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Research Brief

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Points of difference

- We have developed a decision support tool to help managers decide when and where to burn.
- It simultaneously optimises fire management outcomes for both asset protection and conservation
- It is a flexible tool suitable for use in any fire dependent ecosystem that is adjacent to urbanization
- Takes into consideration requirements of any management region e.g. Budget.

Fire management for asset protection and the environment

Reducing fuel around assets is considered an effective hazard reduction strategy, however, a more effective approach may be to burn for a mosaic throughout the ecosystem. This may reduce the overall fuel of the system, as well has have added benefits for the environment.

Context

Ensuring the safety of Australians living within fire-prone environments can be challenging due to the complexity of fire management. Factors such as time and budget constraints, the potential for a prescribed burn to escape, negative perceptions of the community, and conflicting objectives of different stakeholders. Damage to the ecosystem from burning too frequently or not frequently enough is another unpredictable risk. While asset-protection is an essential fire management objective, fire is also applied to the environment to ensure the ecological integrity of fire-dependent ecosystems. The following research brief has been developed in conjunction with land managers engaged in the implementation of prescribed burns.

Background

Fire management since European settlement has dramatically changed the Australian environment. Previously fire regimes were influenced by indigenous practices, and by wildfire attributed to natural processes such as lightening strikes. During the 20th century, fire management was largely focused on the suppression of fire to mitigate the possibility of damage occurring to human lives and infrastructure. This however, has led to present-day increases in fuel load, which have likely led to many wildfire disasters. As a result of climate change, extreme fire weather and the frequency of wildfire is increasing. Drier and warmer weather results in higher than usual wildfire potential, as well as fire seasons extending beyond their historical range.

Fire management today

Prescribed burning is a common action used to protect assets from wildfire damage. Prescribed burning will not necessarily prevent fire from occurring under extreme wildfire conditions but can have a positive localised influence on house survivorship by reducing fuel loads. Reducing fuel only in urbanised areas is considered an effective methodology for mitigating the risk of wildfire. However, studies have suggested that this may in fact exacerbate the likelihood of wildfire occurring based on increased fuel loads in surrounding areas (Cruz *et al.* 2012). While burning at a high frequency may be effective at reducing fuel, a large homogenous burn increases the chance that a prescribed burn breaks containment lines, as well as having negative impacts on natural ecosystems. Land managers and scientists increasingly recognise the importance of identifying areas for burning that not only reduce fuel load around assets (Gibbons *et al.* 2012), but also reduce the overall fuel load of the system effectively.

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Recommendations

A more effective strategy than current asset protection burn regimes may be to implement a regime that reduces the overall fuel load of an ecosystem, through the implementation of a heterogeneous mosaic burn (Bradstock *et al.* 2005; Duncan *et al.* 2015). While likely being more effective as an asset protection protocol, there may also be added benefits for biodiversity. Decision support tools can also be used to optimise areas to implement a burn. Spatial analysis techniques are ever improving, and are capable of identifying priority areas for burning based on asset protection objectives and ecological concepts.

Researchers at the Australian Research Council Centre of Excellence for Environmental Decisions have developed a decision-support framework for planning prescribed burning, and have applied this to the dry sclerophyll forests of southeast Queensland in collaboration with the City of Gold Coast (Williams *et al*, In Press). The team has quantified the trade-offs between asset protection and conservation objectives and show that it is possible to achieve good outcomes for conservation with minimal impact on asset protection. Their framework also improves asset protection by identifying a better distribution of prescribed burns in space and time. This work provides a transparent, objective and flexible framework that can be applied to many different prescribing burn scheduling problems at large spatial scales.

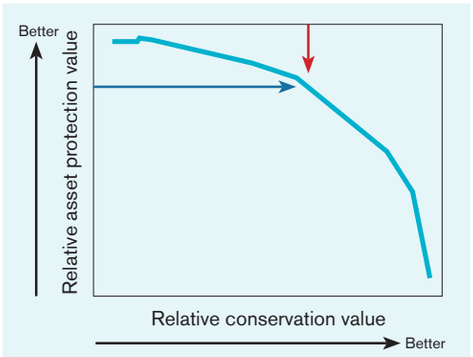

Figure 1 CAP trade-off curve: Good outcomes are possible for both objectives

In the future the team will build on this pioneering work by developing more sophisticated model of risk to assets, incorporating bushfire hazards and models of ignition points, including other habitat types, and applying it to even broader scales.

Methodology

- We use mathematical optimization (Integer Linear Programming) to answer the question of when and where to burn
- Our approach identifies spatially areas for burning based on asset protection objectives and ecological concepts (see Figure 1).

Recent Research Findings

We have recently shown the utility of our decision support tool using the dry sclerophyll forest ecosystem of the City of Gold Coast as a case study. For further details, see Williams *et al.* 2017 (In press).

Collaboration Opportunity

In the future we will build on this work by developing more sophisticated model of risk to assets, incorporating bushfire hazards and models of ignition points, including other habitat types, and applying it to even broader scales.

We are looking for collaborators from a variety of backgrounds to work with us on developing these ideas further. We are seeking collaborators who have experience implementing prescribed burns, managing prescribed burning regimes, land managers, academics, or from any other relevant field. ●

Key references

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5. Williams, B. A., Shoo, L. P., Wilson, K. A & Beyer, H. L. (In Press) Optimisation of multiple objectives associated with fire management in a fire-dependent ecosystem using integer linear programming. *Journal of Applied Ecology*.

Further resources

South East Queensland Fire and Biodiversity Consortium
> www.fireandbiodiversity.org.au

Restoration prioritisation at The University of Queensland
> https://wilsonconservationecology.com/our-research/research-themes/restoration-prioritisation/

Firesticks – Cultural burning: healthy communities, healthy landscapes
> www.firesticks.org.au

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