

The Climate Update

March generally settled, dry and sunny

New Zealand's climate during March was dominated by anticyclonic conditions, bringing unusually dry and sunny weather to many areas ... *page 2*

Outlook: near normal rainfall

With El Niño's departure the risk of ongoing dry conditions in the east is now lower ... *page 3*

Drought: the Levin rainfall record

The current drought has been severe, but not unprecedented ... *page 4*



New Zealand climate in March 2003

Settled, dry and sunny

New Zealand's climate during March was dominated by anticyclonic conditions, bringing unusually dry and sunny weather to most areas apart from the north of the country. For many localities it was a continuation of already unusually dry summer conditions.

Lower than usual pressures to the north of the country strengthened northeasterly air flow over New Zealand with resulting high rainfalls in North Auckland, Auckland, Coromandel, and Gisborne. Dry conditions in parts of Canterbury were alleviated by rainfall at the end of the month.

In contrast, rainfall was less than a quarter of average in much of Otago, and less than half average in many other areas.

Warmest month in 2003

Much of the country recorded higher than

normal air temperatures, particularly in the Southern Lakes district and Central Otago. Overall, New Zealand was warmer in March than in January or February, with the late onset of summer-like conditions

The high March temperatures were matched by higher than normal radiation and hours of bright sunshine.

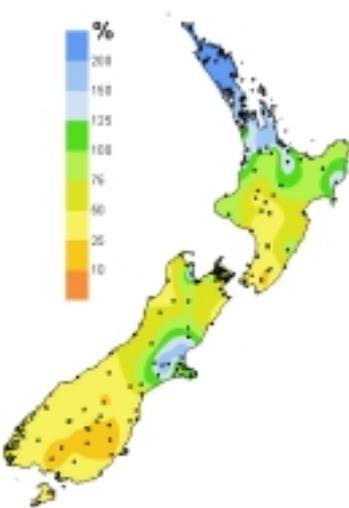
Record conditions

A mark of the unusual variability of the climate in March was the number of new observation records set at many sites. Monthly extremes were surpassed for high rainfall (Kaitiaki, Kaikohe), low rainfall (East Taratahi, Queenstown, Clyde), high sunshine hours (Paraparaumu, Kelburn, Arapito, Musselburgh), high solar radiation (Palmerston North, Levin, Wanganui) and high mean air temperature (Farewell Spit, Wanaka, Queenstown, Lauder, Clyde).

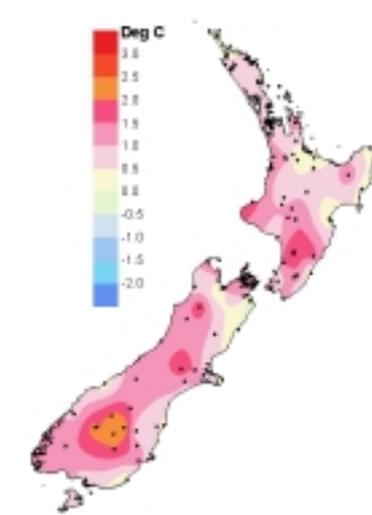
March flows mostly low

March streamflows were high in parts of Northland, Coromandel, and the East Cape, but below normal elsewhere.

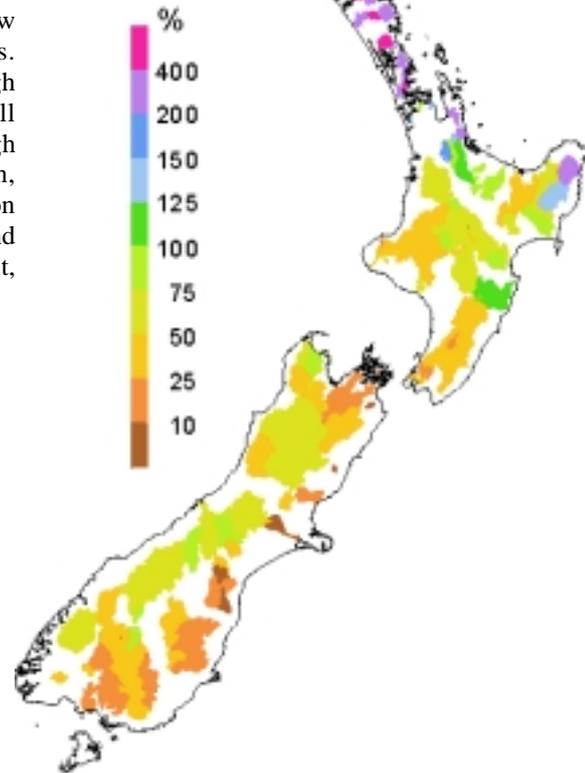
Rainfall



Mean air temperature



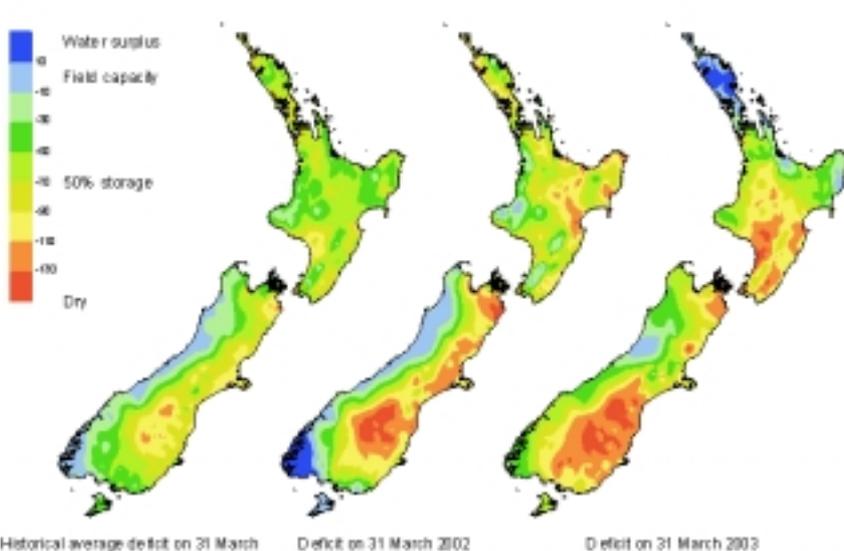
River flows



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

ABOVE: Percentage of average March 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.

Soil moisture deficit



Patchy relief for dry soils

Significant soil moisture deficits continued through much of March in the north and east of the South Island, from Nelson to Otago, as well as in the southwest North Island from Wanganui to Wellington, and in Wairarapa. Rainfall at the end of the month resulted in significant relief for Nelson, central Canterbury, and north Canterbury soils.

Soils in the southern North Island, Marlborough, and the southeast of the South Island were much drier than average at the end of the month.

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

Checkpoint

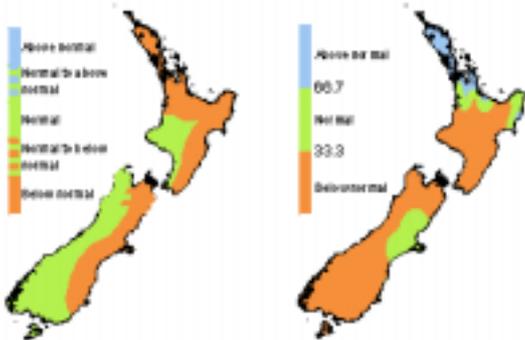
January to March 2003

Rainfall was as predicted for parts of Waikato, Bay of Plenty, the east of the North Island, Marlborough and Nelson, and eastern Otago. Rainfall was lower than forecast in western regions, and higher than forecast in the north of the country.

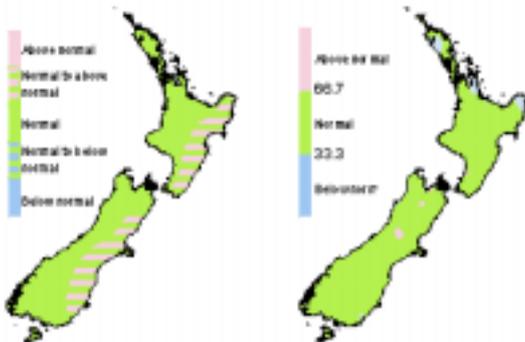
Air temperatures were average in most regions, as expected.

River flows were higher than expected in Northland, Waikato, and in parts of the east of the North Island. Lower than expected flows were recorded in western areas.

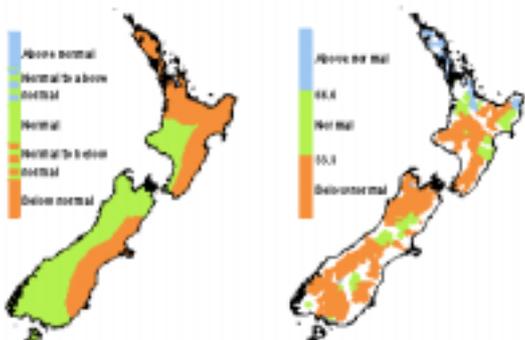
Rainfall **Outlook** *What we said* **Outcome** *What actually happened*



Mean air temperature



River flows



The three outcome maps (right col) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for January to March 2003. Terciles were obtained by dividing ranked January to March 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

April to June 2003

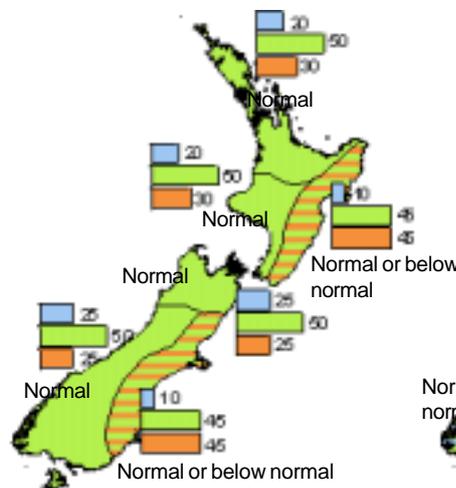
For April–June, temperatures are expected to be average over the North Island and north of the South Island, and average or below average over the rest of the South Island.

Normal or below normal rainfall is expected in the east of both main islands, with near normal rainfall likely elsewhere.

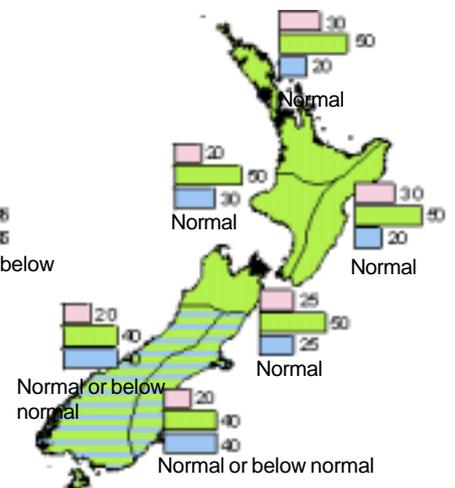
Soil moisture levels and river flows are predicted to be below normal in eastern regions of both islands, and to be normal or below normal elsewhere.

The El Niño event in the tropical Pacific is nearing its end, and little influence from this is expected on New Zealand climate over the coming months.

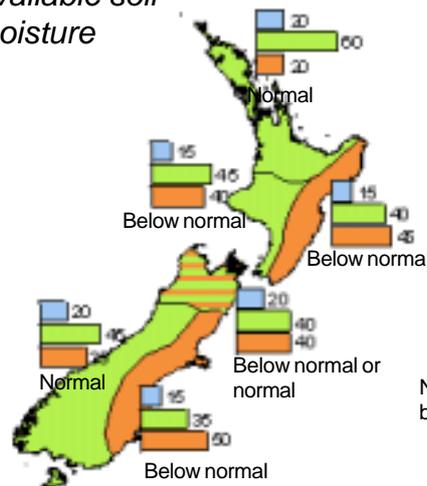
Rainfall



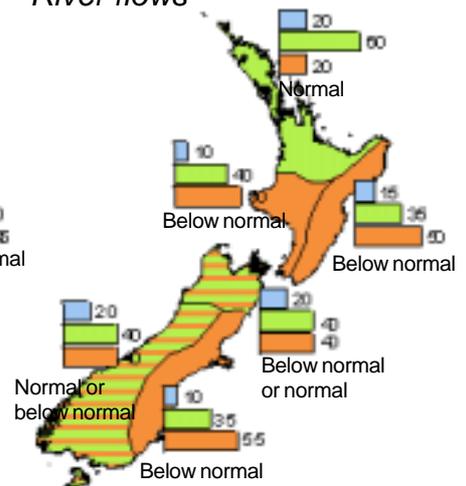
Mean air temperature



Available soil moisture



River flows



KEY to maps (Example interpretation)

In example A, 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 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).

	No strong climate signal	Strong expectation of below normal
Above normal	33	10
Normal	33	30
Below normal	33	60

Feature

Current drought severe, but not unprecedented

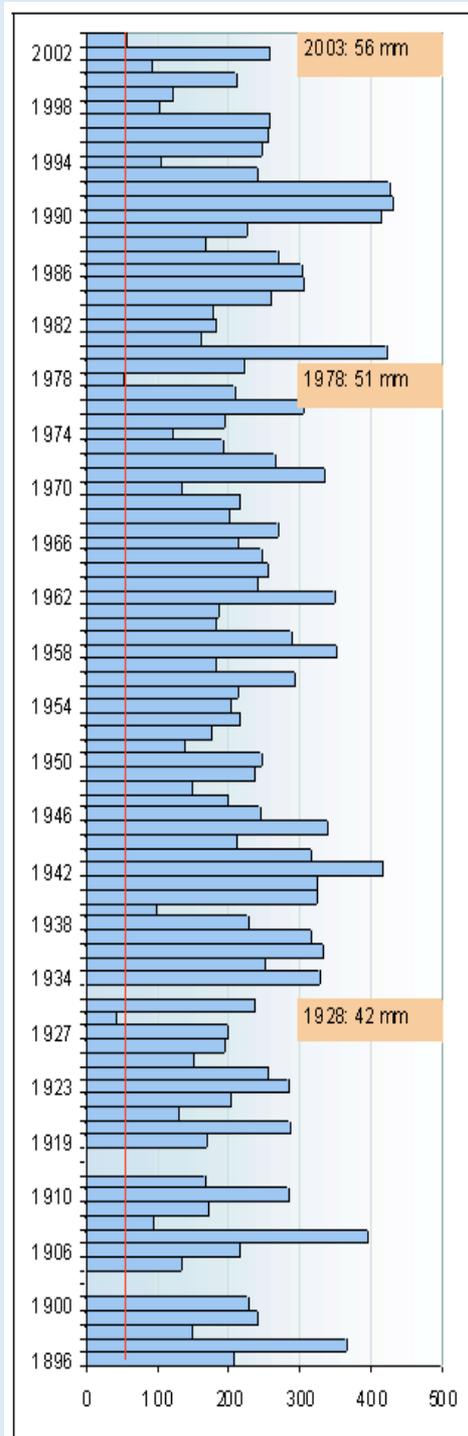
Many regions of New Zealand have experienced severely dry conditions over the last few months. Droughts are difficult to define because of the many contributing causes and effects. Key questions are the nature of user requirements, the time of year of the low rainfall, and how often similarly dry conditions might occur.

The rainfall record since 1896 for Levin, shown in the figure to the right, suggests that the dry conditions during January to March this year have occurred only twice before (although there are some years missing from the record).

The widespread nature of the current drought has meant that hill and mountainous regions, catchments for many rivers and streams, have had similarly low rainfalls, with consequent low river flows.



An diminishing stream in Ohariu Valley in the southwest of the North Island. Flows in many local streams almost ceased during one of the driest summers on record. Photograph: Alan Blacklock



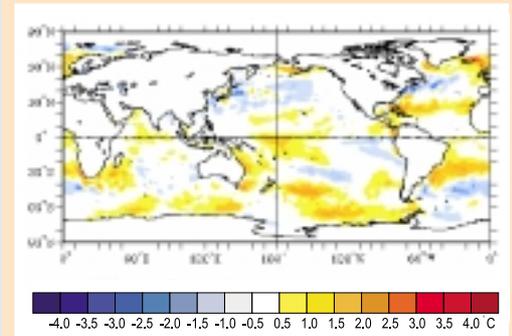
Levin rainfall totals for January to March, from 1896 to 2003. The red vertical line is placed at 56 mm, this year's total for January to March. Only two years shown on the record had less rain – 1928 (42 mm) and 1978 (51 mm). Note there are three periods of missing data, 1901–04, 1912–18, 1930–33.

Global setting

ENSO signal approaching neutral

The current warm phase of the El Niño-Southern Oscillation is nearing its end and is not expected to influence New Zealand's climate over the next few months.

Most forecast models of the development of the El Niño-Southern Oscillation are predicting neutral conditions through late autumn and winter.



ABOVE: Mean sea surface temperature departures from normal for the period from 9 March to 5 April 2003.

Update on the SOI

The mean Southern Oscillation Index (SOI) for March was -1.0, with the three month average now at -0.7. The present El Niño continues to wane. Further general information on El Niño is available on the World Meteorological Organization web site, www.wmo.ch



ABOVE: The Southern Oscillation Index (SOI), a measure of changes in the atmospheric pressures across the Pacific, smoothed over three months. 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.



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Cover picture: Drought scene typical of recent conditions in the southwest of the North Island. The lack of substantial rain between mid December and late March left a blanket of brown pastures and greatly reduced stock numbers. Photograph: Alan Porteous

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