

Fire in the mountains: a new technique to map the wet and dry zones for planned burning in mountainous forests.

Sean F Walsh, 9th Mar 2017

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Why was this research done?

Planned burning in mountain forest areas is difficult work, requiring teams of highly experienced staff, on-ground monitoring and extensive preparation. One of the main challenges is estimating how wet the forest floor is likely to be on a given day, over a large area.

This research project developed a simple model for estimating the dryness of topsoil in mountainous forest areas, accounting for the amount of sunlight reaching each mountain slope, the effect of elevation above sea level on air temperature, how much shade is given by the tree canopy, and local weather conditions.

Wet soil usually means wet forest litter and plenty of moisture in the leaves of small plants near the ground. Fire can't get going in areas like this, and burn teams may find it useful to map these dry and wet zones in detail before they start the burn. This research makes it possible to prepare such maps at high spatial resolution.

What were the main findings?

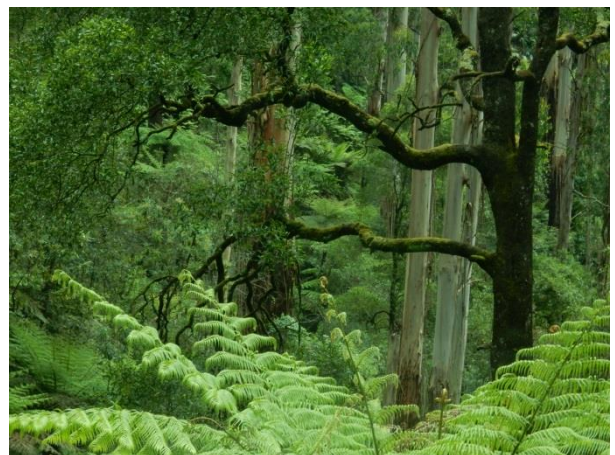
The researchers found that topsoil moisture varied in mountainous forests in a predictable way, and were able to model this effect with a modified version of a conventional drought index. The modifications involved predicting air and litter temperatures underneath the forest canopy, and plugging these predictions into the drought index formula.

Using below-canopy air temperatures in the drought index, the model explained 84% of the variation in topsoil moisture. Using litter temperatures, the model explained 91% of this variation. Some test maps were prepared at 20m resolution for a burn conducted in 2015, showing good agreement between areas that actually burnt and areas predicted to be dry.

The model in this study is very simple, and much more work needs to be done to understand all the factors that affect the flammability of wet mountain forests. Soil type, plant species, distance to creek lines, ignition technique, and humidity of the air can all be important. Research in these areas is ongoing.

What does it mean for policy and practice?

The model developed in this project is designed to support operational work, but there may also be some policy implications. If conditions are extremely dry, bushfires can burn through forests that are normally very wet, so fuel reduction is still required. Terrain (elevation, steepness and which way each hillslope is facing) and the amount of canopy cover were found to have a strong influence on forest floor moisture. This means that in wetter mountainous forests there will always be some areas that are too wet to burn in reasonable burning conditions. Mapping these areas may help burn controllers to achieve the best possible fuel reduction in mountainous forests.



For more information, contact Sean Walsh (seanwalsh.research@gmail.com), or Dr Tom Duff (University of Melbourne: tjduff@unimelb.edu.au).

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