

# ATMOSPHERIC STABILITY ENVIRONMENTS AND FIRE WEATHER (1) - AN EXTENDED HAINES INDEX

**Graham Mills**

Centre for Australian Weather and Climate Research, Melbourne, Australia

**Lachlan McCaw**

Department of Environment and Conservation, Manjimup, Western Australia

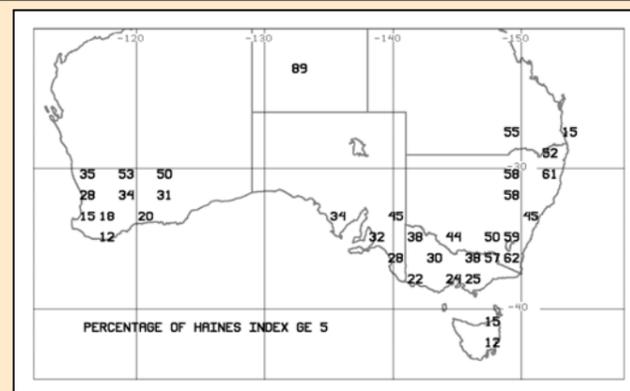
While traditional fire danger indices such as the FFDI, the FWI, and the USFDRS focus on the danger of a “wind-driven” fire, it is widely considered amongst fire managers that atmospheric stability affects fire behaviour.

The Haines Index, which combines a temperature lapse rate and a dryness component to give a score from 2-6 is widely used in the US, but has less acceptance in Australia.

## THE HAINES INDEX IN AUSTRALIA

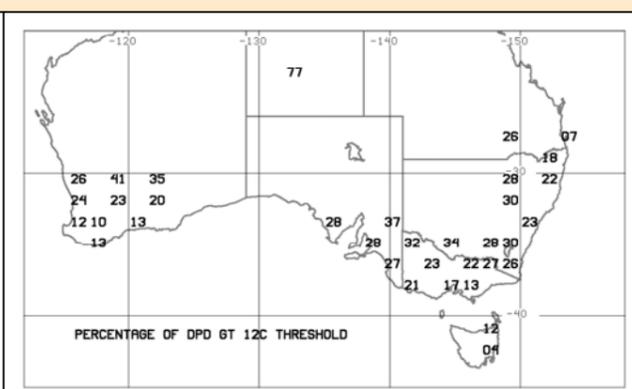
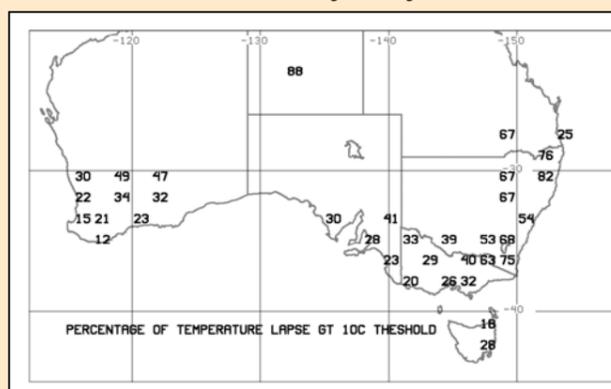
### THE PROBLEM

Too many days have  $HI \geq 5$  so don't discriminate the 5% of “bad” days.



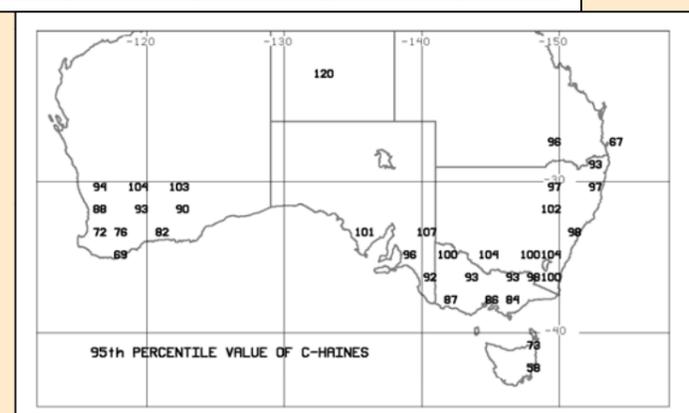
### THE REASON

The lapse rate and the dewpoint depression ingredients of the Haines Index exceed the upper bounds used in Haines' formulation on too many days – the Australian climate is different.



### A SOLUTION?

Re-formulate the Haines Index to use open-ended linear functions of temperature lapse and dewpoint depression. With some constraints, this leads to a potential range from 0 – 13.5. There is considerable variation in the climate of this proposed “C-HAINES” Index across Australia, but the 95<sup>th</sup> percentile values show a strong relationship with the number of days for which the  $HI \geq 5$  or  $HI = 6$  at the same point.



## IS THE NEW C-HAINES USEFUL? (TRIAL PRODUCTS THIS SUMMER)

Systematic quantitative comparison with fire activity data sets will be needed

Comparison with a large number of fire and pyrocumulus events shows

- Only weak correlation between C-HAINES and FFDI – independent information
- Association of extreme C-HAINES values and some unexpected night-time fire activity events
- Association of extreme C-HAINES values and sustained fire activity under decreasing FFDI
- Often a period of very high C-HAINES leading up to fire ignition or extreme fire activity days
- An association of extreme FFDI and extreme C-HAINES on days of major pyrocumulus developments