Climate

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

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N.B For temperature comparisons Bathurst Airport, located outside the sub-catchment, is used as Oberon is the only location in the sub- catchment for which temperature data is available

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. The average annual rainfall for locations in the Fish River sub-catchment are in table 1. These figures demonstrate the general rule that the higher the altitiude of an area the higher the annual average rainfall it receives. Other factors, discussed below, can also influence how much rain an area receives.

Table 1
Average annual rainfall and approximate altitude for locations in the Fish River sub-catchment (Bureau of Meteorology)

Town	Oberon	O'Connell	Tarana	Hampton
Rainfall (mm)	844	637	766	946
Altitude (m ASL)	1082	700	760	1080

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.

The Fish River sub-catchment lies in between the predominantly summer rainfall area of northern Australia and the winter rainfall areas of the south. For Oberon, the **seasonal distribution** of rain is, on average, slightly winter dominant (Table 2). This contrasts to Hampton, O'Connell and Tarana that have a slightly summer dominant rainfall pattern. The influence of each system shifts from year to year - so some years have more winter rain and others a predominant summer pattern. Oberons height and location means it may be more winter dominant because it receives rain and snow from cold fronts coming from the south-west in winter and this rain doesn't make it as far as Hampton nor does it fall in places as low as O'Connell and Tarana. Because the other towns miss the winter rainfall that Oberon receives, they rely more on summer rainfall systems for their rain.

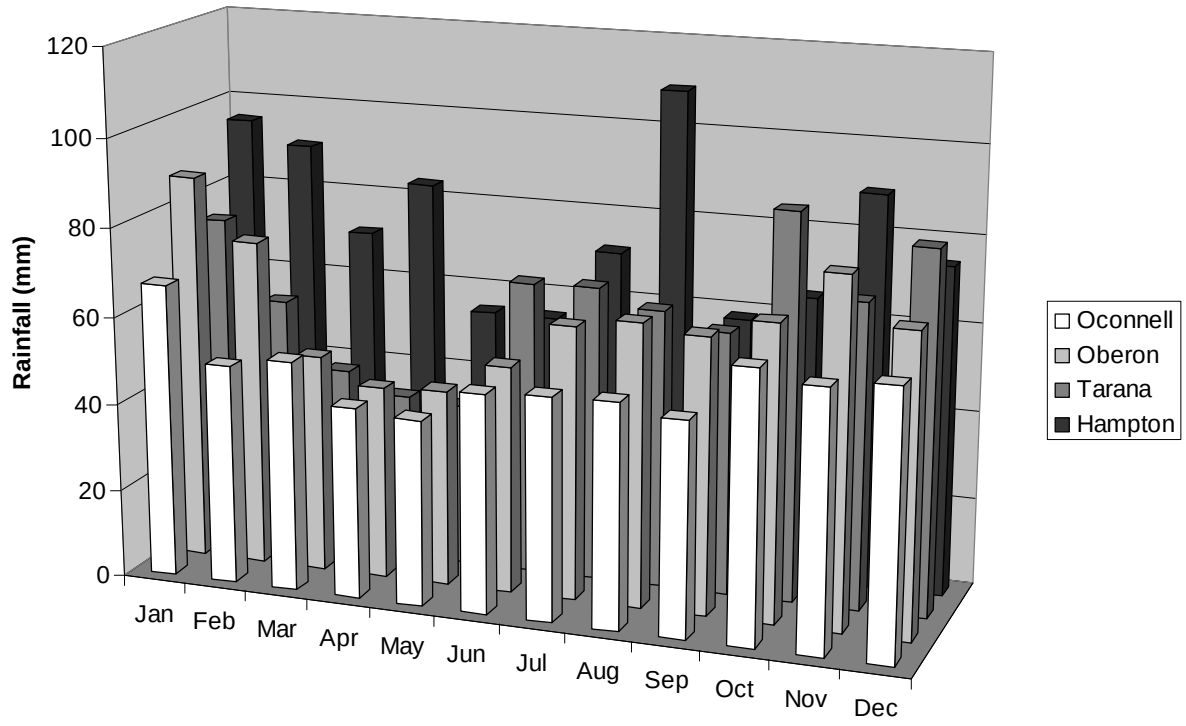
Table 2
Summer/winter rainfall (mm) for areas of the Fish River sub-catchment. (Bureau of Meteorology)

Location	Summer Rainfall	Winter Rainfall	Winter dominance*
Oberon	214	227	1.06
O'Connell	178	151	0.85
Tarana	214	197	0.91
Hampton	261	235	0.90

* 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.

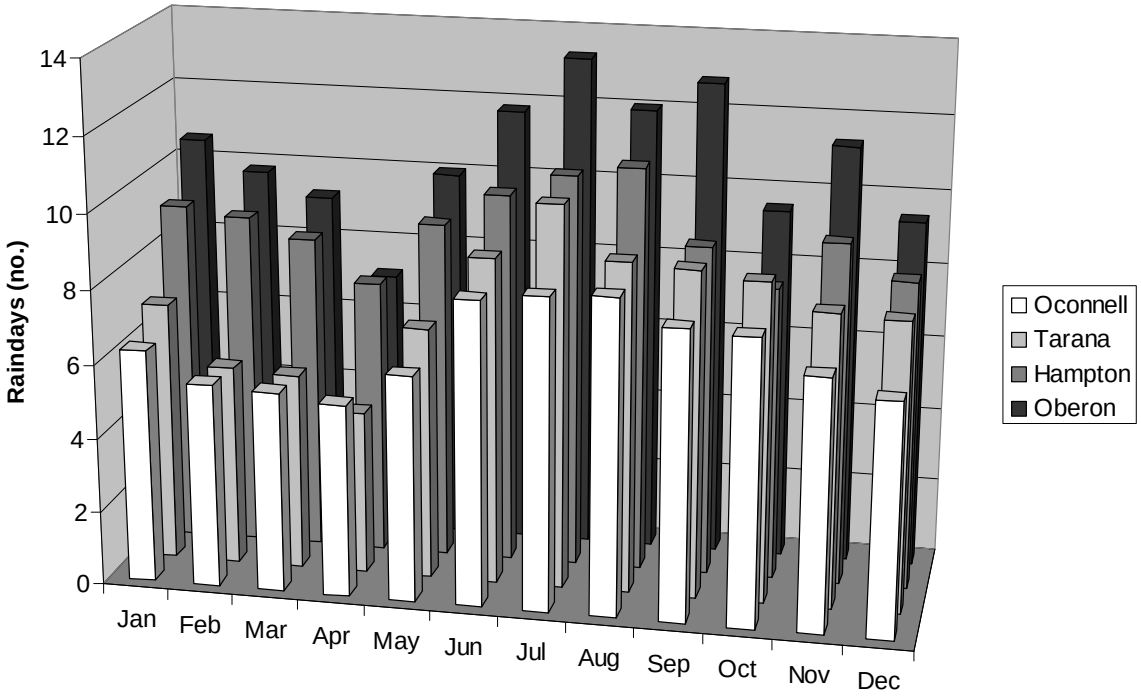
Rainfall information can be reduced further to show the **monthly distribution** of rain throughout the year. The monthly distribution for locations in the Fish River sub-catchment is shown below (figure 1) and shows how rainfall differs over the seasons.

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. Oberon has 123 raindays per year whereas Hampton has 109, Tarana has 93 and O'Connell has 83. Raindays are recorded on a monthly basis and are shown below in figure 2.

Figure 2
Average number of raindays per month for towns in the Fish River sub-catchment.
(Bureau of Meteorology)



Reliability

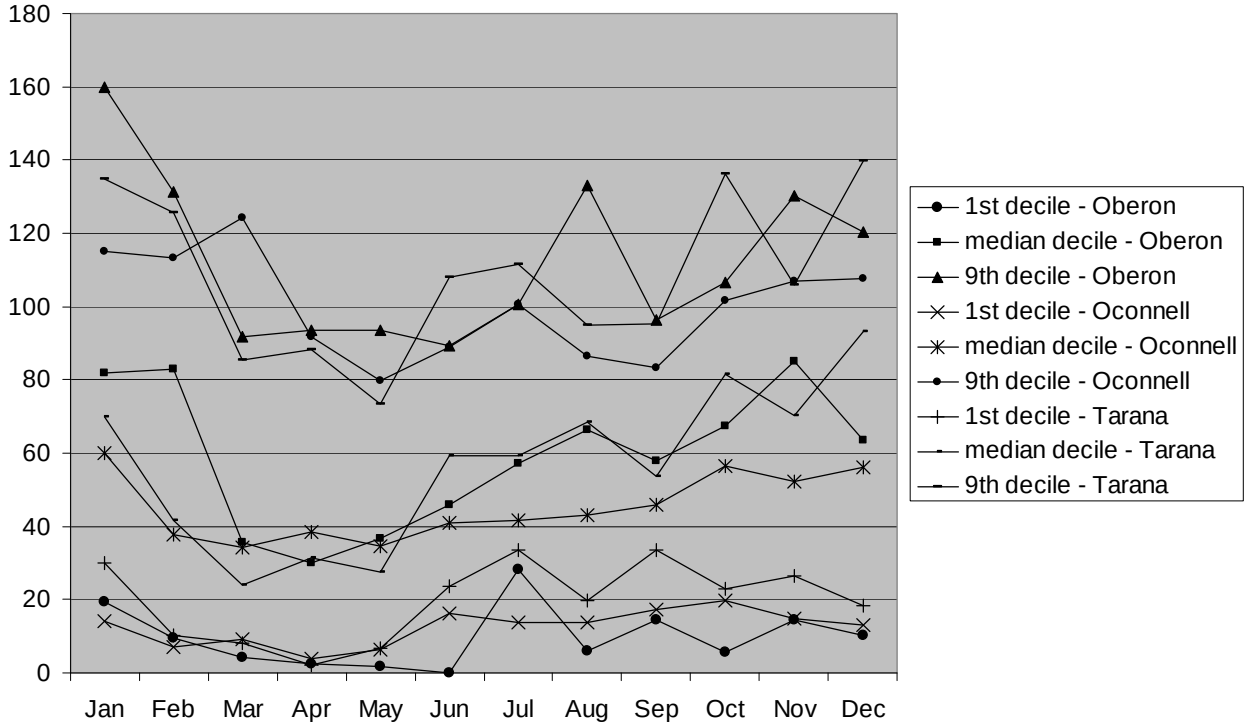
Expressing rainfall as **deciles** gives an idea of reliability and is a better measure of reliability than the average annual rainfall (see the main climate section of the toolkit for more information on deciles)**.** The percentiles for towns in the Fish River sub-catchment are shown below (Table 3).

Table 3
The 1st, median and 9th decile for rainfall (mm) for locations in the Fish River sub-catchment (Bureau of Meteorology).

Town	1st decile	Median decile	9th decile
Oberon	537	824	1110
O'Connell	428	638	845
Hampton	657	908	1229
Tarana	543	782	968

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 Fish River sub-catchment on a monthly basis.

Figure 3
The median decile rainfall for towns in the Fish 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.

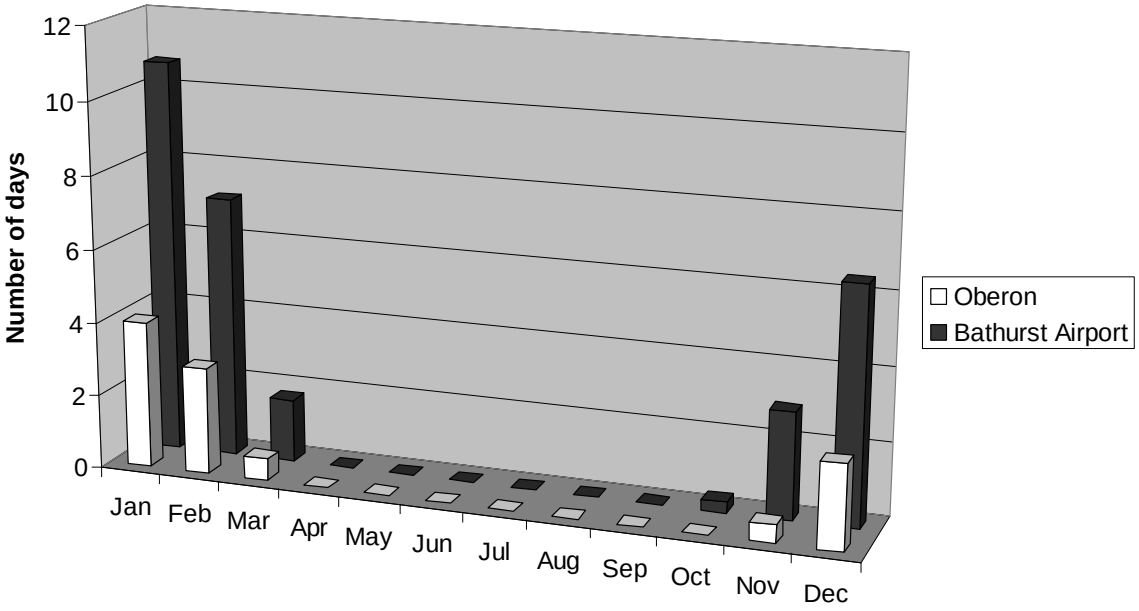
Heat

Bathurst Airport (~ 730 m ASL) has a higher average annual maximum temperature than Oberon (Table 4). This difference is due to elevation and demonstrates the principle that temperatures fall as altitude increases. 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 4 (below) reinforces the above principle as it shows that Bathurst Airport has a greater number of days where the temperature exceeds 30°C than does Oberon and the highest ever temperature recorded is also greater for Bathurst Airport. The average numbers of days above 30°C is also recorded on a monthly basis and is shown below (Figure 4).

Table 4.
Mean annual maximum temperature, highest ever maximum temperatures and number of days over 30C maximum for Bathurst Airport and Oberon (Bureau of Meteorology).

Location	Mean annual maximum (°C)	Highest ever temp °C	Days > 30 °C
Bathurst Airport	20.1	40.7	29.1
Oberon	16.9	35.9	10.3

Figure 4
Average number of days the temperature exceeds 30°C for Bathurst Airport and Oberon on a monthly basis (Bureau of Meteorology).



Cold

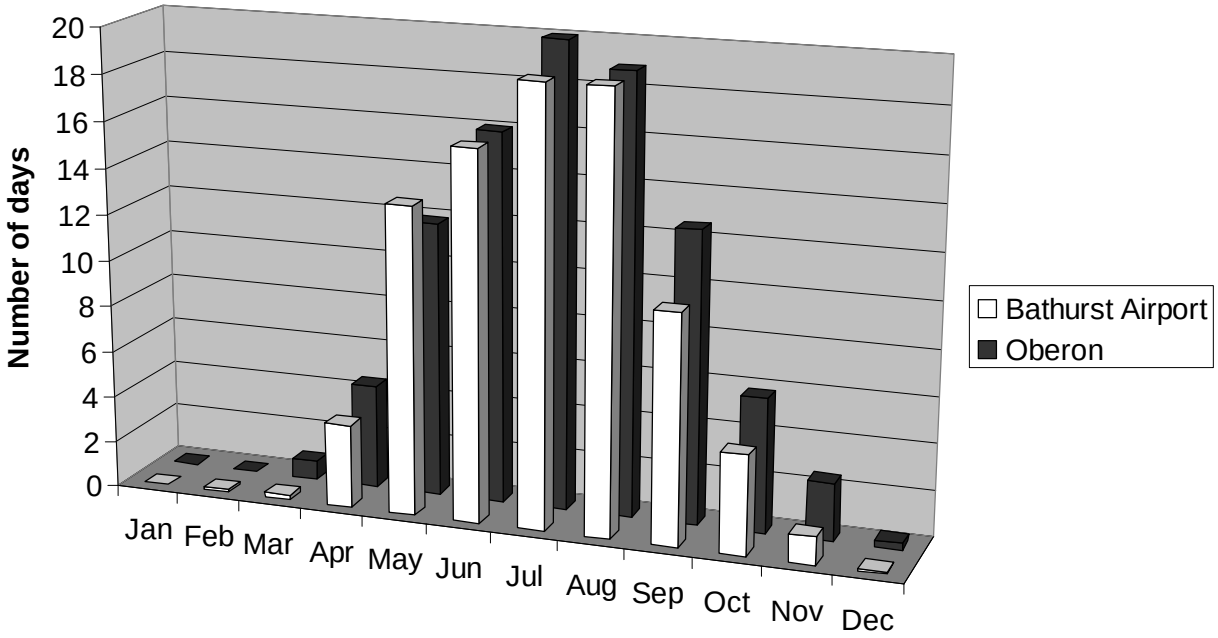
The **mean annual minimum temperature** measures the average minimum daily temperature of a place for the whole year. Table 5 shows that Oberon has a lower annual minimum temperature than Bathurst Airport. This is likely to be because Oberon is located at a higher altitude (~1050 m above sea level (ASL)) than Bathurst Airport (~750 m ASL). Oberon also has a higher number of frosts than Bathurst Airport (Table 5) and this is likely to be a combination of greater altitude *i.e.* cooler, but also because of local topography. Oberon is located on the side of a valley where cold air drains and settles overnight where as Bathurst Airport is on a rise from where cold air can drain. Frosts can occur when temperatures fall are at or 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 both locations over 60% of frosts are severe (table 4).

Table 5.
Lowest ever temperature, no. of frost days, mean annual minimum temperature and % heavy frosts for towns in the Fish River sub-catchment. (Bureau of Meteorology)

Location	Lowest ever temp °C	Frost days (Days < 2 °C)	Mean annual minimum (°C)	% heavy frosts
Bathurst Airport	-7.3	86.2	6.7	58
Oberon	-8.7	93	5	58

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 is shown in figure 5.

Figure 5.
Average number of days the temperature is at or below 2°C for Bathurst and Oberon on a monthly basis (Bureau of Meteorology).



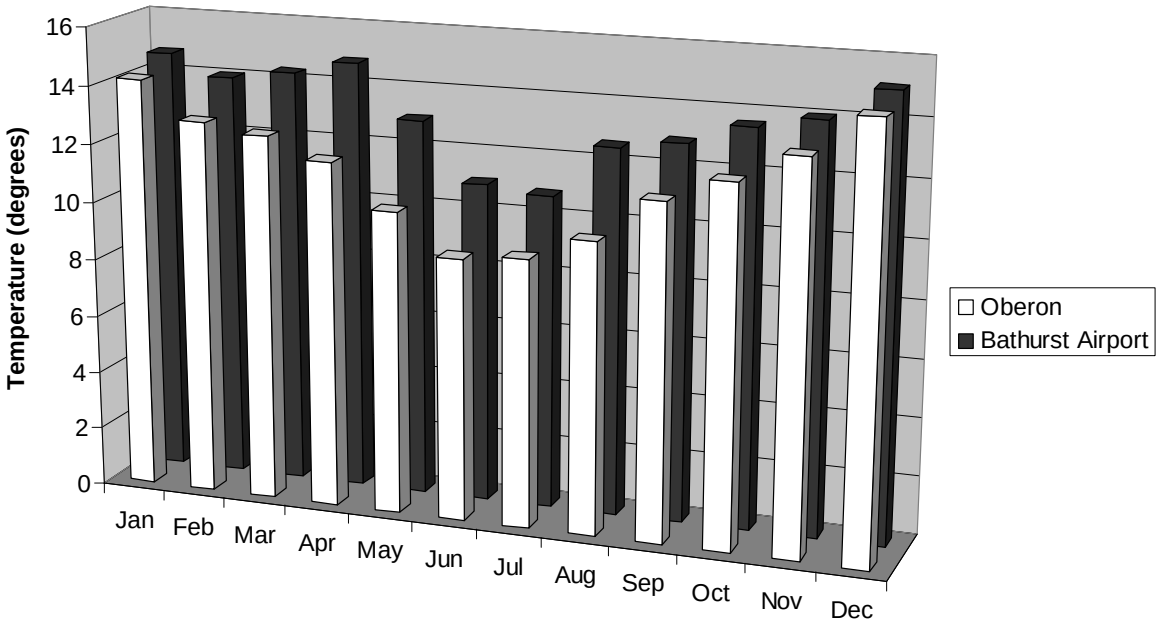
Temperature variability

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, daily 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 Bathurst Airport has greater temperature fluctuations than Oberon.

Figure 6.
The daily diurnal temperature fluctuations for Bathurst Airport and Oberon on a monthly basis . (Bureau of Meteorology)

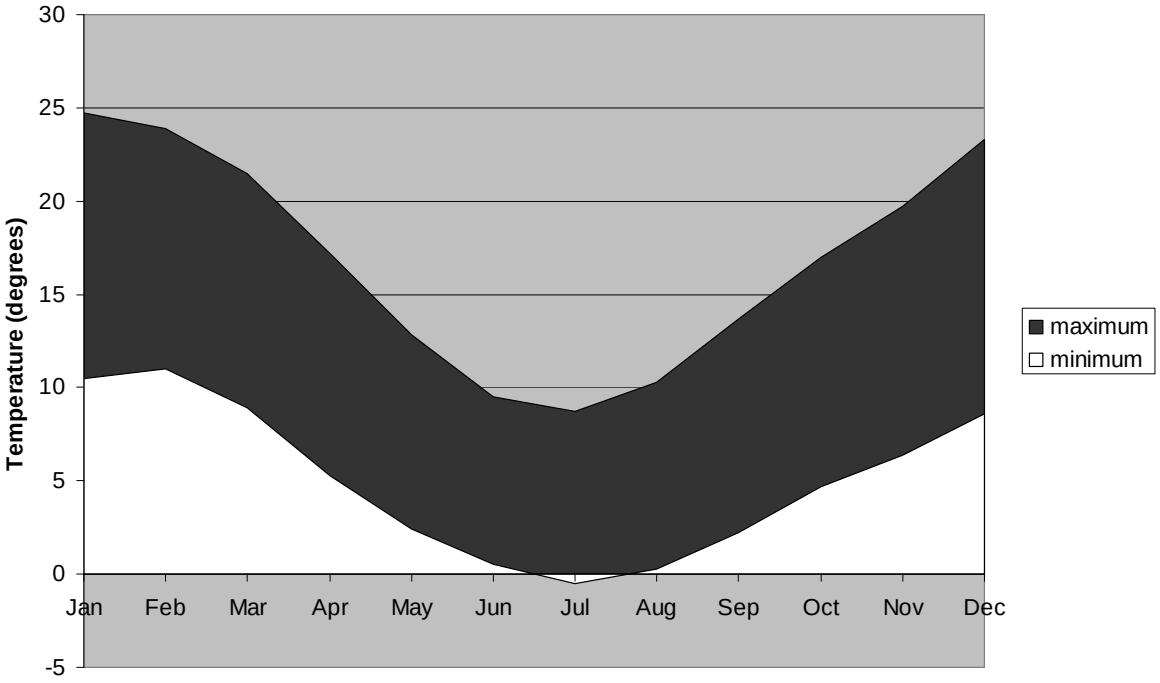


Seasonal patterns

As most of the Fish 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.

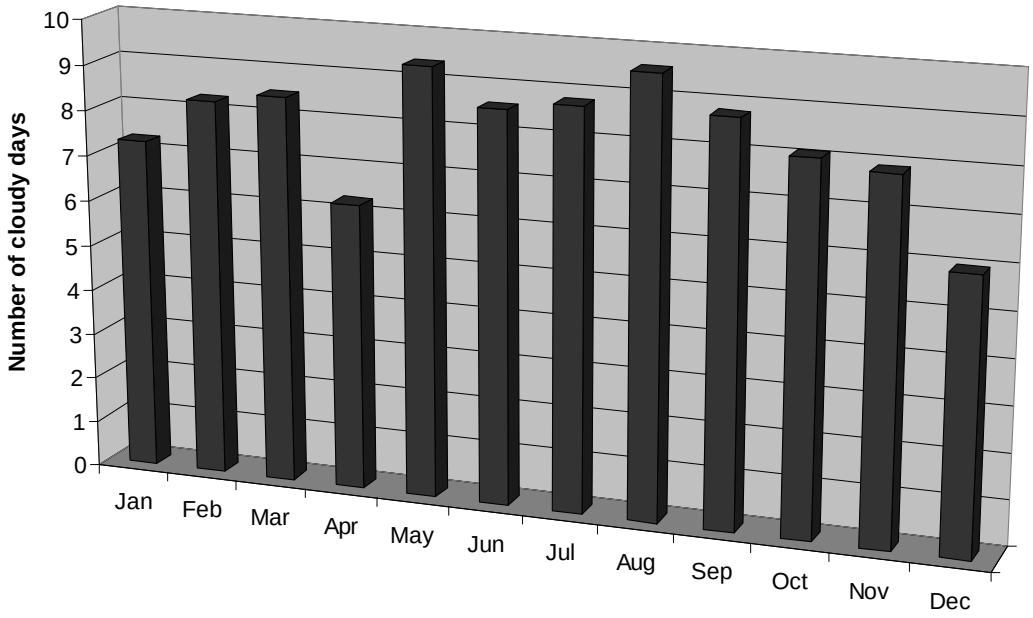
This pattern, typical for all places in our district, can be seen for Oberon in figure 7 below.

Figure 7.
Average maximum and minimum temperatures for Oberon on a monthly basis.



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 (figure 8) for Oberon.

Figure 8.
The numbers of cloudy days for Oberon on a monthly basis . (Bureau of Meteorology)



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 also affect climate (e.g. cold air drains into valleys and basins). 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 is *the value that occurred 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.

References

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