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NIWA
Taihoro Nukurangi

The Climate Update

A monthly newsletter from the National Climate Centre

Warmest June in the 150–year record

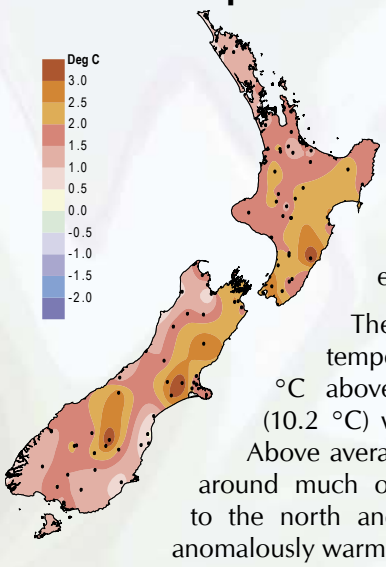
A mild late winter expected

Winter Chilling

How does June 2003 compare to previous years?

New Zealand climate in June 2003

Mean air temperature

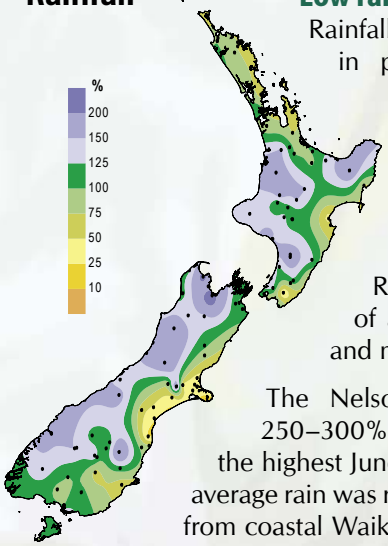


Warmest June on record

June was the warmest recorded in New Zealand since realiable records began over 150 years ago. Temperatures reached more than 3 ºC above normal in some inland sheltered areas of the eastern South Island.

The June national average temperature of 10.3 °C was 2.0 °C above normal. Only June 1971 (10.2 °C) was anywhere near as warm. Above average sea surface temperatures around much of New Zealand, especially to the north and west, contributed to the anomalously warm June land temperatures as did the predominantly northerly airflows over the country during the month.

Rainfall



Low rainfall in the east

Rainfall was less than 50% of average in parts of coastal Canterbury despite the wet weather at the end of the month. It was also drier than average in some other eastern regions from Gisborne to coastal Otago. Rainfall was also less than 75% of average in eastern Northland and much of Coromandel.

The Nelson area was deluged with 250–300% of normal rainfall for June, the highest June falls on record, while above average rain was recorded in all western regions from coastal Waikato to Fiordland, as well as in parts of north and west Otago.

Above and left: Percentage of average rainfall (above map) and the difference from the average air temperature in degrees Celsius (left map). Dots indicate recording sites.

Sunny in the east

Sunshine hours were above average in most eastern regions from Gisborne to Southland, with record high June totals in eastern Otago. Totals were below average in the north and west of the North Island.

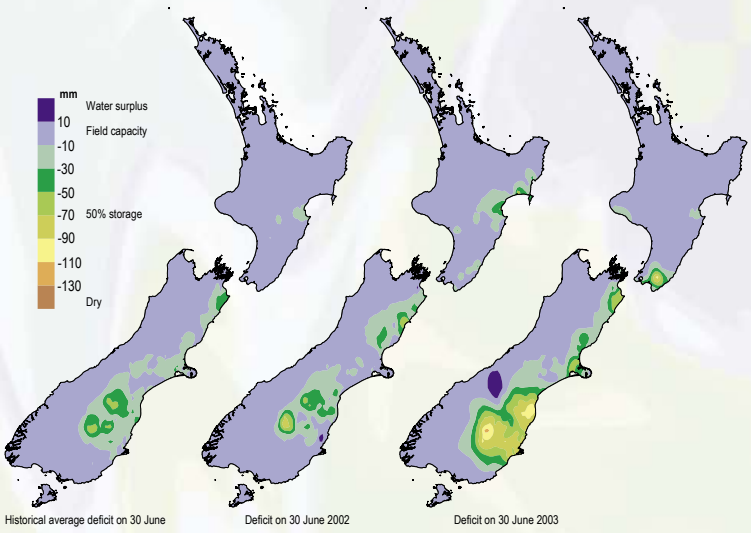
Soils mostly at field capacity

By the end of June soils were mostly at field capacity in the North Island, apart from an area of south Wairarapa, and in the north, west and south of the South Island. Lower than normal rainfall in the east of the South Island slowed soil moisture recovery in some areas. At the end of the month, some areas of Marlborough, south Canterbury and Otago were still drier than normal.

June stream flows variable

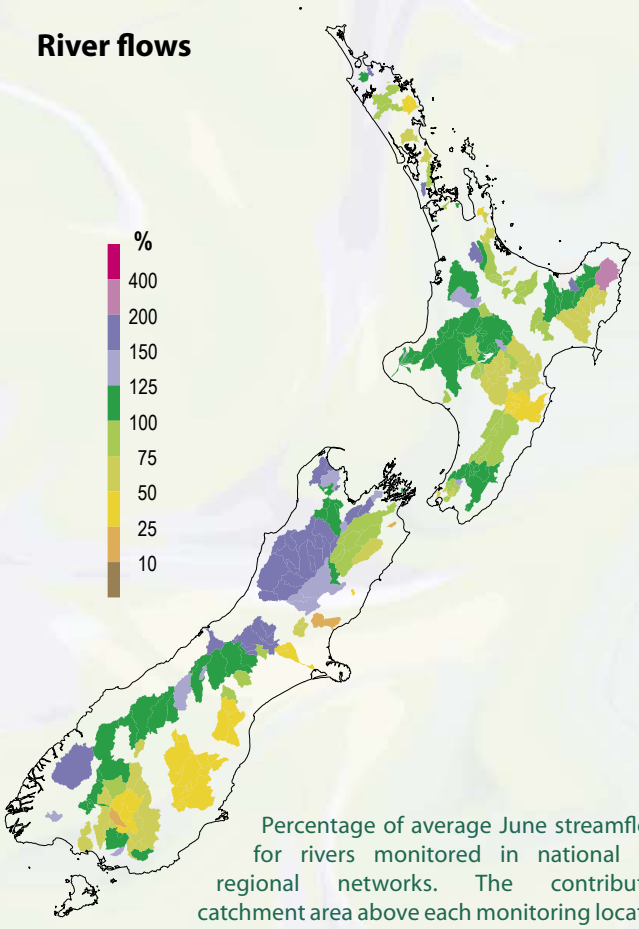
June streamflows were below normal in Northland, Coromandel, the east coast of both islands, and Southland. Flows were near normal for rivers in the west and south of the North Island and were above normal for many Nelson and South Island west coast rivers.

Soil moisture deficit



Soil moisture deficit in the pasture root zone at the end of June (right) compared with the deficit at the same time last year (centre) and the long-term end of June average (left). The water balance is for a typical soil type where the available water capacity is taken to be 150 mm.

River flows



Percentage of average June streamflows for rivers monitored in national and regional networks. The contributing catchment area above each monitoring location is shaded. NIWA field teams, regional and district councils, and hydro-power companies are thanked for providing this information.

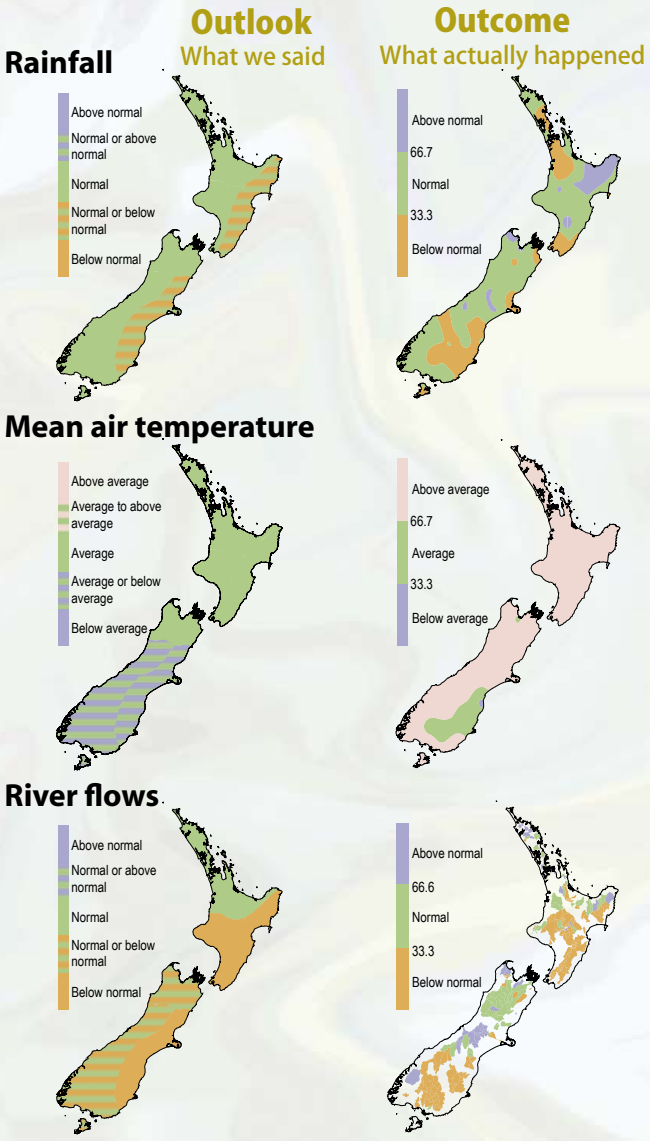
Checkpoint

April to June 2003

Rainfall occurred as predicted over much of the country apart from the northeast of the North Island where it was above normal and parts of Waikato to north Auckland which were drier than normal.

Temperatures were expected to be near average over the North Island and the northern South Island, and average or below average elsewhere. Resulting temperatures were above average almost everywhere.

Below normal flows occurred in the eastern regions of both islands as predicted. Apart from above normal flows in the far north, the predicted normal or below normal river flows occurred elsewhere.



The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for April to June 2003. Terciles were obtained by dividing ranked April to June data from the past 30 years into three groups of equal frequency (lower, middle, and upper one-third values) and assigning the data for the present year to the appropriate group. As an approximate guide, middle tercile rainfalls (33.3 to 66.7%) often range from 80 to 115% of the historical average. Middle tercile air temperatures typically occur in the range of the average plus or minus 0.5 °C. The upper, middle, and lower tercile ranges are indicated in the maps by the terms *Above normal*, *Normal*, and *Below normal*, respectively.

Outlook

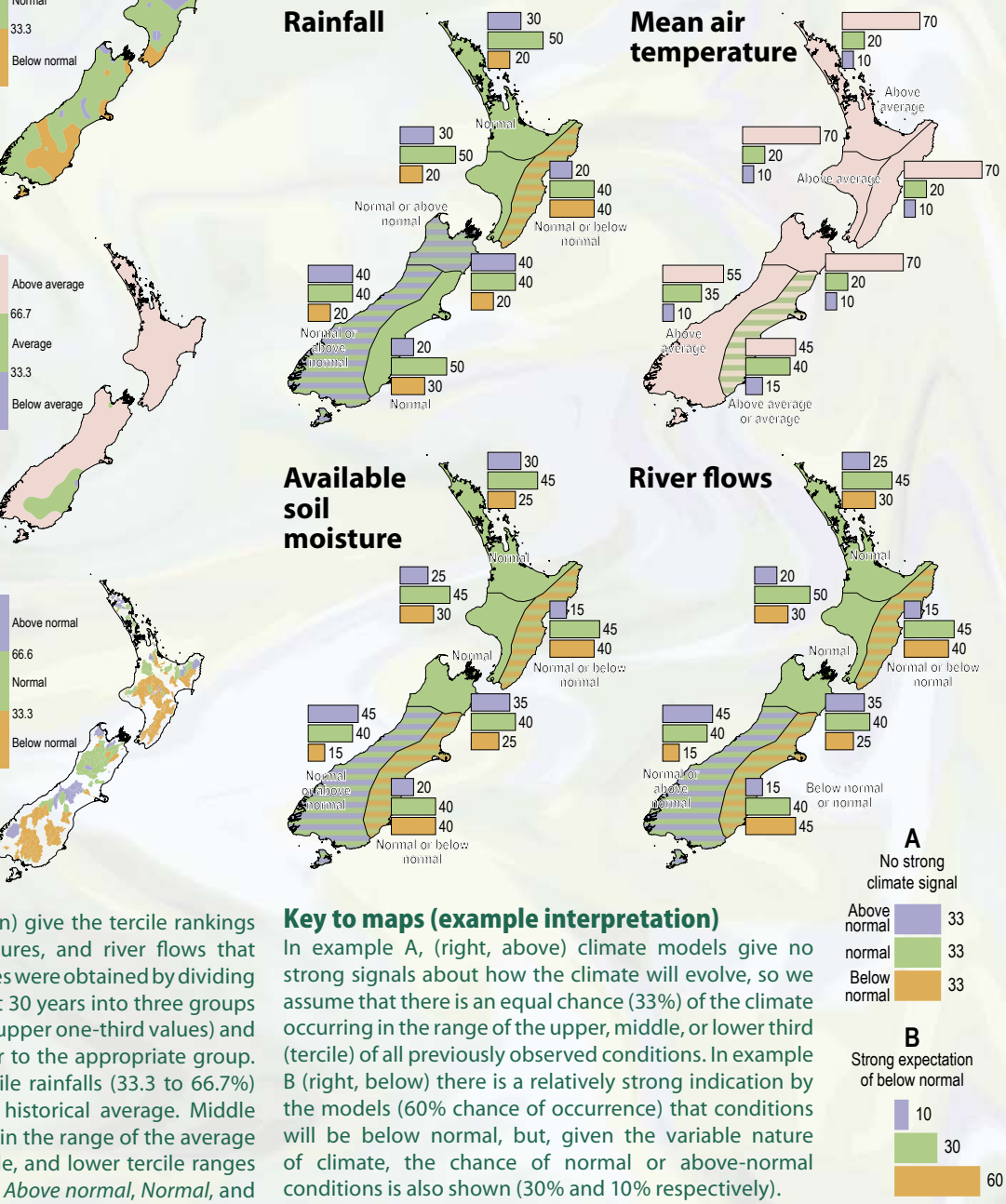
July to September 2003

A mild late winter is expected, with above average temperatures in all districts except the east of the South Island, where above average or average temperatures are expected. Despite this, typical winter cold spells are also likely, with frosty conditions at times in inland places. Local sea surface temperatures are likely to remain above average and local circulation patterns are expected to favour an enhanced westerly wind flow.

Normal or below normal rainfall is expected in the east of the North Island. Normal or above normal rainfall is expected in the north and west of the South Island, with near normal rainfall likely elsewhere.

Soil moisture levels and river flows are predicted to be normal in the north and west of the North Island and north of the South Island, normal or below normal in the east of both islands, and normal or above normal in the west of the South Island.

The El Niño event in the tropical Pacific has ended, and is unlikely to return later in the year. The tropical Pacific may be moving towards moderate La Niña conditions, but the situation remains unclear.



Key to maps (example interpretation)

In example A, (right, above) climate models give no strong signals about how the climate will evolve, so we assume that there is an equal chance (33%) of the climate occurring in the range of the upper, middle, or lower third (tercile) of all previously observed conditions. In example B (right, below) there is a relatively strong indication by the models (60% chance of occurrence) that conditions will be below normal, but, given the variable nature of climate, the chance of normal or above-normal conditions is also shown (30% and 10% respectively).

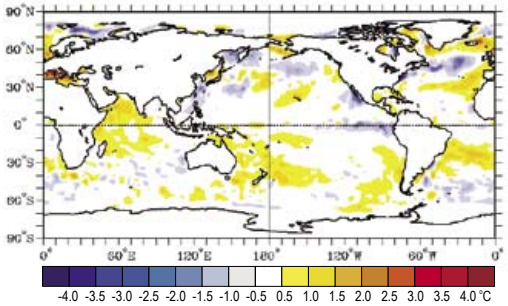
Global setting

Low SOI does not signal an El Niño

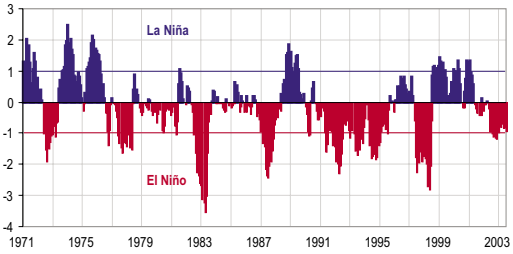
The Southern Oscilliation Index dropped surprisingly to -1.4 during June indicating a subtle change in developments from the movement towards La Niña like conditions that was evident in May.

Meanwhile, sea surface temperatures (SST) in the eastern tropical Pacific along the Equator fell to a degree below normal during May and June. This is consistent with the development of a La Niña event.

Despite the uncertainties, there is general agreement among climate models that the development of an El Niño is very unlikely during the rest of this year. For further information see www.wmo.ch



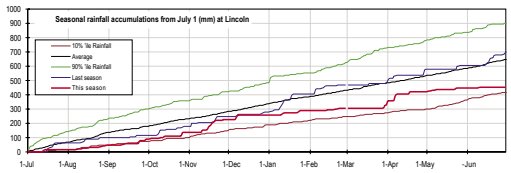
Above: Mean sea surface temperature departures from normal for June 2003. The New Zealand region average SST anomaly has been positive for all of 2003 so far. The anomaly for June was +0.8 °C, with the AMJ mean around +0.5 °C. *Map reproduced courtesy of NOAA/Climate Diagnostics Center.*



Above: The Southern Oscillation Index (SOI), a measure of changes in atmospheric pressures across the Pacific, smoothed over three months. The current three month value of the SOI is –0.9. La Niña or El Niño typically have an observable effect on the New Zealand climate when there is a large departure of the SOI from zero.

On line climate graphics

Climate maps and line plots of climate site observations are updated each week on the Climate Now website at www.niwa.co.nz/ncc/climatenow



Backgrounder

Warm conditions inhibit winter chilling

Higher than normal May and June temperatures are a reminder that meeting winter chilling (also known as vernalization) demand for subtropical crops is always uncertain in New Zealand.

Winter chilling is the period of cold weather that subtropical crops require during their winter rest period, prior to commencing new growth in spring. Typically, the most effective chilling temperatures are between about 3 °C and 7 °C. Conditions colder than freezing do not assist chilling, and at temperatures above 15 °C, the chilling process is reversed. Northern regions of New Zealand often do not get enough cold weather to complete the chilling.

Chill unit calculation

Typically, chill unit calculations are made from air temperatures recorded at least once an hour, although reasonably reliable chill estimates can be made from daily maximum and minimum temperatures. In the latter case, temperatures each hour are calculated from the daily data, and then the chill unit accumulations are taken from the daily values.

Time	Air temperature °C	Hours 0-7	Weighted hours
Midnight	2.3	1	0.4
1:00 a.m.	2.0	1	0.4
2:00 a.m.	0.0	0	0.0
3:00 a.m.	-0.7	0	0.0
4:00 a.m.	0.0	0	0.0
5:00 a.m.	-1.0	0	0.0
6:00 a.m.	-1.6	0	0.0
7:00 a.m.	-3.0	0	0.0
8:00 a.m.	1.0	1	0.2
9:00 a.m.	3.2	1	0.6
10:00 a.m.	7.0	1	1.0
11:00 a.m.	8.0	0	1.0
Midday	11.1	0	0.6
1:00 p.m.	13.0	0	0.2
2:00 p.m.	13.0	0	0.2
3:00 p.m.	11.2	0	0.6
4:00 p.m.	11.0	0	0.6
5:00 p.m.	8.0	0	1.0
6:00 p.m.	6.1	1	1.0
7:00 p.m.	4.0	1	0.8
8:00 p.m.	1.0	1	0.2
9:00 p.m.	2.2	1	0.4
10:00 p.m.	4.0	1	0.8
11:00 p.m.	1.0	1	1.0
TOTAL	4.3	11	11.1

There are various methods to calculate chill units, of which the two most common in New Zealand are:

- a count of the number of hours between 0 °C and 7 °C
- an accumulation of hours between 0 °C and 15 °C, weighted so that temperatures near or at 7 °C add most to the chill unit total.

Example

The table on the left shows the hourly temperature taken at Dunedin Airport on 12 June, 2003; the observed temperature is shown in the second column. The third and fourth columns show chill units for each hour by using the two methods mentioned above. The total chilling for the day, 11 and 11.1 units respectively, is almost the same in each case.

Chill units this year

Temperatures this year in May and June have been higher than average in New Zealand's fruit growing regions. The adjacent table shows chill unit accumulations (from both calculations) for May and June for the past 20 years, at Whakatu in Hawke's Bay. The warmer years with low chill units (shaded yellow), are clustered from the late 1990s onwards, highlighting the increased frequency of mild winter months in recent years compared with 20 years ago.

YEAR	May Hours 0 to 7	Jun Hours 0 to 7	May Weighted hours	Jun Weighted hours
1984	220	221	330	276
1985	116	197	361	363
1986	220	346	284	345
1987	246	287	310	369
1988	183	212	193	325
1989	139	235	222	352
1990	270	308	189	432
1991	260	340	336	429
1992	296	279	476	380
1993	228	306	289	314
1994	125	258	225	421
1995	196	256	210	393
1996	216	272	353	368
1997	147	259	235	393
1998	162	188	252	301
1999	162	234	79	270
2000	171	187	220	278
2001	126	229	106	310
2002	121	130	196	138
2003	173	153	87	243
Average	189	245	248	335

Kiwifruit approaching harvest quality. Winter chilling of subtropical crops is likely to be below normal this year.

Photo: Alan Blacklock

The Climate Update is a monthly newsletter from NIWA's National Climate Centre for Monitoring and Prediction, and is published by NIWA Private Bag 14901, Wellington. It is also available on the web. Comments and ideas are welcome. Please contact Alan Porteous, Editor
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