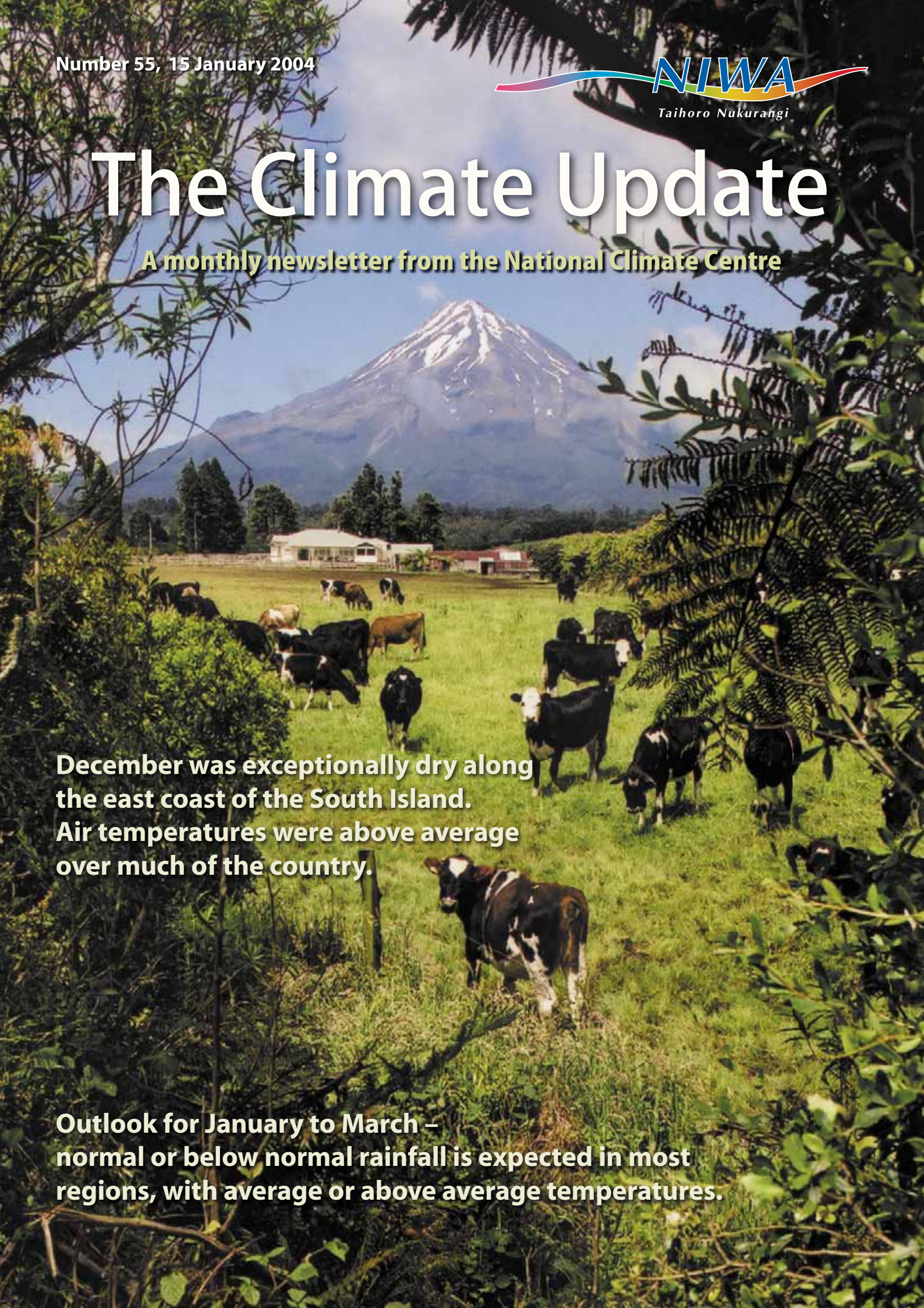
Number 55, 15 January 2004

NIWA
Taihoro Nukurangi

The Climate Update

A monthly newsletter from the National Climate Centre

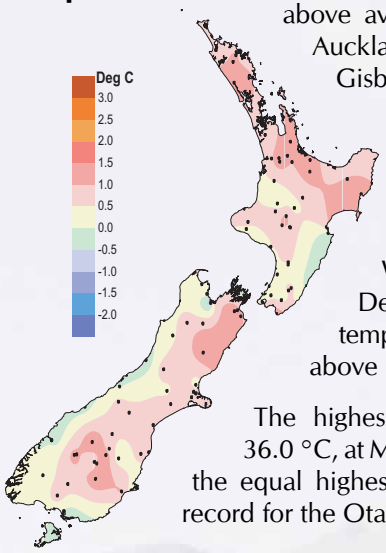


December was exceptionally dry along the east coast of the South Island. Air temperatures were above average over much of the country.

Outlook for January to March – normal or below normal rainfall is expected in most regions, with average or above average temperatures.

New Zealand climate in December 2003

Mean air temperature

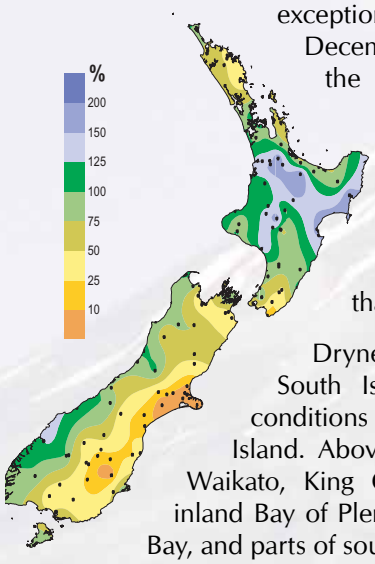


Warm in most areas

Mean temperatures were at least 1.0 °C above average in parts of Northland, Auckland, Waikato, Bay of Plenty, Gisborne, Marlborough, and Central Otago. It was also warmer than usual in Coromandel and central Hawke's Bay, but cooler than average in parts of Westland and Fiordland. The December national average temperature of 15.9 °C was 0.3 °C above normal.

The highest temperature recorded was 36.0 °C, at Middlemarch on 31 December, the equal highest December temperature on record for the Otago region.

Rainfall



Record low rainfall in Canterbury

Canterbury bore the brunt of the exceptionally dry conditions in December in east coast regions of the South Island. Many locations in the region recorded only 1 mm of rain, making it the driest December on record. Christchurch Botanic Gardens' rainfall was the lowest for December in more than 140 years of measurement.

Dryness in eastern regions of the South Island contrasted with wetter conditions in the west and in the North Island. Above average rainfall occurred in Waikato, King Country, Taranaki, Wanganui, inland Bay of Plenty, Taupo, Gisborne, Hawke's Bay, and parts of south Westland and Fiordland.

Milford Sound recorded 260 mm of rain on 5 December, and rainfall exceeded 50 mm in one day in Upper Hutt, Rotorua, and Gisborne later in the month.

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

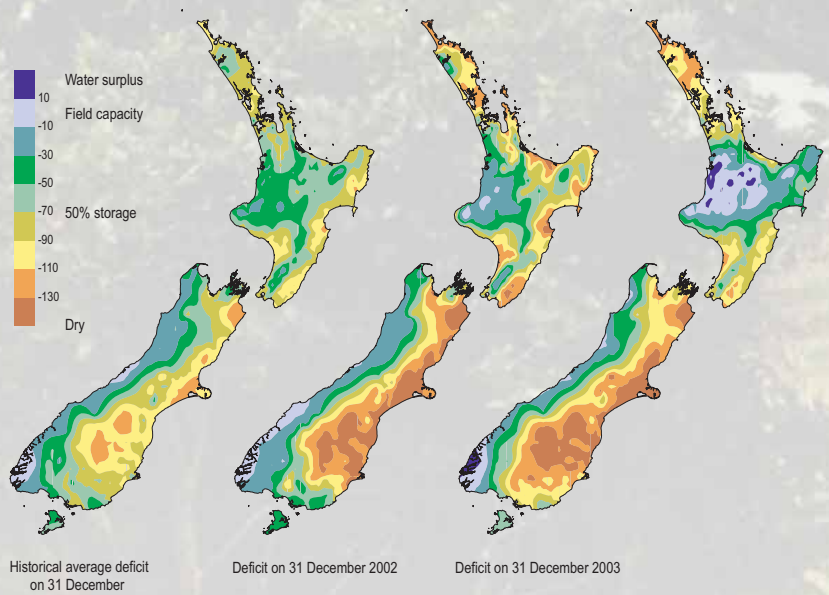
Dry soils extending into the deep south

Soils in the eastern South Island continued to be drier than normal through December, and abnormally dry conditions extended further into Southland during the month. Northland and parts of the south of the North Island were also drier than average at the end of December, contrasting with wetter than normal soil (some soils at field capacity) through western and central North Island regions.

Streamflows extremely low in the north, east, and south of the South Island.

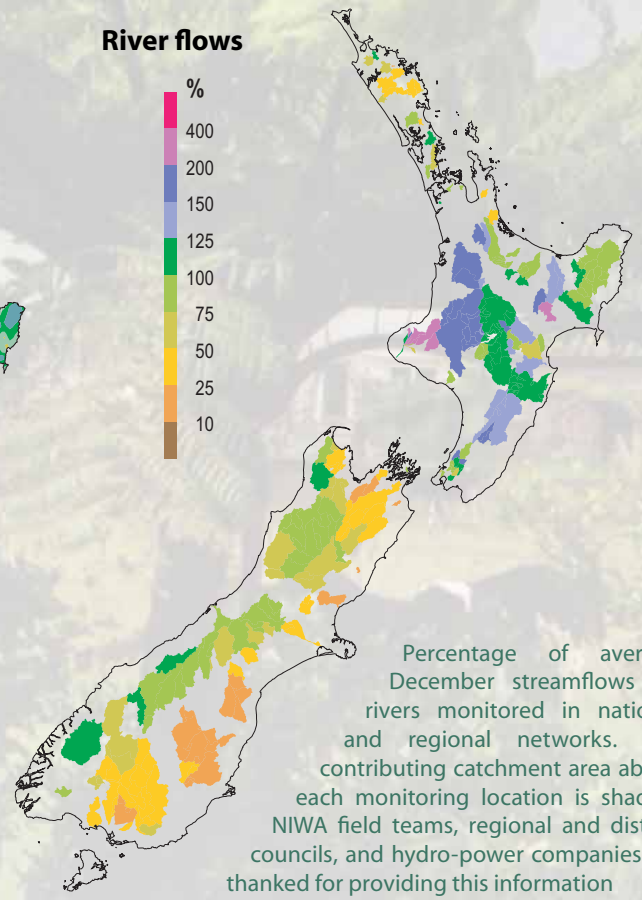
December streamflows were below normal in Northland, Coromandel, Bay of Plenty, Wairarapa, and in the north, east, and south of the South Island. Streamflows were near normal around Auckland, East Cape, and in the west of the South Island, and above normal in the central North Island, Taranaki, and Hawke's Bay.

Soil moisture deficit



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

River flows



Percentage of average December 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

Checkpoint

October to December 2003

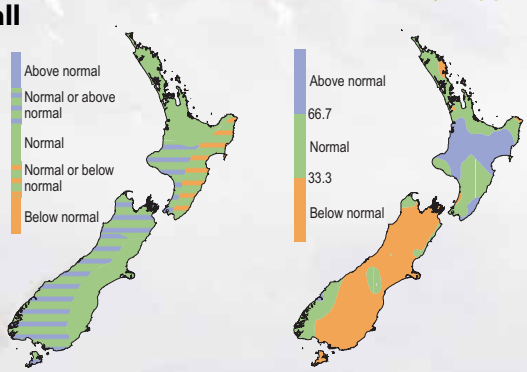
Rainfall: the South Island was drier than expected and, it was wetter than expected in parts of the east of the North Island.

December was warmer than average in many places, but October and November temperatures were generally below average. As a result mean temperatures for the three months as a whole were lower than predicted.

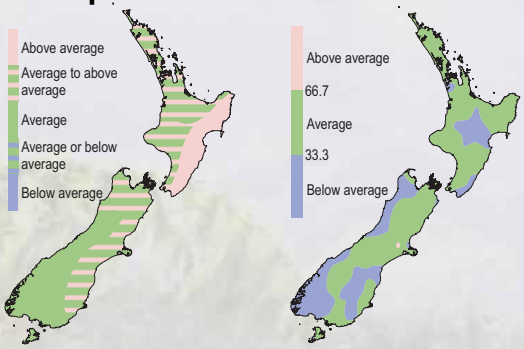
River flows were expected to be normal or above normal in most locations, but normal or below normal in the east of the South Island. Flows were normal or above normal in the North Island, and normal or below normal in the South Island.

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

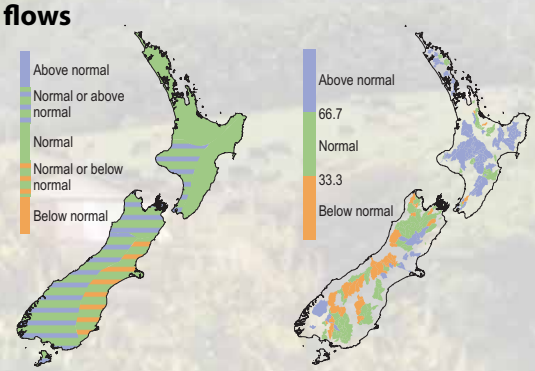
Rainfall



Mean air temperature



River flows



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

January to March 2004

Normal or below normal rainfall is expected in most regions, with normal rainfall in the west of the North Island, and the west and south of the South Island.

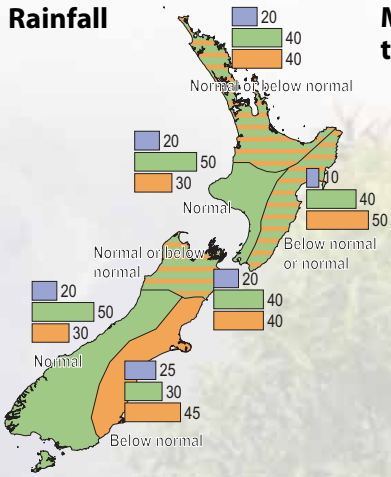
Average or above average temperatures are likely in eastern areas, with average temperatures expected for the rest of the country.

Soil moisture levels and river flows are predicted to be below normal in the east and in Nelson-Marlborough, and normal or below normal in the north of the North Island. Normal soil moisture levels and river flows are predicted elsewhere.

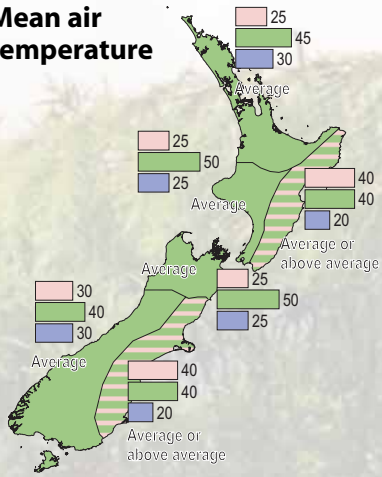
Equatorial sea surface temperatures are slightly higher than normal, but the other indicators show that no El Niño is expected through to early autumn 2004.

Atmospheric pressure over New Zealand is expected to be above average with more anticyclones than usual, and with more frequent westerly and northwesterly winds to the south. Local sea surface temperatures are likely to remain slightly below average throughout this period.

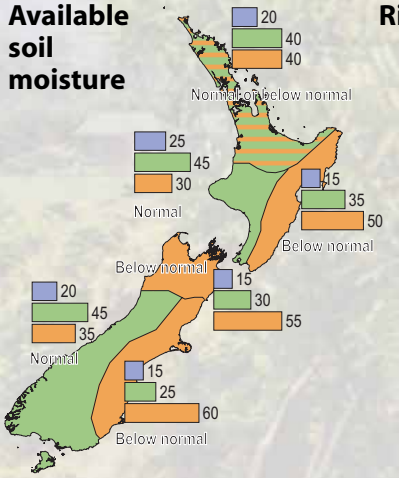
Rainfall



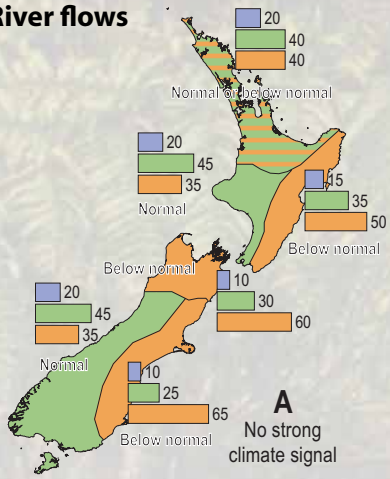
Mean air temperature



Available soil moisture



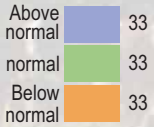
River flows



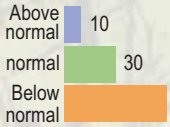
Key to maps (example interpretation)

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).

A
No strong climate signal



B
Strong expectation of below normal



Backgrounder

Climate 'normals' for 1971—2000 are now available on the National Climate Database. The word normal is typically associated with something that is common or happens every day, but in climatology it has a meaning that is quite specific.

Mark Twain's alleged observation 'Climate is what you expect, but weather is what you get' is perhaps a good starting point for understanding what meteorologists mean by climate normals. In everyday use, the word normal typically refers to something that is frequent or ordinary. But normal in the climate context is different. It is the term used for the arithmetic mean, and other statistical measures such as the median and standard deviation, of the values of a climate parameter (such as rainfall) over a standard period, normally 30 years. Normals describe the average climate at a location.

Normals calculation

Computing climate normals is not just a matter of analysing whatever data are available. Many climate stations have records that are shorter than 30 years, or have periods of malfunction, and therefore estimates of missing data are necessary. Other complications occur, for example, when instruments or observing methods are changed at a climate observing station, or the station has moved. It's sometimes possible in these cases to transpose data from nearby stations where observations are highly correlated.

NORMAL RAINFALL, 1971–2000

Station	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Te Rehunga	114	98	130	139	157	158	184	146	171	165	154	134
Waipuna	85	79	95	103	115	117	124	111	118	119	110	106
Makamako	103	100	114	114	145	156	159	135	139	150	133	12
Pahiatua	83	62	96	110	134	133	154	129	137	139	128	
Makiro	68	69	84	89	102	105	119	103	104	105		
Mangamaire	71	63	81	76	129	108	137	106	117	107		
Putara	206	171	231	220	288	295	357	313	342			
Willowlea	49	67	79	82	99	118	114	101	96			
Waingawa	54	58	85	66	103	101	103	98	83			

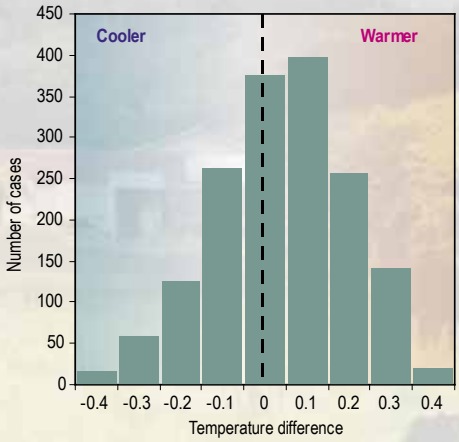
Monthly normal rainfall data for a selection of east coast North Island stations. The data provide for statistically valid comparisons of the climate from one location to another, and between months of the year at the same location.

Uses of climate normals

High quality climate normals provide the basis for more reliable comparisons of the climate from one location to another than can be achieved with just a few years of record, or with records from non-concurrent observing periods.

Calculation methods for climate normals conform to international standards set out by the World Meteorological Organization, and therefore can provide reliable country-to-country comparisons.

Climate normals are also important for studies of long-term climate variability and change. The figure below gives a 'snap-shot' of the difference between the monthly mean air temperature normals of 1971–2000 and those of the previous period, 1961–1990, for a selection of 138 New Zealand stations. The figure shows the distribution of differences between the monthly normals for these stations – a positive difference of 0.1 °C being the most common difference (for nearly 400 months). The data show that the climate of the later period was slightly warmer.



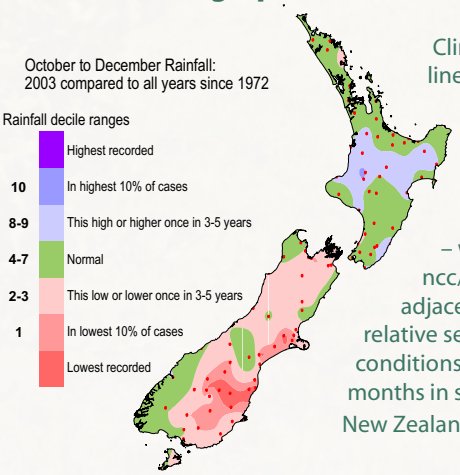
Acknowledgment: Dr John Sansom of NIWA calculated the 1971–2000 normals for the National Climate Database and provided the data for the figure (left).

New Zealand climate normals

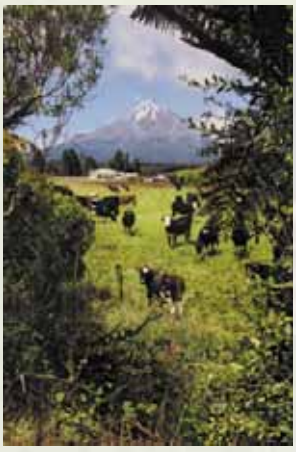
Normals that are available through NIWA on the National Climate Database are:

- Total rainfall
- Average maximum, mean, and minimum air temperatures
- Total hours of bright sunshine
- Mean sea-level pressure at 9.00 am.

On-line climate graphics



Climate maps and line plots of climate site observations are available on subscription from the Climate Now website – www.niwa.co.nz/ncc/climatenow. The adjacent map shows the relative severity of the dry conditions of the past three months in southern New Zealand.



Icons of Taranaki – snow tipped mountain, subtropical forest, and dairying. Climate normals confirm the reliability of Taranaki's climate for pastoral farming.
Cover photo: *Wendy St George.*

The Climate Update is a monthly newsletter from NIWA's National Climate Centre for Monitoring and Prediction, and is published by NIWA, Private Bag 14901, Wellington. It is also available on the web. Comments and ideas are welcome. Please contact Alan Porteous, Editor
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