

Wildfire impact on hydrology within Sydney's drinking water supply catchments

Jessica Heath^{1*}, Chris Chafer², Tom Bishop¹, Floris Van Ogtrop¹

¹ Faculty of Agriculture, Food and Natural Resources, University of Sydney, New South Wales

² Sydney Catchment Authority, New South Wales

*jessica.heath@sydney.edu.au

INTRODUCTION

Wildfires have a considerable impact on the hydrological processes within a catchment causing a decrease in infiltration rates and an increase in runoff. Victorian studies have found that a decline in water yield levels occurs three- five years after wildfire (Langford 1976). However, Victoria's vegetation is dominated by obligate seeders whilst Sydney is dominated by obligate resprouters, meaning the Victorian catchments can not be representative of the Sydney catchments.

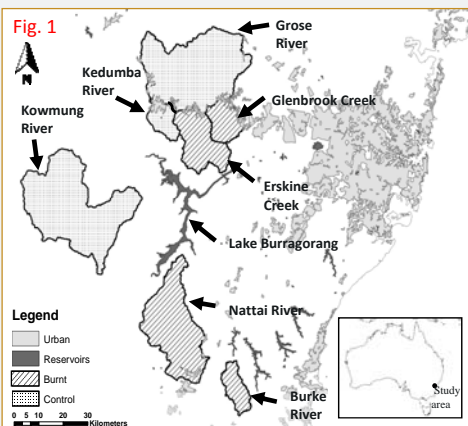
RESEARCH AIMS

To determine if the 2001-2002 summer wildfires have had an impact on the post-wildfire water yield.

STUDY AREA

4 burnt sub-catchments: Burke River, Glenbrook Creek, Erskine Creek and Nattai River (Fig. 1).

3 unburnt sub-catchments: Grose River, Kedumba River and Kowmung River (Fig. 1).



RESULTS

Table 1.

Catchment	NSE pre-fire	NSE post-fire
Burke River	0.91	0.75
Erskine Creek	0.72	0.85
Glenbrook Creek	0.64	0.53
Nattai River	0.55	0.53
Grose River	0.90	0.41
Kedumba River	0.73	0.61
Kowmung River	0.63	0.33

• Nash-Sutcliffe coefficient (NSE) produced fairly good values from a hydrological perspective (ranges from $-\infty$ to 1). This indicates Gamma is a good model to use to predict post-wildfire water yield (Table 1).

• The Flow Duration Curves (FDC) across both burnt and unburnt sub-catchments are similar. An example of the FDC for burnt catchments are shown below (Fig. 2).

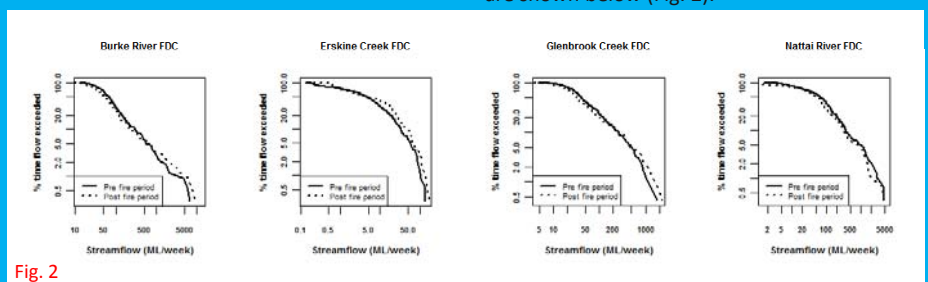


Fig. 2

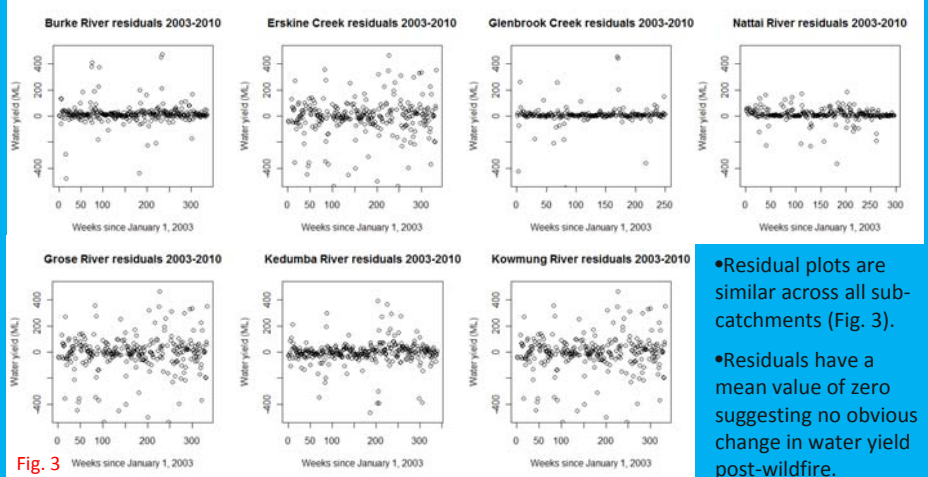
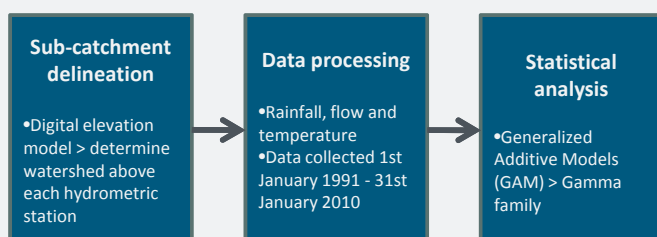


Fig. 3

• Residual plots are similar across all sub-catchments (Fig. 3).

• Residuals have a mean value of zero suggesting no obvious change in water yield post-wildfire.

METHODOLOGY



Sub-catchment delineation

• Digital elevation model > determine watershed above each hydrometric station

Data processing

• Rainfall, flow and temperature
• Data collected 1st January 1991 - 31st January 2010

Statistical analysis

• Generalized Additive Models (GAM) > Gamma family

CONCLUSION

- Based on the NSE values it can be seen that pre-wildfire models used predict the post-wildfire models well.
- Similar trends in data occurs across both burnt and unburnt sub-catchments post-wildfire.
- Wildfire has no obvious effect on water yield within the Sydney drinking water supply catchments.

Reference: Langford K (1976) Changes in yield of water following a bushfire in a forest of *Eucalyptus regnans*. *Journal of Hydrology* 29, 87-114.