THEME 3B.4 BIODIVERSITY AND ENVIRONMENTAL IMPACTS

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Subproject: Ecosystem Impacts

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OVERVIEW

1. Theme

Biodiversity and Environmental Impacts

2. Project question or problem statement

To what extent did the 2019/20 fires affect native vegetation and what are the potential impacts on their post-fire recovery?

3. Key Findings

- Many Australian ecosystems are resilient to particular bushfire regimes, including some that tolerate occasional high severity fires. However, the extent and extreme severity of the 2019/20 fires, and the interacting pressures of drought, disease and anthropogenic disturbances, in combination with legacies of previous fires, means that **post-fire recovery of some ecosystems could be slow or completely impeded, while some ecosystems will undergo long-term transformational changes, with implications for their diversity and provision of ecosystem services**.
- Rainforests are among the most fire-sensitive of Australian ecosystems (Bowman 2000). Much of the rainforest fauna is dependent on a moist microclimate and many rainforest plants have no fire-resistant recovery organs and no seed banks to support post-fire regeneration. **Over 300 000 ha (37%) of NSW rainforests were estimated to have been burnt in the 2019-20 - likely to be the largest area of rainforest burnt in recorded history -** of which 14%

burnt at moderate to extreme fire severity. Large areas of World Heritage rainforest were within the fire footprint. The burnt areas include approximately half of NSW's warm temperate rainforests and dry rainforests, and one-quarter of NSW's subtropical rainforests.

- Alpine ecosystems are extremely restricted on the Australian continent and also sensitive to fire because of their organic soils and slow recovery rates (Camac *et al.*, 2012). More than one-fifth (**27 000 ha) of alpine** vegetation in NSW were within the 2019-20 fire footprint (Fig. 1), of which 18% burnt moderate to extreme fire severity (Fig. 2). This adds to extensive areas of alpine vegetation still regenerating after severe fires in 2002-03.
- The 2019-20 fires burnt more than half of NSW's extensive Wet Sclerophyll Forests and Heathlands amounting to **an area of ~1.9 million ha**. More than one third was burnt at moderate to extreme severity. Wet Sclerophyll Forests are the tallest forests in NSW and main habitats for much of the bird and mammal fauna of NSW. Heathlands are repositories for unique flora and fauna, with more than 90% of their extent burnt in montane parts of the Sydney Basin, including the Blue Mountains World Heritage Area.
- Of 114 Ecological Communities listed as threatened under the NSW *Biodiversity Conservation Act 2016*, 87 were wholly or partly within the 2019-20 bushfire footprint. Of those, 15 had more than one-third of their estimated occurrence within the fire footprint, and are at significant risk from fire-related threats that stem from interactions with a series of other threatening processes. These threats include: fire-drought interactions, high fire frequency, post-fire impacts of non-native herbivores and predators, fire-disease interactions, high fire severity, post-fire weed invasion, fire-sensitivity of key components, fire interactions with hydrological change and post-fire disturbances, and erosion or pollution.
- Several of these fire-related threats are closely linked to climate change, which is increasing the frequency and intensity of droughts, exacerbating fire interval squeeze and increasing the occurrence of erosive post-fire rainfall events.
- Among the direct fire outcomes, the cumulative effects of successive fires in recent decades have major implications for the viability and diversity of Australia's ecosystems. As a consequence of the 2019-20

bushfires, seven NSW Rainforest community types, 46 Wet Sclerophyll Forest types and two alpine vegetation types experienced successive fires in less than 50 years across more than 50% of their distributions (Table 2). Twenty Dry Sclerophyll Forest types, three Hetahland types and four wetland types experienced fire intervals of less than 15 years across more than half of their distributions (Table 2).

- High fire frequencies are known to interrupt life cycles, reduce regenerative capacity, transform habitat structure and increase exposure to invasive species (Keith 1996; Enright et al. 2014; Fairman et al. 2017). The specific nature of degradation varies between ecosystem types and depends on the severity of successive fires (i.e. both low and high severity fires may have serious impacts, depending on their frequency of recurrence). High severity fires are also more likely to produce areas with shorter fire intervals, in part because when fire weather conditions are extreme (such as during many times during the 2019-20 season), they can burn over recently burnt areas (Tolhurst & McCarthy, 2016). The loss of diversity and function associated with frequent fires is exacerbated by interval squeeze driven by climate change (Enright *et al*. 2015).
- The vast extent of 2019-20 fires means that very few areas of vegetation now remain in a mature state (Williamson, 2020), underscoring the importance remaining unburnt refuges and the exposure of large areas to amplified risks of high frequency fire regimes.
- **Understanding the capacity for fire-impacted ecosystems to recover**, particularly under interacting pressures of drought, disease, erosion and weed invasion **is a top priority**. Erosion of this resilience to fires is already leading to the collapse of some key ecosystems (Keith, 2020).
- On-ground assessment of the impacts and recovery response is essential to inform priorities for restorative action and adaptive strategies for fire management to reduce risks to Australia's unique environmental assets in an uncertain future. In general, these management strategies need to be broadly based, reducing other stressors, to build resilience to climate-forced changes fire regimes.

4. Significance of findings in context of previous studies

The impacts of the 2019-20 bushfires on ecosystems are far-reaching in terms of the extent and diversity of natural assets affected. The area of affected rainforest and wet sclerophyll forest appears to be the most extensive in the history of spatially explicit records.

While much public attention has focused on the high severity and unprecedented extent of the 2019-20 bushfires and the extreme conditions that led to them, the ecological impacts and recovery of ecosystems and species depend heavily on multiple contextual factors that either amplify direct fire impacts or reduce the resilience of ecosystems to withstand and recover from fires. Effective action to reduce risks and promote recovery therefore require broad strategies that reduce threats posed by fire-drought interactions, high fire frequency, post-fire impacts of non-native herbivores and predators, fire-disease interactions, high fire severity, post-fire weed invasion, fire-sensitivity of key components, fire interactions with hydrological change and post-fire disturbances, and erosion or pollution. Importantly, these strategies focus attention on the period between major fire events, rather than the post-disaster phase.

New mapping technologies, combined with accumulating inventory data, have enabled a more comprehensive and more rapid overview of major effects than has been possible in any previous fire event. Continued capacity building in these areas will enhance the ability of governments, industries and communities to reduce risks of accelerated biodiversity loss by enabling pre-emptive and rapid-response strategies to avoid cumulative fire impacts and mitigate the causal factors.

The extent of fire sensitive vegetation communities impacted is large, and fundamental knowledge gaps exist, such as knowing the resprouting response of some dominant species.

High severity fires are also more likely to produce areas with shorter fire intervals, in part because when fire weather conditions are extreme (such as during many times during the 2019/20 season), they can burn over recently burnt areas (Tolhurst & McCarthy, 2016). This is a key element of projected fire interval squeeze (Enright *et al*., 2015) where increased fire frequency results from increasing frequency of dangerous fire weather conditions. High fire frequency can have wide ranging impacts including decline or local extinction of key functional plant groups (e.g. obligate seeding species with long primary juvenile periods). Consistently high frequency fire can have negative impacts across all plant types (Keith, 1996, Enright et al., 2014). Fire sensitive vegetation types are particularly sensitive to fire frequency increases (Camac *et al*., 2012)

5. Approach and Methods

Fire severity was calculated using the FESM algorithm (Gibson *et al*., 2020) and ranged from unburnt to extreme. The number of hectares and percent burnt for both Vegetation Formations and Classes (Keith, 2004) were calculated from where they intersected with FESM classes for the 2019/20 fires.

For more information on the State Vegetation Type Map layers used, please see https://www.environment.nsw.gov.au/resources/vegetation/nsw-state-vegetation-type-map-methodology-170134.pdf

6. Limitations and remaining knowledge gaps

Remotely-sensed detection of fire effects can be limited where canopies remain intact and dense (i.e primarily for fires at the lower end of severity). Additionally, for the approach used here (FESM), the robustness of the output is also dependent on suitable quantities of training data. For these reasons, the total area burnt could be underestimated.

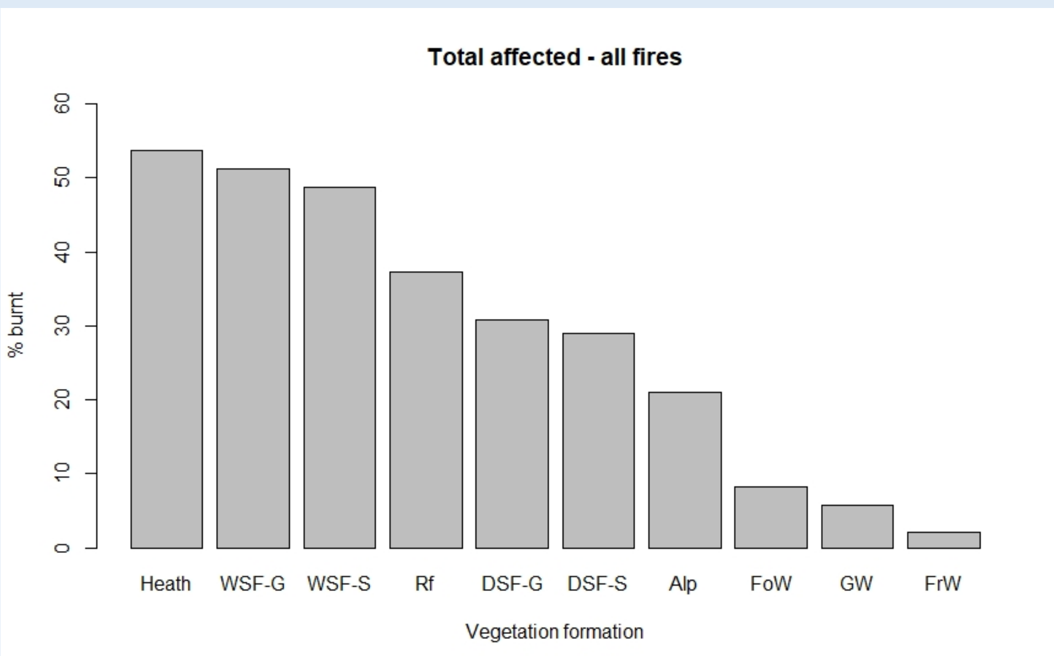
However, moderate to extreme severity fires appear to match other products well (for example the Google Earth Engine Burnt Area Mao (GEEBAM) version 23rd March 2020 (https://datasets.seed.nsw.gov.au/dataset/google-earth-engine-burnt-area-map-geebam) and we have focused on the moderate to extreme severity output here.

Note that this is a preliminary analysis, and further inspection of the impacts of fire severity is required at finer resolution. Importantly, long term monitoring is also required to understand the capacity for vegetation to recover after being impacted by fires at different severities.

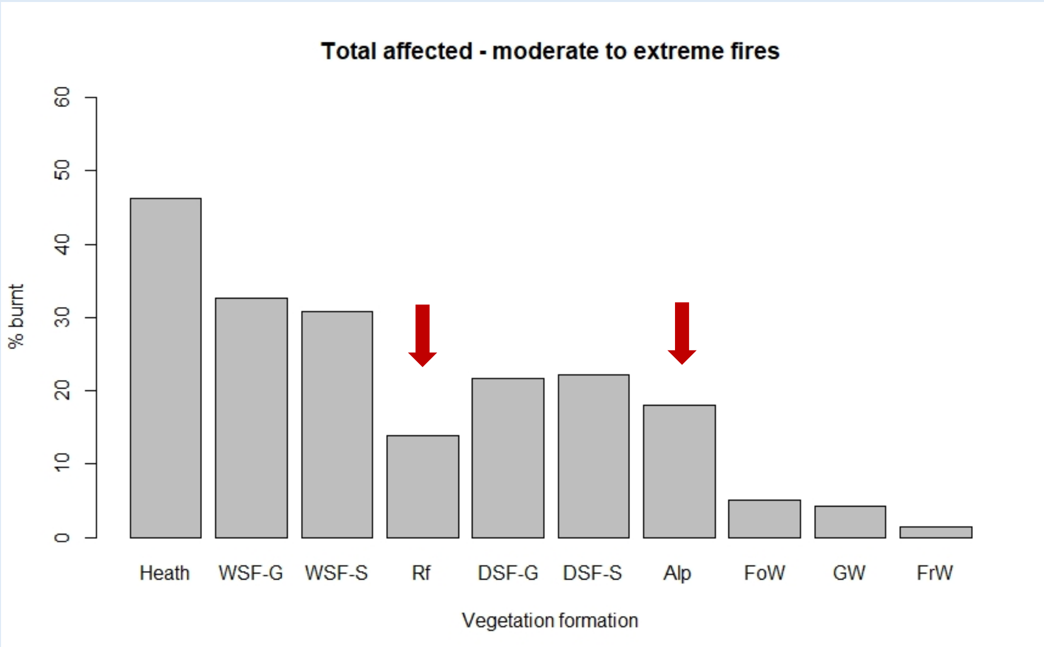
7. Implications for management

Minimising negative impacts on ecosystems requires reduction of other interacting pressures where possible. This could include, but is not restricted to, ensuring adequate time is given for natural recovery (e.g. ensuring no prescribed burns where this could induce threat from high frequency fire). Introduction of landscape-scale planning could identify where sensitive environmental assets are most at risk and provide a template for planning a response in the event of future fires or other disturbance. The clear plan and coordinated response for protection of the Wollemi Pine during this fire season gives a good example of enhanced preparedness for such future events. **Such a response could be applied across multiple sensitive assets**.

8. **Figure 1** Vegetation formations impacted by the 2019/20 fires. WSF is Wet Sclerophyll Forest (sub-formations Grassy (G) and Shrubby (S)); Rf Rainforest; DSF Dry Scleophyll Forest (sub-formations Shrub/grass (G) and Shrubby (S)); Alp Alpine Complex; FoW Forested Wetlands; GW Grassy Woodlands; FrW Freshwater Wetlands.



9. **Figure 2** Vegetation formations impacted by the 2019/20 fires and burnt at moderate to extreme severity fire. **Arrows indicate Vegetation Formation considered very fire sensitive**.



10. **Table 1** All Vegetation Classes burnt across at least 10% of their distribution by the 2019/20 fires, with % total (of range in NSW) burnt at moderate, high and extreme severity.

Vegetation Class	% Moderate severity	% High severity	% Extreme severity	Total % fire affected	Total hectares (ha) affected
Sydney Montane Heaths	4.09	25.97	44.99	90.11	55 250
Sydney Montane Dry Sclerophyll Forests	3.56	49.29	12.07	87.06	105 004
South Coast Heaths	9.08	24.05	29.13	74.57	2 381
Southern Hinterland Dry Sclerophyll Forests	14.98	33.75	10.43	78.10	63 150
South Coast Wet Sclerophyll Forests	17.26	24.02	13.23	76.77	203 955
Southern Lowland Wet Sclerophyll forests	13.84	26.49	13.95	80.25	131 771
Southern Warm Temperate Rainforests	17.74	21.02	14.75	76.56	24 844
South East Dry Sclerophyll Forests	10.05	24.97	13.67	68.22	333 412

Southern Escarpment Wet Sclerophyll Forests	11.19	23.92	7.36	64.43	150 181
Sydney Coastal Heaths	1.67	11.92	23.94	42.05	15 391
Northern Gorge Dry Sclerophyll Forests	8.56	24.24	2.36	66.05	217 417
Montane Wet Sclerophyll Forests	7.95	17.40	9.80	48.15	70 460
Sydney Hinterland Dry Sclerophyll Forests	3.17	28.56	2.08	71.30	477 315
Coastal Heath Swamps	2.14	11.94	19.68	39.18	18 373
Southern Montane Heaths	2.25	9.26	20.90	34.92	6 785
Subalpine Woodlands	8.52	11.63	11.91	43.74	94 559
Central Gorge Dry Sclerophyll Forests	7.66	21.52	1.74	66.53	139 958
Northern Tableland Wet Sclerophyll Forests	9.95	18.76	2.12	58.59	227 060
Clarence Dry Sclerophyll Forests	5.79	21.76	2.31	51.16	233 186
Sydney Sand Flats Dry Sclerophyll Forests	0.71	26.28	1.50	42.27	8 174
Wallum Sand Heaths	1.29	7.58	18.91	30.52	6 792
Northern Escarpment Dry Sclerophyll Forests	11.37	14.20	2.11	52.88	52 051
Alpine Heaths	2.98	5.68	16.82	27.55	6 005
Northern Hinterland Wet Sclerophyll Forests	6.48	16.49	1.60	51.70	597 594
Northern Montane Heaths	9.80	8.87	4.20	36.90	14 765
Southern Tableland Wet Sclerophyll Forests	6.48	12.58	3.39	31.28	120 601
Alpine Herbfields	2.08	3.14	15.74	23.59	18 473
Northern Escarpment Wet Sclerophyll Forests	8.54	11.13	1.06	45.81	48 944
Montane Bogs and Fens	6.17	8.29	4.63	25.93	19 224
Sydney Coastal Dry Sclerophyll Forests	1.54	12.24	5.00	29.70	86 811
Dry Rainforests	7.28	8.91	2.04	47.27	101 592
Coastal Swamp Forests	2.37	11.16	3.89	26.75	26 594
New England Dry Sclerophyll Forests	4.90	9.84	1.40	30.09	121 929

North Coast Dry Sclerophyll Forests	3.06	12.18	0.75	37.84	28 474
Coastal Valley Grassy Woodlands	1.96	8.17	5.34	20.94	52 975
Southern Tableland Dry Sclerophyll Forests	2.52	10.19	2.28	21.63	193 541
North Coast Wet Sclerophyll Forests	5.05	7.97	0.78	33.92	244 532
South Coast Sands Dry Sclerophyll Forests	5.01	5.95	2.80	22.40	4 232
Coastal Headland Heaths	2.27	7.12	4.07	18.25	1 604
Upper Riverina Dry Sclerophyll Forests	1.06	9.26	2.31	15.88	32 810
Northern Tableland Dry Sclerophyll Forests	3.15	6.86	2.20	20.87	97 231
Coastal Floodplain Wetlands	3.75	6.20	1.61	23.06	24 845
Northern Warm Temperate Rainforests	6.11	3.95	0.90	43.11	103 378
Eastern Riverine Forests	5.22	4.56	0.58	21.18	39 966
Subtropical Rainforests	5.21	3.86	0.49	25.95	71 451
Saltmarshes	7.02	2.07	0.37	13.16	1 196
Cool Temperate Rainforests	3.47	2.70	2.98	15.73	3 300
Alpine Bogs and Fens	1.15	1.54	5.86	9.85	2 932
SVTM - unattribtued PCT	3.00	3.27	1.48	12.65	4 249
Coastal Freshwater Lagoons	2.38	3.59	1.69	12.58	6 842
Coastal Dune Dry Sclerophyll Forests	1.31	3.97	2.21	10.99	4 145
Littoral Rainforests	2.29	2.37	1.30	10.63	760

11. Table 2. NSW plant community types exposed to high fire frequency as a consequence of 2019-20 bushfires and past fire history. Plant communities include rainforests, wet sclerophyll forests and alpine ecosystems experiencing fire return intervals of less than 50 years, and dry sclerophyll forests, heathlands and wetlands experiencing fire return intervals of less than 15 years. All listed communities had more than 50% of their mapped distribution within the 2019-20 fire footprint.

Name of Plant Community Type	Vegetation Formation	% distribution burnt	Fire recurrence
Sydney Basin Warm Temperate Rainforest	Rainforests	81	<50 yrs
Upper Blue Mountains Gully Rainforest	Rainforests	63	<50 yrs
South Coast Temperate Gully Rainforest	Rainforests	69	<50 yrs
Southeast Warm Temperate Rainforest	Rainforests	65	<50 yrs
Southeast Cool Temperate Rainforest	Rainforests	69	<50 yrs
Northern Escarpment Grey Myrtle Gully Rainforest	Rainforests	92	<50 yrs
South Coast Grey Myrtle Dry Rainforest	Rainforests	77	<50 yrs
Blue Mountains Enriched Blue Gum Moist Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	84	<50 yrs
Blue Mountains Wet Gully Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	78	<50 yrs
Burragorang Turpentine Moist Gully Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	72	<50 yrs
Hunter Range Grey Myrtle Dry Gully Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	73	<50 yrs
Hunter Range Turpentine-Grey Myrtle Gully Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	89	<50 yrs
Far South Sandflats Angophora Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	100	<50 yrs
Far South Lowland Creekflat Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	88	<50 yrs
Shoalhaven Hinterland Peppermint Gully Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	100	<50 yrs
South Coast Creekflat River Peppermint Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	78	<50 yrs
South Coast Ranges Moist Gully Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	57	<50 yrs
South Coast Riverflat Ribbon Gum Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	85	<50 yrs
South Coast Stringybark-Monkey Gum Wet Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	78	<50 yrs
Southeast Escarpment Flats Swamp Gum Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	92	<50 yrs
Southeast Hinterland Intermediate Shrub Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	53	<50 yrs
Southeast Hinterland Monkey Gum Moist Shrub Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	70	<50 yrs
Northern Escarpment Blackbutt-Maple Wet Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	93	<50 yrs
Northern Escarpment Blackbutt-Tallowwood Wet Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	73	<50 yrs

Northern Escarpment Rocky Blackbutt Scrub Woodland	Wet Sclerophyll Forests (Shrubby sub-formation)	75	<50 yrs
Blue Mountains Basalt Cap Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	100	<50 yrs
Blue Mountains Cool Wet Eucalypt Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	89	<50 yrs
Far South Escarpment Damp Flats Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	93	<50 yrs
Southeast Mountain Wet Fern Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	83	<50 yrs
Southern Escarpment Messmate Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	86	<50 yrs
Western Blue Mountains Montane Wet Fern Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	86	<50 yrs
Hunter Escarpment Enriched Moist Forest	Wet Sclerophyll Forests (Grassy sub-formation)	82	<50 yrs
Hunter Range Blue Gum Gully Forest	Wet Sclerophyll Forests (Grassy sub-formation)	75	<50 yrs
Hunter Range Colluvial Angophora-Gum Forest	Wet Sclerophyll Forests (Grassy sub-formation)	69	<50 yrs
Hunter Range Sheltered Grey Gum Forest	Wet Sclerophyll Forests (Grassy sub-formation)	67	<50 yrs
Northern Gorges Diverse Grassy Forest	Wet Sclerophyll Forests (Grassy sub-formation)	76	<50 yrs
Northern Hinterland Tallowwood-Forest Oak Grassy Forest	Wet Sclerophyll Forests (Grassy sub-formation)	87	<50 yrs
Sydney Basin Creekflat Blue Gum-Angophora Forest	Wet Sclerophyll Forests (Grassy sub-formation)	74	<50 yrs
Nattai-Morton Sandstone Peppermint Gully Forest	Wet Sclerophyll Forests (Grassy sub-formation)	70	<50 yrs
Shoalhaven Foothills Turpentine Forest	Wet Sclerophyll Forests (Grassy sub-formation)	93	<50 yrs
Shoalhaven Foothills Turpentine-Ironbark Moist Forest	Wet Sclerophyll Forests (Grassy sub-formation)	97	<50 yrs
Shoalhaven Spotted Gum-Blackbutt Moist Forest	Wet Sclerophyll Forests (Grassy sub-formation)	65	<50 yrs
South Coast Creekflat Grassy Forest	Wet Sclerophyll Forests (Grassy sub-formation)	72	<50 yrs
South Coast Spotted Gum-Cycad Dry Forest	Wet Sclerophyll Forests (Grassy sub-formation)	61	<50 yrs
South Coast Stringybark-Cycad Exposed Forest	Wet Sclerophyll Forests (Grassy sub-formation)	80	<50 yrs
Carrai-Werrikimbe Moist Grassy Forest	Wet Sclerophyll Forests (Grassy sub-formation)	100	<50 yrs
Far North Escarpment Blackbutt Grassy Forest	Wet Sclerophyll Forests (Grassy sub-formation)	87	<50 yrs
Far North Escarpment Blackbutt Moist Forest	Wet Sclerophyll Forests (Grassy sub-formation)	77	<50 yrs
Far North Escarpment Gorges Blackbutt Forest	Wet Sclerophyll Forests (Grassy sub-formation)	79	<50 yrs
Western Guy Fawkes Plateau Moist Gum Forest	Wet Sclerophyll Forests (Grassy sub-formation)	94	<50 yrs
Sydney Montane Basalt Moist Forest	Wet Sclerophyll Forests (Grassy sub-formation)	77	<50 yrs

Kosciuszko-Namadgi Alpine Ash Moist Grassy Forest	Wet Sclerophyll Forests (Grassy sub-formation)	70	<50 yrs
Southeast Escarpment Ash Forest	Wet Sclerophyll Forests (Grassy sub-formation)	87	<50 yrs
Chandlers Creek Dry Grassy Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	91	<15 yrs
Clarence Gorges Granite Grassy Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	95	<15 yrs
Clarence Gorges Grey Gum-Ironbark Grassy Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	94	<15 yrs
Macleay Gorges Stringybark-Red Gum Grassy Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	85	<15 yrs
Northern Gorges Granite Stringybark-Apple Grassy Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	89	<15 yrs
Northern Gorges Grey Gum-Tallowood Grassy Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	88	<15 yrs
Northern Gorges Red Gum-Stringybark Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	87	<15 yrs
Upper Guy Fawkes Stringybark-Red Gum Grassy Forest	Dry Sclerophyll Forests (Shrub/grass sub-formation)	100	<15 yrs
Banyabba Rockplate Shrubby Woodland	Dry Sclerophyll Forests (Shrubby sub-formation)	67	<15 yrs
Clarence Sandstone Blackbutt-Bloodwood Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	87	<15 yrs
Blue Mountains Peppermint Shrub Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	93	<15 yrs
Hunter Range Grey Gum-Stringybark Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	78	<15 yrs
Hunter Range Peppermint Moist Gully Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	100	<15 yrs
Mellong Sand Swamp Woodland	Dry Sclerophyll Forests (Shrubby sub-formation)	100	<15 yrs
Carrai-Werrikimbe Blackbutt Dry Shrub Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	100	<15 yrs
Chaelundi-Mann River Granite Scrub Woodland	Dry Sclerophyll Forests (Shrubby sub-formation)	100	<15 yrs
Clarence Escarpment Blackbutt Moist Fern Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	78	<15 yrs
Timbarra Granite Blackbutt Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	85	<15 yrs
Timbarra Granite Strawberry Gum-Stringybark Woodland	Dry Sclerophyll Forests (Shrubby sub-formation)	97	<15 yrs
Upper Blue Mountains Moist Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	85	<15 yrs
Timbarra Granite Rocky Heath-Woodland	Heathlands	100	<15 yrs
Blue Mountains Rocky Mallee Heath	Heathlands	70	<15 yrs
Newnes Plateau Rockplate Heath	Heathlands	89	<15 yrs
Namadgi Subalpine Rocky Shrubland	Alpine Complex	69	<50 yrs
Kosciuszko Frost Hollow Grassland	Alpine Complex	93	<50 yrs
Blue Mountains Creekline Shrub Swamp	Freshwater Wetlands	64	<15 yrs
Far South Hinterland Heath	Freshwater Wetlands	100	<15 yrs

Northern Escarpment Granitoid Wet Heath	Freshwater Wetlands	96	<15 yrs
Newnes Plateau Shrub Swamp	Freshwater Wetlands	100	<15 yrs

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