NIWA National Climate Centre

Annual Climate Summary

NIWA Taihoro Nukurangi

National Climate Summary: **2012** Issued: 10 January 2013

The year 2012: Slightly cooler than average for most areas

Rainfall	A relatively dry year for western areas of both Islands. Above normal rainfall for Gisborne, parts of Central Otago, and between Oamaru and Timaru.
Temperatures	Below average temperatures over the northeast South Island, also Wellington, Wairarapa, parts of the Manawatu, and between Tararua District and the Waikato. Near or slightly below average temperatures elsewhere.
Sunshine	Sunnier than normal for western areas from Te Kuiti to the Kapiti Coast, as well as the West Coast of the South Island. Below normal sunshine for Wellington, Wairarapa, Blenheim, Northland and Central Otago. Near normal sunshine elsewhere.
Soil moisture	At the end of the year significant soil moisture deficits were present in eastern areas of both Islands, as well as Auckland, Manawatu, Wellington, Nelson, Otago, and central Southland.

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Significant extremes

Overview

The year 2012 was rather dry and sunny in western areas of both Islands, but annual rainfall in eastern areas of both Islands was generally near normal or above normal. Many regions experienced a somewhat cool year.

Annual mean sea level pressures were slightly lower than usual across New Zealand in 2012, but the circulation anomaly for the year was rather weak. More easterly circulation than normal affected the country for the first five months of the year, as well as in August. A change took place in the second half of the year, with more frequent southwesterly airflows than usual in June, September, October, and November. July and December were influenced by frequent anticyclones, and more northerly quarter winds, overall.

The large-scale climate setting was primarily driven by a moderate La Niña event at the start of the year, but this eased back to neutral in autumn. Although ocean temperatures in the equatorial Pacific Ocean reached

the El Niño threshold by spring, the atmosphere did not develop an El Niño pattern and neutral conditions continued through the remainder of 2012.

Mean annual temperatures were below average in the northeast of the South Island, as well as for Wellington, Wairarapa, parts of the Manawatu, and between the Tararua District and the Waikato. Mean annual temperatures were generally near or slightly below average elsewhere. The nation-wide average temperature for 2012 was 12.5°C (0.1°C below the 1971–2000 annual average), using NIWA's seven-station temperature series which begins in 1909[1].

Annual rainfall totals for 2012 were below normal (less than 80 percent of annual normal) in western areas of the North Island between Wanganui and the Kapiti Coast, and for Fiordland. It was the driest year on record for Wanganui and Secretary Island. It was also a relatively dry year (with rainfall between 80 and 100 percent of annual normal) for the south, west, and north of the South Island, and across much of the remainder of the North Island (except for Gisborne). Above normal rainfall (more than 120 percent of annual normal) was observed in Gisborne, as well as for parts of Central Otago, and between Oamaru and Timaru.

The year 2012 was a sunny one for western areas of the North Island from Te Kuiti southwards to the Kapiti Coast, as well as for the West Coast of the South Island. It was the sunniest year on record for Te Kuiti, New Plymouth, Paraparaumu, and Greymouth. This sunshine pattern reflects the enhanced easterly winds that occurred for the first five months of the year, as well as in August. In contrast, below normal annual sunshine totals (below 95 percent of annual normal) were observed for the Wairarapa, Wellington, Blenheim, Central Otago, and Northland. Elsewhere, sunshine totals were generally close to the annual normal.

The year 2012 will be remembered for extremely heavy snowfall on 6 June. Snowfall was heavy and to very low levels over Canterbury, Arthur's Pass, Otago, West Coast, and Marlborough. Afternoon temperatures in Canterbury, Blenheim, around Arthurs Pass, and on the West Coast on the 6th set new low records for the month, and in some cases, broke all-time (any month) records, too. Maximum temperatures on 6 June in Canterbury struggled to reach even 1 degree, with heavy snow falling throughout the daylight hours.

And it was a year in which 14 tornadoes or waterspouts were observed, including a tornado which touched down near Hobsonville, Auckland, on 6 December, tragically killing three people.

Severe frosts were widespread and frequent in the second half of June; and unusually late frosts on 7 and 8 November were problematic for some.

Heat waves and extreme high temperatures were generally lacking in 2012. In January and February, La Niña's cloudy and wet conditions meant that the typical summertime swelter was absent. In contrast, winter warmth was periodically observed – with northerly winds producing unusual warmth during the second half of July, 25-27 August, the last two days of September, and the last week of October. Ex-Tropical Cyclone Evan slowly approached the northern North Island between 22 and 27 December, dragging very warm and humid subtropical air onto the country. Humidity levels were very high during this period over the North Island. The northeast air stream also produced extremely high Christmas Day and Boxing Day temperatures in western areas which were in the 'lee', namely Taranaki to Wellington, as well as Nelson. Elsewhere, numerous extreme maximum temperature records occurred during the week around Christmas due to warm windy northwesterly conditions.

[1] Interim annual value

In 2012, there were eight particularly notable rainfall events. On 22-23 February, heavy rain caused flooding and slips in Otago, Nelson, and the central North Island. A weather 'bomb' during 3-4 March caused heavy rain and extremely strong winds for the western and southern North Island, and Nelson. On 19 March, Northland was affected by widespread floodwaters due to a deep low stalling east of the Bay of Islands. This low moved south over the North Island on 20 March, all but isolating Gisborne by causing slips and tree-falls that blocked numerous roads. On 5 June, the northwest South Island was affected by record-breaking rain, associated with a rapidly deepening low over the Tasman Sea. On 16 July, flooding was widespread in many regions over the southern half of the North Island and the northern South Island. Westport was isolated, and numerous State Highways were closed due to slips and floodwaters. The Western Bay of Plenty and Coromandel were flooded in back-to-back events on 23 and 30 July. And several heavy rain events in the period to 1-15 August flooded parts of Marlborough, Canterbury, and north Otago.

Section 1: Prevailing climate patterns – 2012 started with La Niña; ended with neutral conditions

Tropical climate patterns to the north of the country affected New Zealand climate at the start of 2012. A moderate La Niña event in the equatorial Pacific dominated our climate at the start of the year (Figure 1), but this eased back to neutral in autumn. Although ocean temperatures in the equatorial Pacific Ocean reached the El Niño threshold by spring, the atmosphere failed to adequately respond, meaning that a fully-developed El Niño pattern did not occur (and neutral conditions continued through the remainder of 2012).

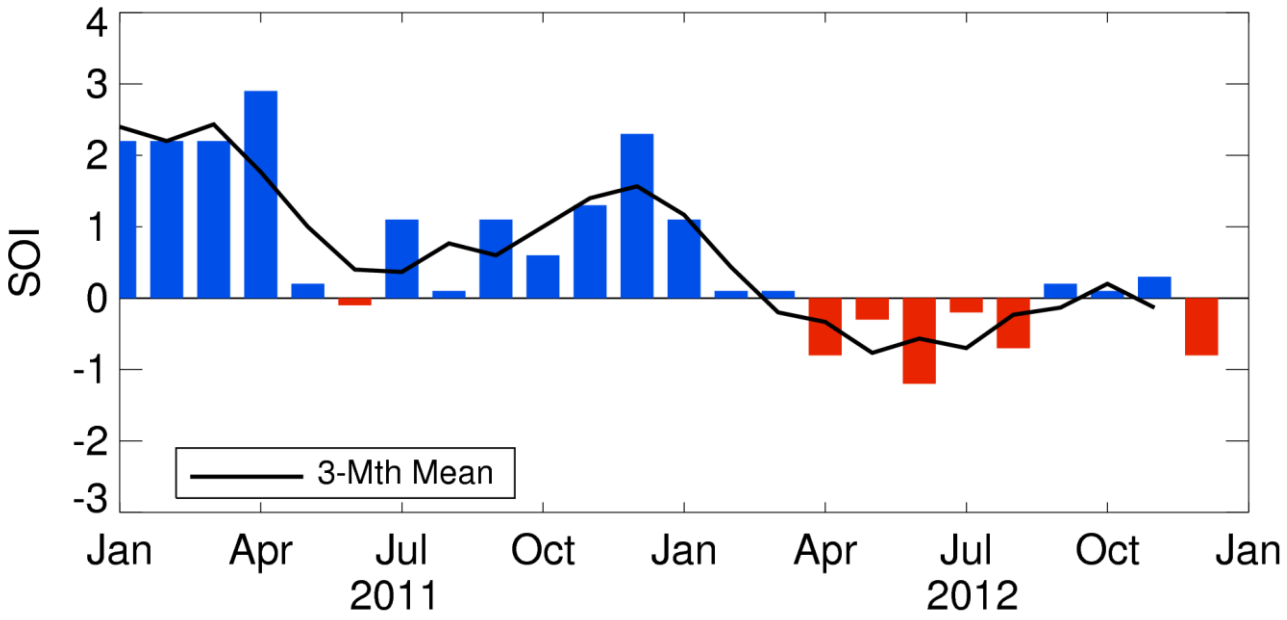

Figure 1: The monthly mean Southern Oscillation Index (SOI) for 2011-2012. The SOI is an index of the El Niño-Southern Oscillation (ENSO) cycle and measures the strength of the tropical Pacific trade winds. Values of the SOI above +1 indicate La Niña conditions, and those below -1 indicate El Niño.

Annual mean sea level pressures were slightly lower than usual across New Zealand in 2012, and the circulation anomaly for the year was rather weak. More easterly circulation than normal affected the country for the first five months of the year , as well as in August. But a change took place in the second half of the year, with more frequent southwesterly airflows than usual in June, September, October and

November. July and December were influenced by frequent anticyclones, and more northerly quarter winds, overall.

At the same time, to the south of New Zealand, the other major climate pattern that influences New Zealand, the Southern Annular Mode (SAM) was predominately positive for much of 2012 (Figure 2). The SAM is one of the most prominent features of southern hemisphere climate on monthly and seasonal time scales. It controls where and how strongly the middle-latitude westerly winds blow, and where the tracks of storms and anticyclones lie across the southern middle latitudes. In the positive phase of the SAM, storm activity tends to decrease over New Zealand, with more settled weather, while windiness and storm activity increase over the southern oceans. The SAM was predominately positive for much of 2012 (Figure 2), with October, November, and December notable exceptions. October and November, with negative SAM indices, were notable for southerly quarter flows and below average temperatures, whereas although December also had a negative SAM index, the month was characterised by warmer than usual temperatures and northerly quarter flows.

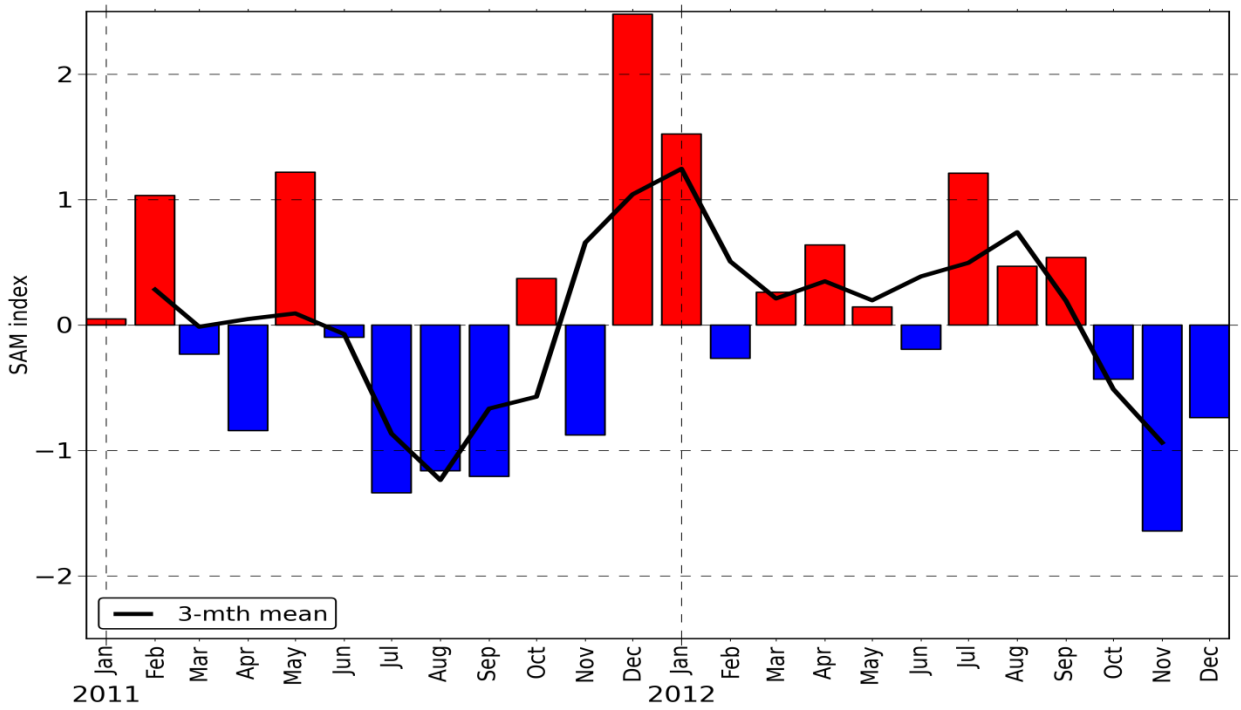

Figure 2: The monthly mean Southern Annular Mode (SAM) index for 2011-2012. The index is related to the strength of the westerly winds over the southern Oceans. Positive values indicate stronger than normal southern ocean westerlies and higher than normal pressures at New Zealand latitudes, while negative values indicate weakened southern ocean westerlies and lower than normal pressures over New Zealand.

Section 2: The year in review

The monthly sequence of New Zealand climate (with clear geographical exceptions) was as follows:

- January: Lower pressures than normal caused a cool, windy, and unsettled month for most regions. Northerly and easterly winds prevailed during the first half of the month; southerly winds kicked in towards the end of the month.
- February: Extremely cloudy and cooler than normal. More easterly circulation than usual.
- March: Generally cloudy and cool. Extremely wet for much of the North Island and eastern South Island. More easterlies than normal.

- April: Persistent anticyclones cause sunny, dry, and warm weather in most areas. More easterly circulation than usual.
- May: Extremely dry for much of the South Island, and sunny in the west of both islands. More easterly winds than normal.
- June: More southwest winds than usual, with some notable rapidly deepening lows in the New Zealand region. Extremely dry in some areas, unusually wet in other areas. A widespread snow event occurred in the South Island on 6 June.
- July: Very cold and dry to start the month as Highs prevailed, then very wet and warm due to a change to more northerly circulation.
- August: Unusually mild month; extremely wet in north and east South Island, but very dry in south and west South Island. Frequent northeasterly winds.
- September: Westerlies produced a wet month in the west; but dry and sunny in the east.
- October: A relatively stormy month, with frequent southwesterlies causing cool conditions in the south and west of the South Island, and very dry conditions in Gisborne and Hawkes Bay.
- November: A cold November across New Zealand, due to frequent southerly winds. A dry month in many regions. Extremely sunny in west of the South Island and across much of the North Island.
- December: High pressures over and to the east of New Zealand produced sunny and dry weather in many regions. More northerly airstreams than usual across the country, causing a warm month throughout the country.

January 2012: Unusually cool throughout New Zealand, dry in Nelson/Marlborough but wet in Southland and southern North Island

Lower than normal pressures prevailed over New Zealand during January, which resulted in a rather cool, windy, and unsettled month overall. Below average temperatures (between 0.5°C and 1.2°C below average) were generally experienced across western regions of the North Island, as well as inland Bay of Plenty, inland Hawkes Bay, Wellington and the Wairarapa, Canterbury, and across most of Fiordland, Westland and Buller. Elsewhere (generally in the northeast of both islands), mean temperatures for January were close to average (within 0.5°C of the January average). Well-below normal January rainfall totals were observed in the northern South Island, whereas extremely wet conditions were experienced in the southern South Island, and the southern North Island. At the end of January, significant soil moisture deficits (more than 110 mm of deficit) were observed in eastern areas of the South Island, Central Otago, and Gisborne.

February 2012: Extremely cloudy and cool in eastern areas

It was an extremely cloudy February across much of New Zealand, with well below normal sunshine totals (below 75 % of February normal) observed between Hamilton and Dunedin. This cloudiness was caused by highs to the southeast of New Zealand, and more lows than usual over the Tasman Sea, which produced more moist easterly winds over the country, generating cloud. Well-below average temperatures for February were observed in eastern regions of both Islands, because of the onshore easterly winds, but it was a warmer than usual month for the West Coast. Rainfall for the month was rather patchy – with some very dry regions bordering extremely wet ones – in part because frequent thunderstorm activity during the month resulted in rather local rainfalls. On 22/23 February, heavy rain flooded areas in Otago, Nelson, Hamilton, Rotorua, and Taupo.

March 2012: Continuing cool throughout New Zealand, and wet for the North Island

March was characterised by higher pressures than usual to the east of the Chatham Islands, and more lows than normal to the north of the North Island. This produced more easterly winds than usual over the country. The frequent easterly winds resulted in an extremely cool March for eastern areas of both Islands, and produced wetter conditions for many areas of the North Island and some eastern South Island regions. It was also much cloudier than usual for the northeast of the North Island, as well as the northern South

Island. March rainfall totals were at least 200 percent (double) normal for Northland, north Auckland, and for eastern parts of the North Island. It was also a wet March (with at least 120 percent of March normal) across most of the remainder of the North Island, as well as for Kaikoura, north Canterbury and Otago. In contrast, it was rather dry for the West Coast of the South Island, Fiordland, Nelson, Christchurch, south Canterbury, as well as between Wanganui and Palmerston North, and around Taupo. A weather 'bomb' hit western and southern North Island on 3 March, bringing heavy rain and extremely strong winds. On 19 March, widespread flooding occurred in Northland due to a deep low stalling east of the Bay of Islands. On 20 March this low moved south over the North Island, all but cutting off Gisborne by causing slips and tree-fall over roads.

April 2012: Anticyclones abound – extremely dry and sunny

April was characterised by markedly high pressures over the South Island and to the east of the Chatham Islands, with prevailing easterly winds (and high pressures) over the North Island. The frequent anticyclones ('highs') during the month resulted in very dry and extremely sunny conditions for April, for many regions of the country. April rainfall was less than half of normal in the southern South Island, Auckland, Coromandel, as well as throughout the western and central North Island. It was the driest April on record for Wanganui and Alexandra. Mean temperatures were well above average for much of the country. Notably, afternoon (maximum) temperatures were extremely high for the south and west of the South Island, Nelson, between Wanganui and Palmerston North and northwards to the Waikato, the Central Plateau, Bay of Plenty, and parts of Auckland – reflecting the settled and sunny weather associated with the April anticyclones. It was extremely sunny across much of the South Island, as well as in many western and central regions of the North Island, with sunshine totals at least 125% of April normal. Sunshine totals were the highest on record for April for Te Kuiti, Taumarunui, New Plymouth, Nelson, Cheviot, Lake Tekapo, Dunedin and Cromwell – and some of these locations experienced an astounding one-and-a-half times typical April sunshine totals.

May 2012: Very dry and sunny month for some areas

It was an extremely dry May for Canterbury, with less than a quarter of normal May rainfall recorded – and it was generally dry elsewhere in the South Island. It was the 2nd-driest May on record for Christchurch. Rainfall was around half of May normal in Nelson and Marlborough, and across much of Westland and Otago. In Fiordland and for the alpine districts, rainfall ranged between 50 and 80 percent of May normal. At the end of May, soils were much drier than normal for the time of year in Canterbury and Nelson, as well as in the Tararua District and around Palmerston North. May was an extremely sunny month between Hamilton and the Kapiti Coast, as well as Westland, Fiordland and Southland. It was the sunniest May on record for New Plymouth and Queenstown – in over 80 years of record in the case of Queenstown.

June 2012: Dry in the northeast North Island and south Canterbury, but wet in the northern South Island

Lower pressures than usual affected the area to the southeast of New Zealand during June 2012, resulting in more southwest winds than normal over the country. The month was notable due to several rapidly deepening, intense weather systems in the New Zealand region. In particular, a rapidly deepening low over the Tasman Sea on 5 and 6 June produced heavy precipitation in Tasman and Buller, and snow to sea level in Canterbury, whilst intense lows on 18 and 25/26 June resulted in severe winds across the South Island (and heavy rainfall in some areas). It was an unusually dry June in the north and east of the North Island, as well as in South Canterbury. Rainfall totals in Northland, Coromandel, Bay of Plenty, Gisborne, Hawkes Bay, and South Canterbury were less than half of June normal, and it was the driest June on record for Whangarei, Rotorua and Whakatane. In contrast, it was an extremely wet June over the northern half of the South Island, with totals exceeding 120 percent of normal. Notably, in Christchurch and Nelson, totals were in the order of twice the June normal (i.e. 200 percent of normal). June 2012 was notable for an extremely cold

event on 6 June, in which afternoon (maximum) temperatures in Canterbury, Blenheim, around Arthurs Pass, and on the West Coast set new low records for the month, and in some cases, broke all-time (any month) records, too. Maximum temperatures on 6 June in Canterbury struggled to reach even 1 degree, with heavy snow falling throughout the daylight hours. In between southerly outbreaks, winter-time ridges of high pressure brought clear skies, and light winds, to the country on 13, 16, 17, and 30 June, producing extremely cold mornings and/or severe frosts for many regions. It was an extremely sunny June for the southern South Island, with sunshine totals exceeding 125 percent of June normal. It was the sunniest June on record for Queenstown and Cromwell.

July 2012: A month of two halves; cold and dry to start, then wet and warm

July started unusually cold and dry, due to winter time anticyclones or ridges prevailing over the country during the first half of the month, bringing clear skies, light winds and a recipe for frost. Frosts during the period 1 July to 5 July were particularly severe. In stark contrast, northwest winds produced unusual warmth in eastern areas mid-month. During the last two weeks of July, lows dominated over the north Tasman Sea, bringing unusually mild conditions, northeast winds and high rainfall to northern and eastern regions of the North Island, as well as Nelson/Marlborough. It was an extremely wet July (rainfall totals exceeded 150 percent of July normal) for much of the North Island, as well as south Canterbury and Otago. It was the fourth wettest July on record for Tauranga, with 255 percent of normal July rainfall. It was a very dry month for Southland.

August 2012: Unusually mild; very wet in north and east of South Island, dry in south and west of South Island

August was unusually mild across most of New Zealand, due to higher pressures than usual to the southeast of the country and lower pressures than usual over the mid Tasman Sea, which squeezed frequent northeast winds over the country. It was the warmest August on record for a number of locations. The northeasterly winds also produced a very large contrast in rainfall across the Southern Alps. It was an extremely wet August (with more than 200 percent of August normal rainfall recorded) in the north and east of the South Island, namely Nelson, Marlborough, Canterbury, and north Otago. Some areas received treble (300 percent of) August normal rainfall, such as in Timaru, which recorded its third wettest August since 1881. In contrast, it was very dry over the west and south of the South Island (with less than 50 percent of August normal rainfall south of Westport). Record low or near-record low August rainfall was seen across Southland. It was a very sunny August for the south and west of the South Island, reflecting the high frequency of northeasterly winds during the month.

September 2012: Spring westerlies cause a wet month in the west, and a dry and sunny month in the east

Spring westerlies arrived during the first few days of September, and prevailed during the first half of the month. These stormy winds produced very wet conditions on the West Coast, but in contrast, it was a rather dry month in eastern areas of both islands. Rainfall exceeded 150 percent of September normal in many western regions in the South Island, whereas in Gisborne, Hawkes Bay, and Canterbury, rainfall was less than half of September normal. Eastern areas of both islands were also very sunny, with sunshine totals typically exceeding 125 percent of September normal, reflecting the high frequency of westerly winds during the month. From mid-September, a pattern change saw more anticyclones than usual lie over New Zealand and to the east of the country. This combination of patterns resulted in more northwest winds than usual over New Zealand for September. It was a mild month for some eastern regions, with temperatures between 0.5°C and 1.2°C above the September average in the lower South Island, north Canterbury, Coromandel, the Hauraki Plains, and the Rodney District. A cold southerly airstream affected the country mid-month, causing record or near-record low September temperatures at many locations. In stark contrast,

the last two days of September were extremely warm.

October 2012: Frequent southwesterlies cause a cool month in parts of South Island, dry in eastern North Island

October was relatively stormy, with more southwesterlies and lower pressures than usual affecting New Zealand. These southwesterly winds produced a rather cool October for parts of the South Island, and very dry conditions in the eastern North Island. Well below average temperatures (around 1.2°C below the October average) were observed over the south and west of the South Island, as well as between Mt Ruapehu and Hamilton, and the inland Bay of Plenty. For south Canterbury, it was a wetter than normal October with more than 150 percent of normal October rainfall experienced. In contrast, it was a rather dry month across much of the North Island, as well as north Canterbury and Marlborough. In Gisborne, Hawkes Bay, and the coastal Wairarapa, rainfall was less than half October normal.

November 2012: A cold month, but dry and sunny for many regions

It was a cold November across New Zealand, due to more frequent southerly winds than normal. Well below average temperatures (more than 1.2°C below the November average) were observed in eastern areas of both islands, as well as inland North Island areas from the Waikato extending southwards to Palmerston North. It was a very dry November (less than half of November normal rainfall recorded) for much of the North Island, as well as Nelson, Marlborough, Buller, and the West Coast of the South Island. The notable exceptions were Gisborne and northern Hawkes Bay (with double normal November rainfall), and south Canterbury and much of Otago (with between 120 and 149 percent of November normal rainfall). At the end of the month, soils were unusually dry for the time of the year across much of the North Island (except for Gisborne and northern Hawkes Bay), as well as Nelson and Buller. It was an extremely sunny November for the West Coast of the South Island, with the sunniest November on record for Hokitika and Greymouth. It was also sunny across much of the North Island and Nelson/Marlborough.

December 2012: A warm and sunny month, dry in eastern areas, with a deadly tornado

December was warmer than average throughout New Zealand, due to more frequent northerly and northwest winds than usual affecting the country. Well above average temperatures (more than 1.2°C above the December average) were observed over much of the North Island, as well as around Nelson and parts of the eastern South Island, resulting in several December temperature records or near-records. Temperatures during the week before Christmas were particularly high for numerous locations. It was a very sunny month for the South Island and eastern North Island, where sunshine totals were greater than 120 percent of December normal. In contrast, below normal sunshine totals were recorded for the northern half of the North Island (between 75 and 90 percent of December normal). Rainfall for December was above normal in the extreme north and south of the country, but less than 50 percent of normal December rainfall was recorded in Gisborne, Hawkes Bay, Wairarapa, Nelson, and much of Canterbury, Otago, and central Southland. On 6 December, a tornado struck west Auckland, bringing down trees, causing property damage, and tragically killing three people at a construction site. Ex-Tropical Cyclone Evan approached the northern North Island in the last week of December, causing rainy and windy conditions, but no damage was reported.

Section 3: Monthly rainfall (as a percentage of the 1981-2010 monthly averages).

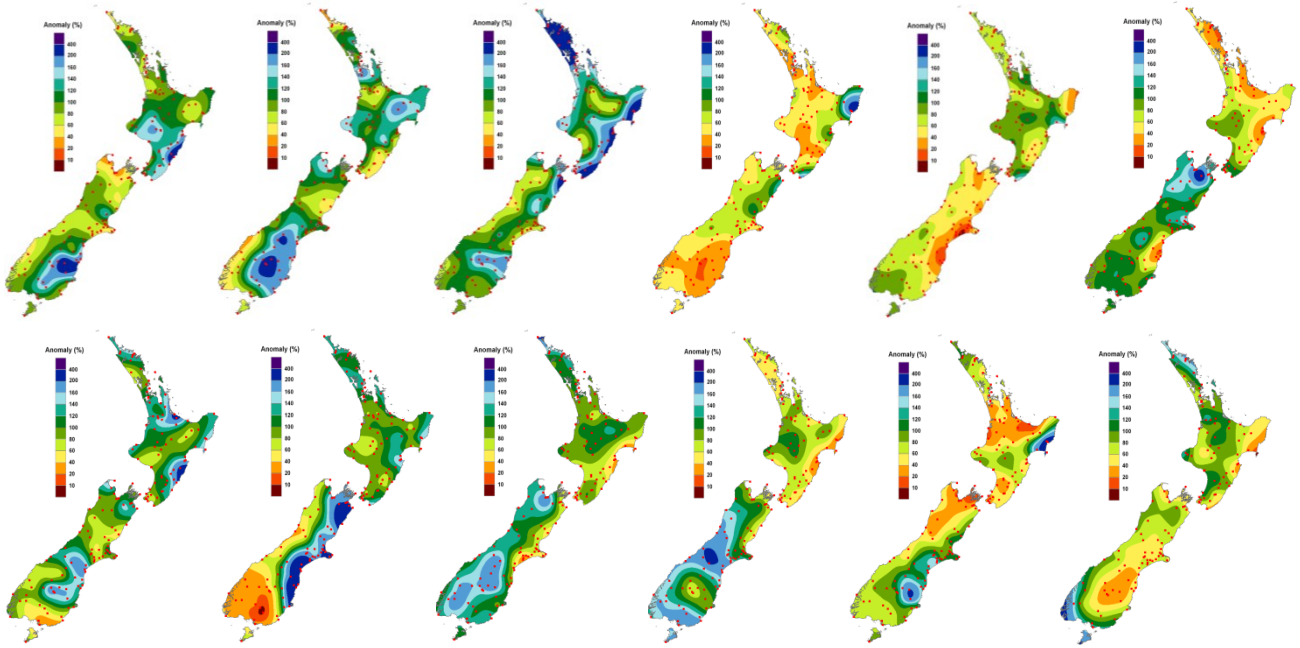

Figure 3 shows monthly rainfall as a percentage of the 1981-2010 monthly averages for each month of 2012, starting in the top left with January; bottom left is July.

Section 4: Monthly temperature departures (in °C from the 1981-2010 monthly averages).

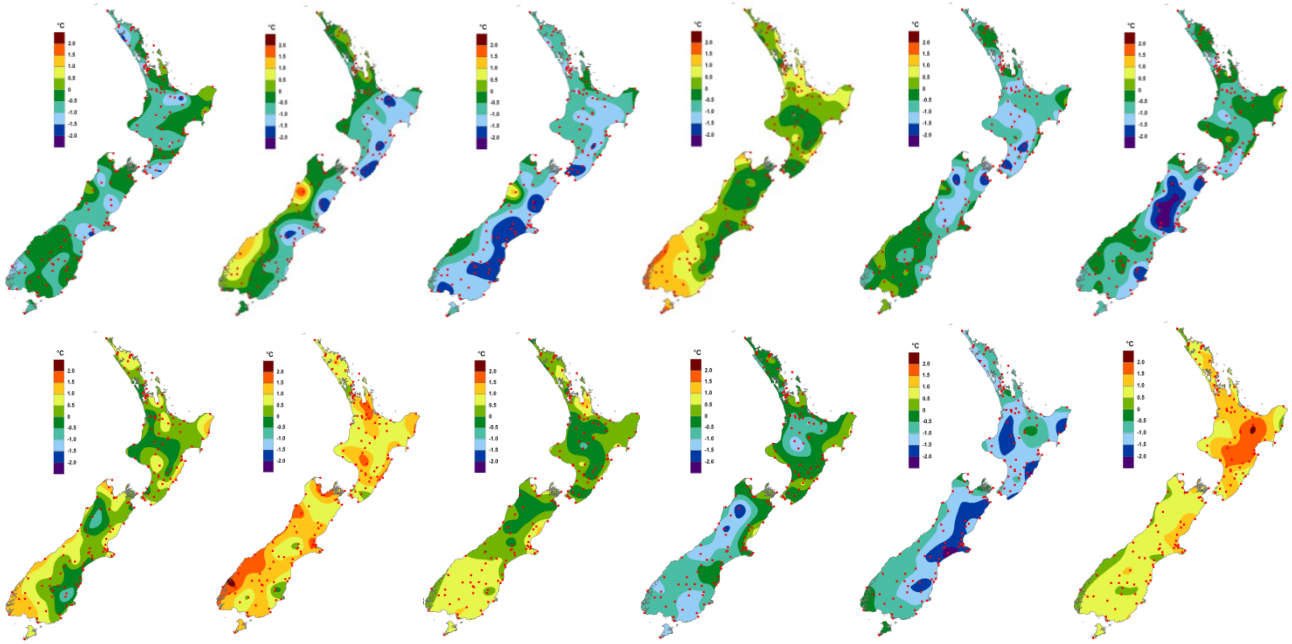

Figure 4 shows monthly temperature anomalies (compared to the 1981-2010 monthly averages) for each month of 2012, starting in the top left with January; bottom left is July.

Section 5: The numbers

NIWA analyses of month-by-month records show:

- Whangarei recorded the highest annual average temperature for 2012 (15.8°C), followed by Kaitaia with 15.7°C and Cape Reinga and Whangaparaoa, both with 15.5°C.
- The highest recorded extreme temperature of the year (34.5 °C) occurred at Gisborne on 19 December, followed by 33.5 °C recorded at Middlemarch and Clyde on 25 December, and 33.3°C observed at Christchurch on 17 December.
- The lowest air temperature of the year was –11.8 °C recorded at Darfield on 7 June, followed by –11.5°C at Lake Pukaki on the same day, and –11.3°C observed at Ranfurly on 2 July.
- The nation-wide average temperature for 2012 was 12.5°C (0.1°C below the 1971–2000 annual average), using NIWA's seven-station temperature series which begins in 1909. 2012 was the 41st warmest year since 1909, based on this seven-station series.
- The highest confirmed wind gusts for 2012 was 206 km/hr recorded at Cape Turnagain on 2 December, then 185 km/h experienced at both the Rock and Pillar range, Central Otago, on 31 January, and at Cape Turnagain (on 18 and 25 October).
- The top 3 daily rainfall totals from regularly reporting gauges in 2012 were all recorded at North Egmont, being 336 mm observed on 15 July; 275 mm on 22 February, and 256 mm on 14 July. The highest 'lower elevation' rainfalls observed in the year were 204 mm observed at Takaka on 14 July, 198 mm at Akaroa on 12 August, and 168 mm at Kerikeri on 18 March.
- The driest rainfall recording locations (based on data available at time of writing) were: Alexandra with 378 mm of rainfall recorded for the year, followed by Clyde with 417 mm, and then Cromwell with 455 mm.
- Of the regularly reporting gauges (based on data available at time of writing), the wettest locations in 2012 were Cropp River (West Coast) with 9630 mm, Doon River (Fiordland) with 7410 mm, and Tuke River (West Coast) with 7175 mm[2].
- Whakatane was the sunniest location in 2012, recording 2602 hours, followed by Nelson (2584 hours) and Lake Tekapo (2562 hours).
- Of the six main centres, for 2012 as a whole, Hamilton was the wettest, Christchurch the driest, Tauranga the sunniest, Auckland the warmest, and Dunedin the coolest and cloudiest.

Ranked annual means and totals for the stations available at time of writing are displayed on the following pages.

[2] Tuke River rainfall only covers the period 01-January to 22-October-2012

Location	Mean temp (°C)
WHANGAREI AERO AWS[3]	15.8
KAITAIA AERO EWS	15.7
CAPE REINGA AWS	15.5
WHANGAPARAOA AWS	15.5
KAITAIA EWS	15.4
AUCKLAND AERO	15.4
MUSICK PT EWS, AUCKLAND	15.3
PORT TAHAROA AWS	15.3
AUCKLAND, MANGERE EWS	15.2
DARGAVILLE 2 EWS	15.1
TAURANGA AERO AWS	15.1
KERIKERI AERODROME AWS	14.9
HICKS BAY AWS	14.9
WHENUAPAI AWS	14.6
WHITIANGA AERO AWS	14.5
PAEROA AWS	14.4
WARKWORTH EWS	14.3
WAIROA, NORTH CLYDE EWS	14.3
GISBORNE AWS	14.2
TOENEPI EWS	14
TE PUKE EWS	14
WHAKATANE AERO AWS	14
NGAWI AWS	14
NAPIER AERO AWS	13.9
WHATAWHATA 2 EWS	13.6
BROTHERS ISLAND AWS	13.6
NEW PLYMOUTH AWS	13.5
HAMILTON AWS	13.4
WELLINGTON AERO	13.4
WANGANUI,SPRIGGENS PARK	13.4
CASTLEPOINT AWS	13.2
NELSON AWS	13.2
PALMERSTON NORTH AWS	13.1
TAKAKA EWS	13.1
MATAMATA, HINUERA EWS	13
WAIONE RAWS	13
WHAKATU EWS	13
TE KUITI EWS	12.9
LEVIN AWS	12.9
WESTPORT AERO AWS	12.9
BLENHEIM RESEARCH EWS	12.9
PARAPARAUMU AERO AWS	12.8
PALMERSTON NORTH EWS	12.8
CAPE CAMPBELL AWS	12.8
WELLINGTON, KELBURN AWS	12.7
MOTUEKA, RIWAKA EWS	12.6
AKAROA EWS	12.6
HAMILTON, RUAKURA 2 EWS	12.5
LYTTELTON HARBOUR	12.5
ROTORUA AERO AWS	12.3
MARTINBOROUGH EWS	12.3
HAWERA AWS	12.3
BLENHEIM AERO AWS	12.3
KAIKOURA AWS	12.2
APPLEBY 2 EWS	12
CHRISTCHURCH, KYLE ST EW	12
HOKITIKA AWS	11.9
SECRETARY ISLAND AWS	11.9
WALLACEVILLE EWS	11.7
RANGIORA EWS	11.6
AWATERE VALLEY, DASHWOOD	11.5
TAUPO AWS	11.4
TURANGI 2 EWS	11.4
LINCOLN, BROADFIELD EWS	11.4
HAAST AWS	11.3
CHRISTCHURCH AERO	11.3
LE BONS BAY AWS	11.2
TAKAPAU PLAINS AWS	11.1
DUNEDIN, MUSSELBURGH EWS	11.1
FRANZ JOSEF EWS	11
WANAKA AERO AWS	10.6
CROMWELL EWS	10.6
TIMARU EWS	10.5
TIWAI POINT EWS	10.5
TIMARU AERO AWS	10.3
WINDSOR EWS	10.3
SOUTH WEST CAPE AWS	10.3
OAMARU AIRPORT AWS	10.2
INVERCARGILL AERO AWS	10.2
DUNEDIN AERO AWS	10.1
NUGGET POINT AWS	10.1
GORE AWS	9.9
QUEENSTOWN AERO AWS	9.7
TARA HILLS AWS	9.5
MIDDLEMARCH EWS	9.5
MANAPOURI AERO AWS	9.5
LAUDER EWS	9.5
HANMER FOREST EWS	9.4
LUMSDEN AWS	9.4
MANAPOURI, WEST ARM JETT	9.1
RANFURLY EWS	8.9
MT COOK EWS	8.5
LAKE TEKAPO EWS	8.4
ARTHURS PASS EWS	7.6
CAMPBELL ISLAND AWS	7.3
MT RUAPEHU, CHATEAU EWS	6.7

[3] AWS = Automatic Weather Station (operated by MetService)
EWS = Electronic Weather Station (operated by NIWA)

Location	Rainfall (mm)
CROPP RIVER	9630
DOON RIVER	7410
TUKE RIVER	7175[4]
ARTHURS PASS EWS	3921
MT COOK EWS	3679
SECRETARY ISLAND AWS	3189
MT RUAPEHU, CHATEAU EWS	2843
HOKITIKA AWS	2370
WESTPORT AERO AWS	2033
TAKAKA EWS	1994
STRATFORD EWS	1928
KERIKERI AERODROME AWS	1901
REEFTON EWS	1743
TE PUKE EWS	1664
TROUNSON CWS	1593
NEW PLYMOUTH AWS	1365
SOUTH WEST CAPE AWS	1363
KAITAIA EWS	1359
TURANGI 2 EWS	1357
KAITAIA AERO EWS	1317
TE KUITI EWS	1315
PAEROA AWS	1314
GISBORNE AWS	1309
WARKWORTH EWS	1295
HAMILTON AWS	1290
LOWER RETARUKE CWS	1275
TAURANGA AERO AWS	1202
AKAROA EWS	1196
WALLACEVILLE EWS	1188
WELLINGTON, KELBURN AWS	1185
CAPE REINGA AWS	1168
HAMILTON, RUAKURA 2 EWS	1155
WAIROA, NORTH CLYDE EWS	1137
LEIGH 2	1134
MOTUEKA, RIWAKA EWS	1069
AUCKLAND AERO	1063
MANAPOURI AERO AWS	1031
WHANGAPARAOA AWS	1028
CAMPBELL ISLAND AWS	1027
DARGAVILLE 2 EWS	1026
AUCKLAND, MANGERE EWS	1011
WHAKATANE AERO AWS	1008
CASTLEPOINT AWS	985
HAWERA AWS	978
TIWAI POINT EWS	978
HANMER FOREST EWS	972
TAUPO AWS	938
GORE AWS	938
LEVIN AWS	920
PARAPARAUMU AERO AWS	901
PALMERSTON NORTH AWS	889
PARAPARAUMU EWS	876
PALMERSTON NORTH EWS	850
MASTERTON, TE ORE ORE CW	827
WELLINGTON AERO	798
NUGGET POINT AWS	790
WANGANUI,SPRIGGENS PARK	778
WANGANUI AWS	765
DUNEDIN, MUSSELBURGH EWS	745
NAPIER AERO AWS	741
QUEENSTOWN AERO AWS	735
TIMARU EWS	693
BLENHEIM AERO AWS	667
CHRISTCHURCH AERO	655
OAMARU AIRPORT AWS	608
TIMARU AERO AWS	606
WINDSOR EWS	590
LINCOLN, BROADFIELD EWS	582
DUNEDIN AERO AWS	582
BLENHEIM RESEARCH EWS	580
RANGIORA EWS	544
RANFURLY EWS	536
LAUDER EWS	525
TARA HILLS AWS	515
WANAKA AERO AWS	496
MIDDLEMARCH EWS	480
CROMWELL EWS	455
CLYDE 2 EWS	417
ALEXANDRA CWS	378

[4] Tuke River rainfall only covers the period 01-January to 22-October-2012

Location	Sunshine (hours)
WHAKATANE	2602
NELSON AERO	2584
LAKE TEKAPO EWS	2562
APPLEBY 2 EWS	2530
BLENHEIM RESEARCH EWS	2445
NEW PLYMOUTH AERO	2433
RANGIORA EWS	2389
PARAPARAUMU AERO	2360
TAKAKA EWS	2309
TAURANGA AERO	2306
ASHBURTON COUNCIL	2294
CHEVIOT	2235
NORTH SHORE ALBANY EWS	2190
KAWERAU AWS	2161
GREYMOUTH AERO EWS	2160
CHRISTCHURCH AERO	2135
WAIPAWA EWS	2132
BALCLUTHA, TELFORD	2118
KAITAIA EWS	2118
AKAROA EWS	2084
AUCKLAND, MANGERE EWS	2026
TE KUITI EWS	2023
WELLINGTON, KELBURN	2008
TURANGI 2 EWS	2002
HAMILTON RUAKURA 2 EWS	1978
HOKITIKA AERO	1970
TAUMARUNUI AWS	1935
DANNEVIRKE EWS	1916
MARTINBOROUGH EWS	1904
DARGAVILLE 2 EWS	1878
DUNEDIN MUSSELBURGH EWS	1831
INVERCARGILL AERO	1791
PALMERSTON NORTH EWS	1774
REEFTON EWS	1740
WALLACEVILLE EWS	1726
MIDDLEMARCH EWS	1712
FRANZ JOSEF EWS	1700
MT COOK EWS	1647

Section 6: Annual Rainfall – A relatively dry year for western areas of both Islands. Above normal rainfall for Gisborne, parts of Central Otago, and between Oamaru and Timaru.

Annual rainfall totals for 2012 were below normal (less than 80 percent of annual normal) in western areas of the North Island between Wanganui and the Kapiti Coast, and for Fiordland. It was the driest year on record for Wanganui and Secretary Island (see Table below). It was also a relatively dry year (with rainfall between 80 and 100 percent of annual normal) for the south, west, and north of the South Island, and across much of the remainder of the North Island (except for Gisborne).

In contrast, above normal rainfall (more than 120 percent of annual normal) was observed in Gisborne, as well as for parts of Central Otago, and between Oamaru and Timaru.

Table 1: Record or near-record annual rainfall totals for the year 2012[5]

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
Wanganui	765	85	1987	Lowest
Secretary Island	3189	80	1985	Lowest

The driest rainfall recording locations (based on data available at time of writing) were: Alexandra with 378 mm of rainfall recorded for the year, followed by Clyde with 417 mm, and then Cromwell with 455 mm. Of the regularly reporting gauges (based on data available at time of writing), the wettest locations in 2012 were Cropp River (West Coast) with 9630 mm, Doon River (Fiordland) with 7410 mm, and Tuke River (West Coast) with 7175 mm[6].

The top 3 1-day rainfall totals from regularly reporting gauges in 2012 were all recorded at North Egmont, being 336 mm observed on 15 July; 275 mm on 22 February, and 256 mm on 14 July. The highest 'lower elevation' rainfalls observed in the year were 204 mm observed at Takaka on 14 July, 198 mm at Akaroa on 12 August, and 168 mm at Kerikeri on 18 March.

In 2012, there were eight particularly notable rainfall events. On 22-23 February, heavy rain caused flooding and slips in Otago, Nelson, and central North Island. A weather 'bomb' during 3-4 March caused heavy rain and extremely strong winds for the western and southern North Island, and Nelson. On 19 March, Northland was affected by widespread floodwaters due to a deep low stalling east of the Bay of Islands. This low moved south over the North Island on 20 March, all but isolating Gisborne by causing slips and tree-falls that blocked numerous roads. On 5 June, the northwest South Island was affected by record-breaking rain, associated with a rapidly deepening low over the Tasman Sea. On 16 July, flooding was widespread in many regions over the southern half of the North Island and the northern South Island. Westport was isolated, and numerous State Highways were closed due to slips and floodwaters. The Western Bay of Plenty and Coromandel were flooded

[5] The rankings (1st, 2nd, 3rd….etc) in Tables 1 to 8 are relative to climate data from a *group* of nearby stations, some of which may no longer be operating. The current climate value is compared against all values from any member of the group, without any regard for homogeneity between one station's record, and another. This approach is used because of the practical limitations of performing homogeneity checks in real-time.

[6] 19 percent of Tuke River 2012 daily rainfall data, from 23-October to 31-December 2012, is not yet available.

in back-to-back events on 23 and 30 July. And several heavy rain events in the period to 1-15 August flooded parts of Marlborough, Canterbury, and north Otago.

Table 2: One day rainfall extremes for 2012

Location	1-day extreme rainfall (mm)	Date	Year records began	Comments
Cape Reinga	120	Mar-18th	1919	4th-highest
Gisborne	153	Mar-19th	1937	4th-highest
Takaka	204	Jul-14th	1976	3rd-highest
Greymouth	151	Jun-05th	1947	3rd-highest

Section 7: Annual Temperature – Below average temperatures over the northeast South Island, also Wellington, Wairarapa, parts of the Manawatu, and between the Tararua District and the Waikato. Near or slightly below average elsewhere.

Mean annual temperatures were below average (more than 0.5°C below the long-term average) in the northeast of the South Island, as well as for Wellington, Wairarapa, parts of the Manawatu, and between the Tararua District and the Waikato. Mean annual temperatures were generally near or slightly below average (within 0.5°C of the long-term average) elsewhere.

The nation-wide average temperature for 2012 was 12.5°C (0.1°C below the 1971–2000 annual average), using NIWA's seven-station temperature series which begins in 1909. 2012 was the 41st warmest year since 1909, based on this 7-station series.

Overall, it was the second-coldest year on record at Taumarunui and Martinborough. Mean annual temperatures were also near-record low in parts of the Waikato, central North Island, Tararua District, and the Wairarapa (see Table below).

Table 3: Near-record or record high or low annual average temperature departures for 2012

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
Mean temperature				
Te Kuiti	12.9	-0.7	1959	3rd-lowest
Taumarunui	12.1	-0.7	1947	2nd-lowest
Takapau Plains	11.1	-0.8	1962	4th-lowest
Castlepoint	13.2	-0.6	1972	4th-lowest
Martinborough	12.3	-0.5	1986	2nd-lowest

Heat waves and extreme high temperatures were generally lacking in 2012. In January and February, La Niña's cloudy and wet conditions meant that the typical summertime swelter was absent. In contrast, winter warmth was periodically observed – with northerly winds producing unusual warmth during the second half of July, 25-27 August, the last two days of September, and the last week of October. Temperatures recorded during the week surrounding Christmas were some of the highest for the year for many locations, due to northerly wind flows bringing warm air masses from the tropics.

During the heavy snowfall event on 6 June, afternoon (maximum) temperatures in Canterbury, Blenheim, around Arthurs Pass, and on the West Coast set new lows (see Table below). Severe frosts followed the snow event on 7 and 8 June as clear skies prevailed, and were subsequently widespread and frequent over the second half of June. Unusually late frosts on 7 and 8 November were problematic for some.

Table 4: Near-record or record high or low annual temperature extremes for 2012

Location	Temperature (°C)	Date of occurrence	Year records began	Comments
Highest extreme maximum temperatures				
New Plymouth	29.9	Dec-24th	1944	4th-highest
Paraparaumu	29.2	Dec-24th	1953	Equal 3rd-highest
Palmerston North	30.8	Dec-26th	1991	4th-highest
Wellington Airport	29.6	Dec-25th	1962	2nd-highest
Wanganui	29.7	Dec-24th	1987	Highest
Motueka	31.9	Dec-25th	1956	2nd-highest
Highest extreme minimum temperatures				
Whangarei	21.9	Feb-23rd	1967	Equal 2nd-highest
Whangaparaoa	20.0	Feb-23rd	1982	4th-highest
Palmerston North	19.4	Dec-25th	1991	3rd-highest
Takaka	20.3	Dec-26th	1978	3rd-highest
Nelson	20.1	Dec-26th	1943	4th-highest
Lowest extreme minimum temperatures				
Te Kuiti	-3.9	Jul-2nd	1959	4th-lowest
Turangi	-6.7	Jul-2nd	1968	3rd-lowest
Martinborough	-3.8	May-21st	1986	4th-lowest
Paraparaumu	-4.2	Jul-2nd	1953	4th-lowest
Palmerston North	-3.9	Jun-17th	1991	2nd-lowest
Arthurs Pass	-11.2	Jun-7th	1973	Lowest
Culverden	-10.2	Jun-8th	1928	4th-lowest
Timaru	-6.8	Jul-24th	1990	4th-lowest
Ranfurly	-11.3	Jul-2nd	1975	3rd-lowest
Lumsden	-8.0	Jul-4th	1982	Lowest
Alexandra	-8.9	Jul-2nd	1983	4th-lowest
Lowest extreme maximum temperatures				
Hamilton	6.4	Jul-5th	1940	2nd-lowest
Martinborough	6.5	Jun-12th	1986	4th-lowest
Hokitika	5.1	Jun-6th	1964	Lowest
Greymouth	5.2	Jun-6th	1972	Lowest
Milford Sound	3.1	Jun-26th	1935	4th-lowest
Blenheim	5.6	Jun-6th	1947	2nd-lowest
Hanmer Forest	1.0	Jun-15th	1972	2nd-lowest
Arthurs Pass	-1.2	Jun-6th	1973	2nd-lowest
Waipara	2.3	Jun-6th	1973	Lowest
Lincoln	0.7	Jun-6th	1881	Lowest
Orari	2.8	Jun-6th	1972	3rd-lowest
Wanaka	-0.4	Jul-5th	1972	4th-lowest
Manapouri	1.6	Jul-1st	1973	4th-lowest
Alexandra	-1.9	Jul-5th	1983	2nd-lowest

Section 8: Annual Sunshine – Sunnier than normal for western areas Te Kuiti to Kapiti Coast, as well as West Coast South Island. Below normal sunshine for Wellington, Wairarapa, Blenheim, Central Otago and Northland. Near normal sunshine elsewhere.

The year 2012 was a sunny one for western areas of the North Island from Te Kuiti southwards to the Kapiti Coast, as well as for the West Coast of the South Island. It was the sunniest year on record for Te Kuiti, New Plymouth, Paraparaumu, and Greymouth. This sunshine pattern reflects the enhanced easterly winds that occurred for the first five months of the year, as well as in August. In contrast, below normal annual sunshine totals (below 95 percent of annual normal) were observed for the Wairarapa, Wellington, Blenheim, Central Otago, and Northland. Elsewhere, sunshine totals were generally close to normal.

Whakatane was the sunniest location in 2012, recording 2602 hours, followed by Nelson (2584 hours) and Lake Tekapo (2562 hours).

Table 5: Near-record or record sunshine hours for the year 2012

Location	Sunshine (hours)	Percent of normal	Year records began	Comments
Whakatane	2602	116	1992	3rd-highest
Te Kuiti	2023	118	1962	Highest
New Plymouth	2433	111	1972	Highest
Paraparaumu	2360	115	1953	Highest
Greymouth	2160	125	1947	Highest
Ashburton	2294	123	1930	4th-highest
Lake Tekapo	2562	106	1928	3rd-highest
Balclutha	2118	131	1964	2nd-highest

Section 9: 2012 climate in the six main centres

Of the six main centres, for 2012 as a whole, Hamilton was the wettest, Christchurch the driest, Tauranga the sunniest, Auckland the warmest, and Dunedin the coolest and cloudiest.

Annual temperatures were near average and annual rainfall near normal, for all six of the main centres in 2012. Annual sunshine values were above normal in Dunedin, but near normal elsewhere.

Table 6: Climate in 2012 in the six main centres

Temperature			
Location	**Mean temp. (°C)**	**Departure from normal (°C)**	**Comments**
Auckland[a]	15.2	-0.2	Near average
Tauranga[b]	15.1	0.2	Near average
Hamilton[c]	13.4	-0.2	Near average
Wellington[d]	12.7	-0.2	Near average
Christchurch[e]	11.3	-0.3	Near average
Dunedin[f]	11.1	0.0	Near average
Rainfall			
Location	**Rainfall (mm)**	**% of normal**	**Comments**
Auckland[a]	1011	90%	Near normal
Tauranga[b]	1202	101%	Near normal
Hamilton[c]	1290	107%	Near normal
Wellington[d]	1185	97%	Near normal
Christchurch[e]	655	110%	Near normal
Dunedin[f]	745	101%	Near normal
Sunshine			
Location	**Sunshine (hours)**	**% of normal**	**Comments**
Auckland[a]	2026	99%	Near normal
Tauranga[b]	2306	104%	Near normal
Hamilton[g]	1978	99%	Near normal
Wellington[d]	2008	95%	Near normal
Christchurch[e]	2135	100%	Near normal
Dunedin[f]	1831	109%	Above normal

[a] Mangere [b] Tauranga Airport [c] Hamilton Airport [d] Kelburn [e] Christchurch Airport [f] Musselburgh [g] Ruakura

Section 10: Significant extremes

Floods

In 2012, there were eight particularly notable rainfall events. On 22-23 February, heavy rain caused flooding and slips in Otago, Nelson, and central North Island. A weather 'bomb' during 3-4 March caused heavy rain and extremely strong winds for the western and southern North Island, and Nelson. On 19 March, Northland was affected by widespread floodwaters due to a deep low stalling east of the Bay of Islands. The hills above Kaeo received approximately twice the normal March rainfall total in 35 hours (283.5 mm). This low moved south over the North Island on 20 March, all but isolating Gisborne by causing slips and tree-falls that blocked numerous roads. On 5 June, the northwest South Island was affected by record-breaking rain, associated with a rapidly deepening low over the Tasman Sea. On 16 July, flooding was widespread in many regions over the southern half of the North Island and the northern South Island. Westport was isolated, and numerous State Highways were closed due to slips and floodwaters. The Western Bay of Plenty and Coromandel were flooded in back-to-back events on 23 and 30 July. Katikati was flooded on 23 July, and both Katikati College and Katikati Primary School closed early. Waihi Beach was isolated after both roads heading into the town were closed. On 30 July, the western Bay of Plenty and Coromandel Peninsula were again flooded after heavy rain. Several heavy rain events in the period to 1-15 August flooded parts of Marlborough, Canterbury, and north Otago; closing many roads due to slips and surface flooding, and damaging numerous properties. On 1 January 2013, Milford Sound received intense rainfall, which raised river levels, trapping trampers on the Milford Track.

Snow

One extremely significant snowfall event occurred in 2012. On 6 June, snowfall was heavy and to very low levels over Canterbury, Arthur's Pass, Otago, West Coast, and Marlborough. During the event, many major roads were closed, including SH1 from Greta and Waipara, Lewis Pass, SH8 between Fairlie and Twizel, Porter's Pass, Arthur's Pass, and Dansey's Pass. Many local roads were also closed. Schools throughout the affected regions closed for the day, and universities in Christchurch also closed. Many flights in and out of Christchurch, Dunedin, and other airports were disrupted because of the weather. In the following days, numerous roads were still closed or required chains due to snow and ice.

On 26 June, snow caused numerous road closures in Canterbury and Otago, and SH94 between Te Anau and Milford Sound. On 27-28 June, snow closed additional roads, including Lewis Pass, Arthur's Pass, SH1 at the Desert Road, and the Napier-Taihape Road, and chains were required on many other main highways. Snow fell to sea level on the West Coast, and settled further inland, with 15 cm reported at Reefton.

From 9 to 12 September, snow caused road closures in Southland, Canterbury, and Otago. SH 94 from Te Anau to Milford Sound was closed for a number of days, and SH 1 at the Desert Road and SH 2 at the Rimutaka Ranges were closed for a time also. Chains were required on other major roads in the South Island, including SH 73 at Arthurs Pass, SH 7 at Lewis Pass, the Crown Range Road between Arrowtown and Wanaka, and roads around Queenstown and Central Otago. Schools were closed or starting times were delayed, and Queenstown airport was closed with about 30 flights diverted.

Wind

Winds associated with the 3-4 March storm were severe, tearing down trees and causing property damage and power cuts throughout much of the North Island. October was a relatively windy month, with a number of wind-related disruptions especially in the middle of the month. On 13-14 October, unusually strong winds were experienced in Northland, Auckland, and the Waikato, as well as parts of Canterbury and the West Coast. Trees were brought down and caused power cuts in many areas. On the Mahia Peninsula, extreme winds were identified as a major factor in spreading two bushfires. On 17 October, large trees were blown onto SH1 north of Wellington, and fire fighters were forced to abandon a fire in a pine forest because of dangerous conditions caused by the wind. On 6 December, a tornado struck west Auckland, bringing down trees, causing property damage, and tragically killing three people at a construction site.

Drought

Spring 2012 was relatively dry for much of the North Island, as well as Nelson and Marlborough. At the start of summer (1 December), soils were extremely dry for the time of year across much of the North Island (except for Gisborne and northern Hawkes Bay), as well as in Nelson and Buller. Dry conditions persisted through the first half of December across much of New Zealand, and significant soil moisture deficits were in evidence mid-December across much of the north and east of the South Island, as well as Hawkes Bay, Wairarapa, much of the Manawatu, and parts of Northland, Auckland, Bay of Plenty, and Gisborne. As at 1 January 2013, significant soil moisture deficits were present in parts of Auckland, Waikato, Bay of Plenty, Gisborne, Hawkes Bay, Wairarapa, Manawatu, Wellington, Nelson, Marlborough, Kaikoura coast, Canterbury, Otago, and central Southland.

Further detailed information about significant climate and weather events for 2012 is attached.

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Note for editors:

Climate measurements have been made in New Zealand for about 150 years, with reasonable coverage of reliable data from at least 1900. NIWA makes its raw climate data publicly available

for free on-line. Journalists are advised, however, to take extreme care when interpreting trends from raw data to ensure they have not been compromised by changes in site location, urbanisation, exposure, or instrumentation over time. If in any doubt, please call us.

Significant weather and climate events – 2012

Section 11: High temperatures

Heat waves and extreme high temperatures were lacking in 2012. In January and February, La Niña's cloudy and wet conditions meant that summer temperatures were generally well down – and the typical summertime swelter was absent. In contrast, winter warmth was periodically observed – with northerly winds producing unusual warmth during the second half of July, 25-27 August, the last two days of September, and the last week of October. Very warm conditions surrounded Christmas week, caused by a northerly wind flow bringing warm air masses from the tropics. Numerous extreme maximum temperature records were broken across the country during this time (see table below).

Table 7: Extremes of high daily maximum temperature in 2012 were recorded at:

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Ranking
April				
Port Taharoa	26.4	3rd	1973	Highest
July				
Kaikohe	19.1	23rd	1973	Highest
Leigh	19.5	20th	1966	Highest
Port Taharoa	19.9	26th	1973	Highest
Motueka	19.9	18th	1956	Highest
Cheviot	22.3	15th	1982	Highest
August				
Leigh	20.2	18th	1966	Equal highest
September				
Cheviot	25.1	30th	1982	Highest
Dunedin (Airport)	24.9	29th	1962	Equal highest
October				
Kaikohe	22.5	27th	1973	Highest
Farewell Spit	23.6	31st	1971	Highest
December				
Kaikohe	28.1	19th	1973	Highest
Port Taharoa	31.4	24th	1973	Highest
New Plymouth	29.9	24th	1944	Highest
Martinborough	31.3	25th	1986	Highest
Paraparaumu	29.2	24th	1953	Equal highest
Palmerston North	30.8	26th	1991	Highest
Levin	29.7	25th	1895	Highest
Wellington (Airport)	29.6	25th	1962	Highest
Wallaceville	29.3	25th	1939	Highest
Hawera	25.5	26th	1977	Equal highest
Ohakune	29.0	25th	1962	Highest
Wanganui	29.7	24th	1987	Highest

Takaka	30.5	24th	1978	Highest
Reefton	32.2	24th	1960	Highest
Motueka	31.9	25th	1956	Highest
Nelson	30.3	24th	1943	Highest
Gore	29.0	25th	1971	Equal highest

Section 12: Low temperatures and severe frost

The year 2012 will likely be remembered as one of periodic, unusual, cold snaps. Severe frosts were widespread and frequent in the second half of June; and unusually late frosts on 7 and 8 November were problematic for some.

In the second half of January, unusually cold air reached the South Island following a procession of cold fronts, with records broken on 14/15, 23 and 27/28 January. Minimum temperatures were record low for January at Appleby and Blenheim on the 23rd, at Puysegur Point (Fiordland) and Le Bons Bay (Banks Peninsula) on the 27th, and at New Plymouth, Takapau Plains, and Dannevirke on the 28th.

An extremely cold event occurred on 6 June, in which afternoon (maximum) temperatures in Canterbury, Blenheim, around Arthur's Pass, and on the West Coast set new low records for June, and in some cases, broke all-time (any month) records, too. Maximum temperatures on 6 June in Canterbury struggled to reach even 1°C, with heavy snow falling throughout the daylight hours. At several stations, the maximum temperatures recorded were both record low for June *and* an all-time (any month) new record low. This was the case at Hokitika, Cheviot, and Waipara West (with climate records of approximately 50 years, 30 years, and 40 years, respectively), as well as at Christchurch Airport. On 6 June, Christchurch Airport reached a maximum temperature of only 0.4°C, a new all-time lowest maximum temperature record at this site since records began there in 1954. Another notable record was at Lincoln, which recorded a maximum temperature of only 0.7 °C on 6 June, the second lowest maximum temperature at that site ever, in records which began in 1881. Minimum (morning) temperatures in Canterbury were also extremely low on the following two mornings (7 and 8 June). And in between southerly outbreaks, winter-time ridges of high pressure brought clear skies, and light winds, to the country on 13, 16, 17, and 30 June, producing extremely cold mornings and/or severe frosts for many regions.

An unusually cold southerly air stream for the time of year affected New Zealand on 11-12 September, breaking September temperature records at many southeastern sites. Afternoon temperatures on the 12th at Martinborough and Mahia were the coldest on record for September. On the 13th, record low September morning temperatures were recorded in Kerikeri, Warkworth, Whangaparaoa, Rotorua, and Te Kuiti.

An unseasonably cold southerly (which dragged very cold air from about 60^{o}S up and over the country) occurred on 5 and 6 November, and resulted in some extremely low afternoon temperatures in Canterbury on the 5th. Ridging (high pressures) then affected New Zealand on 7 and 8 November, meaning that clear skies and light winds produced a recipe for unusually late-in-

the-year frosts. Morning (minimum) temperatures in many regions of the country were record or near-record low on these two days. And then an unusually cold southeast air stream affected the east coast of the North Island on 13 November, with near-record low daytime (maximum) temperatures observed in Gisborne and Hawkes Bay.

Table 8: Extremes of low daily minimum temperature in 2012 were recorded at:

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Ranking (* indicates all-time lowest ranking)
January				
New Plymouth	4.2	28th	1944	Lowest
Takapau Plains	1.0	28th	1962	Lowest
Dannevirke	0.8	28th	1951	Lowest
Puysegur Point	5.7	27th	1978	Lowest
Appleby	2.3	23rd	1943	Lowest
Blenheim	1.3	23rd	1932	Lowest
Le Bons Bay	4.3	27th	1984	Lowest
March				
Martinborough	1.0	14th	1986	Lowest
May				
Leigh	5.3	30th	1966	Equal lowest
Turangi	-4.9	22nd	1968	Lowest
June				
Arthurs Pass	-11.2	7th	1973	Lowest (*3rd lowest)
Culverden	-10.2	8th	1928	Lowest (*2nd lowest)
Le Bons Bay	0.0	6th	1984	Equal lowest
September				
Kerikeri	0.9	13th	1981	Lowest
Warkworth	-0.5	13th	1966	Lowest
Whangaparaoa	4.6	12th	1982	Lowest
Rotorua	-3.2	13th	1964	Lowest
Te Kuiti	-2.4	13th	1959	Lowest
October				
Lake Tekapo	-8.3	14th	1925	Lowest
November				
Turangi	-2.3	7th	1968	Lowest
Lumsden	-3.6	6th	1982	Lowest
Tiwai Point	0.0	7th	1970	Lowest
Balclutha	-1.1	6th	1964	Lowest
December				
Motu	-1.7	1st	1990	Lowest
Hicks Bay	5.7	1st	1969	Equal lowest

Section 13: Floods and high rainfall

In 2012, there were eight particularly notable rainfall events. On 22-23 February, heavy rain caused flooding and slips in Otago, Nelson, and central North Island. A weather 'bomb' during 3-4 March caused heavy rain and extremely strong winds for the western and southern North Island, and Nelson. On 19 March, Northland was affected by widespread floodwaters due to a deep low stalling east of the Bay of Islands. This low then moved south over the North Island on 20 March, all but isolating Gisborne by causing slips and tree-falls that blocked numerous roads. On 5 June, the northwest South Island was affected by record-breaking rain, associated with a rapidly deepening low over the Tasman Sea. On 16 July, flooding was widespread in many regions over the southern half of the North Island and the northern South Island. Westport was isolated, and numerous State Highways were closed due to slips and floodwaters. The Western Bay of Plenty and Coromandel were flooded in back-to-back events on 23 and 30 July. Several heavy rain events in the period to 1-15 August flooded parts of Marlborough, Canterbury, and north Otago; closing many roads due to slips and surface flooding, and damaging numerous properties. Lastly, on 31 December and 1 January, Milford Sound received intense rainfall, closing the Milford Track and trapping 120 trampers.

On 22 and 23 February, heavy rain in Otago flooded properties in Alexandra, and caused Shotover Jet in Queenstown to cancel boat trips because of high river levels. Dunedin Airport was closed for several hours, and rural roads in South Otago, and SH97 at Lowther in northern Southland, were closed by surface flooding. About 25 tourists were trapped at a camping ground at Trotter's Gorge near Hampden, and some groups in the Otago Goldfield's Heritage Trust Cavalcade Trail became stuck in the Nevis area. In the Nelson area, slips came down on Cable Bay Road. Hospitals in both Rotorua and Taupo were flooded, with some patients having to be moved. One flight from Hamilton Airport was cancelled because of the conditions, and others delayed. A large slip blocked one lane of SH2 inland from Opotiki. On 24 February, many Otago roads remained closed after the very heavy rain, including SH90 at Pomohaka Bridge between Raes Junction and Gore.

A rapidly deepening low (or weather 'bomb') approached New Plymouth from the Tasman Sea on 3 March, migrating eastwards across the lower North Island on the 4th. The low brought heavy rain and extremely strong winds. The Round New Zealand yacht race fleet was between New Plymouth and Nelson at the time, with one boat issuing a Mayday and several yachts seeking shelter for a time in Golden Bay. Patea and Waverley were badly affected with property damage, and downed trees blocked SH3 in more than one place. In Wellington, the Hutt River burst its banks. Four classrooms were flooded at Wainuiomata's Fernlea School. The Karapoti Mountain Bike event held near Upper Hutt was postponed a day.

On 19 March, Northland was affected by floodwaters due to a deep low stalling east of the Bay of Islands. A fire crew had to use an inflatable boat to rescue a family of three from rising flood waters near Ngunguru, 22km northeast of Whangarei. The driver of a car was trapped in floodwaters at Motatau, 52 km northwest of Whangarei, but was freed by passersby soon thereafter. Neighbours helped to save a 61-year-old woman who was swept away by floodwaters near Whangarei. The 61-year-old had attempted to cross a bridge in her car about 11.30am at Otaika, 7km southeast of Whangarei, but became stuck. She managed to get out of the vehicle but was swept away by the

rising waters. The woman managed to grab hold of a branch and neighbours, wearing lifejackets, managed to pull her to safety.

Northland Regional Council figures show that the hills above the Far North township of Kaeo recorded 283.5mm of rainfall in 35 hours – roughly twice the usual rainfall for the month of March. Roads in and out of the township were closed, and floodwater in the main street rose to a metre deep, flooding some businesses. Kerikeri Primary School shut for the day. The Twin Bridges at Kawakawa were shut about 10.50am due to rising flood waters. Flooding was reported on Ngunguru Rd, SH1 Whakapara, SH10 between Kaeo and Hihi Rd, Whananaki North Rd, Matipo Pl, Marua Rd, Otonga Rd, Kokopu Rd and Russell Rd.

On 20 March, this low remained slow-moving to the east of the Bay of Islands, resulting in gale to storm force southeast winds over the North Island. Gisborne was all but isolated, with almost all routes out of the district blocked by slips, trees or flooding for a couple of hours. The two detours out of town, after the closure of the Waioeka Gorge between Gisborne and Opotiki more than two weeks previously, were hit by the severe wind and rain lashing the East Coast. Drivers heading south on State Highway 2 were turned back after flooding temporarily closed both sides of the Whareratas south of Gisborne city during the morning. Temporary road closures also occurred during the morning for SH2 between Wairoa and Nuhaka, as well as between Gisborne and Muriwai. Slips partially blocked SH35, the East Coast highway on the south side of Tolaga Bay during the morning. There was also extensive surface flooding in the same area.

On 5 June, the northwest South Island was affected by record-breaking rain, associated with a rapidly deepening low over the Tasman Sea. In the case of Greymouth Airport, this was the highest June daily rainfall total in the record.

On 6 June, SH94 was closed by a slip between the Lower Hollyford Valley turn-off and The Cavern. Heavy rain caused surface flooding on SH1 at Johnsonville, and SH2 at Petone, and further south in Christchurch. Murchison was flooded, with businesses and homes affected. SH6 from Greymouth to Runanga was closed by flooding, as were many local roads in the region. Families were evacuated from flooded homes. A slip closed one lane of SH60 between Takaka and Collingwood. The heavy rain caused all Tranz Metro trains in the Wellington region to run late in the afternoon.

On 15 July, flooding and slips closed SH6 between Inangahua and Westport, and SH65 from Spring's Junction to O'Sullivan's Bridge. The Takaka-Collingwood Highway in Golden Bay was closed by flood debris on the road at the Waitapu Bridge. Many Nelson city roads were also closed by flooding.

On 16 July, SH73 was closed by a slip between Springfield and Arthurs Pass. Westport suffered surface flooding in the town, and was isolated by severe flooding and slips on SH67 from Westport to Greymouth, SH6 from Westport to Inangahua, SH67 from Westport to Karamea, and SH69 to Reefton. Minor flooding occurred in Murchison, with five homes inundated, and in Nelson where the Matai River overflowed. In Marlborough, the Wakamarina River overflowed its banks in several areas, and SH6 from Havelock to Wangamoa was closed by severe flooding. A fallen tree blocked the Picton end of Queen Charlotte Drive. In Wellington, the harbour ferry was cancelled because of the heavy rain and strong winds. In Upper Hutt, a woman was rescued from her vehicle attempting to

cross the Akatarawa River, which had risen rapidly after the heavy rain, and a rock fall affected SH2 north of the Haywards Hill traffic lights. SH1 was closed by flooding between Taupo and Turangi, as was SH43 between Taumarunui and Whangamomona. SH3 was closed by a large slip north of the Awakino Hotel, and many minor roads in Taranaki were closed by smaller slips and surface flooding. At Coronet Peak, the ski area was closed after rain soaked the snowpack.

On 17 July, floodwaters isolated the King Country township of Ohura after the swollen Ohura River burst its banks. Several roads in the Ruapehu district were closed by flooding, slips or downed trees. The road to Rainbow Ski Field was closed after it was damaged by the heavy rain on 15 and 16 July. In New Plymouth, the Huatoki walkway was closed after heavy rain caused the path to slump. On 18 July, a large slip closed Gladstone Road, east of Levin, isolating 20 to 30 properties.

On 23 July, SH2 was closed by a slip in the Athenree Gorge and flooding in the Karanagahake Gorge, and reduced to one lane by surface flooding in the Papamoa area. SH26 between Paeroa and Te Aroha was closed by flooding. Katikati was also affected by flooding and both Katikati College and Katikati Primary School closed early. Waihi Beach was isolated after both roads heading into the town were closed. In the Coromandel, the Tapu-Coroglen Road was blocked by land slips. In Auckland, heavy rain brought down a tree in Titirangi, closing the road.

On 24 July, slips closed SH2 near Apata, and SH25 between Thames and Coromandel, and between Coromandel and Whitianga. In Gisborne, pupils were sent home from Kaiti School after flash floods entered classrooms and a toilet block. In the Waikato, flash floods inundated Cambridge homes, and a large slip left a 2 m high mound on Te Puroa Road, cutting off 24 properties, and isolating about 80 residents. In Hawkes Bay, the Clive River overflowed, damaging property, reserves and walkways.

On 30 July, heavy rain caused a slip on SH29 near the summit on the Matamata side of the Kaimai Ranges, surface flooding on SH1 near the SH29 turnoff, SH26 between Paeroa and Te Aroha, and between Paeroa and Hikutaia, SH25 at the Thames Coast Road and further north at Manaia, and minor slips at Ruamahanga, Tapu and Kereta. In the Tauranga area, the heavy rain flooded roads, and the accompanying strong winds, brought down trees and power lines. In Dunedin, heavy rain caused surface flooding and property damage in the suburb of Helensburgh.

On 31 July, heavy rain caused surface flooding on SH8 between Fairlie and Lake Tekapo, SH79 between Fairlie and Geraldine, and SH83 between Duntroon and Kurow. Surface flooding closed many other roads in South Canterbury, including Dansey's Pass, with SH1 between Pukeuri and the Waitaki Bridge requiring extreme care. In Christchurch, the Heathcote River burst its banks after two days of heavy rain, flooding the surrounding area. In Tauranga, heavy overnight rain caused the sewer system to overflow into the Waikareao Estuary. The Daisy Hardwick Walkway around the Waikareao Estuary was closed after a section of the seawall collapsed.

On 1 August, surface flooding affected SH1 between Clarence and Kaikoura. In Blenheim, the Opawa River burst its banks, and two young people had to be rescued when their car became stranded in the floodwaters. Many roads in Marlborough were closed by flooding and slips, including Queen Charlotte Drive, and the Awatere Valley Road. Flooding closed SH3 between Fairlie and Lake Tekapo, and surface flooding also affected SH79 between Geraldine and Fairlie, and SH83 between Duntroon and Kurow. Further north in the Wairarapa, roads and paddocks were flooded.

On 2 August, heavy rain and flooding closed many roads and bridges in South Canterbury. Further north, there was extensive surface flooding in the Gisborne region, with soils waterlogged, and all sports grounds closed.

On 3 August, residents in the Clarence area were isolated after heavy rains made the fords on George River impassable. Flooding also affected properties on Inland Road, west of Kaikoura.

On 8 August, heavy rain caused surface flooding on SH1 between Blenheim and Kaikoura, Kaikoura and Waipara, and Pareora and Glenavy, and on SH63 between Renwick and Wairau Village. Many other minor roads in Marlborough were affected by flooding and slips, with several closed completely. In Blenheim, the heavy rain and surface flooding caused raw sewage to overflow the sewer network. Surface flooding affected SH83 from Kurow to Pukeuri. In Timaru sports fields were closed. Many rural roads in north Otago were closed by flooding.

On 9 August, just after midnight, SH1 was closed by a large slip near Ward, and flooding at Seddon, between Blenheim and Kaikoura. Surface flooding also affected SH1 between Waitaki and Oamaru, and SH83 at Blackpoint and Otekaieke. Many minor roads in Marlborough remained closed by flooding and slips, and most Blenheim sports grounds were closed. Some schools sent rural pupils home early. Surface flooding and slips also affected commuter roads in Wellington, with Makara Beach cut off.

On 12 August, flooding closed SH70 between Fairlie and Geraldine, and further north, a slip closed one lane of SH29 over the Kaimai Ranges. The heavy rain caused a lahar from Tongariro's northern slopes, closing a section of SH46 near Lake Rotoaira. Flooding closed SH2 both north and south of Katikati. Flooding also occurred in Rotorua, particularly in the Ngongotaha area, and in the Wairarapa.

On 13 August, flooding affected SH83 between Pukeuri and Duntroon, SH1 from Christchurch to Rakaia, and SH75 from Christchurch to Akaroa. There was widespread surface flooding in Christchurch, particularly in eastern suburbs, with many roads closed. The Ashley River bridge was closed by flooding, and the Heathcote River, Dudley Creek, and streams at Akaroa and Duvauchelle burst their banks. In Lyttelton, the heavy rain caused a retaining wall to collapse, blocking stormwater drains and creating a flash flood which damaged property. A slip isolated Okains Bay, and slips on The Summit Road trapped some motorists. In Temuka, Opihi College delayed the start of the school day because of the conditions. Many minor roads in Dunedin were closed by flooding. In Northland, a slip closed one lane of SH10 near Matauri Bay.

On 14 August, SH75 was closed by a slip between Birdlings Flat and Barrys Bay. Flooding affected SH1 between Oamaru and Palmerston, SH85 between Palmerston and Dunback, and SH88 between Dunedin and Port Chalmers. A large slip closed Portobello Road, and many minor roads in Otago were closed by flooding. A mud slide forced the evacuation of properties in Lyttelton, and one cottage was inundated with mud up to a metre deep. Further north in Tauranga, two landslides occurred in the suburb of Matua, about 10-15 m away from houses.

On 15 August, after heavy rain overnight, many more roads in Otago were closed by flooding and slips, isolating rural properties. SH1 was flooded between Oamaru and Waitaki Bridge. School bus services were cancelled in North Otago. All rural roads in Waitaki were effectively off-limits to motorists, after the Waitaki District Council issued a no non-essential travel notice. In South Canterbury, slips with the consistency of soupy mud, closed some rural roads.

On 20 August, surface flooding affected SH1 from Oamaru to Pukeuri, SH83 between Duntroon and Pukeuri, and SH88 at St Leonards. In Palmerston North all sports grounds were closed after heavy rain. In Dunedin, Portobello Road was closed by a slip. In Taranaki, a large slip at Oakura covered the road and buried a set of public toilets. This was one of eight slips on the coastal road around Mt Taranaki.

On 13 October, a 200-metre slip came down on the road to Milford Sound following heavy rain, closing it for at least three days. Stranded tourists got out by helicopter. In Canterbury, the old Waimakariri Bridge (not SH1) was closed after high rainfall and rising river levels threatened its safety. In the Hokitika area, heavy rain caused surface flooding, and creeks burst their banks, flooding paddocks and access roads. Surface flooding also caused problems in Nelson, and in the Pelorus Valley, rivers burst their banks, flooding paddocks and a rugby field in Canvastown.

On 18 October a washout was reported on SH73 between Griffin and Kumara, closing the road. In New Plymouth, the police station was flooded to a depth of about 20 cm in the early hours of the morning after a sudden downpour.

On 6 December, heavy rain caused flooding, closing SH18 between Tauhinu Road and Westgate, the major link between North Shore and west Auckland. Flash flooding affected many minor roads particularly in the Hobsonville and Whenuapai areas. The storm caused delays and cancellations of flights into and out of Auckland International Airport. Near Rotorua, intense rain caused flash flooding in Ngongotaha, sweeping a caravan about 50 m from its berth. In the Reporoa area, the storm uprooted trees, flooded roads and paddocks, and damaged driveways.

On 7 December, heavy rain caused the Heathcote River in Christchurch to burst its banks.

On 30 December, brief but intense heavy rain, thunder and lightning, affected Dunedin about 4pm causing stormwater systems to back up and floodwaters to lap at the front doors of Mosgiel shops. Dunedin firefighters were kept busy with about eight water-related callouts in about 40 minutes.

On 1 January 2013, the Milford Track was closed after heavy rainfall overnight. The Arthur and Clinton rivers were flooded across the track in several places, with the Arthur having reached record levels. About 120 stranded trampers already on the track had to hunker down in Department of Conservation huts for two nights, and no new walkers joined the trail. In addition, one tramper had to be airlifted from the Kepler Track with hypothermia. The trampers were able to resume their walk on 2 January.

Table 9: Record high extreme 1-day rainfall totals were recorded in 2012 at:

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Ranking
January				
Takaka	139	22nd	1976	Highest
June				
Greymouth	151	5th	1947	Highest
July				
Hicks Bay	96	3rd	1916	Highest
Takaka	204	14th	1976	Highest

Section 14: Low soil moisture levels and record low monthly rainfall

At the start of 2012, soil moisture deficits were evident in eastern areas of both Islands, including Central Otago. However, a relatively wet start to 2012 meant that deficits were alleviated across much of New Zealand by the first week of March. During the spring westerlies of September, eastern areas of both Islands once again started to dry out. An unusually dry October followed for much of the North Island, as well as in north Canterbury and Marlborough, and soils had become much drier than usual in Gisborne, Hawkes Bay and the Wairarapa. November continued dry for much of the North Island, as well as Nelson, Marlborough, Buller, and the West Coast of the South Island. At the start of summer (1 December), soils were extremely dry for the time of year across much of the North Island (except for Gisborne and northern Hawkes Bay), as well as in Nelson and Buller. Dry conditions persisted through the first half of December across much of New Zealand, and significant soil moisture deficits were in evidence mid-December across much of the north and east of the South Island, as well as Hawkes Bay, Wairarapa, much of the Manawatu, and parts of: Northland, Auckland, Bay of Plenty, and Gisborne. As at 1 January 2013, significant soil moisture deficits were present in parts of Auckland, Waikato, Bay of Plenty, Gisborne, Hawkes Bay, Wairarapa, Manawatu, Wellington, Nelson, Marlborough, Kaikoura coast, Canterbury, Otago, and central Southland.

Well below normal January rainfall totals (less than half of January normal) were observed in the northern South Island, and on Banks Peninsula. Nelson and Takaka also experienced a very dry January, with only about a quarter (25 percent) of usual January rainfall observed. By the end of January, significant soil moisture deficit (more than 110 mm of deficit) was observed in eastern areas of the South Island, Central Otago, and Gisborne, but soil moisture levels were near-normal elsewhere.

The dry trend continued in the South Island in February, with an extremely dry month in Fiordland (less than half of February normal rainfall). Below-normal rainfall for February was also experienced in north Canterbury, Wairarapa, and parts of Waikato and Northland.

March was a dry month for the West Coast of the South Island, Fiordland, Nelson, Christchurch, south Canterbury, as well as between Wanganui and Palmerston North, and around Taupo (rainfall in these regions between 50 and 79 percent of March normal). Soil moisture levels in the Manawatu-Wanganui region were drier than usual for March.

April was a very dry month for many regions around the country, primarily due to prevailing anticyclones. Notably, rainfall was less than half of normal (less than 50 percent) for the bottom half of the South Island, as well as Auckland, Coromandel, Western Bay of Plenty, and the central-western North Island. Central Otago was particularly dry, with rainfall less than a quarter (25%) of April normal there. It was the driest April on record for Wanganui and Alexandra. At the end of April, soils were much drier than normal for the time of year between Wanganui and the Kapiti coast, and in Southland.

It was an extremely dry May for Canterbury, with less than a quarter (25%) of normal May rainfall recorded – and it was generally dry elsewhere in the South Island. At both Lincoln and Christchurch

Airport, it was the 2nd driest May on record. Rainfall was also well below normal (around 50% of May normal) in Nelson and Marlborough, and across much of Westland and Otago. At the end of May, soils were much drier than normal for the time of year in Canterbury and Nelson, as well as in the Tararua District and around Palmerston North.

It was an unusually dry June in the north and east of the North Island, as well as in south Canterbury, with less than 50% of June normal rainfall. It was the driest June on record for Whangarei, Rotorua, and Whakatane. Below-normal rainfall totals (between 50 and 79 per cent of June normal) were also observed in Auckland, Waikato, Taranaki, Central Plateau and the Wairarapa.

It was an unusually dry August over the west and south of the South Island (with less than 50 percent of August normal rainfall south of Westport), showing the effects of the prevailing northeasterly winds. Record low or near-record low August rainfall was seen across Southland.

It was a rather dry September in eastern areas of both islands, illustrating the lee effect of the westerly winds that prevailed during the month. In particular, rainfall was well below normal (less than 50 percent of September normal) for parts of Gisborne, Hawkes Bay, and Canterbury. Below normal rainfall (between 50 and 69 percent of September normal) was also experienced between Wanganui and Wellington.

It was an unusually dry October across much of the North Island, as well as in north Canterbury and Marlborough (with between 50 and 79 percent of October normal rainfall observed). In Gisborne, Hawkes Bay, and the coastal Wairarapa, rainfall was less than half October normal. At the end of October, soils were much drier than usual in Gisborne, Hawkes Bay and the Wairarapa. Soil moisture levels were also below normal for the eastern Bay of Plenty, between Auckland and Whangarei, in Central Otago, and around Wanganui.

It was the driest November on record for Te Puke (18 mm observed) and Rotorua (13 mm received), in records that began in 1973 and 1963, respectively. November rainfall was well below normal (less than 50 percent of November normal) for south Auckland, Waikato/Coromandel, Bay of Plenty, between Wanganui and Wellington, parts of the Wairarapa, Nelson, Marlborough, Buller, and on the West Coast northwards of Hokitika. Soils were unusually dry for the time of year across much of the North Island (except for Gisborne and northern Hawkes Bay, where soil moistures remain elevated after heavy rainfall on 12 November), as well as Nelson and Buller.

It was a drier than normal December for eastern regions including Gisborne, Hawkes Bay, Wairarapa, Canterbury, Otago, and Southland, as well as for Nelson. Some locations recorded less than 50 percent of December normal rainfall. At the end of December, significant soil moisture deficits were present in parts of Auckland, Waikato, Bay of Plenty, Gisborne, Hawkes Bay, Wairarapa, Manawatu, Wellington, Nelson, Marlborough, Kaikoura coast, Canterbury, Otago, and central Southland.
In contrast, soils were wetter than usual in Northland.

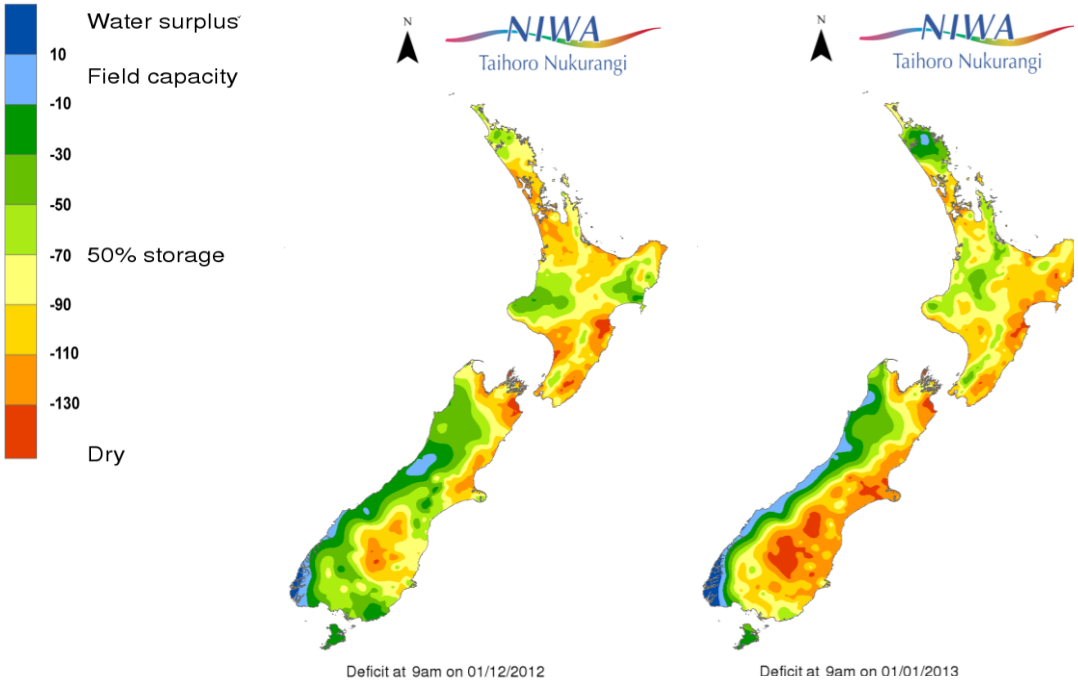

Figure 5: Left hand panel: Soil moisture deficit across New Zealand as at 1 December 2012. Areas in Auckland, Waikato, Bay of Plenty, southern Hawkes Bay, Manawatu, Wairarapa, Wellington, Nelson, Marlborough, Kaikoura coast, coastal Canterbury and Otago have significant soil moisture deficits (More than 110 mm of deficit). Right hand panel: Soil moisture deficit as at 1 January 2013. Areas in Auckland, Waikato, Bay of Plenty, Gisborne, Hawkes Bay, Wairarapa, Manawatu, Wellington, Nelson, Marlborough, Kaikoura coast, Canterbury, Otago, and central Southland have significant soil moisture deficits.

Section 15: Snow and ice

Heavy snow affected Canterbury and the upper South Island on 6 June. During the snowfall, afternoon (maximum) temperatures in Canterbury, Blenheim, around Arthurs Pass, and on the West Coast set new low records for the month, and in some cases, broke all-time (any month) records, too. Maximum temperatures on 6 June in Canterbury struggled to reach even 1 degree, with heavy snow falling throughout the daylight hours. Snow fell on the Canterbury Plains, including in Christchurch, Oxford, Rangiora and Ashburton, and further south in Oamaru, Dunedin and Twizel.

Many local roads were closed. Power was cut to thousands of homes, mainly because snow-laden trees fell on to power lines. In Hanmer Springs the power cuts closed many businesses, including the hot pools. Pupils were sent home early from schools in Kaikoura and St Arnaud. Flights in and out of Christchurch airport were delayed by the storm, but it was closed for only a short time when power was lost. Buses in Christchurch did not go into the hill suburbs. Christchurch Polytechnic Institute of Technology and the Southern Institute of Technology (Christchurch campus) closed, the University of Canterbury closed at midday, and schools all over central Canterbury closed for the day. New Zealand Post suspended deliveries in Greymouth and central Canterbury, with delays in Westport,

Gore and Balclutha. Flights at Dunedin Airport were disrupted by significant black ice on the runway with 10 flights affected. Early morning bus services to Dunedin's hill suburbs were also affected by ice. In Marlborough, snow blocked road access to Wairau Valley, and brought down trees.

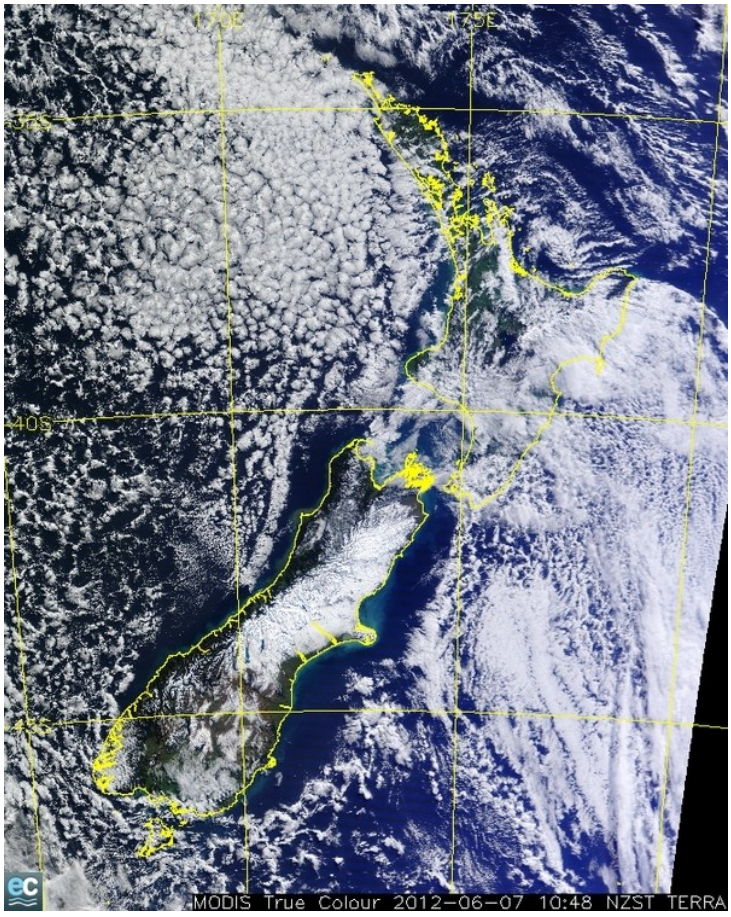

Figure 6: Extent of snowfall after 6 June 2012 event in Canterbury. Source: Nasa (2012)

On 7 June, the following roads were still closed by snow and ice, or chains were required: SH65 from O'Sullivan's to Shenandoah, SH63 from St Arnaud to Wairau Valley, SH7 from Reefton via Springs Junction to the Hanmer Springs turn-off, SH75 from Springfield via Arthur's Pass to Otira, SH1 from Pukerau to Arthurton and from Greta to Waipara, SH6 from Athol to Five Rivers, and SH73 from Te Anau to Milford. Two trampers were rescued by helicopter after two days in a hut in the Lewis Pass.

On 8 June, the Lewis Pass, Porter's Pass and Arthur's Pass roads remained closed by snow. Chains were required on SH94 from Te Anau to Milford Sound. Some properties in north Canterbury were still without electricity after two days. In Christchurch, morning bus services did not operate in the hill suburbs, and most city schools did not open until mid-morning. Several rural schools remained closed, and Amberly Golf Club was closed.

On 15 June snow fell in the Port Hills suburbs of Christchurch, closing Summit Road and Dyers Pass Road. It fell on SH2 at the summit of the Rimutaka Hill Road, and closed Danseys Pass in north Otago.

On 19 June, black ice affected many roads in inland Otago and Southland. Poolburn and Omakau schools closed for the day because of the dangerous roads, and bus services to Maniototo, Alexandra and Clyde schools could not run until after 10 am.

On 25 June, snow closed SH94 between Te Anau and Milford Sound, and chains were required on SH8 at Lindis Pass, and SH73 at Arthurs Pass and Porters Pass. Danseys Pass remained closed.

On 26 June, snow closed SH94 between Te Anau and Milford Sound. Chains were required on SH7 at the Lewis Pass, SH8 at Lindis Pass and SH73 at Porters Pass. Ice warnings were issued for SH8 between Fairlie and Twizel, and SH80 from Pukaki to Mt Cook, with both roads closed to towing vehicles. Snow fell on SH6 at the Hope Saddle but the road was not closed. The Crown Range Road was closed overnight, and schools in the Wakatipu area opened later than normal as some school bus services did not run. Snow fell in Invercargill and Winton.

On 27 June, snow closed SH1 between Waiouru and Rangipo, SH94 from Te Anau to Milford Sound, SH93 from Clinton to Mataura, SH87 from Outram to Kyeburn, SH73 from Arthurs Pass to Otira, and SH7 at the Lewis Pass. Chains were required on SH7 at Reefton Saddle and from Reefton to Springs Junction, SH6 at the Hope Saddle and from Haast to Makaroa, SH73 at Porters Pass, and SH80 from Bush Stream Bridge to Mt Cook. Snow and ice warnings were in place for SH60 from Motueka to Upper Takaka, SH6 from Franz Josef to Fox Glacier, SH1 from Waikouaiti to Dunedin, SH99 from Riverton to Tuatapere, SH96 from Winton to Ohai, and SH8 at the Lindis Pass. In Southland, sports grounds and schools were closed, and some flights into and out of Invercargill Airport were cancelled. Snow fell down to sea level on the West Coast, and settled further inland, with 15 cm reported at Reefton. In Taranaki, the road to North Egmont was closed and flights at New Plymouth Airport were delayed.

On 28 June, SH94 from Te Anau to Milford Sound remained closed for the morning. The Napier to Taihape Road was closed overnight.

From 9 to 12 September, snow caused road closures in Southland, Canterbury, and Otago. SH 94 from Te Anau to Milford Sound was closed for a number of days, and SH 1 at the Desert Road and SH 2 at the Rimutaka Ranges were closed for a time also. Chains were required on other major roads in the South Island, including SH 73 at Arthurs Pass, SH 7 at Lewis Pass, the Crown Range Road between Arrowtown and Wanaka, as well as roads around Queenstown and Central Otago. Schools were closed or starting times were delayed, and Queenstown airport was closed with about 30 flights diverted.

Section 16: Severe or damaging hail, electrical storms, and tornadoes

On 17 February, a tornado blew roofs off houses in the Taupo suburb of Paetiki.

On 15 February, a swarm of twisting waterspouts was reported over the Waitemata Harbour, Auckland, including one large waterspout that moved along the harbour edge past the central business district.

On 29 April, a mini-tornado struck Hokitika, knocking out power and causing property damage. A tree was blown onto a transformer, setting the line and nearby trees on fire.

On 30 April, lightning stuck the metal roof of the gymnasium at Southland Girls' High School in Invercargill, setting off the fire alarm, causing the evacuation of the school. Lightning also affected traffic lights in the city.

On 14 May, a twister moved through Papamoa Beach, lifting roof tiles and causing other property damage, including a piece of "2x4" timber being blown through a window. In Taranaki, water spouts were reported off the coast at Oakura.

On 16 May, an Air New Zealand flight from Auckland to Wellington returned to Auckland after flying into a lightning storm. The plane was not damaged.

On 29 May, a hailstorm lashed Wellington, settling on the roads causing hazardous driving conditions.

A thunderstorm passed over Wellington in the early hours of 6 June. In Owhiro Bay, lightning struck a power pole knocking out electricity and internet junctions, and closing the local primary school for the day. Lightning and hail were also reported in Marlborough, with the lightning causing intermittent problems with power transmission.

On 19 June a dramatic thunder and lightning storm hit Nelson, setting off property alarms.

On 12 August, a tornado ripped out trees and deposited them on SH10 near Taipa, northeast of Kaitaia, closing the road. Property and crops were damaged, and a dinghy's flight was stopped only when its anchor was caught in a tree. A power pole and lines near Lake Ohia were brought down, cutting off power to about 1200 properties.

On 4 September, Christchurch had thunder, lightning, and a severe hailstorm in the early evening. Conservatories and cars were damaged, power was lost to some suburbs, and one flight was delayed.

On 8 September, a lightning storm in Manawatu caused a brief power outage in Wellington City. It occurred at half time in the rugby match between New Zealand and Argentina, causing a 30 minute delay as the lights had to cool down before being restarted. Hail storms also passed through Manawatu.

On 9 September, Hamilton and the surrounding region experienced thunder, lightning, and torrential downpours of hail, damaging cars.

On 22 October, a tornado whipped through Hector and Ngakawau, destroying property, bringing down trees, and cutting power to the area.

On 2 December, a rare form of lightning storm crossed Wellington and Wairarapa, with cloud-to-cloud lightning bolts. The NIWA electronic weather station at Baring Head was destroyed by the lightning.

Around midday on 6 December, an active trough line containing thunderstorms passed across Auckland, and then move southeastwards across the Bay of Plenty during the afternoon, and onwards to Mahia Peninsula. It then moved out to sea by evening. In Auckland, one of the thunderstorm cells contained a tornado which touched down near Hobsonville, with three people tragically killed by falling slabs of concrete, blown on top of them at a Hobsonville school construction site. Several people were also injured and required hospital treatment. The tornado damaged about 150 houses in the area, and forced around 250 residents to evacuate to the nearby Whenuapai air force base. The Fire Service attended to about six calls from Hobsonville residents requiring assistance, as heavy rain leaked through damaged roofs. Power was cut off to about 1300 customers. The damage to the area around Waimarie and Totara Roads was extensive, with eight power poles and three transformers needing to be replaced. Auckland Transport suspended several bus services because of the extreme weather.

The same trough was reported to have spawned another tornado in Ngongotaha (Lake Rotorua) during the afternoon, which brought down trees and power lines, damaged property, sent calves flying, injured horses and trapped children at a remote riding school. At the same time, eight young cows were killed by lightning on a Reporoa farm.

On 6 and 7 December, hail storms in the Nelson area caused significant damage to fruit crops.

On 13 December, a severe lightning storm struck Nelson, knocking out power in many areas. Strong winds associated with the lighting storm also damaged property, particularly in the Stoke area, with many trees uprooted, including historic trees in Isel Park. A tulip tree, possibly the biggest in the southern hemisphere, split and fell, squashing a 150-year-old fig tree, and a giant oak was uprooted. At Nayland Primary School, branches were torn off trees, and the telegraph poles holding up the shade sails over the playground were ripped off at ground level.

On 14 December, a tornado was reported in Cromwell, damaging property and uprooting at least one large tree.

Section 17: High winds

On 8 January, gale force winds struck Taranaki, demolishing garden sheds, downing trees and power lines, and causing the cancellation of eight flights at New Plymouth Airport, and the closure of Todd Energy Aquatic Centre. Residents of Egmont Village, Rahotu, Whangamomona, and Strathmore lost power, some overnight. Trees were brought down, and power was also lost around Palmerston North. Three poplar trees fell across SH57 just north of Tokomaru, and in Palmerston North, Centennial Drive was blocked when a pine tree fell across both lanes. The Saddle Road, between Ashhurst and Woodville, the alternative route to the closed Manawatu Gorge, was blocked by fallen trees.

On 13 January in Wellington, flights were delayed by the strong winds, and further south, winds felled trees and damaged roofs in Buller, with power cuts to about 1000 consumers, mainly north of Westport. Flights were cancelled between Westport and Wellington. Trees were also blown down north of Auckland and in Lower Hutt, and power lines brought down in Wairoa.

On 28 January, gales battered Southland, causing property damage, and downing trees and power lines.

On 23 February, gale force winds toppled trees in the Nelson region, closing roads for short periods. Two large yachts ended up on the beach at Anchorage in the Abel Tasman National Park after dragging their anchors, making it necessary to cut tangled anchor lines. In Motueka, power was cut to the central area.

A low rapidly deepened over the Tasman Sea on 3 March, migrating eastwards across the lower North Island on the 4th. The winds associated with this low tore down trees and cut power to homes and farms in Taranaki, Wanganui, the Coromandel Peninsula, Te Puke, Wairoa, Kawhia, Kapiti Coast, northern Wellington, Hutt Valley, Wairarapa, Auckland, Piha, Waiheke Island and Kaipara. Cook Strait ferries were cancelled on 4 March, and flights cancelled or delayed at Wellington, Napier and New Plymouth Airports. At the Egmont A & P showgrounds, the storm blew down the doors to a pen housing 500 horses and ponies assembled for the three-day Show Jumping New Zealand's series final show. All the animals were moved to a safer area in the early hours. All the fences in the jumping arena had to be retrieved and reset, and the Saturday programme was cancelled, with the first Trans-Tasman test between New Zealand and Australia postponed a day.

Nearly two weeks later (16 March), about 40 rural properties were still without power in the Patea, Waverly and Waitotara areas, as well as some farms in the Whanganui hill country. Lines company Powerco said the damage has been so great during the storm of 3-4 March that it had had to completely rebuild line networks in some places. Meanwhile, foresters had begun the task of clearing hundreds of hectares of trees flattened or damaged in the 3-4 March storm over the southern North Island.

On 19 March, a total of 24 return flights had to be cancelled due to Auckland Airport's gusty cross winds and wet runway, caused by a deep low east of the Bay of Islands. And the Volvo Ocean Race yacht ‘Abu Dhabi’ spent the night sheltering in the Hauraki Gulf, waiting for 60-knot winds to ease before resuming the round-the-world race, after being forced to turn back with a damaged bulk head the previous evening. Firefighters in Gisborne had a busy night overnight on the 19th, with gusts lifting roofs at some properties.

On 20 March, the strong southeasterly winds associated with the same slow moving low brought trees down between Taupo and National Park, blocking roads including State Highways 4, 46, 47 and 49. The Fire Service also dealt with wind damage problems in Ohakune and Turangi. Around 2500 properties lost power, mainly in Taranaki, as trees and branches came down onto lines due to the high winds. Air New Zealand flights were cancelled or delayed in many parts of the North Island due to strong winds, with about 10 flights in and out of Wellington Airport cancelled. Winds in the Capital caused the mooring of a yacht to snap at Evans Bay and forced it on to nearby rocks. Wellington's East by West ferry cancelled all sailings and high winds forced the rescheduling of Interislander sailings.

On the morning of 21 March, strong winds cut power in parts of Feilding for a short time. Around 1000 homes remained without power in the Taranaki region, even after crews worked overnight to repair the network. Around 500 Taupo residences also remained without power.

On 27 May, strong winds in Kaikoura caused damage to property and trees, and even tossed two shipping containers on to a fishing boat.

On 6 June in Golden Bay and the Nelson region, wind brought down power lines, cutting power across Tasman region, and closing some roads. Some parks and reserves were also closed because of the danger of falling trees. At Runanga on the West Coast, wind lifted the roof from a house, and trees were blown on to power lines at Barrytown. In Richmond, high winds lifted roofing iron from a line of stables at the Richmond Park race track, blew out windows in the stand, and knocked over the winning post.

On 6 September, strong winds brought down power lines in Balclutha, and uprooted trees at Whataroa on the West Coast. The Lux-Mini Light Festival on the Wellington waterfront was closed early because of the strong winds.

On 7 September, strong winds battered Wellington, bringing down power lines and trees, cutting power to some northern suburbs.

On 8 September, strong winds closed SH 2 over the Rimutaka Ranges. Flights at Wellington Airport were cancelled, delayed, or diverted. Power poles, telephone lines, and trees were brought down, trampolines were sent flying, roofs were lifted, and in the central city, the wind forced a window at the Amora Hotel to crash onto Wakefield Street, and a large sign on Dixon Street was uplifted, smashing into a car, breaking its windscreen. Gusts caused power lines to clash, resulting in about 6000 homes in Upper Hutt, and another 700 in Wainuiomata, losing power for several hours. In Taranaki, high winds brought down trees and cut power to 1600 homes. A Stratford supermarket had to close for more than an hour when glass panels on the entrance roof were lifted by the wind. Trees were also brought down in Manawatu, while in Wairarapa, power lines were downed and roofs lifted.

On 10 September in Invercargill, trampolines were sent flying and trees toppled, and power cuts were reported in Winton, Otatara, and Invercargill. In central Tauranga, a large waka sail on a stainless steel pole blew over in strong winds, blocking the railway line.

On 17 September, strong winds in Christchurch uprooted a large tree growing on the Avon River bank. In Queenstown, the wind disrupted flights, with some planes diverted to Dunedin, or returned to Christchurch.

On 4 October, strong winds damaged the main lift at Mt Dobson ski area, closing the field early for the season.

On 13 October, unusually strong winds affected Northland, Auckland and the Waikato. Strong winds in Whangarei brought down a tree, trapping two young brothers underneath. Fortunately they were not injured. Trees were also brought down in Auckland, blocking roads and, in one case, crashing

into a house. Further south, the wind brought afternoon power cuts to the Thames area. On the Mahia Peninsula, extreme winds were identified as a major factor in re-igniting and spreading two vegetation fires. Near Tolaga Bay, power lines brought down by the wind started a grass fire and blew the transformer for the East Coast. In Canterbury, trampolines and greenhouses were damaged, and about 700 passengers on the Sea Princess could not rejoin their ship in Akaroa Harbour, but were forced to stay on land overnight. Wind warnings were issued for SH6 from Harihari to Franz Josef, particularly for high-sided vehicles, with several trucks pulling off the road in the hazardous conditions, and a campervan blown off the road.

On 14 October, continuing high winds brought down trees in Auckland, disrupting power to many areas. At Auckland Airport a catering truck was blown over into the side of an aircraft. Winds also caused power outages in Bells Junction, Hihitahi, Kakatahi, Karioi, Rangiwai, the upper Whanganui Valley and Waiouru, with some rural customers having no power overnight. In the Rotorua district, several large trees were toppled by the wind.

On 17 October, four large trees were blown over, damaging one vehicle, and blocking both northbound lanes of SH1 north of Wellington. In the Wairarapa, fire fighters were forced to abandon a re-ignited blaze in a pine forest near Carterton because of the dangerous conditions caused by the wind. On SH2, a car was blown into the bank near the top of the Rimutaka Hill. The ambulance attending the scene was damaged when a gust of wind folded back its door. In Queenstown, windblown embers from a rubbish fire caused a vegetation blaze near Arthur's Point.

On 18 October, wind brought down a tree on SH29 over the Kaimai Ranges, closing the road for a short time. South of Tolaga Bay, high winds reignited blazes started by fallen power lines on the 13th, damaging trees on several hectares of land at Okitu. On SH5, the Napier-Taupo Road, a campervan was blown off the road near Tapawera. Further south, a northbound truck carrying four empty water tanks was blown over on SH1 near Kaikoura. Two cyclists who had been leaving Kaikoura about the same time turned back to town, fearing for their safety.

On 22 October, in Hawkes Bay, two kayakers were blown out to sea, but made it back to shore under their own steam. In a Hastings car park, a shopping trolley with a two-year old child in the seat, was blown over, causing minor injuries to the child.

On 2 December, strong winds caused property damage in Featherston.

On 5 December, strong winds in the Wellington region damaged property and brought down trees and power lines.

Section 18: Fog

On 21 March, evening fog and low cloud in the Capital forced the cancellation of about 30 flights from Wellington Airport, upsetting the travel plans of about 2500 people.

On 10 May, fog caused the cancellation or delay of about 30 domestic flights into and out of Auckland Airport.

On 24 May, fog caused the cancellation or delay of domestic and international flights into and out of both Auckland and Hamilton Airports.

On 26 May, fog again caused the cancellation or delay of about 40 domestic flights into and out of Auckland Airport. Two international flights were diverted to Christchurch.

On 19 June, thick fog over Christchurch caused delays for aircraft into and out of Christchurch Airport.

On 5 July, thick fog forced the cancellation of outgoing and incoming flights at Auckland Airport. Many other flights were delayed. Warnings were issued for SH1 in the Auckland region. On 6 July, fog again caused the cancellation or delay of flights at Auckland Airport. Fog also caused the cancellation of flights at Hamilton Airport and Christchurch Airport.

On 19 July, heavy fog blanketed parts of Auckland, causing the delay or cancellation of several domestic flights into and out of the airport.

On 24 July, heavy fog again caused the cancellation or delay of many domestic flights into and out of Auckland Airport. Flights were also cancelled at Whangarei, Kaikohe and Kerikeri airports.

From 16 to 19 August, fog caused cancellations and delays to flights into and out of Dunedin Airport every day, and on the 19th the fog prevented a container ship entering Dunedin Harbour.

On 17 September, fog caused delays at Christchurch Airport.

On 2 December, low cloud and fog caused cancellations and delays of flights into and out of Wellington Airport.

On 18 December, fog caused the cancellation of several flights into and out of Wellington Airport. Low cloud also affected Nelson Airport, and sea fog closed New Plymouth Airport.

On 23 December, thick fog and low cloud caused delays and cancellations to more than 100 flights in and out of Wellington Airport during the afternoon and evening. Flights were resumed at 9am on the 24th.

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