NSW BUSHFIRE WEATHER UNDER THE INFUENCE OF CLIMATE CHANGE.

Grahame Douglas[1,2]

[1] NSW Rural Fire Service, NSW, [2] University of Western Sydney, NSW, School of Engineering.

Introduction.

While it is reasonably predictable that bushfires will and do occur on an annual basis, the spatial and temporal distribution of risk within the New South Wales landscape is not well understood. This risk is related not just to the vegetation (see Figure 1 below) and topographical features which dominate the landscape, but also the prevailing weather conditions during the fire season.

Aim and 0bjectives of the Study.

The aim of this study is to consider the implication of regional climatic variables and climate change on bush fire behaviour for use in the planning and construction of residential developments in bush fire prone areas in New South Wales (having dry sclerophyll vegetation).

The broader objectives of the Study are:

1. To gain an understanding of the impact of current regional climate and likely human induced climate change on bush fire patterns in terms of frequency, severity and consequences;

2. To investigate how climate and dry forest vegetation combine to affect land-use planning in bush fire prone areas; and

3. To investigate the implications of climate and vegetation/land-use data to building design and construction in bush fire prone areas.

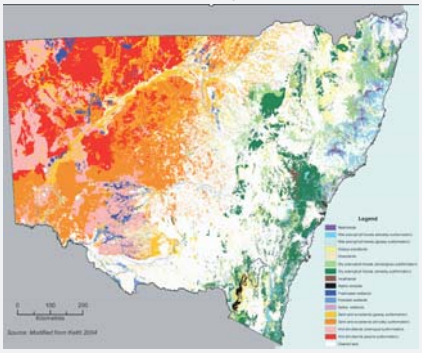

Figure 1: Vegetation of NSW (Keith, 2004).

3 fire weather datasets have been acquired from the Bureau of Meteorology and include:

1. 1976/86-2009 data on FFDI/GFDI and associated data (Lucas, 2009) (16 stations);
2. All 1950-2009 daily data available at 3:00pm wind, RH, Temp, gusts and rainfall;
3. 1994-2009 drought indices (DF, KBDI & SDI) with 3pm RH, T max and 24 hr rainfall (88 stations).

NSW Fire (Weather) Districts.

There are 21 Fire Districts established under the Rural Fires Regulations (NSW) including the ACT (see Figure 2 below). These districts are generally used to denote areas which are subject to administrative arrangements such as bush fire danger periods and total fire bans.

These boundaries are based on local government boundaries and are also used for establishing fire weather conditions when considering referrals of development approvals under the EP&A Act or Rural Fires Act.

Figure 2: NSW Fire Districts and some AWS locations (Source: RFS, 2009).

The datasets have been consolidated and 30 locational datasets have been produced covering all 21 fire weather districts. These include FFDI (& in western NSW GFDI), T max, 3:00pm wind speed/directions, RH and T as well as forest fuel moisture. This covers the period from 1976 to 2009 for the 16 (Lucas) datasets and another 14 covering 1994-2009.

This allows for a comparison of design fires for land-use planning purposes between the current methodology using the MacArthur Equations (Noble et al, 1980) and that of Project Vesta (Gould et al, 2007).

Significance of proposed study.

The significance of the proposed study is to determine what role if any, climate change has as a determinant of future fire events, either in terms of frequency and/or severity/intensity. Of particular concern is the issue of how climate change may affect the recurrence of fire intensities in determining the 'design fire' or whether the absolute intensity will increase within an existing recurrence period. This can be used in planning of future residential areas.

Preliminary analysis.

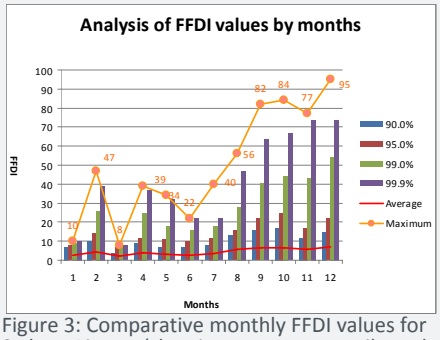

Figure 3: Comparative monthly FFDI values for Sydney Airport (showing mean, percentile and maximum values over the period 1976-2009).

To date a preliminary analysis of FFDI, KBDI, RH, T max has been undertaken. The current scope of analysis is illustrated in Figure 3 for Sydney Airport above. Fuel moistures have also been derived for all sites.

Summary.

This presentation provides a preliminary understanding of fire weather conditions in New South Wales and how climate change has affected bushfire behaviour in terms of the duration of the fire season, frequency of adverse fire conditions and potential severity of fires. Such conditions will consider the overall trends on fire weather's disaggregated components. In particular drought, humidity and temperature are considered at this stage.

The preliminary results give a strong indication of changes that are likely to arise from climate change over the longer term.

References.

Gould J.S., McCaw W.L., Cheney N.P., Ellis P.F., Knight I.K. and Sullivan A.L. (2007) *Project Vesta: fire in dry eucalypt forests: fuel structure, fuel dynamics and fire behaviour*. Ensis-CSIRO, Canberra, and WA Dept of Environment and Conservation, Perth.

Keith D. (2004) *Coastal Shores to Desert Dunes: the native vegetation of Australia and ACT.* DECC, Sydney.

Lucas C. (2009) *On developing a historical fire weather dataset for Australia.* Draft paper for the Australian Meteorological Society. Supplied by author.

Noble I.R., Bary G.A.V. and Gill A.M. (1980) *McArthur's fire danger meters expressed as equations.* Aust. J. of Ecology 5, 201-203.

Watson P. (2009) *Understanding Bushfire Fuels. A report to the NSW RFS.* Centre for Environmental Risk for Bushfires. University of Wollongong.

CRC

University of Western Sydney
Bringing knowledge to life