Annual Climate Summary NIWA National Climate Centre NIWA Taihoro Nukurangi

#### National Climate Summary: 2013

Issued: 13 January 2013

# The year 2013: 3rd-warmest year on record for New Zealand

Temperatures	Temperatures were above average or near average across the entire country. Temperature anomalies were especially high about parts of Hawke's Bay, Manawatu, Wairarapa, Banks Peninsula and western Southland. The year 2013 was the 3 <sup>rd</sup> -warmest on record for New Zealand, based on NIWA's seven-station series which begins in 1909.
Rainfall	Below normal rainfall for parts of Northland, Waikato, Bay of Plenty, Taranaki and isolated areas of the West Coast. Above normal rainfall for parts of the eastern South Island including Marlborough, North Canterbury and North Otago.
Sunshine	Sunnier than normal for areas of Northland, Bay of Plenty, Taranaki, southeastern North Island, North Canterbury, the Canterbury High Country and the West Coast. Near normal sunshine elsewhere.
Soil moisture	The 2013 drought was one of the most extreme on record, affecting almost all the North Island as well as parts of the South Island's West Coast. The drought had broken in most locations by the end of April. At the end of the year soils were drier than normal across western and central parts of the North Island, especially about western and central Waikato, the Central Plateau, as well as across and west of the Tararua Range. Soils were wetter than normal throughout the Coromandel Peninsula, the Bay of Plenty, and many eastern parts of the South Island.

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### Overview

2013 was a very warm year for New Zealand, with annual mean temperatures above average or near average across the entire country. The nation-wide average temperature for 2013 was 13.4°C (0.8°C above the 1971–2000 annual average), using NIWA's seven-station temperature series which begins in 1909<sup>1</sup>. According to this seven-station series, 2013 was the third-warmest year on record.

Annual mean sea level pressures for 2013 were lower than usual to the west and south of New Zealand, whereas higher than normal pressures persisted to the east of the Chatham Islands, resulting in a northerly flow anomaly over the country. For the Tasman-New Zealand region as a whole, 2013 had the strongest northerly anomaly since 1971<sup>2</sup>, based on pressure differences between Hobart and the Chatham Islands. Slow-moving anticyclones dominated from the last 10 days of January through to the first half of April, coinciding with widespread drought conditions in the North Island. The remainder of the year was rather changeable, with May and June experiencing more south-easterly airflows than usual, and July and October being months with stronger north-westerly airflow. Sea-surface temperatures around New Zealand were higher than normal throughout the year, which combined with the northerly flow anomaly will have contributed to the warm mean air temperatures observed throughout the country in 2013. ENSO-neutral conditions prevailed for most of the year.

Above average annual mean temperatures (0.5-1.2°C above annual average) were recorded in parts of every region of the country. Temperature anomalies were especially high about parts of southern Northland, Hawke's Bay, Manawatu, Wairarapa, Banks Peninsula and western Southland, where annual mean temperatures were at least 1.0°C above annual average respectively. Seventeen locations recorded their warmest year on record, from as far north as Tauranga and as far south as Gore. Near average annual mean temperatures (within 0.5°C of annual average) were recorded in isolated areas including parts of the Far North, Coromandel, Western Waikato, Gisborne, Central Plateau, eastern Wairarapa, inland parts of the upper South Island, coastal mid-Canterbury and South Otago.

Annual rainfall totals for 2013 were below normal (less than 80 percent of annual normal) for parts of Northland, Waikato, Bay of Plenty, Taranaki and isolated areas of the West Coast. It was the driest year on record for Dargaville, Toenepi (near Morrinsville), Taupo and Turangi, with these locations each recording between just 67 percent and 72 percent of normal annual rainfall. In contrast, above normal rainfall was recorded in parts of the eastern South Island including Marlborough, North Canterbury and North Otago. Ranfurly, Alexandra and Lumsden each observed near-record high annual rainfall totals. Annual rainfall totals were typically near normal (within 20 percent of annual normal) for the remainder of the country.

2013 was a sunny year for many areas, including southern Northland, Bay of Plenty, northern Taranaki, southeastern North Island, North Canterbury, the Canterbury High Country and the West Coast, where annual sunshine hours were at least above normal (more than 110 percent of normal). It was the sunniest year on record for Turangi and Cheviot. Near normal sunshine was typically observed elsewhere.

The year 2013 will be remembered for widespread drought conditions throughout many parts of the North Island early in the year. Further details about this and other significant weather events occurring in 2013 can be found in Section 10; *Significant Extremes*.

<sup>&</sup>lt;sup>1</sup> Interim annual value

<sup>&</sup>lt;sup>2</sup> Note that the strong northerly year of 1971 was the warmest year in the New Zealand 7-station temperature series at that time, and as at the start of 2014, 1971 is New Zealand's 4th-equal warmest year since 1909.

## Section 1: The year in review

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

- January: Extremely dry for much of the North Island; wet for the South Island. Second half of the month very sunny and dry.
- February: Widespread dryness and soil moisture deficits across most of the country, and extremely sunny.
- March: A very warm March for New Zealand, with widespread dryness for North Island and parts of South Island.
- April: Extremely wet for northern South Island but dry for Otago; a very warm April for North Island.
- May: Wettest May on record for Auckland and cold blast for NZ in late May.
- June: Wettest June on record throughout Central Otago and significant snow event for the South Island in late June.
- July: 4th-warmest July on record for New Zealand. Very warm in the South, dry in the North.
- August: Warmest August on record for New Zealand. Dry in many parts; wet in the east and north of the North Island.
- September: Very wet in parts of many regions, but dry in south Canterbury and Central Otago. A warm month for the North Island.
- October: Very dry in the north and east of the North Island. A warm month for eastern parts of the North and South Islands.
- November: Warmer than average November for much of New Zealand.
- December: A warm and dry month about central parts of New Zealand.

#### January 2013: Extremely dry and sunny for much of North Island; wet for South Island.

January rainfall totalled less than 10 percent of normal across the northern half of the North Island. Rainfall totals were less than half of January normal across much of the rest of the North Island, excluding Wanganui to the Kapiti Coast (where rainfall was below normal) and Wellington (with totals about 120 percent of normal). More than double the usual January rainfall occurred around Mt Cook, the Kaikoura Coast, and in parts of north Canterbury. At the end of January, extreme soil moisture deficits (more than 130mm of deficit) were evident throughout much of the North Island, as well as Christchurch and Central Otago.

#### February 2013: Widespread dryness and soil moisture deficits throughout the country, and very sunny.

February rainfall totalled less than 15 percent of February normal in parts of Northland, Auckland, and the Bay of Plenty. Rainfall was less than 25 percent of February normal around Taupo, in parts of Gisborne and the Hawkes Bay, and along the West Coast of the South Island. Less than 50 percent of normal February rainfall was generally observed across the remainder of the country. Extreme soil moisture deficits were observed across most of the North Island except for Wellington, and in Marlborough, Canterbury, and Central Otago.

# March 2013: A very warm March for New Zealand; widespread dryness for North Island and parts of South Island.

March rainfall was around 20 percent of normal in parts of Northland, Bay of Plenty, and Hawkes Bay. Rainfall was less than 60 percent of March normal for much of the remainder of the North Island north of Stratford, the West Coast of the South Island, parts of Canterbury, Otago, and Southland. In contrast, Kaikoura recorded 200 percent of normal rainfall for March. At the end of March, extreme soil moisture deficits were evident in parts of: Northland, Auckland, Waikato, Bay of Plenty, Gisborne, and Hawkes Bay, Marlborough and Canterbury. Mean temperatures for March were well above average across northern and central areas of the North Island, and southern and western parts of the South Island.

#### April 2013: Extremely wet for northern South Island but dry for Otago; a very warm April for North Island.

More than double the normal April rainfall total was recorded in the north of the South Island. Rainfall was also well above normal in parts of Waikato, Bay of Plenty, and Manawatu. In contrast, some Central Otago locations recorded well below normal rainfall (less than 50 percent of normal April rainfall). Mean temperatures for April were well above average across most of the North Island. Mean temperatures were above average for most of the South Island except for parts of inland Canterbury and Otago (near average temperatures for April there).

#### May 2013: Wettest May on record for Auckland and cold blast for NZ in late May.

Almost two-and-a-half times the normal May rainfall was recorded in Auckland – it was the wettest May on record for Auckland and Pukekohe. Nearly double the normal rainfall for May was experienced in parts of Waikato. Low temperatures were experienced throughout the country on May 28, with many locations recording their lowest May afternoon temperatures on record.

# June 2013: Wettest June on record throughout Central Otago and significant snow event for the South Island in late June.

Of particular note was the storm of 19-21 June, which brought the strongest sustained 10-minute winds that Wellington airport has seen since 1985. In addition, cold south-southeasterly winds associated with the storm resulted in a significant snowfall event across the South Island. Locations throughout Central Otago recorded their wettest June since records began, as did Timaru and Lincoln. Areas of Otago and Canterbury received more than 400 percent of June normal rainfall. More than 200 percent of June normal rainfall was recorded in parts of Otago, Canterbury, and Marlborough. Mean temperatures for June were above average across areas of southern and western Southland, Fiordland, Westland, Manawatu, Hawke's Bay, Gisborne and Bay of Plenty.

#### July 2013: 4th-warmest July on record for New Zealand. Very warm in the south, and dry in the north.

Mean temperatures were well above average (more than 1.2°C above the July average) across most of the South Island, with many locations in Canterbury and Otago recording their highest July mean temperatures

on record. July was a very dry month for the upper half of the North Island (except for the Far North), as well as parts of coastal Manawatu, Nelson-Tasman, south Canterbury, and coastal Otago north of Dunedin. In these areas, well below normal rainfall for July occurred (less than 50 percent of July normal rainfall). Numerous locations had near-record-breaking low rainfall for July.

# August 2013: Warmest August on record for New Zealand. Dry in many parts; wet in the east and north of the North Island.

Mean temperatures for August were well above average (more than 1.2°C above the August average) across almost the entire South Island, and most parts of the North Island. Mean temperatures of at least 2.0°C above the August average were recorded in inland parts of Southland, Otago, and Canterbury, as well as Christchurch, Banks Peninsula, West Coast, Manawatu, Taranaki, Bay of Plenty, and Waikato. Well below normal rainfall (less than 50 percent of August normal) was recorded in southwestern and eastern Southland, as well as parts of south and central Otago and the Mackenzie Country. Gisborne and Hawke's Bay recorded well above normal rainfall (over 150 percent of normal August rainfall).

# September 2013: Very wet in parts of many regions, but dry in south Canterbury and Central Otago. A warm month for the North Island.

A severe windstorm occurred in Canterbury early in the month, which broke numerous September gust records. More than 150 percent of September normal rainfall observed in parts of all North Island regions except for Hawke's Bay, as well as Marlborough, inland Canterbury, and Fiordland. In contrast, only 50 to 80 percent of normal September rainfall was observed in south Canterbury and Central Otago. Temperatures of more than 1.2°C above the September average were experienced in Hawke's Bay and inland Gisborne.

# October 2013: Very dry in the north and east of the North Island. A warm month for eastern parts of the North and South Islands.

Well below normal rainfall (less than 50 percent of October normal) was recorded throughout Northland, Auckland, and Gisborne, and in parts of Waikato, Bay of Plenty, and Hawke's Bay. Rainfall was below normal (50-79 percent of October normal) was observed in parts of Waikato, Bay of Plenty, Hawke's Bay, coastal mid-Canterbury, and Marlborough. Well above normal rainfall (more than 150 percent of October normal) occurred in Westland, parts of Southland, Central Otago, and northwest Tasman. Well above average temperatures (more than 1.2°C above October average) were recorded in parts of Hawke's Bay and north Canterbury.

#### November 2013: Warmer than average for much of the country.

Temperatures were above average or well above average throughout most of New Zealand. The exceptions were limited eastern parts of Otago, Canterbury, Marlborough, Gisborne, and northern parts of Northland, where near average temperatures were recorded. Rainfall was below normal or well below normal across much of the South Island, with record or near-record low rainfall totals observed in the southeast of the island. Well above normal rainfall was observed in southeastern parts of the North Island.

#### December 2013: A warm and dry month about central parts of New Zealand.

Temperatures were above average (0.5-1.2°C above December average) or well above average (more than 1.2°C above December average) throughout New Zealand, with the exception of parts of the Far North, Waikato, Bay of Plenty, eastern Canterbury and Otago, and Southland, where near average temperatures were recorded. Rainfall was below normal or well below normal for parts of Taranaki, the Central Plateau and the lower North Island, as well as northern Marlborough, the Mackenzie Country and parts of Central Otago. In contrast, well above normal rainfall was observed in northeastern parts of the North Island, including areas of Northland, the Coromandel Peninsula and Bay of Plenty, as well as around the Kaikoura coast and southwestern Southland.

Section 2: 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 2013, starting in the top left with January; bottom left is July

Section 3: 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 2013, starting in the top left with January; bottom left is July.

## Section 4: The numbers

NIWA analyses of month-by-month records show:

- Dargaville recorded the highest annual average temperature for 2013 (16.5°C), followed by Whangarei with 16.3°C and Whangaparaoa with 16.2°C.
- The highest air temperature of the year was 35.1°C recorded at Clyde on 5 January, and at Gisborne on both 9 and 10 January.
- The lowest air temperature of the year was -12.1°C recorded at Lake Tekapo on 28 June, followed by 9.4°C at Ranfurly on 22 June, and -8.4°C observed at Arthur's Pass on 11 July.
- The nation-wide average temperature for 2013 was 13.4°C (0.8°C above the 1971–2000 annual average), using NIWA's seven-station temperature series which begins in 1909. 2013 was the third-warmest year since 1909, based on this seven-station series.
- The highest confirmed wind gusts for 2013 were 202 km/hr recorded at Mt Kaukau (Wellington) on 20 June, then 170 km/h experienced at both South West Cape (Stewart Island) on 26 May and Brothers Island (Cook Straight) on 14 July.
- The top 3 daily rainfall totals from regularly reporting gauges in 2013 were 346 mm observed at Mt Cook Village on 9 January, 278 mm at North Egmont on 4 February, and 253 mm at Mt Cook Village on 10 September.
- The driest rainfall recording locations (based on data available at time of writing) were: Lauder with 453 mm of rainfall recorded for the year, followed by Alexandra with 455 mm, and then Cromwell with 492 mm.
- Of the regularly reporting gauges (based on data available at time of writing), the wettest locations in 2013 were Cropp River (West Coast) with 10870 mm, Doon River (Fiordland) with 8820 mm, and Tuke River (West Coast) with 8240 mm<sup>3</sup>.
- Whakatane was the sunniest location in 2013, recording 2792 sunshine hours, followed by Tauranga (2515 hours) and Gisborne (2483 hours).
- Of the six main centres, for 2013 as a whole, Auckland was the warmest, Tauranga was the sunniest, Christchurch was the driest, Wellington was the wettest, and Dunedin was the coldest and cloudiest.

Ranked annual mean temperatures, total rainfall and sunshine hours for the stations available at time of writing are displayed on the following three pages.

<sup>&</sup>lt;sup>3</sup> Tuke River rainfall only covers the period 1 January to 20 December 2013, and is additionally missing 31 days of data.

Location	Mean temp (°C)	MATAMATA, HINUERA EWS	14.0	CROMWELL EWS	11.7
DARGAVILLE 2 EWS <sup>4</sup>	16.5	LEVIN AWS	14.0	WANAKA AERO AWS	11.6
WHANGAREI AERO AWS <sup>5</sup>	16.3	AKAROA EWS	14.0	OAMARU AWS	11.6
WHANGAPARAOA AWS	16.2	NELSON AWS	13.9	TIMARU EWS	11.5
AUCKLAND AERO	16.1	BLENHEIM RESEARCH EWS	13.9	MILFORD SOUND	11.4
KAITAIA AERO EWS	16.0	TE KUITI EWS	13.8	TIMARU AERO AWS	11.3
MUSICK PT EWS, AUCKLAND	16.0	PARAPARAUMU AERO AWS	13.7	OAMARU AIRPORT AWS	11.2
AUCKLAND, MANGERE EWS	15.9	WELLINGTON, KELBURN AWS	13.7	TIWAI POINT EWS	11.2
TAURANGA AERO AWS	15.8	MARTINBOROUGH EWS	13.6	NUGGET POINT AWS	11.2
PORT TAHAROA AWS	15.8	WESTPORT AERO AWS	13.4	GORE AWS	11.0
KAITAIA EWS	15.7	LYTTELTON HARBOUR	13.4	DUNEDIN AERO AWS	10.9
HICKS BAY AWS	15.7	ROTORUA AERO AWS	13.3	INVERCARGILL AERO AWS	10.9
KAIKOHE AWS	15.5	HAWERA AWS	13.3	SOUTH WEST CAPE AWS	10.9
KERIKERI AERODROME AWS	15.4	TAKAKA EWS	13.3	HANMER FOREST EWS	10.5
AUCKLAND, WHENUAPAI AWS	15.2	BLENHEIM AERO AWS	13.3	MIDDLEMARCH EWS	10.5
PUKEKOHE EWS	15.2	MOTUEKA, RIWAKA EWS	13.2	QUEENSTOWN AERO AWS	10.5
NGAWI AWS	15.2	KAIKOURA AWS	13.2	LUMSDEN AWS	10.4
WHITIANGA AERO AWS	15.1	CAPE CAMPBELL AWS	13.1	LAUDER EWS	10.4
GISBORNE AWS	15.0	CHRISTCHURCH, KYLE ST EWS	13.0	MANAPOURI AERO AWS	10.3
PAEROA AWS	14.9	WALLACEVILLE EWS	12.9	RANFURLY EWS	9.7
WANGANUI, SPRIGGENS PARK	14.9	STRATFORD EWS	12.9	MT COOK EWS	9.4
FAREWELL SPIT AWS	14.9	REEFTON EWS	12.6	LAKE TEKAPO EWS	9.3
WHAKATANE AERO AWS	14.8	TAUPO AWS	12.5	ARTHURS PASS EWS	8.8
HAMILTON, RUAKURA 2 EWS	14.8	TAKAPAU PLAINS AWS	12.5	MT RUAPEHU, CHATEAU EWS	8.7
NAPIER AERO AWS	14.8	SECRETARY ISLAND AWS	12.5	CAMPBELL ISLAND AWS	7.3
MAHIA AWS	14.8	HOKITIKA AWS	12.4		
WARKWORTH EWS	14.7	LINCOLN, BROADFIELD EWS	12.4		
WELLINGTON AERO	14.4	TURANGI 2 EWS	12.3		
WANGANUI AWS	14.4	RANGIORA EWS	12.2		
CASTLEPOINT AWS	14.3	CHRISTCHURCH AERO	12.2		
HAMILTON AWS	14.2	FRANZ JOSEF EWS	12.0		
NEW PLYMOUTH AWS	14.2	HAAST AWS	11.9		
PALMERSTON NORTH AWS	14.2	DUNEDIN, MUSSELBURGH EWS	11.8		

<sup>4</sup> EWS = Electronic Weather Station (operated by NIWA)

<sup>5</sup> AWS = Automatic Weather Station (operated by MetService)

Location	Painfall (mm)		072
			975
	10870		950
	8820		909
ARTHURS PASS EWS	4751	MASTERION, TE ORE ORE CWS	907
MICOOKEWS	4542	PALMERSION NORTH AWS	847
HOKITIKA AERO	2657	GORE AWS	842
MT RUAPEHU, CHATEAU EWS	2279	ASHBURTON AERO AWS	842
WESTPORT AERO AWS	2024	DARGAVILLE 2 EWS	820
STRATFORD EWS	1877	WANGANUI,SPRIGGENS PARK	800
REEFTON EWS	1640	WANGANUI AWS	777
WHITIANGA AERO AWS	1630	DUNEDIN, MUSSELBURGH EWS	775
KAIKOHE AWS	1570	BLENHEIM AERO AWS	759
MOTUEKA, RIWAKA EWS	1552	LINCOLN, BROADFIELD EWS	751
WELLINGTON, KELBURN AWS	1409	CHRISTCHURCH AERO	683
TE KUITI EWS	1364	TAUPO AWS	645
WALLACEVILLE EWS	1350	OAMARU AIRPORT AWS	642
CAMPBELL ISLAND AWS	1215	RANFURLY EWS	624
WARKWORTH EWS	1214	NAPIER AERO AWS	605
AKAROA EWS	1189	TIMARU EWS	581
TIWAI POINT EWS	1168	WANAKA AERO AWS	571
MANAPOURI AERO AWS	1161	MIDDLEMARCH EWS	565
PUKEKOHE EWS	1158	CROMWELL EWS	492
HANMER FOREST EWS	1152	ALEXANDRA CWS	455
AUCKLAND, MANGERE EWS	1145	LAUDER EWS	453
HAMILTON AWS	1086		
KAITAIA EWS	1085		
TURANGI 2 EWS	1055		
TAURANGA AERO AWS	1052		
KAITAIA AERO EWS	1051		
NELSON AERO	1037		
WHANGAREI AERO AWS	1030		
PARAPARAUMU AERO AWS	1018		
CASTLEPOINT AWS	990		
HAMILTON, RUAKURA 2 EWS	980		

Location	Sunshine (hours)	INVERCARGILL AERO 2 EWS	1730
WHAKATANE	2792	MT COOK EWS	1562
TAURANGA AERO	2515		
GISBORNE AWS	2483		
LAKE TEKAPO EWS	2482		
NELSON AERO	2428		
BLENHEIM RESEARCH EWS	2428		
WAIPAWA EWS	2377		
CROMWELL EWS	2361		
KAITAIA EWS	2315		
CHEVIOT EWS	2314		
TAKAKA EWS	2261		
ASHBURTON AERO AWS	2248		
QUEENSTOWN AERO AWS	2235		
RANGIORA EWS	2234		
TURANGI 2 EWS	2224		
AUCKLAND, MANGERE EWS	2199		
AKAROA EWS	2197		
MARTINBOROUGH EWS	2148		
DARGAVILLE 2 EWS	2140		
PARAPARAUMU AERO	2135		
DANNEVIRKE EWS	2121		
HAMILTON, RUAKURA 2 EWS	2114		
WELLINGTON, KELBURN	2108		
GREYMOUTH AERO EWS	2076		
BALCLUTHA, TELFORD EWS	2062		
CHRISTCHURCH AERO	2024		
STRATFORD EWS	2004		
WALLACEVILLE EWS	1895		
PALMERSTON NORTH EWS	1876		
HOKITIKA AWS	1861		
DUNEDIN, MUSSELBURGH EWS	1817		
REEFTON EWS	1764		
MIDDLEMARCH EWS	1733		

# Section 5: Annual Rainfall – A relatively dry year for some central and northern parts of the North Island, above normal rainfall for some eastern parts of the South Island.

2013 was the driest year on record for four North Island locations, with Toenepi (near Morrinsville), Taupo, and Turangi receiving just two-thirds of their normal annual rainfall respectively. In contrast, near-record high annual rainfall was recorded at three inland locations in the southern South Island. Rainfall was near normal for the remainder of the country.

The driest rainfall recording locations (based on data available at time of writing) were: Lauder with 453 mm of rainfall recorded for the year, followed by Alexandra with 455 mm, and then Cromwell with 492 mm. Of the regularly reporting gauges (based on data available at time of writing), the wettest locations in 2013 were Cropp River (West Coast) with 10870 mm, Doon River (Fiordland) with 8820 mm, and Tuke River (West Coast) with 8240 mm<sup>6</sup>.

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
High records or near-reco	rds			
Ranfurly	624	142	1943	3rd-highest
Alexandra	455	109	1983	4th-highest
Lumsden	998	105	1982	2nd-highest
Low records or near-recor	ds			
Kaitaia	1092	80	1985	3rd-lowest
Dargaville	820	72	1943	Lowest
Toenepi	723	67	1951	Lowest
Taupo	645	67	1949	Lowest
Turangi	1055	67	1968	Lowest
Campbell Island	1215	88	1992	2nd-lowest

#### Table 1: Record or near-record annual rainfall totals for the year 2013<sup>7</sup>

The top three 1-day rainfall totals from regularly reporting gauges in 2013 were 346 mm observed at Mt Cook Village on 9 January, 278 mm at North Egmont on 4 February, and 253 mm at Mt Cook Village on 10 September. Ohakune and Lumsden both observed their highest 1-day rainfall total on record, whilst three other locations observed near record 1-day rainfall totals (Table 2).

<sup>&</sup>lt;sup>6</sup> Tuke River rainfall only covers the period 1 January to 20 December 2013, and is additionally missing 31 days of data.

<sup>&</sup>lt;sup>7</sup> The rankings (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>....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.

## Table 2: One day rainfall extremes for 2013

Location	1-day extreme rainfall (mm)	Date	Year records began	Comments
Ohakune	152	Aug-11th	1961	Highest
Nelson	122	Apr-21st	1941	4th-highest
Mt Cook	346	Jan-09th	1928	3rd-highest
Alexandra	49	Jun-02nd	1983	2nd-highest
Lumsden	68	Jan-09th	1982	Highest

# Section 6: Annual Temperature – Above average temperatures recorded in parts of every region of the country.

In terms of mean temperatures, it was the warmest year on record for 17 locations across New Zealand. Highest mean maximum temperature records were set at 16 locations, including Christchurch (Riccarton), where the annual mean maximum temperature of 18.2°C was the highest there since records began in 1863. Highest mean minimum temperature records were set at 18 locations. This may be partly attributed to the country experiencing its warmest winter on record. During this season, more than a third of the locations in New Zealand where long-term measurements have been made (53 out of 146) recorded winter mean minimum temperatures in the top four of their respective temperature records.

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments				
Mean temperature								
Kaikohe	15.5	0.8	1973	4th-highest				
Dargaville	16.5	1.3	1943	2nd-highest				
Whangarei	16.3	0.5	1967	4th-highest				
Whangaparaoa	16.2	0.5	1982	4th-highest				
Auckland (Whenuapai)	15.2	0.5	1945	2nd-highest				
Auckland (Airport)	16.1	0.6	1959	4th-highest				
Tauranga	15.8	0.9	1913	Highest				
Pukekohe	15.2	0.7	1969	4th-highest				
Hamilton (Ruakura)	14.8	1.0	1906	2nd-highest				
Port Taharoa	15.8	0.6	1973	2nd-highest				
Masterton (Airport)	13.4	1.0	1906	4th-highest				
Masterton (Te Ore Ore)	14.1	1.7	1992	Highest				
Dannevirke	13.7	1.2	1951	Highest				
Ngawi	15.2	0.7	1972	Highest				
Hicks Bay	15.7	0.8	1969	3rd-highest				
Gisborne	15.0	0.5	1905	4th-highest				
Hastings	14.7	1.6	1965	Highest				
Waipawa	13.5	0.7	1945	Highest				
Mahia	14.8	0.7	1990	2nd-highest				
Paraparaumu	13.8	0.7	1953	2nd-highest				
Palmerston North	14.2	1.0	1928	Highest				
Levin	14.0	0.9	1895	2nd-highest				
Wellington (Airport)	14.4	0.6	1962	3rd-highest				
Stratford	12.9	1.1	1960	Highest				
Hawera	13.3	0.7	1977	Highest				
Wanganui	14.9	0.9	1937	Highest				
Takaka	13.3	0.7	1978	4th-highest				
Farewell Spit	14.9	1.0	1971	Highest				
Westport	13.4	0.8	1937	3rd-highest				

#### Table 3: Near-record or record high or low annual average temperature departures for 2013

Reefton	12.6	1.2	1960	Highest
Milford Sound	11.4	1.1	1934	2nd-highest
Secretary Island	12.5	0.7	1985	Highest
Motueka	13.2	0.7	1956	2nd-highest
Nelson	13.9	0.9	1943	Highest
Blenheim	13.9	0.8	1941	2nd-highest
Kaikoura	13.2	0.8	1963	3rd-highest
Culverden	12.0	0.6	1928	4th-highest
Cheviot	12.2	0.7	1982	Highest
Waipara	13.1	0.6	1973	2nd-highest
Christchurch (Riccarton)	13.0	0.9	1863	2nd-highest
Lincoln	12.4	0.7	1881	3rd-highest
Wanaka	11.6	1.1	1955	Highest
Ranfurly	9.7	0.8	1975	3rd-highest
Dunedin (Musselburgh)	11.8	0.7	1947	3rd-highest
Manapouri	10.3	1.0	1963	2nd-highest
Lumsden	10.4	0.8	1982	2nd-highest
Cromwell	11.7	0.8	1949	3rd-highest
Lauder	10.4	0.8	1924	3rd-highest
Alexandra	11.7	0.8	1983	2nd-highest
Gore	11.0	1.2	1971	Highest
Invercargill	10.9	0.9	1905	3rd-highest
Tiwai Point	11.2	0.6	1970	2nd-highest
Nugget Point	11.2	1.0	1970	2nd-highest
South West Cape	10.9	0.7	1991	2nd-highest
South West Cape Campbell Island	10.9 7.3	0.7 0.2	1991 1991	2nd-highest 3rd-highest
South West Cape Campbell Island Mean maximum temperat	10.9 7.3 ture	0.7 0.2	1991 1991	2nd-highest 3rd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri	10.9 7.3 ure 20.7	0.7 0.2 0.6	1991 1991 1981	2nd-highest 3rd-highest Highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe	10.9 7.3 ture 20.7 19.4	0.7 0.2 0.6 1.1	1991 1991 1981 1981 1973	2nd-highest 3rd-highest Highest 3rd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville	10.9 7.3 ture 20.7 19.4 20.4	0.7 0.2 0.6 1.1 1.7	1991 1991 1981 1981 1973 1943	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei	10.9 7.3 cure 20.7 19.4 20.4 20.5	0.7 0.2 0.6 1.1 1.7 0.8	1991 1991 1981 1973 1943 1967	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa	10.9 7.3 ture 20.7 19.4 20.4 20.5 19.5	0.7 0.2 0.6 1.1 1.7 0.8 0.7	1991 1991 1981 1981 1973 1943 1967 1982	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai)	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7	1991 1991 1981 1973 1943 1967 1982 1945	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport)	10.9 7.3 ture 20.7 19.4 20.4 20.5 19.5 19.8 19.8	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8	1991 1991 1981 1973 1943 1967 1982 1945 1959	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 19.8 20.2	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1	1991 1991 1981 1973 1943 1967 1982 1982 1945 1959 1913	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest Highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane	10.9 7.3 Cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1	1991 1991 1981 1973 1943 1943 1967 1982 1945 1959 1913 1974	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest Highest 2nd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1 1.1 0.9	1991 1991 1981 1973 1943 1943 1967 1982 1945 1959 1913 1974 1964	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest Highest 2nd-highest 2nd-highest 2nd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Ruakura)	10.9 7.3 ure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2 21.5	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1 1.1 0.9 2.6	1991 1991 1981 1973 1943 1943 1967 1982 1945 1959 1913 1974 1964 1906	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 3rd-highest 3rd-highest Highest 2nd-highest Highest Highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Ruakura)	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2 21.5 19.9	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1 1.1 0.9 2.6 0.9	1991 1991 1991 1981 1973 1943 1967 1982 1945 1959 1913 1974 1964 1906 1946	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 3rd-highest 3rd-highest Highest 2nd-highest 2nd-highest Highest 2nd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Ruakura) Hamilton (Airport) Port Taharoa	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2 21.5 19.9 19.5	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1 1.1 0.9 2.6 0.9 0.9	1991 1991 1991 1981 1973 1943 1967 1982 1945 1959 1913 1974 1964 1906 1946 1973	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 3rd-highest 3rd-highest Highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Ruakura) Hamilton (Airport) Port Taharoa Te Kuiti	10.9 7.3 Cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2 20.2 18.2 21.5 19.9 19.5 19.5	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.8 1.1 1.1 1.1 0.9 2.6 0.9 0.9 0.9 0.7	1991 1991 1991 1981 1973 1943 1943 1945 1982 1945 1959 1913 1974 1964 1906 1946 1973 1959	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest Highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 3rd-highest 3rd-highest 3rd-highest 3rd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Ruakura) Hamilton (Airport) Port Taharoa Te Kuiti Turangi	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 20.2 20.2 20.2 18.2 21.5 19.9 19.5 19.5 19.5 19.5 19.5 18.3	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1 0.9 2.6 0.9 0.9 0.9 0.9 0.7 1.2	1991 1991 1981 1973 1943 1943 1967 1982 1945 1959 1913 1974 1964 1906 1946 1973 1959 1959 1959	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 3rd-highest 3rd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 3rd-highest 3rd-highest Highest 3rd-highest Highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Ruakura) Hamilton (Ruakura) Hamilton (Airport) Port Taharoa Te Kuiti Turangi Masterton (Airport)	10.9 7.3 ure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2 20.2 18.2 21.5 19.9 19.5 19.5 19.5 19.5 18.3 19.3	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.8 1.1 1.1 0.9 2.6 0.9 0.9 0.9 0.9 0.7 1.2 0.9	1991 1991 1991 1981 1973 1943 1967 1982 1945 1959 1913 1974 1964 1906 1946 1973 1959 1959 1968 1906	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 3rd-highest 3rd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 3rd-highest 4th-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Aurport) Hamilton (Ruakura) Hamilton (Airport) Port Taharoa Te Kuiti Turangi Masterton (Airport) Masterton (Te Ore Ore)	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2 21.5 19.9 19.5 19.5 19.5 19.5 19.5 19.5 1	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1 0.9 2.6 0.9 0.9 0.9 0.9 0.7 1.2 0.9 1.7	1991 1991 1991 1973 1973 1943 1967 1982 1945 1959 1913 1974 1964 1906 1946 1973 1959 1959 1968 1906 1992	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 4th-highest 3rd-highest 4th-highest Highest 4th-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Ruakura) Hamilton (Ruakura) Hamilton (Airport) Port Taharoa Te Kuiti Turangi Masterton (Airport) Masterton (Te Ore Ore) Takapau Plains	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 20.2 20.2 20.2 18.2 20.2 18.2 21.5 19.9 19.5 19.5 19.5 19.5 19.5 19.5 1	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.8 1.1 1.1 0.9 2.6 0.9 0.9 0.9 0.9 0.9 0.7 1.2 0.9 1.7 0.5	1991 1991 1991 1981 1973 1943 1967 1982 1945 1945 1959 1913 1974 1964 1906 1946 1973 1959 1968 1906 1992 1962	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest 4th-highest Highest 4th-highest 2nd-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Airport) Hamilton (Ruakura) Hamilton (Airport) Port Taharoa Te Kuiti Turangi Masterton (Airport) Masterton (Te Ore Ore) Takapau Plains Dannevirke	10.9 7.3 Cure 20.7 19.4 20.4 20.5 19.5 19.8 19.8 20.2 20.2 20.2 18.2 20.2 18.2 21.5 19.9 19.5 19.5 19.5 19.5 19.5 19.5 1	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.8 1.1 1.1 0.9 2.6 0.9 0.9 0.9 0.9 0.7 1.2 0.9 0.7 1.2 0.9 1.7 0.5 1.9	1991 1991 1991 1973 1973 1943 1967 1982 1945 1959 1913 1974 1964 1906 1946 1973 1959 1968 1959 1968 1906 1992 1962 1951	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 4th-highest 3rd-highest 4th-highest Highest 2nd-highest Highest 4th-highest Highest 2nd-highest Highest 4th-highest
South West Cape Campbell Island Mean maximum temperat Kerikeri Kaikohe Dargaville Whangarei Whangaparaoa Auckland (Whenuapai) Auckland (Whenuapai) Auckland (Airport) Tauranga Whakatane Rotorua Hamilton (Airport) Hamilton (Ruakura) Hamilton (Airport) Port Taharoa Te Kuiti Turangi Masterton (Airport) Masterton (Airport) Masterton (Te Ore Ore) Takapau Plains Dannevirke Ngawi	10.9 7.3 cure 20.7 19.4 20.4 20.5 19.5 19.8 20.2 20.2 20.2 18.2 21.5 19.9 19.5 19.5 19.5 19.5 19.5 19.5 1	0.7 0.2 0.6 1.1 1.7 0.8 0.7 0.7 0.7 0.8 1.1 1.1 0.9 2.6 0.9 0.9 0.9 0.9 0.9 0.9 0.7 1.2 0.9 1.7 0.5 1.9 0.7	1991 1991 1991 1981 1973 1943 1967 1982 1945 1959 1913 1974 1964 1906 1973 1959 1968 1973 1959 1968 1906 1992 1968 1992 1962 1992	2nd-highest 3rd-highest Highest 3rd-highest 4th-highest 2nd-highest 3rd-highest 2nd-highest 3rd-highest 2nd-highest 2nd-highest 2nd-highest 2nd-highest 3rd-highest 4th-highest 3rd-highest 2nd-highest 2nd-highest 4th-highest Highest 2nd-highest 4th-highest 4th-highest 2nd-highest 4th-highest 2nd-highest 4th-highest 2nd-highest

Napier	20.0	1.1	1870	4th-highest
Hastings	20.1	1.6	1965	2nd-highest
Waipawa	19.4	1.2	1945	Highest
Mahia	18.0	0.9	1990	2nd-highest
Paraparaumu	17.8	0.9	1953	2nd-highest
Palmerston North	19.1	1.4	1928	Highest
Levin	18.4	1.1	1895	3rd-highest
Stratford	17.1	1.0	1960	Highest
Hawera	17.3	0.9	1977	2nd-highest
Wanganui	19.3	1.5	1937	2nd-highest
Farewell Spit	18.1	0.5	1971	Highest
Westport	17.4	1.2	1937	Highest
Reefton	18.0	1.3	1960	Highest
Secretary Island	15.2	0.5	1985	3rd-highest
Motueka	19.6	1.5	1956	2nd-highest
Nelson	18.7	1.2	1943	Highest
Blenheim	19.2	0.8	1932	2nd-highest
Kaikoura	16.4	0.6	1963	4th-highest
Cheviot	18.0	0.6	1982	2nd-highest
Mt Cook	15.3	1.3	1929	2nd-highest
Waipara	18.5	0.4	1973	4th-highest
Christchurch (Riccarton)	18.2	1.2	1863	Highest
Wanaka	17.1	1.0	1955	3rd-highest
Ranfurly	16.1	1.0	1975	3rd-highest
Dunedin (Airport)	16.7	0.7	1962	4th-highest
Manapouri	15.6	1.0	1963	2nd-highest
Lumsden	15.7	0.8	1982	2nd-highest
Cromwell	18.1	1.1	1949	2nd-highest
Lauder	17.2	1.5	1924	2nd-highest
Gore	15.6	1.5	1971	3rd-highest
Tiwai Point	15.2	1.2	1970	Highest
Nugget Point	14.5	1.0	1970	2nd-highest
South West Cape	13.0	0.3	1991	4th-highest
Mean minimum temperat	ure			
Dargaville	12.7	1.1	1943	2nd-highest
Port Taharoa	12.1	0.5	1973	4th-highest
Masterton (Te Ore Ore)	8.2	1.8	1992	Highest
Castlepoint	11.5	0.6	1972	4th-highest
Ngawi	12.0	0.7	1972	Highest
Hastings	9.2	1.6	1965	2nd-highest
Paraparaumu	9.9	0.6	1953	4th-highest
Wellington (Airport)	11.6	0.8	1962	Highest
Stratford	8.7	1.2	1960	Highest
Hawera	9.3	0.5	1977	Highest
Wanganui	10.8	0.8	1937	3rd-highest
Farewell Spit	11.7	1.5	1971	Highest
Hokitika	8.5	0.8	1866	3rd-highest
Reefton	7.3	1.2	1960	Highest

Greymouth	9.5	1.0	1947	2nd-highest
Milford Sound	7.4	1.3	1934	2nd-highest
Secretary Island	9.7	0.9	1985	Highest
Nelson	9.1	0.6	1943	3rd-highest
Blenheim Research	8.7	1.0	1941	2nd-highest
Cape Campbell	11.2	0.5	1953	Highest
Kaikoura	9.9	0.7	1963	Highest
Culverden	6.5	1.4	1928	Highest
Cheviot	6.3	0.7	1982	Highest
Waipara	7.8	0.8	1973	3rd-highest
Lincoln	7.5	0.9	1881	2nd-highest
Orari Estate	6.1	0.9	1972	Highest
Oamaru	7.2	0.4	1908	2nd-highest
Lumsden	5.1	0.7	1982	3rd-highest
Alexandra	5.3	0.8	1983	2nd-highest
Gore	6.4	0.9	1971	Highest
Invercargill	6.5	1.0	1905	Highest
Nugget Point	7.8	0.9	1970	Highest
South West Cape	8.7	1.0	1991	Highest
Campbell Island	5.4	0.6	1991	Highest

Extreme high or low temperatures were not especially prevalent in 2013, with just two locations experiencing their highest maximum temperature on record, and no new extreme minimum air temperature records established. Occasional cold southerly outbreaks saw lowest or near lowest daily maximum air temperatures recorded in seven locations. Occurrences of such low temperature extremes in 2013 were unusual, as New Zealand observed its warmest winter on record.

Location	Temperature (°C)	Date of occurrence	Year records began	Comments
Highest extreme maximur	n temperatures			
Whakatane	32.5	Jan-07th	1975	3rd-highest
New Plymouth	30.6	Jan-06th	1944	Highest
Masterton	33.5	Feb-02nd	1992	Highest
Secretary Island	25.9	Dec-26th	1985	4th-highest
Tara Hills	33.4	Jan-05th	1949	4th-highest
Highest extreme minimun	n temperatures			
Kaikohe	19.5	Feb-04th	1973	4th-highest
Masterton	19.9	Jan-14th	1992	3rd-highest
Ngawi	20.9	Jan-13th	1972	4th-highest
Lumsden	19.4	Feb-10th	1982	2nd-highest
Campbell Island	11.4	Jan-31st	1991	Equal 4th-highest

#### Table 4: Near-record or record high or low annual temperature extremes for 2013

Lowest extreme minimum temperatures						
Whangaparaoa	4.0	May-29th	1982	2nd-lowest		
Hokitika	-4.0	Jul-12th	1866	3rd-lowest		
Lowest extreme maximun	n temperatures					
Kaikohe	9.3	Jun-20th	1973	Lowest		
Paeroa	9.1	Jun-23rd	1971	3rd-lowest		
Tauranga	8.3	Jul-16th	1941	2nd-lowest		
Masterton	6.4	May-28th	1992	4th-lowest		
Castlepoint	5.8	May-28th	1972	Lowest		
Haast	5.8	May-27th	1949	3rd-lowest		
Nelson	6.3	Jun-22nd	1943	3rd-lowest		
Paeroa Tauranga Masterton Castlepoint Haast Nelson	9.1 8.3 6.4 5.8 5.8 6.3	Jun-23rd Jul-16th May-28th May-28th May-27th Jun-22nd	1971 1941 1992 1972 1949 1943	3rd-lowest2nd-lowest4th-lowestLowest3rd-lowest3rd-lowest		

# Section 7: Annual Sunshine – A sunny year for areas of Northland, Bay of Plenty, Taranaki, southeastern North Island, North Canterbury, the Canterbury High Country and the West Coast.

Whakatane was the sunniest location in 2013, recording 2792 sunshine hours, followed by Tauranga (2515 hours) and Gisborne (2483 hours). Record or near-record high annual sunshine hours were recorded at nine locations across New Zealand, with Balclutha recording well above normal sunshine hours for the year (more than 125% of normal annual sunshine). Mt Cook Village received the fewest sunshine hours in the country (1562 hours), yet relatively nearby to the east, Lake Tekapo recorded 2482 hours. This may be partly attributed to cloudiness along the Southern Alps associated with the orographic effect.

Location	Sunshine (hours)	Percent of normal	Year records began	Comments
High records or near-record	rds			
Kaitaia	2315	107	1985	2nd-highest
Dargaville	2140	104	1943	3rd-highest
Turangi	2224	112	1976	Highest
Dannevirke	2121	112	1963	2nd-highest
Hokitika	2166	114	1912	2nd-highest
Greymouth	2076	120	1947	3rd-highest
Cheviot	2314	120	1983	Highest
Cromwell	2361	108	1979	4th-highest
Balclutha	2062	127	1964	4th-highest

#### Table 5: Near-record or record sunshine hours for the year 2013

Note on New Plymouth sunshine: The raw New Plymouth sunshine data in NIWA's climate database indicates New Plymouth as having the second highest sunshine hours in New Zealand (after Whakatane) during 2013. However, there are doubts about the accuracy of this value because:

- The New Plymouth sunshine measurements changed to an automated recording in November 2011, and appear unusually high since then;
- The 2013 New Plymouth value shows about one hour more bright sunshine per day, on average, than the previous sunniest year with the manual sunshine card;
- The 2013 New Plymouth sunshine was about 20% above its long-term normal, whereas nearby stations (Stratford, Taumarunui) were only about 5% higher in 2013 than their respective normals.

Further analysis of the New Plymouth sunshine data will be carried out to investigate these matters.

## Section 8: 2013 climate in the six main centres

Of the six main centres, for 2013 as a whole, Auckland was the warmest, Tauranga was the sunniest, Christchurch was the driest, Wellington was the wettest, and Dunedin was the coldest and cloudiest.

2013 was the warmest year on record for Tauranga (records began in 1913), and the third warmest year on record for Dunedin (records began in 1947).

Temperature						
Location	Mean temp. (°C)	Departure from normal (°C)	Comments			
Auckland <sup>a</sup>	15.9	0.5	Above average			
Tauranga <sup>b</sup>	15.8	0.9	Above average			
Hamilton <sup>c</sup>	14.2	0.6	Above average			
Wellington <sup>d</sup>	13.7	0.8	Above average			
Christchurch <sup>e</sup>	12.2	0.6	Above average			
Dunedin <sup>f</sup>	11.8	0.7	Above average			
Rainfall						
Location	Rainfall (mm)	% of normal	Comments			
Auckland <sup>a</sup>	1145	102%	Near normal			
Tauranga <sup>b</sup>	1052	88%	Near normal			
Hamilton <sup>c</sup>	1086	90%	Near normal			
Wellington <sup>d</sup>	1409	115%	Near normal			
Christchurch <sup>e</sup>	683	115%	Near normal			
Dunedin <sup>f</sup>	775	105%	Near normal			
Sunshine						
Location	Sunshine (hours)	% of normal	Comments			
Auckland <sup>a</sup>	2199	107%	Near normal			
Tauranga <sup>b</sup>	2515	114%	Above normal			
Hamilton <sup>g</sup>	2114	106%	Near normal			
Wellington <sup>d</sup>	2108 <sup>8</sup>	100%	Near normal			
Christchurch <sup>e</sup>	2024	95%	Near normal			
Dunedin <sup>f</sup>	1817	108%	Near normal			



<sup>a</sup> Mangere <sup>b</sup> Tauranga Airport <sup>c</sup> Hamilton Airport <sup>d</sup> Kelburn <sup>e</sup> Christchurch Airport <sup>f</sup> Musselburgh <sup>g</sup> Ruakura

<sup>&</sup>lt;sup>8</sup> Three days of July Kelburn sunshine data estimated due to earthquake evacuations.

## Section 9: Significant weather and climate events in 2013

This section contains information pertaining to some of the more significant weather and climate events that occurred in 2013. Note that a more detailed list of significant weather event for 2013 can be found in the *Highlights and extreme events* section of NIWA's Monthly Climate Summaries. These summaries are available online at <u>http://www.niwa.co.nz/climate/summaries</u>

#### Drought and low rainfall

A significant drought event affected the North Island and Westland between January and April 2013. This drought was one of the most extreme on record for New Zealand. The cause of this drought was the persistence of slow-moving or 'blocking' high pressure systems over the Tasman Sea and New Zealand over the summer season, which stopped low pressure systems and fronts from approaching the North Island. The El Nino-Southern Oscillation was in its neutral phase and was not a deemed a contributing factor to the drought event. An adverse event due to drought was declared by the Ministry for Primary Industries for the entire North Island on 15 March and for Buller and Grey districts on 22 March.



Figure 5: Soil moisture deficit across New Zealand as at 1 March 2013. Areas in every region of the North Island, as well as in every region of the South Island except for Southland and the West Coast, had extreme soil moisture deficits (more than 130 mm of deficit, red shade), and most other areas of the country have significant soil moisture deficits (more than 110 mm of deficit, dark orange shade).

#### Floods and high rainfall

Two especially notable flooding events occurred during 2013. The first occurred on 21 April in the Tasman region, and the second affected Whanganui on 15 and 16 October.

On 21 April, torrential rain caused flooding in the Nelson and Tasman regions, particularly in Richmond and Stoke. This rainstorm was one of the most intense ever measured in New Zealand, and it was the most intense ever recorded in the Nelson and Tasman regions. The maximum 1-hour rainfall total during the storm was 101 mm/hr in the Roding catchment near Richmond, a rainfall total which has a 500-year return period in this area. The most extreme 1-hour rainfall ever measured in New Zealand is 134 mm/hour in the Cropp River catchment on the west coast of the South Island, a catchment which holds many of New Zealand's extreme rainfall records. The highest 24-hour rainfall total recorded during the 21 April storm was 216 mm, recorded at the Tasman District Council office in Richmond. Rainfall data here were sourced from Tasman District Council.

On 15 and 16 October, 100 houses and 50 businesses in Whanganui were evacuated as the Whanganui River burst its banks. A local state of emergency was declared by the Whanganui Mayor, and floodwaters were considered contaminated due to sewerage system overflows in some places. Residents of the small Turakina Beach settlement were isolated by 3 metre deep floodwaters which closed the only road out of the township. Flooding and slips affected numerous roads in the western North Island.

Over the course of the year, 14 locations observed record extreme 1-day rainfall totals for a specific month (Table 9). On 11 August, Ohakune recorded its highest ever 1-day rainfall total (152 mm) since records began in 1961.

Location	Extreme 1- day rainfall (mm)	Date of extreme rainfall	Year records began	Ranking
January				
Mt Cook	346	9th	1928	Highest (4th highest)
Lumsden	68	9th	1982	Highest (Highest)
April				
Nelson	122	21st	1941	Highest (4th highest)
June				
Ranfurly	33	2nd	1943	Highest
Lumsden	27	1st	1982	Highest
Lauder	49	2nd	1924	Highest
Alexandra	49	2nd	1983	Highest (2nd highest)
July				
Kerikeri	92	3rd	1981	Highest
Ohakune	136	10th	1961	Highest
August				
Ohakune	152	11th	1961	Highest (Highest)

#### Table 9: Record high extreme 1-day rainfall totals were recorded in 2013 at:

September					
Mahia	65	24th	1990	Highest	
Winchmore	73	22nd	1927	Highest	
Alexandra	21	10th	1983	Highest	
December					
Whatawhata	66	5th	1952	Highest	

Note that rainfall rankings in brackets are all-month rankings

#### Temperature extremes

For the year 2013 overall, there was a relative lack of extended hot or cold spells. During the month of August, 8 locations recorded their highest daily maximum temperature for that month, whilst for the winter months as a whole, 16 locations recorded their highest daily maximum temperature for the month in question (Table 7).

A cold outbreak enveloped New Zealand in late-May, and resulted in five locations recording their lowest or equal-lowest daily minimum temperature for the month of May (Table 8).

In the first week of December, a warm northerly airmass ahead of an approaching trough resulted in a number of consecutive hot days, particularly in inland parts of the South Island. Clyde (in Central Otago) had four consecutive days of maximum temperatures reaching at least 29.9°C.

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Ranking		
January						
New Plymouth	30.6	6th	1944	Highest (Highest)		
Masterton	33.1	31st	1992	Equal highest		
Waipawa	34.6	10th	1945	Highest		
Mt Cook	32.8	5th	1929	Highest		
Clyde	35.1	5th	1973	Equal highest		
Puysegur Point	25.0	30th	1978	Highest		
February						
Masterton	33.5	2nd	1992	Highest (Highest)		
March						
Paeroa	29.2	11th	1947	Highest		
Te Puke	30.1	1st	1973	Highest		
Rotorua	28.3	1st	1964	Highest		
Hamilton (Ruakura)	32.6	11th	1906	Highest		
Taumarunui	32.4	11th	1947	Highest		
Turangi	29.3	1st	1968	Highest		

#### Table 7: Extremes of high daily maximum temperature in 2013 were recorded at:

Napier	32.9	18th	1868	Highest
Mahia	30.9	18th	1990	Highest
Reefton	30.1	11th	1960	Highest
Nugget Point	28.6	14th	1970	Highest
April				
Motu	22.8	2nd	1990	Highest
Waione	28.0	3rd	1991	Highest
Hastings	28.6	3rd	1965	Highest
Waipawa	27.9	3rd	1945	Equal highest
May				
Motu	21.9	13th	1990	Highest
Arthurs Pass	17.4	12th	1973	Equal highest
Tara Hills	22.9	13th	1949	Highest
June				
Whakatane	20.0	12th	1975	Highest
Motu	16.9	13th	1990	Highest
Lumsden	17.0	1st	1982	Equal highest
Gore	17.7	1st	1971	Highest
July				
Motu	17.7	23rd	1990	Highest
Hamilton	19.8	4th	1906	Highest
Tara Hills	16.8	17th	1949	Highest
Tiwai Point	16.8	21st	1970	Highest
August				
Kaitaia	22.1	13th	1967	Highest
Port Taharoa	20.3	3rd	1973	Highest
Levin	20.5	25th	1895	Highest
Wallaceville	20.5	25th	1939	Highest
Wanganui	20.8	25th	1937	Highest
Westport	18.5	3rd	1937	Equal highest
Reefton	18.7	17th	1960	Highest
Nelson	18.9	10th	1943	Highest
Appleby	20.0	10th	1932	Highest
November				
Kaitaia	26.3	22nd	1967	Highest
Whangaparaoa	25.5	24th	1982	Highest
Te Puke	27.4	11th	1973	Equal highest
Auckland (Mangere)	26.8	23rd	1959	Highest
Hamilton (Ruakura)	28.4	23rd	1906	Highest
westport	24.6	6th	1937	Equal highest
December	25.0	2011	1005	
Secretary Island	25.9	26th	1985	Highest (4th highest)

Note that temperature rankings in brackets are all-month rankings

## Table 8: Extremes of low daily minimum temperature in 2013 were recorded at:

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Ranking
February				
Balclutha	-0.2	22nd	1964	Lowest
April				
Balclutha	-4.1	10th	1964	Lowest
Мау				
Kerikeri	2.2	29th	1981	Lowest
Whangaparaoa	4.0	29th	1982	Lowest (2nd lowest)
Whakatane	-1.8	30th	1975	Equal lowest
Castlepoint	2.4	29th	1972	Lowest
Le Bons Bay	0.2	29th	1984	Equal lowest
June				
Cheviot	-7.0	12th	1982	Lowest
September				
Kerikeri	0.7	5th	1981	Lowest
October				
Lake Tekapo	-8.3	14th	1925	Lowest

Note that temperature rankings in brackets are all-month rankings

#### Strong winds

2013 was notable for a number of strong and damaging wind events. However, for the year as a whole, 2013 was less 'windy' (Figure 6<sup>9</sup>), primarily because of the very calm period of February through May (which coincided with dominant anticyclonic conditions and widespread drought). Windier months than usual occurred in January, July, September and October. Note that in the climatologically least windy months (February and March), there were no days exceeding the selected threshold of 60 km/hr.



Figure 6: (Top) Number of 'windy days' per calendar year, 1966 to 2013, with horizontal line indicating the 1981-2010 average (39.0 days); (Bottom) Number of 'windy days' by month, comparing the months of 2013 (blue histogram) with the 1981-2010 average (green).

<sup>&</sup>lt;sup>9</sup> In these graphs, a 'windy day' is defined as one where the daily Auckland – Christchurch 9am pressure difference corresponds to a mean wind speed exceeding 60 km/hr (either westerly or easterly). Thus, it is a broad measure and won't capture southerlies or local wind enhancements.

With respect to significant wind events in 2013, two were of particular note. The first event occurred in Wellington and was associated with the storm of 20-21 June, and the second affected many parts of Canterbury on 10-11 September. On 20-21 June, severe gales associated with a significant storm event hit Wellington, causing widespread damage to infrastructure and vegetation in the region. 30,000 homes were without power, and the Fire Service attended over 900 callouts on the night of the 20 June. The Interislander ferry *Kaitaki* broke off its moorings and had to be anchored in Wellington Harbour for the night, with 50 staff on board. A gust of 202 km/hr was recorded at Wellington's Mt Kaukau, and swells were up to 15m in Cook Strait.

On 10-11 September, strong northwest winds affected much of the South Island and the lower North Island. About 28,000 houses and businesses were without power overnight throughout Canterbury, due to wind blowing trees onto power lines. Over 800 irrigators were damaged in Canterbury, which would cost millions of dollars to repair.

Location	Maximum wind gust (km/hr)	Date of maximum wind gust	Year records began	Ranking	
January					
Turangi	104	8th	1973	Highest (equal 2nd- highest)	
Whanganui	98	7th	1977	Highest	
May					
South West Cape	170	26th	1991	Highest	
June					
Auckland (Mangere)	120	9th	1971	Highest	
Mt Kaukau (Wellington)	202	20th	1969	Highest	
Wellington (Airport)	143	20th	1972	Highest	
Whanganui	126	20th	1977	Highest	
Cape Campbell	150	20th	1963	Highest	
Tara Hills	106	2nd	1985	Highest	
Wanaka	78	2nd	1992	Highest	
July					
Turangi	98	14th	1973	Highest	
Baring Head	150	14th	1991	Highest	
Whanganui	107	14th	1977	Highest	
Cape Campbell	124	14th	1963	Highest	
South West Cape	167	1st	1991	Highest	
August					
Westport	102	14th	1973	Highest	
September					
Ashburton	128	10th	1970	Highest (2nd-highest)	
Cape Campbell	120	25th	1963	Highest	
Christchurch	133	10th	1972	Highest	
Oamaru	107	10th	1984	Highest	

#### Table 9: Maximum wind gust extremes in 2013 were recorded at:

Note that temperature rankings in brackets are all-month rankings

#### Snow

One significant snowfall event occurred in New Zealand during 2013. On 20-21 June, a severe snow event occurred in the South Island. Relatively little snow settled at sea level over the course of the event, however significant accumulations occurred at higher elevations. Heaviest snowfalls occurred in areas including Tekapo, Naseby, Clarks Junction and the Hakataramea Valley, where unofficial snow depths of 60 cm or more were reported. Elsewhere, unofficial snow depths of 30 cm or more were reported in areas of northern Southland, eastern Central Otago, and throughout the foothills and high country of Canterbury. Fairlie, Middlemarch and Naseby were cut off by snow. Staff at Mt Hutt ski area in Canterbury estimated a total of 2.8 m of new snow from the storm, with drifts in excess of 6 m on their access road.

#### **Tornadoes and waterspouts**

Over the course of 2013, eleven tornadoes and four waterspouts occurred, from as far south as mid-Canterbury and as far north as southern Northland. No injuries or deaths resulted from these events, however at times there were considerable damage caused to individual properties and vegetation.

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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.

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