

Vegetation monitoring and management at Kinglake National Park following the 2009 Black Saturday Bushfires

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Introduction

The 2009 Black Saturday bushfires affected up to 95% of Kinglake National Park (KNP), situated in the western section of the Victorian highlands. The fire burnt across much of the park in several hours and in places reached intensities never before recorded in Victoria's history. In the aftermath of the fire event, the sheer scale and intensity of the bushfire raised some important and concerning questions for the local land managers, Parks Victoria:

- How had the fire affected populations of threatened plant taxa and vegetation communities?
- Were these populations and communities at immediate risk from other processes in the post-fire period?
- If they were at risk, what could be done to prevent further decline?

In an effort to respond to these questions, Parks Victoria initiated a vegetation monitoring and recovery program which began several months after the fire event and has continued until the present. This article discusses some of the challenges and responses encountered during the program and uses individual plant taxa and communities as case studies.

Swamp Bush-pea (*Pultenaea glabra*) – Nationally Vulnerable

Overview

Swamp Bush-pea is endemic to Victoria where it is known from several widely scattered locations. The species has been eliminated from many of its former occurrences by logging and land development. In KNP, Swamp Bush-pea is only known from one population in an area of damp heathy woodland which was burnt at high intensity during the bushfire.

Fire response

The entire adult population was killed by the fire, however abundant seedling recruitment soon followed. The first seedling recruitment occurred in April 2009 in low lying swales, but a rain episode in June caused sheet erosion of the upper slopes, leading to deposition of silt onto seedlings resulting in their death. In August there was a second recruitment event and several thousand seedlings germinated.



The nationally threatened Swamp Bush-pea (Pultenaea glabra). Photo: Carl Just

Management

Despite the high density of seedling recruitment, Parks Victoria was concerned that browsing pressure from native and feral herbivores such as Goats (*Capra aegagrus hircus*), Sambar Deer (*Rusa unicorn*) and Black Wallaby (*Wallabia bicolor*) would eliminate plants. If the adult population were killed, this could be detrimental if the fire had exhausted the soil seed-bank. To prevent grazing pressure, four 1.5 metre high exclusion fences were constructed around the majority of the population. These have been highly successful and in spring 2010 the population reached maturity and flowered profusely, later dropping large quantities of seed. The population is now considered to be relatively secure.

Fairy Lanterns (*Thismia rodwayi*) – Vulnerable in Victoria

Overview

Fairy Lanterns is arguably one of Australia's most cryptic plant species. The body of the plant spends most of its life cycle below the ground, producing bright red flowering structures that appear below leaf litter. The species is believed to be dependent on mycorrhizal fungi that mostly grow under thick beds of leaves of the Musk Daisy Bush plant (*Olearia argophylla*). At KNP, Fairy Lanterns is only known from one population in wet forest on the upper slopes of Mount Disappointment.

Fire response

Survey of the site several months after the fire revealed that all above ground parts of Musk Daisy Bush plants and surrounding leaf litter had been completely burnt. In the years that have followed, the habitat of this area has been drastically transformed by extremely dense regeneration of Mountain Ash (*Eucalyptus regnans*) saplings. Not surprisingly the *Thismia rodwayi* has yet to be relocated. Future monitoring of this site may help to answer currently unknown aspects of its ecology: is it eliminated completely by hot fires, or is it a mid-late succession specialist, only growing when large (and possible old-growth) groves of Musk Daisy Bush re-establish?

Cool Temperate Rainforest of the Plenty River

Overview

The western section of KNP includes the Mount Disappointment reference area, an area of tall wet forest that has been reserved as protected water catchment since 1881. The reference area contains the twin headwaters of the Plenty River which supports the most westerly occurrence of cool temperate rainforest along the Great Divide. Prior to the 2009 bushfire, this rainforest stand was believed to have remained unburnt for almost 300 years.

Fire response

The extreme conditions on Black Saturday created severe fire storms that affected nearly every gully in the park, including the Plenty River headwaters. The rainforest stand was burnt at high intensity, killing many of the dominant Myrtle Beech (*Nothofagus cunninghamii*) trees and severely affecting the understorey. Monitoring since the fire has revealed that a large suite of rainforest-dependent plants have been temporarily eliminated, particularly fern species. The understorey has become dominated by thick regeneration of wet sclerophyll forest species, drastically transforming the original structure and composition of the rainforest and increasing the risk of further fires. It is predicted that many of the rainforest taxa will not



Mountain Ash wet forest following fire. Photo: Karl Just

recolonise the gully unless it is protected from further fire for at least another century. Ongoing monitoring will be essential to document the recovery of this important rainforest site.

Management

A small number of Myrtle Beech (*Nothofagus cunninghamii*) plants were propagated and replanted at the site to assist in the long-term recovery of the rainforest. Re-shooting Sassafras (*Atherosperma moschatum*) trees had to be fenced to protect from severe browsing by Sambar Deer (*Rusa unicolor*), Black Wallaby (*Wallabia bicolor*) and Bobuck (*Trichosurus cunninghami*).

Mountain Ash forests of Mount Disappointment

Overview

Mount Disappointment supports a large stand of Mountain Ash (*Eucalyptus regnans*) which is relatively disjunct from the heartland of these forests to the east. Prior to the fire it was believed to be the largest stand of unlogged, old-growth ash forest in Australia. This stand supports some of the tallest hardwood trees in the world, including individuals reaching over 93 meters. Mountain Ash is a fire-sensitive species that normally dies if the canopy is affected, followed by mass recruitment from seed held in the canopy.

Fire response

The 2009 bushfire burnt through the entire stand of these trees, leading to the loss of some very old individuals that were believed to have originated from previous fire events in the early 1700s and 1851. Despite the sad loss of these trees, there were some interesting findings from the post-fire study of these forests. Surprisingly, a few small stands of Mountain Ash survived the fire, likely due to their tall height and a chance event in fire behavior (such as a sudden wind change) so that their canopies remained un-scorched. Another theory has been proposed by researchers that the Mountain Ash of Mount Disappointment are more resilient to fire than other stands of these trees to the east due to their close proximity to surrounding dry sclerophyll forests (i.e. an evolutionary adaptation) (Tony Fitzgerald pers. comm.).

The regeneration of the wet forest understorey was fascinating to record. Within six months the tree ferns had re-shot and the ground was a carpet of green. Several herb and grass species that had never or rarely been recorded in the area germinated in massive numbers in the first 18 months. These species flowered and seeded prolifically before virtually disappearing again. Their seed will no doubt remain in the soil until the next fire event.

Conclusion

The post-fire vegetation surveys at KNP documented valuable information on the ecology of threatened flora and vegetation communities and identified potential risks

in the post-fire period. This enabled Parks Victoria to undertake recovery management that included fencing to exclude herbivores, weed control works to reduce competition and replanting. The project highlighted the importance of ecological surveys in the post-fire period, to increase our knowledge of plant ecology and arrest threatening processes. Further monitoring in the long-term

is required to assess the full impact of the fire on some threatened plant species and communities.

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The response of Grampians Duck-orchid and Grampians Pincushion Lily in Victoria to wild fire

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Introduction

Specific detail on fire responses of individual species are often not known or recorded in the literature. Australia's flora is well adapted to wild fires and in many circumstances wildfire is an essential event in the lifecycle of a species, though this is not always the case. Perhaps some species are rare in our landscape due to their inability to respond well to wildfire. Fire is often listed as either a threat to endangered species under Federal Recovery Plans and State Action Statements or as probably beneficial or in need of further study. Threatened species, with small often isolated populations facing numerous threats, may not always have the capacity to recolonise effectively after a stochastic event like wildfire.

Grampians Duck-orchid

Grampians Duck-orchid (*Paracaleana disjuncta*) is sparsely distributed in Victoria, South Australia and Western Australia and is listed under the *Flora and Fauna Guarantee Act 1988* and ranked under IUCN on CRITICALLY ENDANGERED. Two sites in Victoria are known from within the north and south of the Grampians (Gariwerd) National Park consisting of less than 350 plants in total. Within the Adelaide and Mount Lofty Ranges region of South Australia it is extremely restricted. The species has also been recorded from 10 locations within Western Australia between Margaret River and Israelite Bay. This charismatic Duck-orchid grows to 15 cm tall, with 1 or 2 small, dull reddish brown flowers.

Grampians Pincushion Lily

Grampians Pincushion Lily (*Borya mirabilis*) is listed under the *Flora and Fauna Guarantee Act 1988* and as Endangered under the *Environment Protection and*

Conservation Act 1999. It is a perennial herb and one of the world's most endangered plants (IUCN, 2001). The entire natural population consists of five colonies (Kohout and Coates, 2010) on one rock outcrop in the Gariwerd National Park and is not known to produce seed. The species has been successfully reintroduced into a second site within the Gariwerd National Park.

Response to fire

The January 2006 Mt Lubra bushfires in the Gariwerd National Park and the January 2010 Roses Gap bushfire, allowed a unique chance to record the response of these two species to wild fire on sites that had been monitored prior to the fires. Both fires burnt particularly hot on the monitoring sites, with close to 100 % canopy scorch at both sites. The fire response of both of these species has not been well documented previously and it is hoped the information attained should assist their fire management.

Methods

Grampians Duck-orchid

In June 2009 a monitoring quadrat was established with each Grampians Duck-orchid plant tagged and its location within the quadrat measured. Leaf emergence in June, flowering in November-January and seed set in December-February each year were recorded. In January 2010 a wildfire went through Roses Gap. A total of 144 plants were included in the 2009 monitoring quadrat, with any additional plants within the quadrat emerging in subsequent years being added. The number of plants present (leaf/flowering/seed set) pre and post fire have been compared and analysed using Genstat 15.0.