Framework for Using and Updating Ecological Models to Inform Bushfire Management Planning

Research Fact Sheet

Forests, Fire and Regions Group invests in an *Emergency Risk Management Research* agreement with the Bushfire and Natural Hazards CRC that delivers critical science research to support policy and operational practices. This project '*Framework for using and updating ecological models to inform bushfire management planning'* is part of this work and commenced in July 2017. It is due to be completed by June 2019.

The Project

Over many years of ground-breaking research, DELWP has collaborated with world class researchers to develop a suite of models and metrics (measures) to help understand and effectively manage risks to ecosystem resilience and threatened species. This project will develop an analysis module, and a structured decision-making framework, to facilitate more effective and transparent consideration of ecological values in decision making.

The project will:

- Integrate a suite of ecological models-including threatened species habitat distribution models, and those predicting species' responses to fire - into a world-class and user-friendly analysis module.
- Provide a process to identify critical uncertainties, guide monitoring efforts, and identify future research.
- Work with stakeholders to apply the principles and tools of structured decision-making (**Figure 1**) to develop a 'fit-for-purpose' decision framework.
- Provide support for the implementation of this decision framework, through a case study within a DELWP region.

Help build capability within DELWP, through training of technical staff in the use of the ecological analysis module, and training for decision makers who can use data outputs from the analysis module, to consider ecological values in bushfire management planning.

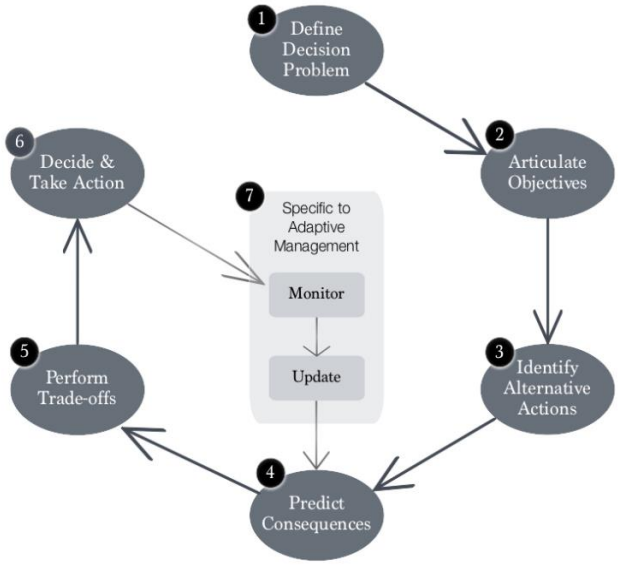

Figure 1: The structured decision-making framework refers to both the steps, and the suite of tools used to address those steps. This figure is taken from Garrard et. al. (2017) [1]

[1] Garrard GE, Rumpff L, Runge MC & Converse SJ (2017) Rapid prototyping for decision structuring: an efficient approach to conservation decision analysis. In Bunnefeld N, Nicholson E & Milner-Gulland EJ (Eds) *Decision-making in conservation and natural resource management: models for interdisciplinary approaches*, Cambridge University Press.

Project Outputs

This project will deliver:

1. A collation of; ecological models, threatened species fire response data (e.g. **Figure 2**), and species distribution models, and associated metadata.
2. Synthesis of current knowledge, a list of ecosystems for which models have not yet been developed, and outline of threatened species data gaps.
3. Descriptions of the conceptual framework for developing and applying the ecological models to inform planning.
4. An ecological resilience module, which consolidates existing ecological models and data into a single system for analysis, and technical guidance on its application.
5. A process map that outlines how to identify and prioritise uncertainty in decision making.

delwp.vic.gov.au

Arthur Rylah Institute for environmental research | The University of Melbourne | La Trobe University | bushfire&natural HAZARDSCRC | Victoria State Government | Environment, Land, Water and Planning

6. A documented case-study and training on the application of the framework.

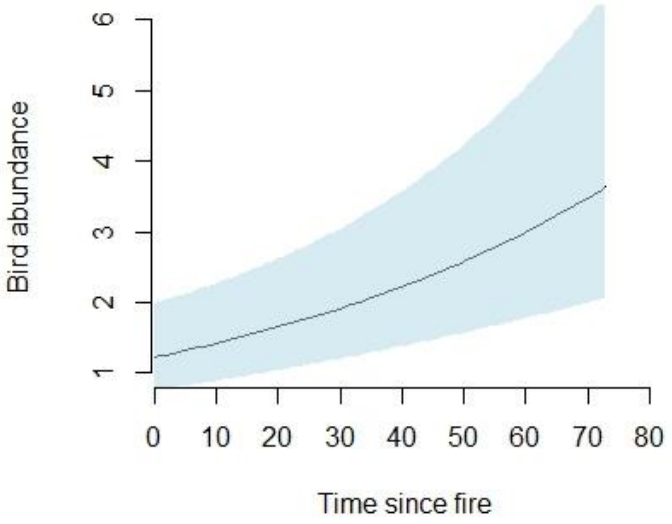

Figure 2: Modelled response of nectar-feeding birds to time since last fire.

Policy and Operational Implications

This work will improve DELWP's ability to incorporate ecological objectives as part of a range of decision-making contents, including Strategic Bushfire Management Planning. Central to this project is building a clearer understanding of the fire management decision context in Victoria, to ensure the framework and tools are 'fit for purpose'.

The Research Team

The project is being delivered by a consortium led by Dr Josephine MacHunter from the Arthur Rylah Institute of Environmental Research (ARI) and Libby Rumpff from the University of Melbourne (UM), joined by Dr Luke Kelly (UM), Dr Tracey Regan (ARI), Dr Nevil Amos (ARI), Dr Terry Walshe (UM), Dr Kate Giljohan (UM/LaTrobe University)(LTU), Prof. Andrew Bennett (ARI/LTU), Prof. Mike Clarke (LTU), Dr Julian Di Stefano (UM), Dr Angie Haslem (LTU), Dr Steve Leonard (LTU), Prof. Michael McCarthy (UM), Annette Muir (ARI), Dr Holly Sitters (UM), Assoc. Prof. Alan York (UM), A/Prof. Peter Vesk (UM).

Project Status

Workshops have been undertaken with decision makers, risk analysts and stakeholders from DELWP, Parks Victoria, Local Government and the CFA to develop a set of:

- Ecological objectives that are relevant to all regions. The objectives relate to minimising the decline in the persistence of all native/indigenous animal species.
- Clear and concise performance measures of all significantly impacted faunal species. These measures will include metrics such as the decline in relative abundance, occupancy and extent of the impacted species.

Work is currently underway to develop and consolidate scripts (the code for data analysis) to enable more streamlined analysis of ecological models, and to produce user friendly outputs of the performance measures (**Figure 3**). The project team is working with regional risk analysts to test the revised scripts using real world scenarios, through data depicting the potential arrangement of planned fire across a region in the long-term.

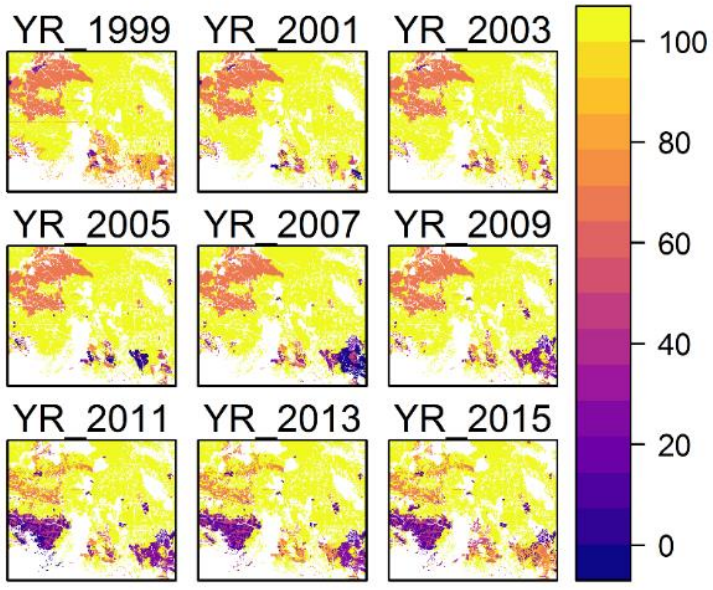

Figure 3: Spatially explicit models of species relative abundance (scaled 0-100%) with fire history allow calculation of change in species' abundance in any management area. This example shows changes in Pilotbird relative abundance in the Central Highlands 1999-2015.