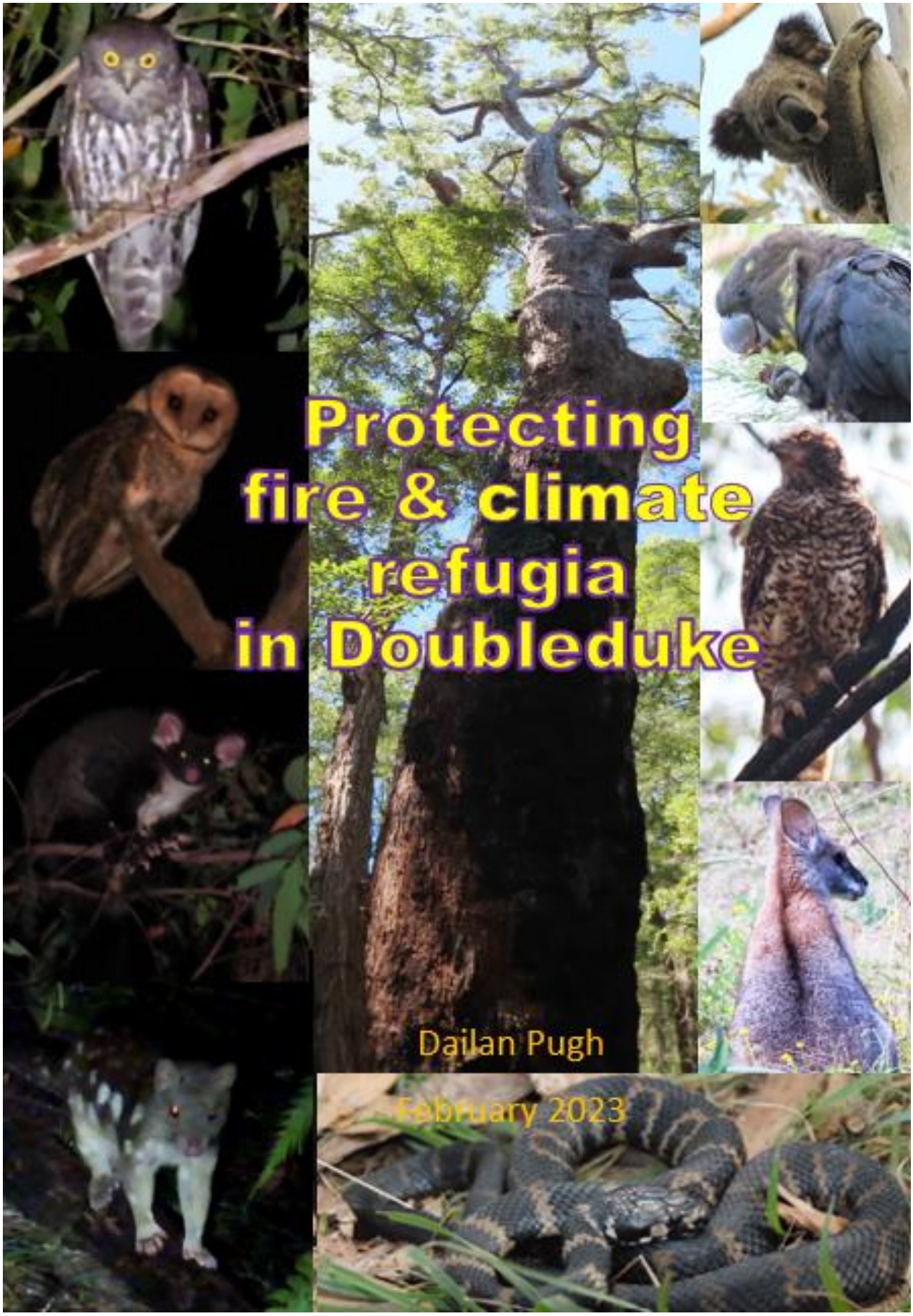
Protecting
fire & climate
refugia
in Doubleduke
Dailan Pugh
February 2023

# Protecting Fire and Climate Refugia in Doubleduke

Dailan Pugh February 2023

Compartments 5-8 of Doubleduke State Forest were burnt in the Myall Creek Road Wildfire in September 2019. The Forestry Corporation sought permission from the Environment Protection Authority (EPA) in February 2020 to log these forests, and in early March the EPA issued Site Specific Operating Conditions (SSOCs) requiring a variety of additional measures, including protection of all hollow-bearing trees and all mapped unburned and partially burned forests. The most intact forests identified by the EPA for protection are in a topographically protected site in the Lower Slopes Road valley, including an important and rare stand of tall oldgrowth forest, which is clearly a fire and climate refugia.

The Forestry Corporation thought the SSOCs too onerous, so waited for the EPA to revert to the pre-fire Coastal Integrated Forestry Operations Approval (CIFOA) logging prescriptions, as if the fires hadn't devastated populations of numerous threatened species and caused the Koala and Southern Greater Glider to be up-listed to nationally Endangered, and the Yellow-bellied Glider and Glossy-black Cockatoo to Vulnerable.

Now the EPA are turning a blind eye as the Forestry Corporation road and prepare to log the unburnt and lightly burnt forest down Lower Slopes Road, that they identified for protection just 3 years ago. This is a dereliction of duty, contrary to the EPA's legal responsibilities under the *Protection of the Environment Administration Act 1991* (NSW), and the CIFOA Objectives of implementing Ecologically Sustainable Forest Management (ESFM) in a precautionary manner. By allowing this to occur the EPA are ignoring the expert advice to protect the least burnt forests, the advice of their own expert Dr. Andrew Smith that such areas be protected for 20 years, and the recommendations of numerous Commonwealth Conservation Advices to protect fire and climate refugia. Most concerning is that they are allowing degradation of an irreplaceable local scale fire and climate refugia at a time when their protection is recognized as vital.

The EPA must act responsibly to ensure they protect the environment in Doubleduke State Forest, and implement the precautionary principle by urgently intervening to reinstate the prohibition on logging unburnt and lightly burnt forests in the Lower Slopes Road valley of Doubleduke State Forest. The EPA need to ensure there is a thorough fauna survey to identify the home ranges and key tree resources of Southern Greater Glider, Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale, Koala, and other vulnerable species, to fully delineate this refugia.

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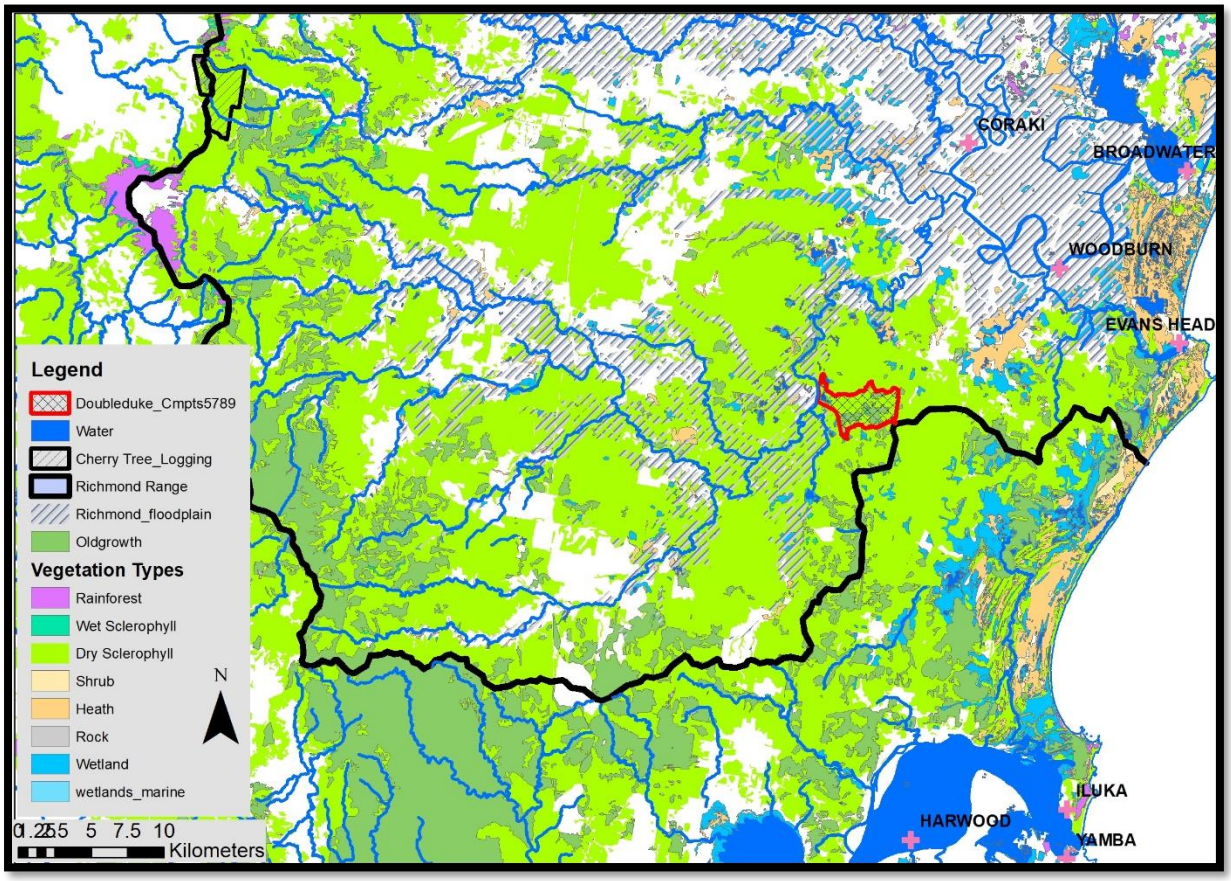
Compartments 5,6,7 and 8 Doubleduke State Forest encompasses 1,170 ha of public native forests stretching from Bungawalbin Creek, along with wetlands and endangered ecosystems on the heavily cleared Richmond River floodplain, up though a diversity of eucalypts, including patches of oldgrowth forest, to the crest of the Richmond Range. It is part of the most significant coastal complex of diverse eucalypt forests, wetlands and heaths left north of the Clarence River, with its diversity of plants and animals making it a biodiversity hotspot recognized as being of national significance. It is part of the region's most important climate change corridor, linking Bundjalung National Park along the Richmond Range to Mount Lindesay on the Queensland border.

**Location of the current logging area in Doubleduke State Forest.**



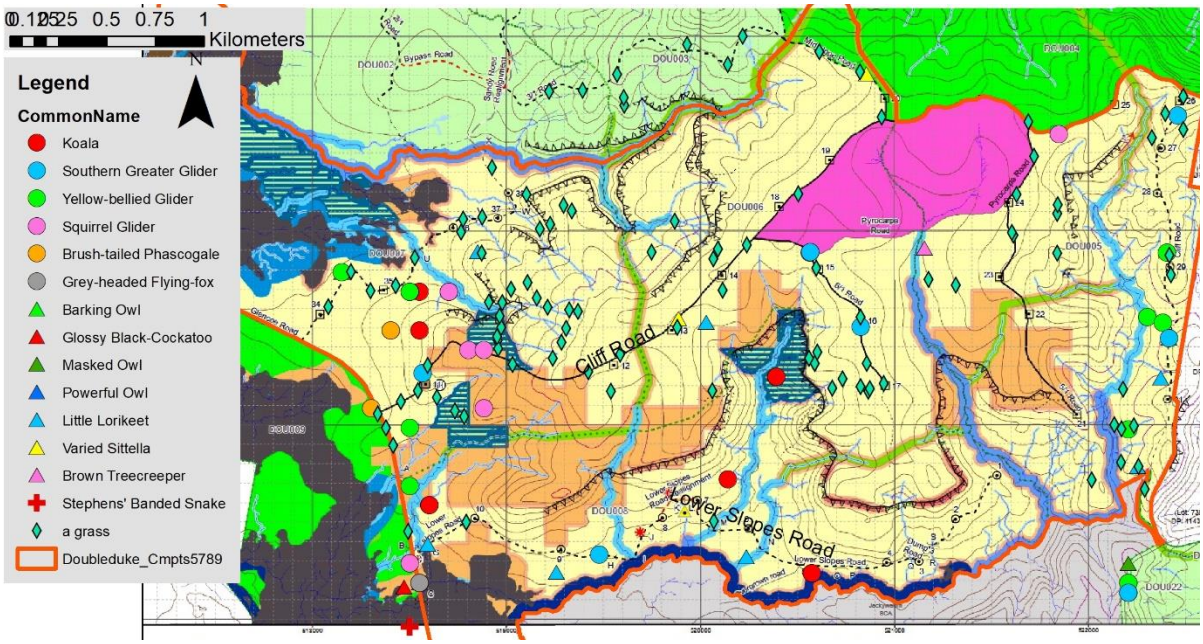

The area being logged is known to be home to a large diversity of forest dependent species.

Despite the inadequate surveys, there are records of a comprehensive assemblage of hollow-dependent species, including the Endangered Southern Greater Glider, along with the Vulnerable Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale, Masked Owl, Barking Owl, Powerful Owl, Glossy Black Cockatoo, Little Lorikeet, Brown Treecreeper and Stephens Banded Snake. With the Vulnerable Spotted-tailed Quoll found nearby.

The survival of these species depends on maintaining existing hollow-bearing trees as well as sufficient large old trees to develop the hollows of the future. There needs to be comprehensive surveys to identify their key feed, denning and nesting trees for protection, along with home ranges needing protection.

This forest also encompasses core habitat for Endangered Koala, though there have been no surveys to delineate important feed trees and home ranges for protection, and no intent to do so. The eastern-most population of the Endangered Black-striped Wallaby has been

recorded nearby, and there is an extensive population of the Vulnerable grass *Paspalidium grandispiculatum.*




**Threatened species records in or adjacent to compartments 5-8 Doubleduke SF, overlaid on harvesting plan (yellow is the logging area). From the ad-hoc records low down the valley it is evident that the Lower Slopes Road valley is of exceptional importance for threatened forest fauna, despite there never having been an attempt to undertake a systematic survey up Lower Slopes Road.**

Compartment 8 in the Lower Slopes Road valley is a standout because most of it is last recorded as being logged in in 1972, and still contains some significant stands of tall oldgrowth forest (some of which is proposed for logging). Two patches low down the valley were logged in 2010, and logging occurred in adjacent compartments above the cliffs and at the head of the valley in 2002.

The region was extensively burnt in the 2019/20 wildfires, with extensive loss of plants and animals. In the intensively burnt forests a large proportion of trees were killed, including numerous hollow-bearing trees, and most individuals of vulnerable species such as Southern Greater Glider, Yellow-bellied Glider, and Koala were killed. Losses were also widespread in less intensively burnt forests. These impacts were massive on populations of species already in decline because of logging and rising temperatures from climate change.

The Myall Creek Road Wildfire burnt through compartments 5-8 of Doubleduke SF in mid-November 2019. In early February 2020 the Forestry Corporation sought approvals from the Environment Protection Authority (EPA) to log a variety of burnt forests in the area, including compartments 1-8 in Doubleduke SF. In early March the EPA issued Site Specific Operating Conditions requiring a variety of additional measures, including protection of all hollow-bearing trees and all mapped unburned and partially burned areas. Once again the mature and oldgrowth forests in compartment 8 are a standout, encompassing the majority of the unburned and partially burned forests the EPA identified as required to have logging excluded. The Forestry Corporation didn't like the constraints and allowed the EPA's approval to lapse.

In June 2021 the Natural Resources Commission (NRC 2021) identified the Casino Management Area (encompassing Doubleduke SF) as being at "medium" risk, recommending retention of forest mapped as "unburnt, low and moderate severity" in

temporary refuges, where the required 8 hollow-bearing trees per hectare aren't available retaining the largest trees to meet the retention requirement, and retention of two mature recruitment trees for each hollow-bearing tree.

The responsible Ministers refused to adopt the NRC (2021) recommendations. The Harvest and Haul Plan does require '*trees with future hollow-bearing potential must be marked to ensure eight trees are retained per hectare*' (which is nebulous as all trees have future potential, and it is legally unenforceable), though does not require retention of recruitment trees and the retained Wildlife Habitat Clumps avoid the least burnt forest.

Climate change was not taken into account in the development of the North East NSW Regional Forest Agreement or the Coastal Integrated Forestry Operations Approval. Since then there were the 2019/20 wildfires which the EPA has repeatedly acknowledged rendered the CIFOA inadequate, numerous studies that have verified significant impacts, and there is growing evidence of the impacts of climate change, yet the EPA are allowing the Forestry Corporation to operate under the 2018 CIFOA as if nothing has changed, including no changes to the climate since the 1999 IFOA.

In Bushfire Survivors for Climate Action Incorporated v Environment Protection Authority [2021] it was clearly established that the EPA has an obligation to "*protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development*", which extends to ensuring environment protection from climate change. This responsibility can't be delegated to the Forestry Corporation.

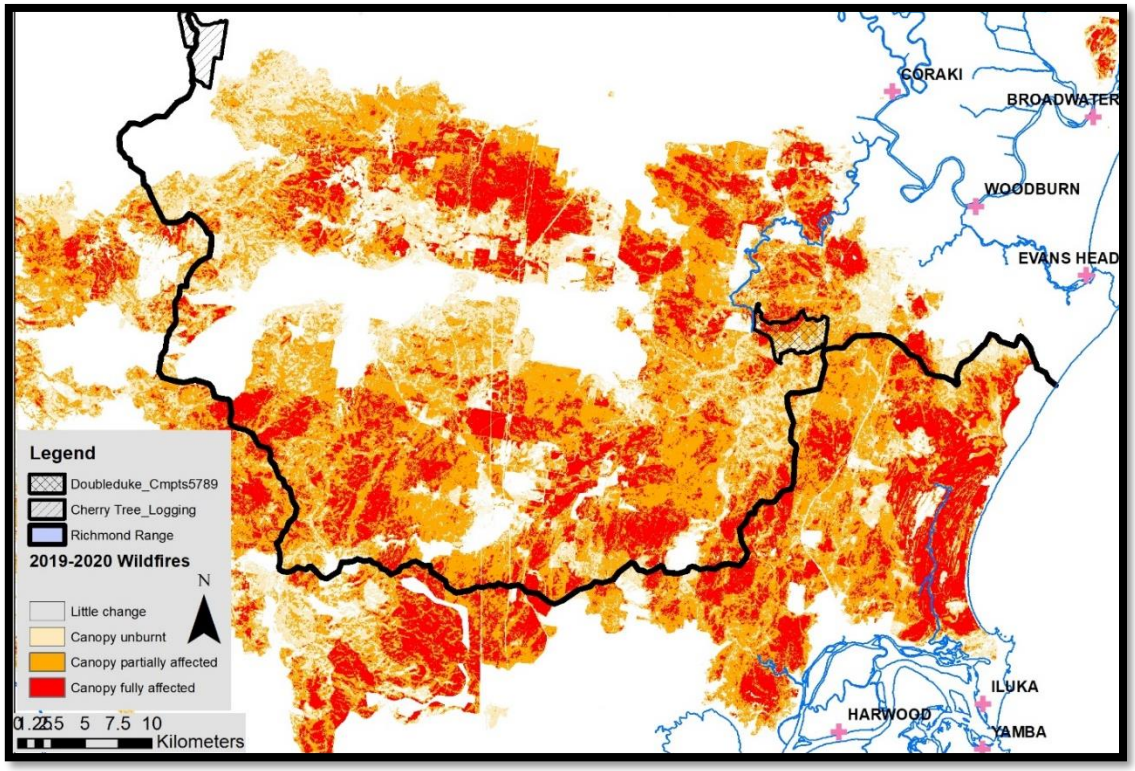
The EPA's mapped areas of forests least impacted by the fires for protection, correspond with an area of oldgrowth forest down Lower Slopes Rd, that has recently been roaded and is now proposed for logging. It is apparent that the Lower Slopes valley, encompassed (in part) by compartment 8, is a fire refuge and likely climate refugia for a suite of threatened forest fauna with preferences for large old trees.

It is clear that the Forestry Corporation is not complying with the precautionary principle as required by the Coastal Integrated Forestry Operations Approval (CIFOA)– Conditions, Division 3 – Objectives of the approval, by logging compartment 8 because they are:

- not protecting fire refugia needed to minimise the serious impacts of the 2019/20 fires on populations of threatened species inhabiting the forest, notably on Southern Greater Glider, Yellow-bellied Glider and Koala
- compounding threats of irreversible environmental damage in the short and long term from climate heating by degrading an important local climatic refugia in a regional climate corridor
- logging a rare and invaluable stand of oldgrowth Blackbutt forest
- increasing the risk of extinction for the Endangered Southern Greater Glider and Koala by logging and roading compounding fire and climate impacts, while increasing the risk of more intense future fires by structural changes and the promotion of lantana.
- ignoring the State and Commonwealth Conservation Advices to protect fire and climate refugia, including for the up-listed Endangered Koala and Southern Greater Glider, and Vulnerable Yellow-bellied Glider

# 1. An identified fire and climate refugia.

The 2019/20 Myall Creek Road Wildfire entered compartment 1 of Doubleduke State Forest from the north on around the 15 November 2019, within a few days the fire burnt most of compartments 1 to 8. The landscape surrounding Doubleduke SF was extensively impacted with the loss of millions of trees and animals, necessitating a reappraisal and change in management. In 2020 the EPA identified unburnt and lightly burnt forest (mostly) in compartment 8 of Doubleduke State Forest for protection as a fire refuge, but now the Forestry Corporation is intending to log these vital refuges as the EPA shirk their responsibilities by allowing logging under the pre-fire rules.




**The extent of the 2019/20 fires around Doubleduke State Forest emphasizing the massive landscape scale impact and the need to protect fire refugia within the fire's footprint.**

In early February the Forestry Corporation sought approvals from the Environment Protection Authority (EPA) to log a variety of burnt forests in the area, including compartments 1-8 in Doubleduke SF. The On 3 March 2020, the Environment Protection Authority (EPA) Chief Executive Officer, Richard Bean observed when approving the logging of burnt Koala habitat in Bungawalbin State Forest, Myrtle State Forest and compartments 1-8 of Doubleduke State Forest:

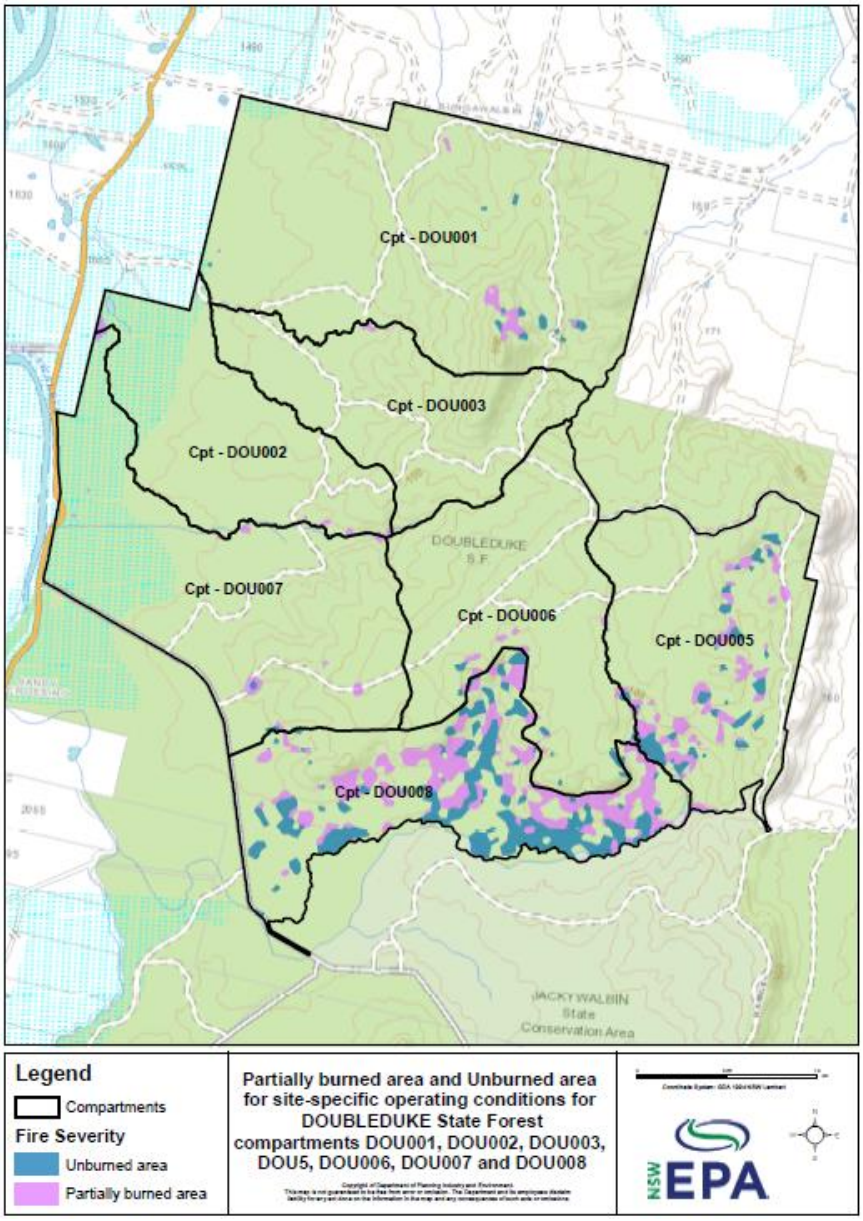
> *The Coastal IFOA permits FCNSW to carry out forestry operations subject to conditions, however it does not address the permissibility of these operations in the context of catastrophic bushfires, Specifically, it does not set environmental controls to mitigate the likely cumulative impacts on native species, critical habitat, soils and streams of logging operations in fire affected forest.*

Because of expert advice on the massive environmental impacts of the fires, the approval included Site Specific Operating Conditions, which included a variety of additional prescriptions for threatened species, such as protecting:

- all unburned and partially burned areas

- all hollow-bearing trees,
- an additional 7% of the logging area as temporary feed tree clumps for koalas, gliders and nectar feeding species,
- 50m buffers around threatened plants

As well as a variety of prescriptions aimed at minimising erosion, such as increasing buffers on headwater streams from 5 to 20m and stopping logging of slopes over 20$^{o}$.




**EPA (2020) identification of unburned and partially burned areas in compartments 1-8 of Doubleduke SF, required to have logging excluded under Site Specific Operating Conditions issued in 2020 – the requirement has since expired.**

The EPA (3 March 2020) state "*FCNSW must prioritise the establishment of tree retention clumps and wildlife habitat clumps in unburned areas or partially burned areas or in areas with unburned groundcover, over other areas*".

The EPA commissioned Dr. Andrew Smith (Smith 2020) to undertake a review of the Site Specific Operating Conditions, who found:

*3. Fauna populations in fire refuges are likely to survive and recover by expanding outwards over the next 120 years in large unlogged public forest reserves. The time required for recovery of threatened and sensitive species after average fires ranges from around 10 - 120 years. Recovery times are likely to be around 10 years for the Hastings River Mouse, up to 45 years for the Koala and 20-120 years for the Greater Glider and Yellow-bellied Glider.*

*4. Fauna populations surviving in fire refuges in state forests are at risk of elimination by timber harvesting under the normal Coastal Integrated Forestry Operations Approvals (CIFOA) which could prevent recovery, and cause catastrophic population decline in species such as the Koala, Greater Glider and Yellow-bellied Glider.*

*10. It was also concluded that special conditions in SSOCs for the burnt areas are inadequate to mitigate fire and logging impacts, primarily because their time frame (12 months) of application is too short.*

*11. ... An examination of case studies indicates that protection of unburnt and lightly burnt areas could mitigate logging impacts in burnt landscapes if it was made permanent (or longer than 20-120 years) and extended to protect a minimum 50% of the least burnt area of forest in each compartment across the entire landscape.*

Smith (2020) identified seven key conditions he considered should be applied to all timber production forests, including:

*That timber harvesting be excluded from all mapped unburnt and lightly burnt forests within state forests for a minimum period of 20 years.*

Because the Forestry Corporation considered the Site Specific Operating Conditions too restrictive they did not proceed with Doubleduke at that time. To resolve an ongoing dispute between the Forestry Corporation and EPA the Government directed the Natural Resources Commission (NRC 2021) to come up with recommendations, they identify:

*The 2019/20 wildfires were unprecedented in their scale, extent of high and extreme fire severity, and duration. They burnt 4.8 million hectares of land in NSW, including just over 64 percent (around 0.7 million hectares) of the native state forest estate. The wildfires significantly impacted forest ecosystems, including native flora and fauna, soil, and water.*

*… Forestry operations in coastal NSW usually occur under the Coastal Integrated Forestry Operations Approval (Coastal IFOA). While the Coastal IFOA reflects best practice forest management for regular conditions, it was not designed to mitigate the risks of harvesting in severely fire-affected landscapes like those from the 2019/20 wildfires. …*

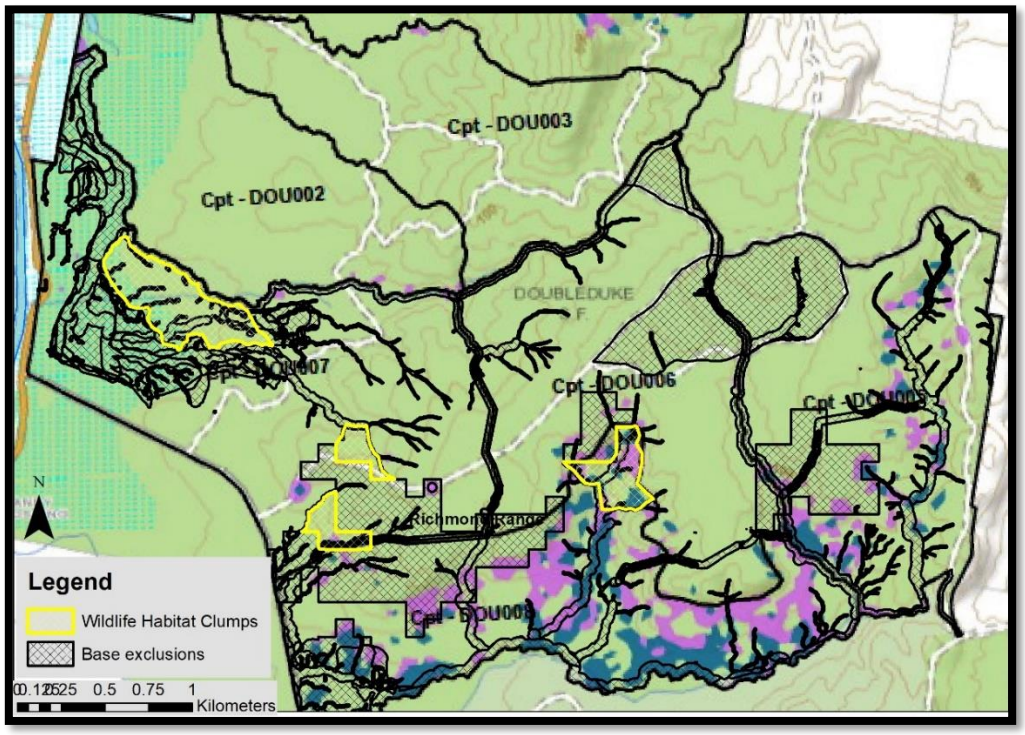
The NRC developed a risk rating for each Forestry Corporation Management Area (MA), with the Casino MA (encompassing Doubleduke SF) receiving a “medium” ranking:

*Management zones that receive medium or high risk ratings can have limited harvesting once there are sufficient additional temporary refuges (preferably unburnt and lightly burnt forest) retained at the local landscape area to mitigate the impacts of additional disturbance. … In medium risk management zones, a variable additional retention requirement is applied based on localised impacts, expected to be approximately 65 percent on average of a local landscape area.*

For Casino MA the requirements were for retention of temporary refuges of forest mapped as unburnt, low and moderate severity, where the required 8 hollow-bearing trees per hectare aren’t available retaining the largest trees to increase retention to a minimum of 8

large trees per hectare, and retention of two mature recruitment trees for each hollow-bearing tree:

> *These additional temporary refuges are located in unburnt and lightly burnt forest with the intent of maintaining an equivalent area of functional habitat in retained areas (i.e. where harvesting is not permitted) as provided by exclusions prior to the 2019/20 wildfires.*
>
> *…*
>
> *For a minimum period of 10 years, retain 2 recruitment trees per hollow-bearing tree required to be retained under standard Coastal IFOA prescriptions. If 8 hollow-bearing trees per hectare are not available retain suitable substitutes (in priority order: potential future hollow-bearing tree, largest mature tree in the stand, regrowth tree that is not suppressed).*

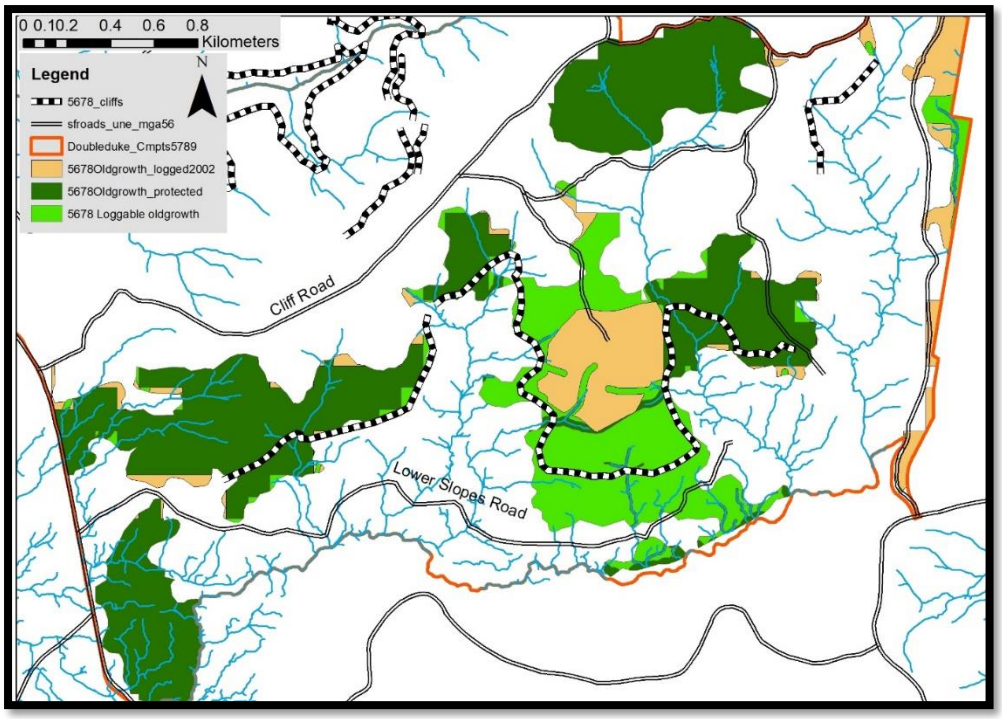



**The base Harvesting Plan exclusions (black hatching) overlaid on the EPA's mapping makes it evident that very little of the EPA's partially burnt and unburnt areas are within the existing exclusion areas, and that the Forestry Corporation have avoided them when choosing their additional Wildlife Habitat Clumps (yellow hatching).**

It is evident that very little of the EPA's partially burnt and unburnt areas are within the existing exclusion areas, and that contrary to the clearly identified need to protect the least fire affected, and most intact, forest the Forestry Corporation avoided them when choosing their additional Wildlife Habitat Clumps in 2022. In fact, of the four clumps, one is identified as being logged in 2002.

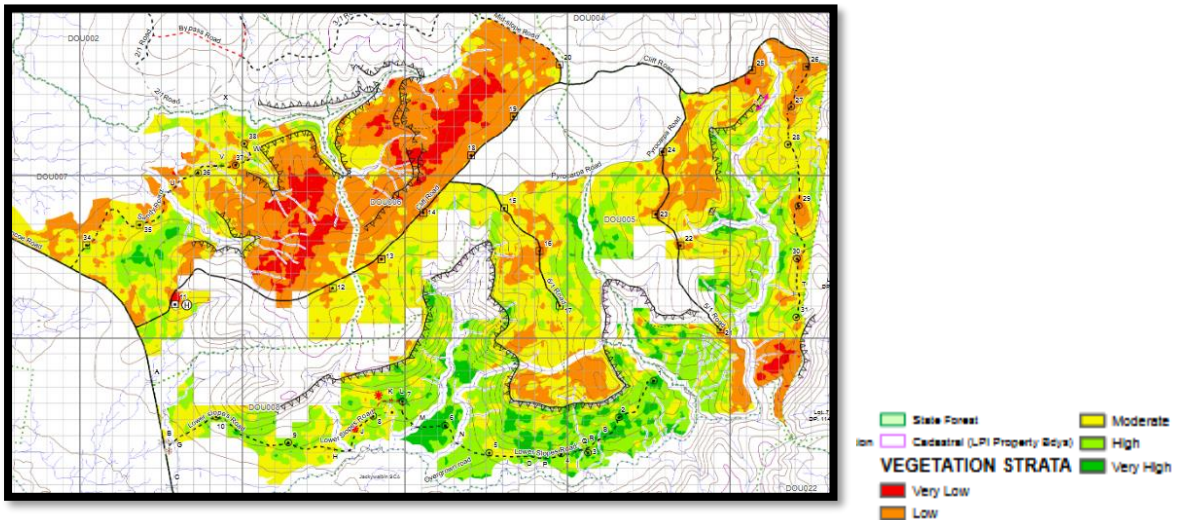
CIFOA Protocol 22: Wildlife habitat and tree retention clumps includes as criteria for the identification of Wildlife Habitat Clumps, 22.2 (1) General conditions for identifying wildlife habitat clumps and tree retention clumps:

> *(j) mature forest **patches** and long-undisturbed forest **patches** (data sources – CRAFTI, **LIDAR**, targeted surveys);*




**Mapped oldgrowth forest in compartments 5-8 of Doubleduke State Forest identified for protection (dark green), logged in 2002 (orange), and available for logging (light green). The oldgrowth identified for logging below the cliffs up Lower Slopes Road coincides with the largest area of partially burnt and unburnt forest identified by the EPA in 2020 for protection.**

Within compartment 5-8 of Doubleduke SF there are 285 ha of forest mapped as oldgrowth forest in 1997, of this 173 ha is protected as either HCV Oldgrowth or is in the Pyrocarpa Flora Reserve, 43 ha was logged in 2002, which leaves 69 ha available to be logged in this operation. The oldgrowth identified for logging below the cliffs up Lower Slopes Road is a rare example of oldgrowth blackbutt forest, and coincides with the largest area of partially burnt and unburnt forest identified by the EPA in 2020 for protection. The Lidar mapping 'Vegetation_Strata_Map_HP_DOUBLEDUKE_5_6_7_8_2019.pdf' confirms the importance of this area along Lower Slopes Road and its priority for inclusion in a protected area.




**The Forestry Corporation's Lidar mapping confirms the area along Lower Slopes Road as the highest priority for protection to meet the intent of the CIFOA.**

# 2. The increasing risks due to climate change and fires.

It has long been apparent that climate change will have a significant impact on numerous species and ecosystems, leading to its being listed as a Key Threatening Process in 2000. Unfortunately, its impacts on ecosystems and species have not been accounted for in the 2018 North East NSW Regional Forest Agreement, nor the 2018 CIFOA in the identification of mitigation measures. The record drought leading to the 2019-2020 wildfires had long been anticipated as a manifestation of the increasingly extreme events expected to occur more frequently into the future due to climate change, though nothing had been done to prepare for it and logging is allowed to continue as if it never happened.

The need for the EPA to ensure climate change was taken into account in logging prescriptions has been apparent for decades, though, for what-ever reasons this growing threat has been ignored. The case Bushfire Survivors for Climate Action Incorporated v Environment Protection Authority [2021] has clearly shown that the EPA cannot continue to ignore this growing threat and must act immediately to modify the CIFOA to account for this threat.

In a letter cosigned by 31 eminent scientists, Australian's for Animals wrote to Tony Chappel, Chief Executive Officer, NSW Environment Protection Agency, on the 2 February 2023, requesting the EPA undertake an urgent review of the CIFOA under the provisions of Condition 23.3, on the grounds that "*The CIFOA protocol and conditions have no adequate provisions to deal with climate change impacts which are projected to increase the frequency and severity of bushfire conditions*". That letter included reference to a broad range of studies which document the impacts of the 2019/20 fires.

Below are references to some relevant reports (of the multitude available), and an overview of the local impacts of the 2019/20 fires, all of which emphasize the need for immediate action by the EPA. Brief coverage is provided of the role of logging and the introduced weed Lantana in increasing the intensity and frequency of wildfires, which are direct threats to numerous species as well as the integrity of climate refugia. Profiles are provided for Southern Greater Glider, Yellow-bellied Glider and Koala highlighting the recognized threats to their survival and the identified needs, particularly in Government Conservation Advices, to protect fire and climate change refuges for them.

This section is only intended to provide a brief overview of the need for urgent action by the EPA to incorporate actions to account for climate change into their CIFOA approvals, and in particular to accommodate the need for protected refuges to safeguard the most vulnerable species from the growing frequencies and intensities of droughts, heatwaves and wildfires, such as that identified in the Lower Slopes Road valley in compartment 8 of Doubleduke State Forest.

In 2010 DECCW (2010b) published 'Priorities for Biodiversity Adaptation to Climate Change, Statement of Intent in response to the listing of Anthropogenic Climate Change as a Key Threatening Process under the NSW Threatened Species Conservation Act 1995'. The Summary of actions (2010–15) includes:

> *2.6 Identify characteristics and locations of climate refugia in NSW bioregions and prioritise these in criteria for protection*

The Statement of Intent identifies it is fundamentally important to "*integrate climate change considerations into regional biodiversity conservation and land-use planning and regulation*". It identifies the need for monitoring and a range of actions including:

> *It is important to identify and protect any known fire and climate refugia, and relict habitats, which may provide important habitat allowing species to persist in the face of climatic stress. However, the characteristics of refugia differ between regions, depending on their scale and the species that target them. For example, refuge areas might include sites that provide microhabitats that are moister and cooler than the surrounding environment (such as deep south-facing gullies in hilly terrain), drought refugia (for example areas with reliable surface or groundwater and wetlands that persist during severe droughts), and areas sheltered from fire (such as rocky or granitic outcrops) (Mackey et al. 2002; Byrne 2007; Dunlop and Brown 2008).*

For their Report to the New South Wales Natural Resources Commission on risks to the CIFOA, Bradstock *et al.* (2021) developed models of suitable habitat for select fauna species within CIFOA regions based on contemporary records of species occurrence and key climatic predictors (within which actual habitat will be constrained by other factors such as vegetation structure and composition). These models were then used to identify likely changes in the extent of potential suitable habitat under 2 climate change scenarios.

**Table 1: Changes in predicted suitable habitat of various threatened animal species recorded in Doubleduke State Forest under climate change for (left) Warmer/Wetter (MIROC32) and (right) Hotter/Little change (ECHAM5) for the near 2030 and far 2070 future (from Bradstock *et al.* 2021).**

| Common name | Scientific name | Percentage change to 2030 | Percentage change to 2070 |
|---|---|---|---|
| Spotted-tailed Quoll | *Dasyurus maculatus* | -20.9 to -33.9 | -34.7 to -61.0 |
| Yellow-bellied Glider | *Petaurus australis* | -25.2 to -51.4 | -24.0 to -78.9 |
| Squirrel Glider | *Petaurus norfolcensis* | 1.9 to 20.8 | 42.8 to 63.2 |
| Brush-tailed Phascogale | *Phascogale tapoatafa* | -3.5 to -45.7 | 40.0 to 28.5 |
| Glossy Black-Cockatoo | *Calyptorhynchus lathami* | -16.0 to -31.7 | 0.5 to -58.0 |
| Masked Owl | *Tyto novaehollandiae* | -16 to -51.5 | -13.2 to -76.1 |
| Barking Owl | *Ninox connivens* | 13.1 to 63.5 | 44.5 to 81.2 |
| Powerful Owl | *Ninox strenua* | -10.7 to -38.7 | -7.5 to -54.7 |

These results show a mixed response, with species of drier forests likely to do well and those of wetter forests very poorly. The expectation that a variety of species could lose 15-50% of their climatically suitable habitat within 7 years should be a trigger for immediate action, not another inconvenient fact. It is also a reason why urgent priority has to be given to selecting topographically protected sites that can remain cooler and wetter for the most vulnerable species.

The Natural Resources Commission (NRC 2022) summarise three years of the Forest Monitoring and Improvement Program, highlighting that forests are degrading, and without major intervention will continue to degrade, as forests and species come under increasing threat from intensifying droughts, floods, and bushfires because of climate change, stating:

> *NSW forests are dynamic systems that provide essential environmental, social, economic and cultural services for the people of NSW across a range of tenures.*

*These services are degrading, and without major intervention they will continue to degrade. The unprecedented bushfires of 2019-2020 will not remain an outlier. The research community had predicted the likelihood of such an event and the scientific consensus is that similar scale events will become increasingly frequent in the future.*

*…*

*Forest canopy recovery is already underway following the 2019-20 wildfires, particularly on the NSW north coast. However, affected areas are considered particularly vulnerable in the next 5 to 10 years, with a risk that subsequent disturbances or threats could undermine forest recovery and carbon capture in these areas. In addition to threats from fire and drought, other factors such as loss and degradation of habitats and invasive species also continue to have a negative impact on biodiversity and forest values and may affect post-fire forest recovery. It is uncertain what the cumulative impacts maybe from the shock of the fires, followed by extensive flooding and the future resumption of intensive harvesting.*

*…*

*FMIP research indicates future climate and disturbance regime scenarios will have adverse impacts on NSW forests, affecting forest carbon, soil organic carbon, soil alkalinity, streamflow quantity, surface water quality and forest productivity. Many forest dependent flora and fauna species are predicted to lose significant proportions of their habitat. As a result, one FMIP study found the potential occupancy of 70 percent of assessed fauna species will decline by 2070 under future climate change predictions.*

Climate change impact is exemplified by the record drought that culminated in the devastating 2019-2020 wildfires burning much of the region's forests.

Doubleduke State Forest is centrally situated towards the coast 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%). The impacts on wildlife would have been massive, with most arboreal mammals and trees likely lost in areas experiencing full canopy loss, and significantly reduced in areas experiencing partial canopy loss.

The fires had a significant impact on Far North Coast State forests by killing an estimated average of 12.5% of trees >30 cm DBH and 34% of trees <30cm DBH (Forestry Corporation 2020). For the Casino MA, in the approx. 37% of forests subject to a hot burn these losses were likely comprised of 50% of trees <30 cm DBH and 10% of trees >30 cm DBH. In the approx. 14% of forests subject to a crown fire the likely losses were some 100% of trees <30 cm DBH and 50% >30 cm DBH. These represent serious and long-term impacts for species reliant upon older trees.

In this vicinity, 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.

Wildlife were significantly affected. As identified below, in the intensively burnt forests most Southern Greater Gliders, Yellow-bellied Gliders and Koalas are likely to have been killed in the intensively burnt forests, with populations reduced in the forests where the canopy was partially affected. This is a significant proportion of the populations of these species in the Casino MA.

The EPA commissioned Dr. Andrew Smith (Smith 2020) to undertake a review of prescriptions in light of the fires, who found that the standard logging conditions fail to guarantee ecologically sustainable forest management and are likely to cause an ongoing decline and significant impact on biodiversity, primarily due to the increased logging intensity they allow and inadequate exclusions. Smith (2020) states:

> *It can be concluded that the standard CIFOA will not deliver ecologically sustainable management as required under the objectives of the Forestry Act 2012 and is likely to cause a significant impact under the NSW Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

Smith (2020) commented:

> *The scale of FCNSW operations in State Forests and extent and severity of the 2019/20 wildfires have the potential to cause a combined adverse impact on biodiversity of considerable magnitude. A potential impact of this size merits an environmental impact assessment of the highest scope, rigour and calibre. … Failure to monitor harvesting impacts over the past 20 years, in conjunction with the severity of the 2019/20 fires, has necessitated the adoption of new and expanded precautionary standards for mitigating logging impacts in fire affected landscapes.*

## 2.1. Logging increases burning risk

Logging of compartment 8 will increase the risk of its burning, and the likely intensity of burning, and thereby its ability to function as a refugia in future fires. Logging increases fire risk by drying the forest, changing its structure and fuel arrays, and promoting lantana.

Logging makes forests more vulnerable to wildfires and increases their flammability by drying them, increasing fuel loads, promoting more flammable species, and changing forest structure. This includes increasing the risks of canopy fires by reducing canopy height, increasing tree density and increasing fuel connectivity from the ground into the canopy (Gill and Zylstra 2005, Lindenmayer *et. al.* 2009, Cohn *et. al.* 2011, Price and Bradstock 2012, Taylor *et. al.* 2014, Zylstra 2018, Cawson *et. al* 2018, Lindenmayer *et. al.* 2023).

Compartment 8 already has suffered significant invasion by Lantana *Lantana camara* as a result of past logging. Lantana is regarded as one of the worst invasive weeds in Australia, it is recognised as a *Weed of National Significance,* declared a Noxious Weed under the *NSW Noxious Weeds Act 1993* and its establishment and spread identified as a Key Threatening Process. It is recognised as a disturbance adapted species, invading logged forests and increasing with repeated logging. It has the potential to block succession, displace native species and reduce biodiversity. (Gentle and Duggin 1997, Day *et. al.* 2003, Wardell-Johnson et. al. 2006, NSW Scientific Committee 2006, Silver and Carnegie 2017, DCCEEW 2022c).

The NSW Scientific Committee (2006) identifies that Lantana can have a range of impacts on natural ecosystems, it "*may change soil microhabitat through shading, self-mulching, and altered water and nutrient balances*", "*may adversely affect the richness of some soil faunal assemblages*", "*inhibit growth of at least some microorganisms*", can "*arrest vegetation succession for decades*", prevent the establishment of "*eucalypt seedlings*", is "*thought to be allelopathic, i.e. able to inhibit or suppress by chemical means the germination and/or growth of at least some competing plant species*", can cause "*a large (at least 70%) decline in inferred recruitment (number of native tree and shrub saplings present)*", and "*adversely affects the ability of Koalas to move between trees*".

Lantana can also increase fire intensity and risk (Day *et. al.* 2003, NSW Scientific Committee 2006, Johnson 2007, DCCEEW 2022c). Day *et. al.* (2003) summarise:

> *Lantana can greatly alter fire regimes in natural systems (Humphries & Stanton 1992). Grassy woodlands rarely have sufficient fuel load to produce fires intense enough to penetrate into the surrounding rainforest, but the fuel load provided by lantana has been implicated in a destructive wildfire in northern Queensland (Fensham et al. 1994). The fire hazard provided by lantana in rainforest situations is paralleled in deciduous forests of the northern hemisphere (Anon. 1962). Lantana burns readily during hot, dry conditions, even when green (Gujral & Vasudevan 1983). Lantana occurring on rainforest margins is seen as a major threat to this community as a result of increased inroads of fire into the rainforest. ….*

The Conservation Advice for the EEC Grey box-grey gum wet forest (DCCEEW 2022c) identifies:

> *In addition, lantana infestations have been known to facilitate fire incursions in dry rainforest (Fensham et al. 1994) -The mechanism by which lantana facilitates such incursions is by introducing more fuel and a more continuous fuel load (Berry et al. 2011). The prevalence of lantana in the ecological community therefore increases the risk of fire to the understorey of the ecological community over significant areas, heightening the risk of loss of the fire sensitive dry rainforest elements of the understorey and therefore the community itself. Taken together, these studies, showing the ability of lantana to promote fire and the ability of fire to promote lantana invasion supports the Fire-Lantana Cycle Hypothesis by Hiremath and Sundaram (2005). This suggests that positive lantana-fire feedback loops may be operating within the ecological community, contributing to its further degradation.*

## 2.2. Southern Greater Glider

The Southern Greater Glider *Petauroides volans* is one of three species of greater glider, and the only one that is found in north-east NSW. In 2022 it was listed as Endangered under the Biodiversity Conservation Act 2016 and Environment Protection and Biodiversity Conservation Act 1999. It was originally listed as Vulnerable under the EPBC Act in 2016.

In their Conservation Advice DCCEEW (2022) identify "*Key threats to the greater glider (southern and central) are frequent and intense bushfires, inappropriate prescribed burning, climate change, land clearing and timber harvesting*".

In relation to logging, the NSW Threatened Species Scientific Committee (2022) consider:

> *The sensitivity of Southern Greater Gliders to timber harvesting has been well documented. Although some habitat across the species' range is found in conservation reserves (Smith and Smith 2018; Wagner et al. 2020), prime habitat coincides largely with areas suitable for timber harvesting (Braithwaite 1984). There is a progressive decline in numbers of hollow bearing trees in some production forests, as harvesting rotations become shorter and dead stags collapse, and hollow bearing trees are not being replaced due to lack of recruitment (Ross 1999; Ball et al. 1999; Lindenmayer et al. 2011; Lindenmayer et al. 2012). Recovery of subpopulations following timber harvesting is slow. Populations in southeast NSW had not recovered eight years after timber harvesting in sites retaining 62%, 52% and 21% of the original tree basal area (Kavanagh and Webb 1998). In the regrowth Mountain Ash forests (Central Highlands) of Victoria, Southern Greater Gliders were*

*absent post-timber harvesting until the regenerating forests were >38 years old (Macfarlane 1988). …*

From their study of Greater Gliders in the Dorrigo region, Maclean *et. al.* (2018, Table 3) found that logging (in the absence of fire) had a significant impact on Greater Gliders in Wet Sclerophyll Forest (WSF), with densities in unlogged forests of 27.6 $km^{-1}$ decreasing to 15.4 $km^{-1}$ in lightly logged forests, and to 7.6 $km^{-1}$ in heavily logged forests. Though fires compounded these impacts, leading them to comment:

*The highest counts of P. volans occurred in unlogged, unburnt WSF (27.6 animals $km^{-1}$, Table 2), with the lowest counts occurring in forest that had been subjected to intensive selective logging and that had experienced at least one wildfire (4.6 animals $km^{-1}$, Table 2).*

*…*

*Our study shows that a single, recent (¬10 yr) wildfire has the capacity to reduce the abundance of* P.volans *populations by more than half, irrespective of the abundance of tree hollows in WSF (Tables 2 and 3).*

In relation to fire, the NSW Threatened Species Scientific Committee (2022) consider:

*… Declines can occur as a result of direct mortality due to lethal heating or suffocation from smoke, or indirect mortality due to the loss of key habitat features and resources (McLean et al. 2018). A single fire in a ten-year period is capable of reducing the abundance of Southern Greater Gliders (Southern and Central) by more than half (McLean et al. 2018). Frequent fire can decrease the availability of hollow-bearing trees in the landscape and change the floristic composition and nutritional profile of glider habitat (Lindenmayer et al. 2013; Au et al. 2019). During the 2019-20 wildfires, an estimated 40% of the Southern Greater Glider's distribution overlapped with the areas affected by the bushfires (Legge et al. 2021). A population decline analysis for the Southern Greater Glider provided an estimate of overall decline for the taxon of 24% (range 17-31%) one year after the fires (Legge et al. 2021). Fire poses an increasing risk to the species, as it is predicted that Australia will experience increases in intensity and frequency of fires into the future (BOM 2021).*

DCCEEW (2022) identify habitat critical to the survival of greater glider (southern and central), irrespective of the current abundance or density of greater gliders or the perceived quality of the site, as including:

(a) *large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees[1] and a diverse range of the species' preferred food species in a particular region; and*

(b) *short-term or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas.*

## 2.3. Yellow-bellied Glider

Yellow-bellied Glider *Petaurus australis australis* was listed as Vulnerable in 1992 under the NSW Endangered Fauna (Interim Protection) Act 1991. The Threatened Species Scientific Committee's Conservation Advice *for Petaurus australis australis* (yellow-bellied glider (south-eastern)) (DAWE 2022) found that the Yellow-bellied Gider was eligible for listing as Vulnerable under the Environment Protection and Biodiversity Conservation Act 1999 from 2 March 2022.

The Threatened Species Scientific Committee (DAWE 2022) identify the yellow-bellied glider (south-eastern) is primarily threatened by climate change, altered fire regimes, clearing, fragmentation and timber harvesting. The effects of logging on populations are dependent on the extent of loss of hollow-bearing and feed trees, the extent of retained habitat and the forest type. DAWE's (2022) conservation advice identifies Timber harvesting as a 'major threat' and includes as Conservation and management priorities:

> *Maintain current effective prescriptions in production forests where the yellow-bellied glider (south-eastern) is found to support subpopulations of the species, and, if necessary, establish new prescriptions. This includes but is not limited to: appropriate levels of timber harvesting exclusion and timber harvesting rotation cycles, maintenance of wildlife corridors between logged patches, active protection of existing sap trees and hollow-bearing trees from known threats, adequate recruitment of hollow-bearing trees, and maintained use of variable retention systems and selective harvesting systems designed to protect hollow-bearing trees.*

DAWE (2022) further commenting:

> *Whenever possible, habitat critical to the survival of the species should not be destroyed or modified. Actions that have indirect impacts on habitat critical to survival should be minimised (e.g. clearing, road construction), and actions that compromise adult and juvenile survival should also be avoided.*

From their modelling Bradstock *et al.* (2021) identify that Yellow-bellied Glider as one of those species likely to be most immediately affected by the loss of climatically suitable habitat, potentially losing 25-50% by 2030, increasing up to 79% by 2070

DAWE (2022) identify that climate change is a likely threat to Yellow-bellied Gliders, and is possibly already causing population declines:

> *Projections of higher temperatures and reduced mean rainfall for eastern Australia due to climate change are leading to increased frequency and severity of droughts and bushfires (CSIRO & Bureau of Meteorology 2015). … The yellow-bellied glider (south-eastern) may be vulnerable to the combination of these threats, as drought conditions can act in tandem with bushfires to reduce the abundance of small and medium-sized marsupials (Hale et al. 2016; Crowther et al. 2018).*
>
> *Gradual declines in subpopulations of the subspecies in north-eastern NSW may have occurred due to climate change, though this requires further investigation (Kavanagh et al. 2021). During surveys in north-eastern NSW, only 25 percent of previously utilized sites were occupied and there was no evidence of recent sap tree usage (R Kavanagh 2021. pers comm 10 August).*
>
> *Rising temperatures will result in elevated water requirements for arboreal marsupials and in some cases water stress, forcing range contraction into climate refugia (Kearney et al. 2010; Krockenberger et al. 2012). Indeed, climate change is likely to influence the distribution of the yellow-bellied glider (south-eastern) through a shift of bioclimates that support the subspecies' habitat (Handayani et al. 2019). A study modelling yellow-bellied glider (south-eastern) habitat loss due to climate change in south-east Qld found that there will likely be substantial decreases in core and marginal habitat for the subspecies, even under low warming scenarios. …*

DAWE (2022) identify habitat critical to the survival of the yellow-bellied glider (south-eastern) as including one or more of a variety of features, including:

- *areas identified as refuges under future climate change scenarios;*
- *short or long-term post-fire refuges (i.e., unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas;*

## 2.4. 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.

In forest environments the primary threats to Koalas are logging and wildfires. They can be significantly affected by droughts, retreating to wetter areas with high leaf moisture, and in extremes needing access to water to drink. Climate change is a growing threat by reducing climatically suitable areas, and increasing the amplitude and frequency of droughts, heatwaves and wildfires.

From their studies in Royal Camp and Carwong State Forests, along with 2 other State Forests, the EPA (2016) found Koalas had a clear preference for areas with >50% mature and over mature trees in the vicinity, noting "*Seventy-four per cent (74%) of all activity resides in the high class of structural maturity*", concluding:

> *While resident populations of koala were found in all pilot areas, habitat utilisation was variable across the landscape. Areas of higher activity positively correlated with greater abundance and diversity of local koala feed trees, trees and forest structure of a more mature size class, and areas of least disturbance*

Wildfires can have a significant impact on Koalas, as observed by DECC (2008):

> *High-intensity wildfires pose a threat to koalas, particularly where refuge habitat is not available. High-intensity fires burn the canopy and can cause the death or injury of koalas and a reduction in the availability of foraging habitat (Lunney et al. 2004). In addition, fast-moving fires fanned by strong winds reduce the ability of koalas to escape to refuge areas. Refuge habitat potentially enables koalas to escape fires and also provides alternative habitat until the burnt areas have regenerated.*

The frequency and intensity of wildfires is expected to increase into the future as climate change progresses, as exemplified by the record drought in 2019 leading to the extensive and intense 2019/20 wildfires. The NSW Threatened Species Scientific Committee (2022) considered:

> *Koalas have displayed nuanced responses to fire with reductions in numbers following high-severity fire but little change in occupancy or density following low-severity fire (NSW Government 2021a). Koala monitoring records from north-east New South Wales following the 2019/20 bushfires, indicate that sites characterised by high-severity fire (e.g. with canopy scorch) had zero koala occupancy (i.e. zero return/recovery) immediately post fire. At sites where koalas have been detected following fire, refuge areas were present in the surrounding landscape, or fire severity was lower (NSW Government 2021b).*

Koalas are primarily reliant on moisture they obtain from leaves, which means that they often retreat to areas with higher soil moisture during dry periods and droughts, and in extreme

conditions require access to water to drink (see the discussion in Seabrook *et. al.* (2011) for a summary of various studies that have found this). This makes them particularly vulnerable to climate change and the increasing frequency and severity of droughts and fires. In drought conditions, leaf moisture (and in extreme conditions free water) can become an over-riding determinant of tree usage (Ellis *et. al.* 1995, Seabrook *et. al.* 2011, Wu *et. al.* 2012, Davies *et. al.* 2014), with Koalas contracting to wetter refugia, particularly riparian habitats.

Seabrook *et. al.* (2011) compared the distribution of Koalas in south east Queensland over the period 1995–1997 until 2009 after 8 years of drought, finding an 80% decline in koala numbers which was partly due to land clearing, but significantly to Koalas becoming increasing restricted to moister riparian habitats:

> *Changes in the area of occupancy and numbers of koalas allowed us to conclude that drought significantly reduced koala populations and that they contracted to critical riparian habitats. Land clearing in the eastern part of the region may reduce the ability of koalas to move between habitats.*

Rennison and Fisher (2018) considered riparian refugia a key factor in identifying Koala habitat, with "*access to permanent water in times of drought and heat stress considered important landscape features for koala populations during these high stress events*". Rennison and Fisher (2018) identify:

> *Where droughts are severe there is well documented evidence of the devastating effects on koala populations with Gordon et al. (1990) reporting a 63% reduction in the population numbers during a drought in southern Queensland in the early 1980's. In this case the only animals that survived the severe conditions were those in habitat close to permanent water holes. The defoliation of drought stressed trees resulted in the malnutrition and dehydration of koalas away from the better-quality habitat. In years to follow with good seasons the population did recover and recolonise the area.*

In the Conservation Advice DAWE (2022b) note the importance of habitat, corridors and climatic refugia for Koalas:

> *A population of koalas requires a sufficient total amount of resources within their habitat of adequate quality to support a viable biological population where mortality, survival, and recruitment are balanced or recruitment increasing to optimal carrying capacity and within the bounds of natural fluctuations. Crucial habitat elements include patches and corridors for gene flow. Over longer-time frames habitat critical includes climate refugia such as drainage lines, riparian zones and patches that are resilient to drying conditions due to favourable hydrological systems.*

# 3. Fulfilling the EPA's legal obligations.

The EPA has an obligation to "*protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development*", which extends to ensuring environment protection from climate change. Its first obligation is to "*to ensure environment protection*" by the implementation of the requirements of ESFM. The EPA cannot delegate this responsibility to the Forestry Corporation.

In 2020 the EPA received advice of the significant impacts of the 2019/20 wildfires, and applied that advice in issuing Site Specific Operating Conditions specific to Doubleduke

State Forest. The EPA then commissioned expert advice that identified that to be effective for threatened fauna those conditions, in particular the protection for unburnt and lightly burnt forests, need to be applied for at least 20 years. Since then there have been numerous studies confirming the impacts of the fires of numerous species, including Koala, Southern Greater Glider and Yellow-bellied Glider.

It is not just the increasing frequency of wildfires that are of concern. There is also a growing body of evidence that climate change is already having a significant impact on a variety of threatened species, with Bradstock *et al.*'s (2021) 'Report to the New South Wales Natural Resources Commission on risks to the CIFOA' identifying significant reductions in the climatic envelopes for numerous species by 2030. Other studies identify range contractions for a variety of species are underway. A precautionary approach demands immediate action.

Climate change was not taken into account in the development of the North East NSW Regional Forest Agreement or the Coastal Integrated Forestry Operations Approval. Since then there were the 2019/20 wildfires which the EPA has repeatedly acknowledged rendered the CIFOA inadequate, numerous studies that have verified significant impacts, and more evidence of the growing impacts of climate change, yet the EPA are allowing the Forestry Corporation to operate under the 2018 CIFOA as if nothing has changed, including no changes to the climate since the 1999 IFOA.

In Bushfire Survivors for Climate Action Incorporated v Environment Protection Authority [2021] NSWLEC 92 CJ Preston gave lengthy consideration to the EPA's responsibilities under the *Protection of the Environment Administration Act 1991* (NSW), commenting:

> *24 Section 9(1) requires the EPA to perform two tasks in relation to the quality of the environment: first, to develop certain instruments to ensure environment protection and, secondly, to monitor the state of the environment for the purpose of assessing trends and the achievement of the instruments it has developed. Section 9(1) provides:*
>
> > *"The Authority is required to—*
> > *(a) develop environmental quality objectives, guidelines and policies to ensure environment protection, and*
> > *(b) monitor the state of the environment for the purpose of assessing trends and the achievement of environmental quality objectives, guidelines, policies and standards."*
>
> *27 … The EPA cannot delegate the duty to develop objectives, guidelines and policies to any other person or body. This means that objectives, guidelines or policies developed by a person or body other than the EPA cannot be objectives, guidelines or policies for the purposes of s 9(1)(a) of the POEA Act.*
>
> *29 … one of the objectives of the EPA is to reduce the risks to human health and prevent the degradation of the environment by means such as "adopting minimum environmental standards prescribed by complementary Commonwealth and State legislation and advising the Government to prescribe more stringent standards where appropriate" (s 6(1)(b) of the POEA Act. Standards can be adopted by this process.*
>
> *38 The duty under s 9(1)(a) … "to ensure environment protection", is normative, that is to say, it establishes an evaluative standard or norm for the objectives, guidelines and policies. There are two components: the action "to ensure" and the object of the action "environment protection".*

*42 There are three points to note about this first objective of the EPA in s 6(1), as expanded by s 6(2). The first is that the verbs "protect, restore and enhance" each require the EPA to take positive action. The second is that the object of such action is "the quality of the environment in New South Wales". This is what needs to be protected, restored and enhanced.*

*43 The third is that the taking of such action for this purpose is to be done having regard to "the need to maintain ecologically sustainable development". In order to "maintain" ecologically sustainable development, it must first be achieved. Section 6(2) explains that ecologically sustainable development can be achieved through the implementation of the principles and programs set out in s 6(2), being the precautionary principle, intergenerational equity, conservation of biological diversity and ecological integrity, and improved valuation, pricing and incentive mechanisms, including the polluter pays principle.*

*44 The first objective of the EPA, therefore, is for the EPA to take action to protect, restore and enhance the quality of the environment in New South Wales in ways that are consistent with achieving and maintaining ecologically sustainable development.*

*69 On the evidence, at the current time and in the place of New South Wales, the threat to the environment of climate change is of sufficiently great magnitude and sufficiently great impact as to be one against which the environment needs to be protected. Indeed, this has been recognised by the EPA. One of the instruments on which the EPA relied was its Regulatory Strategy 2021-24, which identified climate change as one of the challenges facing the environment in New South Wales and the EPA. In these circumstances, the duty in s 9(1)(a) to develop environmental quality objectives, guidelines and policies to ensure environment protection requires the development of such instruments to ensure environment protection from climate change.*

The Coastal Integrated Forestry Operations Approval and Regional Forest Agreement imposes requirements for the Forestry Corporation to apply ESFM, and for the EPA to ensure they do. The Coastal Integrated Forestry Operations Approval– Conditions (CIFOA), Division 3 – Objectives of the approval, includes:

*14. **General objectives of the approval***

*14.1 The overall objective of the **approval** is to authorise the carrying out of **forestry operations** set out in condition 13 above:*
*(a) in accordance with the **principles of ecologically sustainable forest management**;*
*(b) in a manner which integrates the regulatory regimes for:*
*(i) environmental planning and assessment;*
*(ii) the protection of the environment; and*
*(iii) **threatened species** conservation and **biodiversity**;*

The definition of ESFM given is:

*As described in part 5B of the Forestry Act 2012 (and the **NSW Regional Forest Agreements** for Eden, Southern and North East).*

Attachment 14 to the North East NSW Regional Forest Agreement identifies the principles of ESFM, which the EPA are required to implement, including in accordance with their obligations under the *Protection of the Environment Administration Act 1991,* which include in part:

- *Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate*
- *Ensure that ESFM at the regional and smaller scales is implemented by ecologically appropriate planning and operational practices*
- *Address the requirements of vulnerable species.*
- *Assist with the recovery of threatened species, and maintain the full range of ecological communities at viable levels.*
- *Protect landscape values through the careful planning of operations and the reservation of appropriate patches and corridors of vegetation.*
- *Reduce or avoid threats to forest ecosystems from introduced diseases, exotic plants and animals, unnatural regimes of fire*
- *Apply precautionary principles for prevention of environmental degradation*
- *Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*
- *Utilise the concept of adaptive management and continual improvement based on best science and expert advice and targeted research on critical gaps in knowledge, monitoring or evaluation.*

In his assessment of the impacts of the 2019/20 fires for the EPA, Dr Andrew Smith (2020) considers:

> *The purpose of the standard CIFOA is to ensure that timber harvesting in NSW is ecologically sustainable. Essentially this means that timber harvesting should not cause serious or irreversible declines in biodiversity or distribution and abundance of threatened species. In general, under the precautionary principle, timber harvesting can be considered ecologically sustainable if it mimics and does not exceed, or compound, the impacts of natural disturbances such as wildfire …*
> *…*
> *Ecologically sustainable forest management requires that species are retained throughout their natural range, and not just in public national parks and nature reserves, in order to maintain genetic diversity and the capacity for continued evolution. Current evidence indicates that fire and logging is causing progressive declines in the population size and abundance of sensitive and threatened species like the Greater Glider and Yellow-bellied Glider leaving local populations in state forest isolated and vulnerable to genetic drift and extinction (Lumsden et al 2013, Lindenmayer and Sato 2018)*

## 3.1. First the EPA needs to stop logging and require a thorough survey.

The first step the EPA needs to take is to halt logging in compartment 8 and reinstate protection for the unburnt and lightly burnt forests. If the EPA has any intent to comply with the requirements of the *precautionary principle* to prevent serious or irreversible damage to the environment, then they need to require there is a thorough fauna survey to fully identify the home ranges and key tree resources of Southern Greater Glider, Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale and Koala, and other vulnerable species, in order to fully delineate the extent of this fire and climate refugia.

In his review of the CIFOA for the EPA in light of the impacts the 2019/20 wildfires, Smith (2020) emphasised:

*There appears to have been no systematic collection or analysis of pre and post-logging survey and monitoring data by FCNSW to determine the effectiveness of the standard CIFOA for protection of threatened species and the requirement to collect such data is a glaring omission from recently revised and updated (2018) CIFOA. Pre-logging surveys are essential and unavoidable for detection of rare and poorly known species and those that require special protection where they occur. Failure to undertake comprehensive fauna surveys before harvesting creates a risk that some rare and poorly known species will be missed and their habitat destroyed. Under the Precautionary Principle it could be considered essential to undertake comprehensive fauna surveys in all logged compartments at least once prior to harvesting.*

Smith (2020) identified seven key conditions be applied to all timber production forests, including:

*That all compartments are subject to comprehensive pre-logging surveys at least once every logging rotation to gather all essential information for application of mitigation conditions and that post logging surveys are undertaken at repeat intervals of 1 to 10 years after harvesting at a minimum representative selection of sites sufficient for statistical analysis and feedback for adaptive management at compartment and landscape scales.*

In Environment East Gippsland Inc v VicForests (No 4) [2022] VSC 668, J. Richards emphasised that adequate surveys are required to identify where Southern Greater Glider (SGG), Common Brushtail Possum (CBP) and Yellow-bellied Glider (YBG) occur before logging '*If a goal is to prevent serious or irreversible damage to the environment',* noting *'a failure to know where these species occur in any proposed coupe means that it is very possible (even likely), that any retained vegetation may not be relevant to their requirements',* identifying a need for detailed surveys:

*146. Note that the necessity for accurate knowledge of the whereabouts of SGGs (as well as YBGs and CBPs) becomes most urgent under circumstances that are likely to impact adversely on populations of these species. This includes proposals to intensively log areas that include these species and associated suitable habitat. Thus, a failure to know where these species occur in any proposed coupe means that it is very possible (even likely), that any retained vegetation may not be relevant to their requirements. In other words, where there are attempts to manage logging operations within the context of SGGs or YBGs, there is some risk that unsuitable habitat or habitat without SGGs or YBGs may be retained, while habitat containing them or suitable for them will not, despite the best intentions to cater for their requirements. If this occurs, retention of vegetation within a coupe may not provide any protection for these species in the particular intensively managed area.*

*…*

*295. In order to apply the precautionary principle to the conservation of greater gliders and yellow-bellied gliders, VicForests must survey the whole of any coupe proposed for harvest which may contain glider habitat. It must do so using a survey method that is likely to detect any gliders that may be present in the coupe, so as to locate the gliders' home ranges wherever practicable. This is necessary in order that their home ranges can be excluded from timber harvesting operations, as the precautionary principle requires.*

Justice Richards Orders of 11 November 2022 give effect to the Court's judgment in *Environment East Gippsland Inc v VicForests (No 4)* [2022] VSC 668, stating:

> *THE COURT ORDERS THAT:*
>
> *1. VicForests must not, whether by itself, its servants, agents, contractors or otherwise, conduct timber harvesting operations in any coupe in the East Gippsland FMA unless the coupe has been surveyed using a reasonably practicable survey method that is likely to:*
>
> > *(a) detect any greater gliders that may be present in the coupe and, so far as is reasonably practicable, locate their home ranges; and*
> >
> > *(b) detect any yellow-bellied gliders that may be present in the coupe and identify their feed trees and hollow-bearing trees in the coupe.*
>
> *This Order does not apply to a coupe that has been clear-felled since 1939.*

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