Relative Humidity and Dew Point

Information Sheet, November 2020

Relative Humidity (RH) and Dew Point are both measures of moisture in the air. Dew Point is the temperature to which air must be cooled in order to produce condensation (dew). It represents how much moisture is in the air – the higher the Dew Point temperature, the greater the moisture content of the air. RH is the amount of moisture in the air as a percentage of the maximum amount of moisture that the air could hold at the same temperature, also known as the saturation point.

Due to its direct relationship to fluctuating temperature, RH alone doesn't provide enough information on how much moisture is in the air. As air gets warmer, it can hold more moisture. As a result, if air temperature increases and the amount of moisture in the air stays the same, the RH will fall. The opposite is also true – if temperature falls and the amount of moisture in the air stays the same, the RH will rise. In both of these examples of changing RH there would be no change in the Dew Point, because the quantity of moisture in the air remains the same.

Local Time	Temp (C)	Dew Point (C)	RH (%)
0600	2°	1°	93
0700	3°	2°	93
0800	7°	3°	76
0900	9°	3°	66
1000	12°	3°	54
1100	15°	3°	44
1200	17°	3°	39
1300	18°	2°	34

An example of the relationship between temperature, Dew Point and Relative Humidity (RH) over time.

An increase or decrease in Dew Point temperature happens when the actual quantity of moisture in the air changes. As a result, compared to the RH, the Dew Point temperature is relatively constant. Changes in Dew Point temperature are caused by weather systems and could indicate the movement of a trough, the arrival of a front or be a sign of increased atmospheric mixing, as dry or moist air from higher in the atmosphere mixes with surface air.

What does this mean for fire behaviour?

RH and Dew Point temperature have direct influences on fire behaviour. Dry fuels and low RH (less than 30%) lead to lower fine fuel moisture contents, increasing the availability of fine fuels for combustion and increasing their ignition potential. Very low fuel moisture contents can result in less predictable and more extreme fire behaviour.

Conversely, an increase in RH and Dew Point temperature may signal a decrease in fire behaviour as the moisture in fine fuels increases and forward rate of spread and flame heights decrease.

Understanding the values and forecast changes in RH and Dew Point temperature can inform bushfire planning and preparedness efforts though increased awareness of potential changes in bushfire behaviour and risk.

It is important to note that a forecast change in RH and Dew Point temperature could be an indication of a weather change, potentially preceding a change in wind direction or strength.

Definitions

Dew Point

A measure of the absolute moisture content of the air and the temperature air must be cooled for dew or fog to form. Dew Point is calculated from the dry and wet-bulb temperature while taking the site's elevation into account. If the dry-bulb temperature is the same as the Dew Point temperature, the air is said to be saturated and the Relative Humidity is 100%.

Relative Humidity

A measurement that compares the moisture in the air with the maximum amount of moisture the air could theoretically hold at the same temperature. Relative Humidity is measured as a percentage and at moisture saturation Relative Humidity is 100%. Air can hold more moisture at higher temperatures, so the Relative Humidity alone is not an exact measure of moisture content.

Fuel Moisture

The proportion of fuel that is water, expressed as a percentage of the total dry weight of the fuel. In the field, dead fine fuels will have fuel moisture content from between 3% up to about 35%, which is the fibre saturation point. Above this point, fuels can only absorb additional moisture as free water on the surface of the fuel fibres.

When temperature, relative humidity, dew point and fuel moisture interact

Increase in absolute moisture content →

Dew Point → / Temperature ↓	-15 °C	-10 °C	-5 °C	0 °C	5 °C	10 °C	15 °C	20 °C
10 °C	15.6%	23.4%	34.4%	49.8%	71.1%	100.0%		
15 °C	11.3%	16.8%	24.8%	35.9%	51.2%	72.0%	100.0%	
20 °C	8.2%	12.3%	18.1%	26.2%	37.4%	52.5%	72.9%	100.0%
25 °C	6.1%	9.1%	13.3%	19.3%	27.6%	38.8%	53.8%	73.8%
30 °C	4.5%	6.8%	10.0%	14.4%	20.6%	28.9%	40.2%	55.1%
35 °C	3.4%	5.1%	7.5%	10.9%	15.5%	21.8%	30.3%	41.5%
40 °C	2.6%	3.9%	5.7%	8.3%	11.8%	16.6%	23.1%	31.6%
45 °C	2.0%	3.0%	4.4%	6.4%	9.1%	12.8%	17.7%	24.3%

Increase in temperature ↓

Decrease in relative moisture content ↓

← Relative Humidity

Relationship between Dew Point temperature, Relative Humidity and air temperature. With a Dew Point of 20°C, Relative Humidity can range from 100% right down to 24.3% depending on the air temperature. A general rule is the further apart the air temperature is from the Dew Point temperature, the lower the Relative Humidity of the air above the fire ground.

A decrease in Dew Point temperature (the quantity of moisture in the air) can directly influence the amount of moisture in fine fuels. A drop in Dew Point temperature from 10°C to 0°C can lower the moisture of fine fuel in dry eucalypt forest by 2.5%, which can lead to a doubling in the speed of a fire.

When using dead fine fuel moisture estimates that are based on changes in the RH or Dew Point temperature, a general rule is to factor in a one to two-hour lag time, as it takes about this long for the fine dead fuel moisture to adjust to the new atmospheric moisture conditions.

Understanding the relationship between RH, Dew Point temperature, fuel moisture and rate of spread and how they influence fire behaviour increases the effectiveness of bushfire management, and most importantly the safety of operational staff.

Temp (C)	Dew Point (C)	RH (%)	Dead fuel moisture (%)	Relative Rate of Spread
25	10	39	7	x 1
25	0	19	4.5	x 2

Effect of Dew Point Temperature on Dry Eucalypt Forest. Source: Cruz, M. G., Gould, J. S., Alexander, M. E., Sullivan, A. L., McCaw, W. L. & Matthews, S. (2015), A guide to rate of fire spread models for Australian vegetation, Technical report, CSIRO Land and Water Flagship, Canberra, ACT, and AFAC, Melbourne, Vic.

What are fine fuels?

Fine fuels describe leaves, twigs and bark, and are defined as dead vegetation less than 6mm in thickness, and all live vegetation that is less than 3mm in thickness.

Where can you find this information?

RH and Dew Point temperature are both available on Incident Weather Forecasts. Forecast values are also available over the day and upcoming week through MetEye: bom.gov.au/australia/meteye/

Official RH and Dew Point temperature observations can be accessed directly from the Bureau of Meteorology and Department of Primary Industries and Regional Development:

- bom.gov.au/wa/observations/index.shtml
- weather.agric.wa.gov.au/

They are also available from Portable Automatic Weather Stations and handheld weather meters.

Need more information?

Contact the Bushfire Technical Services team
Email: environment@dfes.wa.gov.au