THE LEEUWIN GROUP

Response to Report 62 by the
Standing Committee on Environment and Public Affairs

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Contents

Overview

The DBCA prescribed burning program is heavily dependent upon a 2009 study by Boer et al., which maintains that the area burned by wildfire decreases when the area burned by prescribed fire increases. The expectation for this concept of leverage was that a small prescribed burn could prevent a large wildfire, but Boer et al. found prescribed burns were 44 times less effective than expected, requiring a large area of prescribed burning to prevent small areas of wildfire.

A 2022 reanalysis of this study (Campbell et al. 2022) has found fundamental errors in both the study design, mathematics and its application to policy. Although Boer et al. was conducted in part of the Warren bioregion (predominantly karri and jarrah forests), it has been used to justify prescribed burning across all bioregions in the southwest predicated on fuel age (including banksia woodlands, heath and shrubland). Campbell et al. showed conclusively that there was no correlation between area of prescribed burning and area of wildfire across the southwest, and for some bioregions more prescribed burning correlated with increased wildfire area. In their advice to the Standing Committee on Environment and Public Affairs, DBCA dismissed this work without justification despite Campbell et al. being published in a respected, independent scientific journal focusing on risk management. Campbell et al. used the exactly the same methodology that Boer et al. applied to the Warren bioregion. DBCA's dismissal of science that fundamentally challenges its policies

underpin why an independent inquiry into the science, protective value and biodiversity impacts of the DBCA prescribed burning program is essential.

The leverage argument

The central piece of scientific literature underpinning DBCA's prescribed burning program is Boer et al. (2009), which maintains that prescribed burning in the south-west exhibits 'leverage' effects on wildfire, meaning that a given area of prescribed burning reduces the area of wildfire by a greater amount. The Leeuwin Group tabled at the Committee a recent peer-reviewed publication that replicates the work of Boer et al. and found that it is flawed (Campbell et al. 2022).

Leverage is a name given to a simple correlation of wildfire area against prescribed fire area, and is assessed by how strong and pronounced the relationship is. The term was introduced by Loehle (2004), who argued from desktop modelling that burning one part of the landscape would not only prevent it from being re-burnt by a wildfire, but would also create a 'shadow' of unburnt landscape in its wake. Loehle argued that if prescribed burns were located optimally, they would have a leverage of 11. That is, burning one part of the landscape would protect an area 11 times larger. This prediction underpinned the argument that prescribed burning was the practice of "lighting a small fire to prevent a large one."

In a real-world situation however, it is not valid to assume that the change in wildfire area over time is caused solely by changes in the area of prescribed burning, because other factors also vary over time. In the case of wildfire in the south-west, the trend correlates well with climatic changes that are known drivers of wildfire regimes and therefore far more likely explanations of the trend (Zylstra et al. 2022). The term 'leverage' is therefore misleading, because it implies causation where none has been proven.

In reference to external research, Section 4.39 of the Standing Committee on Environment and Public Affairs states:

THE MINISTER'S LETTER INFORMED THE COMMITTEE THAT DBCA IS AWARE OF RESEARCH THAT STATES ALTERNATE VIEWS REGARDING FIRE MANAGEMENT IN SOUTH-WEST FORESTS. AFTER REVIEW AND CONSIDERATION, DBCA HAS DETERMINED THAT KEY ELEMENTS OF THIS RESEARCH DO NOT APPROPRIATELY CONSIDER ASPECTS RELEVANT TO SOUTH-WEST FORESTS SUCH AS ACTUAL FUEL ACCUMULATION PATTERNS, DOCUMENTED RELATIONSHIPS WITH FIRE BEHAVIOUR, CURRENTLY IMPLEMENTED POLICY FRAMEWORKS, ACTUAL FIRE INTERVALS AND RELEVANT FIRE INTERVAL THRESHOLDS.

None of these objections apply to the science that we tabled, as the science replicates the approach taken by Boer et al. (2009) and is an analysis of DBCA actual fire records. DBCA have therefore provided no valid reason to reject the findings of our paper.

Although section 4.40 states that further responses have been provided in a tabled paper to some of the issues raised, this material appears not to be publicly available.

Boer et al. (2009) disproved the 'leverage' concept

Critically, the analysis by Boer et al. (2009) disproved Loehle's prediction that a small fire could leverage protection against a large one. The study reported a leverage of only 0.25, which was 44 times smaller than the expected value. Instead of protecting 11 ha by burning one ha, these findings show that four ha must be burned to protect one ha from wildfire. Prescribed burning is therefore the practice of lighting a large fire to prevent a small one.

Leverage calculations should done by plotting the area of wildfire in a period of time as a function of prescribed burns that happened over a period of time before the wildfires occurred (e.g. (Loehle, 2004; Price et al., 2012; Price, Pausas et al., 2015; Price, Penman, et al. 2015; Price et al., 2012).

The paper that we tabled by Campbell et al. (2022) goes well beyond this, demonstrating that even these very modest findings by Boer et al. were based on false assumptions. The first of these assumptions entirely invalidates the findings. Thus, we should plot the area of wildfire in a 6-year period against the area of wildfire in the 6-year period before it. Instead of doing this, Boer *et al*. (2009) plotted the area of wildfire in a 6-year period against the area of prescribed fire *in the same* 6-year period. This means that in some of the cases during each period, the prescribed burns happened before the wildfires, but in the remainder, they occurred after the wildfires. Causality is impossible because one event is not influenced by other events that have not yet happened.

The effect of expanding the data

Campbell et al. (2022) also compared the DBCA/Boer et al. (2009) approach across other bioregions subjected to DBCA's prescribed burning program. Notably, the correlation in the Northern Jarrah and Perth Bioregions went in the opposite direction, so that wildfire area was greater in the periods when there was more prescribed burning. This indicates that, even without addressing the logical fallacy in their analysis, the application of findings by Boer et al. (2009) to support prescribed burning in these northern regions has no support in fact.

Campbell et al. (2022) went on to test whether a significant correlation could in fact be detected in any bioregions using a valid comparison of time periods. Only rare and very weak correlations could be found for isolated combinations with no likely causal relationship. Entirely contrary to DBCA fire doctrine then, the area of wildfire has no correlation with the area of prescribed fire.

DBCA fire research priorities

Section 4.42 of Report 62 states that the DBCA Fire Science program had a budget of $956,000 in 2022-2023. The Department has had adequate resources and capability to address important fire-related issues, and that begs an important question: The justification for the harm caused by the prescribed burning program is that it prevents greater harm caused by wildfires, so has the Department investigated whether this is in fact the case?

Campbell et al. (2022) identified numerous flaws in the primary science supporting the program. In particular that the Department assumed that the findings from part of the Warren region were valid across the diverse landscapes of the southwest without performing an analysis to verify this assumption.

Far more powerful spatial analysis techniques have been published that overcome numerous weaknesses in the leverage approach (Zylstra, 2018; Zylstra et al., 2022), but none of these have been utilised by DBCA. Research led by CSIRO and supported by DBCA has shown that the driver of uncontrollable fire in dry forest is understorey height and cover rather than fuel load (Cheney et al., 2012; Cruz et al., 2022), and research by DBCA scientists has shown that their prescribed burning program increases understorey height and cover for decades (Burrows, 1994; McCaw et al., 2002). Despite this being long-held knowledge, the DBCA Fire Science program has not invested resources to accommodate this reality. It appears that all such fundamental research is conducted by external researchers, and the reluctance by DBCA to engage with the broader scientific community suggests a lack of commitment by the Department to objective, evidence-based management.

Conclusion

Campbell et al. (2022) have demonstrated that the core argument of leverage used to support prescribed burning is invalid. DBCA have offered no reasoned argument to refute this evidence.

In summary, DBCA has not displayed the capacity for objective treatment of science that may necessitate change in their prescribed burning program. With the new evidence now available, we again stress the need for an independent review of their prescribed burning program that can weigh the evidence on its merits.

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