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Prescribed burning in Perth's bushlands: where, when and how much?

One of the most widely used and visible tools to help mitigate bushfire risk is prescribed burning. However, prescribed burning is not always a 'more is better' tool, especially when weeds have invaded our bushlands and forests. Burning too much or too little can worsen bushfire risk and can put our world-class biodiversity at risk.

A partnership led by Kings Park Science, Department of Biodiversity, Conservation and Attractions (DBCA), and made up of scientists, universities and land managers is undertaking research to provide some of the answers to the questions: how often should we use prescribed fire and what other tools, such as weed management, can or should be deployed alongside fire?

Banksia woodland.

Banksia woodlands, and many other woodlands and forests globally, are considered fire-prone, that is, they burn frequently. Indeed, many species are 'fire dependent' — regenerating only, or at least mostly, following fire. Bushfire risk to people and property is a mix of fire ignition (a swelling human population means more ignitions, both intentional and accidental) and the characteristics and dynamics of the vegetation. However, additional factors such as declining rainfall, heatwaves, invasive species, and fragmentation, all interact with fire to influence the persistence of native species.

How often?

A common approach to determining likely impacts of frequent fire on plants involves estimating the time required for the slowest-maturing species to accumulate enough seeds for replacement in the event of a fire (the seedbank). This time period has been estimated by determining the time after fire until half the population is flowering, and then applying a multiplier (often x2–3), given that flowering doesn't indicate a population-replacing seedbank. Application of this approach in banksia woodlands estimated that the replacement period could be around 8–16 years.

The Grass-Fire-Cycle

In the Perth region, grassy weeds such as perennial veldt grass (*Ehrharta calycina*) are a significant conservation problem. Fire enhances the spread of veldt grass, and veldt grass enhances the spread of fire; hence the grass-fire-cycle. Thus, there is another dilemma: in the absence of weed management, the application of fuel reduction burning may be counter-productive from a fire risk perspective. Burning without weed management may also reduce native biodiversity.

Unfortunately, there are few studies of the effect of fire history and fuel attributes, including presence of grassy weeds, on fire behaviour and plant responses in banksia woodlands. Fundamentally, we need more evidence to support fire management decision making. Studies from Jarrah forests and kwongan shrublands inform us about critical processes, however, species behave quite differently across different systems.

Above and inset: Monitoring vegetation prior to prescribed burning.

Right: Banksia woodland after a prescribed burn, clearly showing weed control on the left.

Fuel management

An approach to identifying appropriate fire intervals from the fuel management perspective assesses live and dead plant material accumulation and structure. A study from the 1990s showed that banksia woodland fuel accumulation was rapid in the first 3–4 years post-fire, but declined to stabilise after six years at around 7.5 tonnes per hectare. The study concluded that "given the rapid accumulation of fuel following fire, buffers in banksia woodland may only remain effective for 3–4 years. This poses several dilemmas for those responsible for fire management; if buffer areas are burnt at a frequency of 3–4 years to maintain their effectiveness for wildfire control, then changes in the structure and species composition of the vegetation are likely". While there is little doubt among ecologists that such frequent fire would alter vegetation, the absence of evidence for it — due to lack of studies — is critical.

Our study

Given these unanswered questions, together with our partners: Murdoch University, Parks and Wildlife Service (DBCA), local councils and the Department of Fire and Emergency Services (DFES), and replicating our study across many banksia woodlands around Perth, our project aims to:

- Improve understanding of the fire regime requirements of banksia woodlands;
- Understand impacts of fire and weed management on woodlands structure, composition, and fuels; and
- Identify bushland management approaches that lead to optimal ecosystem resilience and wildfire risk outcomes.

Specifically, we are investigating how changes in fire frequency and season, invasive weeds, and climate interact to affect native species persistence. By examining detailed fire history maps and working together with fire crews, we choose sites that have a wide range of times since last fire and are planned to be burnt in DBCA's prescribed burning program. Currently, we are working on sites with a range of 5–42 years since last fire.

Prior to burning, we document native and weed species diversity and abundance in plots. Along transects, we measure vegetation structure, coarse woody debris (e.g. logs and larger dead branches), and fine fuels (e.g. leaf litter). Fine fuel is collected, sorted and weighed in fuel size classes to assess fire risk and potential fire behaviour.

Following the burn, we resurvey plots and transects and determine the intensity of fire and the responses of native plants, weeds and fuels.

Outcomes

Results thus far suggest that fuel dynamics in banksia woodland are different from the nearby forests, and confirm the importance of following burns with weed management in infested areas. But, we need to re-measure post-fire regeneration to reach our key research goals. We are planning for the next season, growing the number of study sites annually to increase the certainty in the patterns observed.

Keep your eyes peeled for publications and public seminars from our team members; we look forward to engaging with all interested stakeholders. ■

More information

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