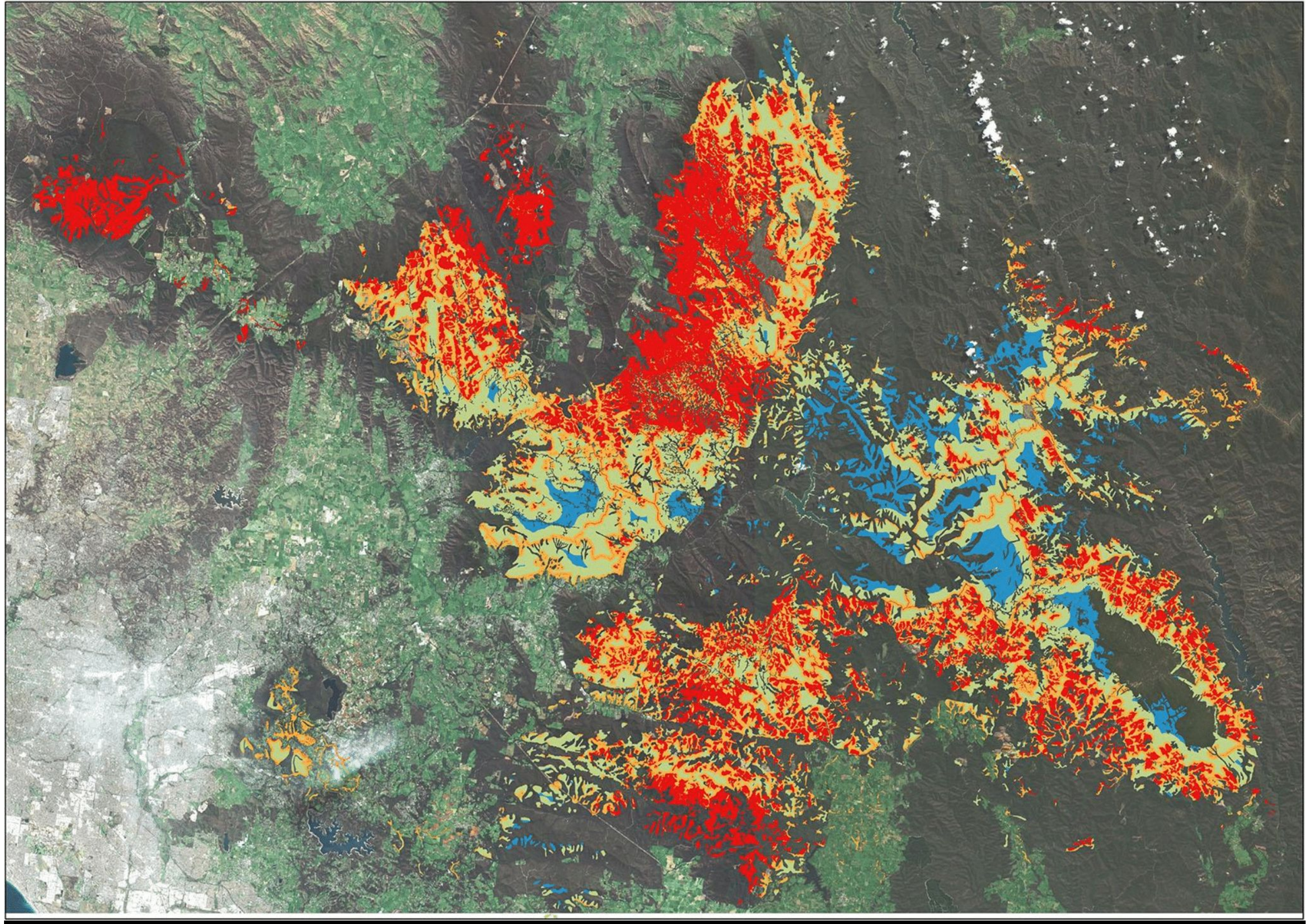

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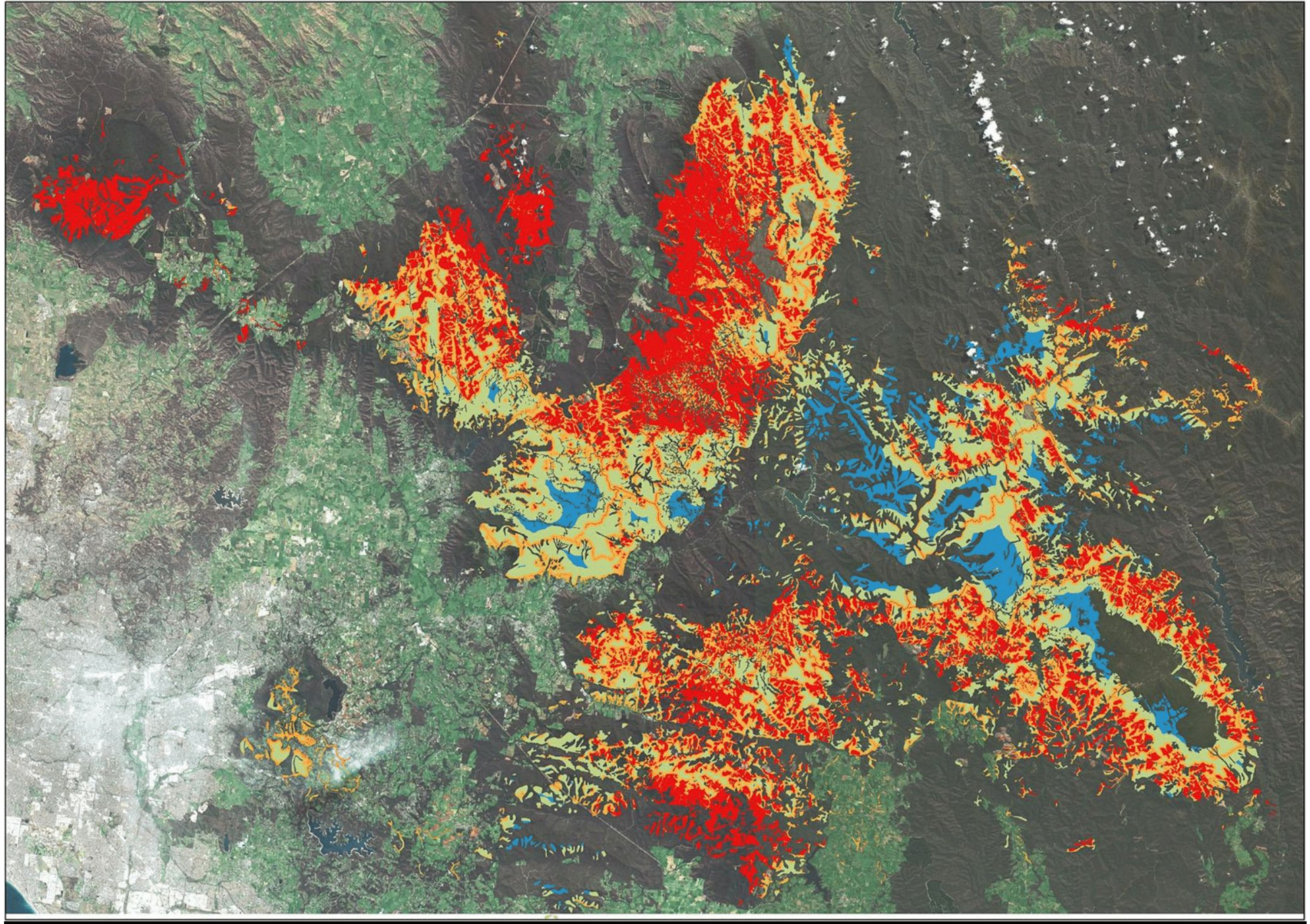

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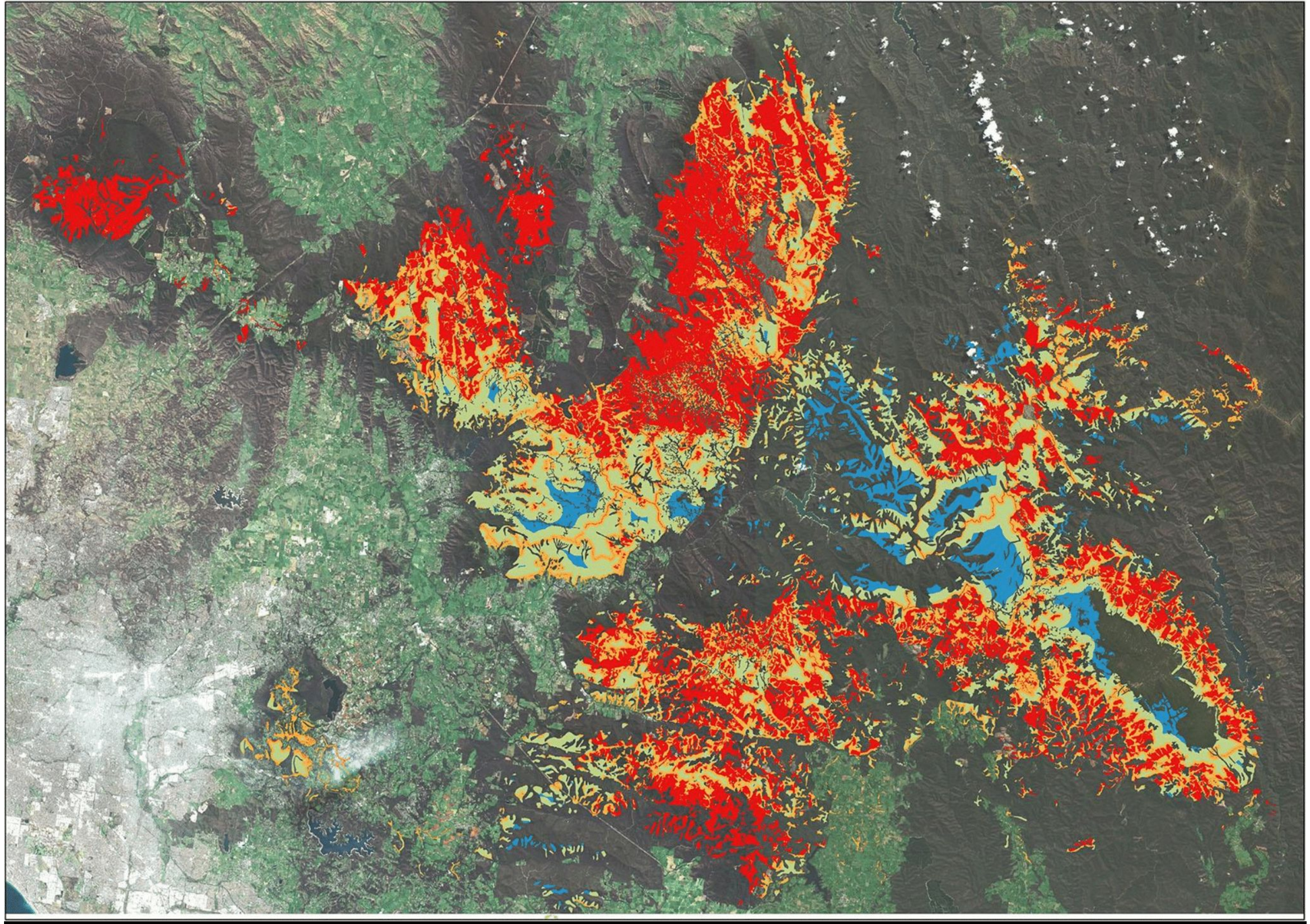

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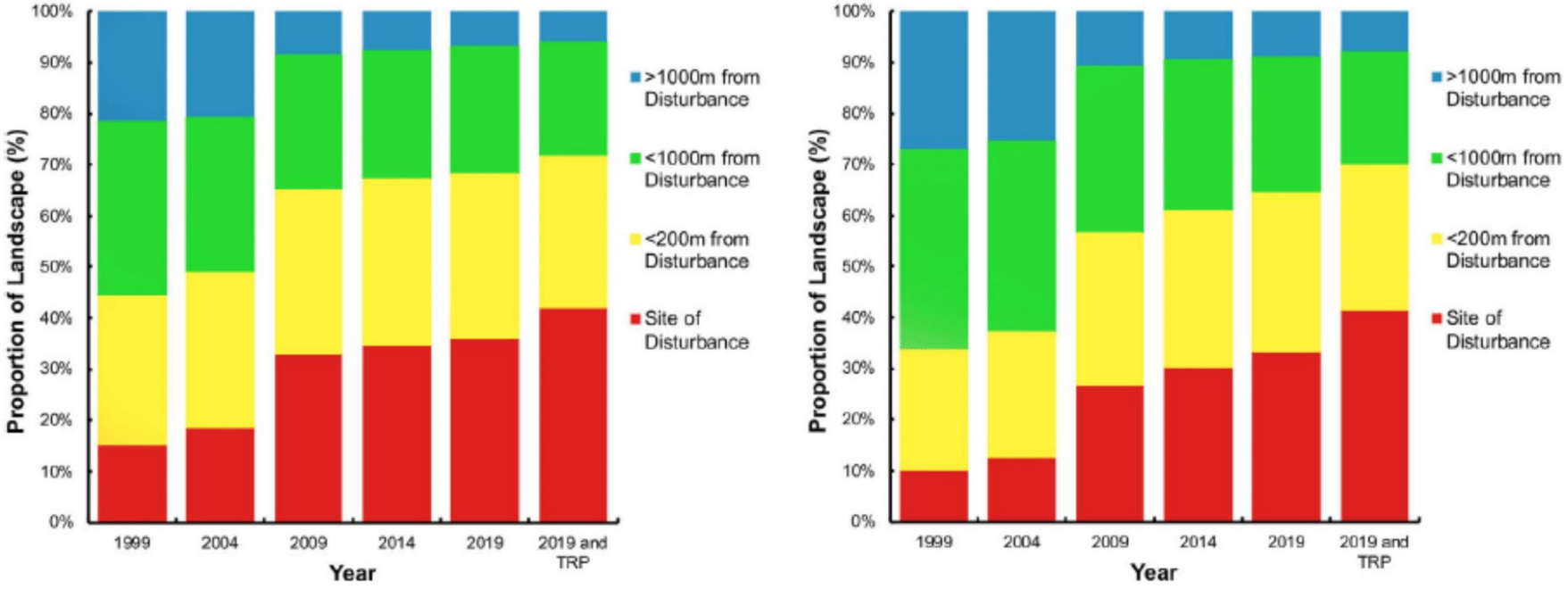

Fig. 9. Disturbance category distributions for Mountain Ash (left) and Alpine Ash (right) forests.

Source: Taylor and Lindenmayer 2020

ECOSYSTEM CRITICALLY ENDANGERED

Regional Assessments

Assessment	Year	Country(ies)	Risk Category	Language(s)
Cape flats sand fynbos	2013	South Africa	CR	English
Cumberland plain woodland	2015	Australia	CR	English
Eastern Stirling Range montane heath and thicket community	2015	Australia	CR	English
Ironstone shrubland	2015	Australia	CR	English
Karst rising-spring wetland community of South East Australia	2013	Australia	CR	English
Mountain ash forest	2015	Australia	CR	English

New spatial analyses of Australian wildfires highlight the need for new fire, resource, and conservation policies

David B. Lindenmayer[a,1,2] and Chris Taylor[a,1]

[a]Fenner School of Environment and Society, The Australian National University, Canberra, ACT 2601, Australia

Edited by Arild Underdal, University of Oslo, Oslo, Norway, and approved April 13, 2020 (received for review February 5, 2020)

Extensive and recurrent severe wildfires present complex challenges for policy makers. This is highlighted by extensive wildfires around the globe, ranging from western North America and Europe to the Amazon and Arctic, and, most recently, the 2019–2020 fires in eastern Australia. In many jurisdictions, discussions after significant losses of life, property, and vegetation are sometimes conducted in the absence of nuanced debates about key aspects of climate, land, and resource management policy. Improved insights that have significant implications for policies and management can be derived from spatial and temporal analyses of fires. Here, we demonstrate the importance of such analyses using a case study of large-scale, recurrent severe wildfires over the past two decades in the Australian state of Victoria. We overlaid the location of current and past fires with ecosystem types, land use, and conservation values. Our analyses revealed 1) the large spatial extent of current fires, 2) the extensive and frequent reburning of recently and previously fire-damaged areas, 3) the magnitude of resource loss for industries such as timber and pulplog production, and 4) major impacts on high conservation value areas and biodiversity. These analyses contain evidence to support policy reforms that alter the mode of forest management, target the protection of key natural assets including unburnt areas, manage repeatedly damaged and potentially collapsed ecosystems, and expand the conservation estate. Our mapping approach should have applicability to other environments subject to large-scale fires, although the particular details of policy reforms would be jurisdiction, ecosystem, and context specific.

wildfire extent and recurrence | sustainable forest management | forest biodiversity conservation

Fire is a key driver of ecosystem structure, condition, composition, and processes. In 2019, there were ∼20 million fire detections globally (1), with the most in the Democratic Republic of the Congo and Russia, and Australia third (∼10% of fire alerts), ahead of Brazil. Fires have long been predicted to become more severe, frequent, and widespread as a result of climate change, although they will, of course, also be influenced at local, landscape, and regional scales by factors such as fuel levels and moisture. In eastern Australia, climate change has exacerbated the extent, frequency, and severity of recent fires (2). Australia is already the most fire-prone continent (3), but assessments by the Australian Academy of Science indicate that some aspects of the current 2019–2020 wildfires are unprecedented (4). It has been estimated that these wildfires burned >12 million hectares of forests and agricultural areas across southeastern Australia (5). This is >12 times larger than the 2019 Amazon fires. More than 1 billion individual Australian animals are believed to have been killed (6), and it has been estimated that 700 species may be driven to extinction (7).

Beyond these broad-scale indicators, a deeper analysis is needed of the different vegetation types and areas under different land use that have been subject to recent and past fire. Such analysis is critical for guiding informed land management policy. We conducted such an analysis of not only the current fire but also recurrent fires for the 23 million-hectare state of Victoria, with a particular focus on forests. The majority of native forest across Victoria is under public ownership and managed by government for either wood production or as conservation reserves. The state is characterized by a wide range of ecosystem types and high levels of biodiversity in many of these ecosystems (8). We completed simple but detailed spatial and temporal analyses that intersected the location and perimeter of current and past fires with ecosystem types, land use, and conservation values. Our analysis revealed pronounced impacts on particular ecosystem types, areas of high conservation value, and the use of resources for industry. These findings, in turn, underscore an urgent need for new policies and approaches to land management that we outline later in this paper.

Results

Across Victoria, wildfires burned ∼1.5 million hectares during the 2019–2020 wildfire season. This is the largest area impacted by wildfires in Victoria since 1939 (when 3.4 million hectares burned). This season was preceded by the 2018–2019 wildfire season, where 211,713 ha was burnt (Fig. 1). The 2019–2020 wildfire is the third megafire (i.e., a fire of >1 million hectares) since 2003, with a 1.3 million-hectare fire in that year and a 1.2 million-hectare fire in 2007 (Fig. 1). Using Tukey's honest significant difference (HSD) test, we found a significant ($P < 0.05$) increase in the annual area burned across the years 2003–2020,

Significance

Discussions after significant fire-related losses of life, property, and vegetation are often conducted in the absence of nuanced debates about climate, land, and resource management policy. Here we present the results of new spatial and temporal analyses of widespread current and previous fires in the Australian state of Victoria that highlight the need for major changes in policies associated with fire and land management. We found compelling evidence to support policy reforms that aim to reduce megafires, alter the mode of forest management, target the protection of key natural assets including unburnt areas, manage repeatedly damaged and potentially collapsed ecosystems, and expand the conservation estate. Our approach should have wide applicability to other jurisdictions confronting threats from widespread, recurrent wildfires.

Author contributions: D.B.L. and C.T. designed research, performed research, and wrote the paper.

The authors declare no competing interest.

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[1]D.B.L. and C.T. contributed equally to this work.

[2]To whom correspondence may be addressed. Email: david.lindenmayer@anu.edu.au.

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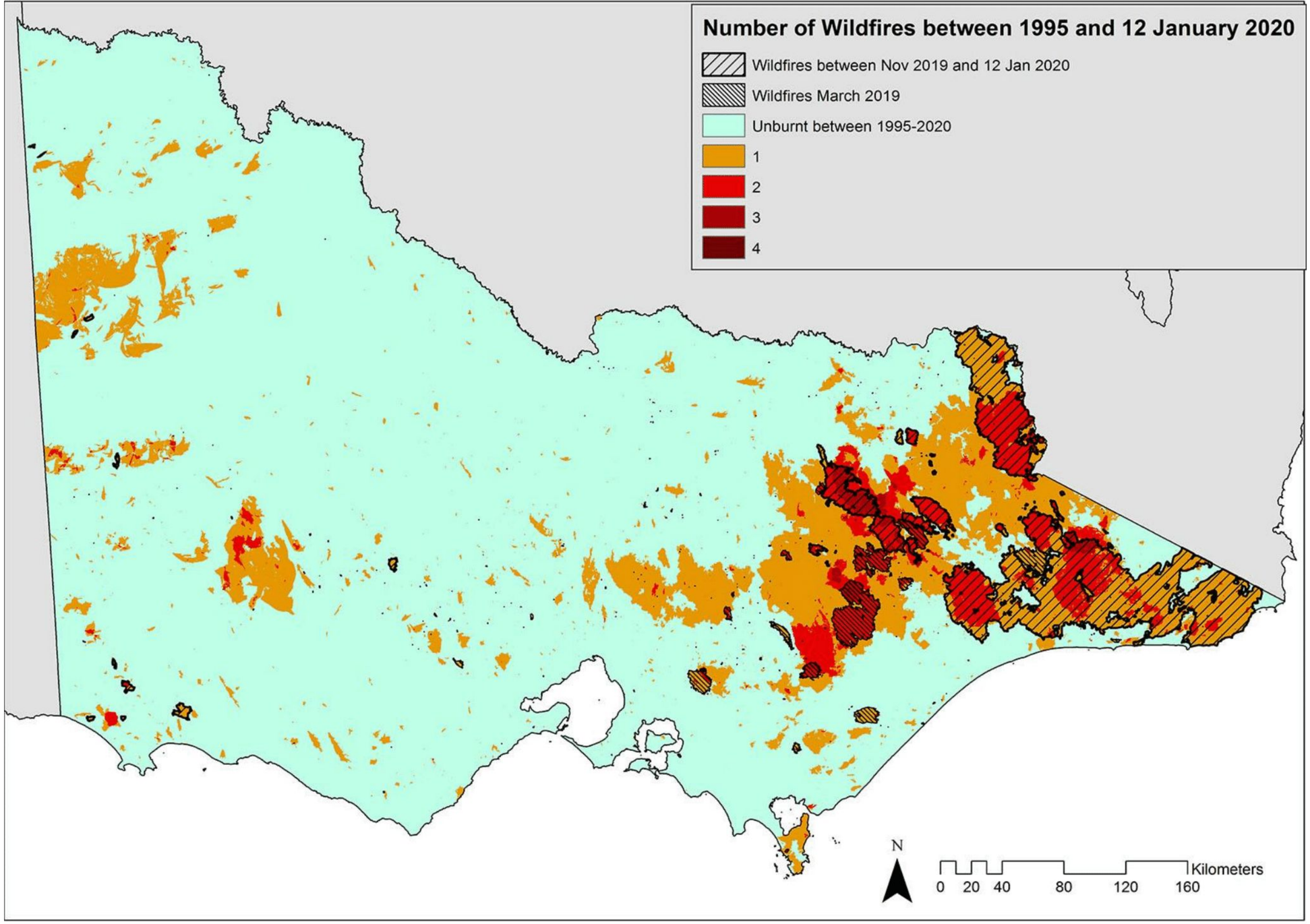
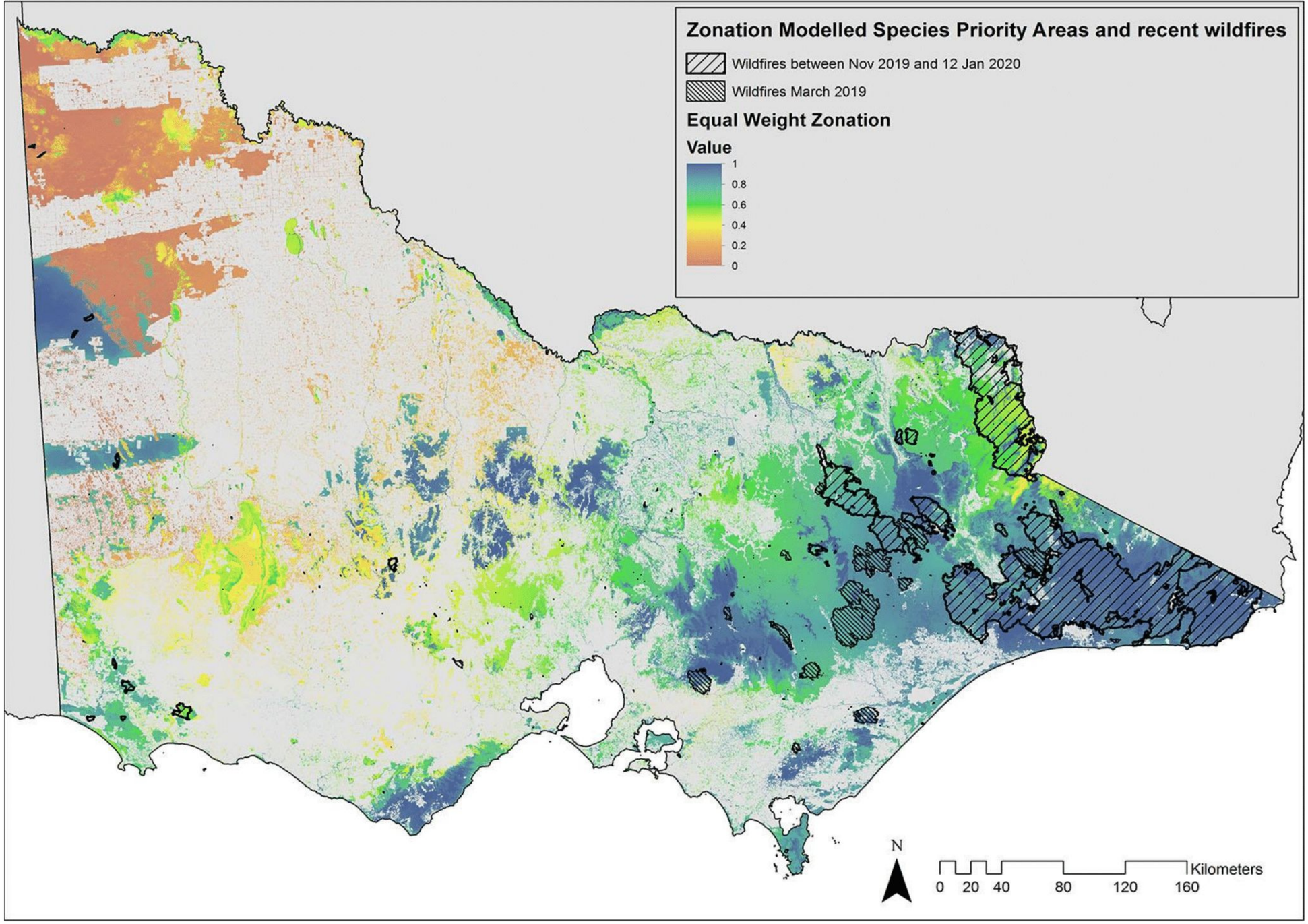
SUSTAINABILITY SCIENCE



Source: Lindenmayer and Taylor 2020



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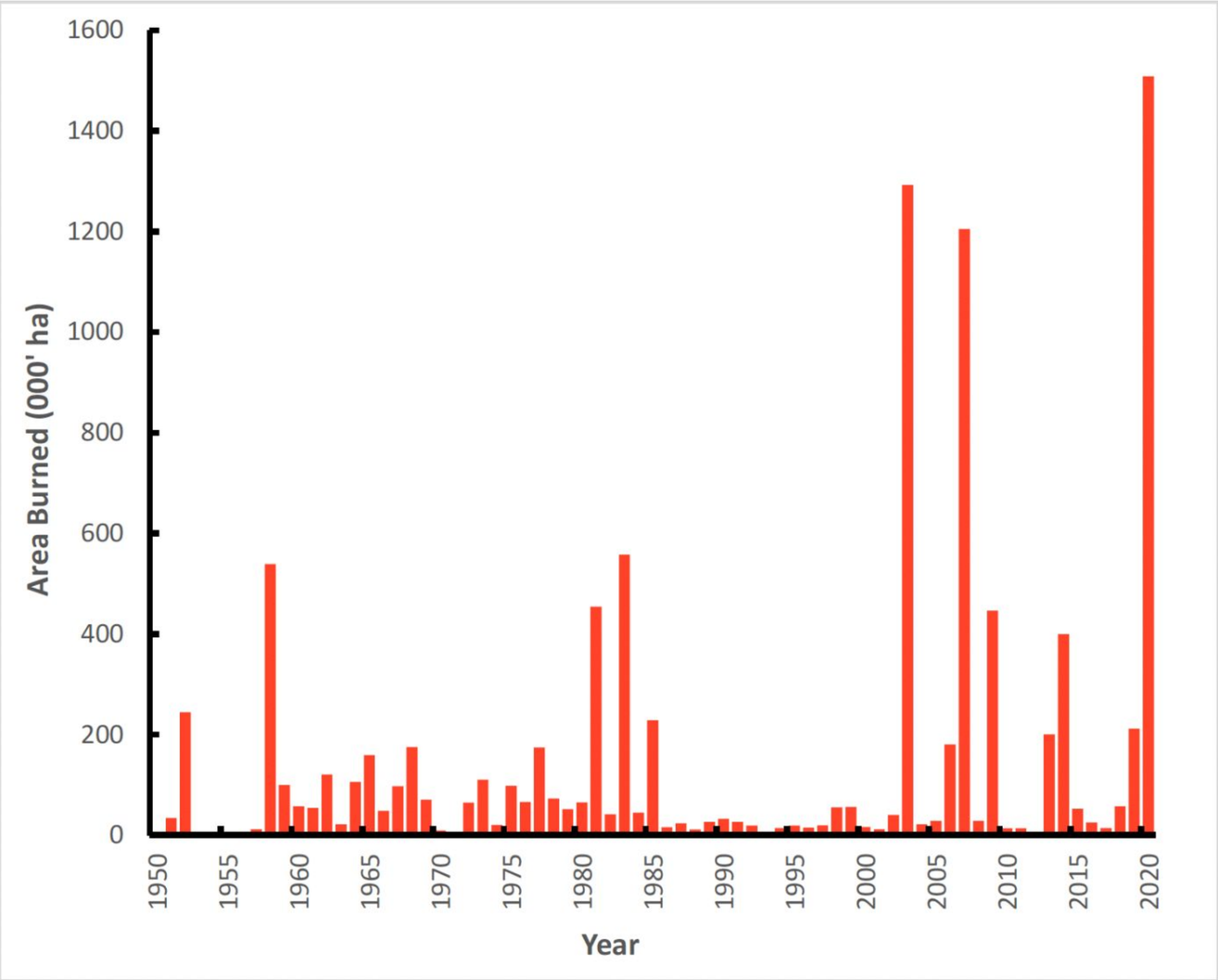

Fig. 1. Area burned across Victoria from 1950 to 2020, showing a significant ($P < 0.05$) increase of annual areas burned after 2000.

Source: Lindenmayer and Taylor 2020


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