

Incorporating the life-cycle of Hairpin Banksia into fire operations planning

Research Fact Sheet

The Policy and Planning Division within Forests, Fire and Regions Group invests in a research agreement with the Arthur Rylah Institute (ARI) that delivers critical science research to support policy and operational practices.

Research on the life cycle of Hairpin Banksia in relation to fire has been conducted over several years by ARI, under various funding arrangements. The sub-project 'Fire severity trial for recruitment of Key Fire Response Species (Hairpin Banksia)' occurred in 2018-2019.

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Fire Management Policy

Bushfire management planning on public land in Victoria prioritises the reduction of bushfire risk to humans and built assets, while aiming to maintain or improve ecosystem resilience.

Tolerable Fire Intervals (TFIs) are one of the key metrics used by DELWP to measure the impact of fuel management on ecological values. Measuring the persistence of key fire response species (KFRS) sensitive to short fire intervals is important in evaluating minimum TFIs for Ecological Vegetation Divisions (EVDs) subject to frequent fire.

Ecological Background

Hairpin Banksia (*Banksia spinulosa* var. *cunninghamii*) is a KFRS with characteristics that make it vulnerable to local extinction due to short fire intervals: it does not resprout after fire; takes long periods to produce seeds; and has no soil-stored seeds.

ARI research on seed production of Hairpin Banksia in Tall Mixed Forest EVD provided evidence for minimum fire intervals needed to maintain populations. However, post-fire seedling germination has been observed to be low. Studies of other Banksia species indicated that recruitment may be increased by higher burn severity to trigger seed release.

Project Aims

The initial aim of the research was to determine fire intervals that would allow the development of enough canopy-stored seed for Hairpin Banksia reproduction.

The objective of the 2018-19 sub-project was to investigate the optimal fire severity for seedling recruitment of Hairpin Banksia in Port Phillip Region.

Project Methods

Seed production and fire intervals

Bemm River and Gembrook areas (2014-2016)

- Sites burnt between 5 and 35 years previously
- Viable cones (closed follicles) counted on 295 live adult plants

Cockatoo (2018)

- 17-year-old and 35-year-old plants
- Count of cones with closed follicles and viable seed

Seedling recruitment and fire severity

Gembrook area (2016)

- Low severity fires 1 or 2 years previously
- Seedlings counted under 200 fire-killed plants

Cockatoo (2018)

- Autumn 2018 planned burn
- 60 Hairpin Banksia plants monitored
- Pre-burn: closed cone count (seed source)
- Post-burn: open cone count (seed release); % burnt vs scorched Banksias (fire severity)
- Post-burn: seedlings per adult plant count



Hairpin Banksia seedling 6 months after burn (Annette Muir)

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Project Results

Seed production and fire intervals

Bemm River and Gembrook areas

- Less than 10 years: 62% of plants had no cones
- Maximum canopy seed bank 15 - 30 years' post-fire
- 65% more cones in 2016 than in 2014

Cockatoo

- 17 vs 35-year-old plants: more closed cones on younger plants (8.6:4.6), and more viable seeds per cone (91%:59%)

Seedling recruitment and fire severity

Gembrook area

- 0.8 seedlings per adult, at 1.5 - 2 years' post-fire

Cockatoo

- No statistically significant relationships between seedling numbers and predictors: cones with closed follicles (seeds); flame effects (severity).
- Limitations: data from one site; unequal scorched and burnt treatments; small numbers of seedlings.
- Other factors may affect seedling germination and survival: post-burn rainfall; grazing pressure.



Hairpin Banksia cone opened after burn (Annette Muir)



Experimental burn at Cockatoo (Annette Muir)

Fire Operations Applications

The following guidelines are suggested at the operational burn planning or tactical delivery stages, depending on fire zoning and local conditions. These are based on ARI's research findings since 2014, as well as related Banksia studies, within the context of hotter drier weather conditions.

- Incorporate time to reproductive maturity and distribution of Hairpin Banksia in Joint Fire Management Plans.
- Check proposed burns for presence of cones with closed follicles, i.e adequate seed source.
- Vary the fire intensity across a burn if possible, to optimise the opening of cones of varying heights.
- Delay burning Hairpin Banksia in drought conditions, to maximise potential for germination.
- Use lighting patterns and moisture differentials to exclude some patches of mature Hairpin Banksias from fire, in case of poor post-fire recruitment.
- Monitoring of post-fire recruitment.

Close collaboration with Port Phillip Region staff in Parks Victoria and DELWP has led to the implementation of some of these actions.

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