



## Grassland Curing Guide



The CFA produces its Grassland Curing Guide in both printed and electronic versions.

The printed copy provides an accurate and true colour representation suitable for estimating grassland curing rates. This electronic version is for demonstration and educational purposes only, due to colour inaccuracies which occur when printing or viewing online documents.

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## *The CFA Grassland Curing Guide*

This booklet has been prepared to assist observers in estimating the level of grassland curing for the purposes of monitoring the progression of curing into the fire danger period, and predicting fire danger and fire behaviour. Visual estimation using the CFA Grassland Curing Guide is a useful and immediate method for assessing curing.

The Guide may be used to help identify grass fuel moisture conditions which is particularly useful in assisting fire prevention and suppression activities. Estimates of curing status can aid the:

- Assessment of the onset of a fire season relative to previous years
- Implementation of fire restrictions
- Input into decision making for fuel reduction burning
- Estimation of fire danger
- Calculations of fire behaviour and fire spread
- Deployment of fire fighting resources
- The declaration of Total Fire Ban Days

## *The Curing Process*

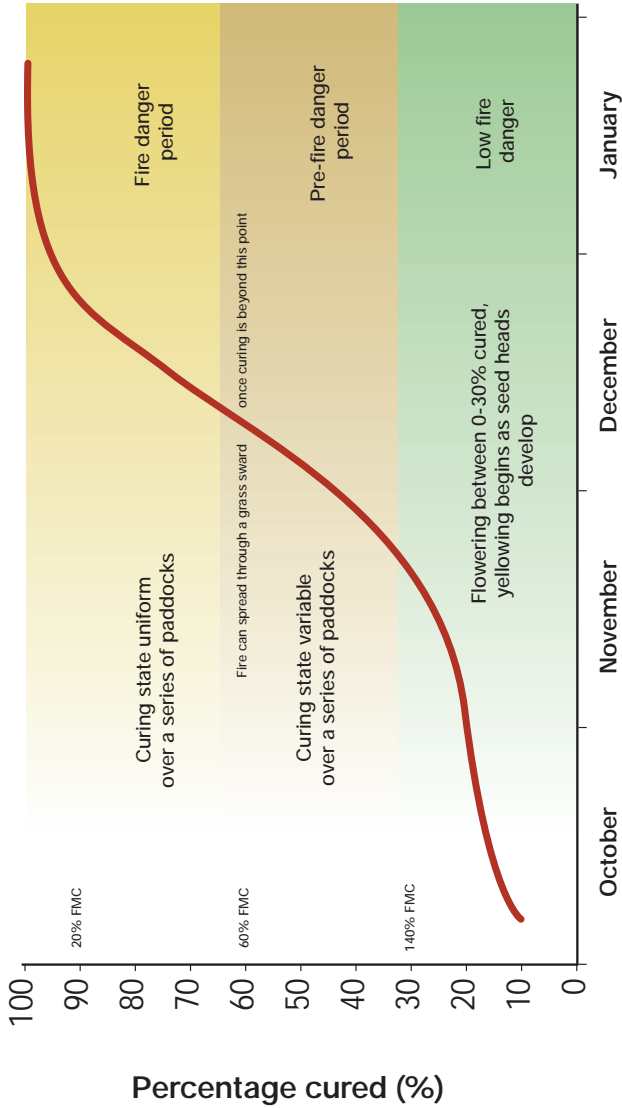
Most crop and pasture species possess a life cycle in which the plant annually dies or becomes dormant and dries out, thereby creating the potential for the uncontrolled spread of fire. This annual drying process is termed curing.

During spring, pasture species undergo a period of growth and would normally complete this in late spring or early summer, depending upon seasonal variables such as rain and temperature. As the period of growth is completed, crops and pastures lose their ability to draw moisture from the soil and consequently begin to desiccate. By high summer the plant is almost devoid of moisture and is said to be completely cured. A generalized progression of curing in south-eastern Australia is shown in Figure 1.





Figure 1: Generalized progression of curing over the summer period in south-eastern Australia



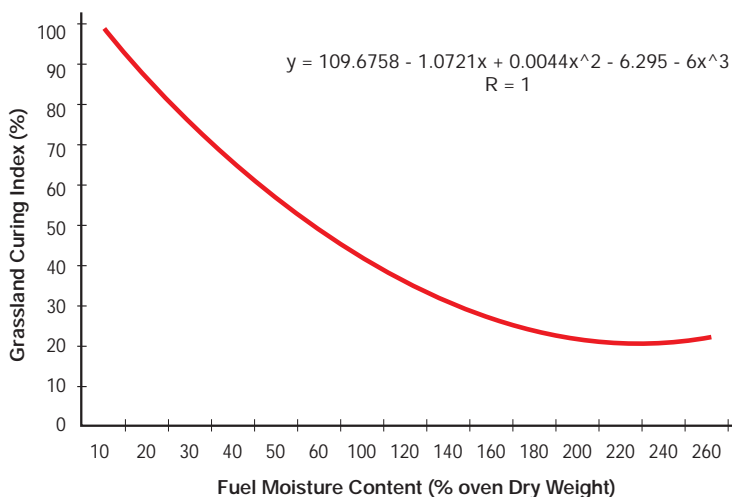
NB: See figure 1 for the relationship between cured (%) and fuel moisture content (FMC).

## How Is Curing Measured?

Using observations made by Parrot and Donald (1970), Barber (1990) developed a mathematical relationship between the Fuel Moisture Content (FMC) and the Grassland Curing Index (Figure 2). FMC is the weight of the water in the plant material expressed as a percentage of the Oven Dry Weight of the plant material. In the guide the corresponding FMC is shown in the top right corner above each photo. Luke and McArthur (1978) related curing, as a percentage, to vegetation colour and the accompanying physical changes (Table 1, see page 7). The changes in colour from green to bleached straw indicate diminishing leaf chlorophyll content. These two methods of assessing the amount of dead grass in a grass sward provide the structural basis for the CFA Grassland Curing Guide.



Figure 2: Relationship between the Grassland Curing Index and Fuel Moisture Content (Barber 1990).





There are several other methods used to determine curing state:

- The most common and reliable being oven dry weighing using a convective oven.
- Field measurements via portable instruments will become more prominent as their accuracy and reliability increase
- Environmental/growth models, using rainfall and temperature data to predict crop and pasture growth and grassland curing, have had limited operational use to date but further investigation and development is continuing.
- Remote sensing instruments are able to calculate grassland curing and have been in use since the mid 1980's. They are becoming a routinely used tool in Australia.

### ***Plant Fuel Moisture Content and Fire Behaviour***

The moisture content of fine fuels such as crops and pastures dramatically affects the ignition potential and spreading characteristics of fire. Moisture affects both these parameters primarily by increasing the specific heat and thermal conductivity of the fuel so that more heat must be absorbed in order for the fuel to reach ignition temperature.

Once ignition has occurred and active combustion is taking place moisture will act as a heat sink and interfere with the preheating of adjacent fuels. As plant moisture decreases, fire intensity and rates of forward spread increase.

Whilst the green component of grassland fuels alter slowly as the physiological state changes, the moisture content of the dead component may fluctuate diurnally due to the influences of temperature, relative humidity, rain and dew.

## Important Notes

- From the time seed heads are fully developed it will take at least six weeks for grasses to become fully cured.
- Late rains delay the maturing process until the onset of hot weather conditions, when curing will proceed rapidly. Lack of spring rains and an early commencement to the summer will cause pasture to cure early but less rapidly.
- Rainfall before 60% cured will prolong grass life and slow curing, while rainfall after 60% cured will not further delay the curing of adult grass.
- Over a series of paddocks, the progression of curing will be patchy, especially during the 40-80% curing period (ie, some parts will cure faster than others). Curing is more patchy with increasing species number and variable topography. Figure 3 gives examples of variation in curing and pasture condition observed at 50-60% cured over several paddocks.
- Above 80% cured, fuel moisture content begins to be significantly influenced by environmental factors such as humidity and temperature.
- The long-term rainfall and temperature patterns, and the growth habits of the individual grass species also influence the progression of curing.





## How to use this Guide

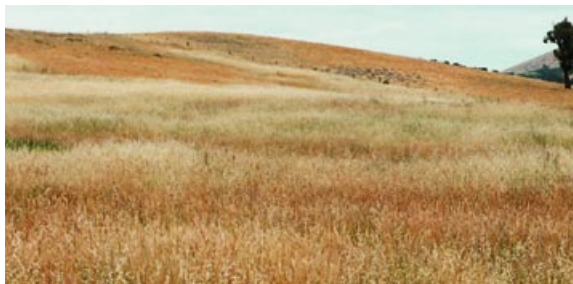
The following photos are a guide only and measurements made based on colour alone are not adequate. Investigation of the physiological characteristics of the grass sward (the descriptions are located beside each photo) is also required.

- It is recommended that observers study the pastures at close quarters at a number of individual sites, before determination of the state of curing, as pasture viewed from the roadside or fenceline may lead to inaccurate estimates.
- Determine the overall colour of pasture and check for seed head development. Match these with the appropriate description in the guide and select the 'percentage cured' figure.
- Ensure that the selected figure is appropriate to other pasture species within the district by carrying out observations at a number of other locations.
- The 'percentage cured' may now be used in an appropriate Model to estimate fire danger and fire behaviour, given certain weather condition.

Table 1: Various Stages of Curing (Barber 1966)

% Cured	Colour	Physiological Change
0	Green	From the beginning of growth to commencement of seed head development
10	Green	Seed heads formed and flowering
20	Yellowish-Green	Seed heads maturing and seed dropping
30	Yellowish-Green	Most seed heads mature and seed dropping
40	Yellow-Green	Most seed heads mature and seed dropping
50-60	Straw- odd patch of green and greenish-yellow	Up to $\frac{1}{2}$ of all stems have dropped their seed, some paddocks will be fully cured, others may be quite green
70-80	Straw-very little green showing anywhere	Most seed heads have dropped their seed, lower third of stalk may be green
90	Straw, odd green gully,	Essentially all seed has dropped, odd individual stalk may be green
100	Bleached	All stalks fully cured, seed heads and stalks break easily

Figure 3: Examples of differences in appearance of paddocks at 50-60% cured.



**NOTE:**

This electronic version is for demonstration and education purposes only and is not to be used to make curing estimates



**Colour**  
Green

**NOTE:**  
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**Seed Development**

From the beginning of growth to the commencement of seed development.

**Colour**  
Green



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**Seed Development**

Seed heads formed and flowering.



**Colour**  
Yellowish-Green

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**Seed Development**

Seed heads maturing and opening from top.

**Colour**  
Yellowish-  
Green



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**Seed Development**

Most seed heads mature and seed dropping.



**Colour**  
Yellow-Green

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**Seed Development**

Most seed heads mature and seed dropping

### Colour

Straw: Odd patch  
of Green or  
Yellowish-Green



### NOTE:

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### Seed Development

Approximately  $\frac{1}{2}$  of all stems have dropped their seed.

Note: Some paddocks will be nearly fully cured, others may be fairly green. (See page 8.)





### Colour

Straw, very little green showing anywhere, some greenness still evident in lower third of stalks. Many stalks fully cured.

### NOTE:

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### Seed Development

Most seed heads have dropped their seed.

### Colour

Straw, odd green gully. Odd individual grass stalks may show some greenness.



### NOTE:

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### Seed Development

All seed has dropped



**Colour**  
Bleached

**NOTE:**

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**Seed Development**

All stalks fully cured, seedheads and stalks starting to break easily.

## References

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