

Opinion paper

Research for fuel and bushfire management in the Victorian High Country.

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The opinions expressed are solely those of the author.

Context

The Victorian State Government faces considerable challenges to reduce the risks posed to lives, property and the environment by uncontrolled and uncontrollable bushfires. Those risks are likely to increase as the frequency and severity of bushfire events increases. The Alpine National Park and adjoining other public land pose particular problems owing to their large areas and lengthy perimeters with private land.

The Secretary of the Victorian Government Department of Sustainability and Environment made a determination that the available evidence does not allow for an opinion to be formed on the effectiveness of fuel and bushfire management using strategic cattle grazing.

This led in 2011 to the commencement of a Government supervised trial of grazing using areas that had previously been grazed.

The University of Sydney is discussing with the government, approaches to fuel and fire management for the regions/ecosystems covered by the trial. Initially, discussions have focused on the need to identify and test methods appropriate for assessing the impacts of cattle on fuel loads and a range of other ecological properties. A second phase is to identify experimental or trial designs that offer the most robust means of establishing effective fuel and bushfire management.

This paper is written to aid public discussion. It is not written in the style of a scientific review – rather it is written without references but with a thorough knowledge of the primary literature.

Background

The depth of scientific data and knowledge vary widely for the different ecological vegetation classes (EVC) within Victoria's high country, including the Alpine National Park. By far the majority (nearly all) of primary research has been undertaken on the EVC that make up the Bogong High Plains and similar land-forms. That research can be supplemented with a significant proportion of decades of research in the Snowy Mountains.

There have been many reviews of cattle grazing in relation to these EVC (that dominate areas

>1600m). Some are focused only on bio-physical science attributes, though most take a broader view including social and economic aspects. Most broader reviews conclude that negative environmental effects of cattle outweigh any environmental, social or economic benefits. Soil and water issues have been a significant focus and influence on those conclusions. I agree with the general conclusions of those broad reviews insofar as: (a) they are tenure-specific including the currently defined purposes of that tenure, (b) they reflect currently available data.

I do not agree with assertions that no further research is needed in these high-elevation EVC in relation to disturbance, or that past research is 'impeccable'. For these EVC there is a pressing need to elucidate relationships among all of: disturbance, long-term changes in climate and atmospheric CO₂, productivity, diversity and ecosystem functions. For example, there is global evidence that grasses and herbs are often displaced by woody species in the absence of disturbance, especially disturbance that renews cycling of critical elements such as phosphorus. If the government and the general public wish the Bogong High Plains to remain dominated by grasses and herbs, then further research is vital.

In contrast to the high-elevation EVC, there is far less depth of knowledge (all of environmental, economic, social) for montane and foothill forests and sub-alpine woodlands that comprise ~90% of the area of the current trial. In particular we lack data and knowledge focused on fire management, but by comparison with the Bogong High Plains there are also relatively few studies relevant to general environmental management. It is this lack of knowledge that does not allow for an opinion to be formed on the effectiveness of fuel and fire management using strategic cattle grazing. I agree with the Secretary's determination for these (<1600m asl) EVC and argue these areas of Victoria's high country need research to identify best-bet options for fuel and fire management. How best to manage fuels is the key issue and grazing will only ever be one of several possible approaches.

The objective of fuel management is to moderate fire behaviour. More specifically, a strategic reduction in fine fuels can help reduce all of: the likelihood of ignition, bushfire intensity and rate of spread. Fine fuels need consideration especially where overall fuel loads are heavy, as they are in many montane and foothill forests, sub-alpine woodlands that are contiguous with montane forests, and some other EVC at lower elevations (excluding riparian EVC).

A major consideration is that fire behaviour in montane/foothill/sub-alpine forests and woodlands (as exemplified by current trial areas) is not well studied and that this, in addition to fuel loads and prescribed fire as a fuel-reduction treatment, needs further research.

A serious effort to better understand and develop practical tools for managing fuel and bushfire requires research at both extensive (or landscape) scales, and in more focused, statistically robust, research and demonstration experiments at smaller scales. Results and conclusions from smaller scale experiments do not always translate to the landscape scale, while landscape scale data and information can be difficult to interpret without the knowledge gained from more targeted research. These points have been made many times before. Combining approaches will give land managers the best possible knowledge of the effects of treatment on fuels, ecological values and fire risks.

In establishing the effects of treatment, there are two clear issues.

The first is that there is nearly always significant underlying or background variation. For example, the majority of the current trial areas were grazed for around 100 years up till 2005 and were affected by bushfire in 2003 and/or 2006. Considerable areas have been affected by other fires of varying intensity in the years prior to 2003. There has been no grazing since 2005. In the past 100 years or so, there have been significant changes in climate – wetter periods, periods with more snow, drier and warmer periods. All of these have their legacies.

The second is that treatments are seldom uniform, they are instead often highly variable. For example cattle do not graze uniformly, they are selective, even in relatively uniform pastures and almost certainly in areas of native vegetation. Fires too, especially cooler, slower moving fires, are not homogenous in their effects.

Solutions to these issues are seldom easy or quick. Taking the second issue first, the variability in treatment can help if it can be quantified. For example, if cattle can be tracked reliably, then grazing intensity might be able to be established at a suitable spatial scale (e.g. intensity per hectare). Grazing effects can then be related to grazing intensity. A similar approach is often used in studies of prescribed fire.

Background variation is more difficult again. Background variation is commonly addressed using long-term studies such that the effects of background variation can slowly be ‘distilled’

or inferred via additional measurements, from the effects of treatment – this approach has been widely used in Australia. Treated areas can also be compared with control areas, though there are problems in selecting ‘controls’ and we can seldom do more than select the most appropriate ‘reference’.

It is axiomatic that in targeted research and demonstration experiments there is a wider range of options to deal with background variation. Replicated before-after, control-impact (BACI) designs are often proposed as being statistically robust approaches to field experimentation. BACI trials are not always possible or appropriate and do not remove the need for significant periods of study (for example to allow for seasonal variation to be expressed and measured) and do not ‘remove’ the legacies of the past. They do allow for legacies to be controlled and for the effects of treatment to be more reliably established.

Recommendations

Based on the above and that the need to ensure high quality scientific outcomes, I have a series of recommendations for future experimental design, including location:

1. Research be expanded to include prescribed fire and be focused on montane and foothill forests and sub-alpine woodlands (that are contiguous with montane forests). Other higher productivity, lower elevation EVC should be considered if practicable.
2. A combination of landscape scale trials, and research and demonstration experiments, is required. That is, ‘one-size does not fit all’. Controls (more properly ‘references’) need to be identified according to trial or experiment design.
3. For elevations >1600 m, small-scale, (e.g. tens of m²) research is needed to elucidate relations between disturbance and species composition and ecosystem functions of major EVC.
4. Research and demonstration experiments should include fully replicated, BACI style, prescribed fire and grazing treatments, where practicable. Sites for these experiments need to be based on experimental need and not tenure.
5. Treatments should be applied in accordance with likely utility in mitigating fire risks within the EVC in question. For example, grazing treatments are more likely to be useful *after* at least one cycle of prescribed fire in forested EVC.
6. Significant communities known to be sensitive to research treatments (e.g. moss-beds) must be protected.

Research and demonstration experiments might require a total of a few hundred to a few thousand hectares. Options for research and demonstration experiments need to be carefully considered and developed to a standard that could be brought to the Secretary of the DSE for a decision on implementation. This would include a thorough review and synthesis of existing evidence and analysis to identify critical ecological characteristics, and to inform the sampling protocols and sampling effort required to reliably detect change. It is important that this work starts as soon as practicable. Considerable infrastructure works may also be required (e.g. fencing and track work) ahead of implementation of treatments.

Landscape scale research will still be needed and will have to be based on sites similar to those selected for initial studies, given similar site selection criteria. Further consideration will be needed for issues such as: frequency of prescribed fire, grazing intensity (numbers of cattle per unit area), size of trial sites, as well as the exact nature of sampling protocols (including cattle tracking). Further sites are likely to be needed.