Number 33 15 March 2002

NIWA
Taihoro Nukurangi

The Climate Update

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

February 2002: Mostly cloudy and cool

Summer was confined to the west coast of the South Island for much of the month ... *page 2*

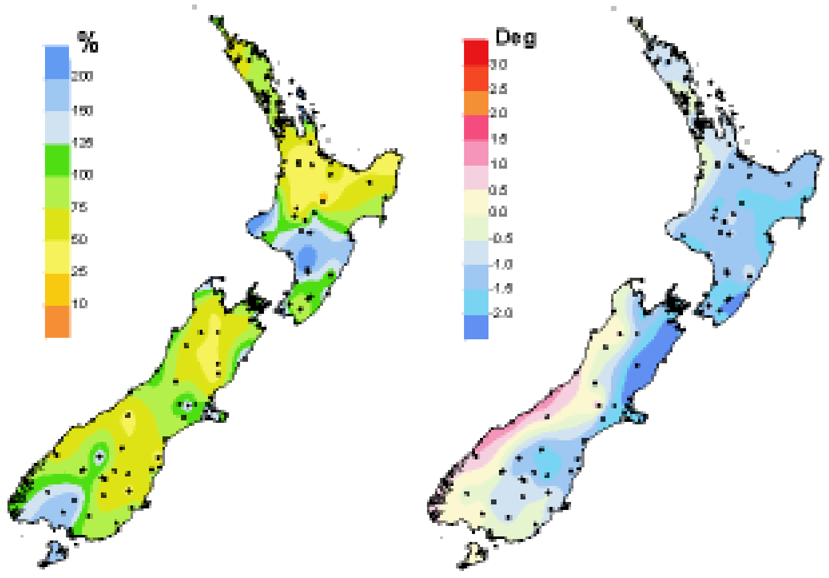
Rainfall expected to be down from normal in the east, up in the west

March to May rainfall is likely to be lower than average in the east from Gisborne to Marlborough, but above average in the west of the South Island... *page 3*

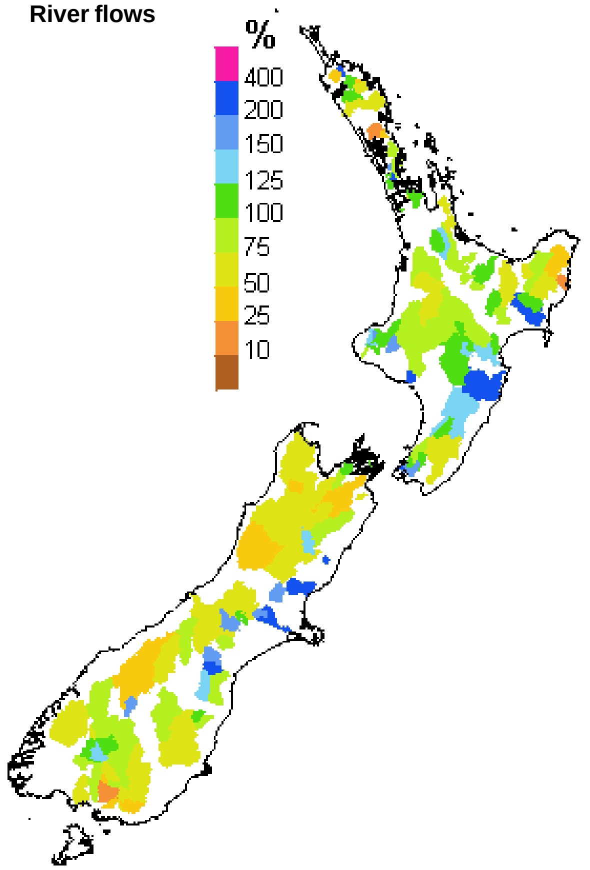
Update on El Niño

Could be in place by spring, but uncertainty remains ... *page 3*

New Zealand climate in February 2002



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



Percentage of average February 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.

A month of contrasts

It was dry, warm, and sunny on the South Island's west coast, while eastern South Island regions experienced cool, cloudy conditions. The lower North Island was wet, while much of the upper half was drier than normal.

Patchy rainfall

Some parts of the lower North Island, including Taranaki and Hawke's Bay, had double their normal rainfall. An isolated extreme rainfall event on 21 February brought more than three times normal February rainfall to Great Barrier Island. Above average rainfall also occurred in Coromandel, central Hawke's Bay, the central North Island volcanic plateau, north Canterbury, and coastal Southland.

In contrast rainfall was less than half normal in Waikato, western Bay of Plenty, Taupo, and parts of Northland and Central Otago. Rainfall was down 25% from normal in Auckland, eastern Bay of Plenty, south Westland, and Fiordland.

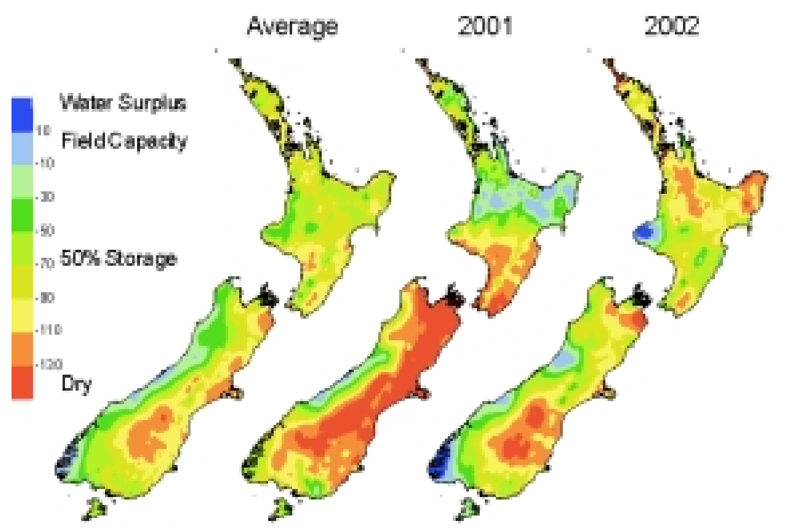
Warm West Coast

Mean temperatures were about 1.0 °C above normal on the West Coast, but at least 1.0 °C below normal in many other regions. In the east from Gisborne to Canterbury they were at least 1.5 °C, and up to 3.5 °C, below average. Mean temperatures were near average in the southern lakes region and Southland.

Sunshine was above average in Westland and Southland. Lower than normal sunshine hours were recorded in eastern regions from Gisborne to Canterbury, including Wellington.

Low flows in the south and west of the South Island

February river flows were very low on the South Island's west coast and alpine areas, and in coastal Southland and Otago. Inland Southland and Otago, and much of the North Island, recorded near average flows, while in Canterbury and Hawke's Bay the flows were higher than average.



Some areas drier than average

At the end of February, total root zone soil moisture availability was down from average in the key livestock farming areas of Northland, Waikato and the central North Island, East Cape, Marlborough, south Canterbury, and North and Central Otago. Parts of Wairarapa were also drier than average.

In western Taranaki, parts of the west and southwest of the South Island, central and southern Hawke's Bay, and northern and mid Canterbury, soils were wetter than usual following above average February rainfalls in those areas.

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

Checkpoint

December 2001 to February 2002

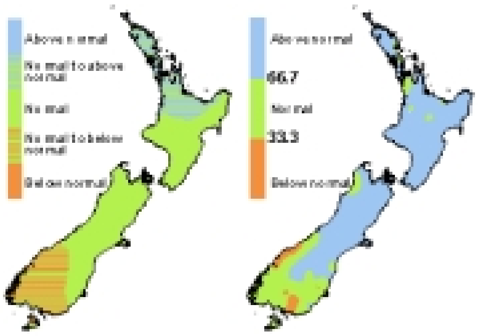
Parts of the southwest of the South Island experienced the predicted below average rainfall. Central New Zealand and eastern North Island regions received more rain than was predicted. There was near average seasonal rainfall elsewhere as expected.

The anticipated average to above average temperatures were experienced over much of the country. The exceptions were a few eastern regions where conditions were cooler than expected.

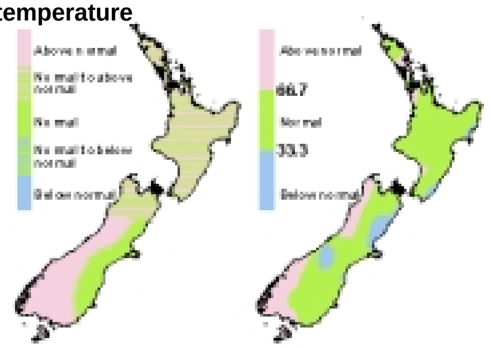
River flows were expected to be normal to above normal in northern New Zealand and below normal in the southwest. Summer flows were mostly above normal, except in south Westland and Southland.

Outlook What we said	Outcome What actually happened

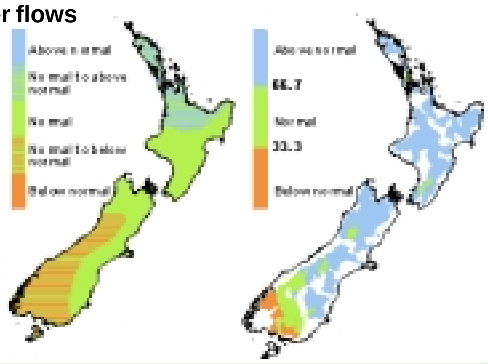
Rain



Air temperature



River flows



The three outcome maps (right column) give the tercile rankings of the rainfall totals, mean temperatures, and river flows that eventuated for December 2001 to February 2002. Terciles were obtained by dividing ranked December to February 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

March to May 2002

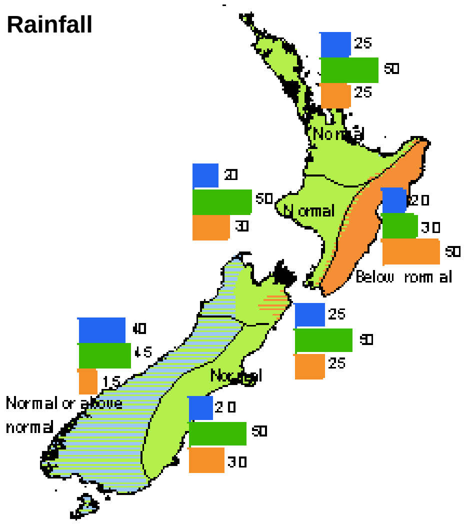
The present neutral phase of the El Niño-Southern Oscillation is likely to remain through autumn. An El Niño 'alert' is in place, with some early signs that an El Niño could develop by spring, although this is not yet certain.

South Island temperatures are expected to be above normal in the west and normal to below normal in the east. Near normal temperatures are expected in Nelson and Marlborough. In the North Island, temperatures are likely to be normal or above normal in the southwest and near normal in the north and east.

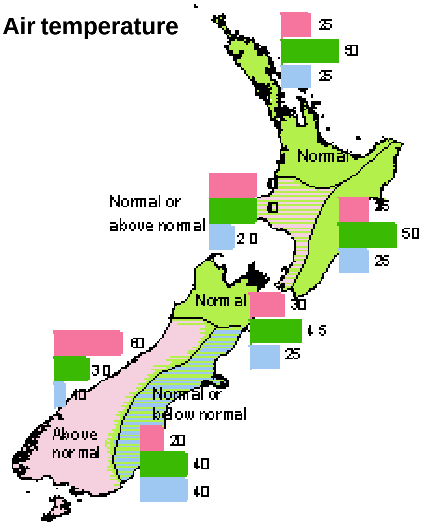
Near normal rainfall is expected over much of the country. Exceptions are the east of the North Island, where rainfall is likely to be below normal, and the west of the South Island, where normal or above normal rain is expected.

Normal soil moisture levels and river flows are predicted for most parts of the country, apart from the north of the South Island and the east of the North Island, where river flows are expected to be normal to below normal.

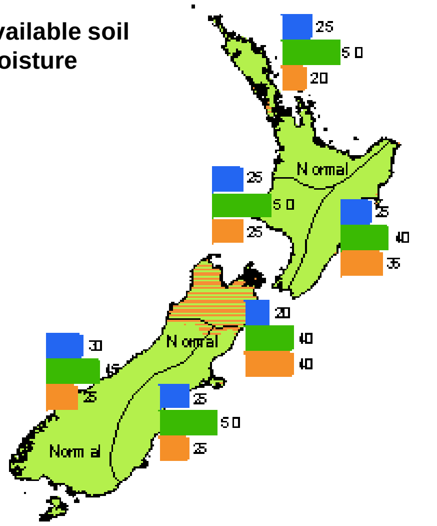
Rainfall



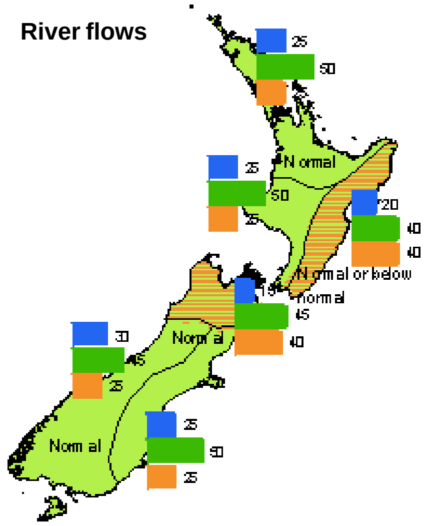
Air temperature



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 (A)	Strong expectation of below normal (B)
Above normal	33	10
Normal	33	30
Below normal	33	60

Backgrounder

GIS – improving electronic pictures of the real world

Geographic Information Systems (GIS) are hard to describe to everyone's satisfaction. Definitions often depend on users' backgrounds and how they think, or on organisations' objectives in implementing the technology. GIS is a powerful tool in climate work because it provides a means of bringing together a whole range of climate analysis tasks that have historically been handled in separate steps.

Climate observations

New Zealand's climate and weather monitoring stations have been set up over the years in places where there was convenient access, where the data were useful in meeting regional information needs, or at places where industries such as communications or transport needed the observations for operational purposes, for example at airports.

Sites were chosen so that the data recorded would be as representative as possible of the surrounding area. In areas where there were no observations, a reasonable guide to the climate had to be made by assuming that a climate gradient occured between adjacent observation points. For example, if one station averaged 100 mm of rain per month, and another 200, then locations in between might be expected to receive rainfalls somewhere between the two amounts, depending on the proximity of those locations to either station.

The use of computers allowed a range of spatial analysis methods to be more easily applied to estimate variations in the climate from one region to another.

Geographic influence

However, as everyone knows, geographic features influence or *force* the weather, and therefore collectively the climate, to behave differently than it would if the earth were flat. Features such as altitude, aspect, slope, and the presence of mountains and valleys, all exert an influence on the resulting rainfall, temperature, and wind patterns.

Because we have climate observations at locations with various geographic features we have been able to build up conventions or *paradigms* on how these features typically influence climate. For example, we know that the windward side of a mountain range generally has higher rainfall than the lee side. Or that cold air flowing into low lying areas at night can replace warm air on valley floors, for example, thereby increasing the frost risk in low lying areas.

We know also that the sea has a modifying effect on air temperature, so distance from the sea is another important geographic feature, and that latitude is a factor in determining daylength, another important influence on climate.

GIS platform

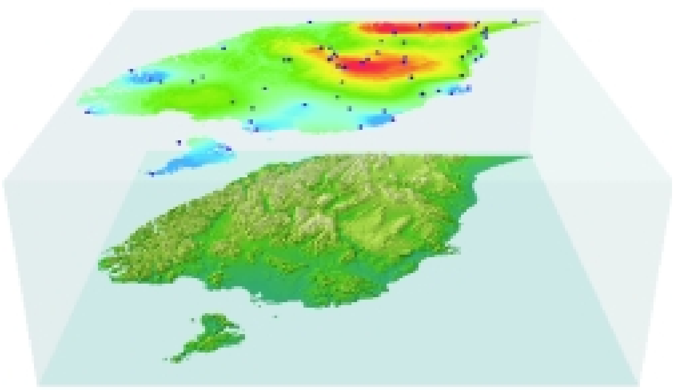
GIS computing procedures enable us to integrate the spatial analysis methods and the typical geographic influences in systematic ways, something that had to be done manually in the past, process them rapidly, and produce easy to interpret maps, commonly called *layers* or *coverages*.

The methods can be varied to display different map outputs, for example, to give the 1 in 10 year low rainfall as well as the average rainfall. We can sample subsets of the data that help us to identify areas, or match them with selection criteria, e.g., where is the rainfall lower than 900 mm in places that have more than 350 hours of bright sunshine during summer?

We can also combine sets of information, e.g., climate data with cadastral data (which show features like roads and regional boundaries).

Picture perfect?

GIS layers often look so good that one can be tempted to assume that the picture says it all, but, of course, the final image can only be as good as the observational data underlying it and the methods used to analyse those data. Generally, getting these steps right is the biggest and most expensive stage in any GIS procedure. The resolution of the image, that is, how quickly the data vary with distance across the image, must be chosen so that there is no pretence that more precise information is being shown than is reasonable given the size and quality of the underlying data set.



Trial chill unit accumulation map for southern New Zealand. Dots indicate temperature observation sites.The topographical map in the lower layer is given at a resolution of 250 metres. In the upper layer, chill unit summations have been estimated using both spatial and topographical procedures. Chill unit accumulation is an index of the duration and intensity of dormancy in temperate climate crops. The most effective chilling air temperatures are between about 3° and 10 °C. Temperatures below 0 °C do not assist chilling, and at temperatures above 15 °C the chilling process is reversed. *Map prepared by Jason Keys, NIWA.*

The Climate Update

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Cover picture:
Wetter than normal conditions over summer in some areas have produced rank pasture growth, which, combined with humid weather, provides favourable conditions for the development of facial eczema spores.

Photograph: Alan Blacklock