

## From the editor

*Selga Harrington  
Parsons Brinckerhoff*

Welcome to the winter edition of *Australasian Plant Conservation*! The theme for this edition is Fire and threatened biodiversity.

Fire is a common disturbance in Australia and has shaped the landscape, habitats, survival of animals and patterns of vegetation. Fire can produce dramatic changes in the environment and following fire, plants can experience increases in space, light, water, pH and total soluble salts. Plants utilise these improved conditions after fire in a variety of ways. In some species fire stimulates flowering or seed release. Other species with seed accumulated in the seed bank use specialised cues to synchronise germination to the post-fire environment. These germination cues may be either physical (such as heat shock cracking impermeable seed coats) or chemical cues (such as leachates of wood, smoke and ash).

The germinability of seeds varies with age with seeds usually exhibiting a decline in germinability with increasing age. Due to these changes in seed viability, species dependant on fire for germination or seed release

can disappear from the environment if the fire interval is too long. Short fire intervals can also result in loss or decline of fire sensitive species if there is insufficient time between fires for plants to reach reproductive maturity.

Fire is a major tool available for land management and can be used to protect property from wildfire, protect fire sensitive habitats, maximise biodiversity and manage woody weeds. Although fire is an important management tool, there are many gaps in our knowledge of how and how often it can and should be used. In this edition we explore the use of fire for plant conservation, in particular for management of threatened ecological communities, threatened species and their habitats.

The edition also includes an article on the new IUCN Red List of threatened communities and concludes with the regular features: Report from New Zealand Plant Conservation Network, Recent workshop reports, Upcoming conferences, Information resources and useful Websites and finally the Research roundup.

A hot topic for the cooler winter months. Happy reading!

## Integrating fire management into conservation actions for the threatened shrub *Grevillea caleyi*

*Tony D. Auld\* and Judith Scott*

*NSW Office of Environment and Heritage, Hurstville NSW; \* Email: tony.auld@environment.nsw.gov.au*

Managing threatened species in fire-prone habitats requires an understanding of how fire, in combination with other existing threats, impacts on these species. In urban areas, there is also the priority issue to manage fire for the protection of life and property. Successful integration of these issues into an effective recovery program for a threatened species is the goal of conservation management.

### ***Grevillea caleyi*, an endangered shrub**

The shrub *Grevillea caleyi* is listed as endangered under both the NSW *Threatened Species Conservation Act* in NSW and the Commonwealth *Environment Protection*



*Grevillea caleyi* in flower. Photo: Mark Ooi

and *Biodiversity Conservation Act*. It is confined to an area of some 8 x 8 km in northern Sydney (Scott *et al.* 1995, DEC 2004). The species is known from floristically diverse remnant patches of bushland on three Hawkesbury sandstone ridgetops with laterite cappings. These ridgetops have been developed for housing, rural properties and roads and infrastructure so that over 85% of the habitat of the species has been lost (Scott *et al.* 1995). A few patches of *G. caleyi* remain on the edges of Garigal and Ku-ring-gai Chase National Parks. Ongoing threats include weeds, further loss of habitat to housing, infrastructure and road widening.

Consequently, the remaining habitat of *G. caleyi* is divided into two main types in relation to fire management. Firstly, many *G. caleyi* remnant sites are burnt in large expansive wildfires that occur approximately every 15-20 years (the last major fires being 1979 and 1994). These sites may also be subject to ongoing hazard reduction burning. Some sites are now isolated from the surrounding expansive bushland and generally do not burn in large wildfires. These sites may not experience fires for >30 years and fire needs to be actively applied to such sites to promote the conservation of *G. caleyi*.

### Fire regime impacts

To manage fire in conservation planning for both *G. caleyi* and its surrounding habitat (the Duffys Forest Ecological Community, which is listed on the NSW *TSC Act* as endangered), the potential impact of each component of the fire regime has been considered in fire management guidelines (DEC 2004). These guidelines drew upon existing relevant literature on how fire impacts on *G. caleyi* and other species with similar life histories.

### Fire frequency

Fire frequency thresholds are important as *G. caleyi* plants are killed by fire and rely on germination from a soil-stored seed bank for post-fire recruitment (Auld and Scott 2004). The species mostly occurs in areas managed to reduce fuel for the protection of life and property, so there is an ongoing need to conduct hazard reduction burning to reduce fuel loads in habitat of *G. caleyi*. The guidelines for fire frequency suggest a fire-free threshold of 8-12 years to allow sufficient time for seedlings to mature (2-4+ years), grow and replenish the soil seed bank. It is essential to prevent any site from being burnt by three consecutive fires at <5 year intervals. Auld and Scott (2004) showed declines in abundance of 46% and 55% from two sites that had been burnt twice in 5 years. At the same time, any areas >20 years since fire, and degraded by invasion of exotics or non local native species, may require a fire to promote the recovery of *G. caleyi* and its habitat (DEC 2004). These fire frequency thresholds are used in the annual fire planning process to determine if any site containing *G. caleyi* should be burnt for fuel reduction purposes as well as being incorporated into the statutory fire planning document for environmental



Top: Burning in and around habitat of *Grevillea caleyi*.  
Bottom: Seedlings of *Grevillea caleyi* emerging soon after a fire. Photos: Tony Auld.

assessment in NSW (the NSW Rural Fire Service Bushfire Code). There still remains a risk that wildfires may burn over any areas burnt in hazard reduction burns, so even this protection may lead to the unforeseen risk of increases in fire frequency. But the risk from having too frequent fire from hazard reduction burning is greatly reduced.

### Fire spatial extent

For other components of the fire regime, research on impacts and thresholds are not yet complete, so the guidelines are more precautionary. Fires of small spatial extent are not recommended for *G. caleyi* sites where there is widespread adjacent vegetation that remains unburnt.

Post-fire grazing impacts on seedlings can be high in such spatially small fires, and there is also a high risk of increased fire frequency from a fire burning across the site from the adjacent unburnt vegetation.

#### Fire severity

Whilst seedling recruitment is known to be very high after severe wildfires (high loss of organic matter) (Auld and Scott 2004), recruitment may be variable after lower severity fires, such as hazard reduction burns. For example, a site burnt in the January 1994 wildfire had over 3000 seedlings emerge post-fire. The same site burnt in a hazard reduction burn 15 years later only produced 500 seedlings, while all adults were killed. Many factors may influence the magnitude of seedling recruitment, including fire cues and post fire rainfall. There is some data on *Grevillea* (and *G. caleyi*) that suggest that heat and smoke in combination may be a promoter of germination (Kenny 2000, Llorens 2004). Consequently the guidelines (DEC 2004) suggest that whilst the effect of fire severity is largely unknown, fires of varying severities are recommended to try and promote seedling recruitment.

#### Fire season

There is no evidence that *G. caleyi* and its associated habitat has any major requirements for burning in any particular season. Sydney can have significant rainfall that promotes seed germination at any time of the year. Consequently, no advice on the preference for fire in different seasons can be made at present, but repeated fires in only one season should be avoided.

#### Conclusion

Integrating the fire management recommendations for *G. caleyi* into the existing annual fire planning process along with actions to reduce the impacts of threats to the species (for example weed control and fire have been used as combined tools to promote recovery in long unburnt sites) has led to a pathway to promote evidence-based conservation management. The fire management guidelines for *G. caleyi* are designed to be dynamic and to be updated as new research becomes available, and offer a long term solution for conserving a fire-sensitive threatened plant. Monitoring the success of the program can be done by fire mapping and recording fire history in combination with on ground estimates of seedling population sizes after each fire.

#### References

- Auld, T.D. and Scott, J (2004) Estimating population abundance in plant species with dormant life-stages: fire and the endangered plant *Grevillea caleyi* R. Br. *Ecological Management and Restoration* **5**, 125-129.
- DEC (2004) *Grevillea caleyi* R. Br. (Proteaceae) Recovery Plan. Department of Environment and Conservation (NSW), Hurstville.
- Kenny, B. J. (2000) Influence of multiple fire-related germination cues on three Sydney *Grevillea* (Proteaceae) species. *Austral Ecology* **25**, 664–669.
- Llorens, T.M. (2004) Conservation genetics and ecology of two rare *Grevillea* species. Unpublished thesis University of Wollongong.
- Scott, J., Marshall, A. and Auld, T.D. (1995) Conservation research statement and recovery plan for *Grevillea caleyi*. ANCA Endangered Species Project No. 456.

# Translating science into practice for improved fire management and biodiversity conservation in South East Queensland

Craig Welden and Dr Samantha Lloyd

South East Queensland Fire and Biodiversity Consortium, Brisbane, Qld.  
Email: cwelden@seqcatchments.com.au or slloyd@seqcatchments.com.au

The South East Queensland Fire and Biodiversity Consortium (SEQFBC) was established in 1998 and is a network of land managers and stakeholders aimed at providing a coordinated response and best-practice recommendations for fire management, fire ecology and biodiversity conservation in South East Queensland (SEQ) through education, community engagement, applied research and representation.

The key aims of the SEQFBC are:

- Education and engagement - assisting land managers and private land holders with practical information on fire management and biodiversity conservation
- Applied research - fire ecology research investigating knowledge gaps in biodiversity and fire management