

Climate

Use this section to find out more about the climate of the Belubula River sub-catchment. Learn about rainfall, drought, temperature, frosts, and the variability of our local climate.

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How much rain?

An important measure of rainfall for an area is the **average annual rainfall**. This shows how much rain, on average, a place receives per year. In the Belubula River sub-catchment the southern slopes of Mt Canobolas (State Forest Nursery near Four Mile Creek) have the highest at 1076mm, Millthorpe and Carcoar are intermediate (802 mm and 785mm, respectively) and Blayney has the lowest at 766 mm. It should be remembered that landscape influences rainfall and generally, the higher an area the higher the rainfall. In the Belubula sub-catchment, however, there are rain shadows behind Mt Canobolas and probably Mt Macquarie.

Average annual rainfall gives a general indication of how much rainfall an area receives but it does not show the variation of rainfall that can occur between years or the time of year rain generally falls.

When does it fall?

Annual patterns

Apart from the amount of rain that falls it is also important to know when it falls during the year and how reliable the rain will be.

Our sub-catchment lies in between the predominantly summer rainfall area of northern Australia and the winter rainfall areas of the south. In our district the **seasonal distribution** of rain is, on average, relatively even between summer and winter (Table 1). The influence of each system shifts from year to year - so some years have more winter rain and others a predominant summer pattern.

Table 1

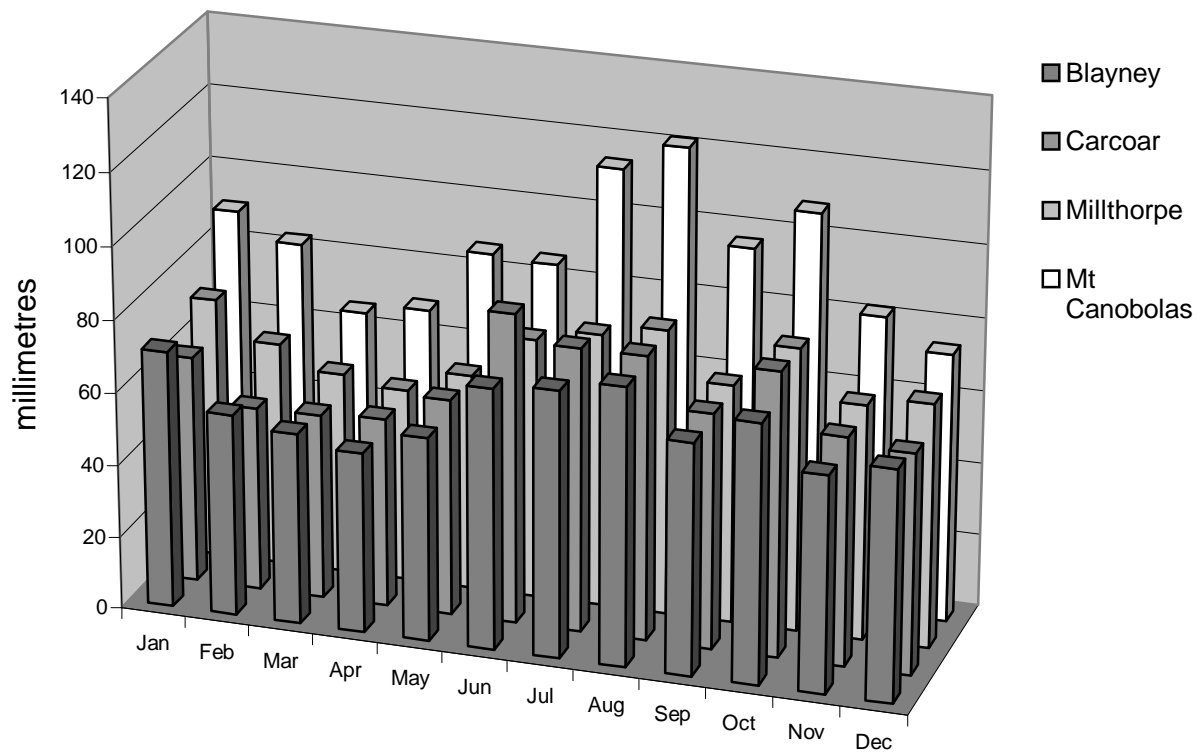
Summer/winter rainfall (mm) for areas of the Belubula sub-catchment. (Bureau of Meteorology)

Location	Summer Rainfall	Winter Rainfall	Winter dominance*
Blayney	190.1	222	1.17
Carcoar	173.9	241.8	1.39
Millthorpe	200.8	225.2	1.12
Mt Canobolas	247	321.3	1.30

* Winter dominance is ratio of the sums of the mean rainfall for the 3 winter months compared to the 3 summer ones. A ratio of 0.5 indicates summer dominance where as 1.5 indicates winter dominance.

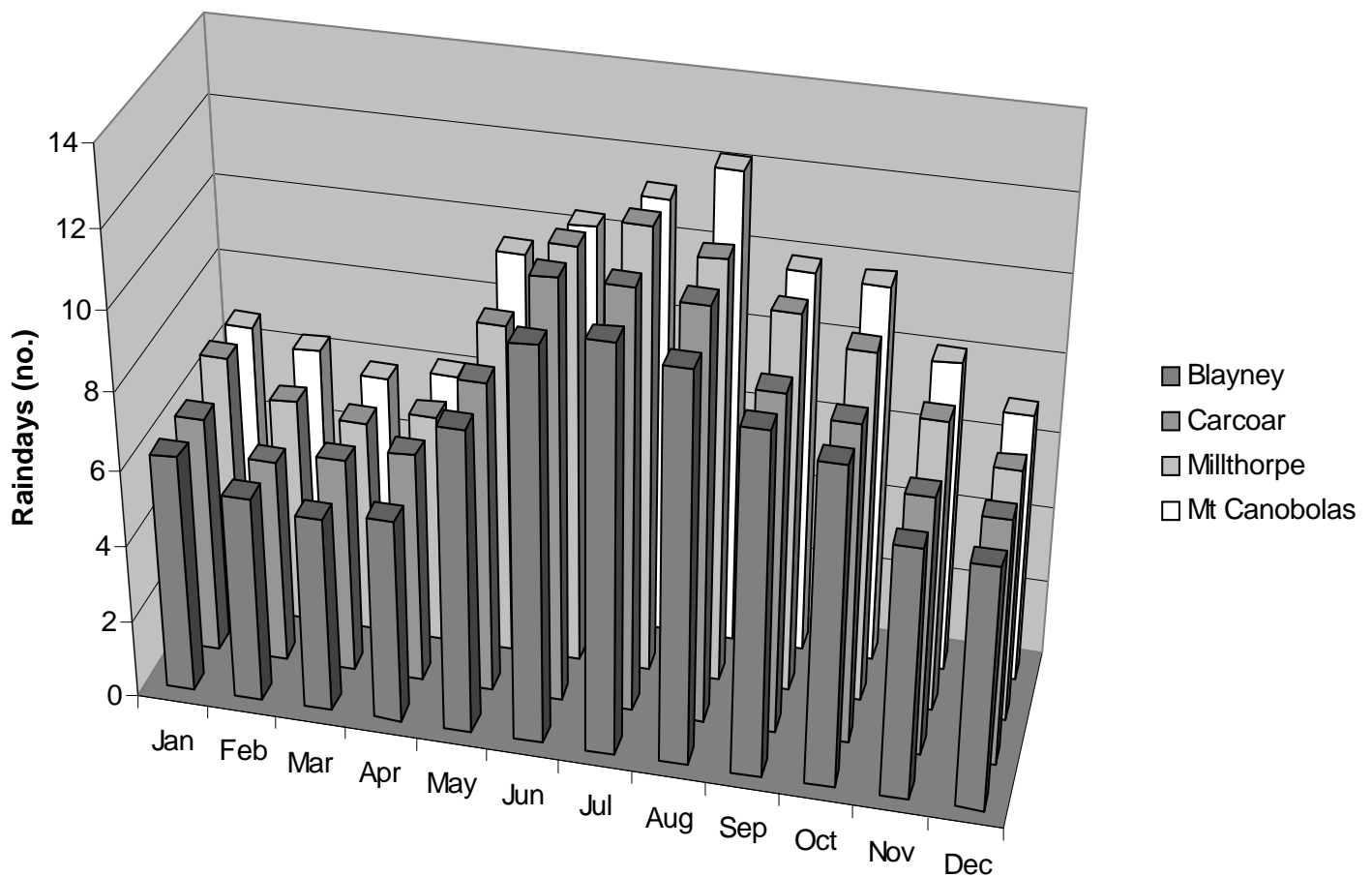
Rainfall information can be reduced further to show the **monthly distribution** of rain throughout the year. The monthly distribution for Blayney, Carcoar, Mt Canobolas and Millthorpe is shown below and shows lower rainfall, generally, in the summer months.

Figure 1
Annual distribution of rainfall (mm) by monthly rainfall means. (Bureau of Meteorology)



The average number of raindays, another representation of distribution, indicates how many days during a period that rain falls in a locality. It can be measured per month, season or for a year. Mt Canobolas has 103 raindays per year, Carcoar has 94, Millthorpe has 100 and Blayney has 91 raindays per year. Raindays are also recorded on a monthly basis and are shown below in figure 2.

Figure 2
Average number of raindays per month for towns in the Belubula sub-catchment.



Reliability

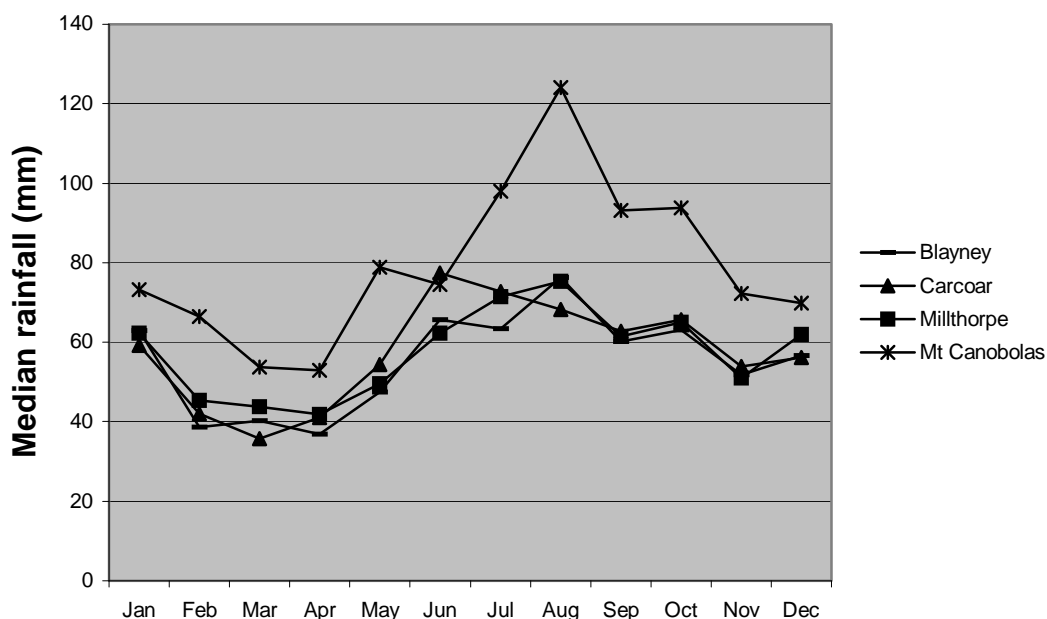
Expressing rainfall as deciles gives an idea of reliability and is a better measure of reliability than the average annual rainfall (see the main climate section of the toolkit for more information on deciles). The percentiles for towns in the Belubula River sub-catchment are shown below (Table 2).

Table 2
The 1st, median and 9th decile for rainfall in Blayney, Carcoar, Millthorpe and Mt Canobolas (Bureau of Meteorology).

Town	1 st decile	Median decile	9 th decile
Blayney	512	751	1018
Carcoar	520	763	1086
Millthorpe	563	793	1111
Mt Canobolas	708	1060	1488

As for other climate data, deciles can be expressed on a monthly basis. The graph below (Figure 3) shows the median decile for locations in the Belubula sub-catchment on a monthly basis.

Figure 3
The median decile rainfall for towns in the Belubula River sub-catchment expressed on a monthly basis.



Drought

Drought is a widely used term to describe periods of low rainfall. More accurate terms are used to describe a drought and these are covered in the main climate chapter. It is important to remember that *the maintenance of ground cover is essential in times of drought*. This should become a major goal for landholders. With at least minimal ground cover and the good root mass that accompanies this, recovery of pastures is much quicker when adequate rains do return. Ground cover protects the farmer's major asset - his soil - from wind and water erosion both during and at the end of a drought. Compaction and loss of soil structure make the problem worse if ground cover is not maintained.

What influences our temperatures?

Local influences

For more detailed information on local influences consult the main climate section of the toolkit. It is important to remember general rules, such as; places that are situated in a valley may experience a greater number of frosts than places higher up. This is because cold air drains at night down slopes and hillsides. Also, wind can make exposed places seem cooler than protected areas. **Clouds** reduce the occurrence of frost by trapping heat at night so places with cloudy nights generally have milder nights with less frosts occurring. Each location is unique and so it is important to get local knowledge for effective land management.

How hot and how cold?

Two measurements of temperature for a location are the **mean annual maximum** and the **mean annual minimum temperatures**. Mean temperatures give an overall indication of how hot or cold it is.

Heat

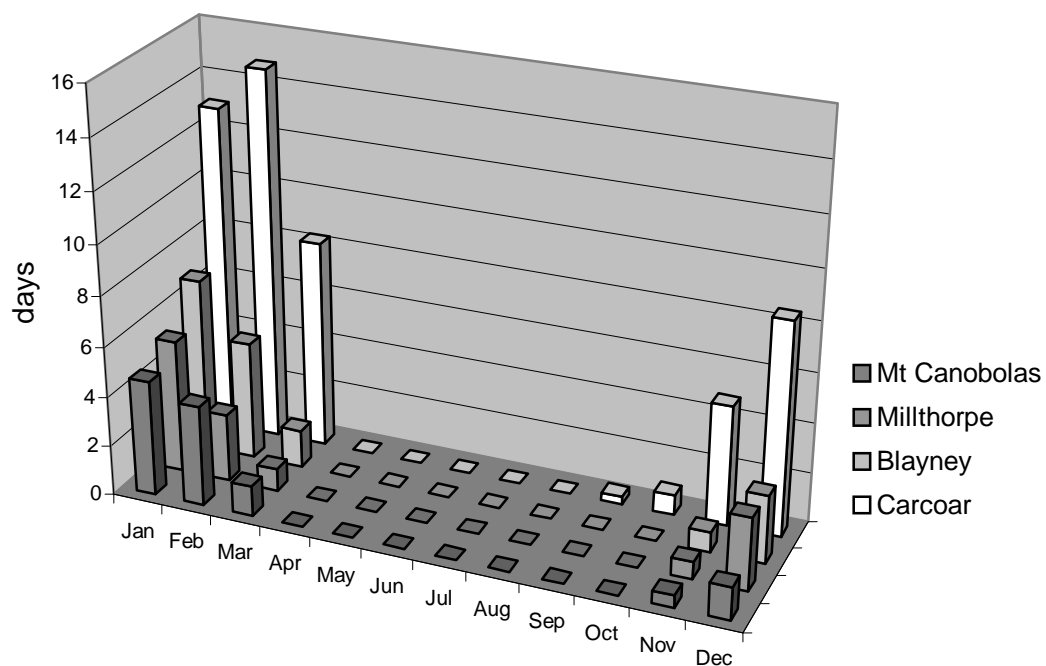
Of the sites in our sub-catchment, Carcoar has the highest average annual maximum temperature whereas the southern slopes of Mt Canobolas have the lowest (Table 3). This difference is likely to be the result of elevation. The **average number of days above 30°C** a location gets each year and the **highest temperature ever recorded** are also measures of how hot a region is. Table 3 (below) shows that Carcoar is hotter than Blayney, Millthorpe and the southern slopes of Mt Canobolas. The average numbers of days above 30°C is also recorded on a monthly basis (Figure 4).

Table 3.

Mean annual maximum and highest ever maximum temperatures and numbers of days > 30°C for towns in the Belubula River sub-catchment.

Location	Mean annual maximum (°C)	Highest ever temp °C	Days > 30 °C
Blayney	18.3	37.5	16.6
Carcoar	20.9	38.9	50.3
Millthorpe	17.7	37.0	12.5
Mt Canobolas	17.2	36.7	11.6

Figure 4
Average number of days the temperature exceeds 30°C for Blayney, Carcoar, Millthorpe and the southern slopes of Mt Canobolas on a monthly basis (Bureau of Meteorology)



Cold

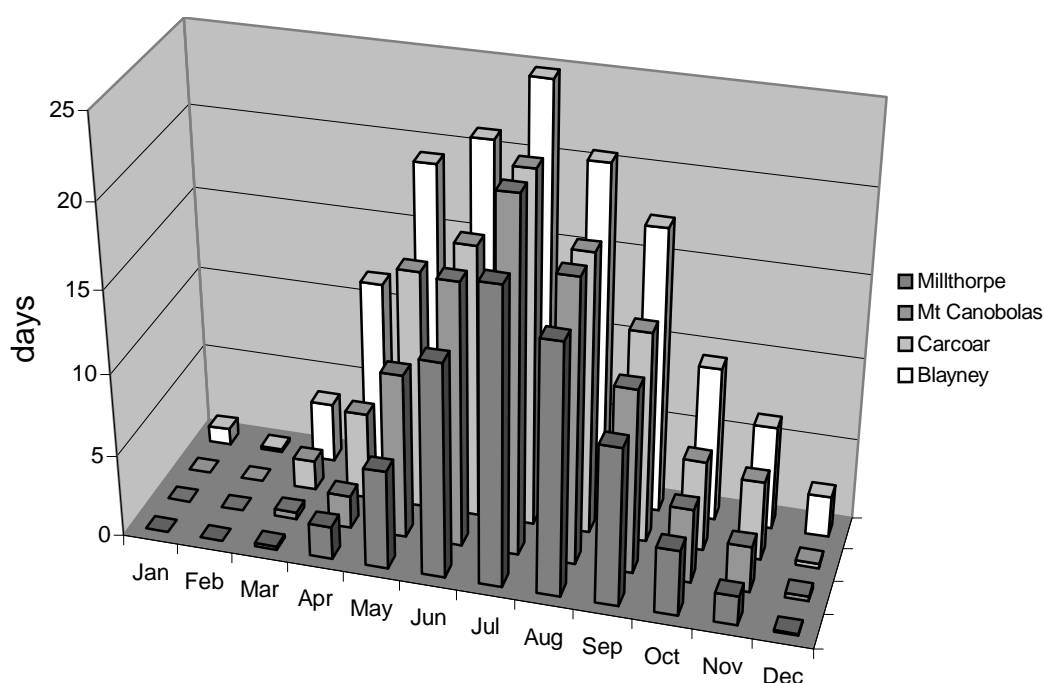
The **mean annual minimum temperature** measures the average minimum daily temperature of a place for the whole year. Table 4 shows Blayney has the lowest mean annual minimum temperature. This is likely to be because Blayney sits in a basin whereas the cold air can drain from the higher Millthorpe and Mt Canobolas. This would also account for Blayney having a greater number of frost days (Table 4). Frosts can occur when temperatures fall below 2 °C and are referred to as 'light frosts'. Light frosts are just as important as heavy frosts as they can damage crops. Frosts that occur when the temperature falls below 0 °C are classed as severe frosts. The severity of frosts can be measured by determining the percentage of frosts that are severe and for Carcoar and Blayney over 60% of frosts are severe (table 4).

The measure of the average number of frost days per year does not tell when the frosts occur. This is important because frosts occurring in spring, summer and autumn can restrict pasture growth on livestock properties and affect horticulture crops and revegetation activities by damaging seedlings in spring or blossoms and fruits later in the year. The number of frosts on a monthly basis are shown in figure 5.

Table 4.
 Lowest ever temperature, no. of frost days, mean annual minimum temperature and % heavy frosts for towns in the Belubula River sub-catchment. (Bureau of Meteorology)

Location	Lowest ever temp °C	Frost days (Days < 2 °C)	Mean annual minimum (°C)	% heavy frosts
Blayney	-10.6	137.8	4.4	62
Carcoar	-8.3	99.5	6.6	63
Millthorpe	-6.6	69.6	6.3	45
Mt Canobolas	-3.3	85.7	6.2	53

Figure 5.
 Average number of days the temperature is at or below 2°C for Blayney, Carcoar, Millthorpe and the southern slopes of Mt Canobolas on a monthly basis (Bureau of Meteorology).



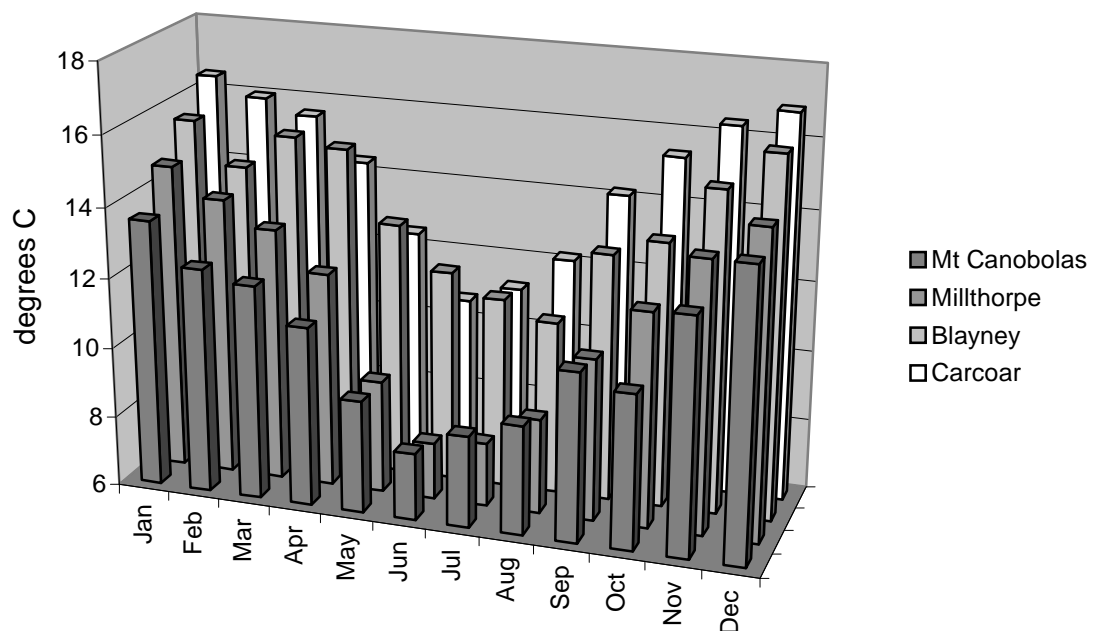
Temperature variability

Maximum and minimum temperatures do not reveal the variations in temperature a place may receive through the seasons and the change in temperature a location may experience between day and night. Temperature varies throughout the year changing with each of the seasons. Changes in temperature between night and day, diurnal temperature variations, have an important effect on plant growth and animal production.

Daily variations

A daily variation is known as the **diurnal temperature fluctuation**. In some locations high daytime temperatures are followed by very cold nights so even on moderately warm days, frosts can occur overnight. Figure 6 (below) shows that Blayney and Carcoar have the greatest diurnal temperature fluctuations throughout the year when compared to Millthorpe and Mt Canobolas.

Figure 6.
The daily diurnal temperature fluctuations Blayney, Carcoar, Millthorpe and the



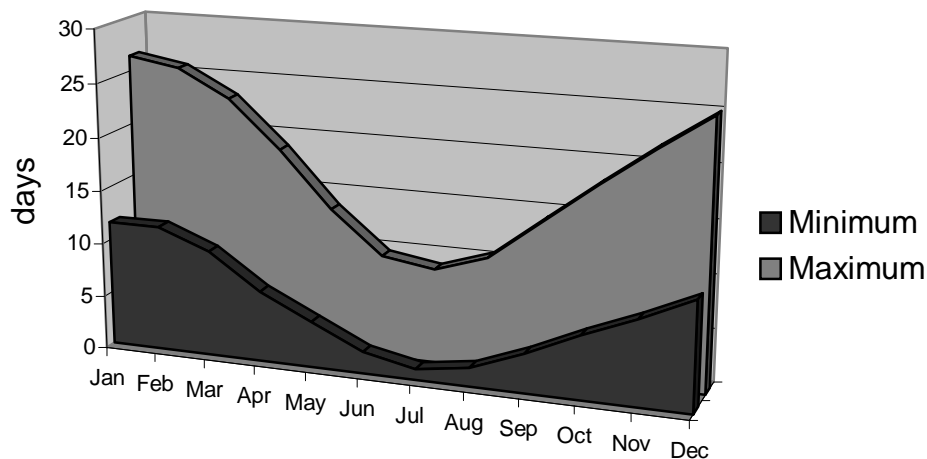
southern slopes of Mt Canobolas on a monthly basis . (Bureau of Meteorology)

Seasonal patterns

As most of the Belubula River sub-catchment is temperate, the seasonal changes in temperature for locations follow four distinct seasons. The warm summer is followed by falling temperatures in autumn, then the coldest period of winter and finally the rising temperatures of spring as the year moves onto the next summer.

This pattern, typical for all places in our district, can be seen for Millthorpe in figure 7 below.

Figure 7.
The seasonal temperature patterns of Millthorpe showing average daily maximum and minimum temperatures for each month. (Bureau of Meteorology)



Direct solar radiation is reduced by cloud cover. Different locations have different amounts of cloud cover which affects the amount of solar energy received. Cloudiness during daytime can reduce temperatures which can in turn slow plant growth and reduce evaporation. Conversely night time cloudiness can keep the environment warmer and so reduce the incidence of frost. Naturally, cloudiness is closely related to raindays. The number of cloudy days (a day where there is predominantly more cloud than clear sky) are shown below in figure 8.

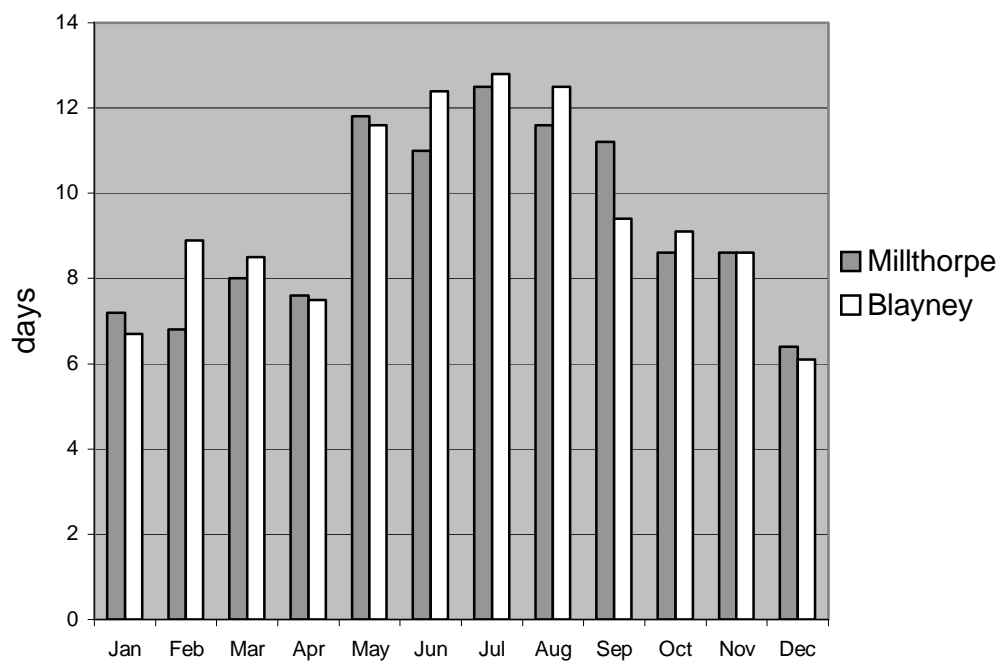
Conclusion

The climate within any sub-catchment is highly variable. Elevation is the main driver of these variations (e.g. the higher the elevation the colder the temperature and the higher the rainfall). Local variation in the landscape, however, can affect climate (e.g. cold air drains into valleys and basins) and that is why Blayney (~ 860m above sea level (ASL)) has lower minimum temperatures than Millthorpe (~965 m ASL). Variations within a local landscape are quite noticeable on a frosty morning; the creek line will have a heavier frost where the top of the ridge 50 - 100 vertical metres higher will have only a light frost or no frost at all.

It is also important, when considering rainfall, to focus on the median value and *not* the mean value. The mean is the average of all records taken for an area whereas the median *the value that occurred the most frequently*.

Remember that the climate data provided in this section should be used only as a guide, unless you live at the specified locations. For a more detailed picture on the climate at your location you should consider keeping records.

Figure 8
Average number of cloudy days for Millthorpe and Blayney on a monthly basis. (Bureau of Meteorology)



References

- Bureau of Meteorology - Australia
www.bom.gov.au