GIANTS PRESCRIBED BURN FRK_111

TREE FALL ASSESSMENT

Report by Uralla Luscombe-Pedro

This survey and report was completed by Uralla Luscombe-Pedro who acknowledges and gives thanks to contributors who assisted with mapping and technical advice.

The author and contributors to the report would like to acknowledge the Traditional Custodians of the land we live, work, research and enjoy, the Noongar people, as well as all Australian Aboriginal and Torres Strait Islander people. We pay respects to the ancestors, Elders and Custodians for their past and continued care of the land.

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Cover image:
Nicky and Daniel stand next to a Red Tingle with a diameter of almost 2.5 metres which was felled by this prescribed burn and recorded as waypoint 0134.

1. SUMMARY

The West Australian Government's prescribed burning program as actioned by the Department of Biodiversity, Conservation, and Attractions (DBCA) in the Tingle forests of Walpole-Nornalup National Park, has caused many large trees to collapse.

A post-burn tree fall assessment was undertaken in an area of Red Tingle forest in Bow Bridge, WA on 9th January 2025 to record the number of large trees over approximately 90 cm diameter felled by the prescribed burn in the Giants block, Frankland 111 (FRK 111) conducted on the 18th December 2024.

Within a 28 ha area of forest 60 felled large trees were counted. When this number was extrapolated across the entire 85 ha of Tingle forest, the total number of potential trees felled was 180, which equates to 2.1 large tree falls per hectare. A return visit to FRK 111 has revealed new tree collapses that were not recorded in this survey.

This report acknowledges the past recommendations of The Red Tingle Consultative Committee, in reference to a "Trial Tingle Burn" conducted in January 1997 in FRK 111, which raised concerns about the number of large trees felled by fire in their post-burn report (Mair et al., 1998 (unpublished)). This report provides observations and explanations for media and public inspection on this issue.

2. ASSESSMENT AREA

Tingle Forest Endemism

The Tingle forests are endemic to the Walpole area and the iconic Red Tingle (known for its large and sometimes hollow bole) only grows in the Walpole-Nornalup National Park. Only 60 km2 of ancient Red Tingle Forest exists in the world today.

Described as Gondwanan, the tingle tree and some relict flora and fauna that live within Tingle forests have a lineage to the period when the South West was a part of the supercontinent, Gondwana. The Red Tingle originated during this time over 65 million years ago.

Tingle forests are considered relicts of a wetter climate and soil regimes that were once more widespread *(Walpole Wilderness and Adjacent Parks and Reserves 2008)*.

The presence of Gondwanan taxa and the high proportion of obligate seed species within the tingle mosaic (different tingle species interspersed with other vegetation types over a landscape scale) suggests these habitats experienced less frequent fire than the surrounding landscape *(Walpole Wilderness and Adjacent Parks and Reserves 2008)*.

Tree species within the area

The forested area within FRK 111 (Figure 2) consists of predominantly Red and Yellow Tingle, *Eucalyptus jacksonii*, and *E. guilfoylei* respectively, Karri *(E. diversicolor)* and Marri, *(Corymbia calophylla)* as the main overstory tree species. These are the species recorded as collapsed due to prescribed fire, with the Tingle trees making up the bulk of the count.

Giants (FRK_111) prescribed burn area

Figure 1: *Total burn area of FRK_111, Giants East block, Walpole-Nornalup National Park.*

Prescribed burn FRK 111 was actioned over an area of native vegetation within the Walpole-Nornalup National Park which sits within the locality of Bow Bridge. FRK_111 covers an area of approximately 204 hectares, consisting of higher elevation areas of sand and laterite with Jarrah *(Eucalyptus marginata)* - Marri *(Corymbia calophylla)* forest, Banksia *(Banksia attenuata)* woodland, seasonally wet heathlands and riparian vegetation with Fine Teatree *(Taxandria parviceps)* and Spearwood *(Kunzea sulphurea)*. A SE facing hill in the southern part of the burn area comprises a forest dominated by Red and Yellow Tingle (here on referred to as Tingle) and Karri with Marri interspersed. This is the study area of the assessment (Figure 2) and will be referred to simply as the forested area.

Figure 2: *The forested area within FRK_111 is the area of this assessment. The South Coast Hwy is the S-E boundary, Pascoe Road the N-E, Vermeulen Road the S-W, and an unnamed maintenance track the N-W boundary.*

Giants (FRK_111) Fire History

The Walpole-Nornalup National Park experienced major wildfires in February 1937 and another east of the Frankland River in 1951 burnt sections of the National Park, including Giants East Block (a part of State Forest at that time). A smaller area of wildfire is documented in 1973 (approx. 40 hectares) of which the majority was not in the Tingle forest and another in 1976 (17.4 hectares) that impacted part of the Tingle forest survey area. The survey area has also received numerous prescribed burns documented since the early 1960's over the entire forested area or part thereof in 1960 (partial), 1964 (partial) 1971 (partial), 1988 (entire), January 1997 (entire), known as the 'Trial Tingle Burn', and the last prescribed burn occurred in December 2024.

3. METHODS

Measurement specifications

Fire-felled trees sighted to 90 cm in diameter at breast height (DBH) and above were recorded and trees that appeared smaller than 90 cm DBH were not recorded. Measurements were not made with an instrument but determined by eye. No maximum diameter size limit was used and no further classifications within size.

Assessment of Giants (FRK_111) prescribed burn as the cause of tree fall

Fire can enter a tree by the trunk base-ground interface or by roots (either because they are exposed or close to the surface) and burn internally *(see image 2)*. This hollows out the tree and root channels *(see Image 3)*, ultimately disrupting its weight-bearing capacity. Fire can burn for weeks and even months inside a tree and thus, tree fall can occur during or a long while after a prescribed burn or wildfire has passed through a forest.

Five criteria were used as evidence when determining recent tree collapse caused by the prescribed burn FRK 111. These were freshly broken wood exposure, disturbed soil, bark and canopy presence on the ground, fresh root exposure and smoke.

Image 2: *A hollowed-out Tingle tree with fire burning internally. This photo was taken two weeks after the prescribed burn was completed.*

Image 3: *Fire damage to tree roots*

Wood exposure

Freshly broken wood is a lighter brown, or orange colour, than wood exposed to the elements, which takes on a grey or bleached colour. Fresh wood has a higher moisture content than long dead. The fresh wood on the trees observed was not charred indicating the tree fell after the fire had passed, rather than before.

Image 4: *Examples of exposed fresh wood, indicating the tree had recently fallen.*

Soil disturbance

Recently disturbed soil is a different colour to the surrounding ground within the burn area. Ash had not settled on top of this soil and nor did the soil appear 'compacted', or 'settled', instead it appeared 'freshly overturned'.

Image 5: *Examples of fresh soil disturbance indicating the tree had recently fallen.*

Intact bark

When a Tingle tree has been dead for some time, the outer bark loses its brown ruddy colour and cracks and flakes off the sapwood. This dead outer bark tends to shed in small to medium rectangular pieces off the standing tree. In contrast, live bark is firmly attached to the sapwood in a way that is obvious even when the tree is scorched.

Image 6: *Examples of intact and ruddy coloured outer bark on tingle trees, indicating the tree was recently alive.*

Canopy presence

Canopy presence on the ground not only suggests that a tree fell after a fire had passed through (otherwise the canopy would have been burnt up or singed), but also how long the tree has been felled for, as dying leaves go through stages of senescence. Most tree leaves appeared scorched which likely occurred during the fire.

Image 7: *Examples of canopy presence on the ground that indicate trees fell after the fire passed.*

Fresh root exposure

Freshly exposed and broken roots were also signs of a recent fall.

Image 8: *Examples of freshly broken and exposed roots indicating the tree fell recently and was alive at the time.*

Smoke presence

Moreover, some trees that appeared to have recently fallen were still smoking even two weeks after the prescribed burn was completed. The image below suggests that fire burnt out this tree's base and roots causing it to topple as it could no longer support its own weight with the trunk continuing to burn.

Image 9: *A smoking tree two weeks after the prescribed burn was completed.*

Instruments used for recording count and location

A Garmin GPSMAP i67 satellite phone was used to record the location where fallen trees lay as waypoints and to record the path. In places where many trees had fallen, one waypoint was used to mark the area (see Appendix 1).

After inspection to determine a fire-caused fall, individual trees were tallied on a notepad and recorded under the appropriate tree species.

	A	B	C
1	28 ha area		
2			
3	Tingle	48	
4	Karri	7	
5	Marri	5	
6			
7	total	60	

Figure 3: *The final tree count numbers in a spreadsheet format.*

Survey path

Where fallen trees were visable in the distance then a direct path was taken from tree to tree. When trees were not visible through the undergrowth, or past fallen debris, or not in the vicinity, satellite phone tracking ensured areas had not previously been walked through and previous trees sighted again.

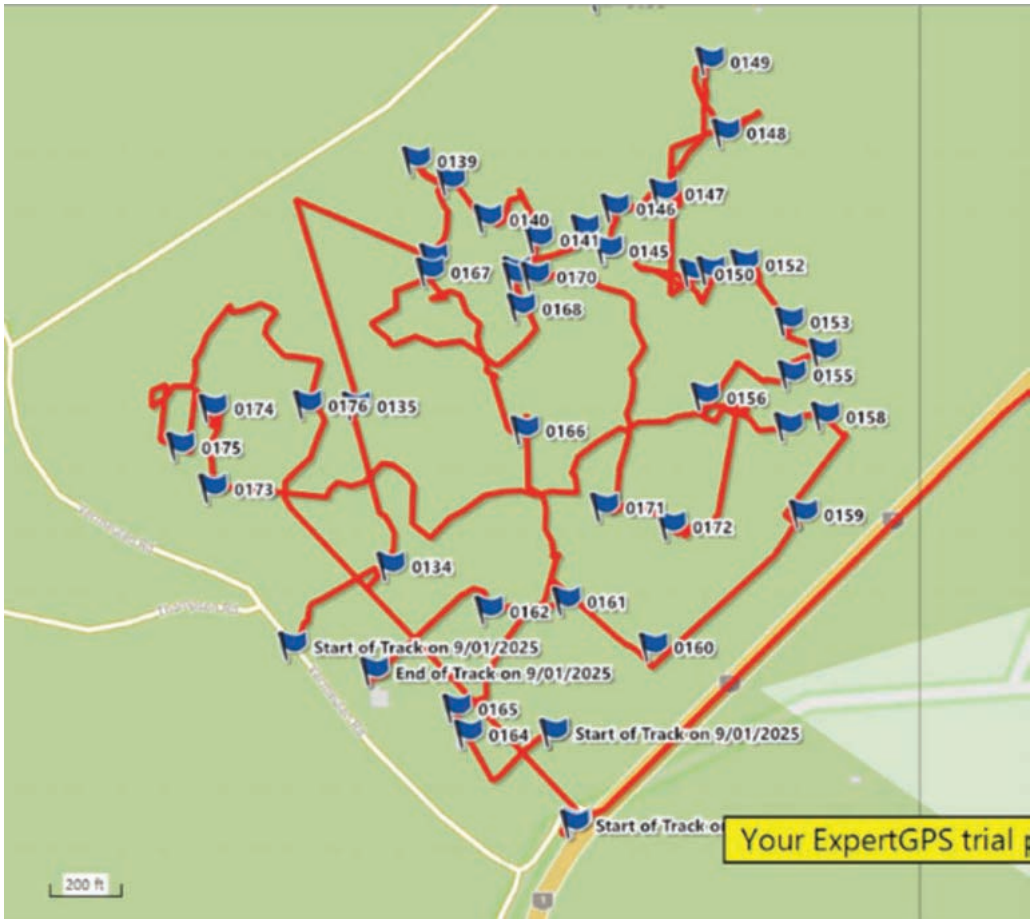


Figure 4: *Path through the survey area. The blue flags with numbers mark fallen tree locations.*

4. RESULTS

Summary of tree fall results in Giants (FRK_111)

60 fire-felled trees were recorded over an area roughly 28 hectares in size within the forested area. There were 48 Tingles, 7 Karri and 5 Marri trees felled within this area (Appendix 1). These results were extrapolated across the 85-hectare area of Tingle forest.

The estimated number of large tree falls (90 cm diameter (DBH) and above) in the December 2024 prescribed burn was 180 large trees over an area of 85 hectares. This equals 2.1 large tree falls/ hectare or 210 large tree falls/100 hectares.

Numerous large trees that fell were also documented within the scrub-rolled area that was cleared prior to lighting the burn, the fallen Red Tingle with a diameter of approximately 2.5 metres, recorded as waypoint 0134, is one of these trees. Scrub-rolling involves clearing vegetation around the trees with heavy machinery close to the road's edge with the intention to prevent fire damage and collapse of large trees.

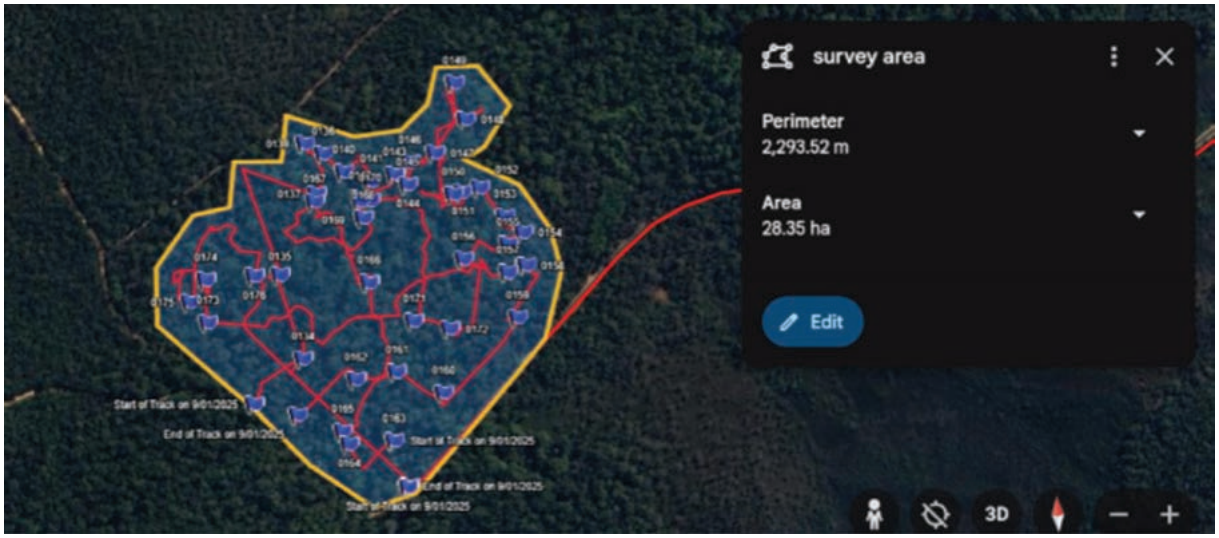


Figure 5: *The survey area*

Extrapolating the survey numbers

The number of trees counted within the survey area was extrapolated over the adjacent forest area providing an estimate of 180 fire-felled trees.

Figure 6: *The post-burn tree fall survey results*

When extrapolating the survey numbers, the continuity of the forest area with the survey area was tested. This was done by inspecting satellite imagery, fire severity, and field observations. As pictured in Figure 7, the survey area covered some places that received canopy scorch and some that didn't. This is further visualised in the fire severity map (Figure 8), which shows that all classes of fire severity were covered within the survey area. The burn outcomes in the survey area are continuous across the forest area in various proportions, and there are no large unburnt areas or large areas that received low fire severity, which could suggest fewer tree falls in the forest area. Most of the tingle forest received a high severity burn with areas of very high severity, often indicating large tree losses.

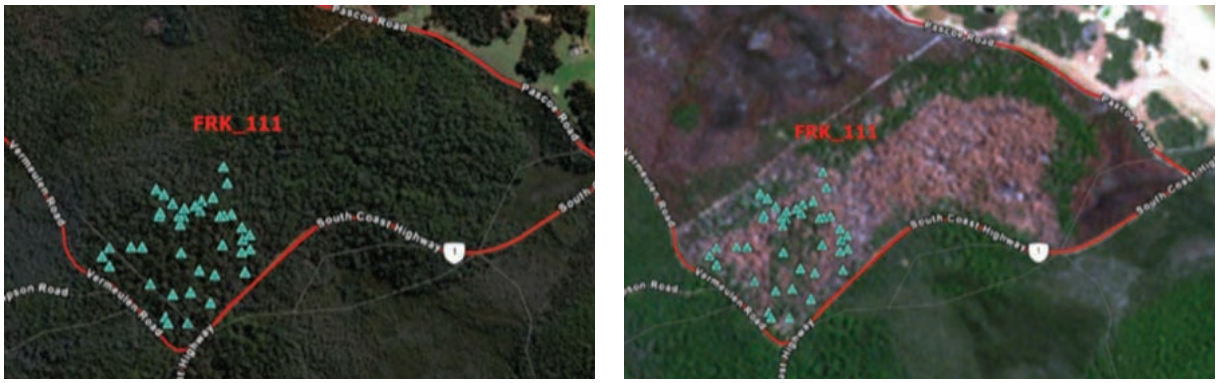


Figure 7: *Left: Maxar satellite image of the forest area within FRK 111 captured before the prescribed burn on 21/05/2020, with GPS locations plotted as green triangles. Right: Sentinel-2 L2A satellite image captured on 02/01/2025 showing the same area after the prescribed burn was completed. Image source: Sentinel Hub EO Browser. Note the uniform crown scorch pattern across the forested area compared to before it was burned.*

Fire severity map

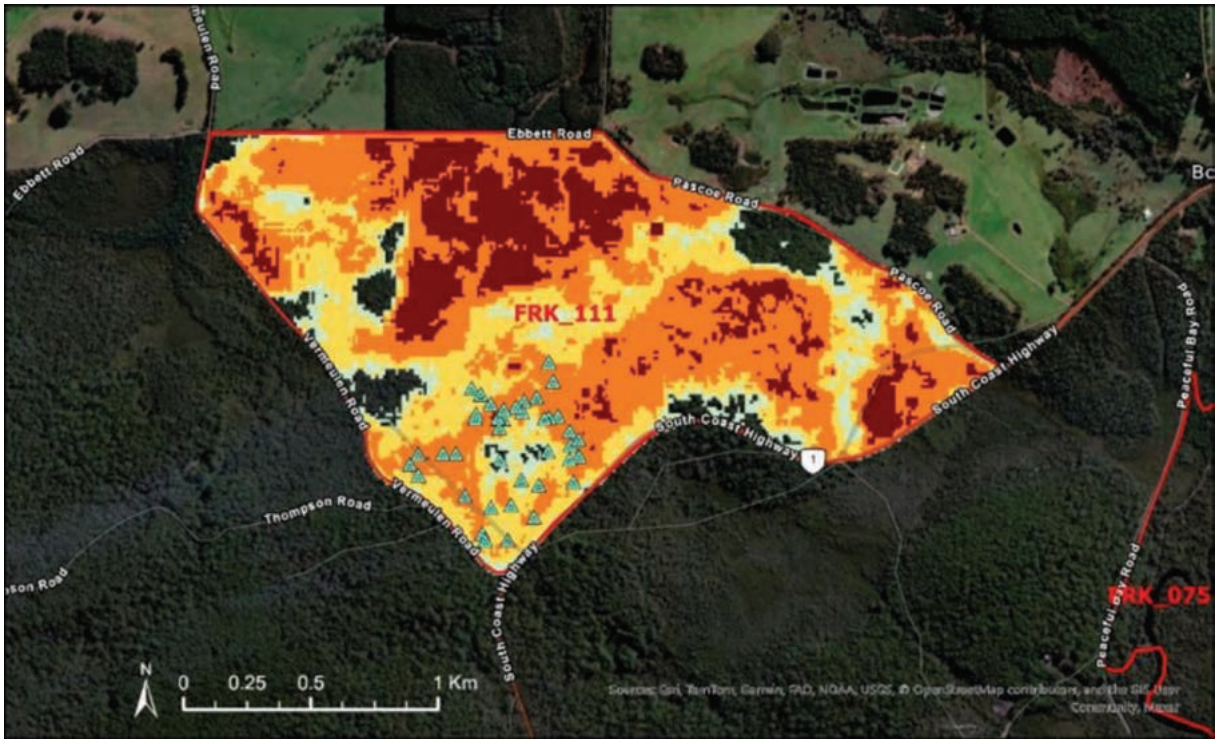


Figure 8: *Fire severity map of the prescribed burn FRK 111 with recorded tree fall locations. Colours represent degrees of fire severity, with red areas representing very high severity (canopy has been consumed or gone such as when tree falls occurred), orange representing high severity (extensive canopy scorch but not consumption), yellow represents moderate severity (most or all surface layer burnt with some canopy damage), white representing low severity (surface layer burnt only), and uncoloured patches represent unburnt areas or uninterpretable areas. The fire severity map used a pre-fire image from December 2023 which was overlaid with a post-fire image late December 2024.*

To test the uniformity of fire-caused tree fall over the forested area the NE boundary, Pascoe Rd, was inspected. Three randomly chosen spots along the road were access points for traverses into the forest. Fire-felled trees within the class range were sighted close to the road *(see images 19 & 20)*.

Image 10: *Photos taken along Pascoe Road looking into the forested area.*

Image 11: *A short walk into the forested area from the N E boundary, Pascoe Rd, reveals fire-fallen trees. They are captured under the extrapolated number of 180 fire-felled trees.*

The unnamed maintenance road that forms the NW boundary, was also inspected *(see image 12)*. A time-constrained assessment of the area revealed two fire-felled trees along a 200-metre stretch of road. These tests provide ground-truth evidence to support the extrapolated number of fire-felled trees from the survey area to the adjacent forest area.

Image 12: *The unnamed road that makes up the NW boundary of the forested area. The felled tree in the left image is captured under the extrapolated number of 180 fire-felled trees within the forested area.*

Calculation of the extrapolated area

85 ha (total area) ÷ 28 ha (survey area) = 3

60 fire-felled trees x 3 = 180

180 fire felled trees over 85 hectares

This equals approximately 2.1 large tree falls/hectare or 210 tree falls/100 hectares in the December 2024 prescribed burn.

Results of the 'Trial Tingle Burn' conducted in January 1997

The Red Tingle Consultative Committee found a concerning number of veteran trees fire-felled during a "Tingle Trial Burn" in January 1997 which covered the same forested area as the December 2024 prescribed burn in Giants (FRK 111) (Figure 9).

The maximum potential tree loss predicted before the 1997 trial prescribed burn was 10 trees/100 hectares which would have equated to a maximum of 6.5 tree falls over the 65 hectare survey area. Their final count was 30 fallen trees over 65 hectares (Figure 9) equalling 0.46 large tree falls/hectare or 46 large tree falls/100 hectares. The tree loss that occurred as a result of the trial burn was 4.6 times the maximum number of potential tree losses predicted.

The 'Trial Tingle Burn' report that is publicly available doesn't specify the tree diameter parameters used to measure the 30 fire-felled trees that were recorded. With this information, a more informed comparison could be made between the tree fall results of the prescribed burn in January 1997 and December 2024, as recommended by the Red Tingle Consultative Committee in 1998. A Link to the 'Trial Tingle Burn' report is available in Appendix 2 and below: https://library.dbca.wa.gov.au/FullTextFiles/020722.pdf

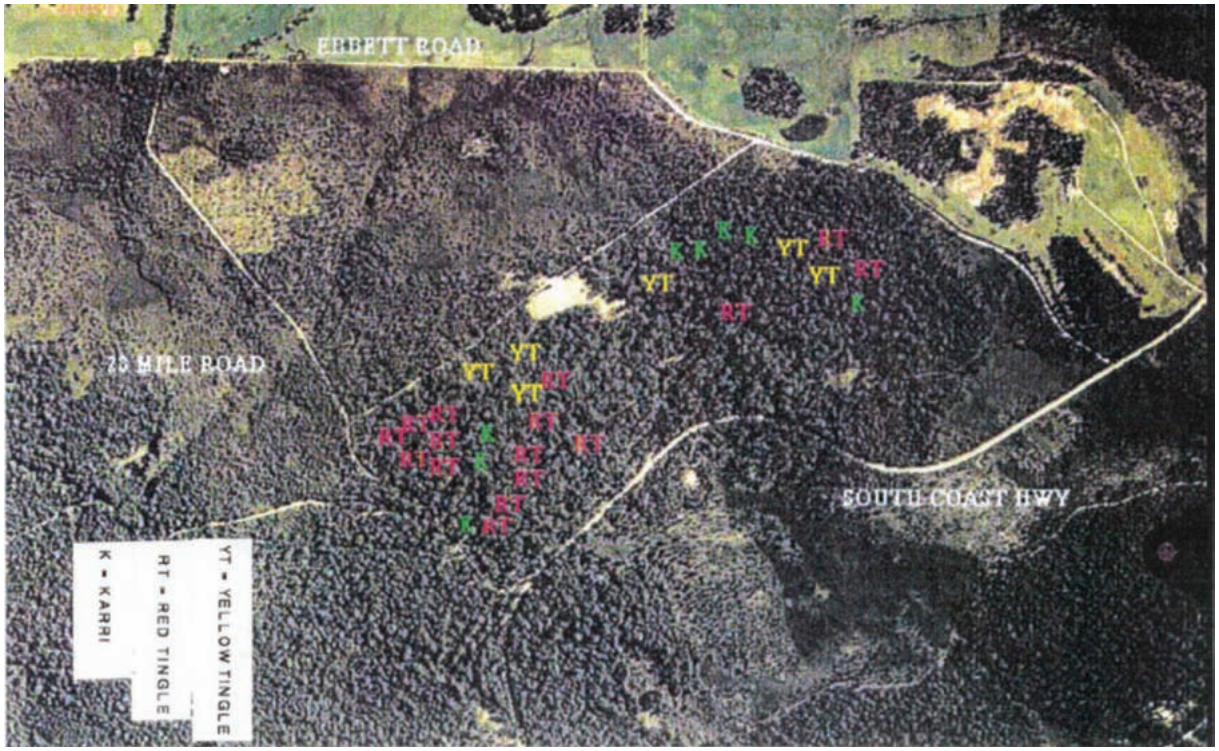


Figure 9: *This post-burn tree fall map of the January 1997 'Trial Tingle Burn' undertaken in the same area as Giants (FRK_111) prescribed burn in December 2024 shows 30 fire-felled trees including 16 Red Tingle, 6 Yellow Tingle and 8 Karri over approximately 65 ha as a result of this trial prescribed burn (Mair, et al., 1998 (unpublished report)).*

This is 4.6 times the maximum number of potential tree collapses predicted was 10 tree falls/100 hectares which would have equated to 6.5 tree falls over the 65 ha prescribed burn area.

Tingleview (FRK_073) post-burn tree fall assessment in March 2024

In another citizen science survey in a nearby Tingle forest, 63 fire-felled trees over a 20 hectare area were recorded in March 2024 after the Tingleview (FRK_073) prescribed burn of the Jones road cell was conducted in December 2023. This survey captured a wider pool of fire-felled tree species and ages, with some large tree falls, but the majority of tree falls measured under 90 cm diameter (Appendix 3).

Tingleview (FRK_073) has been entirely or partially burned by numerous prescribed fires in 1956 (partial), 1961 (partial) 1963 (entire), 1964 (partial), 1978 (entire), 1986 (partial), 1988 (entire), January 2004 (entire), December 2022 (partial) and December 2023 (partial). Areas of forest within Tingleview have also been partially burnt by wildfires in 1973, 1974, 1987 and a proportionately smaller area (0.49 ha) in 2001. It is one of the most frequently burnt tingle forests.

Image 13: *Loss of old growth veteran Red Tingle tree over 2 metres in diameter in Tingleview (FRK_073) prescribed burn conducted by DBCA in January 2022. The Tingleview prescribed burn was conducted in parts over a few years. This area and the tree in this image were not covered in the March 2024 survey.*

5. CONCLUSIONS

- The survey results demonstrate that many large trees collapsed as a result of the Giants Block prescribed burn (FRK_111) conducted within the Walpole-Nornalup National Park in December 2024. The fire has caused long-lasting and irreversible damage to an estimated 180 large tingle, karri, and marri trees over 85 hectares, equating to 2.1 large tree falls/hectare or 210 large tree falls/100 hectares.
- The cumulative, undermining effect of numerous and/or severe fires on tree stability is likely a causal factor to the high number of tree falls with many fallen trees having pre-existing large hollows at their bases.
- The deleterious relationship between fire and Red Tingle trees is well-known. Their susceptibility to collapsing from fire was raised as a concern more than 30 years ago by the local community, scientists, and members of the Red Tingle Consultative Committee. This issue was also documented in a report on the 'Trial Tingle Burn' conducted in January 1997 in Giants (FRK_111) (Mair et al., 1998 (unpublished report)) prepared for the Red Tingle Consultative Committee.
- The effectiveness of invasive scrub-rolling measures, which involves clearing vegetation around large trees with heavy machinery, asserted to protect them from falling during prescribed burns, requires further investigation. Numerous large trees that fell were within the scrub-rolled area. Furthermore, the disturbance to soil biology, and habitat, and the impacts of compaction on the tingle tree roots are long-lasting and may also be problematic.
- Not only does the large loss of trees found in this survey suggest a tendency for the issue to be underestimated and poorly understood by the land managers, but the numbers found in this, and previous surveys, indicate these adverse outcomes have continued to be replayed since the Red Tingle Consultative Committee reported the issue.
- With each prescribed burn, many big, veteran Tingle and other trees, are continuing to be destroyed.
- The overwhelming evidence of extensive large tree falls from numerous prescribed burns in Red Tingle forests are grounds for an immediate moratorium on prescribed burning in the remaining areas of long unburnt Tingle forests. The impact of frequent fire needs further scrutiny to ensure the outcomes of the Giants (FRK_111) burn are not repeated in other Tingle forests in the future.

Images 13: *Three new trees were found collapsed on a return visit to FRK 111 on 21/01/25. It had been about one month since the prescribed burn was completed.*

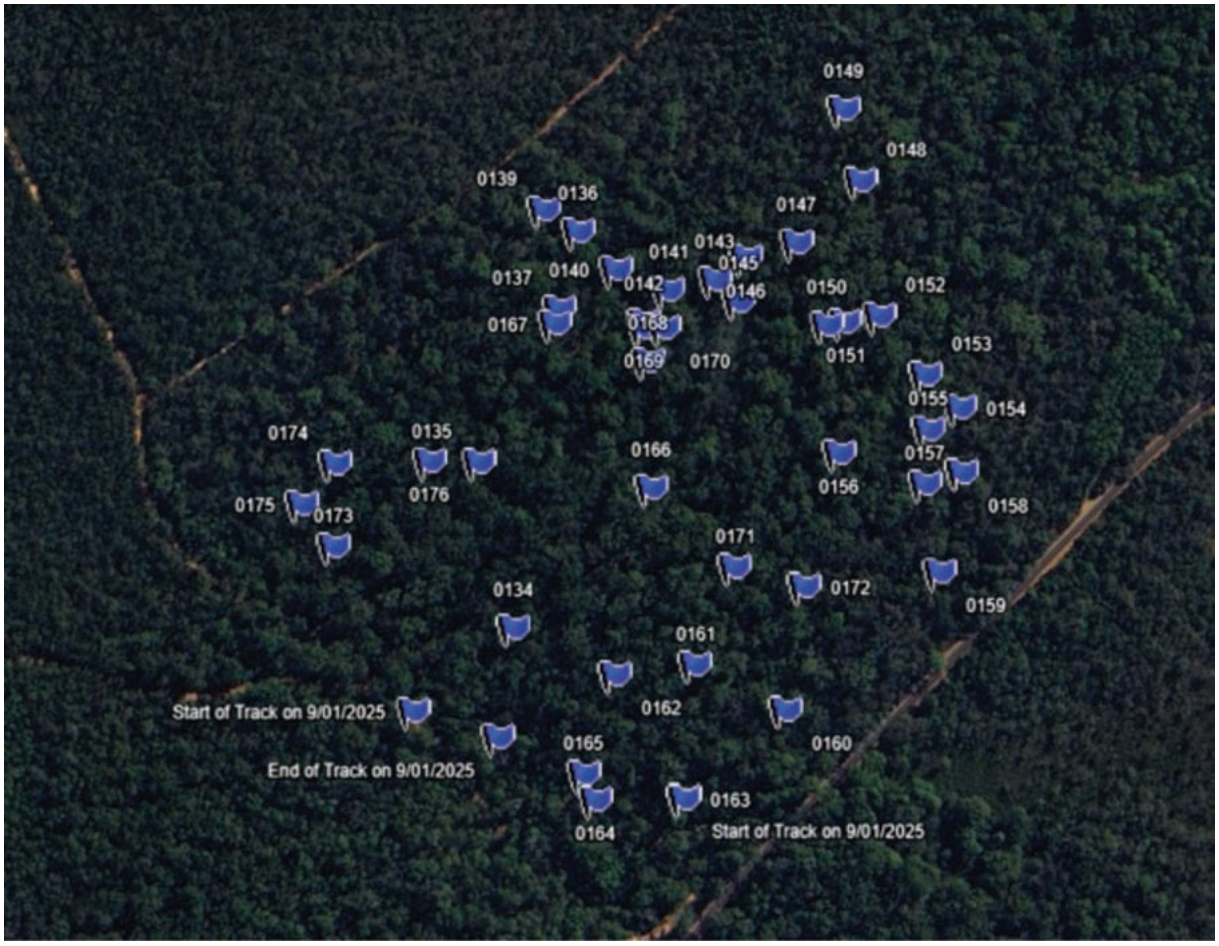
6. REFERENCES

G. Mair, J. Tillman, R. Troeth (1998). Trial Tingle Burn Prepared for *Red Tingle Consultative Committee* (Unpublished report). Department of Conservation and Land Management, Western Australia.

Walpole Wilderness and Adjacent Parks and Reserves (2008). Retrieved from https://www.dbca.wa.gov.au/management/plans/walpole-wilderness-and-adjacent-parks-and-reserves

7. APPENDICES

Appendix 1: Giants (FRK_111) Waypoint data and additional images



Waypoint 0174

Waypoint 0175

Waypoint 0173

Waypoint 0165: Deceased nesting parrots were found in a collapsed hollow.

Waypoint 0164

Waypoint 0163

Waypoint 0134

Table of Waypoints

NB: When multiple tree falls were counted within the same area, they were marked with one waypoint.

	Waypoint	Latitude	Longitude
Blue Flag	**176**	S 34.975881	E 116.924314
Blue Flag	**175**	S 34.9762	E 116.923141
Blue Flag	**174**	S 34.975902	E 116.923443
Blue Flag	**173**	S 34.976512	E 116.923443
Blue Flag	**172**	S 34.976801	E 116.927699
Blue Flag	**171**	S 34.976654	E 116.927075
Blue Flag	**170**	S 34.974898	E 116.926437
Blue Flag	**169**	S 34.974896	E 116.92626
Blue Flag	**168**	S 34.975142	E 116.926301
Blue Flag	**167**	S 34.974865	E 116.925454
Blue Flag	**166**	S 34.976071	E 116.926335
Blue Flag	**165**	S 34.978192	E 116.925707
Blue Flag	**164**	S 34.978389	E 116.925808
Blue Flag	**163**	S 34.978383	E 116.926605
Blue Flag	**162**	S 34.977447	E 116.926002
Blue Flag	**161**	S 34.977373	E 116.926718
Blue Flag	**160**	S 34.977721	E 116.927526
Blue Flag	**159**	S 34.976709	E 116.928919
Blue Flag	**158**	S 34.975968	E 116.929122
Blue Flag	**157**	S 34.976051	E 116.928786
Blue Flag	**156**	S 34.97582	E 116.928013
Blue Flag	**155**	S 34.975646	E 116.928819
Blue Flag	**154**	S 34.975486	E 116.929103
Blue Flag	**153**	S 34.975242	E 116.928791
Blue Flag	**152**	S 34.974806	E 116.928373
Blue Flag	**151**	S 34.974853	E 116.928062
Blue Flag	**150**	S 34.974876	E 116.927901
Blue Flag	**149**	S 34.973257	E 116.928048
Blue Flag	**148**	S 34.9738	E 116.9282
Blue Flag	**147**	S 34.974265	E 116.927626
Blue Flag	**146**	S 34.974378	E 116.927172
Blue Flag	**145**	S 34.9747	E 116.927109
Blue Flag	**143**	S 34.974541	E 116.926893
Blue Flag	**142**	S 34.974851	E 116.92626
Blue Flag	**141**	S 34.974617	E 116.926469
Blue Flag	**140**	S 34.974462	E 116.925997
Blue Flag	**139**	S 34.974014	E 116.92533
Blue Flag	**137**	S 34.974755	E 116.925491
Blue Flag	**136**	S 34.974179	E 116.925648
Blue Flag	**135**	S 34.975886	E 116.92477
Blue Flag	**134**	S 34.977103	E 116.925092

Appendix 2: Trial Tingle Burn Report prepared for the Red Tingle Consultative Committee

Link to reference:

Walpole Wilderness and Adjacent Parks and Reserves (2008). Retrieved from https://www.dbca.wa.gov.au/management/plans/walpole-wilderness-and-adjacent-parks-and-reserves

https://library.dbca.wa.gov.au/FullTextFiles/020722.pdf

Appendix 3: Tingleview (FRK 073) post-burn tree fall survey area and results

Figure above: The Tingleview (FRK_073) survey area within the burn cell. Post-burn tree fall survey conducted in March 2024.

20 hectare area			
Tingle	23	Bulldozer	19
Karri	10	Caught up in tree fall	23
Karri Sheok	19		
Marri	2		
Jarrah	4		
Dead trees	5		
TOTAL fire-felled	63	TOTAL non fire-felled	42

~ 5 fire-felled and non-fire felled trees per ha
~ 3 fire-felled trees per ha

Figure above: The Tingleview (FRK_073) survey results