NIWA
Taihoro Nukurangi

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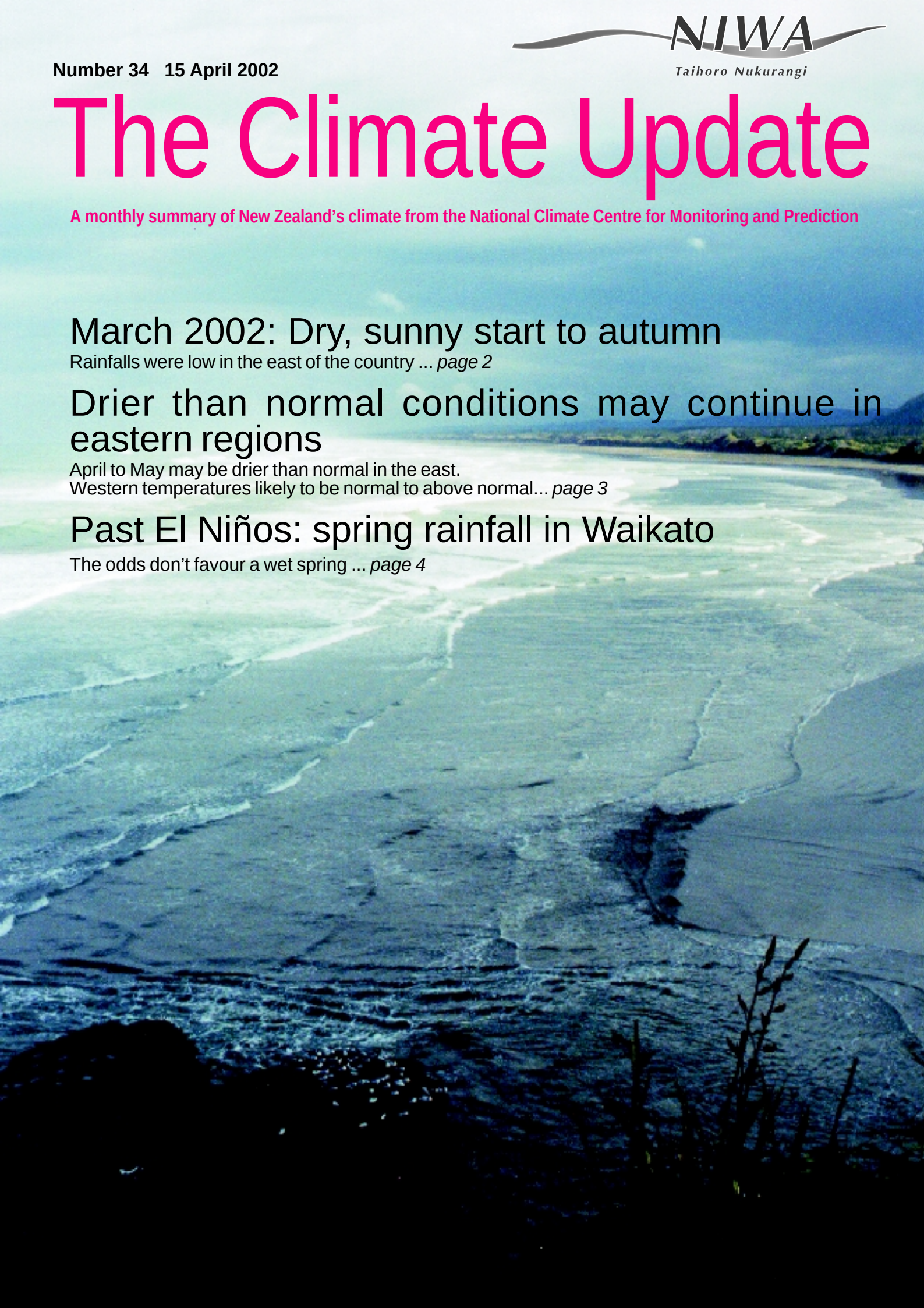
The Climate Update

A monthly summary of New Zealand's climate from the National Climate Centre for Monitoring and Prediction



March 2002: Dry, sunny start to autumn

Rainfalls were low in the east of the country ... *page 2*

Drier than normal conditions may continue in eastern regions

April to May may be drier than normal in the east.
Western temperatures likely to be normal to above normal... *page 3*

Past El Niños: spring rainfall in Waikato

The odds don't favour a wet spring ... *page 4*

New Zealand climate in March 2002

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

A dry, sunny start to autumn

March was dry, especially in the east, and sunny almost everywhere. Many eastern sites between Bay of Plenty and Otago recorded less then 50% of their usual March rainfall. Gisborne Airport recorded 12 mm and has recorded less than this only twice in 95 years. Rainfall was above average in parts of Auckland, Buller, Nelson Lakes, the Southern Alps, and coastal Southland

Almost all New Zealand locations were sunnier than normal after a cloudy summer. It was especially sunny in Nelson and the east coast of the South Island. Christchurch equalled its sunniest March in more than 50 years.

Mild in the north and east

It was warmer than normal in Gisborne, Hawke's Bay, northwest Nelson, and around Blenheim, and near normal elsewhere.

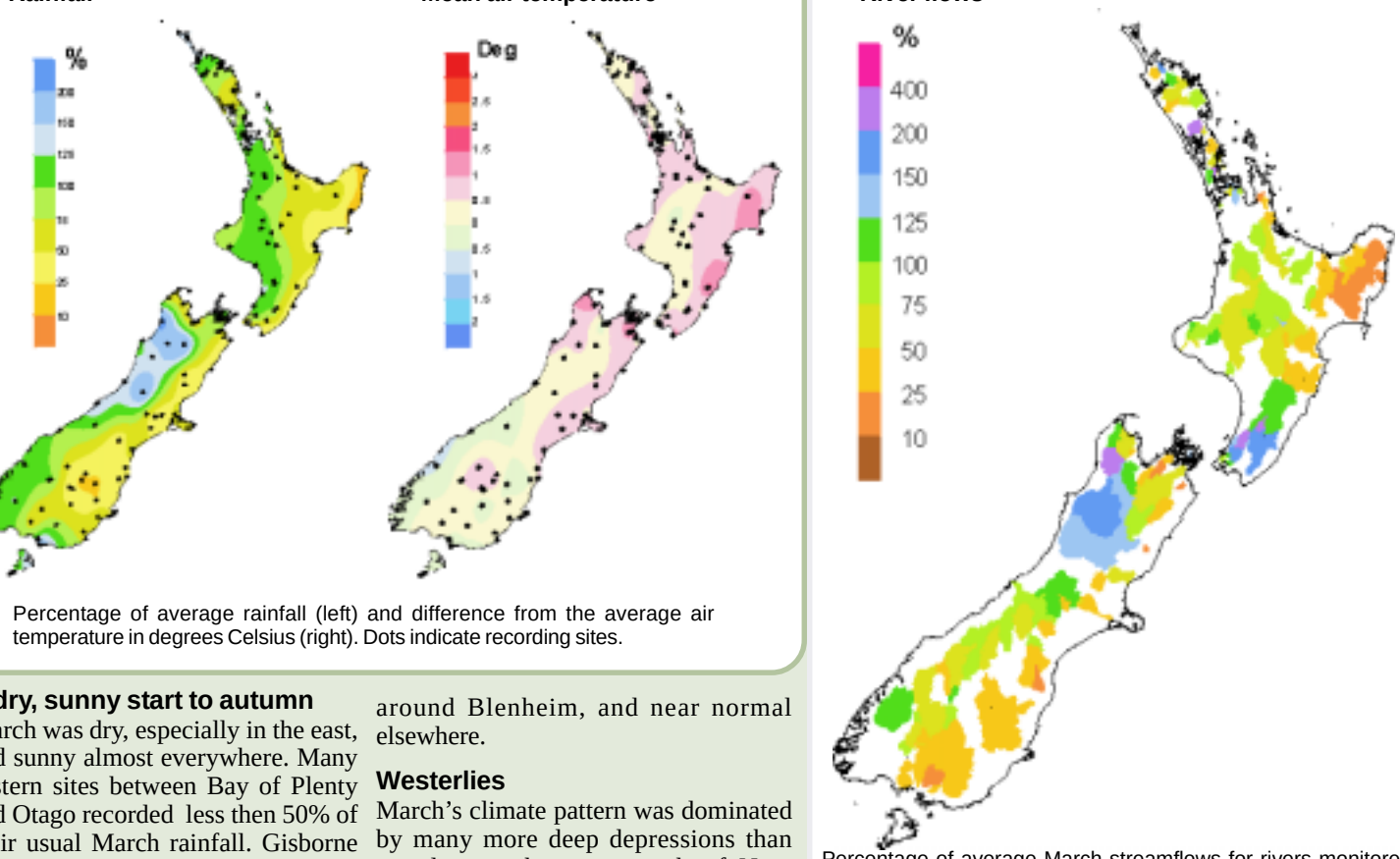
Westerlies

March's climate pattern was dominated by many more deep depressions than usual over the seas south of New Zealand. These depressions resulted in more frequent westerly winds than usual over the country.

Notable storms

A severe rainstorm on 1 March produced 98 mm between 3.05 and 4.05 pm in Egmont Village, causing serious flooding and car accidents in North Taranaki. Inglewood recorded 59 mm between 3.15 and 4.15 pm on the same day.

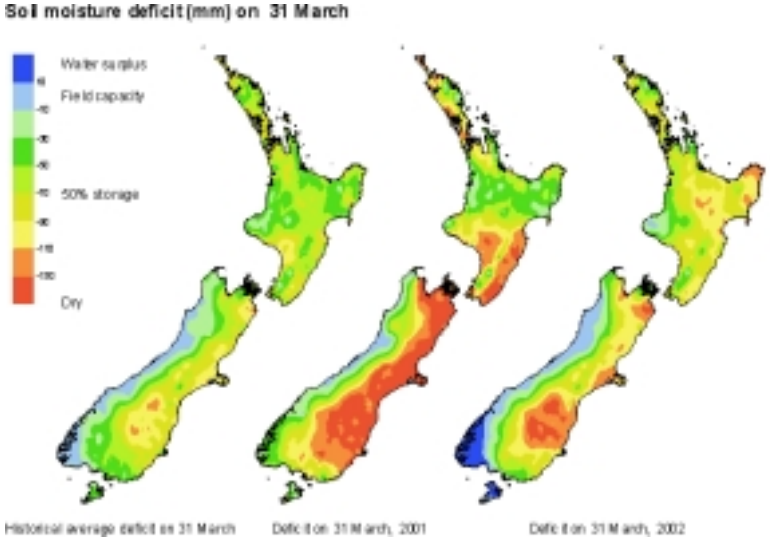
Thunderstorms occurred on the West Coast on 1–3 and 16–22 March, in Southland on 1–3 March, Nelson 19–21 March, and Wellington on 21 March.



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.

High stream flows in Wellington and Buller

Wellington, Wairarapa, and Buller river and stream flows were above average in March. Flows were below average in the Bay of Plenty, East Cape, Marlborough, Otago, and Southland, and near average elsewhere.



Conditions improve in the North Island

Moderate soil moisture deficits continued, particularly in eastern regions, but rainfall brought some relief to Waikato and King Country. Conditions in much of the North Island were near or just below average at the end of March

Significant soil moisture deficits in Otago have now spread to parts of inland south Canterbury, central Marlborough and the Canterbury Plains. Regions east of the ranges were drier than average by the end of March, but the situation was not as severe as at the same time last year.

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.

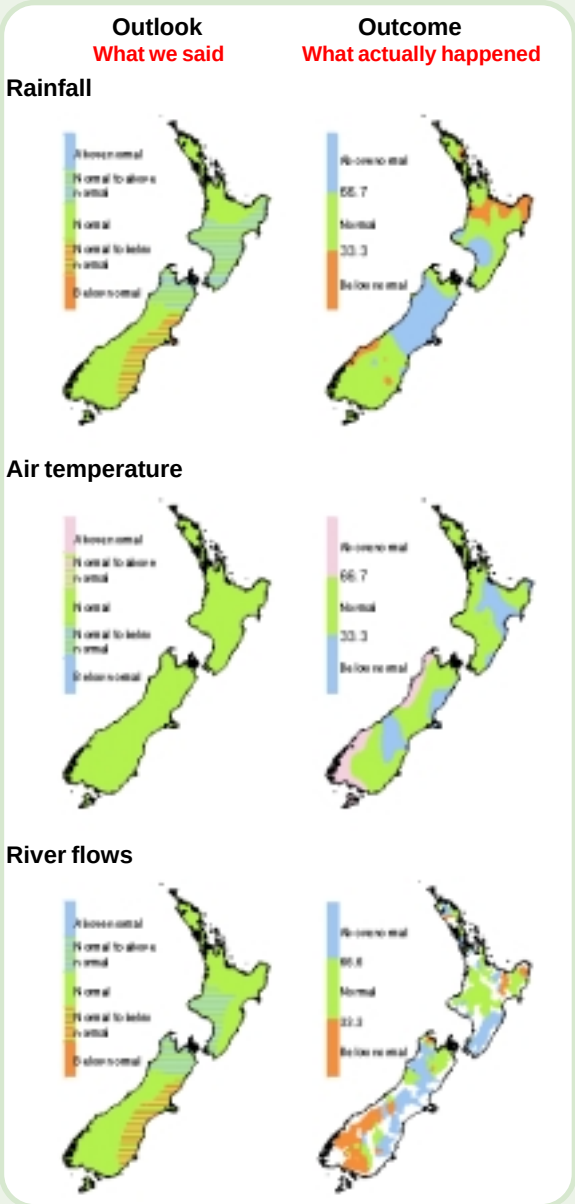
Checkpoint

January to March 2002

Rainfall was above average in Taranaki,Whanganui, and Buller as was predicted in the January to March Outlook. North and central Canterbury received more rain than was forecast. Parts of Waikato, Bay of Plenty, and East Cape were drier than expected.

Air temperatures were normal over much of the country as was expected, although large areas were cooler than forecast. It was warmer than expected in the west of the South Island.

River flows were above normal as forecast in Wellington and Buller, but lower than expected in west Otago and Southland. Eastern South Island flows were higher than expected.



The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for January to March 2002. 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.
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.

Outlook

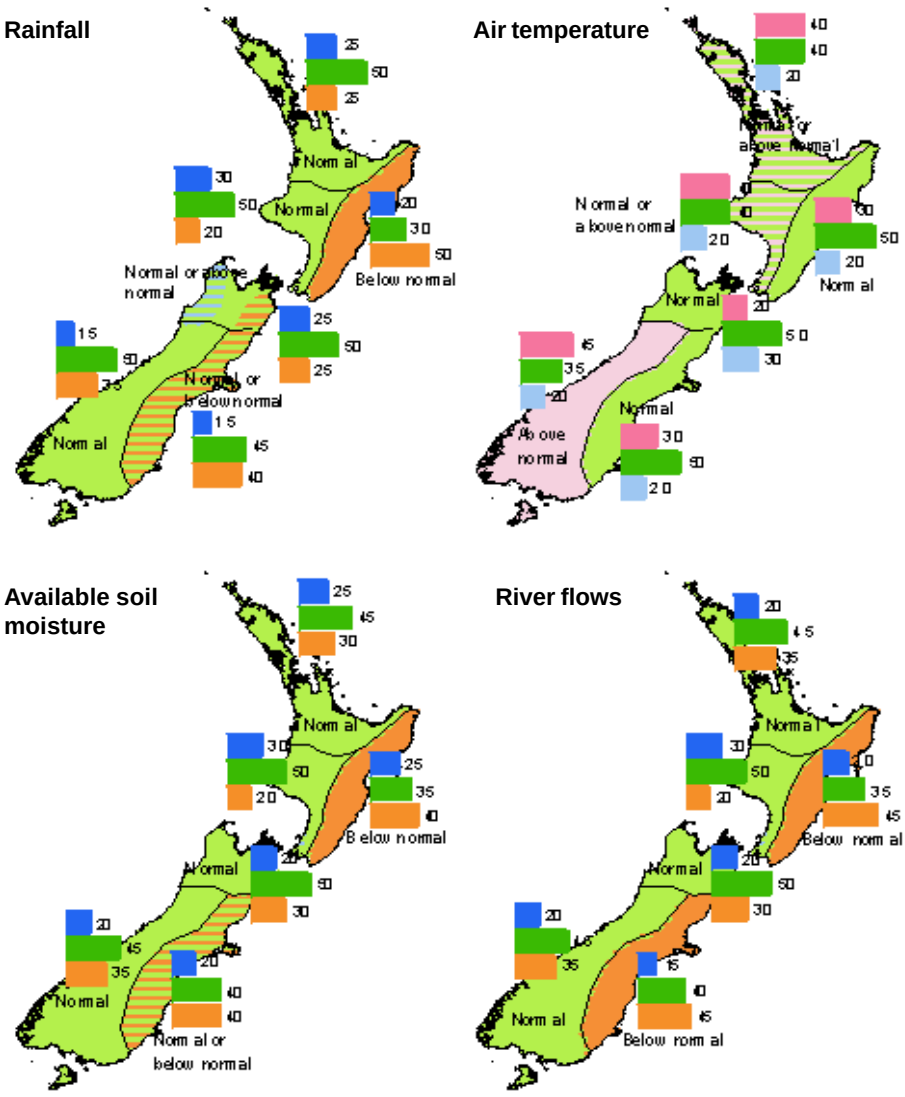
April to June 2002

There are now strong indications that an El Niño may develop by spring. One indication is that sea surface temperatures in the equatorial Pacific are now above normal, and are expected to rise further relative to normal over coming months. Another typical feature of El Niño, lower than normal sea surface temperatures to the west of New Zealand, is also becoming evident.

Rainfall is expected to be near normal in most regions of New Zealand, apart from below normal in the east of the North Island and normal to below normal in the east of the South Island.

Temperatures are expected to be normal or above in the north and west of the North Island, above normal in the west of the South Island, and normal in other regions.

Normal soil moisture levels and river flows are predicted for most regions of the country. Below normal river flows and normal to below normal soil moisture levels are likely in the east of the South Island. In the east of the North Island, both soil moisture levels and river flows are likely to be below normal.



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

El Niño and Waikato spring climate: dry or wet?

The possibility of a return to El Niño conditions later this year has been strengthened by recent developments in the tropical Pacific (see the Climate Outlook on page 3). The best indication of the effect that El Niño might have on spring rainfall can be found in the historical record of previous El Niño springs. Here we look at Waikato spring rainfall as an example of how to use historical data to determine probable regional El Niño impacts.

Waikato spring rainfall

About 260 to 320 mm of rainfall is typically recorded in lowland Waikato during spring, with higher falls in the hill country. At Morrinsville, in central Waitako, the average spring rainfall is 284 mm.

Morrinsville spring rainfall for all years since 1950 is shown in Figure 1 below. The data points are shown in orange, green, and blue to illustrate the lower, middle, and upper tercile rainfalls respectively (see caption). The vertical green dashed lines mark the boundaries of the tercile ranges.

The driest spring in Morrinsville, 1954, recorded just 129 mm (155 mm below average), and in the wettest year, 1971, there were 477 mm (193 mm above average).

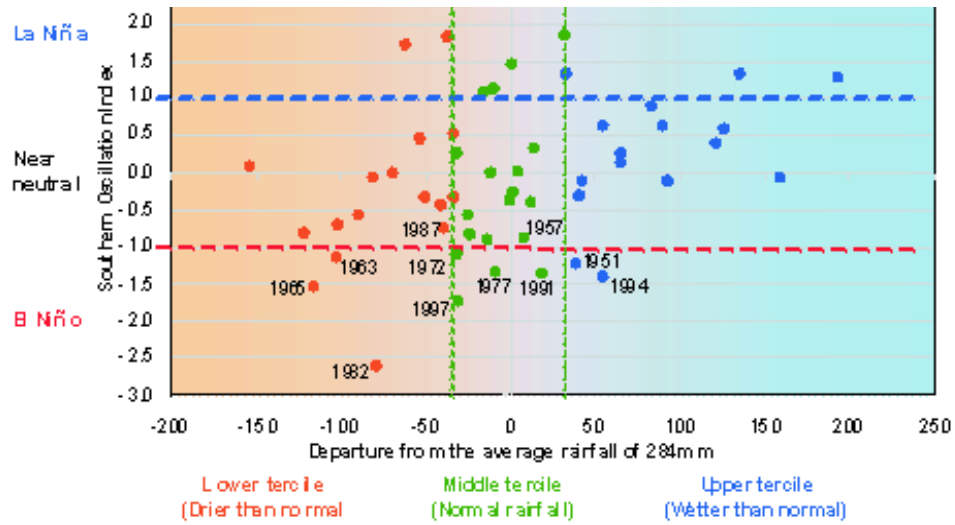
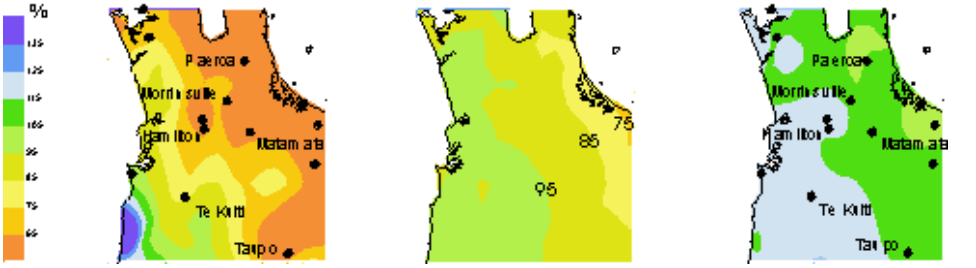


FIGURE 1 ABOVE: Spring rainfall at Morrinsville from 1950 to 200. Data points are classified by colour into three equal groups (terciles). Tercile ranges for Morrinsville spring rainfalls are: lower tercile, 34 mm or more below average, orange; middle tercile, 33 mm below average to 32 mm above average, green; upper tercile, more than 32 mm above average. The mean three-month Southern Oscillation Index (SOI) is shown on the vertical axis. El Niños are considered to be strong when the three-month SOI is at or less than -1 (at or below dashed red line), and similarly, strong La Niñas occur when the SOI is plus 1 or more (at or above dashed blue line). El Niño springs are labelled.



Driest El Niño spring: 1965 | Average El Niño spring | Wettest El Niño spring: 1994

FIGURE 2 ABOVE: El Niño spring rainfall, percent of average. Contours for the driest El Niño spring, 1965 (left), the average of the 11 El Niño springs since 1950 (centre), and the wettest El Niño spring, 1994 (right). The maps indicate that El Niño spring rainfalls are likely to be near or above average in the west of the region, and below average in the east.

El Niño years

Both the El Niño and La Niña phases of the El Niño-Southern Oscillation are associated with typical spring atmospheric circulation patterns over New Zealand. During El Niños there is a tendency for more southwesterlies than normal over the Waikato.

El Niño seasons are characterised by above-average sea surface temperatures in the equatorial Pacific Ocean, and by changes in atmospheric circulation patterns over the Pacific that can result in the Southern Oscillation Index (SOI) remaining about or less than -1 for periods of three months or longer (near or below the dashed red line in Figure 1).

The El Niño spring seasons since 1950 are labelled in Figure 1. Four seasons, 1963, 1965, 1982, and 1987 had lower tercile rainfalls, five seasons, 1957, 1972, 1977, 1991, and 1997 recorded middle tercile rainfalls, and two seasons, 1951 and 1994, fell in the upper tercile.

El Niño spring outlook?

The data in Figure 1 illustrate why forecasts of 2002 spring rainfall are best given in probabilistic terms. Of the 11 El Niño springs since 1950, only two resulted in upper tercile rainfalls at Morrinsville. These data suggest that the chance of above normal rainfall in central Waikato in an El Niño spring is less than 20%, while the probability of lower decile rainfall is greater than 50%.

Figure 2 shows El Niño spring rainfall anomaly patterns across the Waikato region. The centre map, showing the average anomaly, indicates that rainfall is likely to be near average in the west (95–105% of average), and that there is a tendency to below average rainfalls in the east (less than 85%). This tendency for lower than average rainfall in the east is reflected also in the spring rainfalls of both the driest and wettest El Niño springs, 1965 and 1994 respectively, and provides another clue as to how the spring rainfall pattern might evolve.

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, PO Box 14-901, Wellington. It is also available via the web.

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Cover picture: The surf at Muriwai Beach, Auckland. El Niño may bring heightened west to southwest winds, and perhaps better surf, to west coast beaches in spring and summer.

Photograph: Georgina Griffiths