The Effect of the Black Saturday Bushfires

- on Victoria's tallest trees

By Brett Mifsud

Introduction

The Victorian bushfires of February 7th 2009 rightly received worldwide media attention for the terrible loss of life and destruction of property that occurred on that day. What was less widely reported was that the same fires destroyed much of Victoria's remaining extensive old growth stands of very tall *Eucalyptus regnans* trees in the closed water catchments of Wallaby Creek and O'Shannassy. In one day Victoria lost the 5 trees measured in 2001 at over 90m tall and a further 35+ trees that were over 85m tall. These areas now consist of a sea of even aged 2-4m tall regrowth growing under a sparse over story of dead giant trees. While a few isolated old tall trees survived in these catchments, the majority of Victoria's promising tall regrowth stands, all aged less than 100years, survived less intense fires, or were not affected at all. The tallest of these trees is 86.4m tall with many others currently measured at over 80m. With a growth rate of 25 to 40cm per annum, it is highly likely that Victoria will have trees exceeding 90m in height within 20 to 25 years if these stands remain free from fire and logging.

Background

Victoria has had a reputation for having very tall trees since European settlers first came across mature Mountain Ash *Eucalyptus regnans* forest in the Central Highlands, Otway and Strzelecki ranges from the 1850's onwards. Amazing and likely exaggerated stories of incredibly tall trees came from these early explorations. Measurements of trees up to 140m tall were reported at the time and are still referred to in modern literature on the world's tallest trees (Carder 1995, Pakenham 2002). However, very few of these trees survived the major fires or the splitters axe to make in into the 20th century. More fires in 1908, 1919, 1922 and 1926 made further inroads into the last remaining mature ash forests. However, it was the fires of January 1939 that destroyed most of the forests that pre-dated European settlement. A few old stands of *E regnans* had avoided logging and survived all these fires and were still intact until February 2009. The largest of these stands were in the O'Shannassy, Upper Watts and Wallaby Creek water catchments which were reserved in the 1880's to 1890's as part of Melbourne's water supply catchments (Griffiths 1992).

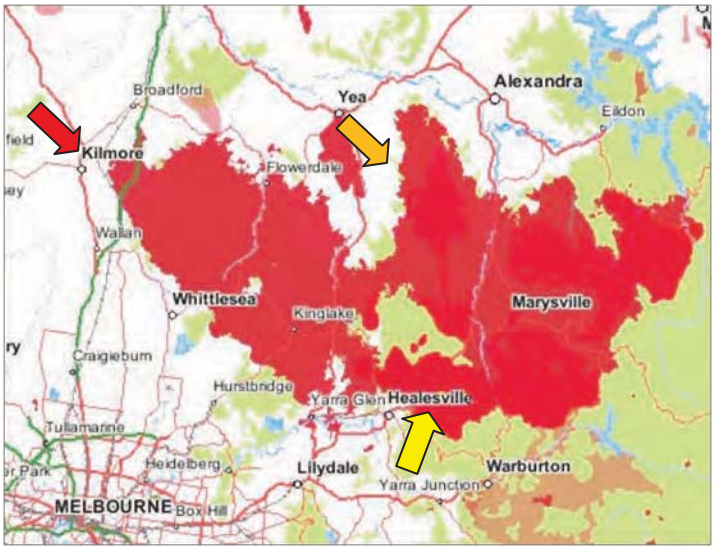

Figure 1. Location map of Murrindindi, Kilmore East and Maroondah Fires (Forest explorer online 2010)

For most of the 20th century it was assumed that the tallest trees in the State were to be found in the Cumberland Tall Trees reserve, north east of Marysville (Griffiths 1992). While early records of the stand show the tallest tree to be 92m tall, (a figure that this author regards as highly unlikely), by the 1970's, windstorms had reduced the height of the tallest tree to 84m, with a few other trees just reaching 80m. In 2001 I measured the tallest tree, labelled 'The Big Tree' at 81m. However, the assumption that Cumberland did indeed have the tallest trees was proven quite incorrect with the advent of laser rangefinders in the late 1990s. By using a rangefinder, a single surveyor could accurately measure hundreds of trees in a single day. Following the first major surveys of the old growth *E. regnans* forests in Melbourne's water catchments, it was found that many hundreds of trees in the Wallaby Creek and O'Shannassy catchments far exceeded the heights of those in the Cumberland Tall Trees Scenic Reserve (Mifsud 2003). What was perhaps more surprising was that by using the rangefinder, many much younger trees originating from fires in the early 20th century were also found to be approaching or exceeding 80m.

The Black Saturday Bushfires

Weather conditions in Victoria on February 7th 2009 combined gale force north-westerly winds, shade temperatures reaching or exceeding 46 degrees in most districts and humidity levels in single digits. A week before hand, a virtually stationary high pressure system in the Tasman Sea had baked the State with 3 consecutive days of 44 degree plus temperatures. No relieving rain followed the heatwave and these days of intense heat came on top of very low January rainfalls of between 1 to10mm in most forest areas. In short, conditions were perfect for catastrophic, fast moving and intensely hot bushfires (Victorian Bushfires Royal Commission 2010).

Kilmore East Fire

This fire started in the small locality of Kilmore East 55km north of Melbourne. While there were various instances of the fire spotting many kilometres ahead of the main front creating a complex web of fires, broadly speaking the main fire initially burnt in a south east direction for up to 3 hours before a strong south west wind change created a huge fire front which burned in a north easterly direction. The change of direction of the fire due to the south west wind change was sudden and severe and devastated communities in the Kinglake area who were given no warning of the impending fire and were taken by surprise. This south west wind change also brought the fire into the Wallaby creek catchment from the south. Aerial photos of the catchment

Figure 2. Burnt bases of fire killed 300y/o trees in the Wallaby Creek catchment a few weeks after the fires. Photo: Steve Sillett

taken on the day following the fire show that most trees had a full crown of brown leaves indicating that the fire had not 'crowned' at any stage in the area containing the 300y 'Big Ash' forest. Nevertheless the fire still had enough heat to kill over 99% of the *E. regnans* forest. Before being killed in the Black Saturday fires of February 2009 the tallest trees at Wallaby Creek were 'Big Ash One' at 92.5m and Amabilis at 91.4m. A further 25+ trees were known to have exceeded 85m. (Data exists for this item) Eighteen months after the fire, survivorship in the 'Big Ash' stand is limited to two small patches of trees, each containing about 30 trees. Nevertheless these stands include 2 trees 85m tall and these are the tallest trees now living on the Hume Plateau.

Murrindindi Fire

This fire, apparently deliberately lit, started near the small community of Murrindindi around 60km NE of Melbourne. Similar to the Kilmore East fire, it initially burned in a south easterly direction on the back of extreme temperatures and fierce north westerly winds. When the south west wind change came the fire front became huge and swept in a north easterly direction. The township of Marysville was directly in the path of the fire after the wind change and was largely destroyed. It was this fire that killed most of the old *E. regnans* forest in the higher elevations of the O'Shannassy water catchment. Again, it would appear that while the fire was hot enough to kill the Mountain Ash, it did not actually burn as a crown fire. It is likely that most *E regnans* that were killed in the O'Shannassy died on that day, even though the fire continued to burn at a lower intensity in the lower elevation parts of the catchment for at least a week afterwards. The O'Shannassy catchment's tallest trees were 90.6, 90.4 and 90.0m with at least 10 others exceeding 85m (Table 1). All the 90m tall trees were killed in the fires. However, a few 85m trees survived in a tiny isolated patch which must have burned less intensively.

Maroondah Catchment fire

This fire started on the evening of February 7th. It was caused by lightning striking forest on Mount Riddell. This fire never reached the intensity of the Murrindindi or Kilmore East fires due to the milder conditions that followed Black Saturday. It took three weeks to gradually burn throughout 90% of the catchment. While small areas of 1939 regrowth trees were killed, most survived intact. However, many of the 300- 400 y/o trees in the Mt Monda region were severely impacted by the fire even though 1939 trees in the same area were relatively unaffected (Benyon 2010). This is likely because decayed areas in the base and trunk of the old trees allowed multiple fire entry points. The fire did not extend to the extensive old growth stands in the Upper Watts. All the tallest known old growth and regrowth trees in the Maroondah Catchment survived this fire.

Victoria's tallest regrowth trees

The finest surviving tall stands of *E. regnans* trees in Victoria are arguably those that are less than 110 years old. These include stands in the Dandenong ranges, Beenak, Toolangi (Yellowdindi Creek), Powelltown, and the Acheron Valley. Data is available of

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Figure 3. 'Ferguson's Ghost' an 83m tall 1939 regrowth tree, named after the 'Ferguson Tree'. Back in 1872, William Ferguson, a forester employed by the Victorian Government, measured a prostrate tree in the Watts River area that was allegedly 140m+ tall.

the tallest known regrowth trees and their approximate location is shown in Figure 4. What is significant about the most promising regrowth stands is that they are mostly at significantly lower elevations than those stands killed at Wallaby creek and O'Shannassy. They are also still growing quite vigorously. Arguably the most impressive individual stand of regrowth trees occurs along Tomahawk Creek near the locality of Beenak. Here 8 trees exceed 80m within a 30m x 20m patch. These trees have been monitored for the past 6 years and their growth recorded. From the data it would appear that these trees are still growing a meter every 4 to 5 years. Similarly, 'Hades fork' a tall tree from Sassafras Creek in the Dandenong Ranges was measured at 84m in 2001 and had grown a meter when remeasured in 2005.

Tall tree protection for the future

It was once thought that *E. regnans* reached its maximum height between 150 to 200 years (Ashton 2000)(Mifsud 2003). However, studies on 300y/o trees at Wallaby Creek showed that the tallest trees were still growing over the 9 years in which they had been monitored. 'Big Ash One' had grown 95cm and 'Amabilis' 55cm. (Sillett et al 2009) Furthermore, in Tasmania the 99.6m tall 'Centurion', the tallest known *E. Regnans*, is thought to be around 500 years old and while it appears to have lost its original crown 100 years ago or more, it subsequently re-sprouted a new crown which is still growing. This indicates that *E. regnans* has the ability to keep adding height as long as both its crown and the surrounding forest remains intact. It was also intriguing that the 1926 and 1939 stands that were growing adjacent to the old growth stands at Wallaby Creek and O'Shannassy were, by this study's standards, not particularly tall, being in the 55 to 65m range. This implies that the exceptionally tall old growth trees growing nearby were likely not impressively tall when they were 70 to 100 years old. It also lends weight to the conclusion that it was the long time between stand replacing fires, rather than exceptional stand fertility or genetic qualities, which allowed certain trees to reach 90m in these areas. It also indicates that the replacement forest at O'Shannassy and Wallaby Creek, which now consists of regrowth less than 3m tall, has centuries to wait before it once again, if ever, produces trees over 90m.

A different situation exists for some of the lower elevation *E. regnans* forests. A longer and warmer growing season combined with more fertile soils mean that certain stands in these forests are growing extremely fast and it is highly likely that there will be trees over 90m tall in 1919 and 1926 stands within 15-25 years and in 1939 stands within 30-40 years. If there are more favourable seasons, like the wet summer of 2011 then this time frame may be shortened.

Figure 4. 'Big Axe One', 81m tall 1939 regrowth tree with author Brett Mifsud at its base. Unfortunately this tree was not recognised as being very tall until after the clear-cut had exposed it. Photo by Darren Primm

There is no protection policy that could save all trees from a devastating bushfire. However, there are easily implemented measures which could ensure that future generations will be able to experience trees over 80m tall in Victoria into the foreseeable future. A possible model for Victoria could be based on the one used in Tasmania where both exceptionally large and tall trees are afforded protection when found in areas of State forest which potentially could be subject to future harvesting (Forestry Tasmania 2002, 2004).

The first step would be to ensure that all the most promising tall stands in State Forest, State Parks, National Parks and roadside reserves are located. It is possible that the use of LiDAR would be highly useful in pinpointing any currently unrecognised tall stands. For example LiDAR was used to locate the tallest known tree in Tasmania (Forestry Tasmania 2008). LiDAR is currently being used State-wide in Tasmania over

Figure 5. Approximate Tall Stand Locations.

Figure 6. Beenak tall trees grove, 1926 regrowth. Tallest tree is now over 86m

all forested areas to measure tree volume, develop digital terrain maps and to monitor carbon storage, as well as measuring tree heights. The next step would be to ensure that these recognised tall stands are protected in as many places as possible across the range of *E. regnans*. This will ensure that even if large fires do occur, there will likely be places where the fire is of a lower intensity and the stand survives, or that the fires miss some areas entirely. Not all these reserves need to be large, but they do need to be sufficiently substantial to protect the tallest trees from windstorms and regeneration fires, especially if they are located near forestry operations. (Herrmann 2006)

The important difference in Victoria would be that protection would need to be afforded to stands of trees rather than just an individual tree. In late 2010, VicForests implemented a plan which gave protection to all tall trees over 85m and giant trees over 4m DBH that occurred in State Forest (Vicforests 2011).

Conclusion

While Victoria lost its tallest trees in the Black Saturday bushfires, it did not lose its most promising regrowth trees. There are already a few trees over 85m and many more over 80m tall. Therefore within a generation there should once again be trees over 90m on the Australian mainland. However, these tall tree stands need to be acknowledged and afforded proper protection so that there is a high likelihood of some stands surviving in the medium to long term. With good management and a healthy dose of good fortune, perhaps Victoria will once again have trees that reach the heights of the trees that were recorded by the early explorers in the 1850's.

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A full version of this article which contains relevant tables of data including Victoria's tallest tree losses from February 7 bushfires and Victoria's tallest regrowth trees , and references is available for download from the IFA website: http://www.forestry.org.au/news/templates/ifa-article.asp?articleid=1906&zoneid=1