Concept Plan SP 2021-013

Fine-Scale Burn Mosaics in South West Forests

BCS Fire Science

Project Core Team

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Project status as of July 19, 2023, 11:14 a.m.

X X New project, pending concept plan approval

Document endorsements and approvals as of July 19, 2023, 11:14 a.m.

X X
Project Team granted
Program Leader required
Directorate required

Fine-Scale Burn Mosaics in South West Forests

Program

BCS Fire Science

Departmental Service

Service 9: Prescribed Burning and Fire Management

Background

Fine scale patch mosaic burning (PMB) – a regime of low-intensity patchy fire introduced in a cell at high frequency – intersects with high-priority concerns for DBCA's management of conservation lands. Cultural, fire risk, and biodiversity management benefits have been put forward in support of the re-introduction of mosaic burning practices in SW forests.

Precedence for the practice of PMB in WA includes the Walpole fine mosaic project (a Science-Warren Region collaboration), and the northern savanna PMB project (a Science Kimberley Region collaboration). This research indicates that savanna and forest biota studied are largely resilient to PMB.

However, the PMB concept remains to be fully demonstrated for forests, especially relative to current prescribed burning programs which burn whole blocks. DBCA's SW Region has commenced implementation of a soft edge mosaic burn prescription, partly motivated by putative indigenous fire management, but also as a way to deliver a balance between improved risk reduction and biodiversity conservation through frequent introduction of fine-grained burns into the landscape.

Previous research has demonstrated that species richness and composition for most forest biota is fairly resilient to fire regimes. Resilient groups include bird assemblages, most vascular flora, ground active invertebrates, some obligate seeder species and some small mammal species.

However, considerable knowledge gaps remain in our understanding of how more fire-sensitive biota. Knowledge gaps include persistence of delayed maturing obligate seeder shrub species, critical weight range mammals, arboreal and tree hollow dependent fauna (e.g. forest cockatoos, western ringtail possums) and structural habitat features (e.g. hollow logs, riparian thicket) in frequently burnt landscapes, either under conventional or mosaic burning programs. Interactions between PMB (vs conventional burning) and threatening processes including climate change, feral predators, large feral herbivores and invasive plant species also represent further knowledge gaps.

Aims

Key questions for the Forest Mosaic project include:-

- What is the fire regime – spatial complexity, severity, fire return intervals – created by frequent introduction of fire in a forest landscape? How does this compare to standard cell-scale prescribed burning?
- Assessing bushfire-risk benefits – What are the patterns of fuel and fire risk that result from the two treatments? If unplanned ignitions occur, how is fire behaviour and spread affected?
- Biodiversity consequences of PMB for key values – plant species sensitive to short fire intervals, fire sensitive fauna, vegetation community structure, composition and function, cultural resources and values. Does mosaic burning maintain all life history, habitat and resource requirements for all fire sensitive forest flora and fauna?
- What other costs and benefits may be associated with PMB? Includes smoke production, nectar resources, water quality/production, cost-benefit assessment and Cultural values and indigenous engagement.

The main study areas where patch mosaic burning (PMB) is being actively implemented are at Milyeannup (Sth of Nannup in Blackwood district) and in Wellington District (NE of Collie in Wellington District). Fire mosaic outcomes will be compared to adjacent forest blocks under conventional prescribed burning. However, fire mosaic complexity will also be investigated more broadly across the forests, both geographically in the south west, and among other non-jarrah forest vegetation types (riparian, wandoo, heath), to characterise and investigate fire mosaic outcomes and their biodiversity outcomes in DBCA managed lands. Much greater ability to define existing and applied mosaics is now available through the broad-scale fire severity mapping across the firest region.

The study will focus on fire sensitive groups, including threatened mammals, obligate seeder/serotinous plants, arboreal hollow nesting species and vegetation community structure to test whether outcomes are better under fine-grained PMB compared to conventional compartment burning. We will also look at the operation of threatening processes, including feral predator activity, with respect to fire mosaic attributes.

To test for differences between different types of burning, monitoring sites will be stratified according to on-ground mosaic attributes using remote sensing (SP2018-134). dNBR severity mapping will form the basis of the fire regime metrics assessed annually for each site.

Expected outcome

Knowledge on whether key fire threatened groups (obligate seeder heath species, critical weight range mammal species, arboreal species) or key habitat structures (structural hollow bearing trees, hollow logs) have benefited/improved, are unaffected, or have declined (defined by persistence, reproductive output or recruitment) under soft edge mosaic burning vs landscape cell burning. Knowledge on interactions of threatening processes (e.g. feral predator and herbivore activity, wildfire extent and impact) with fire mosaic treatment, whether they have lessened, remained the same or increased. This will inform management decisions and public debate over implementation of prescribed burning in the SW Region. This project provides opportunities for publications and media exploring the applied fuel hazard and biodiversity benefits of fire mosaics, and also the relative importance of pyrodiversity (diversity of fire regimes) relative to functional elements of mosaics (season, severity, interval, vegetation/habitat structural attributes) in supporting forest assemblage structures.

Strategic context

DBCA has a legislated responsibility for land and fire management in SW Region and throughout WA. In SW WA there has been a trend of declining rainfall since the 1970s, which along with changed human activities (e.g. clearing) has increased periods of high fire danger. In this situation it is incumbent on DBCA to test mosaic burning for efficacy in reducing risk associated with increasing fuel hazard. Mosaics have theoretical hazard reduction benefits relative to whole compartment fuel management (e.g. reduced total landscape flammability in Patch Mosaics vs conventional compartments where heavy continuous vegetation fuels accumulate over 8-12 years making fire management potentially hazardous). However potential risks to fire sensitive species including obligate seeders and species requiring long unburnt vegetation, must be addressed to allay fears that these species will decline under mosaic burning. This project will seek to address criticisms from some elements of the public and science communities regarding perceived risks and impacts under both conventional and mosaic burning. This project is a second step in the SW Region in addressing this highly relevant issue for DBCA.

Expected collaborations

Ryan Butler (RFMS) and Kim Williams (NC) in the South-West Forest Region, DBCA, are important collaborators on this project. In fact, the soft edge mosaic project was initiated by the SW Forest Regional management team, so collaboration with the Region is inherent in the project.

We will be collaborating with Remote Sensing and Spatial Analysis, DBCA, for provision of spatial fire severity mapping to provide quantification of the fire mosaic both inside and outside the mosaic treatment blocks.

Given the size of the mosaic project, there is alot of potential to value add to our research on biodiversity impacts of mosaic burning through collaborations with academic partners and research students. I plan to develop a project with Rob Davis (ECU) and Michael Craig (DBCA) on development of suitable tree hollow nesting sites and forest cockatoo habitat within patch mosaic burnt (PMB) and conventional burning treatments.

I hope to collaborate with Adrian Wayne (DBCA) and his team in exploring the mosaic attributes necessary for fire sensitive arboreal mammal species including the western ringtail possum. Extensive camera survey data already available on threatened mammal occupancy during Western Shield provides the opportunity to collaborate with Michelle Drew (DBCA) and the Western Shield team to more fully quantify the role of fire mosaic context in influencing forest mammal assemblages.

The opportunity for changes to fire seasonality profiles of fire mosaics under PMB compared to conventional burning (e.g. increased potential for early autumn and summer patch burning in a landscape dominated by low fuels), provides the opportunity for collaborations with Joe Fontaine (Murdoch University) on changing forest obligate seeder communities, and their flow-on effects for habitat structure, floral resources and fauna communities in early post-fire habitats.

There may be opportunities to collaborate with local Noongar traditional owners on traditional approaches to mosaic fire management within the forests. These collaborations are contingent on future establishment of native title in the SW Forest Region, and also establishment of appropriate governance structures representing native title groups.

Proposed period of the project

July 1, 2021 – Dec. 31, 2030

Staff time allocation

to | X | X | X | X |

Role	Year 1	Year 2	Year 3
Scientist	1.4	1.4	1.4
Technical	1.2	1.2	1.2
Volunteer			
Collaborator	0.2	0.2	0.2

Indicative operating budget

to | X | X | X | X |

Source	Year 1	Year 2	Year 3
Consolidated Funds (BCS)	$33,039$	31,414	$40,932$
Consolidated Funds (FMP)	$20,000$	20,000	$20,000$