Results of Braemar State Forest Assessments

Dailan Pugh June 2023

I have visited Braemar State Forest regularly since July 2019 when I found a dense Koala colony in an area proposed for logging, which are now compartments 6 and 7. I primarily focused on identifying use of the area by the now nationally Endangered Koala (*Phascolarctos cinereus)*, initially to identify Koala High Use Areas for protection, then to assess the devastating impacts of the October 2019 wildfire on them, and recently to assess their recovery.

Before the 2019 fire, the logging area was identified as having an exceptional density of nationally and NSW Endangered Koalas, though most were killed in the fire. Within the logging area there is also a high density of the nationally and NSW Vulnerable Slaty Red Gum. Other nationally and NSW threatened species recorded within the compartments are the Endangered Southern Greater Glider, and Vulnerable Yellow-bellied Glider, and Grey-headed Flying Fox.

Other NSW threatened species recorded within the compartments are the Vulnerable Barking Owl, Powerful Owl, Masked Owl, Black-chinned Honeyeater, Brown Treecreeper, Diamond Firetail, Dusky Woodswallow, Grey-crowned Babbler, Little Lorikeet, Squirrel Glider, Rufous Bettong, and Little Bent-winged Bat, and the Endangered Weeping Paperbark.

The Endangered Southern Purple Spotted Gudgeon has been recorded downstream in Sandy Creek.

I have extensively documented the values of the forest and the impacts of the 2019 wildfires in my 2020 Proposed Sandy Creek Koala Park. As the area is once again proposed for logging, this report documents my review of the new 2023 Harvest and Haul Plan (HHP) and findings from 3 visits in May and June 2023, in company with a number of volunteers, in particular with botanist Andrew Murray on two occasions and zoologist David Milledge on one occasion. The focus of the visits was to assess Koala usage, with limited time spent documenting locations for the nationally Vulnerable Slaty Red Gum (*Eucalyptus glaucina*) after it became clear that the Forestry Corporation's 2022 Ecology Report grossly under-represented its presence in the area.

The use of call-playback one evening elicited a response from a Barking Owl (*Ninox connivens)*, and a Masked Owl (*Tyto novaehollandiae*) came and perched in a tree above us. While it was reassuring to observe these species dependent upon large tree hollows for nesting after the widespread loss of large hollow-bearing trees in the wildfires, they are not considered further as there are no specific CIFOA prescriptions for them.

The area was originally intended to be logged in 2019 under a 2017 **HHP** which applied the requirements of the 1999 Integrated forestry Operations Approval, including the Threatened Species Licence. After NEFA identified exceptional densities of Koala scats (faecal pellets) that would have required substantial areas to be protected as Koala High Use Areas, a new **2019 HHP** was prepared that applied the new Coastal Integrated Forestry Operations Approval (**CIFOA**), which removed the requirements for pre-logging Koala surveys and the protection of Koala High Use Areas, only requiring retention of 5 small Koala feed trees per ha.

The area was badly burnt in the October 2019 Busby's Flat Fire, killing most Koalas. Some survived the fires, though population recovery still has far to go. The revised **2023 HHP** has adopted the Forestry Corporation's (2021) 'Post Fire Voluntary Environmental Safeguards' in response to the fire. These are a variety of voluntary (legally unenforceable) additional provisions.

Key Issues:

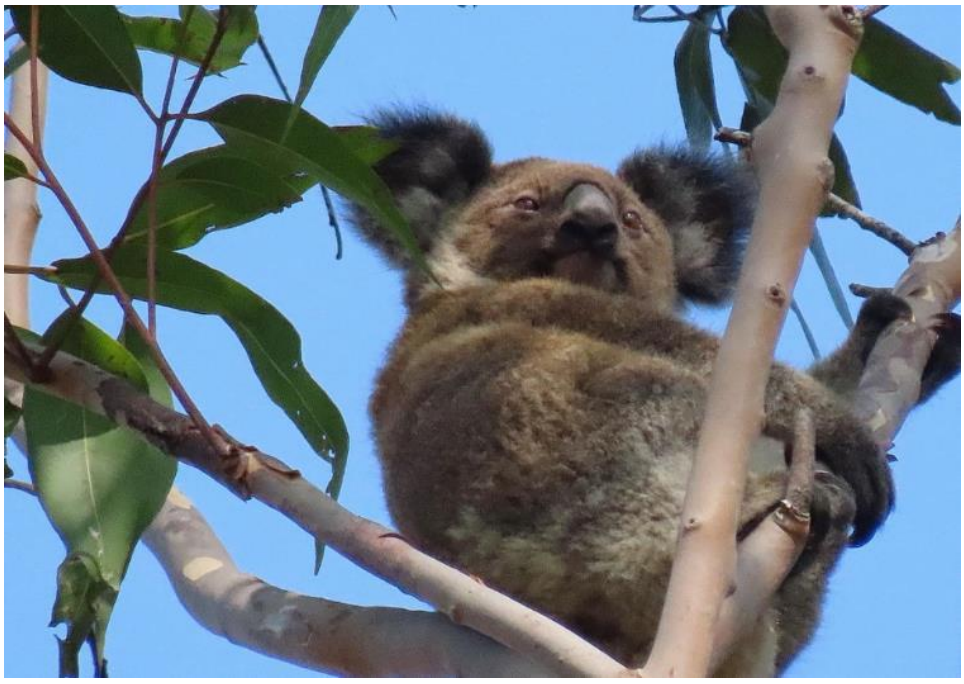
1. Braemar and extensive surrounding forests were heavily burnt in the 2019 fires, with landscape scale impacts on forest structure (significant areas in which some or most trees were killed) and populations of wildlife (notably nationally Endangered Koalas and Southern Greater Gliders, and Vulnerable Yellow-bellied Gliders, which were up-listed due to the fire impacts)
2. The only surveys undertaken for the **2023 HHP** were transects targeting threatened plants. They identified 8 Slaty Red Gum and made incidental records of threatened fauna, including 3 trees with Koala scats. There are no requirements for surveys for threatened fauna, and so no assessment of their persistence after the 2019 fires, particularly in relation to regional populations.
3. In response to the fire, the **2023 HHP** adopts a variety of legally unenforceable temporary Voluntary Safeguards in addition to the **CIFOA**. Most significantly requiring "*LLA Offset Exclusion Zones",* a 10 m buffer around exclusion areas, requiring protection of other trees where there are not 8 hollow-bearing trees per hectare, and the protection of 5% of the potentially loggable area in Temporary Koala Feed Tree Clumps. It is surprising that with application of the voluntary post-fire exclusions, the net logging area and timber yields are shown in the **2023 HHP** as slightly increasing compared to the **2019 HHP**. It is apparent from the 2023 Harvesting Plan Operational Map (**HPOM**) that there have only been minor changes.
4. A temporary Voluntary Safeguard is that Local Landscape Area (LLA) Offset Exclusion Zones covering a minimum of 50% of the gross area of the LLA be set aside from harvesting, with the criteria identified as "*lowest fire severity, recovered forest and other priority habitat*". It is apparent from the FESM fire intensity map that a significant proportion of existing exclusion areas were burnt at extreme severity which will have resulted in extensive tree deaths and compromised their ability to function as fauna refuges. Limited areas within compartments 6 and 7 were subject to moderate severity fires (and none to no or low severity fires), a significant proportion of which occurs in the net harvest area, much of which I identified as post-fire Koala refuges. Most of compartments 4 and 5 are identified as fire offsets, though these are some of the most intensively burnt.
5. As logging progresses, 5% (16 ha) of the base net area (BNA) is to be excluded from logging as Tree Retention Clumps and 5% (16 ha) as voluntary Temporary Koala Feed Tree Clumps. Though without the benefit of surveys (including of preferred feed trees) to identify the most important areas to protect, these may be of limited benefit.
6. My assessments in 2019 found Braemar State Forest to have an exceptional density of Koalas. I found that the population was likely reduced in burnt forests by 84-96% due to the 2019 Busby Flat Fire. My recent assessments found 10 trees with Koala scats beneath them scattered throughout the area, indicating that Koalas are now extensively using the area, though in significantly reduced numbers.
7. Based on the trees I found with Koala scats beneath them in Braemar and nearby State forests, primary Koala feed trees are Small-fruited Grey Gum (*Eucalyptus. propinqua*), Coastal Grey Box (*E. moluccana)*, and red gums (Forest Red Gum *E. tereticornis* and Slaty Red Gum *E. glaucina*). Small-fruited Grey Gum appears to be a particularly important feed tree as it is used disproportionally more than what would be expected from its distribution, yet it is only identified as a secondary feed species in the **CIFOA**, and thus not prioritised for protection. I also found 85% of trees used had a 30cm diameter (dbh) or larger, and tree usage increased with tree size relative to tree availability. Trees 10-30 cm DBH comprised 74% of trees, though only 15% of trees used. The current **CIFOA** prescription adopted by the **2023 HHP** is for the retention of 5 Koala feed trees per hectare >20cm DBH (diameter at

breast height) within the logging area. All Koala Preferred Feed Trees >30 cm DBH should be retained.

8. Based on application of the **2023 HHP** prescriptions to my plot data, I estimate that within the logging area they allow the removal of around 42-47 potential Koala feed trees per hectare (>30cm diameter), or around 77-87% of potential feed trees, without accounting for post-fire mortality. Across the 187ha identified for logging, this equates to 7,780-8,790 potential feed trees. The removal of such a high proportion of Koala feed trees is expected to have a highly significant impact on the recovering Koala population and, with droughts and fires increasing, may threaten Koalas persistence. If the aim is to facilitate recovery of Koalas to pre-fire densities then their core refugia need to be identified and protected, along with all potential feed trees >30 cm DBH.
9. There are 9 threatened species recorded in compartments 6 and 7 of Braemar State Forest that utilise tree hollows. The **CIFOA** requires the retention of up to 8 hollow-bearing trees per hectare, though there are few remaining in Braemar, and large hollow-bearing trees are rare in the surrounding landscape. The temporary Voluntary Safeguards require that additional recruitment trees should be retained to make up the 8 per-hectare, defined as "*a mature or late mature growth stage that is not suppressed and has good potential for hollow development and long-term survival".* This leaves the choice of trees very open and falls short of the intent of the NRC (2021) recommendation for prioritising the largest trees in the stand. Neither does it address the crucial recommendation to retain 2 recruitment trees for each of the habitat trees, which is essential for restoring and maintaining hollow-bearing trees over time.
10. There are 5 threatened fauna species recorded in these compartments that depend upon the abundant nectar provided by mature trees. The **2023 HHP** removes the requirement to protect nectar feed trees, and only requires the retention of 8 (23%) of the 35 trees per ha >45 cm DBH which provide the abundant nectar relied upon, which will compound nectar shortages exacerbated by the loss of mature trees in the surrounding landscape in the 2019 fires.
11. The Forestry Corporation only identified 6 Slaty Red Gums on their 13,672m of traverses targeting this species, whereas my brief assessments identified 84 seedlings or suckers (at 69 locations) 1-5m tall, 19 trees 4-30cm DBH and 22 trees >30 cm DBH (with many of these in the vicinity of one of their transects), and expect there to be hundreds of plants. The temporary Voluntary Safeguard requires additional survey effort that was not apparently implemented as this would increase the required traverses to 15,275 m. The **CIFOA** prescription is to retain all red gum trees >30cm DBH. It is apparent that the 2019 fires had a significant impact on this species, by killing many mature trees, increasing the proportion of the population that is regrowth, and promoting dense regrowth of wattles that will increase flammability. The loss of mature trees capable of setting seeds, combined with the dense regrowth has significantly increased the risk of a major population decline should there be another fire before regrowth Slaty Red Gum have matured enough to set good seed crops. An assessment of impacts may identify a need for revised prescriptions.
12. The **2023 HHP** includes an additional voluntary requirement for 20m buffers around Slaty Red Gum, though it is unclear whether this is based on a mistaken belief that there are only the 8 records identified in the **HHP**, as if this was applied to all Slaty Red Gum (including seedlings) identified by thorough surveys it would rule out logging in a substantial proportion of the area.
13. The 2023 HHP inexplicably removes about a kilometer of drainage lines within the logging area which previously required 10m buffers, and the May revision reduces buffers on most retained streams from 10m down to 5m. This will increase stream pollution in a catchment heavily impacted by the 2019 fires, including on the adjoining habitat of the Endangered Purple Spotted Gudgeon.

Masked Owl in Braemar State Forest, June 2023.

Contents

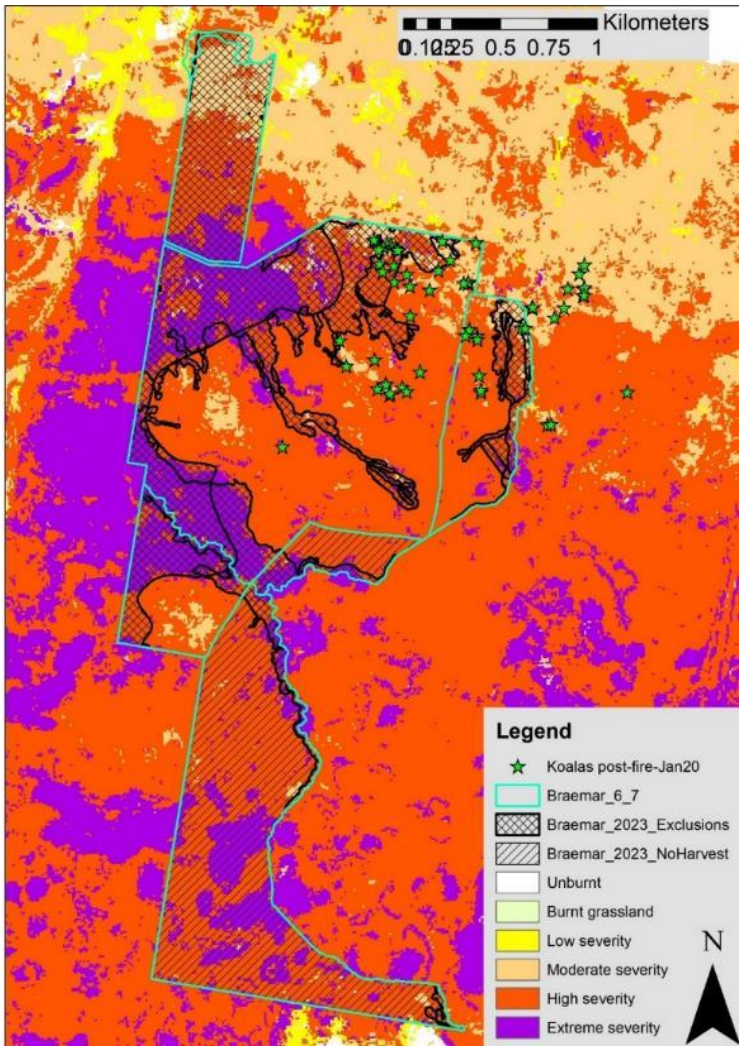


In August 2019 Compartment 6 of Braemar State Forest was found to support an exceptional density of Koalas. On one night in October 2019 the Busby's Flat fire burnt through the forest killing most of the Koalas, this is one of the few survivors. Despite being identified as a Nationally Important Koala Area, logging operations recently commenced with the intent of removing over 77% of mature Koala feed trees. Koala populations have still not recovered, so this logging could be their death sentence.

1. 2019 Wildfire

By the afternoon of the 8 October 2019 the Busbys Flat fire had burnt a long strip of land immediately to the south of Braemar State Forest. That night a wind change redirected the fire into these forests, and by the morning the fire had burnt through compartments 6 and 7 of Braemar State Forest, killing many trees and most Koalas. Most of Braemar burnt at high and extreme intensities, with the exclusion areas in compartment 6 of Braemar burnt particularly severely. After the fires drought persisted for two and a half months, the ground remained covered in black ash and trees did not resprout, compounding the fire impacts.

Braemar State Forest is situated in the Forestry Corporation's Casino Management Area (CMA) which encompasses 115,904 ha of native forest on State forests. Of these forests some 83,340 ha (72% of State forests) were burnt in the 2019/2020 wildfires, with the canopy fully affected over 16,027ha (14%) and partially affected over 42,334 ha (37%) (based on an analysis of GEEBANG v2 data). The impacts on wildlife would have been massive, with most arboreal mammals and trees likely killed in areas experiencing full canopy loss, and significantly reduced in areas experiencing partial canopy loss.



Map showing the Department of Planning and Environment Fire Extent and Severity Mapping (FESM) 2019/20 classes, overlaid with the boundary of compartments 6 and 7, the exclusions mapped in the **2023 HHP** (cross-hatched – note that much was subject to extreme severity fire**)**, no harvest areas (hatched - identified on the basis they were logged in 2006 and are pre-merchantable), and post-fire Koala records showing where Koalas survived the fire (koala and scat observations made by me after the October 2019 fire up to 20 January 2020).

The fires had a significant impact on Far North Coast State forests by killing an estimated average of 12.5% of trees >30 cm Diameter at Breast Height (DBH) and 34% of trees <30cm DBH (Forestry Corporation 2020). In the 30% of forests subject to a hot burn this was comprised of 50% of trees <30 cm DBH and 10% of trees >30 cm DBH. In the 19% of forests subject to a crown fire loss were some 100% of trees <30 cm DBH and 50% >30 cm DBH.

To the east of Braemar State Forest Milledge and Soderquist (2022) found 22.6% large trees and stags (≥60cm DBH) were lost or severely damaged in burnt forests, including 38.1% of trees >100 cm DBH.

Large parts of the exclusion zones were burnt at severe intensities, killing and damaging many large hollow-bearing trees (LEFT), along with many other trees, while creating a dense understorey of wattles – increasing the future fire risk.

The fire and drought had a major impact on compartments 6 and 7 of Braemar State Forest, resulting in the loss of resources for many threatened species for an extended period, the death of many trees, and long-term reductions in some fauna populations. The Forestry Corporation have identified the need for Voluntary Safeguards additional to the **CIFOA** to account for the fire impacts, though these are not overseen by the EPA or legally enforceable. The Voluntary Safeguards identify the Casino Management Area (covering Braemar) as the third most affected by high and extreme fires, and thus requiring additional post fire measures in fire affected Local Landscape Areas (LLAs). It is revealing that after accounting for the application of these, the **2023 HHP** identifies a slight net increase in the Net Harvest Area and product yields when compared to the pre-fire **2019 HHP**,

before accounting for the May **2023 HHP** variation to reduce buffers on unmapped and class 1 streams from 10m down to 5m.

Below comparisons of the 2019 (pre-fire) Harvest and Haul Plan (**2019 HHP**) for compartments 6 and 7 are made with the **2023 HHP** plan**.**

Changes between the pre-fire 2019 HHP and the post fire 2023 HHP

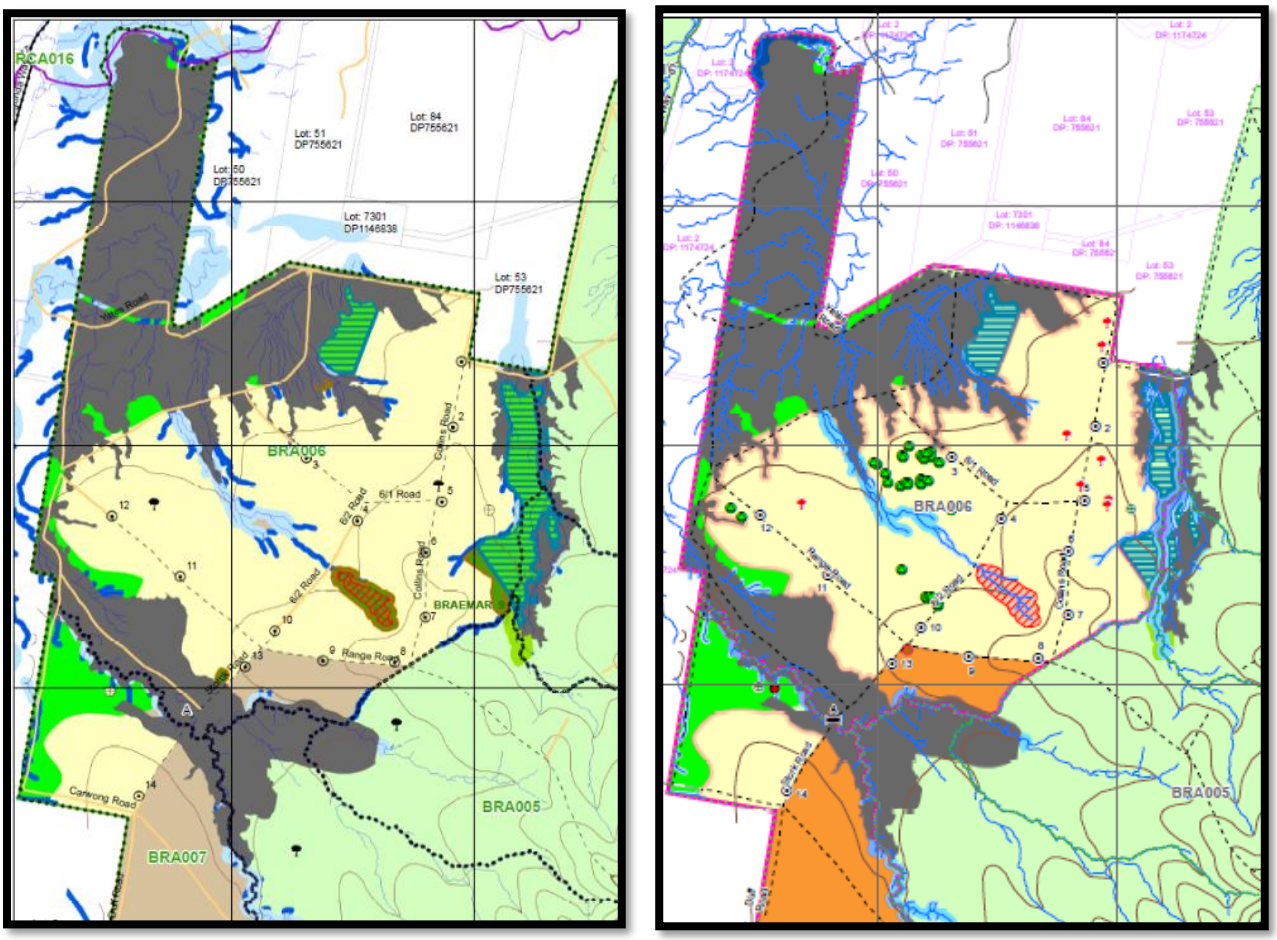
	2019 HHP	**2023 HHP**
Net Harvest Area	185 ha	187 ha*
Product Yield	2,792 m^3	2,830 m^3
Basal Area retention	10 m^3	10 m^3
Hollow-bearing trees	8/ha where available	8/ha where available
Recruitment trees	none	Add to make up 8
Giant Trees (>140 cm dbh)	all	all
Nectar Feed trees	5/ha	None
Koala Feed Trees	5/ha >20cm dbh	5/ha >20cm dbh
Koala sighting buffer	25m until it leaves	25m until it leaves
Yellow bellied glider	Active sap-feed trees	Active sap-feed trees
Damage to Retained Trees	Replace Damaged	Replace Damaged
Tree Retention Clumps	5% Base Net Area	5% Base Net Area
Temporary Koala Feed Tree Clumps		5% Base Net Area
Slaty Red Gum	All red gum >30 cm dbh	All red gum >30 cm, dbh 20m exclusion around each individual+
Weeping Paperbark exclusion	20m	20m
Unmapped drainage line exclusion	10m	5m**
Class 1 drainage line exclusion	10m	5m**

*This is despite an additional 16 ha being removed from the Net Harvest Area as Temporary Koala Feed Tree Clumps and application of other fire offsets.
+ It is unclear whether this applies to all Slaty Red Gums or just the 8 mapped in the 2023 HHP.
** exclusions were reduced from 10m to 5m in the May 2023 variation to the 2023 HHP.

Notes on changes:

- 2019 HHP required "*Nectar feed tree condition – 5 per ha applies*", whereas the 2023 HHP states "*Nectar feed tree condition - Does not apply*"
- 2019 HHP requires for "*Hollow-bearing tree condition*" "*8 per ha must be retained where available*", whereas the 2023 plan states "*Minimum of 8 per hectare must be retained*", which requires retaining additional recruitment trees.
- Unlike the **2019 HHP**, **2023 HHP** requires 20m exclusion area around "*Slaty Red Gum (Eucalyptus glaucina) – Mapped records within harvest area*", though it is unclear whether this is intended to apply to all Slaty Red Gum or just the 8 mapped in the HHP.
- Temporary Koala Feed Tree Clumps, and other additional fire offsets, have been added in the **2023 HHP**, though don't reduce the identified net harvest area compared to the **2019 HHP**.
- Buffers on unmapped and Class 1 drainage lines were reduced from 10m to 5m in the May **2023 HHP** variation. Note that buffers on Class 3 and 4 drainage lines have been increased

by 10m in the **2023 HHP**, though as they are in existing exclusions this does not materially affect the net harvest area.



2019 HPOM **2023 HPOM**

Comparison of pre-fire 2019 (left) and post-fir 2023 (right) Harvesting Plan Operational Maps (**HPOM**s). Yellow is the net logging area. These show the minimal changes to logging plans made in response to the 2019 fire. Note the removal of some stream buffers.

One of the voluntary Safeguards is to protect a minimum of 50% of the gross Local Landscape Area (in this case the LLA includes compartments 3, 4, 5, 6, 7 and 8, with a total area of 1,433 ha). The Forestry Corporation has provided a Fire Offsets map which shows a combination of Permanent CIFOA Exclusions and additional LLA Offsets. The LLA Offsets are meant to compliment the CIFOA Exclusions *"by the best identified additional habitat opportunities including lower fire intensity areas, recovered areas and connected areas".* In Braemar they selected the whole of compartments 4 and 5, outside exclusions, to designate as LLA Offsets (see white hatched areas on map below), despite their being severely burnt, with large areas over which the majority of trees were killed in the 2019 fires.

Forestry LLA Fire Offsets (white diagonal hatching) over FESM fire history: Purple - extreme severity, red – high severity, orange – moderate severity. Note the Fire Offsets were severely burnt, and there were alternative '*lower fire intensity areas'* as options, and other less severely burnt forests, that were ignored.

Large areas of the “additional LLA Offsets”, such as these above, along with significant portions of the Wildlife Habitat Clumps, were very badly burnt in the fires, with most trees killed and dense regrowth of wattles.

The loggable part of compartments 6 and 7 were generally not as severely burnt as the “additional LLA Offsets”, so should have preferentially been selected as offsets. As there was a loss of >40% of canopy trees over significant areas in the vicinity of log dumps 7 and 8, and the widespread loss of occasional trees (up to 10% of canopy in places) and damage to trunks elsewhere, it is very strange that the **2023 HHP** can claim a small increase in the product yields, when compared to the pre-fire **2019 HHP.** From a total of 2,792 m^3 of products in the 2019 HHP to 2,830 m^3 of products in the 2023 HHP, with slight increases across most products.


Despite the above significant loss of canopy in the vicinity of log dumps 7 and 8, and widespread tree damage and death across the loggable area, it is very strange that the **2023 HHP** can claim a small increase in the product yields, when compared to the pre-fire **2019 HHP.**

2. Koala

Koala *Phascolarctos cinereus* was first listed as Vulnerable on the NSW Endangered Fauna (Interim Protection) Act 1991 in 1995, and up-listed to Endangered under the NSW Biodiversity Conservation Act 2016 in May 2022. *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory, was up-listed from Vulnerable to Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999, effective from 12 February 2022.

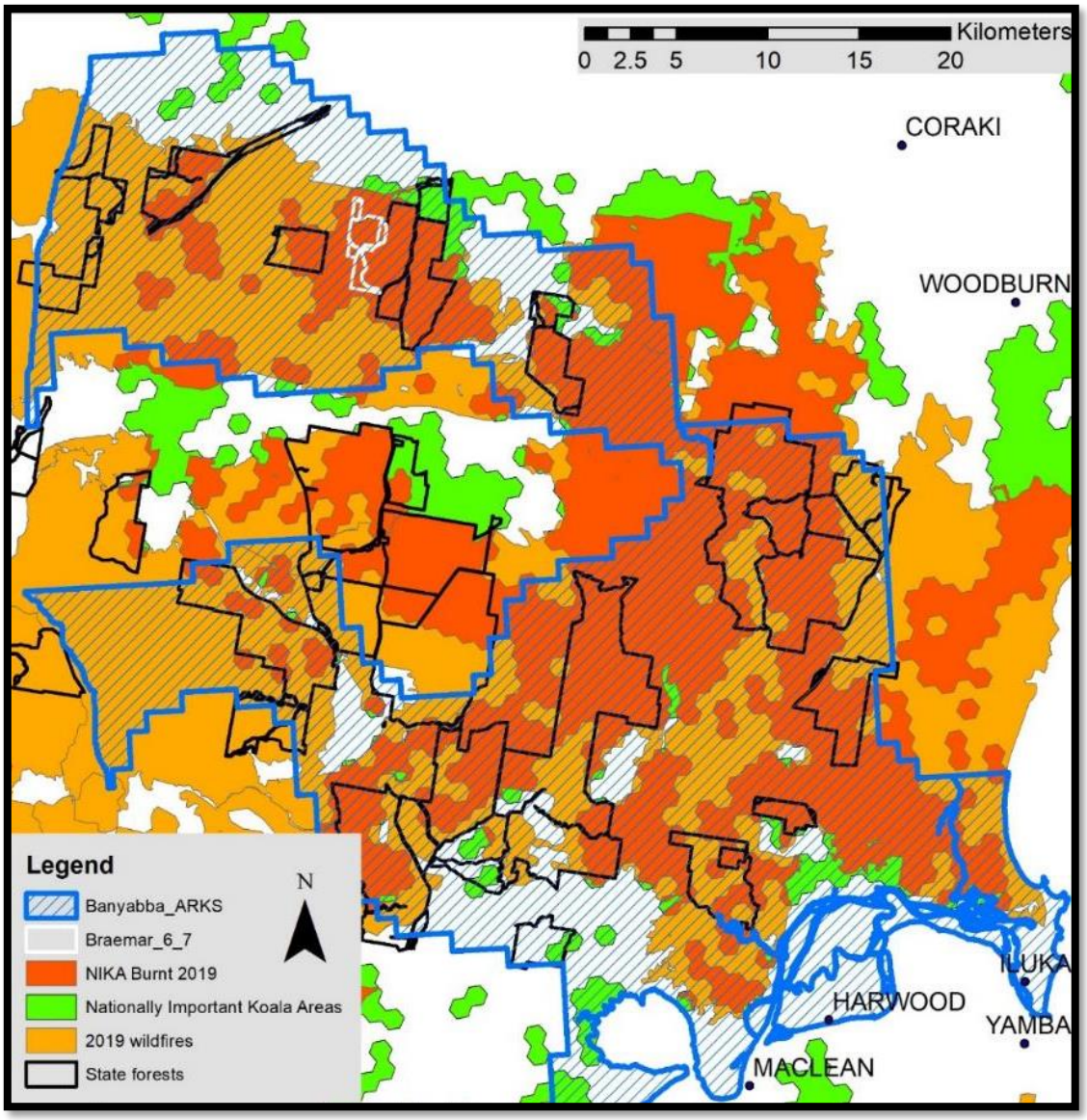
The NSW Threatened Species Scientific Committee (2022) identified the Koala as being in significant decline, hastened by the 2019/20 fires, and eligible for listing as Endangered:

> *The koala (DAWE 2022) is estimated to have undergone a large reduction in population size of 50% over the last 20 years (3x generation length). This is likely to be an underestimate as the impact of both the 2019/20 bushfires and the preceding drought have not been accounted for in that figure (DAWE 2022). It was estimated that populations had declined by 10 per cent by one year after the 2019/20 fires and would continue to decline thereafter without returning to their pre-fire population size (Legge et al. 2021)*

In accordance with the National Recovery Plan, the Commonwealth undertook a project to identify Nationally Important Koala Areas (Runge *et. al.* 2021), that identifies Braemar as being nationally significant, though they have since done nothing to protect it on public lands.

Braemar State Forest is within the Banyabba Area of Regional Koala Significance (ARKS). Banyabba is one of the nineteen populations identified under the NSW Koala Strategy for 'immediate investment' as "relatively large koala populations supported by good levels of knowledge but subject to significant threats".

In 2012 and 2013 I identified the nearby Royal Camp and Carwong State Forests as having exceptional densities of Koalas, which was verified by a detailed assessment of Koalas by the EPA that found they had significant populations of resident Koalas (2016). The regional significance of this population led me to propose their inclusion in a 2,100 ha Sandy Creek National Park (Pugh 2017).

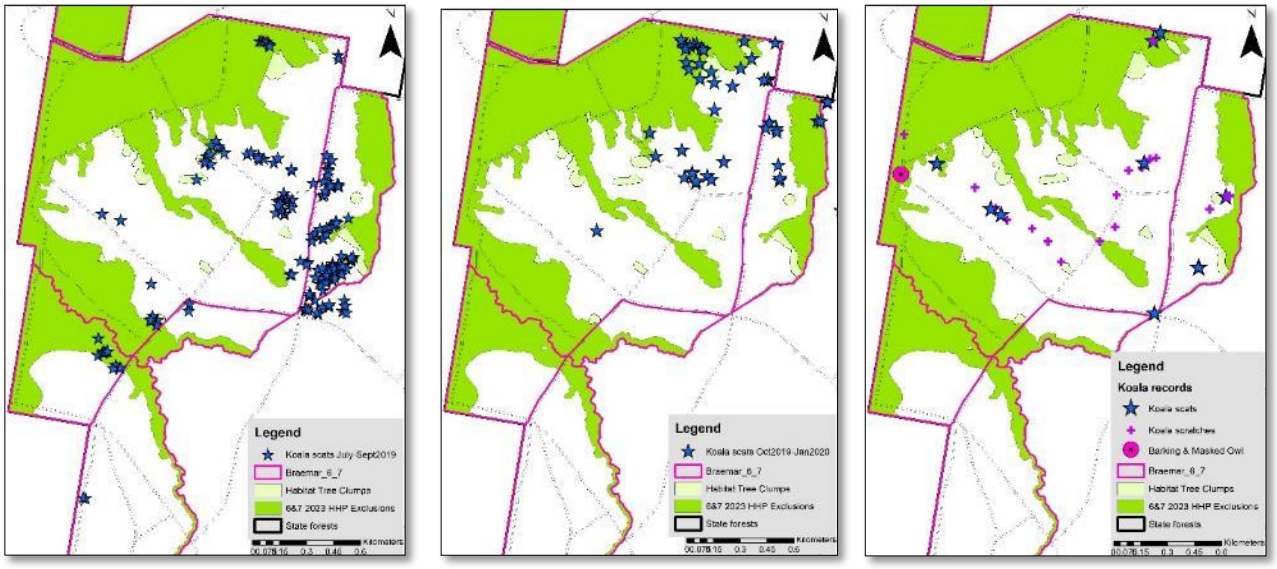


The Commonwealth's Nationally Important Koala Areas (NIKAs), overlaid with the 2019/20 fires identified in NPWS Fire History, and NSW's Banyabba Area of Regional Koala Significance (ARKS), showing the extent of burning of NIKAs within the Banyabba ARKs. Note that Braemar State Forest is within a NIKA.

Koala records for Compartments 6 and 7 in Braemar State Forest date back to 1998, though it wasn't until I undertook intensive Koala scat searches, with the assistance of volunteers, in 2019 that extensive areas were proven to also have exceptional densities of Koalas. Based on the evident importance of this area I decided to propose an expanded Sandy Creek Koala Park to include compartments 6 and 7 of Braemar State Forest (Pugh 2020).

In October 2019 the Busby's Flat Fire burnt through the compartments, killing most Koalas, though some survived in the less severely burnt stands. While there is the potential to rebuild their populations, it is apparent that there is limited recovery at this time. The removal of most mature Koala Preferred Feed Trees in the proposed logging will significantly affect the recovering Koala population.

KOALA RECORDS for compartments 6 and 7, overlaid on identified 2023 logging exclusions



2019 Pre-fire **2019/20 Post-fire** **2023 Current**

The pre-fire surveys were time consuming because of the sheer numbers of scats found, and the intervention of the fire meant that only partial coverage of the logging area was completed. Initially the aim was to identify high use trees with >20 Koala scats beneath them, as these were a trigger for identifying Koala High Use Areas. Across the 4 assessments of Braemar undertaken by NEFA before the fire, 165 trees with Koala scats beneath them were identified, including 67 high use trees which were the trigger for identifying Koala High Use Areas. It was considered at the time that over half the logging area would be likely to constitute Koala High Use Areas and therefore have to be excluded from logging under the original 2017 HHP. Though a new HHP was adopted in 2019 that no longer required the identification and protection of Koala High Use Areas.

Over the 3 months after the October 2019 fires, 64 trees were identified from scats as being used by Koalas in Braemar State Forest. No evidence of post-fire Koala use was found in most of the highest use areas identified before the fires. After the fires the drought persisted for two and a half months, resulting in a further 67-79% decline in the use of trees, which coincided with a decline in the variety of scats being found, indicating a significant ongoing population decline (Pugh 2020). In Braemar SF Koalas appeared to be lost from most of the eastern assessed area, and contracted in the western area.

Based on my pre- and post- fire Koala data, as well as vegetation plots, I quantified the impacts of the bushfire and continuing drought on the Koala population (Pugh 2020), concluding:

> *The lines of evidence relating to the decline of Koalas in the partially burnt forests show a decline in Koala tree usage and Koalas post fire, a 49% loss of canopies of suitable Koala feed trees, and a further 60-80% decline in Koala feed tree usage over the 3 months after the fires. Based on this it is estimated that there has been a 60-90% loss of Koalas from the partially burnt forests, which increases the Koala losses from burnt forests to 84-96%. This equates to a 78-89% loss of Koalas across the proposed Sandy Creek Koala Park.*

The recent assessments were undertaken on 3 occasions in May and June 2023. Scat searches were hampered by the dense grassy understory in most areas. In total, scats were found under 10 trees scattered throughout the area. Given that Small-fruited Grey Gum is a preferred Koala feed tree, and that its relative soft bark is readily scratched by Koalas, it provides a good indication of Koala usage. Small-fruited Grey Gum were found to be widely used, though usage was often low, with a few patches not displaying any use. In total 18 trees were recorded with numerous Koala

scratches, indicating repeat usage, with some scratches observed on numerous other trees. It is considered that Koalas are widely using the logging area, though at low densities with patches of higher use. It is apparent that there has been limited recovery of the population at this stage, though Koalas appear to be ranging over most of the forest.

The Forestry Corporation Ecology Report identifies that the Forestry Corporation recorded 3 trees with Koala scats on their traverses in 2022.

The 10 trees I found with Koala scats ranged from 27cm to 63cm DBH, with an average 47cm DBH and only one tree <30cm DBH. The 18 trees found with numerous Koala scratches ranged from 24 to 99 cm DBH, with an average 55cm DBH and only one tree <30cm DBH.

Over all my assessments (Pugh 2020) within the proposed Sandy Creek Koala Park I recorded 477 trees (for which I recorded species and diameters) with Koala scats beneath them, comprised of 35% Small-fruited Grey Gum (*Eucalyptus. propinqua*), 34% Coastal Grey Box (*E. moluccana)*, and 22% red gums (Forest Red Gum *E. tereticornis* and Slaty Red Gum *E. glaucina*). Small-fruited Grey Gum appears to be a particularly important feed tree as it is used disproportionally more than what would be expected from its distribution.

I also found 85% of trees used had a 30cm diameter (dbh) or larger, and tree usage increased with tree size relative to tree availability. Trees 10-30 cm DBH comprised 74% of trees, though only 15% of trees used (Pugh 2020). From their assessment of nearby forests, the EPA (2016) found "*that koalas preference for utilisation of feed trees by koalas is towards larger trees (higher diameter at breast height >30 centimetres)*".

For preparation of NEFA's Sandy Creek Koala Park proposal (Pugh 2020) I assessed a series of 76 plots on 10 transects where all tress over 10 cm DBH were recorded, to assess forest structure across the proposal (see the report for methodology). To assess the past effects of logging,12 plots were measured in CRAFTI mapped oldgrowth forest in Banyabba State Forest. The results indicated that logging had reduced the basal area of live trees from 40.7 m^2 to 20.2 m^2, a reduction of above ground biomass of these forests of 59%, likely with a similar decline in canopy volumes and thus the availability of resources for Koalas. This increases to a loss of 65% of biomass for trees above 30 cm dbh and to 84% of biomass for trees above 50 cm dbh. Given the distinct preferences of Koalas for larger trees, the impacts of canopy loss on Koalas is likely to be greater than just the volume of browse lost by past logging. (Pugh 2020)

Within compartment 6 of Braemar State Forest I assessed 29x475.3m^2 plots on four sites, giving an assessed area of 13,784m^2. These plots were measured after the fires, but before the mortality of trees could be determined, so does not account for trees that subsequently died. They are considered to provide a reasonably representative sample of the structure of the forest pre-fire. The data for Braemar State Forest is presented below and used to provide an indication of the impacts of future logging on forest structure and the availability of Koala feed trees.

Representative structure of forest proposed for logging in Braemar State Forest

Size class dbh (cm)	Number trees/ha	Basal area m2/ha	Koala Feed Tree no/ha	Red Gum no/ha	Red Gum basal area m2/ha
60+	7.3	2.2	3.6	1.5	0.4
45-59.9	27.6	5.6	18.1	1.5	0.5
30-44.9	68.9	7.3	31.9	3.6	0.4
Sub total	103.7	15.1	53.7	6.5	1.3
20-29.9	65.3	3	15.2	1.5	0.1
10-19.9	226.4	3.6	67.5	10.9	0.2
Grand Total	395.4	21.7	136.4	18.9	1.5

Koala feed trees were limited to the principal feed trees used, being Small-fruited Grey Gum, Coastal Grey Box and red gums. Red gums includes both Slaty Red Gum and Forest Red Gum

At the most basic level, the current basal area in Braemar is 21.7 m^2 (though due to tree loss in the fire this will now be reduced), the CIFOA requirement is to retain an average basal area of 10m^2 per ha, so in the order of 54% of the basal area within logging areas can be removed. This of itself will represent a significant loss of potential Koala browse. The previous IFOA limited basal area removal to 40%, though the **2017 HHP** got around this by including adjacent compartments in the plan which were claimed as offsets, allowing the minimum basal area within the area intended to be logged (basically the same area as now) to be given as 10m^2

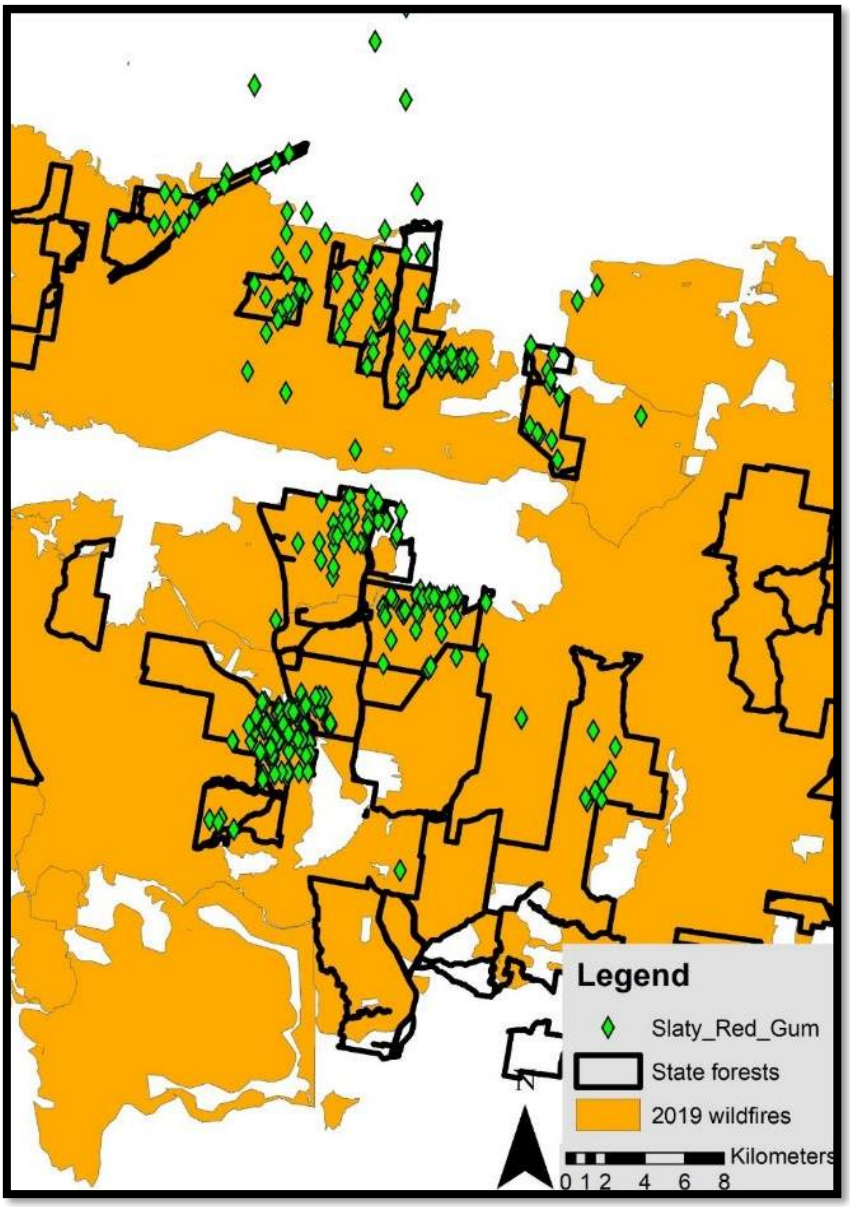
To quantify tree retention and removals within the net logging area it is assumed that:

- Firstly all red gums >30 cm DBH are retained, which requires the retention of 6.6 trees/ha (basal area of 1.3m^2/ha), if all these are counted as Koala feed trees then that requirement is satisfied and no additional Koala feed trees require retention, if those greater than 45 cm dbh are counted as habitat trees then that represents 3 trees per ha, leaving 5 per ha to be sourced from other species.
- To satisfy the requirement for 5 more habitat trees, then 5 trees >60 cm DBH may be selected (though they could be smaller), with, say, an average 2.5 being Koala feed tree species and a basal area of 1.5 m^2.
- This means that the habitat tree retention requirements will have been satisfied, with a basal area achievement of 2.8 m^2. In practice trees under 30 cm dbh are rarely logged (though often damaged), giving a basal area of 6.6m^2. This then only requires an additional 0.6 m^2 to be retained in the 30-44.9 cm size class to satisfy the 10m^2 basal area requirement, which can be satisfied with the retention of about six trees, of which half may be Koala feed tree species (though there is no requirement that any are).

Koalas are known to preferentially utilise trees >30 cm DBH. My plots identify that there are in the order of 53.7 Koala feed tree species per hectare >30 cm DBH (without accounting for fire losses). Under the above scenario the **2023 HHP** effectively allows for retention of around at least 7, and possibly12 potential Koala feed trees per hectare, while allowing the removal of around 42-47 potential Koala feed trees per hectare, or around 77-87% of potential feed trees. Across the 187 ha identified for logging, this equates to 7,780-8,790 potential feed trees. The removal of such a high proportion of Koala feed trees is expected to have a highly significant impact on the recovering Koala population and, with droughts and fires increasing, may threaten its persistence.

3. Slaty Red Gum:

Slaty Red Gum (Eucalyptus glaucina) is a tree listed as Vulnerable at both State and Federal levels. The Commonwealth's 'Approved Conservation Advice for Eucalyptus glaucina (Slaty Red Gum)' identifies forestry as a threat requiring monitoring and that logging "*not adversely impact on known populations".* OEH's Species Profile identify as a threat "*Timber harvesting activities*", and as a management activity "*Protect areas of habitat from timber harvesting activities*". Save Our Species identifies "Braemar" as one of 2 proposed priority management sites.



Bionet (2023) records of Slaty Red Gum over the 2019/20 fires identified in NPWS Fire History, Bionet records show Braemar State Forest to be part of the core of this dense northern cluster of records, the majority of which were affected by the 2019 wildfires.

Many large trees were killed in the 2019 fire, though it is unknown how many of these were Slaty Red Gums. The stand identified by Benwell (1998) atop Mount Braemar was burnt very severely with most canopy trees killed. The extensive burning of Slaty Red Gum emphasizes the need for surveys to assess the population health of this species before logging. In some areas there has been regeneration of Slaty Red Gum since the fire, as well as suckering from dead trees, though in

some areas this is mixed in with prolific wattle growth. The loss of mature trees capable of setting seeds, combined with the dense regrowth has significantly increased the risk of a major population decline should there be another fire before regrowth Slaty Red Gum have matured enough to set good seed crops.

The Stand of Slaty Red Gum on Mt Braemar (now in compartment 4 and 5, used as fire offsets) was severely impacted by the 2019 fires with most Slaty Red Gums killed. The reduction in mature trees capable of setting seed and the dense regrowth, including numerous wattles, makes this stand extremely vulnerable to burning again.

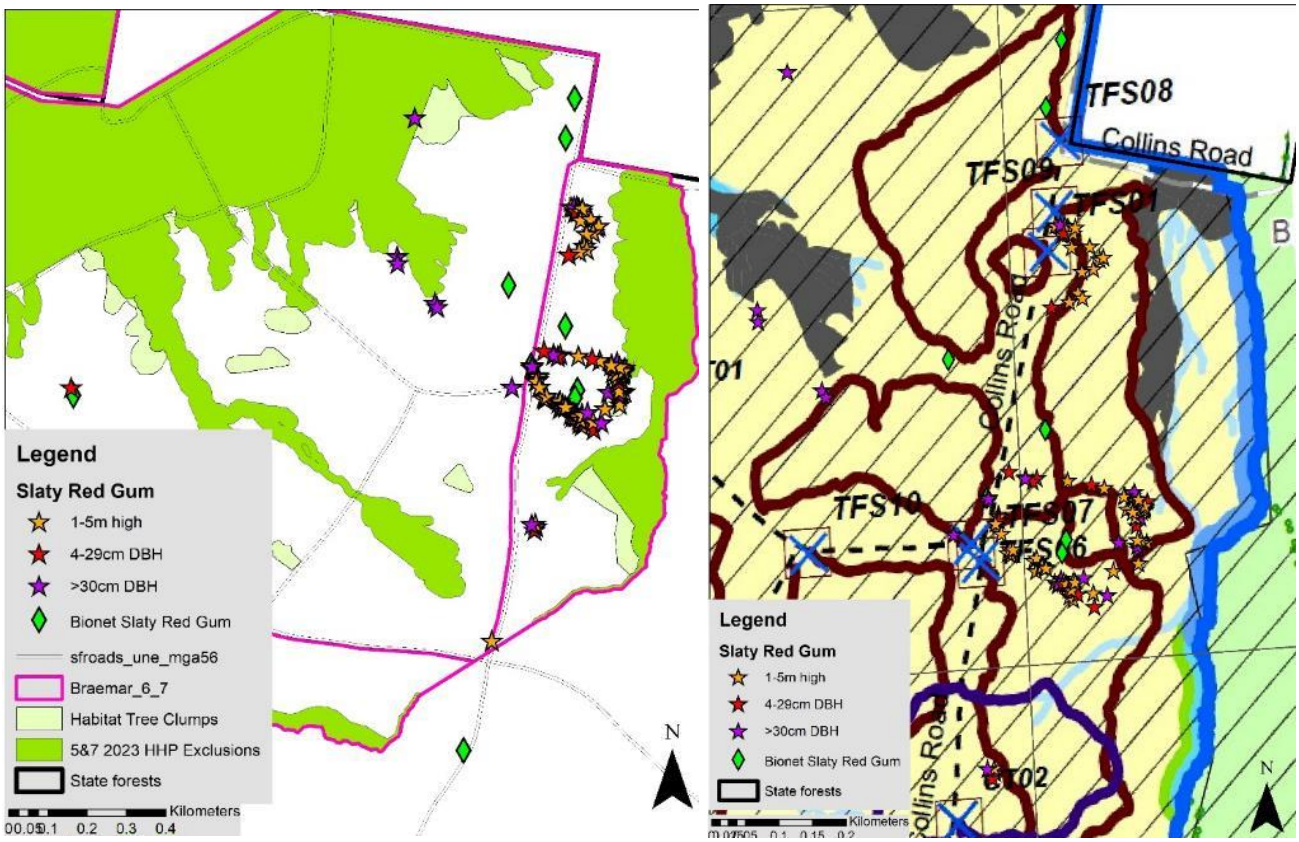
Benwell (1998) undertook an assessment of Slaty Red Gum for State Forests in then compartment 24 of Braemar State Forest, part of which is now included in the renumbered compartment 6. At that time the prescription for *E.glaucina* required 10m exclusions around 50% of records and an additional 10m modified harvesting zone with at least 50% canopy retention. Benwell estimated a total population well in excess of 1000 canopy trees, forming a distinct association around Mt. Braemar. He recommended implementing the prescription by excluding logging from the denser stands he identified, including Mt. Braemar.

The 1999 Threatened Species Licence classed Slaty Red Gum as one of the 11 plants that could be logged indiscriminately subject to the undertaking of a Monitoring Program. The only monitoring report for Slaty Red Gum (*Eucalyptus glaucina)* was prepared by the Forestry Corporation in 2012, finding 30% of trees up to 60 cm dbhob were damaged by logging (5 logged) and 3 years after logging there was a population decline. The Coastal IFOA limits protection to trees >30 cm dbh, with no buffers. Because of identification difficulties this is extended to all red gum species in Braemar State Forest.

The **2023 HHP** also has an unenforceable clause apparently requiring 20m buffers around records of Slaty Red Gum. Though it is assumed that this prescription was adopted based on a mistaken belief that there are only 11 localities, without awareness that there are actually hundreds of individuals and that applying this prescription to them would exclude extensive areas from logging and thus have significant resource impacts.

Our recent counts recorded numerous Slaty Red Gums in compartment 6 of Braemar State Forest: 84 seedlings or suckers (at 69 locations) 1-5m tall, 19 trees 4-30cm DBH and 22 trees >30 cm DBH. There is a high density of seedlings/suckers along the ridge to the east of Collins Road in the

vicinity of log dumps 2 and 5, with only a representative sample made of the total numbers of Slaty Red Gums occurring.



Records of Slaty Red Gum by size class (seedlings/suckers 1-5m high, 4-29cm DBH and >30cm DBH) identified on site inspections, along with Bionet records. **LEFT**: Note the two clusters with high densities of records to the east represent the routes traversed, indicating the very high density of Slaty Red Gums of all sizes in that area. **RIGHT**: Records overlaid on the Forestry Corporation Ecology Report traverses, indicating the extremely high numbers of Slaty Red Gum that should have been recorded in an adequate survey.

For compartments 6 and 7, the Forestry Corporation Ecology Report has 1 record of Slaty Red Gum from 2003, 4 records from 2 sites in 2017, and 6 records from their 13,672m of traverses undertaken in 2022 (Ecology Report 3.1 Surveys Undertaken (Protocol 20.3 & 20.4)) specifically searching for Slaty Red Gum. As shown above their transects passed through areas with very high densities of Slaty Red Gum, and yet they were apparently unable or unwilling to identify them. There is something fundamentally wrong - the surveyor could not have been adequately trained as required by CIFOA Protocol *6.5 Targeted survey – surveyor experience.*

The Ecology Report identifies the Potential Habitat Area (ha) for flora surveys for Slaty Red Gum as 325 ha, and therefore the Survey Distance required (in accordance with the CIFOA Protocol 20.3) as 12,025m. The FCNSW's 'Post Fire Voluntary Environmental Safeguards - Update to Rationale North Coast' identify "*Additional operational surveys - Traverse: 1km/100ha*", which would require an additional 3,250m of flora traverses. This would bring the total required to 15,275 m, whereas the claimed total is just 13,672m of traverses. As the additional survey effort is purely voluntary this is not a legal breach, though the surveyors failure to identify numerous individuals along their traverses shows that the surveys undertaken were not up to the standard required by Protocol 20.3 & 20.4.

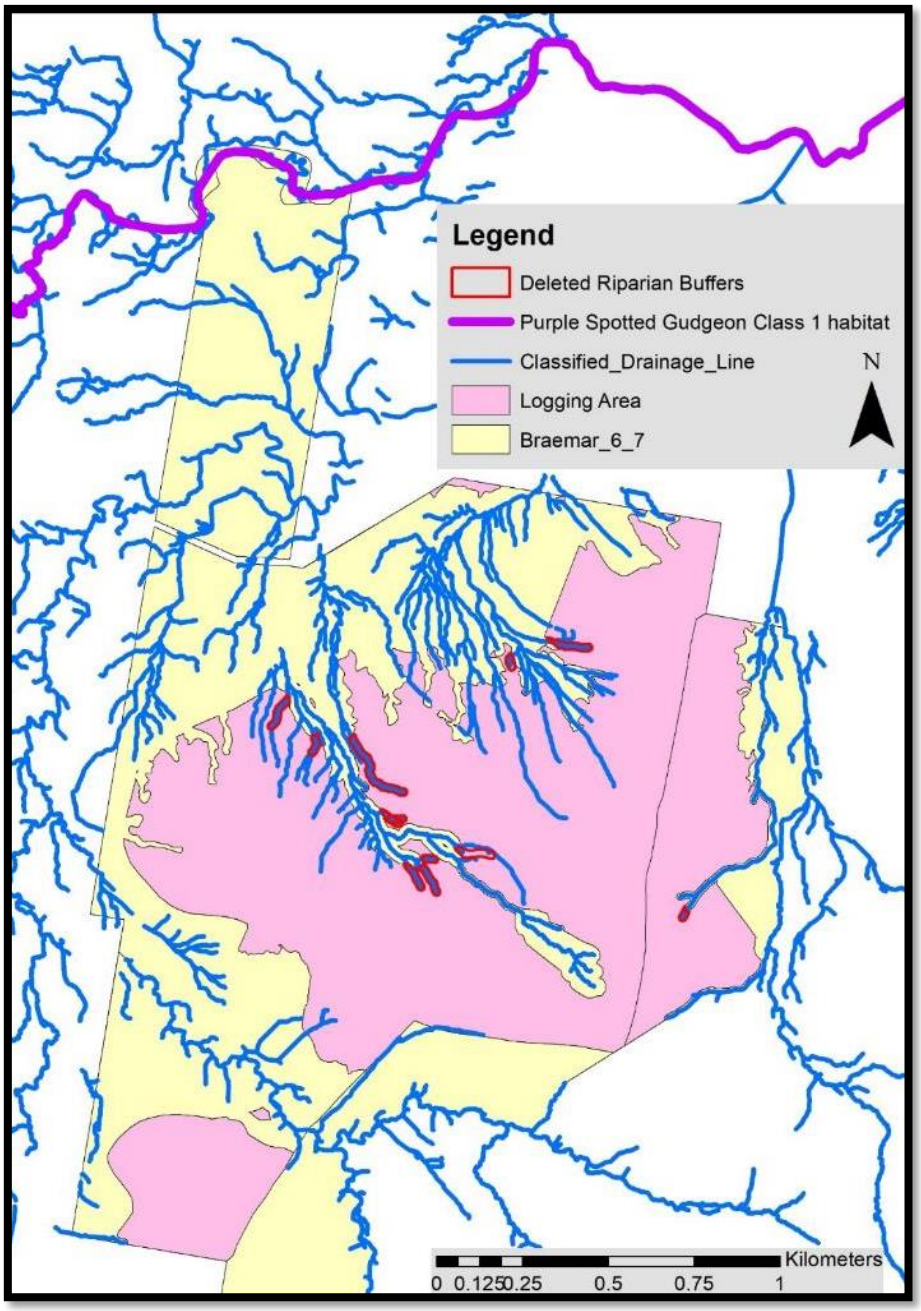
The only works undertaken at the time of this assessment were roadworks. Of the 8 locations identified for Slaty Red Gum on the **2023 HPOM** only one occurs immediately adjacent to a road, and therefore should have been an obvious target for special consideration given the **2023 HHPs**

(voluntary) requirement for 20m buffers around Slaty Red Gum and the CIFOA requirement to protect all red gum >30 cm DBH. Instead the machinery had diverted off the road within the 20m buffer, pushed a log against the base of a 33cm DBH Slaty Red Gum just 4m from the identified tree, causing significant basal damage, and bulldozed a smaller Slaty Red Gum out of the ground. None of this was necessary for the roadworks and could have easily been avoided.

A = One of 8 Slaty Red Gums identified in the 2023 HHP as requiring a 20m exclusion zone
B = Slaty Red Gum pushed out of the ground
C = Log pushed into base of a Slaty Red Gum 33cm DBH, causing significant damage, 4m from A

4. Southern Purple Spotted Gudgeon

Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) is listed as Endangered in NSW, with threats identified by the Department of Industries including '*Decreased water quality due to agricultural runoff and siltation*' and '*Extreme weather events, such as drought and bushfires*'. Sandy Creek, adjoining compartment 6 of Braemar State Forest, is identified as "Indicative Habitat" of Southern Purple Spotted Gudgeon by Fisheries, with a record downstream and historical records in the vicinity (Brooks 2009).



Braemar State Forest compartments 6 and 7 showing logging exclusions, proposed logging area, classified drainage lines, adjacent "Indicative Habitat" of Southern Purple Spotted Gudgeon (also Class 1 habitat), and 10m drainage line buffers identified on the 2019 HHP that were deleted from the 2023 HHP (red). Note that most mapped drainage lines within the logging area did not require buffers under either plan.

The 1999 Fisheries Licence (condition 7) defined **Class 1 aquatic habitat** "*as that part of a watercourse, wetland or other water body where potential habitat of threatened species does occur*

within 2km upstream or 5km downstream of the site of the proposed works", which meant that all unmapped and Class 1 drainage features in Compartments 6 and 7 qualified as Class 1 aquatic habitat, and therefore required minimum 10m buffers. The 2018 CIFOA limited identification of Class 1 Aquatic Habitat to "Indicative Habitat", meaning that only Sandy Creek itself now qualifies. Never-the-less the **2019 HHP** continued to identify streams within the compartments as being within Class 1 Aquatic Habitat and requiring 10m buffers, with the requirement for 10m buffers maintained in the March **2023 HHP**. Without explanation the **2023 HHP** removed parts of 11 class 1 drainage lines identified in the **2019 HHP** with a 10m buffer, totaling some 954m of drainage lines. Then again without explanation the May **2023 HHP** variation reduced the 10m buffers along unmapped and Class 1 drainage features down to 5m (presumably because it was no longer considered Class 1 Aquatic Habitat).

The Forestry Corporation's Additional Voluntary Safeguard for Riparian Exclusions requires an additional 10m buffer on class 3 and 4 streams, which appears to have resulted in minimal additional protection along some 80m of a class 3 stream.

One of the most effective ways of reducing runoff volume and sediment entering streams is with undisturbed riparian buffers to trap sediments and disperse flows, for headwater streams 30m buffers have been identified as required. Given the previously identified need for 10m buffers on all unmapped and Class 1 drainage features in Braemar State Forest to reduce impacts on the Southern Purple Spotted Gudgeon, the need for increased riparian buffers (on large streams) identified in the voluntary Safeguards, the inexplicable removal of some 954m of identified drainage features and their buffers, and the extensive impact of the 2019 fires on the Sandy Creek catchment, it is irresponsible to reduce buffers down to 5m.

Without contemporary surveys for Southern Purple Spotted Gudgeon downstream in Sandy Creek the impacts on this species cannot be assessed, though it is evident that increased turbidity and sediments generated by the logging operations will have an effect on instream biota.

References

Benwell, A. (1998) Preliminary Flora Survey, Compartment 24 Braemar State Forest. Report to State Forests of NSW, Casino Regional Office.

Brooks, D. (2009) The biology, distribution and key threats of the Purple Spotted Gudgeon (*Mogurnda adspersa*), in the Richmond River catchment. Unpublished Third Year Undergraduate Report. School of Environmental Science and Management, Southern Cross University, Lismore.

Environment Protection Authority (EPA 2016) Koala Habitat Mapping Pilot: NSW state forest Report. Environment Protection Authority

Forestry Corporation (2012) '*Eucalyptus glaucina* Flora Monitoring Program First report'. Unpublished report to EPA.

Forestry Corporation (2020) 2019–20 Wildfires, NSW Coastal Hardwood Forests Sustainable Yield Review. Forestry Corporation of NSW.

Forestry Corporation (2021) Post Fire Voluntary Environmental Safeguards - Update to Rationale North Coast. https://www.forestrycorporation.com.au/__data/assets/pdf_file/0011/1429616/north-coast-addendum.PDF

Milledge, D. and Soderquist, T., 2022. Impacts of the 2019 wildfires on large trees and stags in Barking Owl *Ninox connivens* territories in the lower Richmond River district, north-eastern New South Wales. *Australian Zoologist*. DOI: https://doi.org/10.7882/AZ.2022.019

Natural Resources Commission (NRC 2021b) Final report Coastal IFOA Operations post 2019/20 wildfires, June 2021. https://www.parliament.nsw.gov.au/lcdocs/other/17530/23%20August%202022%20-%20PC%207%20-%20tabled%20by%20Sue%20Higginson.pdf

NSW Threatened Species Scientific Committee (2022) Notice and reasons for the Final Determination. 20/05/2022 https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/Determinations/final-determination-phascolarctos-cinereus-endangered-species.pdf?la=en&hash=005D26A4C7215AF7CF913ADE39FCC02F0E211089

Pugh, D. (2017) 'Sandy Creek National Park Proposal. Revised'. North East Forest Alliance, March 2017 https://d3n8a8pro7vhmx.cloudfront.net/ncec/pages/40/attachments/original/1528797079/Sandy_Creek_National_Park_Proposal_update.pdf?1528797079

Pugh, D. (2020) Proposed Sandy Creek Koala Park. North East Forest Alliance. *https://d3n8a8pro7vhmx.cloudfront.net/ncec/pages/40/attachments/original/1597453150/Proposed_Sandy_Creek_Koala_Park.pdf?1597453150*

Runge, C.A., Rhodes, J.R., Latch, P. 2021. *A national approach to the integration of koala spatial data to inform conservation planning report.* NESP Threatened Species Recovery Hub Project 4.4.12 report, Brisbane.