7 PRESCRIBED BURNING INCREASES GREENHOUSE GAS EMISSIONS

FACTS ABOUT PRESCRIBED BURNING AND WILDFIRE IN SOUTH-WEST FORESTS

The Department of Biodiversity, Conservation and Attractions (DBCA) manages 2.5 million hectares of forest in the south-west of Western Australia. Its prescribed burning program targets 200 000 ha of this Forest Management Area (FMA) annually. At this rate, 45% of the FMA will be maintained at a 'fuel age' of less than six years. Analysis of wildfire and prescribed burn extents in the FMA (Campbell et al, 2022)[1] has shown that on average 50 ha of prescribed burn has reduced wildfire extent by 1 ha (leverage of 50:1; Fact Sheet 2).

Since the effects of climate change have increased the severity and frequency of devastating wildfires, it makes sense to analyse the greenhouse gas (GHG) contribution of both prescribed burning and wildfire.

Using methodologies from the IPCC (2006)[2], and Volkava et al. (2019)[3], the estimated GHG emissions for prescribed burning and wildfire in south-western Australian forests have been calculated in the box on the next page. The results are approximately 40 tonnes per ha and 80 tonnes per ha respectively (CO_2-equivalent). The higher value for wildfire is due to the increased patch area and the increased fraction of biomass combusted.

This means that 200 000 ha of prescribed burning would emit approximately 8 million tonnes of GHG per year, 25 times as much as the 0.32 million tonnes that would be emitted from the 4000 ha of wildfire it is supposedly preventing.

DBCA burned 175 414 ha of the FMA in the 2022–23 prescribed burning program (DBCA annual report)[4]. This burning would have emitted approximately 7 million tonnes of GHGs or **8% of Western Australia's reported total emissions of 83 million tonnes for the period[5].**

This photo shows a prescribed burn in Mt Lindesay National Park, in November 2019 that was as hot as a wildfire, so would have had similar emissions. Source: Roger D'Souza.

Styx block prescribed burn, November 2023. Source: Bart Lebbing.

The IPCC has estimated the maximum atmospheric GHG concentration required to limit global warming to 1.5 deg C. At the world's current emission rate, just 9–11 years remain to reach net zero emissions to limit global warming to 1.5 deg C. Australia has less time (7 years; Pugh 2022[6]). Clearly, GHG emissions need to be radically reduced. Prescribed burning south-west forests makes a significant, completely avoidable contribution and, on this basis alone, it should be discontinued in its current form. This is recognised in Europe where prescribed burning is prohibited in many European countries (Narayan, 2007[7]).

Conclusions:

- Stopping the annual broad-scale 200 000 ha prescribed burning program would eliminate approximately 8 million tonnes per year of GHG emissions.
- The expected increase in wildfires is estimated to be 4000 ha, which would have GHG emissions of approximately 0.32 million tonnes.
- The net saving in GHG emissions would represent approximately 1.5–1.7% of Australia's current emissions and 8–10% of W.A.'s emissions.
- Resources from DBCA's current broad-scale prescribed burning program could be redirected to more targeted strategies to protect human life and infrastructure.

GHG emission calculations for 1 ha of prescribed burn and 1 ha of wildfire

The principal greenhouse gases of concern are carbon dioxide, methane and nitrous oxide.

Emission equation[2]: $E_i = A * P * M * CF * EF_i$

where
- E_i GHG emission (g) due to gas i
- A Fire area (ha)
- P Patchiness
- M Biomass available for burning (t/ha)
- CF Combustion factor = fraction of biomass burnt
- EF_i Emission factor = g of gas i emitted per kg of matter burnt

and i is
- CO_2 for carbon dioxide
- CH_4 for methane
- N_2O for nitrous oxide

Parameter values:

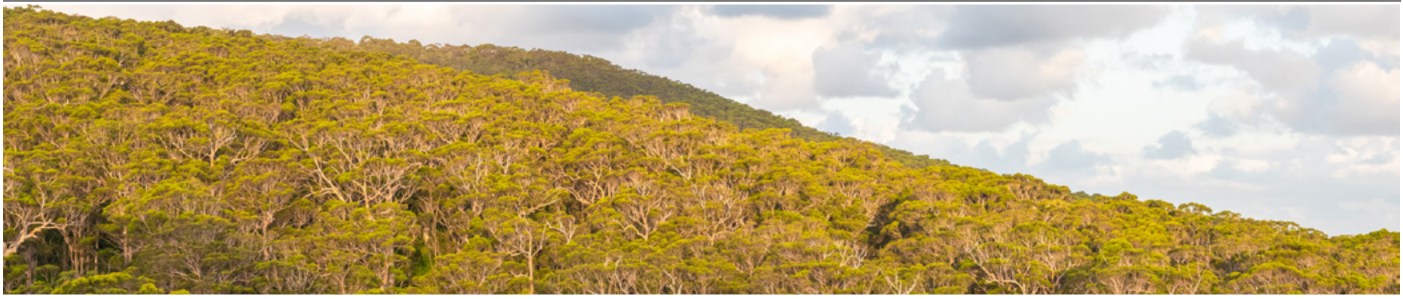
- A = 1 ha
- P = 0.65 for prescribed burn (PB), 0.8 for wildfire (WF)[8]
- M = 20.2 t/ha for litter < 6mm, 72.7 t/ha for coarse wood debris (CWD)[3]
- CF = 0.6 for litter in PB, 0.9 for litter in WF, 0.3 for CWD in PB, 0.5 for CWD in WF[3]
- EF_{CO2} = 1640 g/kg for litter, 1479 g/kg for CWD[9]
- EF_{CH4} = 0.9 g/kg for litter, 10.9 g/kg for CWD[3]
- EF_{N2O} = 0.072 g/kg for litter, 0.038 g/kg for CWD[3]

The different GHGs have different potentials for contributing to global warming. This is expressed as global warming potential (GWP). To calculate the CO_2-equivalent emissions for a GHG, the mass of gas emitted is multiplied by the GWP.

GWP = 1 for CO_2, 34 for CH_4, 298 for N_2O[9]

Using the emission equation, the parameter values and the GWP, the CO_2-equivalent GHG emissions are:

40 t/ha for prescribed burning and 79 t/ha for wildfire.



Walpole National Park January 2020. Source: South-West Forests Defence Foundation Inc.

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2 Intergovernmental Panel on Climate Change (IPCC) (2006) *IPCC Guidelines for National Greenhouse Gas Inventories Chapter 4: Forest Land.*

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