



Wildfires can be bad for biodiversity

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Background

Granite rock outcrops are the remains of an ancient land surface that was thought to have been stripped away some time between the Middle Jurassic and the early Eocene, some 60 million to 150 million years ago. These outcrops are of immense biological importance because they are often 'islands' that comprise a small proportion of the entire landscape, so are uncommon and unusual compared with other landforms. Consequently biotic assemblages on rock outcrops are also uncommon and unusual landscape elements. Rock outcrops in the south-west forest region display high levels of plant endemism and species assemblages that contrast with the surrounding landscape as a result of strong environmental gradients, particularly associated with substrate and moisture regime. A significant proportion (~11 per cent) of all Declared Rare Flora in the south-west region occurs on or around rock outcrops.



Mt Cooke monadnock before the 2003 wildfire. A 'refuge' for fire sensitive and fire intolerant species and communities such as *Acacia ephedroides* (yellow flowers), moss swards (foreground left photo) and *Borya* meadows (foreground right photo).



The 2003 wildfire – based on extent of tree death, probably the most intense fire on Mt Cooke in ~250 years. Photo: Kristian Pollock.

The unusual rock outcrop environment gives rise to a fire environment that is also unusual compared with the surrounding forests. In forests, live and dead vegetation, or fuel, is more-or-less continuous and can reach heavy loads if unburnt for long periods. On rock outcrops, vegetation is usually fragmented, often sparse and does not reach the same high fuel loading as surrounding forests. Because of the nature of the fuels, rock outcrops are less flammable and it is not surprising to find assemblages of plants that are either 'fire sensitive' (readily killed by fire but will readily regenerate from seed) or 'fire intolerant' (harmed by fire, which appears to play no beneficial role). *Acacia ephedroides* and *Calothamnus rupestris* are examples of fire sensitive plants while moss rock swards and *Borya* meadows are examples of fire intolerant communities.

Rock outcrops have been referred to as 'fire refuges'. For this reason, the fire management strategy for the Monadnocks Conservation Park, an area of high concentration of outcrops some 70 km south-east of Perth, was to limit or exclude fire from the Park. This was successful for almost 20 years until January 2003 when a lightning strike started a fire in the Park in jarrah forest near Mt Cooke, one of the largest outcrops in the Park. Under hot, dry windy weather, a high intensity wildfire quickly developed in the heavy forest fuels. The fire burnt 18,000 ha and was brought under control when, some 25 km from its origin, it ran into forest that was recently prescribed burnt. The wildfire provided an opportunity to investigate the response of rock outcrops to fire, their role as 'fire refuges' and to add to our knowledge of how best to manage fire in these landscapes.

Findings

- All vegetation on and around Mt Cooke (and other outcrops) was either severely burnt or charred by the wildfire. Rock outcrops can't function as 'fire refuges' when they are surrounded by long unburnt forests capable of sustaining large, high intensity wildfires.
- Fire sensitive plants were killed but regenerated prolifically from seed following the fire. Others resprouted.
- Numerous animals, including mammals, reptiles, invertebrates and even some birds, were observed to have been killed by the fire.
- In the first few years after fire, there was a high diversity of plants, with the co-existence of fire ephemerals and long-lived species.
- Rock moss swards were killed by radiant heat and burning embers and showed no signs of recovery six years after fire.
- *Borya* meadows were killed or damaged by radiant heat and burning embers but are slowly recovering where the shallow topsoil overlaying the rock has not been eroded.
- Rocks cracked and flaked due to the extreme heat.
- A large volume of the thin topsoil vital for plant growth was eroded by rain following the wildfire and resulted in high levels of sedimentation in creeks.
- Forest and woodland trees on and around the outcrops were severely impacted with numerous large, old trees killed suggesting that this may have been the most intense fire for ~250 years.
- Most younger trees survived, regenerating from basal sprouts or epicormic shoots. Fire promoted dense seedling regeneration.
- Prior to the wildfire, there existed a diverse mosaic of habitat ages ranging from about 20 to 50 years since last fire. The wildfire simplified this to a single seral stage.
- Prescribed burning significantly aided containment and suppression of this wildfire.



All vegetation on the outcrop was burnt or charred by wildfire – there were no 'refuges'.



Forest and woodland trees on and around rock outcrops take many decades to recover following an intense wildfire.



Herbs and shrubs regenerated from seed or by resprouting and will recover relatively quickly.

Management Implications

Attempting to exclude fire from large areas will ultimately fail. The inevitable wildfires burning in heavy, long unburnt forest fuels will be unstoppable at their peak and will cause soil erosion and long term or irreversible changes to forests, woodlands and fire sensitive components in the landscape such as rock outcrop communities. Regular introduction of low intensity, patchy fire into surrounding fire resilient forests and under mild weather conditions in spring or late autumn is necessary to:

- improve protection of rock outcrop communities from lethal wildfires and to allow them to function as fire refuges;
- provide habitat diversity at appropriate scales;
- Reduce the size, intensity, damage potential and suppression difficulty of wildfires.