

## Warm Temperate Rainforests of Yurammie State Forest Special Prescription Zone FMZ 3B Compartments 963-967

### Summary

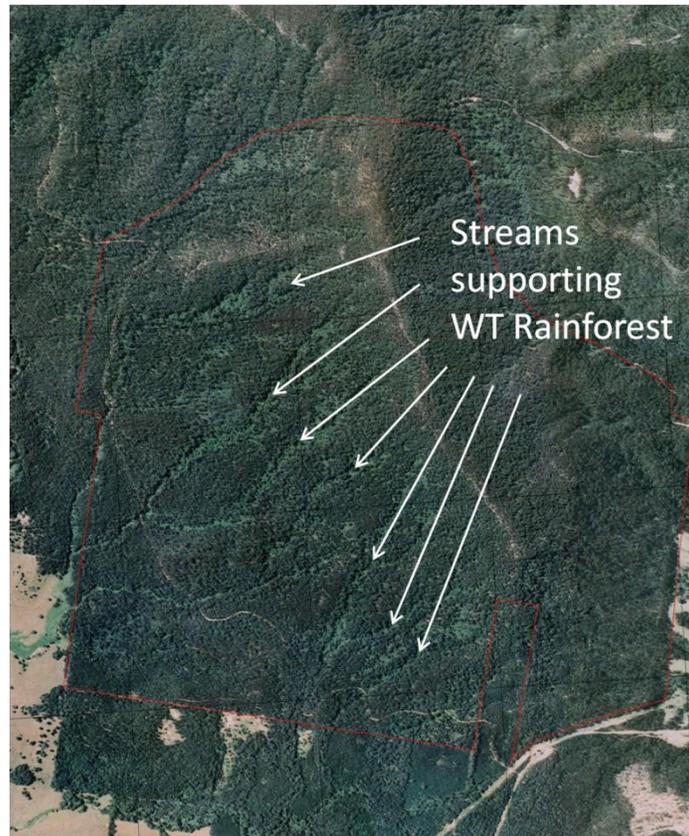
1. The west to south-west facing slopes of YSPZ are dissected by a high density of gullies with warm temperate rainforest, each separated by only 50m to 250m. The frequency and development (age and size) of rainforest within YSPZ is highly unique at a landscape scale. A similar density of rainforest on equivalent aspect and topography cannot be observed elsewhere in the Eden RFA region.
2. They support the southern-most occurrences of the rainforest tree *Doryphora sassafras*.
3. The very large size (0.6 to 0.7m dbh) of single stemmed *Acmena smithii* and the close spacing of rainforest streams provide very strong evidence that these forests act as a major landscape-scale refuge from fire.
4. Inappropriate fire regimes are the single most significant threat to rainforest persistence.
5. Proposed harvesting operations pose a very significant threat to these rainforests due to inevitable increases in forest fire risk which is magnified owing to future climate change (drier & hotter).
6. Post-timber harvest re-growth forest has greater rates of evapotranspiration compared to older forest stands, particularly in summer. High rates of evapotranspiration lead to more rapid sub-surface soil moisture drying and reductions in fuel moisture content, both highly correlated with fire proneness.
7. Landscape scale management will be required to protect these rainforests from severe and/or frequent fires. Proposed timber harvesting operations pose an unacceptable threat to managing the landscape in a way which is sympathetic to the persistence of these rainforests.
8. The YSPZ is likely to play a significant role in landscape-scale persistence of fauna that utilize rainforest in the Eden RFA region. Owing to the high density of closed warm temperate rainforest, productivity of the soils and diverse mosaic of vegetation types the importance of this area is potentially greater than predicted based on area alone and in addition is likely to an important fire refugia.
9. The Assessment of Forest Management Practices for the Eden RFA (1997) states that “extensive mid- to high-elevation wet sclerophyll forests and moist gullies and rainforest in low elevation forests are likely to provide the most important fire refuges” and that existing buffer zones (20-40m) are “less than adequate to protect fauna which depend on rainforest margins as a refuge after wildfire. Wildfire is an important hazard in the Eden region and the distribution of rainforest is likely to be a good indication of the distribution and location of important wildfire refuge areas. For this reason it is recommended that the undisturbed buffer zone around rainforests in the Eden region be expanded to a minimum 100 m, particularly where rainforest patches are small (<10 ha)”.
10. Ecologically sustainable forest management aims to maintain species, communities, ecosystems and ecosystem processes at local and regional landscape-scales. Based on available scientific evidence, proposed logging operations pose an unacceptable risk to these regionally important stands of rainforest within YSPZ. These logging operations cannot be viewed as ecologically sustainable.

## **WARM TEMPERATE RAINFORESTS OF YURAMMIE STATE FOREST SPECIAL PRESCRIPTION ZONE FMZ 3B COMPARTMENTS 963-967**

**This submission provides evidence that proposed timber harvesting activities in Yurammie State Forest Special Prescription Zone FMZ 3B (YSPZ) are likely to have landscape scale negative environmental impacts. Timber harvesting poses a significant risk to the long-term persistence of regionally significant rainforest that occur in the network of headwater streams within YSPZ. These rainforests have been, and continue to be, important fire refugia, a role that is likely to become increasingly important in a hotter, dryer climate. Owing to the potential risks to the persistence of these rainforests it must be concluded that proposed timber harvesting operations are not ecologically sustainable in either a local or regional context.**

The west through to south-west facing slopes of YSPZ are dissected by a high density of mapped and unmapped headwater streams with warm temperate rainforest, each separated by only 50m to 250m of sclerophyll forest (Fig. 1). The southern warm temperate rainforest that occurs in most of these headwater streams is dominated by *Acmena smithii*. Another co-occurring rainforest tree, *Doryphora sassafras*, is at its southern most limit within the YSPZ.

The very high density and frequency of rainforest patches within YSPZ is unique for several reasons. Firstly, within the Eden RFA much of the warm temperate rainforest occurs in moderate to very steep terrain, in contrast to the relatively gentle terrain of the western slopes of YSPZ below 400m elevation. Secondly, most rainforests in the Eden RFA region occur as small isolated pockets in east, south-east and south facing, steep, narrow drainage lines. At a landscape scale, rainforest in western or south-western drainage lines rarely occur as mapable units. There are a few other relatively large patches of rainforest along south-western drainage lines (e.g. a tributary of Stony Creek south of Jingera Rock and below Ben Boyd Road) but these are in very steep dissected terrain and are isolated occurrences, unlike the rainforest within YSPZ. Finally, the density and development of these rainforests suggest that they have escaped severe forest fires.



**Fig. 1.** The network of streams supporting warm temperate rainforest that dissect the west to south-west facing slopes of Yurammie State Forest.

### **Factors Influencing Rainforest Distribution and Persistence**

The distribution of warm temperate rainforest in the Eden region and elsewhere in south-eastern Australia is partly a result of high soil moisture, relatively fertile soils and protection from high levels of solar radiation (Keith and Saunders, 1990), hence their greater frequency in east through to south facing drainage lines. *Acmena smithii* seedlings are able to establish under heavy shade (Melick, 1990) but both seed and seedlings are not tolerant of dry conditions (Ashton and Frankenberg, 1976). However, these rainforests do not occur in all apparently suitable drainage lines and in a very few instances, such as within Yurammie State Forest, they also occur in more exposed westerly facing drainage systems. These patterns suggest that other factors, such as the presence of glacial refugia and post-glacial fire regimes, have a major role in current distribution patterns (Ashton and Frankenberg, 1976; Floyd, 1990). Certainly fire, or the lack thereof, is generally regarded as the major factor influencing rainforest distributions in south-eastern Australia (Webb, 1968; Keith and Bedward 1999). Indeed, it has been estimated that development of rainforest may require a fire-free period of 350-400 years (Attiwil, 1994). In south-eastern Australia evaporation rates exceed rainfall throughout summer and as a result the flammable sclerophyll forests are often prone to fires (Gill and Catling, 2002). So, while rainforests are not highly flammable, as they occur within a highly flammable matrix of sclerophyll forest they depend on landscape features (steep moist gullies) to offer some protection from frequent intense fire events (Keith 2004).

Infrequent, low intensity ground fires may not affect the persistence of warm temperate rainforest and are likely to have been a natural feature in most temperate rainforests (Cameron, 1992). Indeed, adult trees of *A. smithii* and *D. sassafras* can survive and re-sprout (coppice) following irregular fires (Ashton and Frankenberg, 1976; Fox, 1978; Campbell and Clarke, 2006). However, they do not re-establish from seed post-fire (Campbell and Clarke, 2006) and their relative re-sprouting ability is typically not as great as most eucalypt species (Johnston and Lacey 1983).

While many warm temperate rainforest trees can re-sprout post-fire, fires and other disturbances that increase light penetration (eg. timber harvesting adjacent to rainforest) favour the establishment of fast growing vines, shrubs and herbs and can enable invasion by sclerophyll species (eg. eucalypts) (Webb, 1968; Keith, 2004). As a result it has been argued that these changes may increase the vulnerability of rainforest to subsequent fires (Barker, 1990). In addition, frequent fire can eventually kill adult rainforest trees and leads to loss of ecotonal rainforest species such as *P. undulatum* (Melick and Ashton, 1991). It has been estimated that following hot fires that result in invasion by sclerophyll species, it can take up to 300 years for warm temperate rainforest to recover (Chambers, 1977; McMahon, 1987). If fire frequencies are greater than 1 in 100 years sclerophyll forest will replace rainforest (Attiwill, 1994). Because adult *A. smithii* trees may survive fires, the loss of rainforest patches may not be detected in the short-term (Chesterfield *et al.* 1990), although over the long-term sclerophyll species may eventually dominate. This is because the decline of rainforest patches can result from invasion by sclerophyll species and a subsequent increase in fire proneness, rather than the direct impacts of the initial fire event itself.

It is therefore clear that the relative distribution of warm temperate rainforest and sclerophyll forests in the Eden RFA region is largely dependent on the frequency and intensity of forest fires. Frequent fires that enter rainforests or the ecotones between rainforest and sclerophyll forests, will most certainly lead to declines or even loss of rainforest. Severe summer running crown forest fires will do likewise.

The abundance of warm temperate rainforest on the western to south-western slopes of YSPZ suggest a landscape that has largely escaped severe forest fire, despite being in a relatively fire prone situation. The large size (upwards of 600mm to 700mm diameter at breast height) and lack of coppicing of many *A. smithii* trees provide very strong evidence to support this hypothesis (Fig. 2). The exact reasons for such a high density of rainforest and absence of frequent severe fires in this location can only be speculated on, but suffice to say it is highly unusual within the Eden RFA region landscape. Furthermore, predictions suggest a warmer and drier future climate with far greater risks of fire (eg. Pitman *et al.* 2005). These rainforests will be increasingly vulnerable unless active management at a landscape scale is undertaken.

The ecological role of rainforests in south-eastern Australia is often underestimated owing to their sparseness and relatively low floristic diversity. However, it is increasingly clear that these rainforests provide important foraging, roosting and breeding habitat and are fire refugia for many fauna species, including the threatened Golden Tipped Bat and Powerful Owl. The density of the rainforests, narrow spacing of the drainage lines and presence of a diverse mosaic of vegetation structures (hence ecotones) indicates that the majority of YSPZ is highly

favourable habitat for the former species (Schultz and Eyre, 2000). Indeed, an individual of this species was detected after only a single survey with one harp trap in only **one** of the many rainforest patches (P. Kambouris, pers. comm).



**Fig. 2.** Warm temperate rainforest within Yurammie State Forest. These *Acmena smithii* have a diameter at breast height in excess of 600mm and have fire scars indicative only of ground fires (no crown damage). These trees are located within an exclusion zone for the nationally threatened Giant Burrowing Frog (*Heleioporus australiacus*). However, Forests NSW plan to construct a road crossing through the middle of this rainforest to enable access to a small area of mixed forest on an adjoining ridgeline.

### **The potential impact of proposed timber harvesting**

Although rainforests within the Eden RFA are protected from direct impacts of timber harvesting operations by a 20 metre buffer, indirect impacts of timber harvesting pose a potential threat to this vegetation community. There is growing national and international data suggesting that timber harvesting operations increase forest fire risk (Lindenmayer, et al 2009). It has also been argued that older mixed aged forests provide rainforests with better protection from fire (Cameron, 1992).

The dense regeneration of eucalypt saplings that follows timber harvesting operations is a key factor in increasing the fire susceptibility of re-growth forests. After 3-5 years the re-growing forest has a much greater total leaf area, stand density and sapwood area compared to pre-harvest (Roberts *et al*, 2001; Vertessy *et al*, 2001). This leads to much higher evapotranspiration rates and more rapid depletion of subsurface soil water by the re-growing forest relative to an older forest stand (eg. Roberts *et al*, 2001) and this greater water use may persist for 45 to 100 years. As a result, soil moisture deficits are greater throughout the year, but especially in summer when evapotranspiration rates are highest. This in turn inevitably

leads to declines in fuel moisture content - both soil moisture deficit and fuel moisture content are highly correlated with fire ignition probability and intensity of forest fire (Lucas et al 2007). Therefore, dense forest re-growth following timber harvesting results in an increase in the number of days when fuel moisture contents are low enough for fire ignition.

Research data also indicates that timber harvesting leads to declines in moist forest understorey species and replacement with sclerophyll species (Mueck and Peacock, 1992, Ough, 2001; Ough and Murphy, 2004). This is especially likely where there are broad transitions between rainforest and sclerophyll forest ecotones and ecotones are not protected within rainforest buffer zones. These vegetation changes may increase a forest's susceptibility to fire and most certainly would increase the likelihood of fire incursion into rainforest owing to a decline in the width of the rainforest – sclerophyll forest ecotone.

Cameron (1992) also suggested that running crown fires in older mixed aged or old growth forests may jump moist rainforest gullies, owing to the height of such fires. He suggested that in some instances crown fires in regrowth stands with a lower canopy height may be less likely to clear rainforest gullies, subjecting rainforests to crown damage.

Current forestry prescriptions only require minimum 20 metre buffer zones around rainforests. Unless buffer size is adjusted to account for variations in vegetation development along the headwater streams many ecotonal areas will be impacted by harvesting operations (Mac Nally et al, 2008), especially on southern facing gully slopes where such ecotones may be relatively large. Furthermore, narrow 20 metre buffers are unlikely to protect rainforests from fire events, particularly if fire frequency increases owing to a predominance of re-growing forests in the surrounding landscape. It needs to be noted here that the proposed harvesting operations in western Yurammie complete the alternate coupe harvesting and as a result the landscape context will be one in which the surrounding forests are almost all less than 40 years old.

The single most significant threat to the persistence of rainforest in western Yurammie is fire. The risk of severe forest fires is predicted to increase owing to increasing temperatures, evaporation and reduced humidity associated with climate change (Pitman et al 2005; Lucas et al 2007). Superimposed upon this is an increase in fire risk that would result from post-harvest re-growth with high rates of evapotranspiration.

## **Conclusion**

The Assessment of Forest Management Practices for the Eden RFA (1997) states that “extensive mid- to high-elevation wet sclerophyll forests and moist gullies and rainforest in low elevation forests are likely to provide the most important fire refuges” and that existing buffer zones (20-40m) are “less than adequate to protect fauna which depend on rainforest margins as a refuge after wildfire. Wildfire is an important hazard in the Eden region and the distribution of rainforest is likely to be a good indication of the distribution and location of important wildfire refuge areas. For this reason it is recommended that the undisturbed buffer zone around rainforests in the Eden region be expanded to a minimum 100 m, particularly where rainforest patches are small (<10 ha)”.

Available evidence would suggest that the warm temperate rainforests in western Yurammie are regionally significant and represent an important long-term landscape-scale refuge from fire

in a relatively fire-prone part of the landscape. Any timber harvesting operations in western Yurammie State Forest will inevitably increase the risks posed to the persistence of these rainforests, through invasion by sclerophyll species into the rainforest-sclerophyll forest ecotone, but most importantly because of the significant risk such harvesting poses of increased fire likelihoods through changes in soil and fuel moisture regimes. At the very least, the recommendations of *The Assessment of Forest Management Practices for the Eden RFA* (1997), cited above, need to be applied.

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