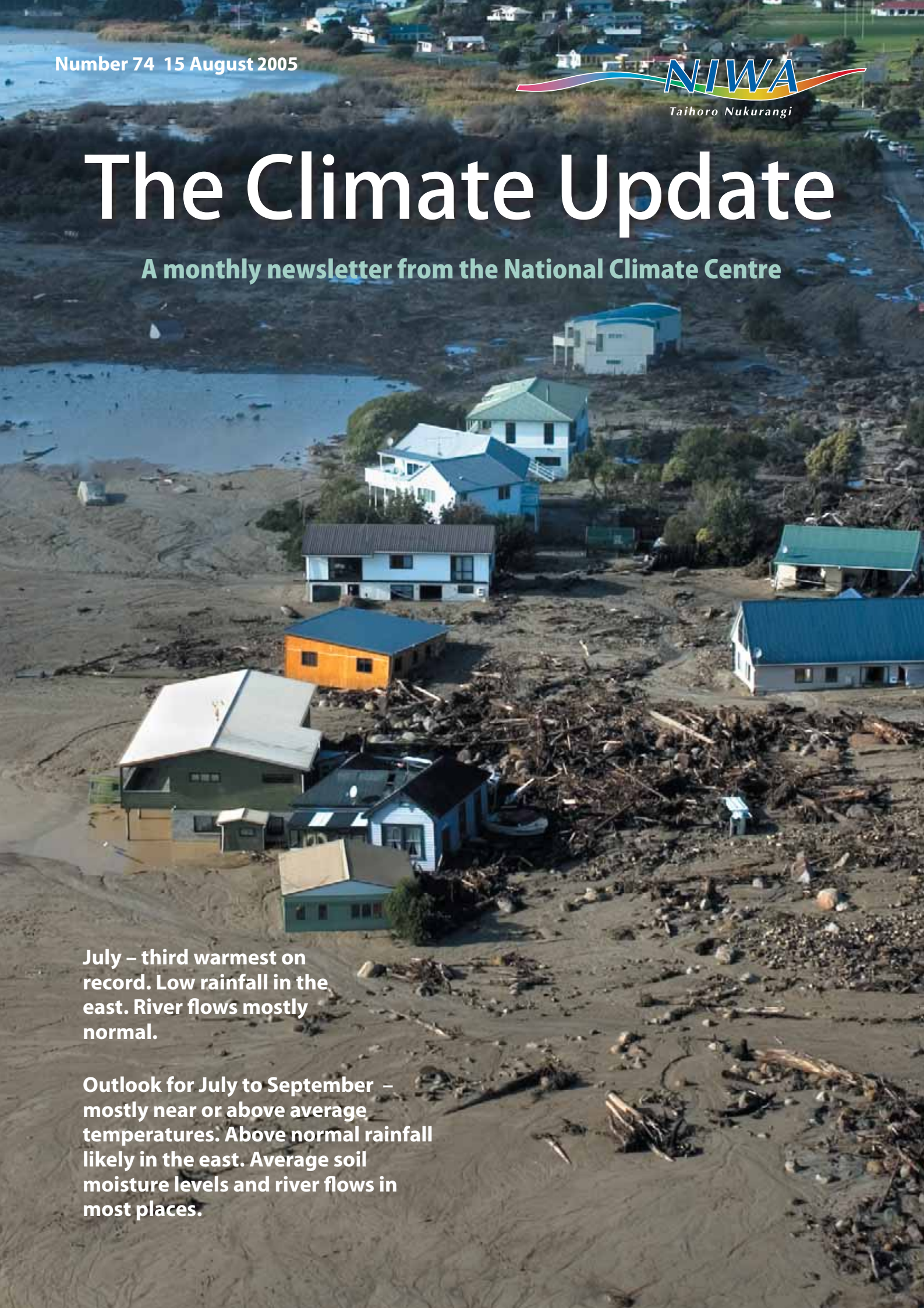
Number 74 15 August 2005

NIWA
Taihoro Nukurangi

The Climate Update

A monthly newsletter from the National Climate Centre



July – third warmest on record. Low rainfall in the east. River flows mostly normal.

Outlook for July to September – mostly near or above average temperatures. Above normal rainfall likely in the east. Average soil moisture levels and river flows in most places.

New Zealand climate in July 2005

The New Zealand average air temperature for July was 9.1 °C, which was about a degree higher than usual in the North Island, and up to two degrees above normal in parts of the South Island. The national temperature was the third highest since records began in the mid 1860s, after 9.6 °C in July 1998 and 9.3 °C in July 2000. About half the typical number of July frosts were recorded in many areas.

Rainfall was well below normal in southern Wairarapa, and in much of south Canterbury and Otago, but above normal in the far north.

Low soil moisture recharge in Otago

Normal winter recharge of soil moisture reserves has been absent so far in much of Otago and parts of South Canterbury. Soils in the rest of the country were at or near field capacity at the end of July.

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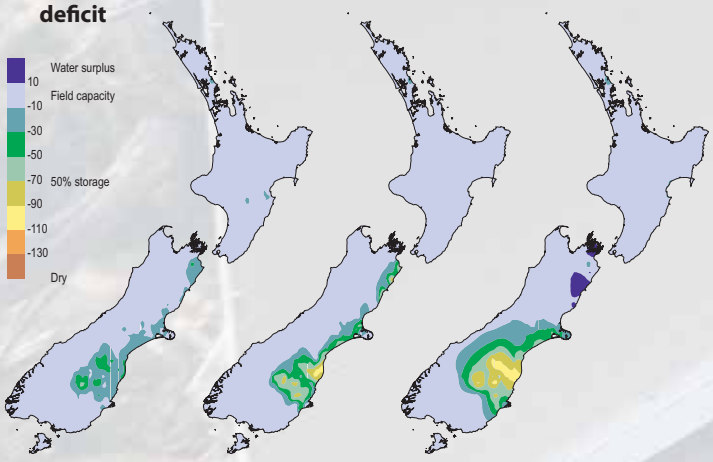
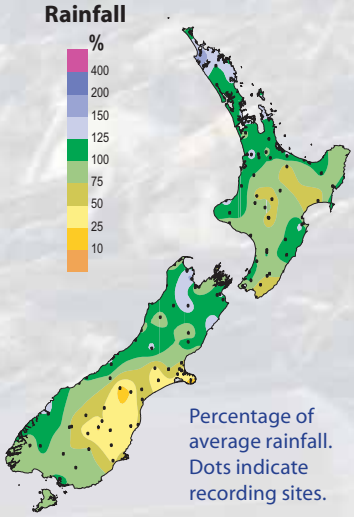
Soil moisture deficit



Historical average deficit on 31 July | Deficit on 31 July 2004 | Deficit on 31 July 2005

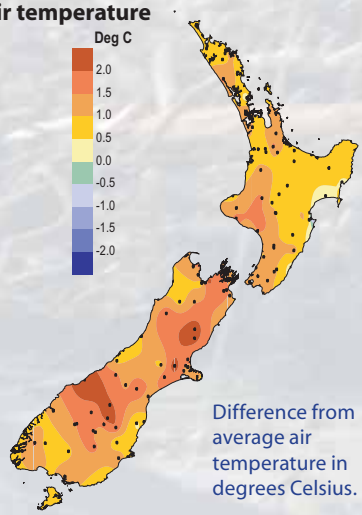
Water balance in the pasture root zone for an average soil type where the available water capacity is taken to be 150 mm.

Rainfall



Percentage of average rainfall. Dots indicate recording sites.

Air temperature



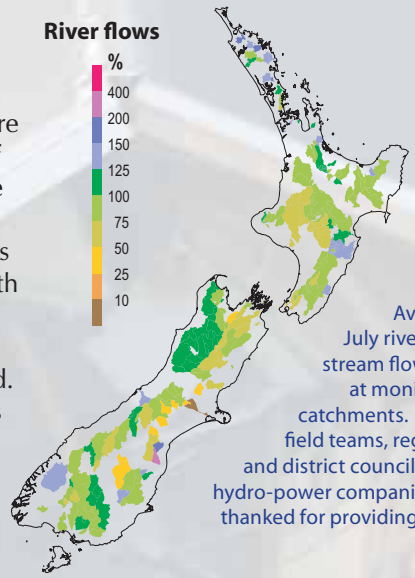
Difference from average air temperature in degrees Celsius.

For more information on the climate in July, visit the climate summaries page at www.niwa.co.nz/ncc/cs/mclimsum_05_07

River flows mostly near normal

Regional river flows were normal everywhere except the southwest of the North Island, where they were normal to low. Localised wet spots were in Northland, south Canterbury and south Otago especially along the coast, and Fiordland. Central Canterbury was drier than normal.

River flows



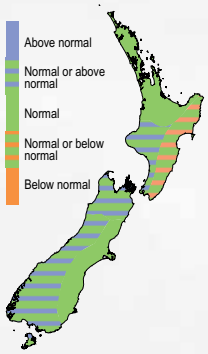
Average July river and stream flows (%) at monitored catchments. NIWA field teams, regional and district councils, and hydro-power companies are thanked for providing data.

May to July: the climate we predicted and what happened

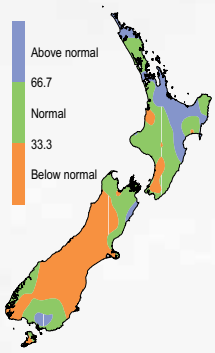
Rainfall

Rainfall was higher than predicted in parts of the north and east of the North Island and less than predicted for much of the South Island.

Outlook



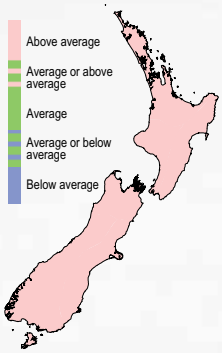
Outcome



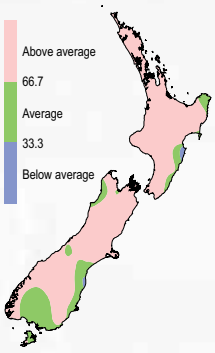
Air temperature

Air temperatures were above average as predicted in most places, apart from near normal temperatures in parts of the east of both islands and south of the South Island.

Outlook



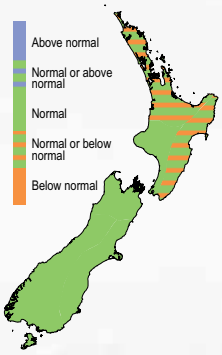
Outcome



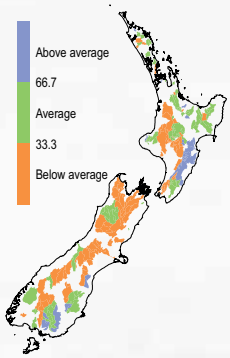
River flows

Stream flows were normal to above normal in the east of the North Island, lower than normal in the north of the South Island, and below normal to normal elsewhere.

Outlook



Outcome



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

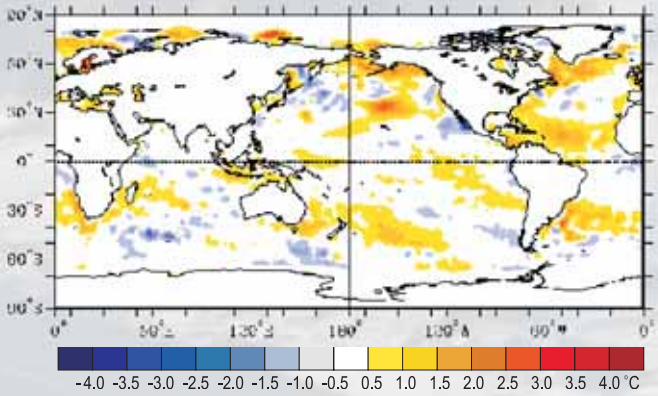
As an approximate guide, middle tercile rainfalls typically range from 80 to 115% of the historical normal, and middle tercile temperatures range about the average by plus or minus 0.5 °C.

Global setting and climate outlook

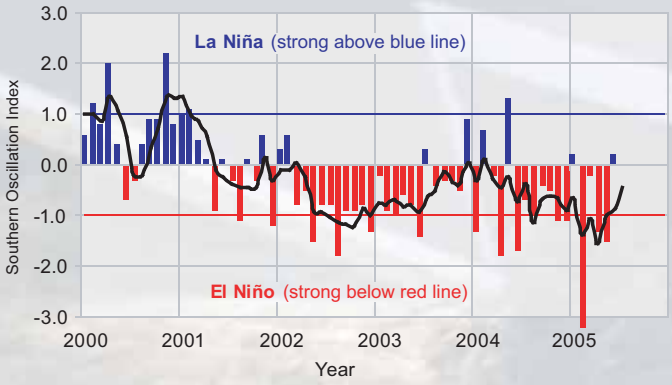
El Niño-Southern Oscillation remains neutral

The tropical Pacific is currently in a neutral state (no El Niño or La Niña). Conditions are likely to stay in the neutral range for the rest of the year. Equatorial Pacific sea surface temperatures (SST) are above average, as they have been for most of 2005.

The Southern Oscillation Index (SOI) has been near zero during June and July, with the 3-month May to July mean at –0.4.



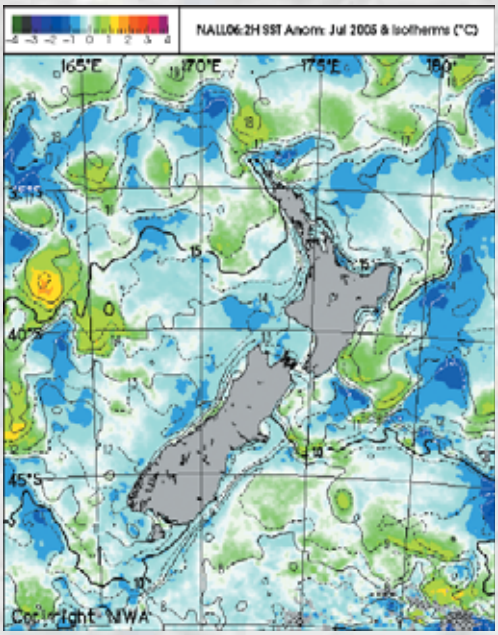
Difference from average global sea surface temperatures for July 2005. Map courtesy of NOAA/Climate Diagnostics Center.



Monthly values of the Southern Oscillation Index (SOI), a measure of the changes in atmospheric pressure across the Pacific, and the 3-month mean (black line). Current values: Jul 0.0; MJJ -0.4.

Sea surface temperatures around New Zealand

The New Zealand average sea surface temperature anomaly was about +0.5 °C in July, with the 3-month mean anomaly for May to July at about +0.6 °C. Early August SST anomalies were positive over much of the Tasman Sea, and in the Pacific to the east of New Zealand. Sea surface temperatures are likely to be near or above average through October.



Average difference from normal July surface temperatures in the seas around New Zealand.

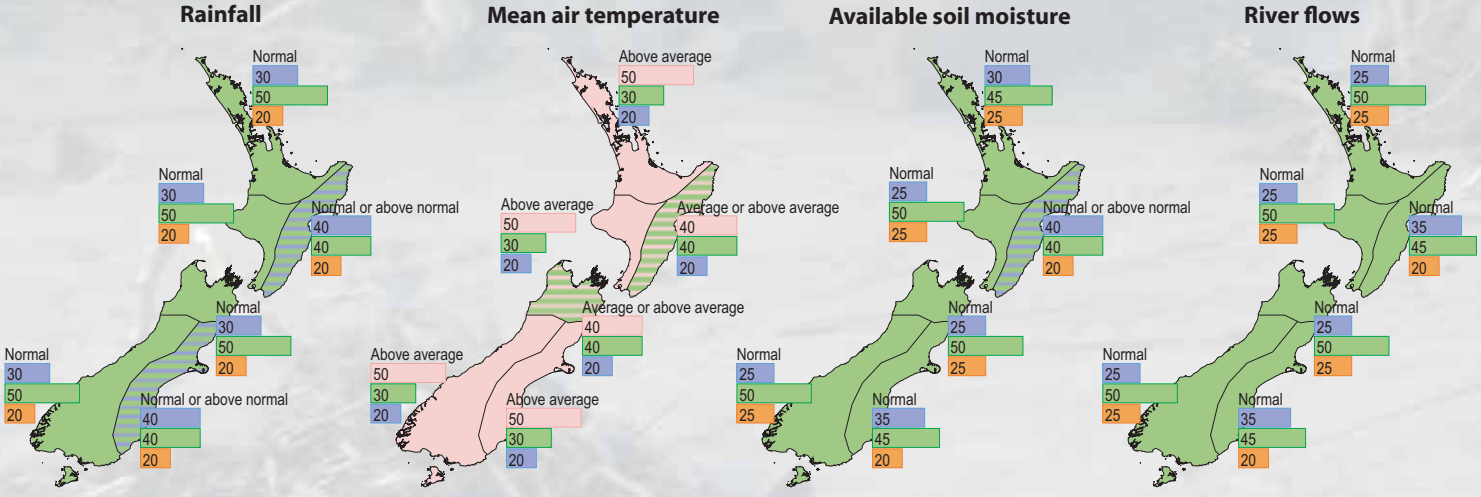
Outlook for August to October 2005

Local atmospheric circulation patterns are likely to lead to more westerly air flows than usual to the south of New Zealand, and anticyclonic conditions east of the South Island.

Air temperatures are expected to be above average in many regions, but near or above average in the east of the North Island and the north of the South Island.

Rainfalls are likely to be normal or above normal in eastern districts of both islands, and near normal elsewhere.

Soil moisture levels are expected to be normal everywhere except for the North Island east coast, where normal or above normal levels are expected. River flows are expected to be normal everywhere.

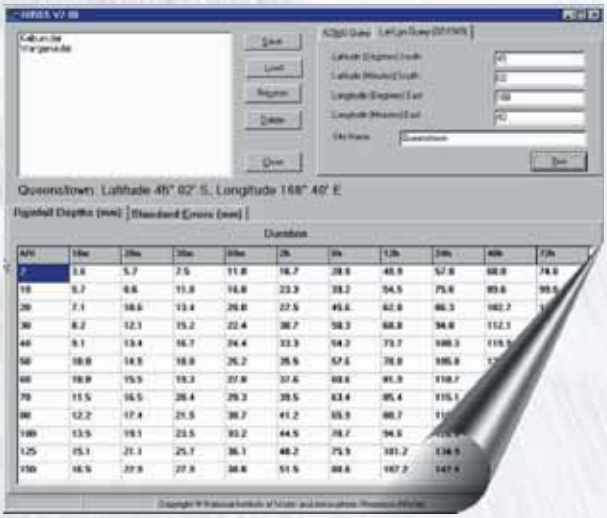


	Below normal
Upper tercile: 20% chance of above normal	20
Middle tercile: 30% chance of normal	30
Lower tercile: 50% chance of below normal	50

Key to maps (example interpretation)
In this example the climate models suggest that below average conditions are likely (50% chance of occurrence), but, given the variable nature of the climate, the chance of normal or above normal conditions is also shown (30% and 20% respectively).

HIRDS: A tool for evaluating storm rainfalls

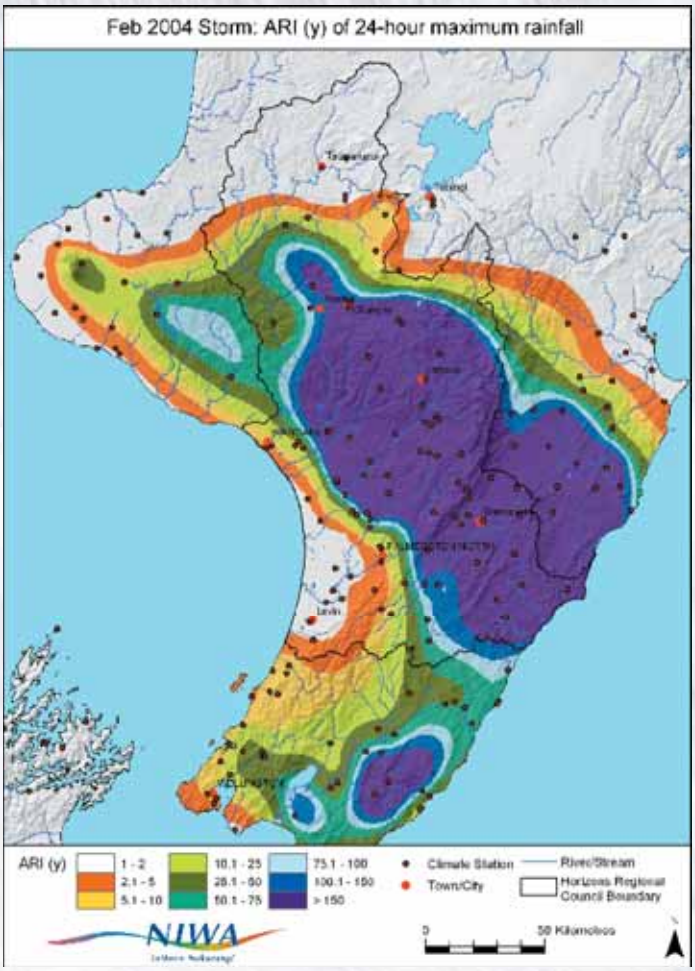
Estimates of high intensity rainfalls are used by scientists and engineers in a wide range of environmental studies, engineering construction work, and design flood estimation. They are also an important tool for assessing the rarity of observed rainfall amounts. Design rainfalls are used in climatological analyses by meteorologists and hydrologists, as well as in the insurance industry, to assess risks of inundation and set premiums. They can also help city and district council planners and engineers to evaluate the intensity of extreme events which storm-water drainage systems and other infrastructure should be designed to handle.



Screen capture of output table from HIRDS for a specified location.

One such tool, used in New Zealand to provide design rainfall estimates, is NIWA's HIRDS (High Intensity Rainfall Design System) software. For any site in New Zealand, HIRDS will estimate the expected rainfall over a range of storm durations and recurrence intervals. A typical screen shot of the output from HIRDS is shown above.

The underlying science behind HIRDS is based on a regional frequency analysis of annual extreme rainfalls, from around



Storm recurrence intervals for the 24–hour maximum rainfall during a southern North Island storm in February 2004. The purple shading shows recurrence intervals in excess of 150 years.

2000 sites in New Zealand, from NIWA and regional council data archives. A very brief summary of the regional frequency analysis procedure involves:

- the mapping of the median annual maximum rainfall (or index storm rainfall)
- the development of regional growth curves that relate rainfall at different recurrence intervals to the index rainfall.

When these two components are combined, design rainfalls are calculated.

The southern North Island storm of 14-17 February 2004 produced widespread flooding and extensive infrastructure damage. So how rare an event was this storm? The map above shows the average recurrence interval of the 24-hour maximum rainfall. A large part of the Horizons Regional Council area had storm rainfalls that were likely to occur less frequently than once every 150 years.

For more information on HIRDS, visit:
www.niwa.co.nz/ncc/tools/hirds or contact ncc@niwa.co.nz

Aerial view of Matata following the extreme rainfall events of May 2005. Storm rainfalls and their likelihood of occurrence can be estimated by HIRDS for any location in New Zealand.

Cover photo:
Alan Blacklock

The Climate Update is a monthly newsletter from NIWA's National Climate Centre,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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