

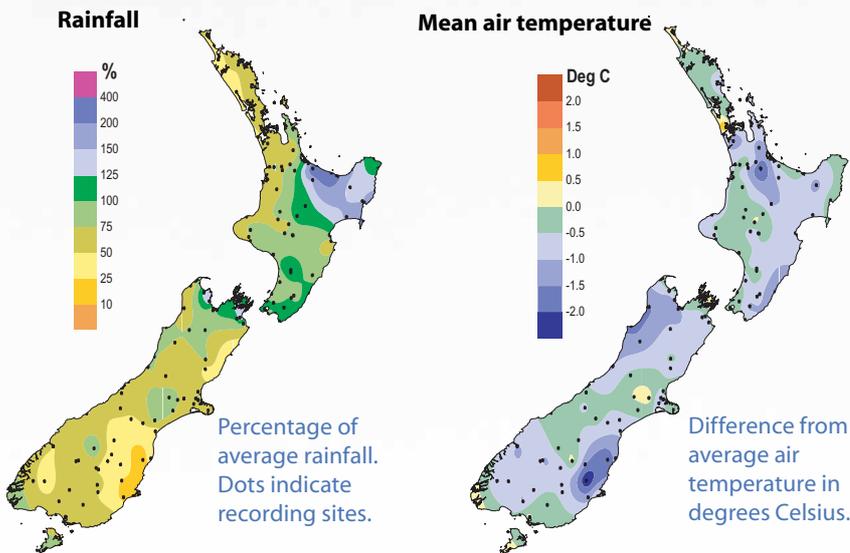
# The Climate Update

A monthly newsletter from the National Climate Centre

**July – extremely wet in Bay of Plenty with severe floods, but dry in the south. High river flows in the central and eastern North Island and below normal elsewhere. Low temperatures; many frosts in Canterbury and Otago.**

**Outlook for August to October – above average temperatures likely in the north, with near normal rainfall in most areas except Nelson.**

# New Zealand climate in July 2004



## Devastating floods in eastern Bay of Plenty

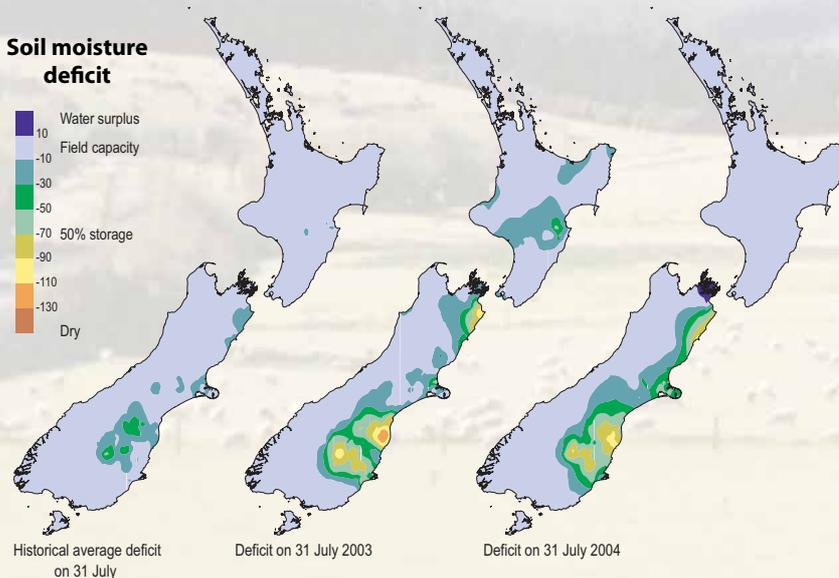
Rainfall was at least 300 percent of average in eastern Bay of Plenty, and also above average in western Bay of Plenty, Gisborne, and in and around Blenheim. However, below average rainfall occurred in many northern and western North Island regions and throughout much of the South Island.

July was relatively cool – the national average temperature of 7.3 °C was 0.6 °C below normal. Mean temperatures were as much as 1.5 °C below average in parts of Buller, Canterbury, and Otago. Overnight minimum temperatures were well below average, with particularly frosty conditions in Canterbury, Otago, and the Central Plateau.

For more information on the climate in July, visit the climate summaries page at [www.niwa.co.nz/ncc/cs/mclimsum\\_04\\_07](http://www.niwa.co.nz/ncc/cs/mclimsum_04_07)

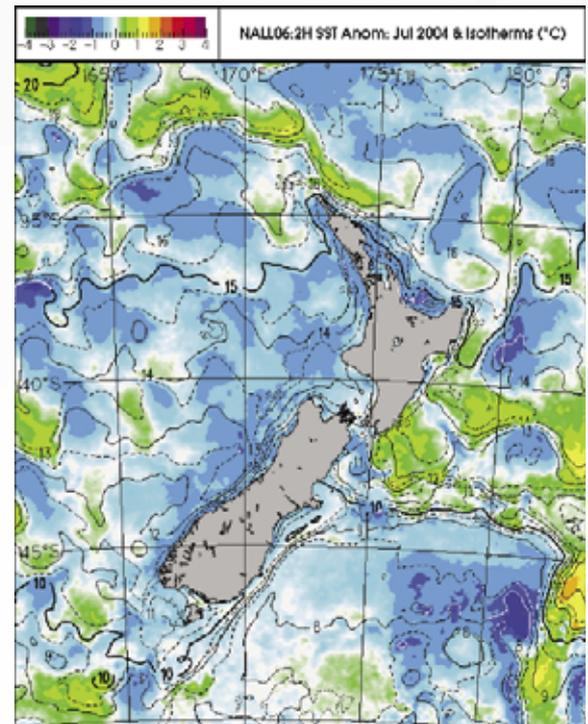
## East coast South Island below field capacity

Soils in parts of the east coast of the South Island remained below field capacity at the end of July, following lower than normal rainfalls during the month. Typically, soil moisture levels would be at or close to field capacity at this time.



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

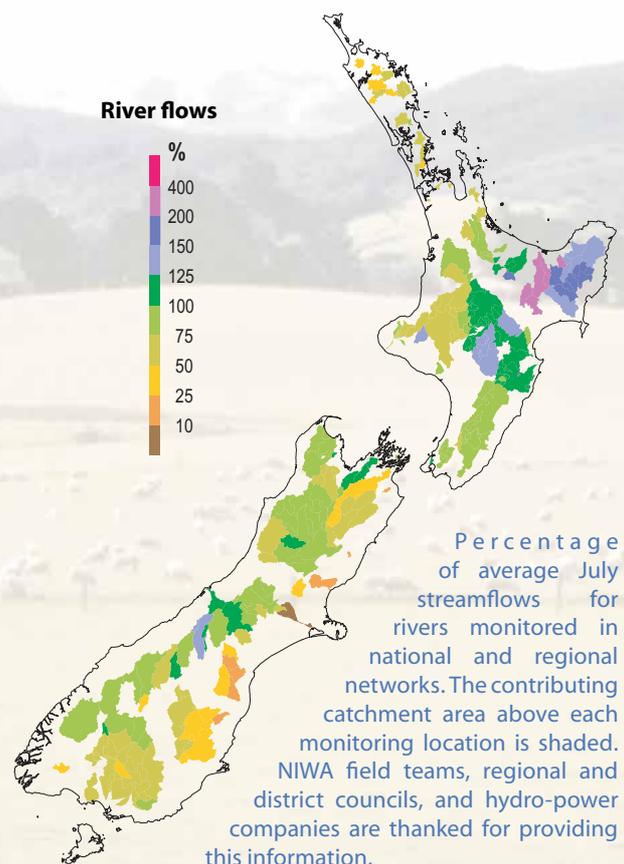
## Sea surface temperatures



Difference from normal surface water temperatures in the seas around New Zealand. SSTs were near average in July. The variation in temperature pattern is created by local eddy activity.

## High river flows in the eastern North Island

Streamflows were above normal in the central North Island, eastern Bay of Plenty, and East Cape. Streamflows were normal in the Hawke's Bay region, and mostly below normal elsewhere.



# Checkpoint

## May to July 2004

As expected rainfall was normal over much of New Zealand, except for above normal rainfall in Bay of Plenty and Gisborne. Higher than normal rainfall occurred in the west of the northern South Island with drier than normal conditions in the east.

Many districts recorded higher temperatures than forecast, due to a higher than normal frequency of northwesterlies, particularly in June. Temperatures were average as expected in some eastern regions.

River-flow conditions were forecast to be below normal in the east of the South Island, and near normal elsewhere. Flows were below normal in Northland and the South Island east coast, and normal to above normal elsewhere.

# Outlook

## August to October 2004

Lower than normal mean sea-level pressures are expected in the Tasman Sea for early spring, with more northwesterly winds than usual over northern and central parts of New Zealand. Sea surface temperatures are likely to remain close to average around the country.

Air temperatures are expected to be average or above average for the North Island, and average for the South Island.

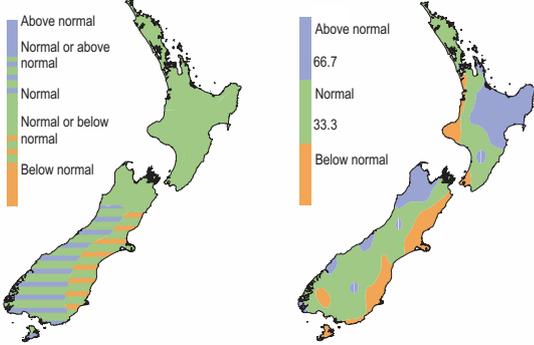
Rainfalls are expected to be near normal in all regions, except for above normal in Nelson. Normal soil moisture levels and streamflows are expected everywhere, except for the east coast of the South Island, where normal or below normal flows are likely.

There have been recent changes in the tropical Pacific towards a more coherent pattern of ocean and atmosphere anomalies that significantly increase the likelihood of an El Niño developing. At present, there appears to be an almost equal chance of either El Niño or 'neutral' conditions through spring–summer of 2004–05. (Note that by 'neutral' we mean neither El Niño nor La Niña).

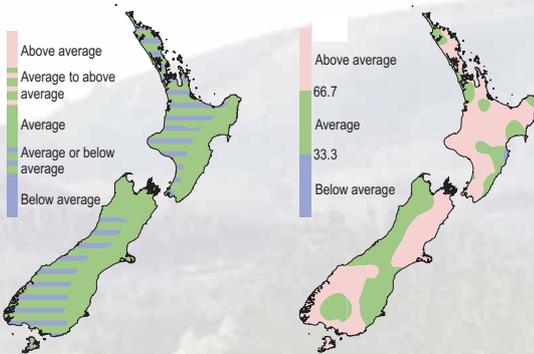
### Outlook What we said

### Outcome What actually happened

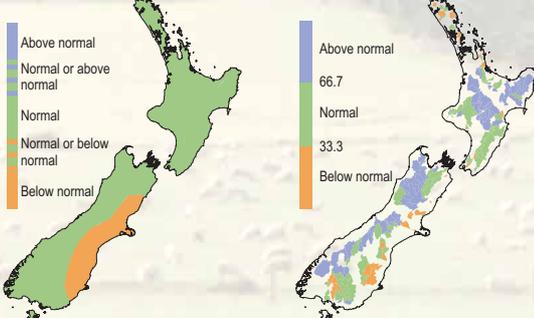
#### Rainfall



#### Mean air temperature



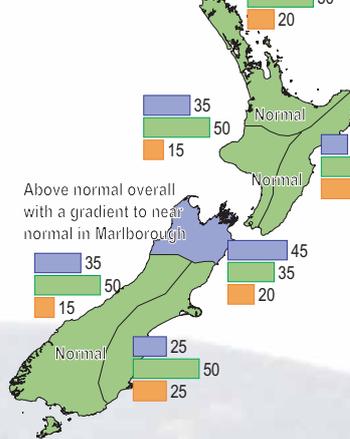
#### River flows



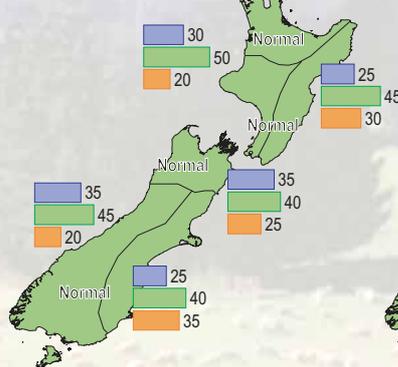
The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean air temperatures, and river flows that eventuated from May to July, in comparison with the forecast conditions (left column).

As an approximate guide, middle tercile rainfalls typically range from 80 to 115% of the historical normal, and middle tercile temperatures range about the average by plus or minus 0.5 °C.

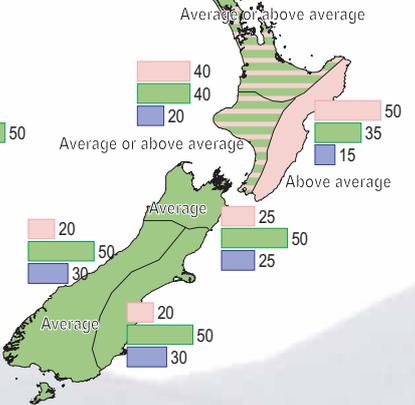
#### Rainfall



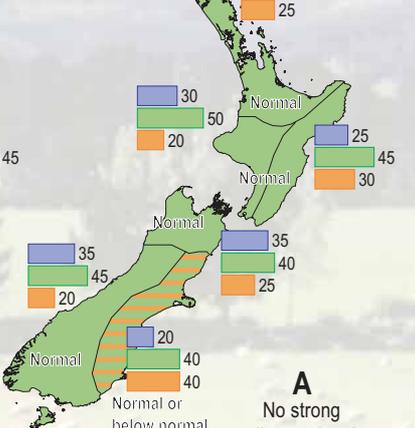
#### Available soil moisture



#### Mean air temperature

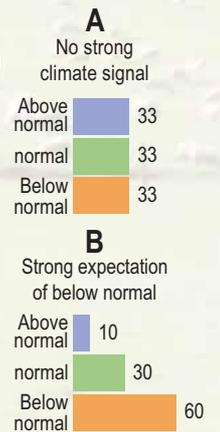


#### River flows



### 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).



## Is New Zealand climate becoming more volatile?

Severe floods this year in Manawatu and Bay of Plenty are leading many to ask whether New Zealand climate is becoming more variable. MAF Policy recently asked NIWA to undertake a preliminary study of New Zealand climate 'volatility'.

We use the term 'volatility' here to refer to the variance about the mean climate – for example, the day-to-day variation within a month, or the month-to-month variation within a year. Are there any trends in these measures of variability in the New Zealand climate?

To find out, we need to look at volatility on two levels.

- What is happening at individual locations where the climate is measured?
- What is happening to global or regional climate that might be causing local changes?

### Global and local influences

New Zealand climate is affected by atmospheric circulation changes (pressure patterns) influencing wind flows across the country, and by sea temperatures both locally and globally. Variations of these influences occur on daily, seasonal, and multi-year timescales, and are in turn influenced by longer-term trends, such as global warming.

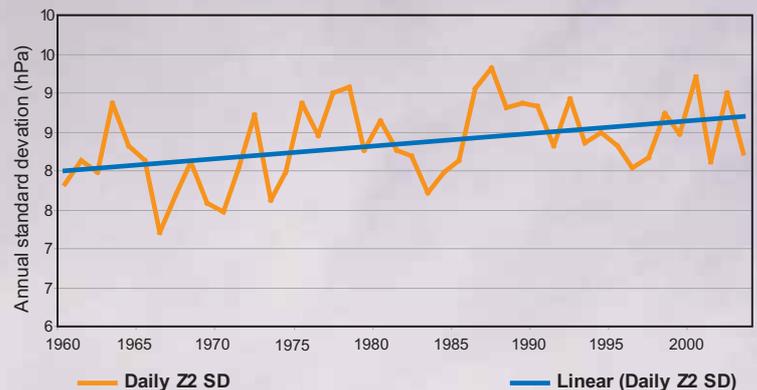
The climate of a particular place depends not only on these global influences, but also on local exposure characteristics, such as proximity to the sea or location in relation to nearby hills, which affect the climate.

If the changes in volatility we see in individual climate station records can be linked to changes in the global or regional climate, then we can better understand why local changes are occurring.

## Example

One of the measures of wind flow patterns over New Zealand is known as the Z2 index. It measures differences in atmospheric pressure between Christchurch and Campbell Island south of New Zealand. The higher the pressure difference, the more 'vigorous' the wind flow.

The figure below shows the increase in the annual standard deviation of the Z2 index from 1960 to 2003. Note that the trend line does not show an increase in mean pressure – it shows that the dispersion of daily atmospheric pressure around the mean pressure (i.e., the volatility) has been greater in recent years.



Trend in the annual standard deviation of the daily Z2 index (Christchurch minus Campbell Island pressure difference) for the period 1960–2003.

This index suggests that there has been an increase in east-west annual volatility – more day-to-day variability within each year, in recent years, than there was in the early 1960s. There have been more days of extreme westerlies and more days of extreme easterlies.

Has this change (and perhaps others like it) had any impact on local climate? We will come back to this question in future issues of *The Climate Update*.

Some preliminary findings from the MAF/NIWA study can be found on [www.niwa.co.nz/ncc/news](http://www.niwa.co.nz/ncc/news)



Route 72, inland mid Canterbury.

Cover photo: Alan Porteous

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