New Zealand Climate Summary: **March 2019** Issued: 3 April 2019

New Zealand's equal 2nd warmest March on record

Temperature	It was New Zealand's equal 2nd warmest March on record. The nationwide average temperature in March 2019 was 17.6°C. Temperatures were above average (0.51°C to 1.2°C above average) or well above average (>1.2°C above average) across the entire country. Many locations observed record or near-record warm mean, mean maximum or mean minimum March temperatures.
Rainfall	Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) across much of the North Island. The only exceptions were parts of Taranaki and the Central Plateau along with the Kapiti Coast and Wellington City which observed near normal (80-120% of normal) or above normal (120-149% of normal) rainfall. In the South Island, rainfall was generally above normal or well above normal (>150% of normal) in the west and far north, while the east and far south observed below to well below normal rainfall.
Soil Moisture	As of 1 April, drier than normal soils were present across the majority of the North Island and a large portion of the South Island. Conversely, soil moisture levels were slightly higher than normal in northern Marlborough and Tasman, along with the West Coast, and parts of Otago. Meteorological drought conditions (as defined by the NZ Drought Index) were present in Western Bay of Plenty as of 30 March.

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Overview

March 2019 was characterised by higher than normal mean sea level pressure over and to the east of New Zealand. This pressure set up led to more northeasterly winds than normal across the country. Warmer than average sea surface temperatures persisted throughout March and marine heatwave conditions continued in the Tasman Sea and in parts of New Zealand's coastal waters.

March was a very warm month with temperatures above average (0.51°C to 1.2°C above average) or well above average (>1.2°C above average) across the entire country. Overall, the month ranked as the equal 2nd warmest March on record (equal to March 1999). The nationwide average temperature was 17.6°C (1.9°C above the 1981-2010 March average from NIWA's seven station temperature series which began in 1909). Many locations observed record or near-record warm mean, mean maximum or mean minimum March temperatures. New Zealand has not experienced a nationwide monthly mean temperature that was below average (0.51˚C to 1.20˚C below the 1981-2010 average) in 26 months or since January 2017.

March was a dry month for many locations, although extremely heavy rainfall occurred in the western South Island on March 25-27. The weather event was a mix of an 'atmospheric river[1]' extending from Australian cyclones coupled with extra energy from the Tasman Sea marine heatwave, as well as a strong low-pressure system siphoning moisture toward New Zealand (refer to the Highlights and extreme events section for additional details).

Further Highlights:

- The highest temperature was 32.4°C, observed in Waipara West on 5 March.
- The lowest temperature was -1.5°C, observed in Hanmer Forest on 1 March.
- The highest 1-day rainfall was 401.0 mm, recorded at Milford Sound on 25 March.
- The highest wind gust was 139 km/h, observed at Cape Turnagain on 14 March.
- Of the six main centres in March 2019, Auckland was the warmest, Dunedin was the coolest, driest and sunniest, Wellington was the wettest, and Christchurch was the least sunny.
- Of the available, regularly reporting sunshine observation sites, the sunniest four regions in 2019 are Wider Nelson (857 hours), Marlborough (833 hours), Bay of Plenty (819) and Taranaki (819 hours).

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[1] Atmospheric rivers are relatively long, narrow corridors in the atmosphere that transport most of the water vapour outside of the tropics. According to the American Meteorological Society, integrated vapour transport (from Earth's surface to about 9000 m) must be at least 250 kgm-1s-1 along the periphery of the moisture plume to be considered an atmospheric river.

Temperature: 2nd equal warmest March on record

March 2019 was New Zealand's equal 2nd warmest March on record (equal to March 1999). Temperatures were above average or well above average across the entire country. The nationwide average temperature in March 2019 was 17.6°C (1.9°C above the 1981-2010 March average from NIWA's seven station temperature series which begins in 1909).

Many locations observed record or near-record warm mean and mean maximum (i.e. day-time) temperatures. Notably, the mean maximum temperature in Ranfurly during March was 23.4°C, which is 4.0°C warmer than average for this location, the highest since records began there in 1897.

Record[2] 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	20.2	1.5	1951	Highest
Whangaparaoa	20.8	1.8	1982	Highest
Farewell Spit	19.1	2.3	1971	Highest
Westport	17.5	2.2	1937	Highest
Reefton	18.0	3.1	1960	Highest
Secretary Island	16.5	2.6	1985	Highest
Puysegur Point	15.5	2.4	1978	Highest
Waiau	17.0	2.1	1974	Highest
Cheviot	16.4	1.9	1982	Highest
Mt Cook	14.9	2.6	1929	Highest
Lake Tekapo	15.5	2.9	1927	Highest
Orari Estate	16.3	2.2	1972	Highest
Wanaka	16.8	2.6	1955	Highest
Ranfurly	15.1	2.6	1897	Highest
Dunedin (Musselburgh)	16.6	2.9	1947	Highest
Lumsden	14.7	2.2	1982	Highest
Cromwell	17.0	2.4	1949	Highest
Roxburgh	16.8	3.1	1950	Highest
Gore	15.3	2.8	1907	Highest
Invercargill	15.0	2.5	1905	Highest
Nugget Point	14.9	2.3	1970	Highest
South West Cape	15.2	3.1	1991	Highest
Rotorua	18.1	2.2	1964	2nd-highest
Taupo	18.2	3.2	1949	2nd-highest
Motu	15.7	1.8	1990	2nd-highest
Auckland (Pukekohe)	19.5	1.8	1969	2nd-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.

Mahia	18.5	1.4	1990	2nd-highest
Motueka	17.9	2.2	1956	2nd-highest
Medbury	16.9	1.8	1927	2nd-highest
Akaroa	17.7	2.1	1978	2nd-highest
Le Bons Bay	15.7	1.5	1984	2nd-highest
Tara Hills	15.6	2.3	1949	2nd-highest
Oamaru	15.7	1.8	1967	2nd-highest
Dunedin Airport	15.5	2.3	1962	2nd-highest
Manapouri (West Arm Jetty)	14.3	2.1	1971	2nd-highest
Lauder	15.9	2.7	1924	2nd-highest
Clyde	16.4	2.0	1978	2nd-highest
Te Kuiti	18.9	2.1	1959	3rd-highest
Waipawa	17.4	1.4	1945	3rd-highest
Takaka	17.2	1.7	1978	3rd-highest
Franz Josef	16.0	2.5	1953	3rd-highest
Milford Sound	15.4	1.9	1934	3rd-highest
Nelson	18.0	1.8	1862	3rd-highest
Lincoln	17.0	2.1	1881	3rd-highest
Waimate	15.9	2.0	1908	3rd-highest
Manapouri Airport	14.5	2.3	1963	3rd-highest
Five Rivers	14.6	2.1	1982	3rd-highest
Alexandra	16.8	1.9	1929	3rd-highest
Balclutha	15.3	2.0	1964	3rd-highest
Paeroa	20.0	2.1	1947	4th-highest
Hamilton (Ruakura)	19.1	2.0	1906	4th-highest
Lower Retaruke	17.8	2.2	1966	4th-highest
Martinborough	17.6	1.7	1986	4th-highest
Gisborne	19.2	1.8	1905	4th-highest
Levin	18.1	1.9	1895	4th-highest
Porirua	17.2	0.9	1968	4th-highest
Hokitika	16.8	2.3	1866	4th-highest
Ashburton	16.8	2.2	1927	4th-highest
Timaru	16.0	2.2	1885	4th-highest
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				
Whangarei	25.1	2.0	1967	Highest
Whangaparaoa	24.4	2.3	1982	Highest
Auckland (Whenuapai)	25.0	2.1	1945	Highest
Paeroa	26.2	2.8	1947	Highest

Te Kuiti	25.9	3.1	1959	Highest
Porirua	21.5	1.3	1968	Highest
Farewell Spit	22.4	1.7	1971	Highest
Reefton	23.8	3.1	1960	Highest
Milford Sound	20.4	2.6	1934	Highest
Secretary Island	19.6	2.8	1985	Highest
Puysegur Point	18.3	2.8	1978	Highest
Lake Tekapo	23.0	3.9	1927	Highest
Tara Hills	23.3	3.1	1949	Highest
Wanaka	23.3	2.8	1955	Highest
Ranfurly	23.4	4.0	1897	Highest
Dunedin Airport	23.0	3.9	1962	Highest
Dunedin (Musselburgh)	20.5	3.2	1947	Highest
Manapouri Airport	21.1	3.0	1963	Highest
Lumsden	21.2	3.0	1982	Highest
Cromwell	25.0	3.7	1949	Highest
Lauder	23.8	3.7	1924	Highest
Clyde	24.9	3.8	1978	Highest
Roxburgh	23.3	3.0	1950	Highest
Invercargill	20.4	3.3	1905	Highest
Balclutha	22.0	3.6	1964	Highest
Nugget Point	18.6	2.5	1970	Highest
South West Cape	17.9	3.4	1991	Highest
Mokohinau (Remove)	22.9	1.3	1994	2nd-highest
Rotorua	23.4	2.9	1964	2nd-highest
Taupo	24.2	3.8	1949	2nd-highest
Auckland Airport	24.5	1.9	1959	2nd-highest
Hamilton	25.6	2.7	1946	2nd-highest
Ngawi	22.2	1.6	1972	2nd-highest
Waipawa	24.5	2.9	1945	2nd-highest
Westport	21.1	2.0	1937	2nd-highest
Hanmer Forest	24.0	3.0	1906	2nd-highest
Five Rivers	21.1	2.9	1982	2nd-highest
Turangi	23.3	2.6	1968	3rd-highest
Lower Retaruke	24.1	2.3	1966	3rd-highest
Hicks Bay	22.9	1.9	1969	3rd-highest
Mahia	21.4	1.3	1990	3rd-highest
Palmerston North	24.3	2.8	1928	3rd-highest
Ohakune	21.8	2.9	1962	3rd-highest
Waiouru	20.4	3.0	1962	3rd-highest
Waiau	23.6	1.9	1974	3rd-highest
Mt Cook Airport	21.2	3.3	1929	3rd-highest
Akaroa	23.1	2.3	1978	3rd-highest
Manapouri (West Arm Jetty)	19.1	2.4	1971	3rd-highest
Alexandra	24.5	2.3	1929	3rd-highest
Motu	20.9	2.3	1990	4th-highest
Martinborough	23.5	2.0	1986	4th-highest
Levin	23.3	2.5	1895	4th-highest

Timaru	21.8	2.3	1885	4th-highest
Oamaru	20.2	1.9	1967	4th-highest
Queenstown	22.2	2.8	1871	4th-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				
Farewell Spit	15.7	2.7	1971	Highest
Westport	14.0	2.5	1937	Highest
Reefton	12.2	3.1	1960	Highest
Secretary Island	13.4	2.4	1985	Highest
Puysegur Point	12.7	2.1	1978	Highest
Medbury	10.8	2.2	1927	Highest
Cheviot	10.6	2.2	1982	Highest
Orari Estate	10.9	2.6	1972	Highest
Dunedin (Musselburgh)	12.8	2.6	1947	Highest
South West Cape	12.4	2.7	1991	Highest
Mokohinau (Remove)	18.8	1.4	1994	2nd-highest
Hokitika	13.1	2.8	1866	2nd-highest
Motueka	12.9	3.0	1956	2nd-highest
Nelson	14.2	2.2	1862	2nd-highest
Culverden	11.0	2.7	1928	2nd-highest
Mt Cook	9.0	2.3	1929	2nd-highest
Le Bons Bay	12.8	1.8	1984	2nd-highest
Nugget Point	11.3	2.1	1970	2nd-highest
Cape Reinga	17.4	1.6	1951	3rd-highest
Mahia	15.6	1.5	1990	3rd-highest
Cape Campbell	14.5	1.1	1953	3rd-highest
Waiau	10.5	2.2	1974	3rd-highest
Akaroa	12.4	2.0	1978	3rd-highest
Gore	9.7	1.9	1907	3rd-highest
Motu	10.4	1.3	1990	4th-highest
Arapito	12.8	2.1	1978	4th-highest
Franz Josef	11.4	2.5	1953	4th-highest
Kaikoura	13.2	1.4	1963	4th-highest
Ashburton	11.2	2.3	1928	4th-highest
Oamaru	11.3	1.7	1967	4th-highest
Roxburgh	10.4	3.3	1950	4th-highest
Invercargill	9.9	2.0	1905	4th-highest
Low records or near-records				
None observed				

Rainfall: Dry for most of New Zealand, wet for the West Coast

Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) across much of the North Island. The only exceptions were parts of Taranaki and the Central Plateau as well as Kapiti Coast and Wellington City where near normal (80-120% of normal) or above normal (120-149% of normal) rainfall was observed. In the South Island, rainfall was generally above normal or well above normal (>150% of normal) for the West Coast, northern Otago, and south Canterbury, as well as northern parts of Tasman, Nelson, and Marlborough. Meanwhile the east and far south observed below to well below normal rainfall.

Extremely heavy rainfall occurred in the western South Island on March 25-27. The weather event was a mix of an 'atmospheric river[1]' extending from Australian cyclones coupled with extra energy from the Tasman Sea marine heatwave, as well as a strong low-pressure system siphoning moisture toward New Zealand (refer to the Highlights and extreme events section for additional details).

On 12 March 2019, the Government announced that a medium-scale drought classification for the Tasman District would be extended to cover Marlborough, Buller, and Nelson. As of the end of March, meteorological drought conditions had been alleviated in the northern South Island, although meteorological drought conditions (as defined by the NZ Drought Index) were present in Western Bay of Plenty.

As of 2 April, drier than normal soils were present across the vast majority of the North Island and a large portion of the South Island. Conversely, soil moisture levels were slightly higher than normal in northern Marlborough and Tasman, along with the West Coast and parts of Otago.

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				
None observed				
Low records or near-records				
Dannevirke	24	31	1951	3rd-lowest
Nugget Point	20	27	1930	3rd-lowest
Balclutha	17	29	1964	4th-lowest

March climate in the six main centres

March was a very warm month and all of the six main centres observed temperatures that were well above average for the time of year. Dunedin experienced its warmest March on record. Rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) for five of the six main centres. Conversely, Wellington received rainfall totals above normal (120-149% of normal) for the time of year.

Of the six main centres in March 2019, Auckland was the warmest, Dunedin was the coolest, driest and sunniest, Wellington was the wettest, and Christchurch was the least sunny.

March 2019 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from normal (°C)	Comments
Auckland[a]	19.9	+1.4	Well above average
Tauranga[b]	19.7	+1.5	Well above average
Hamilton[c]	19.0	+2.1	Well above average
Wellington[d]	17.1	+1.3	Well above average
Christchurch[e]	16.8	+1.9	Well above average
Dunedin[f]	16.6	+2.9	Well above average (warmest on record)
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland[a]	57	66%	Below normal
Tauranga[b]	53	55%	Below normal
Hamilton[c]	47	56%	Below normal
Wellington[d]	104	122%	Above normal
Christchurch[e]	28	60%	Below normal
Dunedin[f]	20	32%	Well below normal
Sunshine			
Location	Sunshine (hours)		
Auckland[a]	222		
Tauranga[b]	181		
Hamilton[g]	191		
Wellington[d]	188		
Christchurch[e]	172		
Dunedin[f]	233		

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

Highlights and extreme events

Rain and slips

Severe meteorological drought was present across the upper South Island to start the autumn season. On March 3, according to the New Zealand Drought Index, Nelson tied for the 2nd most severe meteorological drought in the past 12 years, and the Tasman District had its 3rd most severe drought.

On 7-8 March, a front moved up the country and brought well-needed rain to parched regions. Between 20-30mm of rain fell across the Nelson-Tasman region, but it was not enough to break the meteorological drought conditions.

Whanganui observed 23.6 mm of rain in an hour on 8 March, making it the wettest March hour on record there (data since 1995). Also on 8 March, heavy rain hammered Wellington and lead to flash flooding and landslides during the morning commute. The cricket game between the Black Caps and Bangladesh was cancelled due to heavy rain.

West Coast heavy rain event 25-27 March

Extremely heavy rainfall occurred in the western South Island on March 25-27. The weather event was a mix of an 'atmospheric river[1]' extending from Australian cyclones coupled with extra energy from the Tasman Sea marine heatwave, as well as a strong low-pressure system siphoning moisture toward New Zealand.

On 26 March at 5.45 pm, a State of Emergency was declared in Westland as torrential rainfall and strong winds battered the region and caused evacuations, power outages and road closures. Hours later, the Waiho River bridge on State Highway 6, the link between Franz Josef and Fox Glacier, was claimed by raging floodwaters.

Also on 26 March, Haast River at Roaring Billy recorded a water level of 7.423 m. This is the 2nd highest water level at the station since 1969 (highest 7.580 m in 1978).

On 27 March, a 66 year-old woman was found deceased in flood waters in the Arahura Valley, north of Hokitika, just after 9 am. Acting area commander Senior Sergeant Peter Payne said it appeared the woman got out of the vehicle she was driving and tried to cross the flood waters on foot.

Between 25 March – 27 March, a New Zealand 48-hour rainfall record was set at the Hokitika catchment of the Cropp River which recorded 1086mm, or more than a metre of rain. That beat the previous New Zealand two-day record, also from Cropp River in December 1995, by about 40mm.

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
Manapouri (West Arm Jetty)	140	25th	1971	Highest
Hokitika	174	26th	1866	2nd-highest
Milford Sound	401	25th	1929	2nd-highest
Mt Cook	291	26th	1928	2nd-highest
Secretary Island	148	25th	1985	3rd-highest
Greymouth	110	26th	1947	4th-highest

Arthurs Pass	236	26th	1906	4th-highest

Temperatures

Between 3-6th of March a northerly flow brought warm temperatures across the country. Notably, on 4 March, Whitianga recorded 28.7°C, which is its warmest March temperature on record (data since 1962).

Overnight clouds and high humidity associated with an 'atmospheric river[1]' contributed to several record or near-record daily minimum air temperatures in eastern areas between 26-27 March.

On 31 March, South West Cape recorded 26.0°C, which is its warmest March temperature on record (data since 1991).

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				
Whitianga	28.7	4th	1962	Highest
South West Cape	26.0	31st	1991	Highest
Paeroa	29.2	3rd	1947	Equal highest
Whangaparaoa	27.6	4th	1982	2nd-highest
Motu	26.7	4th	1990	2nd-highest
Akaroa	32.0	13th	1978	2nd-highest
Nugget Point	26.8	5th	1970	2nd-highest
Te Kuiti	29.8	17th	1959	Equal 3rd-highest
Medbury	31.7	5th	1927	Equal 3rd-highest
Oamaru	30.1	5th	1967	Equal 3rd-highest
Dunedin Airport	31.5	5th	1962	Equal 3rd-highest
Rotorua	28.1	3rd	1964	4th-highest
Ngawi	28.2	5th	1972	4th-highest
Blenheim	31.5	4th	1932	4th-highest
Waiau	31.4	6th	1974	4th-highest
Lake Tekapo	29.7	6th	1925	4th-highest
Ranfurly	29.4	6th	1897	4th-highest
Lumsden	27.1	5th	1982	4th-highest
Clyde	31.5	5th	1978	4th-highest
Balclutha	30.3	5th	1964	4th-highest
Mokohinau (Remove)	25.1	28th	1994	Equal 4th-highest
Low records or near-records				
None observed				

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				
Mahia	20.3	14th	1990	Highest
Farewell Spit	19.6	27th	1972	Highest
Milford Sound	19.1	26th	1935	Highest
Secretary Island	18.5	26th	1988	Highest
Cheviot	19.7	26th	1982	Highest
Ashburton	21.1	26th	1928	Highest
Le Bons Bay	19.7	26th	1984	Highest
Oamaru	16.8	26th	1972	Highest
Dunedin (Musselburgh)	17.9	6th	1947	Highest
Roxburgh	19.4	6th	1950	Highest
Porirua	18.8	27th	1972	Equal highest
Gore	17.9	6th	1907	Equal highest
Martinborough	20.1	27th	1986	2nd-highest
Westport	19.3	26th	1966	2nd-highest
Nugget Point	15.5	6th	1972	2nd-highest
Wellington (Airport)	19.9	27th	1972	Equal 2nd-highest
Mokohinau (Remove)	20.6	8th	1994	3rd-highest
Takapau Plains	17.9	14th	1972	3rd-highest
Hawera	19.0	14th	1977	3rd-highest
Dunedin Airport	17.4	26th	1972	3rd-highest
Manapouri (West Arm Jetty)	15.8	26th	1972	3rd-highest
Medbury	20.6	26th	1927	Equal 3rd-highest
Waiau	18.8	26th	1974	Equal 3rd-highest
South West Cape	15.6	6th	1991	Equal 3rd-highest
Masterton	19.6	27th	1943	4th-highest
Franz Josef	16.2	26th	1953	4th-highest
Haast	17.9	26th	1949	4th-highest
Brothers Island	17.4	27th	1997	4th-highest
Upper Hutt	18.8	27th	1972	Equal 4th-highest
Puysegur Point	17.3	7th	1978	Equal 4th-highest
Balclutha	15.5	26th	1972	Equal 4th-highest
Low records or near-records				
None observed				

Wind

The highest wind gust was 139 km/h, observed at Cape Turnagain on 14 March.

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

Location	Extreme wind gust (km/h)	Date of extreme gust	Year records began	Comments
Te Puke	67	8th	1987	Equal 2nd-highest
Secretary Island	128	7th	1994	3rd-highest
Waiouru Airstrip	91	27th	1970	4th-highest

Cloud and fog

On 14 March, New Plymouth flights were cancelled, and forced to turn around due to fog. The fog was caused by a humid air mass and relatively light winds.

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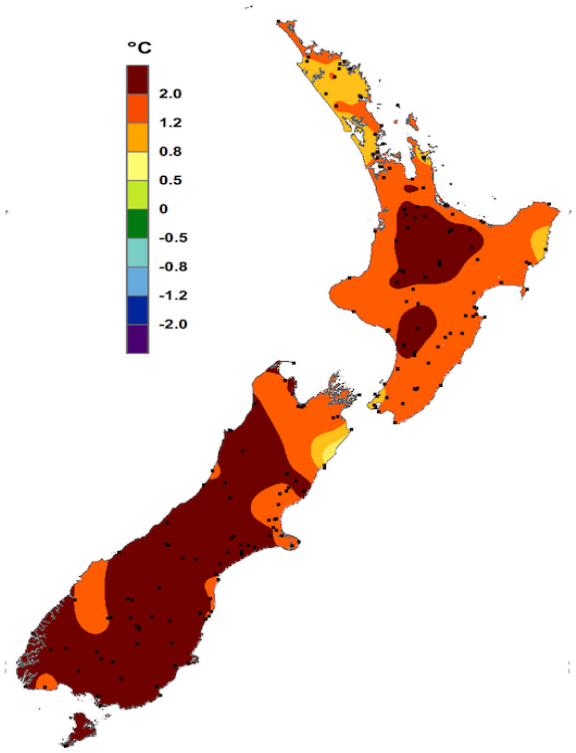

March temperature, expressed as a departure from the 1981-2010 average.

March was a very warm month with a vast majority of the country recording well above average temperatures.

Overall, the month ranked as the equal 2nd warmest March on record. The nationwide average temperature in March 2019 was 17.6°C (1.9°C above the 1981-2010 March average from NIWA's seven station temperature series which begins in 1909).

It has now been 26 months since New Zealand experienced a nationwide average temperature that was below average (0.51˚C to 1.20˚C below the 1981-2010 average).

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