

## **2017 Frosts ,Temperatures and Rainfall compared to the longer term winter averages**

Anecdotally the winter of 2017 has seemed to be very dry, with many frosts and fine, sunny days. The following report represents an analysis of available 15 minute weather data collected in Tallong Park Estate and South Marulan and from rainfall observers in the Tallong region.

### **Frosts**

Frost nights have been identified as occurring when the temperatures fall below 0°C but of course it depends on the number of hours over which that occurs as they are unlikely if only occurring for one or two 15 minute periods. Data from Tallong Park and Peppertree Quarry were analysed for the winters occurring from 2012 to 2017 inclusive. In Table 1 there is a listing of all the occurrences of nights in winter when frost was observed in Tallong Park. Some frosts developed in the late evening and spanned midnight while others developed in the early hours of the morning. The number of frost nights at both locations is noted in Table 2 together with the average intensity and extreme intensities for each winter season. In Tallong Park it is interesting to note that while more frosts were observed in 2015 (43), the average frost temperature was higher than in 2017 (35) by 0.2°C. On average the lowest frost temperatures were observed in 2014 at both locations but there were fewer frost nights observed during that 3 month winter period (see Figure 1 also). In 2017 the lowest extreme minimum over the 6 years of records was observed at -6.8°C on July 2nd in Tallong Park but the lowest extreme minimum was observed in 2014 at the Peppertree Quarry. The 2017 observation coincided with a -10.4°C observation at the Goulburn Airport. Overall there were fewer frosts with higher temperatures observed at Peppertree Quarry in South Marulan than in Tallong Park. However, even within Tallong Park itself, the local terrain exerts a strong influence with more frosts observed in the lower areas than on the hill locations.

### **Temperatures**

Average minimum, maximum and daily winter temperatures are also calculated (Table 3). Overall it appears that 2015 was the coldest winter with all temperature statistics being equal to, or the lowest over the 6 years of observations. The average minimum temperature in 2017 was the equal lowest (Figure 2) and the average maximum the equal highest which confirms that clear sunny and milder days followed frosty mornings (Figure 3). In general Tallong minimum temperatures were lower than at the Peppertree Quarry in South Marulan, and the maximum temperatures higher.

### **Rainfall**

The stable weather patterns which lead to frosty nights and milder days also were associated with lower than average rainfall observations over the region (Table 4). Across

the regional network of observations stations in general the 2017 winter totals were from 45 to 57% lower than the long term averages. However July 2017 rainfall was very low with the monthly total rainfall from 5 to 48% lower than the longer term averages across the network of stations.

### **Bureau of Meteorology**

In June this year the Bureau of Meteorology made the following observations:

The subtropical ridge is a belt of high pressure systems that circles the southern hemisphere midlatitudes—the region of the globe between about 23°S and 66°S. It is a dominant influence on the climate of Australia. The belt of high pressure is associated with blue skies for the parts of the country that sit beneath it. During our summer it tends to sit over southern Australia, bringing generally dry weather. But in the winter it usually migrates north, allowing cold fronts and low pressure systems to move up from the Southern Ocean and bring rainfall to southern Australia.

This winter, that hasn't happened. Instead of a steady progression of rain-bearing fronts, southern Australia has seen high pressure system after high pressure system, bringing clear, dry days. The subtropical ridge has remained firmly down south: it's currently sitting near Albury when it should be closer to Tamworth. Pressure across much of southern Australia is averaging more than 7 hPa above normal.

Not only is the subtropical ridge further south than it should be, but it's stronger as well: the strongest we've seen in June since 1944, which was the driest June on record for southern Australia. Almost all of South Australia and Victoria have recorded their highest June average pressure values on record, and some stations—such as Horsham and Mount Gambier—recorded their highest daily pressure values at any time of the year for at least 10 years.

The strength and location of the ridge means southern Australia has been missing out on the winter westerlies.

All the above observations from the Tallong region should be compared and contrasted to the overall summary of Bureau of Meteorology observations across Australia for the whole of this winter:

- Overall, winter national mean temperature very much above average; fifth-warmest on record for winter
- Exceptionally warm winter daytime temperatures for Australia
- Mean maximum temperature warmest on record nationally, and for Queensland, Western Australia, and the Northern Territory; second-highest for South Australia, and third-highest for New South Wales
- Mean minimum temperatures above average nationally, but cooler than average in the southeast, particularly during June
- Rainfall very much below average overall; ninth-driest winter on record nationally, and for New South Wales and Western Australia
- June particularly was very dry for the southeast; record low rainfall for Victoria, and second-driest on record nationally

Table 1

<b>Start date:</b>	<b>Start Time</b>	<b>No. of 15 Minute periods</b>	<b>End date:</b>	<b>End Time</b>
070612	2130	11	080612	0830
080612	2115	12	090612	0830
090612	2300	5	100612	0815
100612	0015	33		
200612	0330	21		
280612	0045	5		
040712	0200	27		
050712	0545	10		
060712	0445	13		
070712	2215	8	080712	0845
170712	0515	12		
190712	2045	14	200712	0830
300712	0300	21		
310712	2200	6	010812	0800
010812	2115	12	020812	0800
020812	0015	32		
040812	0045	13		
050812	0230	4		
070812	0330	18		
100812	0600	7		
130812	0515	11		
140812	0230	22		

150812	0700	1		
190812	2300	5	200812	0815
200812	2215	8	210812	0745
210812	0015	31		
260812	2330	3	270812	0745
280812	0045	28		
290812	0545	1		
310812	2100	13	010912	0745
030613	0700	4		
040613	0700	4		
190613	2300	2	200613	0830
200613	2330	3	210613	0845
210613	2230	7	220613	0100
220613	0015	4		
010713	0230	24		
020713	0300	4		
030713	2330	3	040713	0245
070713	0500	9		
090713	0415	15		
240713	2215	8	250713	0815
260713	2300	5	270713	0800
010813	0030	33		
020813	0230	13		
090813	0015	30		
160813	0415	15		
260813	0415	14		
080614	0615	7		
180614	2345	2	190614	0545
220614	0330	19		
020714	0415	15		
030714	2230	7	040714	0530
080714	2130	11	090714	0300
120714	2345	2	130714	0845
130714	1945	18	140714	0900
140714	0015	36		
190714	2145	5	200714	0815
200714	2400	1	210714	0845
210714	0015	35		
220714	0430	13		
020814	2145	6	030814	0845
030814	2215	8	040814	0830
040814	2115	12	050814	0800
050814	2115	12	060814	0800
060814	0015	32		

070814	2345	2	080814	0800
110814	1945	18	120814	0900
120814	2230	1	130814	0215
130814	2300	5	140814	0815
140814	0015	33		
150814	0045	29		
160814	0215	3		
010615	1945	18	020615	0815
020615	2015	16	030615	0845
030615	2130	11	040615	0845
040615	0015	35		
060615	0545	10		
070615	0230	14		
100615	0445	13		
110615	0400	18		
120615	0030	34		
130615	0500	13		
190615	2300	5	200615	0345
200615	2200	9	210615	0845
210615	0015	35		
220615	0400	20		
270615	0200	15		
280615	0230	8		
290615	0030	31		
010715	0500	13		
020715	2230	7	030715	0900
030715	1845	22	040715	0615
040715	2215	8	050715	0845
050715	0015	35		
060715	0100	9		
080715	0030	34		
090715	0145	8		
150715	0230	19		
160715	0145	7		
180715	2130	7	190715	0530
190715	2345	2	200715	0930
200715	0015	38		
210715	0100	3		
280715	2345	2	290715	0830
030815	2400	1	040815	0830
070815	2215	8	080815	0615
080815	2300	5	090815	0915
090815	0015	37		
110815	2315	3	120815	0400

150815	0330	15		
180815	2145	10	190815	0345
200815	0345	15		
210815	0130	16		
300815	0215	21		
310815	0515	2		
120616	2015	16	130616	0845
140616	0530	3		
150616	0045	33		
160616	0415	18		
250616	2100	13	260616	0900
280616	0500	12		
290616	2330	3	300616	0745
030716	0700	4		
040716	0145	27		
050716	0145	7		
150716	2345	2	160716	0830
240716	0500	16		
300716	0545	9		
080816	0630	4		
120816	0045	30		
150816	0315	5		
260816	2215	8	270816	0745
290816	0300	12		
310517	2115	12	010617	0815
010617	2315	4	020617	0830
020617	2345	2	030617	0800
030617	0015	32		
210617	0530	11		
220617	2400	1	230617	0600
250617	0100	17		
260617	2215	8	270617	0915
280617	2245	3	290617	0845
300617	2000	17	010717	0915
010717	2045	14	020717	0900
020717	2145	10	030717	0830
030717	0015	34		
060717	2330	3	070717	0845
080717	0300	19		
110717	0215	24		
120717	2245	6	130717	0800
140717	0300	1		
160717	2200	8	170717	0545
210717	2045	14	220717	0845

250717	0645	4		
270717	0400	19		
290717	0400	16		
010817	2330	3	020817	0845
020817	2400	1	030817	0330
030817	0015	14		
140817	0545	7		
190817	2345	2	200817	0745
220817	0400	16		
240817	0130	4		
250817	2345	2	260817	0745
270817	2100	13	280817	0800
280817	2330	3	290817	0800
290817	0015	32		
300817	0100	28		
310817	2230	7		

Table 2

467 Mulwaree Drive, Tallong				Peppertree Quarry		
Year	Average Frost temperature (°C)	Extreme Minimum temperature (°C)	No. Of Frost Nights	Average Frost temperature (°C)	Extreme Minimum temperature (°C)	No. Of Frost Nights
2012	-1.7	-5.3	30	-1.0	-3.2	17
2013	-1.3	-3.5	18	-0.8	-2.6	9
2014	-2.2	-6.2	25	-1.8	-4.7	9
2015	-1.6	-5.1	43	-1.1	-3.4	23
2016	-1.6	-4.1	18	-0.8	-1.8	10
2017	-1.8	-6.8	35	-1.2	-4.3	23

Table 3

467 Mulwaree Drive, Tallong				Peppertree Quarry		
Year	Average Daily temperature (°C)	Average Minimum temperature (°C)	Average Maximum temperature (°C)	Average Daily temperature (°C)	Average Minimum temperature (°C)	Average Maximum temperature (°C)
2012	6.5	1.3	12.6	7.1	2.5	12.3
2013	7.5	2.5	13.4	8.2	3.8	12.8
2014	7.0	2.0	13.1	7.5	3.5	12.3
2015	6.0	0.8	12.3	6.9	2.4	12.0
2016	7.5	3.1	12.7	8.2	4.6	12.4
2017	6.6	0.8	13.4	7.4	2.6	12.8



Table 4

Station	Observation period	June	July	August	Total	June	July	August	Total
		2017				Long term average			
Black	2004-2017	37.9	6.4	41.7	86.0	105.7	30.8	55.2	191.7
Darda	1999-2017	30.0	5.3	41.6	76.9	79.1	34.1	51.5	164.7
Woods	2001-2017	36.0	17.0	30.0	83.0	88.0	35.2	56.3	179.4
Leese	1999-2017	31.0	10.5	52.0	93.5	76.9	37.2	51.0	165.0
Botticchio	1998-2017	44.5	2.0	54.0	100.5	83.1	42.1	63.5	188.7
Clark	2006-2017	39.8	5.4	52.4	97.6	98.6	33.2	60.7	192.5
Peppertree	2012-2017	27.5	14.5	42.5	84.5	86.5	35.9	55.5	177.9

Figure 1

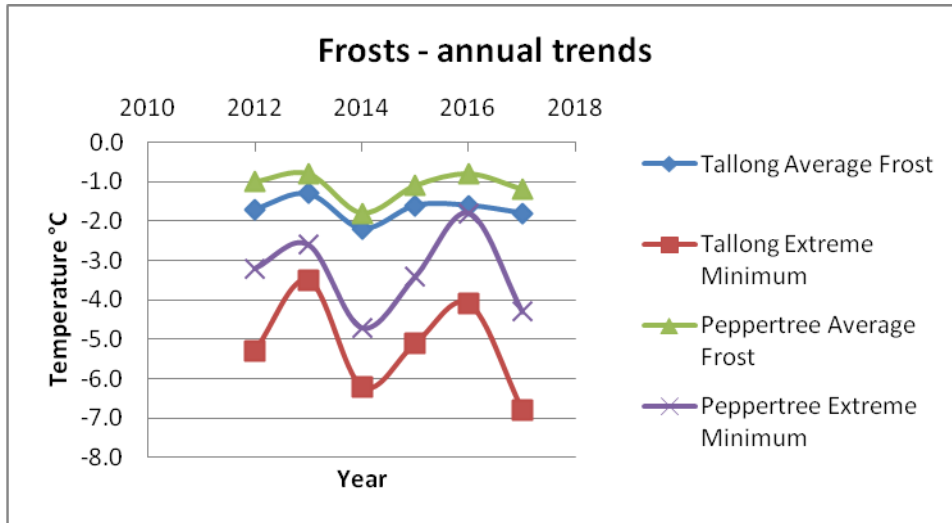


Figure 2

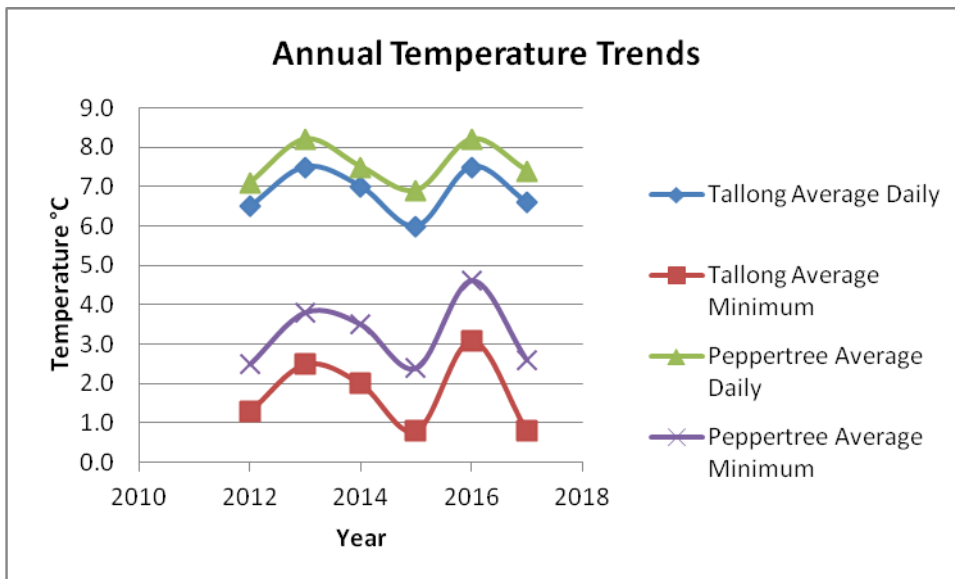


Figure 3

