

Warm month for New Zealand with flooding in the South Island.

Temperature	March temperatures were well above average ($>1.20^{\circ}\text{C}$) or above average ($+0.51^{\circ}\text{C}$ to $+1.20^{\circ}\text{C}$) across virtually the entirety of New Zealand.
Rainfall	Rainfall was well above normal ($>149\%$ of normal) for Tasman, Nelson, parts of Northland, Coromandel, Bay of Plenty, Whanganui, and the west coast of the South Island. Conversely, rainfall was well below normal ($<50\%$ of normal) for southern Northland, Auckland, Hamilton, Wellington, Banks Peninsula, coastal Otago and Invercargill.
Sunshine	Sunshine was generally near normal (90-109%) for most of the country, with pockets of above normal sunshine (110-125%) in northern areas and below normal sunshine (75-89%) in western and southern parts of the South Island.
Soil Moisture	As at 1 April 2016, soil moisture levels were above normal for the time of year for parts of Northland, Coromandel Peninsula, Bay of Plenty, eastern Waikato, northern Hawke's Bay, Nelson, Tasman, Fiordland, and Stewart Island. Drier than normal soils were evident for the remainder of the North Island and the eastern and southern South Island, in particular for Southland.

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Overview

During March 2016, El Niño conditions prevailed in the tropical Pacific but continued to weaken. Typically, more westerly to south-westerly air flows over New Zealand are associated with El Niño during the autumn season. However, this was not the case this month as significantly higher than normal pressure was present to the east of New Zealand and extended over the country. This pressure pattern produced more north-easterly winds than usual over New Zealand.

The increased prevalence of air flow from the northeast during March caused warm, tropically-derived air masses to travel over New Zealand. Most of the country, but particularly the North Island, recorded well above average ($>1.20^{\circ}\text{C}$ above March average) or above average ($+0.51^{\circ}\text{C}$ to $+1.20^{\circ}\text{C}$ above March average) temperatures for the month. Parts of Northland, Waikato, Manawatu-Whanganui, and

Westland recorded more than 2.0°C above the March average. Remarkably, almost every climate station around the country recorded above average or well above average mean temperatures for March. The nationwide average temperature in March 2016 was 17.0°C (1.3°C above the 1981-2010 March average from NIWA's seven station temperature series which begins in 1909)¹, making March 2016 the sixth-warmest March on record using this series.

The moist tropical air masses that affected New Zealand in March not only brought warm temperatures, but also significant rainfall to some parts of the country. Rainfall was more than double (>200%) the March normal in Nelson and Tasman. Takaka experienced its wettest March on record. Rainfall was also well above normal (>149% of March normal) in parts of Northland, the Coromandel Peninsula, western Bay of Plenty, Rotorua, Whanganui, and the west coast of the South Island. Conversely, rainfall was well below normal (<50% of March normal) for southern Northland, parts of Auckland, around Hamilton, the greater Wellington region, Banks Peninsula, coastal Otago (including Dunedin), and Invercargill.

As at 1 April 2016, soil moisture levels were above normal for the time of year for parts of Northland, Coromandel Peninsula, Bay of Plenty, eastern Waikato, northern Hawke's Bay, Nelson, Tasman, Fiordland, and Stewart Island. Drier than normal soils were evident for the remainder of the North Island and the eastern and southern South Island, in particular for Southland.

Sunshine in March was generally near normal (90-109% of March normal) for most of the country. Some areas experienced above normal sunshine (110-125%), including Kaitaia and Dunedin, and some recorded below normal sunshine (75-89%), including Tauranga, Wellington, Christchurch, Hokitika, Mt Cook and Invercargill.

Further Highlights:

- The highest temperature was 33.1°C, observed at Hastings, Napier and Gisborne on 8 March.
- The lowest temperature was -3.3°C, observed at Hanmer Forest on 12 March.
- The highest 1-day rainfall was 304 mm, recorded at Takaka on 23 March.
- The highest wind gust was 196 km/hr, observed at Cape Turnagain on 10 March.
- Of the six main centres in March 2016, Auckland was the warmest and sunniest, Wellington was the driest, Dunedin was the coolest and Tauranga was the wettest and cloudiest.
- Of the available, regularly reporting sunshine observation sites, the sunniest four locations in 2016 so far (1 January – 31 March) were Richmond (856 hours), New Plymouth (806 hours), Blenheim (764 hours) and Takaka (736 hours).

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¹ Interim value

Temperature: A very warm month across New Zealand

March was a very warm month for virtually all of New Zealand. The temperatures were not as unusually high as they were in February, but almost every climate station around the country recorded above average (+0.51°C to +1.20°C above March average) or well above average (>1.20°C above March average) mean temperatures for March. The high temperatures around the country were a reflection of a north-easterly air flow anomaly (with more air masses coming from the tropics) as well as much warmer than normal sea surface temperatures around the country.

The nationwide average temperature in March 2016 was 17.0°C (1.3°C above the 1981-2010 March average from NIWA's seven station temperature series which begins in 1909). It was the sixth-warmest March on record using this series – this is notable because this month follows the second warmest month (of any month) on record in February.

Record² or near-record mean air temperatures for March were recorded at:

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
Cape Reinga	20.1	1.4	1951	Highest
Kaikohe	20.5	2.8	1973	Highest
Whangaparaoa	20.4	1.4	1982	Highest
Motu	15.6	1.7	1990	Highest
Whatawhata	19.8	2.6	1952	Highest
Farewell Spit	18.4	1.6	1971	Highest
Cheviot	16.0	1.5	1982	Highest
Masterton	18.0	2.5	1992	2nd-highest
Hawera	17.5	2.0	1977	2nd-highest
Christchurch (Riccarton)	17.3	2.1	1863	2nd-highest
Kaitaia	20.3	1.5	1985	3rd-highest
Whangarei	20.6	1.8	1967	3rd-highest
Motueka	17.4	1.7	1956	3rd-highest
Auckland (Albany)	20.7	1.7	1994	4th-highest
Auckland (Henderson)	20.1	1.6	1948	4th-highest
Whitianga	19.2	1.5	1962	4th-highest
New Plymouth	18.5	1.8	1944	4th-highest
Takaka	17.1	1.6	1978	4th-highest
Westport	16.9	1.6	1937	4th-highest
Nelson	17.6	1.1	1943	4th-highest
Lake Tekapo	14.5	1.9	1927	4th-highest
Tara Hills	14.8	1.5	1949	4th-highest

² The rankings (1st, 2nd, 3rd.etc) in all Tables in this summary 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 due to the practical limitations of performing homogeneity checks in real-time.

Low records or near-records

None observed

Record or near-record mean maximum air temperatures for March were recorded at:

Location	Mean maximum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
Hawera	21.8	2.2	1977	Highest
Appleby	23.5	2.3	1932	Highest
Tiwai Point	18.8	2.3	1970	Highest
Kaitaia	25.0	1.8	1985	2nd-highest
Kaikohe	24.6	2.9	1973	2nd-highest
Whangarei	24.5	1.6	1967	2nd-highest
Motu	21.4	2.8	1990	2nd-highest
New Plymouth	23.0	2.2	1944	2nd-highest
Christchurch (Riccarton)	23.0	3.0	1863	2nd-highest
Whatawhata	24.9	2.5	1952	3rd-highest
Ngawi	21.9	1.3	1972	3rd-highest
Wanganui	23.6	2.5	1937	3rd-highest
Farewell Spit	21.9	1.2	1971	3rd-highest
Hanmer Forest	23.5	2.5	1906	3rd-highest
Cheviot	22.7	2.0	1982	3rd-highest
Low records or near-records				
None observed				

Record or near-record mean minimum air temperatures for March were recorded at:

Location	Mean minimum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
Kaikohe	16.5	2.7	1973	Highest
Whatawhata	14.7	2.8	1952	Highest
Port Taharoa	16.9	2.5	1973	Highest
Masterton	11.4	2.3	1992	Highest
Cape Reinga	17.4	1.6	1951	2nd-highest
Auckland (Henderson)	16.0	2.3	1948	2nd-highest
Gisborne	14.3	2.1	1905	2nd-highest
Farewell Spit	15.0	2.0	1971	2nd-highest
Whangarei	16.7	2.0	1967	3rd-highest
Whangaparaoa	17.4	1.6	1982	3rd-highest
Auckland (Albany)	17.5	2.1	1994	3rd-highest
Mahia	15.0	0.9	1990	3rd-highest
Cheviot	9.3	0.9	1982	3rd-highest
Dargaville	15.6	1.2	1943	4th-highest

Whitianga	15.1	2.3	1962	4th-highest
Tauranga	15.9	2.1	1913	4th-highest
Waione	12.3	1.0	1991	4th-highest
Hawera	13.1	1.7	1977	4th-highest
Haast	12.4	2.7	1949	4th-highest
Secretary Island	12.0	1.0	1985	4th-highest
Low records or near-records				
None observed				

Rainfall: Very wet in Tasman, very dry in Wellington.

A significant rainfall event caused flooding in the Tasman District on 24 March. The majority of the month's rainfall for stations in that area was recorded on that day – Takaka recorded two and a half times its normal March rainfall. 304 mm out of the monthly total of 352 mm was recorded in one day there. For the South Island, western areas recorded anomalously high rainfall for March and eastern areas recorded lower than normal rainfall for the month.

In the North Island, rainfall was patchier, with high rainfall recorded in the Coromandel Peninsula, western Bay of Plenty and Whanganui, but the rest of the Island was comparatively dry. In particular, Wellington recorded only 21% of normal March rainfall. A number of sites across the North Island recorded below 50% of the normal March rainfall but only two of these were near-record-breaking (see table below).

Record or near-record March rainfall totals were recorded at:

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
High records or near-records				
Takaka	352	250	1976	Highest
Motueka	225	237	1943	3rd-highest
Low records or near-records				
Dargaville	16	21	1943	3rd-lowest
Paraparaumu	19	38	1945	Equal 3rd-lowest

Sunshine: Near normal sunshine for most.

March sunshine was near normal for most of the country (90-109% of March normal). Western and southern parts of the South Island (excluding Dunedin), as well as Wellington and Tauranga, recorded below normal sunshine (75-89%), whereas northern areas of both Islands recorded higher sunshine hours.

Of the available, regularly reporting sunshine observation sites, the sunniest four locations in 2016 so far (1 January – 31 March) were Richmond (856 hours), New Plymouth (806 hours), Blenheim (764 hours) and Takaka (736 hours).

Record or near-record March sunshine hours were recorded at:

Location	Sunshine hours	Percentage of normal	Year records began	Comments
High records or near-records				
Appleby	265	109	1995	2nd-highest
Kaitaia	257	115	1985	3rd-highest
New Plymouth	263	123	1972	3rd-highest
Low records or near-records				
None observed				

March climate in the six main centres

March temperatures for the North Island main centres were all well above average (>1.20°C above March average) and above average for the South Island main centres (+0.50°C to +1.20°C above average). Rainfall was well below normal (<50%) for all main centres except for Christchurch. Tauranga, Wellington and Christchurch observed below normal sunshine (75-89%), Auckland and Hamilton experienced near normal sunshine (90-109%), and it was a very sunny month in Dunedin with well above normal sunshine there (>125%). Of the six main centres in March 2016, Auckland was the warmest and sunniest, Wellington was the driest, Dunedin was the coolest and Tauranga was the wettest and cloudiest.

March 2016 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland ^a	20.2	+1.7	Well above average
Tauranga ^b	19.6	+1.4	Well above average
Hamilton ^c	18.5	+1.6	Well above average
Wellington ^d	17.2	+1.4	Well above average
Christchurch ^e	15.8	+0.9	Above average
Dunedin ^f	14.8	+1.1	Above average
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland ^a	23	27%	Well below normal
Tauranga ^b	145	149%	Well above normal
Hamilton ^c	22	27%	Well below normal
Wellington ^d	18	21%	Well below normal
Christchurch ^e	55	119%	Near normal
Dunedin ^f	20	31%	Well below normal
Sunshine			
Location	Sunshine (hours)	% of normal	Comments
Auckland ^a	208	109%	Near normal
Tauranga ^b	165	77%	Below normal
Hamilton ^g	178	92%	Near normal
Wellington ^d	178	87%	Below normal
Christchurch ^e	171	89%	Below normal
Dunedin ^f	190	132%	Well above normal

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

Highlights and extreme events

Rain and slips

On 10 March, SH 94 from Hollyford to Milford Sound was closed for a time due to rock falls. Heavy rain occurred in the area at the same time.

On 17 March, the eastern Coromandel Peninsula was hit by heavy rain and flooding. Whitianga was cut off for a time due to floodwaters closing roads. There was a slip on Kuaotunu Hill, delaying motorists. Simpson's Beach bridge was also closed.

Early on 24 March, a state of emergency was declared on the South Island's west coast after strong winds and heavy rain pummelled the area. The Waiho River in Franz Josef breached its banks, forcing nearly 200 people to evacuate from the town's Scenic Circle Hotel, Top 10 Holiday Park and Westwood Lodge. The Mueller Hotel in Franz Josef bore the brunt of the flood, with silt coating every floor and water marks 1.5m up the walls, and the river was still flowing through the hotel days later. The hotel may have to be demolished. SH 6 around Franz Josef was closed for a time due to flooding. The area from Motueka to Collingwood in Tasman District was inundated by very heavy rain in the early hours of the morning, causing major flooding and river breaches. The flooding closed SH 60 from Riwaka to Collingwood as well as numerous local roads, and caused around 12 households to be evacuated. Many orchards in the area were flooded, affecting crops and machinery in the middle of harvesting season. Some beaches around Nelson experienced sewage overflows, and tourists who were trapped in their campervan by rising water in Motueka were rescued by a farmer.

The highest 1-day rainfall total in March was recorded at Takaka, which experienced its highest 1-day rainfall on record for March (304 mm).

Record or near-record March extreme 1-day rainfall totals were recorded at:

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Comments
Takaka	304	23rd	1976	Highest
Farewell Spit	101	23rd	1882	Highest
Reefton	82	23rd	1960	Highest
Motueka	193	23rd	1956	Highest
Appleby	116	23rd	1932	Highest
Nelson	145	23rd	1941	Highest
Greymouth	113	23rd	1947	2nd-highest
Blenheim	55	23rd	1927	2nd-highest

Temperatures

A strong ridge of high pressure resided over the country from 5-8 of March and provided a period of unusually warm and settled weather. On the 8th, the heat reached its apex as northwest flow ahead of a weakening cold accentuated the warmth with a Foehn effect on the eastern side of the North Island. This allowed for the highest temperatures of the month to occur as Hastings, Napier and Gisborne all reached 33.1°C.

The lowest March temperature was -3.3°C, observed at Hanmer Forest on 12 March.

Record or near-record daily maximum air temperatures for March were recorded at:

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Comments
High records or near-records				
Motu	27.6	8th	1990	Highest
Martinborough	30.7	6th	1986	Highest
Ngawi	30.6	6th	1972	Highest
Napier	33.1	8th	1868	Highest
Hastings	33.1	8th	1965	Highest
Takaka	30.5	7th	1978	Highest
Farewell Spit	27.5	7th	1971	Highest
Motueka	31.4	6th	1956	Highest
Nelson	29.4	7th	1943	Highest
Appleby	29.6	6th	1932	Highest
Le Bons Bay	28.7	10th	1984	Highest
Gisborne	33.1	8th	1905	2nd-highest
Wairoa	32.0	8th	1964	2nd-highest
Mahia	30.4	8th	1990	2nd-highest
Whakatane	28.7	8th	1975	3rd-highest
Masterton	30.5	6th	1992	3rd-highest
Castlepoint	28.5	6th	1972	3rd-highest
Christchurch (Riccarton)	32.9	20th	1863	3rd-highest
Nugget Point	26.5	5th	1970	3rd-highest
Dunedin (Airport)	31.5	19th	1962	Equal 3rd-highest
Kaikohe	26.7	6th	1973	4th-highest
Tiwai Point	26.7	14th	1970	4th-highest
Balclutha	30.0	19th	1964	4th-highest
Low records or near-records				
Cheviot	10.1	16th	1982	Lowest
Le Bons Bay	9.5	16th	1984	Lowest
Waiau School	10.4	16th	1974	2nd-lowest
Greymouth	13.3	16th	1972	Equal 4th-lowest

Record or near-record daily minimum air temperatures for March were recorded at:

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Comments
High records or near-records				
Secretary Island	17.8	20th	1988	Highest
Nelson	20.5	7th	1943	Highest
Waipara West	21.5	21st	1973	Highest
Le Bons Bay	19.3	22nd	1984	Highest
Lake Tekapo	17.7	8th	1928	Highest
Gore	16.9	20th	1972	Highest
Nugget Point	16.2	20th	1972	Highest
Whangaparaoa	20.0	24th	1982	Equal highest
Waione	18.4	6th	1993	Equal highest
Hawera	19.1	24th	1977	2nd-highest
Milford Sound	18.1	20th	1935	2nd-highest
Kaikohe	20.1	24th	1973	Equal 2nd-highest
Mt Cook	17.3	7th	1929	Equal 2nd-highest
Orari Estate	16.9	20th	1972	Equal 2nd-highest
Auckland (Albany)	20.8	24th	1994	3rd-highest
Port Taharoa	20.3	8th	1974	3rd-highest
Paraparaumu	19.0	8th	1972	3rd-highest
Manapouri	16.5	6th	1973	3rd-highest
New Plymouth	20.0	24th	1944	Equal 3rd-highest
Masterton	18.1	8th	1992	Equal 3rd-highest
Haast	17.7	20th	1949	Equal 3rd-highest
Cape Reinga	19.6	23rd	1971	4th-highest
Hokitika	18.0	20th	1866	4th-highest
Waiau School	18.5	7th	1974	4th-highest
Cheviot	16.4	7th	1982	4th-highest
Tara Hills	16.3	6th	1949	4th-highest
Ranfurly	14.5	20th	1975	4th-highest
Invercargill	17.3	20th	1905	4th-highest
Whangarei	21.5	24th	1967	Equal 4th-highest
Paeroa	20.4	24th	1971	Equal 4th-highest
Hamilton	19.9	24th	1946	Equal 4th-highest
Reefton	17.0	8th	1972	Equal 4th-highest
Puysegur Point	17.3	20th	1978	Equal 4th-highest
Low records or near-records				
Hanmer Forest	-3.3	12th	1906	2nd-lowest
Balclutha	-0.9	17th	1964	2nd-lowest
Waiau School	-0.4	12th	1974	Equal 3rd-lowest
Dunedin (Airport)	-1.9	17th	1962	4th-lowest

Wind

On 7 and 8 March, northwest winds fanned a bush fire near Hanmer Springs. The town was cut off for a time due to road closures around the fire, and many residents lost power.

On 10 March, high winds affected much of the South Island. All flights in and out of Dunedin and Invercargill were cancelled for a time, and downed trees blocked roads in coastal Otago. The winds also caused damage to power lines, leading to power outages in many parts of Otago and Southland. Dunedin Airport also lost power for a short time and had to rely on its generator. In Canterbury, the high winds fanned numerous out-of-control bush and scrub fires, particularly near Darfield and Mt Somers. Wind warnings were in place for SH 2 at Rimutaka Hill, SH 87 from Outram to Kyeburn, SH 1 from Palmerston to Waitaki Bridge, SH 83 from Omarama to Pukeuri, SH 8 from Lindis Pass to Twizel, SH 8 from Pukaki to Twizel, SH 80 at Mt Cook, SH 1 from Rakaia to Glenavy, SH 8 from Pukaki to Fairlie, and SH 73 from Springfield to Castle Hill, warning that extra care was needed for high sided vehicles and motorcycles. On a bridge over the Pukaki-Ohau canal, a truck trailer flipped in the high winds. Wind-driven waves crashed over coastal roads and the high tide flooded the Otepunui Garden area in Invercargill.

On 23-24 March, strong winds battered northern and western parts of the country. Almost 18,000 homes in Auckland and Northland were without power, trees fell on powerlines and trampolines were blown onto roofs. Wind warnings were in place for the Auckland Harbour Bridge and SH 1 at the Desert Road. Auckland ferry services were cancelled or delayed due to the rough seas.

The highest wind gust during March was 196 km/hr recorded at Cape Turnagain on March 10.

Record or near-record March extreme wind gusts were recorded at:

Location	Extreme wind gust (km/hr)	Date of extreme gust	Year records began	Comments
Manapouri	106	10th	1991	Highest
Kaikohe	80	24th	1986	2nd-highest
Tara Hills	93	10th	1985	2nd-highest
Castlepoint	152	10th	1972	Equal 2nd-highest
Kaukau Top	148	24th	1969	Equal 2nd-highest
Cape Reinga	146	23rd	1974	3rd-highest
Hawera	96	24th	1986	3rd-highest
Pukekohe	63	24th	1986	Equal 3rd-highest
Secretary Island	120	10th	1994	Equal 3rd-highest
Gore	107	10th	1987	Equal 3rd-highest
Kaitaia	93	23rd	1972	4th-highest
Auckland (Whenuapai)	83	24th	1972	4th-highest
Auckland (Albany)	70	24th	1994	4th-highest
Whakatane	78	24th	1974	4th-highest
Ashburton	91	10th	1970	4th-highest
Oamaru	78	20th	1984	4th-highest
Paeroa	87	24th	1991	Equal 4th-highest
Dunedin (Musselburgh)	100	10th	1981	Equal 4th-highest

Snow and ice

On 16 March, some South Island ski fields had their first snow of the season. Roundhill, Mt Hutt, and Porters Ski Fields received a light dusting of snow with a cold snap that moved up the Island.

For further information, please contact:

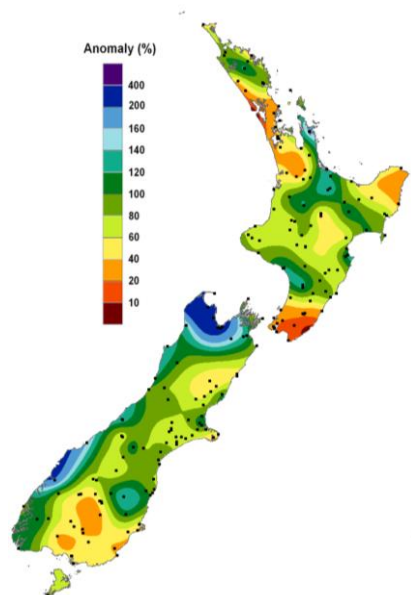
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March 2016 total rainfall, expressed as a percentage of normal (1981-2010 average).

Wellington recorded just 21% of normal rainfall and Takaka experienced its wettest March on record (250% of normal).

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