Number 38 15 August 2002

NIWA
Taihoro Nukurangi

The Climate Update

July 2002: Wet in the north; low rainfalls in the south

A number of North Island localities flooded, but in the south, Lauder had just 1 mm of rain ... *page 2*

August to October outlook

Generally warmer than average, but winter's typical cold outbreaks at times ... *page 3*

Satellites assist frost mapping

Combining ground-based observations and satellite images to assess frost risk ... *page 4*

New Zealand climate in July 2002

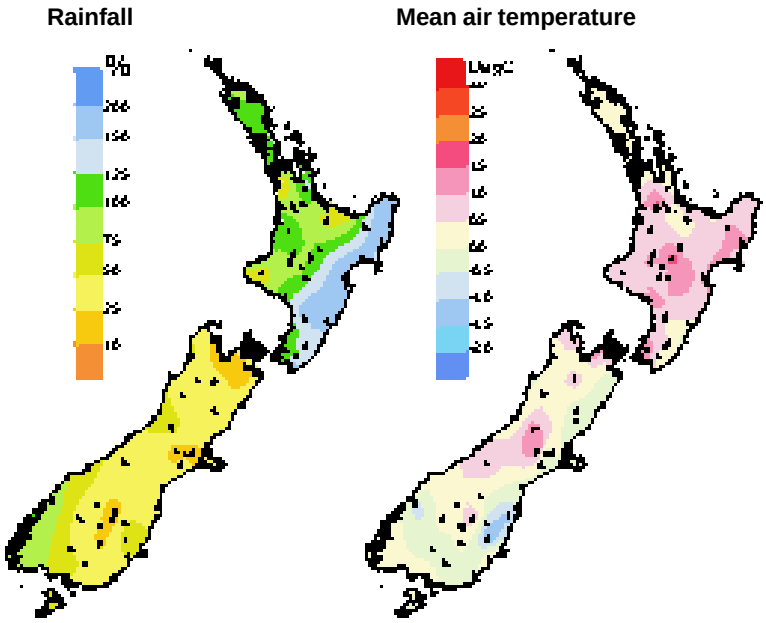
Rainfall and air temperature

Wet in the north; dry in the south
Rainfall in northern and eastern North Island regions was well above normal, with Napier recording more than double its July average. Flooding occurred at Te Awamutu on 5 July, Te Kuiti and Mangakino on 8 July, Kaukapakapa on 11 July, and Mercer on 12 July when the Waikato River flooded farmland already saturated by weeks of wet weather. Snow on 15 July closed central North Island roads.

In contrast, it was dry over much of the South Island, particularly Nelson, Marlborough, Canterbury, and Central Otago, with many places having less than a quarter their average rain. Lauder and Motueka equalled their lowest rainfall since records began at those sites, with just 1 mm in the case of Lauder.

Mild in North and upper South Is.
July was mild, with fewer frosts than usual throughout much of the North Island and northern South Island. There were frequent cloudy nights which kept overnight temperatures much higher than usual. Mean temperatures in these areas were 0.5 to 1.5 °C above normal. Elsewhere, temperatures were near average, with the national average mean temperature at 8.0 °C, which was 0.3 °C above normal.

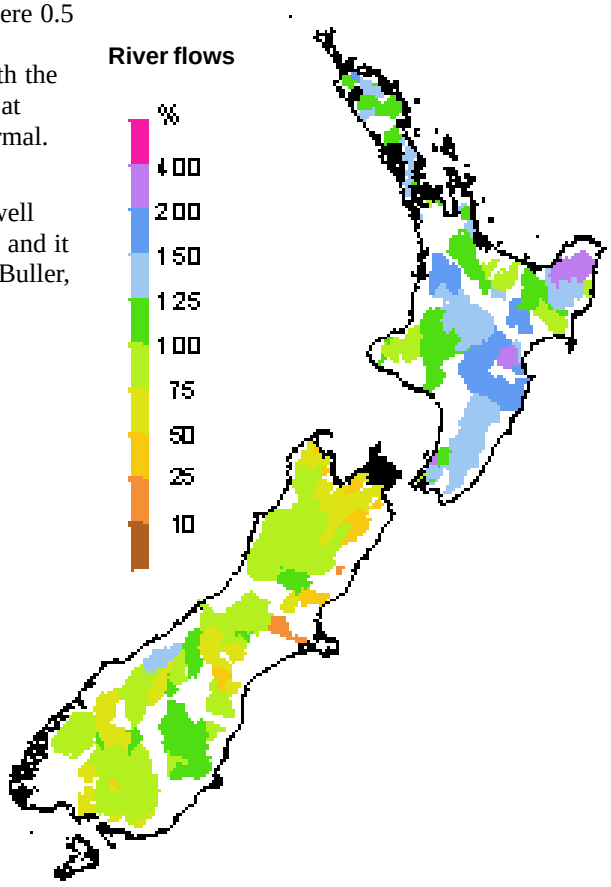
More sun in Southland
Sunshine and solar radiation were well above average in coastal Southland, and it was sunnier than normal in Otago, Buller, and Westland.



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

River and streamflows

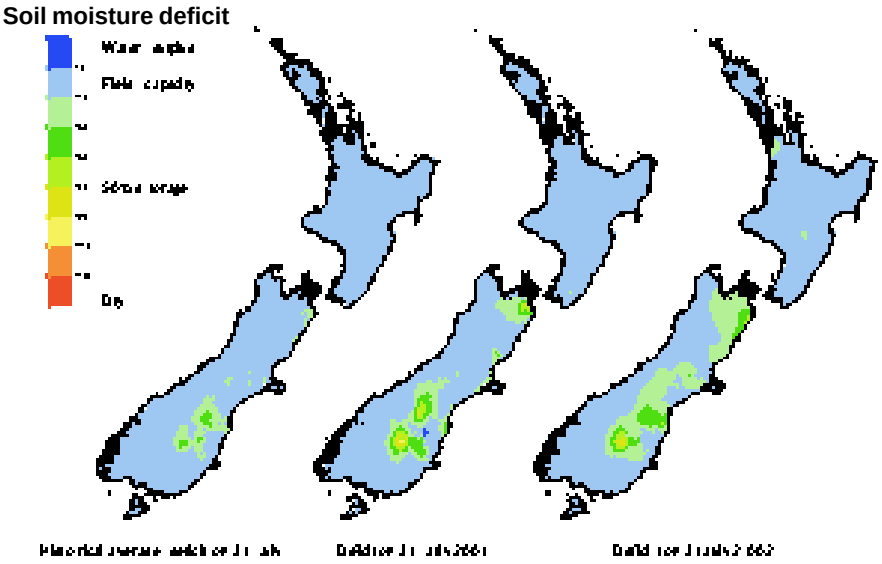
July streamflows high in the north
July flows were above normal for most of the North Island and normal to below normal for the South Island.



ABOVE: Percentage of average July 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

Some east coast South Island soils were drier than normal at the end of July, particularly in Marlborough and south Canterbury. Elsewhere in the South Island, and in most of the North Island, soil moisture levels were near field capacity.



RIGHT: 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.

Checkpoint

May to July 2002

Rainfall was as forecast for many areas. It was higher than predicted in parts of the east of the North Island, and over coastal south Otago and Southland.

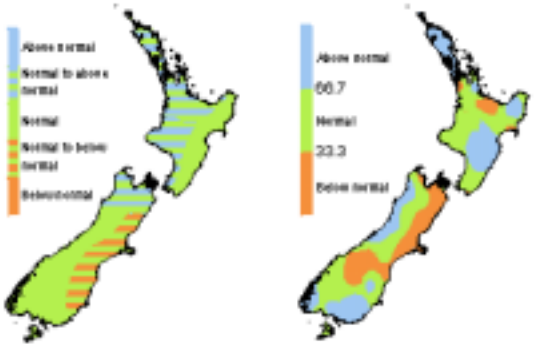
Air temperatures were as expected in all regions except the south and west of the South Island, where they were higher than predicted.

River flows were above what was expected in much of the North Island, and in Buller and Southland. Some central South Island regions had normal to below normal flows rather than the normal flows that were predicted.

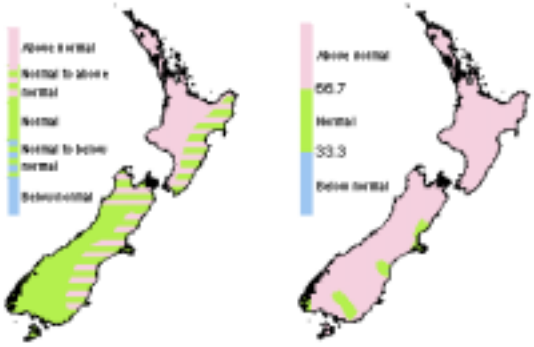
Outlook — What we said

Outcome — What actually happened

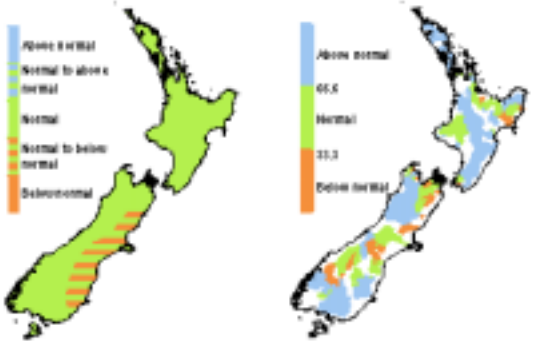
Rainfall



Mean air temperature



River and stream flows



The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for May to July 2002. Terciles were obtained by dividing ranked May to July 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. Note that in the maps above, the upper, middle, and lower tercile ranges are described by the terms *Above normal*, *Normal*, and *Below normal,* respectively.

Erratum: The Checkpoint maps in the July issue were incorrect due to a printing error. See the website for the correct maps.

Outlook

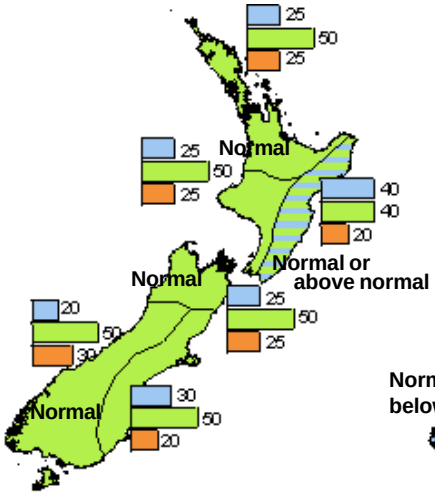
August to October 2002

An El Niño event in the tropical Pacific is now in place, but its duration and magnitude still remain uncertain. It is likely to be much weaker than the 1997–98 event, when there was lower than normal rainfall in many east coast areas, and severe drought in some localities. El Niños are typically, but not always, associated with below average temperatures and more frequent southwesterly winds over New Zealand. At this stage it is not possible to predict what effect this El Niño will have on the New Zealand climate in spring.

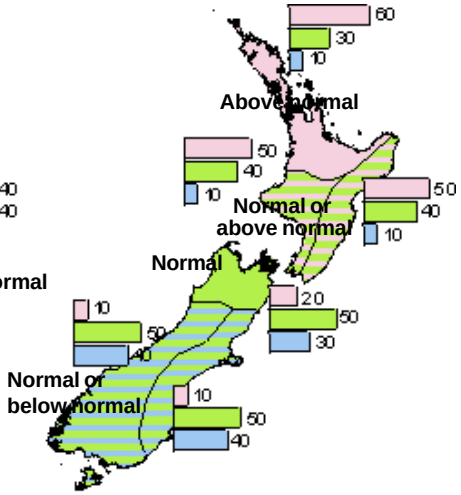
August to October temperatures are expected to show a north-south gradient, with temperatures likely to be above normal in northern North Island regions while tending towards normal or below normal in the South Island.

Rainfall is expected to be near normal over much of the country, but may be above average in eastern North Island regions. Similarly, soil moisture and river flow levels are expected to be normal everywhere except in the southeastern North Island, where they may be normal to above normal.

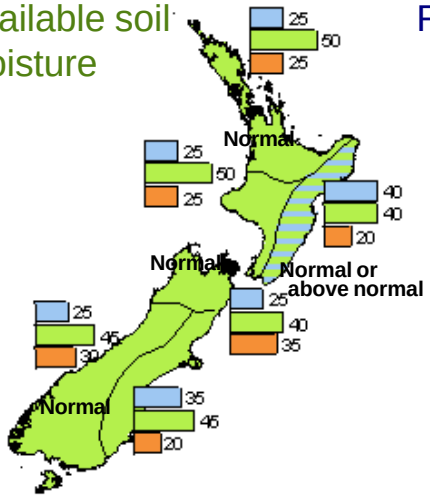
Rainfall



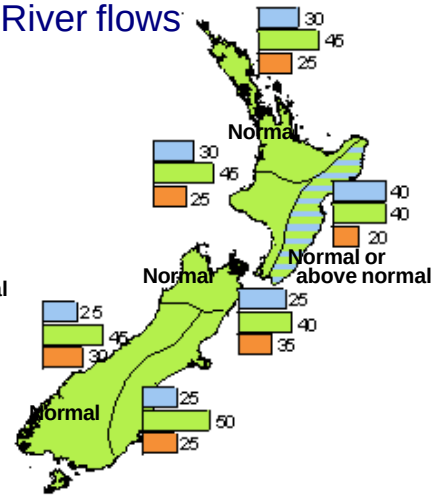
Mean air temperature



Available soil moisture



River flows



KEY to maps (Example interpretation)

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.

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
	A	B
Above normal	33	10
Normal	33	30
Below normal	33	60

Backgrounder

Using satellites to map frost *Dr Andrew Tait, NIWA*

Many agricultural and horticultural crops in New Zealand have their production potential lowered by frost damage. In frost-susceptible areas, such as the Otago region shown in the figure below, a thorough knowledge of the frequency and timing of frosts is necessary to minimise the risk of frost damage.

Minimum temperature observations

Minimum air temperature data recorded at climate stations are used to assess frost risk. However, the frost risk may be significantly different at a location only a few kilometres away from a climate station, due to a change in altitude, aspect, slope, or land cover.

In conjunction with the Otago Regional Council's GrowOtago project, NIWA scientists have combined satellite pictures with minimum air temperature data from climate stations to produce detailed frost maps for the entire Otago region. The maps show information about the length of the frost-free period and the timing of first and last frosts.

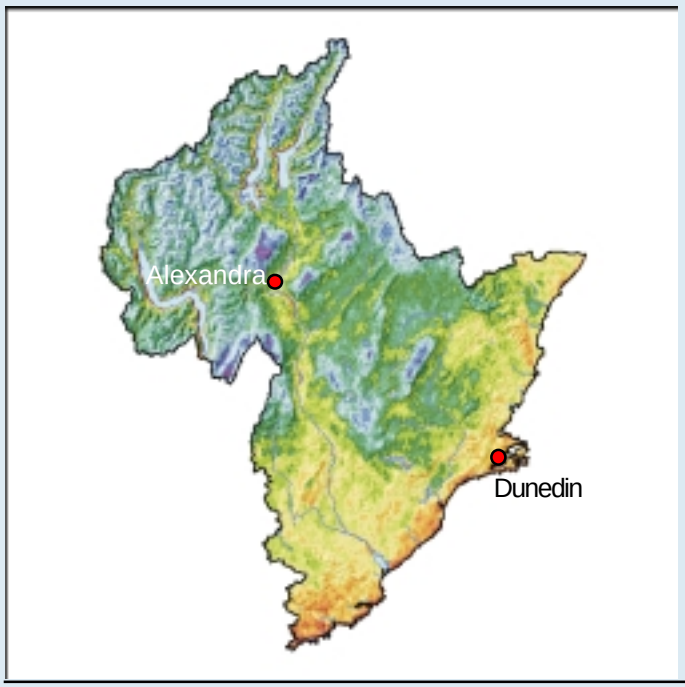
Satellite images

The images used are from satellites that measure the amount of infrared energy being emitted from the surface of the earth. The infrared radiation sensed by the satelite is translated into a colour spectrum that can be interpreted. On cold winter nights with no cloud cover, the patterns of infrared temperature indicate how susceptible places are to frost. Areas that display lower temperatures receive frosts earlier in the autumn and later in the spring. In the figure below, such areas, shown in blue and green shading, are in the broad inland valleys and on top of the mountain ranges. Coastal areas and river valleys display higher temperatures and have lower frost risk in the autumn and spring. These areas appear in yellow and orange shading on the map.

Putting images and data together

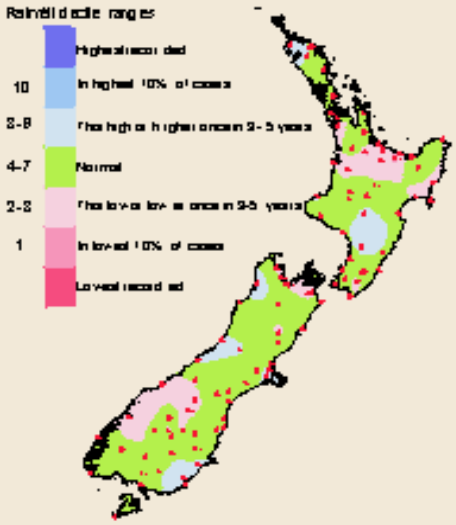
Frost risk calculated from the climate station data is related to the data that the satellite images show over the ground observation sites. This procedure enables accurate interpretion of the satellite data in places where there are no ground-based measurements. In this way a picture of frost risk is built up over the whole Otago region. The information that is obtained like this is not just averages, such as the average length of the frost-free period. It also provides, for example, information on how late the last frost (or how early the first frost) will be at a reasonably practical level that helps risk assessment, such as a one in five year occurrence.

This enables users of the maps to identify the average risk, and the risks associated with the relatively rare events, which could mean the difference between the success and failure of a business.



2002 rainfall to date

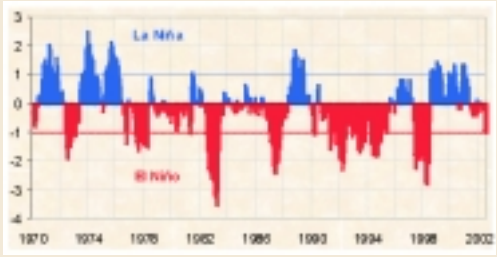
Large areas of New Zealand have received near normal rainfall. Parts of Waikato and Bay of Plenty, and the north and southwest of the South Island have been drier than average.



ABOVE: Total rainfalls for 1 January to 31 July 2002, shown according to decile rankings of all rainfalls for this period from 1972. Dots indicate observation sites used in the analysis.

Update on the SOI

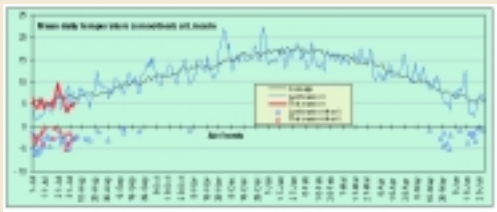
The mean Southern Oscillation Index (SOI) for July was –0.8, with the three month average now at –1.0. A moderate El Niño is now in place, but its affect on New Zealand climate during spring is expected to be weaker than in 1997–98. Further general information on El Niño is available on the World Meteorological 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.

Online climate graphics

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



The Climate Update

The Climate Update is a monthly newsletter from NIWA's National Climate Centre for Monitoring and Prediction, and is published by NIWA, P O Box 14901, Wellington. It is also available via the web.

Comments and ideas are welcome. Please contact:
Alan Porteous, Editor,
Email: ncc@niwa.co.nz
Phone: 0-4-386 0300
Fax: 0-4-386 0341
Visit our website: www.niwa.co.nz/ncc

Cover picture:
Sunny skies at last over school playing fields. Record periods of consecutive wet days this winter have caused problems for sports organisers.

Photograph:
Alan Blacklock