

Marlborough meteorological services

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1 Introduction

The funding that the Marlborough Research Centre (MRC) allocates for meteorological services allowed for the provision of a wide range of services to the Marlborough community in the 2022–23 year, as follows:

- Provision of monthly meteorological summaries and press releases to local media.
- Publication of monthly meteorological summaries for the Blenheim and Dashwood Awatere weather stations on the MRC website.
- Provision of 11 monthly Met Report articles for inclusion in Winepress, the official magazine of Wine Marlborough.
- Access to the Grovetown Park weather station for education groups.
- Provision of data to the National Institute of Water and Atmospheric Research (NIWA) National Climate Database.
- Maintenance of a database of meteorological data for the Blenheim and Awatere stations by The New Zealand Institute for Plant and Food Research Limited (PFR).
- Provision of weather data to support many of the research projects that are conducted by PFR, Lincoln University, University of Auckland and Te Pukenga.
- Provision of data to organisations associated with the wine industry, e.g. Bragato Research Institute, Sustainable Winegrowing New Zealand, Te Pukenga Viticulture & Wine programme, Wine Marlborough and many wine companies.
- Provision of data for use by the wider agricultural and horticultural industries, e.g. Fruitfed Supplies, Farmlands Co-Operative Society Limited, Fruition Horticulture (SI) Limited.
- Talks to educational and community groups; University of the Third Age (3 July 2022), Lincoln University Viticulture & Oenology students (4 April 2023), Seddon Lions Club (25 May 2023).

Detailed summaries of data from the Blenheim and Awatere weather stations can be accessed on the MRC website www.mrc.org.nz.

2 Weather data for the 2022–23 year

Table 1 summarises the main weather parameters for the 2022–23 year, for the Blenheim weather station located at the Grovetown Park campus of the MRC.

Table 1. Blenheim weather summary for the 12 months from July 2022 to June 2023.

	LTA Mean °C	22/23 Mean °C	LTA Mean Max °C	22/23 Mean Max °C	LTA Mean Min °C	22/23 Mean Min °C	LTA GDD	22/23 GDD	LTA PET mm	22/23 PET mm	LTA Rain mm	22/23 Rain mm	LTA Sun hours	22/23 Sun hours
July	8.0	8.9	13.2	13.3	2.8	4.4	9.2	15.5	36.1	31.6	68.8	220.6	161.9	116
August	9.2	10.4	14.3	15.0	4.0	5.8	18.4	46.2	49.6	49.2	63.2	112.4	184.2	156.2
September	11.2	11.6	16.2	16.1	6.0	7.1	52.8	64.5	72.8	68.3	52.5	38.6	196.1	195.4
October	13.2	12.9	18.4	18.0	7.9	7.8	102.8	99.4	103.0	109	56.1	16.8	231.1	247.7
November	14.9	16.5	20.0	21.3	9.7	11.7	145.5	194.2	122.7	128.6	50.2	72.6	239.8	257.1
December	16.9	16.8	21.9	21.4	11.8	12.2	213.3	211.5	139.4	118.2	48.4	48.8	248.9	234.2
January	18.2	18.0	23.6	22.6	12.8	13.3	252.3	247.4	144.9	121.3	41.4	60.4	265.6	211.7
February	17.9	18.8	23.2	23.4	12.5	14.1	222.7	245.7	114.4	111	48.8	40.2	229.5	193.9
March	16.1	16.6	21.5	22.4	10.6	10.7	190.0	204.8	99.2	102.5	41.0	55.6	230.2	247
April	13.5	14.3	18.9	19.5	8.1	9.2	108.0	129.6	64.8	56.3	48.6	35.8	193.4	159.4
May	11.2	12.7	16.6	17.4	5.9	7.9	55.2	87.5	45.8	38.7	59.1	82.4	176.4	139
June	8.8	9.7	13.9	14.8	3.6	4.6	18.2	23.9	33.0	29.4	66.0	22	150.1	167.2
Mean–Jul to Jun	13.2	13.9	18.5	18.8	8.0	9.1								
Total–Jul to Jun							1388.4	1570.2	1025.7	964.1	644.1	806.2	2507.3	2324.8
LTA Jul to Jun comparison		+0.7°C		+0.3°C		+1.1°C		113%		94%		125%		93%
Mean–Sep to Apr	15.2	15.7	20.5	20.6	9.9	10.8								
Total–Sep to Apr							1287.4	1397.1	861.3	815.2	387.0	368.8	1834.6	1746.4
LTA Sep to Apr comparison		+0.5°C		+0.1°C		+0.9°C		108%		95%		95%		95%

LTA – Long-term average Rainfall, Temperature, Sunshine, GDD – growing degree-days (1986–2022), PET – potential evapotranspiration (1996–2022).

2.1 Temperature

The mean temperature for the 12 months from 1 July 2022 to 30 June 2023 was 13.9°C; 0.7°C above the long-term average (LTA), and the same mean temperature as in the previous 12 months (2021–22). Nine months in the 2022–23 year recorded above the LTA and 3 months below the LTA (Table 1).

The 2022–23 year is now the third equal warmest July to June year for Blenheim, in the 91-year period from 1932–33 to 2022–23. In the 2022 report the increase in the annual mean temperature for Blenheim was presented graphically. This indicated that over the period 1932–33 to 2021–22 that Blenheim's mean annual temperature had risen by 1.17°C over the 90-year period. However, the change in annual temperature integrates all 12 months and does not elucidate whether some months or seasons are warming faster than others.

To examine the seasonal increases in temperature, four comparisons are presented based on a 3-monthly seasonal basis. Figures 1 to 4 display the mean temperatures for spring (September,

October, November), summer (December, January, February), autumn (March, April, May) and winter (June, July, August) over a 91-year period. Spring (Figure 1) and autumn (Figure 3) temperatures have increased by very similar amounts over the 91 years (1.13°C and 1.07°C respectively). Summer temperatures (Figure 2) have only increased by 0.5°C over the 91 years. The exceptionally warm mean temperature over the summer of 1934–35 is slightly reducing the slope of the summer trend line. Winter (Figure 4) temperatures have increased by 2.14°C over the 91 years.

When we examine the seasonal mean temperatures for Blenheim it is very clear that the temperatures over winter have warmed to a much greater extent than the temperatures over the other three seasons. This warming winter trend has also been clearly demonstrated in previous reports where we have shown that the number of ground frosts recorded annually in Blenheim has dramatically reduced from an average of 109 in 1932 to only 35 in 2022. Warming temperatures over winter and spring tend to give rise to earlier budburst of plants. While the frequency of frost is decreasing, with an earlier date of budburst the risk of frost damage to newly emerging shoots in spring does not necessarily decrease.

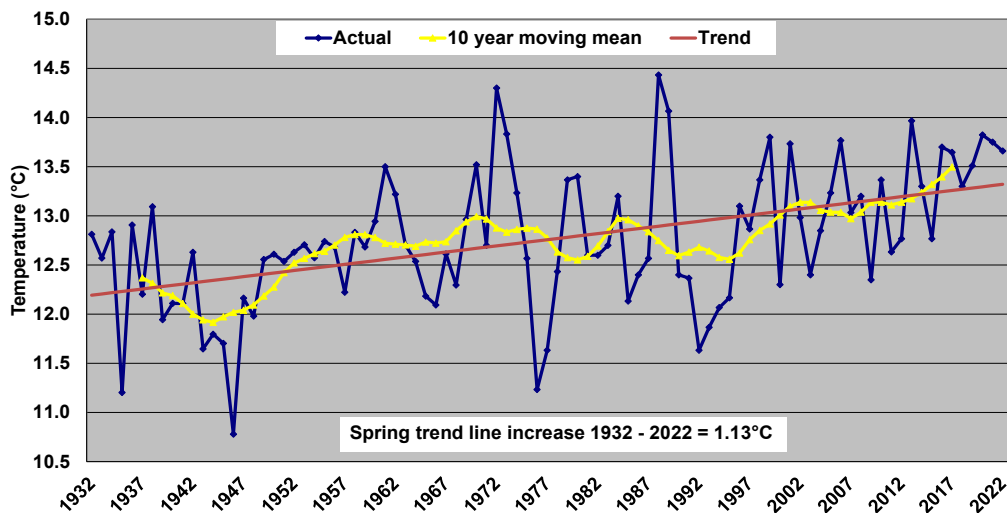


Figure 1. Mean spring temperatures in Blenheim over the 91 years 1932 to 2022.

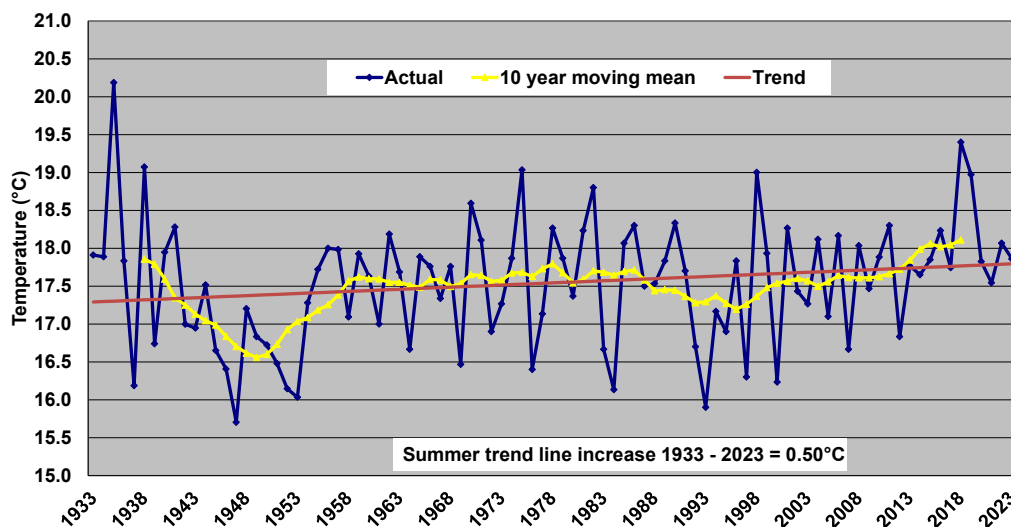


Figure 2. Mean summer temperatures in Blenheim over the 91 years 1933 to 2023.

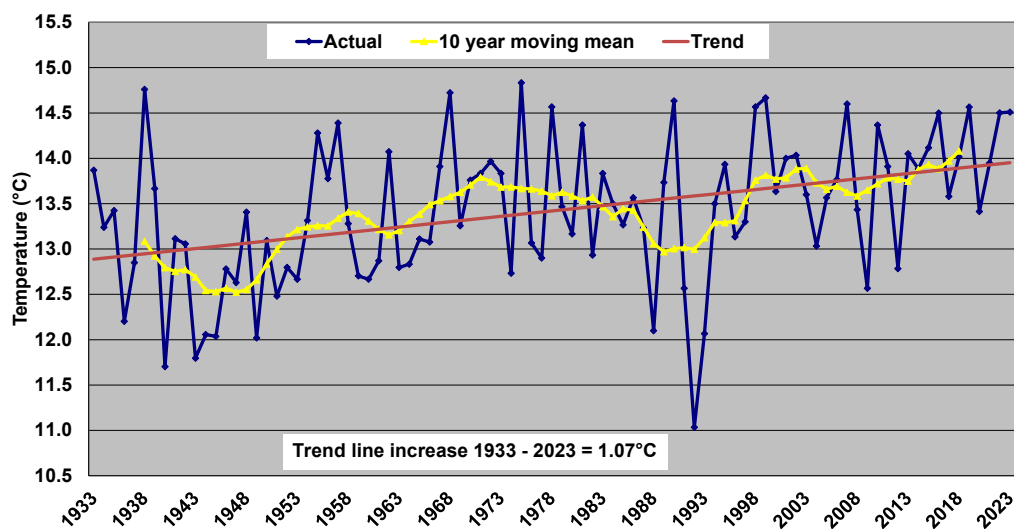


Figure 3. Mean autumn temperatures in Blenheim over the 91 years 1933 to 2023.

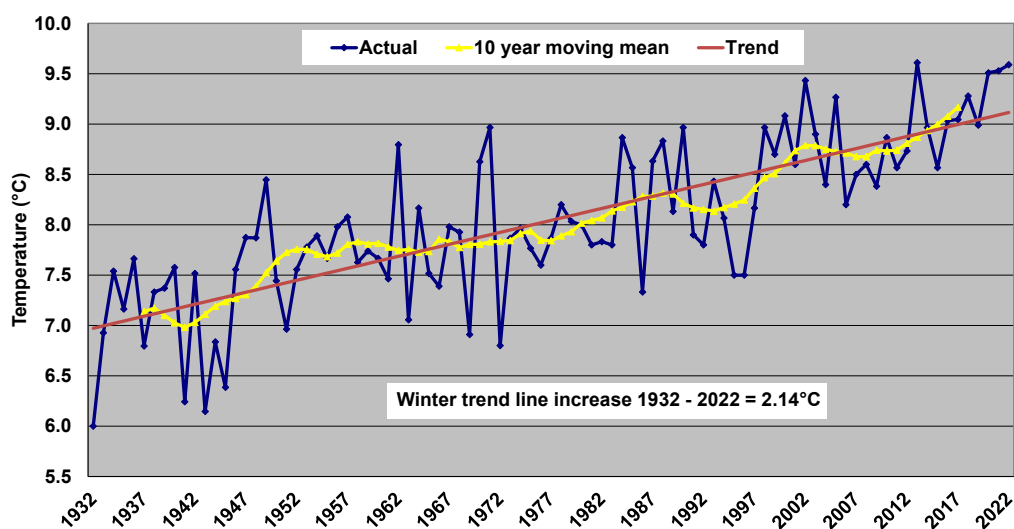


Figure 4. Mean winter temperatures in Blenheim over the 91 years 1932 to 2022.

2.2 Sunshine

Total sunshine for the 12 months from 1 July 2022 to 30 June 2023 was 2324.8 hours (Table 1), 93% of the LTA. Eight of the 12 months recorded lower than average sunshine hours. This 12-month period recorded 177.6 hours less sunshine than in 2021–22 and 281.9 hours less sunshine than 2020–21. The 2022–23 total was 456.2 hours lower than the highest total ever total recorded in 2015–16.

2.3 Rainfall

Total rainfall for the 12 months July 2022 to June 2023 was 806.2 mm (Table 1 & Figure 5). This was 125% of the LTA (644.1 mm). This is the eighth highest July to June total on record over the 93 years 1930–31 to 2022–23. However, only 6- of the 12-months recorded above average rainfall.

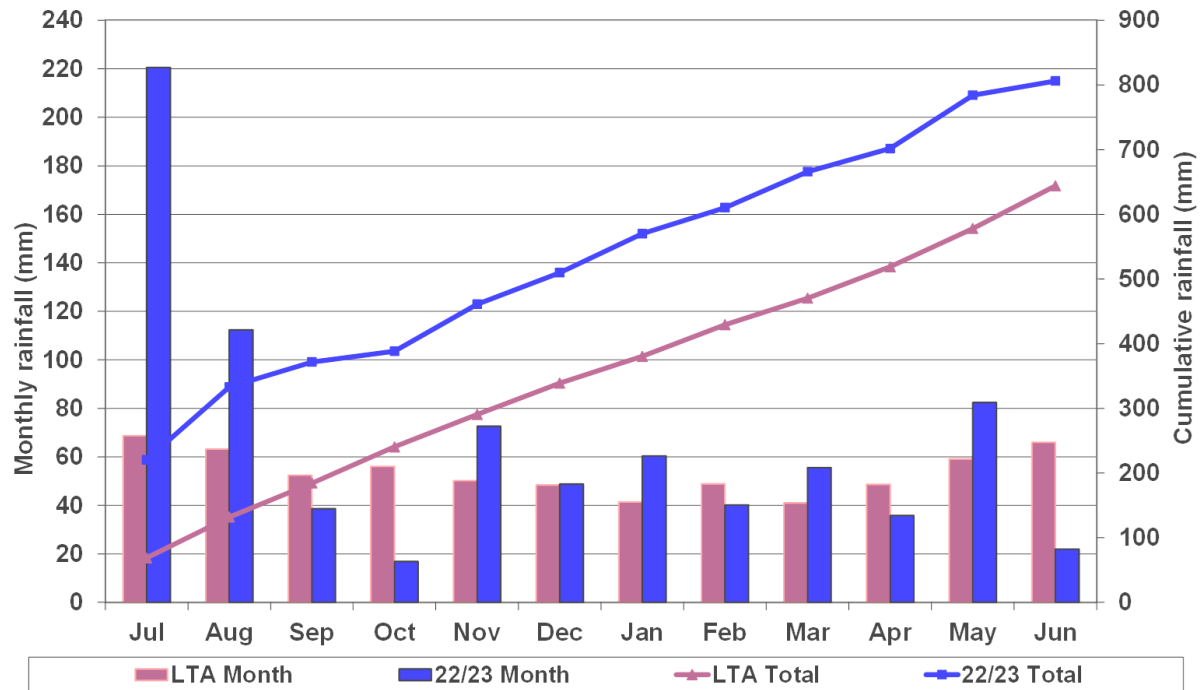


Figure 5. Blenheim monthly and annual rainfall for the 12 months July 2022 to June 2023.

The July 2022 rainfall total of 220.6 mm was 342% of the LTA. The July total has become the highest rainfall for any month over the 93 years 1930 to 2022 and it is the first time that Blenheim’s monthly rainfall exceeded 200 mm. The previous highest monthly total was 191.5 mm recorded in September 1943. Normally when a monthly rainfall record is broken it is only by a few mm. However, in the case of July 2022, the old record was smashed. From January 1930 to July 2022 was a total of 1111 months, maybe the climate’s way of dialling an emergency?

Table 2 presents the mean, the highest and lowest monthly and annual rainfall totals on record for Blenheim, over the 93 years 1930 to 2022. Blenheim’s mean monthly rainfall only varies from a low of 41.0 mm for March, to a high of 68.8 mm for July. However, the mean monthly values hide the fact that there can be a very large variation in the rainfall for any particular month from year to year. It is not uncommon for Blenheim to receive very high rainfall in one month and for that to be followed by very low rainfall the next month, or vice-versa.

Table 2. Highest, lowest, mean monthly and annual rainfall totals on record for Blenheim over the 93 years 1930 to 2022.

Month	LTA Mean (mm)	Highest (mm)	Highest Year	Lowest (mm)	Lowest year
January	41.4	167.0	1985	0.0	1978
February	48.8	181.4	2018	1.0	1973&1983
March	41.0	118.0	1979	2.8	1969
April	48.6	173.0	1962	1.0	1992
May	59.1	182.6	1948	4.0	2008
June	66.0	154.9	1943	8.0	1974
July	68.8	220.6	2022	9.9	1930
August	63.2	171.6	1990	4.6	1969
September	52.5	191.5	1943	3.0	1951

Month	LTA Mean (mm)	Highest (mm)	Highest Year	Lowest (mm)	Lowest year
October	56.1	161.0	2001	2.3	1961
November	50.2	154.6	1999	2.8	2015
December	48.4	131.6	2010	0.8	1934
Annual	644.1	1003.4	1995	381.6	2015

Long-term average – LTA.

Many people in Marlborough complained about the rain over the 2022–23 year. While Blenheim's 12-month rainfall total was well above average, some other regions recorded much higher annual totals. Table 3 presents monthly rainfall for the seven main New Zealand wine regions. PFR monitors the climate in each of these regions as part of the VineFacts newsletter service provided to New Zealand Winegrowers (NZW). Gisborne and Hawke's Bay had some exceptionally high monthly rainfall totals, especially in February 2023 associated with Cyclone Gabrielle. Both these regions recorded their highest totals for the 43 years 1980–81 to 2022–23.

Table 3. Monthly rainfall in New Zealand's seven main wine regions over the 12-months July 2022 to June 2023.

Month 2022-23	Gisborne (mm)	Hawke's Bay (mm)	Wairarapa (mm)	Nelson (mm)	Marlborough (mm)	North Canterbury (mm)	Central Otago (mm)
July	94.4	112.2	195.7	236.8	220.6	176.8	76.4
August	70.8	97.7	65.8	192.2	112.4	48.6	65.4
September	212.4	142.4	88.6	77.8	38.6	30.8	4.8
October	47.3	64.5	43	13.2	16.8	19.6	42.2
November	81.2	93.2	76	100	72.6	122.2	46.4
December	78.2	49.6	109	36.8	48.8	65.4	29
January	252.1	187.1	76.4	73.2	60.4	50	9.8
February	460.3	277.1	106.2	72.2	40.2	51.4	45.8
March	44.8	51.5	93	44	55.6	115.4	43.2
April	103.1	32	84.8	100.2	35.8	49	51.4
May	69.7	27.3	80.4	209.8	82.4	18.4	59.4
June	369.9	174.6	23.2	74.6	22	44.7	26.6
Annual	1884.2	1309.2	1042.1	1230.8	806.2	792.3	500.4
LTA	1009.9	784.8	787.2	950.3	644.1	631.5	417.0
2022-23 % of LTA	187%	167%	132%	130%	125%	125%	120%

Long-term average – LTA.

2.4 Wind-run

The 12 months July 2022 to June 2023 recorded average daily wind-run of 199.5 km (Table 4). This is the lowest annual average daily wind-run total over the 27 years 1996 to 2022 and the first time the annual average has fallen below 200 km. Four months during the year (September, December, January, April) recorded their lowest wind run totals over the 27-year period. Blenheim's annual wind-run has markedly decreased over the 27 years of observation (Figure 6). While the LTA annual wind-run over the 27-year period is 248.2 km, the last year to have exceeded the LTA was 2009–10.

Table 4. Blenheim average monthly wind-run for the 12 months July 2022 to June 2023.

Month	Average Monthly 2022–2023 (km)	LTA Monthly 1996–2022 (km)
July	193.9	224.4
August	213.8	231.1
September	212.1	273.9
October	248.2	286.5
November	254.4	290.0
December	186.1	277.1
January	177.8	268.0
February	212.6	246.6
March	201.6	239.0
April	155.2	218.8
May	168.3	215.5
June	170.4	219.2
Annual	199.5	248.2

Long-term average - LTA

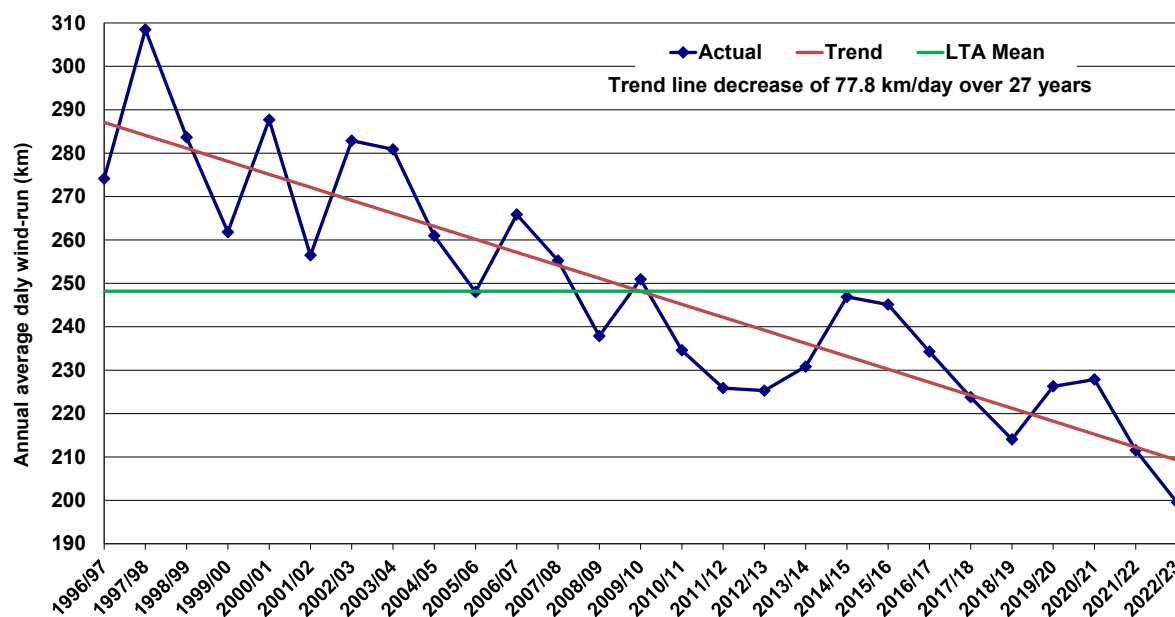


Figure 6. Blenheim annual average daily wind-run (July to June) for the 27 years 1996–97 to 2022–23.

2.5 Growing degree days

Total growing degree days (GDD) in Blenheim for the 8-month growing season (September to April) in 2022–23 were 1397.1, 108% of the LTA (Table 1). This total was only slightly lower than in the 2021–22 season which recorded 1429.5 GDDs. This is indicated by the fact that the GDD lines for 2021–22 (yellow) and 2022–23 (black) ended up close together at the end of April (Figure 7). However, the paths of these two GDD lines were quite different for much of the two seasons. Temperatures during spring 2021 and 2022 were very similar and hence the GDD lines followed a similar path. However,

the GDD lines for the two seasons diverged during December. Because of the very warm temperatures over flowering of Sauvignon blanc in December 2021, fruitset, as determined by number of berries per bunch at harvest, was much higher than average and consequently yield per vine at harvest in 2022 was well above average. This led to the 2022 vintage in Marlborough being the largest on record. GDDs during December 2022 were much lower than in December 2021, due to the cooler temperatures and as a result fruitset and subsequent vine yields were lower at harvest in 2023.

Figure 7 indicates that all six seasons from 2017–18 to 2022–23 recorded above average GDDs, indicated by the mainly upwards sloping GDD lines. The 2011–12 season is included on the graph as a contrasting very cool season and it is worth noting that this is the most recent season to have ended on 30 April with a below average GDD total; i.e. all 11 seasons 2012–13 to 2022–23 have ended the season with an above average GDD total.

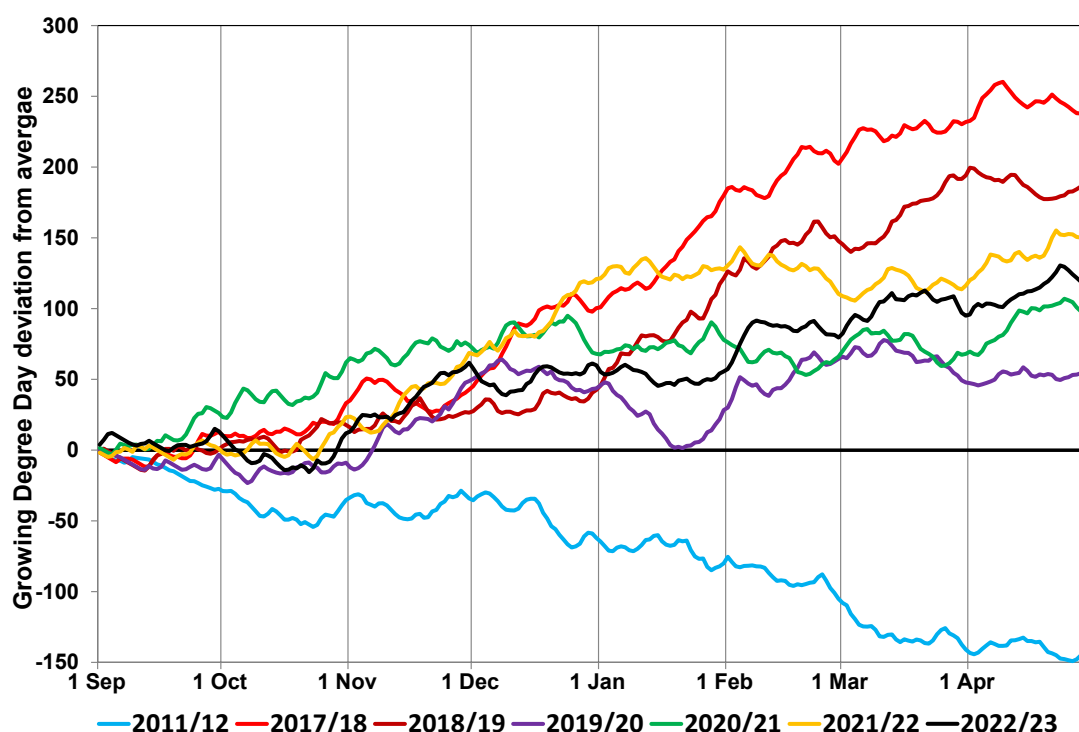


Figure 7. Normalised growing degree days for Blenheim: days above (+) or below (-) the long-term average (LTA) for the period 1 September to 30 April.

3 Key funding sources

- Marlborough Research Centre Trust funding: \$27,500 towards this project.
- The New Zealand Institute for Plant and Food Research Limited (PFR). Additional staff time covered by PFR’s weather station operational funding: \$7,500.
- National Institute of Water & Atmospheric Research. Annual calibration and maintenance of the Blenheim weather station and provision of data in the national climate database, estimated to be \$4,000.

Confidential report for:

Marlborough Research Centre Trust
Project #1

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