Species Distribution Modelling for key tree, shrub and tree fern species in the Central Highlands

Research Fact Sheet

Forests, Fire and Regions Group invests in the Integrated Forest Ecosystem Research Agreement (IFER) with the University of Melbourne, which delivers critical science projects to support policy and operational practices. Core themes of IFER include biodiversity, carbon, vulnerability, hazards, socio-economic and water. This Fact Sheet reports on '*Species Distribution Modelling for key tree, shrub and tree fern species in the Central Highlands'* (Vulnerability Core theme), which commenced in November 2016 and is due to be completed by June 2019.

The Project

Key emerging risks to Victoria's forest ecosystems include potential changes in fire regimes (natural and managed) and climate change. There is a need for data, models and tools to underpin an improved understanding of the interactions between fire and changing climate on plant communities. These interactions may have significant impacts on the distribution of forest species and may lead to changes in the composition and structure of forest communities, which could affect the delivery of ecosystem services.

Previous work has indicated that within the Central Highlands, understorey species composition and distribution are highly variable, and often clumped within geographic locations and influenced more by climate and forest structure than time-since-last fire (see *Landscape Ecology* 2017 DOI 10.1007/s10980-017-0526-7).

This project aims to provide a detailed exploration of the role of climate on Victoria's forest and woodland dependent flora; particularly the understorey species (**Fig. 1**) within these ecosystems.

A combination of high resolution mapping of climate variables across Victoria (**Fig. 2**) will be utilised with existing datasets and new data from collaborators, to create a large database for use in the analyses. The high-resolution climate dataset will allow for datasets containing records of understory species presence and absence, as well as abundance, to be analysed at a finer scale resolution than previously available.

Project Outputs

This work will provide tools for assessing impacts of climate on forest structure and composition and will specifically provide DELWP with:

- more accurate mapping of forests and species at risk to direct climate change
- species' response functions to climate
- response of key species to climate change and mapping of their future distribution.

Figure 1: *Acacia dealbata* (in flower) - a widespread understorey species and important habitat species for the Leadbeater's possum.

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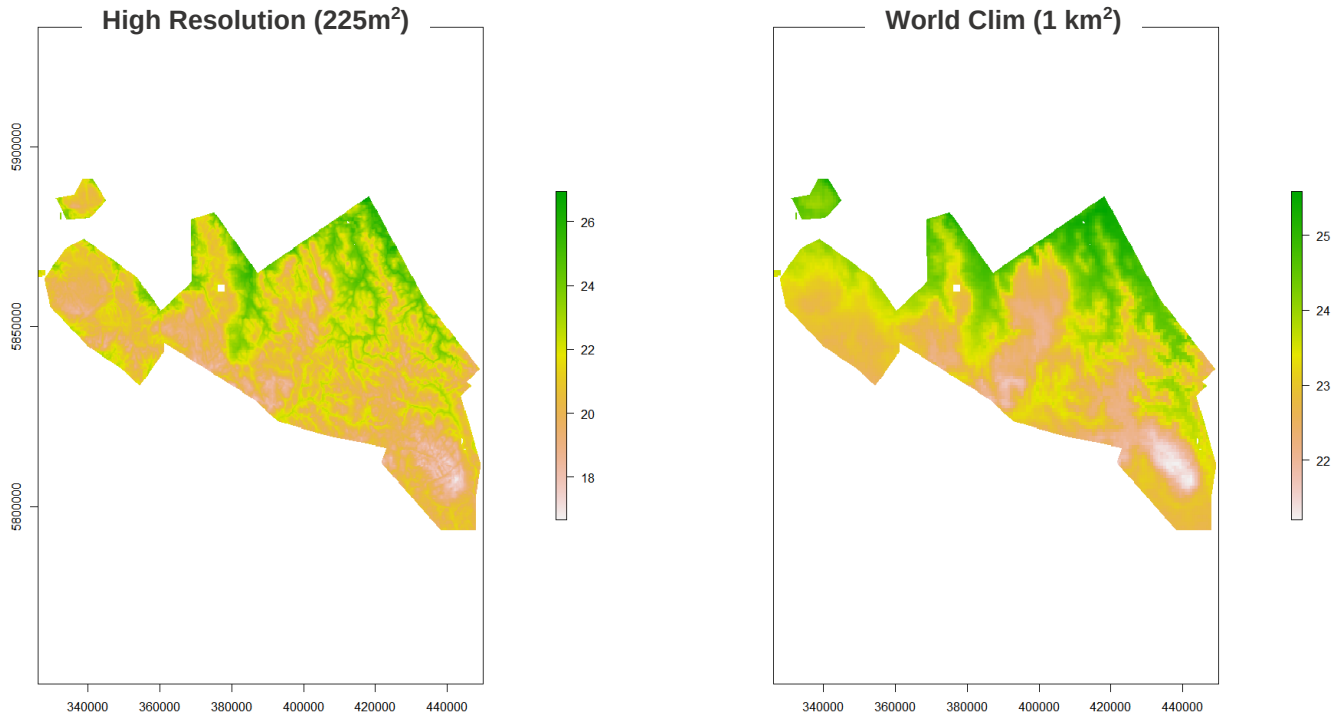

Figure 2: Comparison of Mean Annual Range in Temperature, for a landscape in the Central Highlands in Victoria. The high-resolution dataset is on the left (see *Int. J. Climatology* 37, 3098-3110) and Worldclim on the right. Note the different ranges in temperatures.

Policy and Operational Implications

This work will develop DELWP's ability to:

- predict the distribution of forest communities and associated species at risk to climate change
- predict the future distribution of forest communities and associated species in response to climate change
- assess flow-on effects from changes in the distribution of forest communities and associated species to the delivery of ecosystem services.

The Research Team

The project is led by Dr Craig Nitschke and Dr Sabine Kasel from the School of Ecosystem and Forest Science at the University of Melbourne, joined by staff from the Department of Environment, Land, Water and Planning.

Project Status (August 2018)

A high spatial resolution climate model has been developed for Victoria. This model captures fine scale topographic drivers of temperature and will improve species distribution modelling, particularly in topographically complex landscapes, such as the Central Highlands.

The collation of datasets for inclusion in the 'Victorian vascular plant database for species distribution modelling' has required extensive negotiations and is now largely complete. The next phase will involve data screening and once completed, the generation of species response functions to climate and in turn, species' response to climate change, can begin.