

Dry for many locations; temperatures near to below average

Rainfall	March was dry for many locations in New Zealand, as below normal (50-79% of normal) to well below normal (<50% of normal) rainfall was observed in much of the upper North Island, Hawke's Bay, Tasman, Nelson, much of Marlborough, and large parts of Otago. Most notably, Whitianga only received 6% of its normal rainfall in March. Conversely, rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) in the lower North Island, northern Canterbury, and a small portion of western Waikato. Notably, Masterton received 303% of its normal March rainfall. Elsewhere, rainfall amounts were generally near normal (80-119% of normal).
Temperature	March temperatures were near average (-0.5°C to +0.5°C from average) across a vast majority of the North Island, Tasman, and West Coast. However, below average (0.51-1.20°C below average) and isolated well below average (<1.20°C below average) temperatures were observed across much of the eastern and lower South Island. Isolated above average (0.51-1.20°C above average) to well above average (>1.20°C above average) temperatures occurred near Cape Reinga and Farewell Spit.
Soil Moisture	As of 1 April, soil moisture levels remained below to well below normal across much of the North Island as well as near Nelson and small parts of the lower South Island. Meteorological drought receded significantly during March, but as of 1 April remained in place across parts of Northland, Auckland, and far northern Waikato. In addition, severe meteorological drought was found across the Coromandel Peninsula. Conversely, soil moisture levels were above to well above normal in the lower North Island and northern Canterbury.

Click on the link to jump to the information you require:

[Overview](#)

[Rainfall](#)

[Temperature](#)

[March 2020 climate in the six main centres](#)

[Highlights and extreme events](#)

Overview

March 2020 was characterised by below normal pressure to the northeast of the North Island and above normal pressure to the southeast of the South Island. This pressure setup was associated with a light easterly quarter wind flow anomaly.

March was a dry month for many locations across New Zealand, particularly in the upper North Island where parts of Northland, Auckland, and northern Waikato remain in meteorological drought and severe meteorological drought as of 1 April according to NIWA's New Zealand Drought Index. Notably, Whitianga only received 6% of its normal March rainfall, and through the first three months of 2020 had received only 24.8 mm of rain compared to a normal of 333 mm (7% of normal). Due to the long-

term dryness, on 12 March, Agriculture Minister Damien O'Connor classified the drought in the North Island, upper South Island, and the Chatham Islands as a large-scale adverse event, unlocking up to \$2 million in government funding to support farmers and growers through to June 2021 (see *Highlights and extreme events* for further details). However, heavy rain in the lower North Island and northern Canterbury during 28-30 March resulted in massive soil moisture increases and the cancellation of water restrictions in Christchurch and Banks Peninsula.

March temperatures were near average across nearly all of the North Island and the western South Island. However, due to the easterly wind flow anomaly during the month, eastern and southern portions of the South Island generally saw below average to even isolated well below average temperatures. The nationwide average temperature in March 2020 was 15.4°C, which is 0.3°C below the 1981-2010 March average from NIWA's seven station temperature series which begins in 1909.

New Zealand has not had a month with below average temperatures (i.e. more than 0.5°C below average) since January 2017, a period of 38 consecutive months.

Further Highlights:

- The highest temperature was 32.8°C, observed at Cheviot on 3 March. This was the warmest March temperature in New Zealand since 2017.
- The lowest temperature was -2.7°C, observed at Ranfurly on 18 March and at Pukaki on 24 March.
- The highest 1-day rainfall was 96 mm, recorded at Masterton on 28 March.
- The highest wind gust was 148 km/h, observed at Cape Turnagain on 20 March.
- Of the six main centres in March 2020, Auckland was the warmest, driest, and sunniest, Dunedin was the coldest, Wellington was the wettest, and Christchurch was the least sunny.
- Of the available, regularly reporting sunshine observation sites, the sunniest four locations in 2020 so far are Bay of Plenty (871 hours), Taranaki (864 hours), Greater Nelson (798 hours) and Waikato (795 hours).

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Rainfall: Another dry month in the upper North Island; wet in isolated areas

March was dry for many locations in New Zealand, as below normal (50-79% of normal) to well below normal (<50% of normal) rainfall was observed in much of the upper North Island, Hawke's Bay, Tasman, Nelson, much of Marlborough, and large parts of Otago. In fact, Whitianga only received 6% of its normal rainfall in March. Conversely, rainfall was above normal (120-149% of normal) or well above normal (>149% of normal) in the lower North Island, northern Canterbury, and a small portion of western Waikato. Notably, Masterton received 303% of its normal March rainfall. Elsewhere, rainfall amounts were generally near normal (80-119% of normal).

The dry start to 2020 continued across the upper North Island in March, with water storage significantly affected. At the end of March, Auckland's water storage levels dropped to 54%, which is 24% lower than the historical average level for the time of year.

In Northland, officials stated that water restrictions may continue through winter due to lack of rainfall. At the end of March, Whangarei's main dam was at 55% capacity and dropping. In Kaipara District, water was restricted to essential use only, while in the Far North, water restrictions remained in place as many water sources were below consent levels.

As of 1 April, soil moisture levels remained below to well below normal across much of the North Island as well as near Nelson and small parts of the lower South Island. Meteorological drought receded significantly during March, but as of 1 April remained in place across parts of Northland, Auckland, and far northern Waikato. In addition, severe meteorological drought was found across the Coromandel Peninsula. Conversely, soil moisture levels were above to well above normal in the lower North Island and northern Canterbury.

Record¹ 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				
Whitianga	9	6	1961	2nd-lowest
Auckland (Western Springs)	23	27	1948	4th-lowest

¹ 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.

Temperature: Near average to below average across most of New Zealand

March temperatures were near average (-0.5°C to +0.5°C from average) across a vast majority of the North Island, Tasman, and West Coast. However, below average (0.51-1.20°C below average) and isolated well below average (<1.20°C below average) temperatures were observed across much of the eastern and lower South Island. Isolated above average (0.51-1.20°C above average) to well above average (>1.20°C above average) temperatures occurred near Cape Reinga and Farewell Spit.

Despite the widespread near average to below average temperatures for March as a whole, the month actually began on a very warm note. Between 1-4 March, multiple locations across New Zealand set high maximum temperature records or near-records. This was due to warm northerly winds affecting the North Island, while Foehn westerlies and northwesterlies off the Southern Alps brought hot temperatures to Canterbury.

The nationwide average temperature in March 2020 was 15.4°C, which is 0.3°C below the 1981-2010 March average from NIWA's seven station temperature series which begins in 1909.

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

Location	Mean air temp. (°C)	Departure from average (°C)	Year records began	Comments
High records or near-records				
None observed				
Low records or near-records				
Alexandra	12.7	-2.2	1929	2nd-lowest

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

Location	Mean maximum air temp. (°C)	Departure from average (°C)	Year records began	Comments
High records or near-records				
Farewell Spit	22.9	2.2	1971	Highest
Low records or near-records				
Roxburgh	18.2	-2.2	1950	2nd-lowest
Mokohinau	21.1	-0.5	1994	4th-lowest
Cape Campbell	17.3	-0.9	1953	4th-lowest

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

Location	Mean minimum air temp. (°C)	Departure from average (°C)	Year records began	Comments
High records or near-records				
None observed				
Low records or near-records				
Clyde	5.2	-2.5	1978	2nd-lowest
Turangi	7.1	-2.2	1968	3rd-lowest
Te Kuiti	8.9	-2.0	1959	3rd-lowest
Ohakune	6.6	-1.5	1962	3rd-lowest
Matamata	9.6	-0.8	1999	3rd-lowest
Lake Tekapo	4.2	-1.8	1927	3rd-lowest
Hanmer Forest	4.6	-1.9	1906	3rd-lowest
Cromwell	5.8	-2.1	1949	3rd-lowest
Waiau	7.4	-0.9	1974	4th-lowest
Tiwai Point	8.4	-1.3	1970	4th-lowest
Taumarunui	7.9	-2.0	1947	4th-lowest
Manapouri	4.7	-1.5	1963	4th-lowest

March climate in the six main centres

March rainfall varied considerably across the main centres, with Auckland, Tauranga, and Dunedin having below or well below normal rainfall, while Wellington and Christchurch had above normal rainfall. Temperatures were near average or below average in all main centres. Of the six main centres in March 2020, Auckland was the warmest, driest, and sunniest, Dunedin was the coldest, Wellington was the wettest, and Christchurch was the least sunny.

March 2020 main centre climate statistics:

Temperature			
Location	Mean temp. (°C)	Departure from average (°C)	Comments
Auckland ^a	18.5	0.0	Near average
Tauranga ^b	18.1	-0.1	Near average
Hamilton ^c	17.0	+0.1	Near average
Wellington ^d	15.4	-0.4	Near average
Christchurch ^e	14.0	-0.9	Below average
Dunedin ^f	13.0	-0.7	Below average
Rainfall			
Location	Rainfall (mm)	% of normal	Comments
Auckland ^a	27	32	Well below normal
Tauranga ^b	41	42	Well below normal
Hamilton ^c	74	88	Near normal
Wellington ^d	121	142	Above normal
Christchurch ^e	58	128	Above normal
Dunedin ^f	44	68	Below normal
Sunshine			
Location	Sunshine (hours)		
Auckland ^a	210		
Tauranga ^b	195		
Hamilton ^g	198		
Wellington ^d	192		
Christchurch ^e	157		
Dunedin ^f	179		

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

Highlights and extreme events

Rain and slips

The highest 1-day rainfall was 96 mm, recorded at Masterton on 28 March.

On 17 March, ex-Tropical Cyclone Gretel passed just north of New Zealand, bringing moderate rainfall to the Far North and gusty winds to Great Barrier Island and East Cape. However, the vast majority of impacts remained well offshore and no damage was reported.

Heavy rain from 28-30 March across the lower North Island and northern Canterbury resulted in substantial improvements in soil moisture levels, especially in Wairarapa and Kaikoura.

Steady rain on 30 March in Tararua District increased water levels in the Tamaki River and Mangapapa Stream, allowing for water to be removed for use in Dannevirke and Woodville. However, water restrictions were not lifted.

Drought and water restrictions

As of early March, severe meteorological drought was widespread across the entire upper North Island, East Cape, parts of interior Manawatu-Whanganui, and much of interior Marlborough. Meteorological drought also covered large swaths of the central North Island and upper South Island. By late March meteorological drought had receded significantly, but remained in place across parts of Northland, Auckland, and far northern Waikato. In addition, severe meteorological drought was still found across the Coromandel Peninsula.

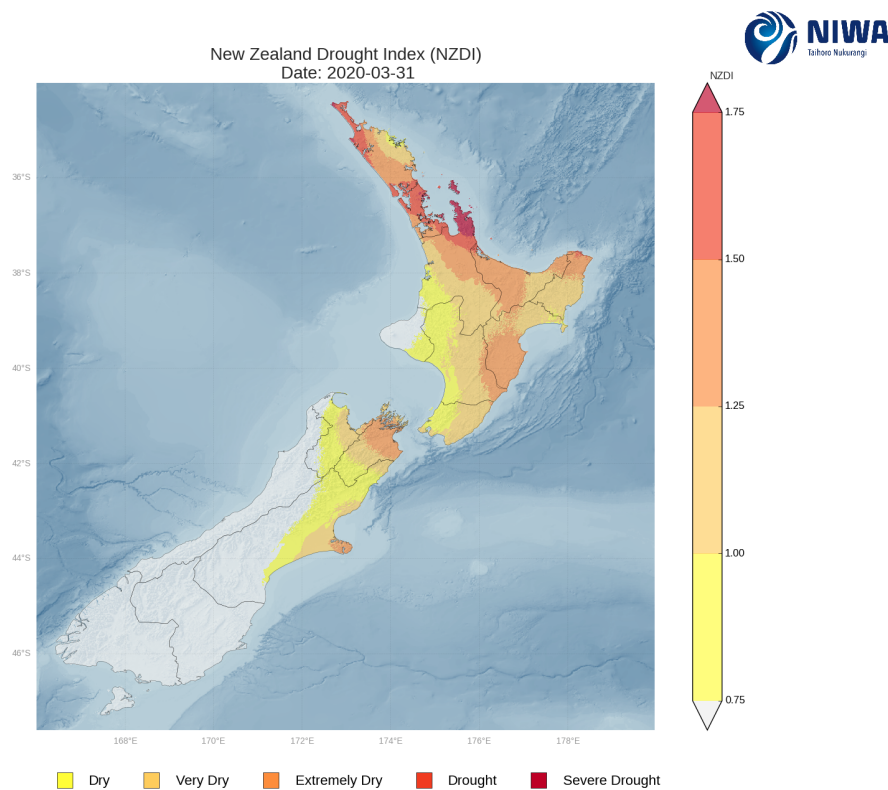


Figure showing New Zealand Drought Index status at the end of March 2020.

On 12 March, Agriculture Minister Damien O'Connor classified the drought in the North Island, upper South Island, and the Chatham Islands as a large-scale adverse event, unlocking up to \$2 million in government funding to support farmers and growers through to June 2021. Drought relief was also extended to Wairarapa and Hawke's Bay with \$90,000 in funding.

In addition, the Government committed \$2 million to set up temporary water supplies in Kaikohe and Kaitaia.

At the end of March, Auckland's water storage levels dropped to 54%, which is 24% lower than the historical average level for the time of year.

In Northland, water restrictions may continue through winter due to lack of rainfall. At the end of March, Whangarei's main dam was at 55% capacity and dropping. In Kaipara District, water was restricted to essential use only. In the Far North, water restrictions remained in place as many water sources were below consent levels.

Significant rainfall in late March allowed for all water restrictions in Christchurch and Banks Peninsula to be lifted.

In the first three months of 2020, Auckland (Mangere) received 48 mm of total rainfall, which is only 22% of normal during January-March.

During January-March 2020, Whitianga received only 24.8 mm of total rainfall, which is a mere 7% of normal during that three-month period.

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
Masterton	96	28th	1926	2nd-highest
Tiwai Point	48	7th	1970	3rd-highest

Temperatures

The highest temperature was 32.8°C, observed at Cheviot on 3 March. This was the warmest March temperature in New Zealand since March 2017.

The lowest temperature was -2.7°C, observed at Ranfurly on 18 March and at Pukaki on 24 March.

Despite the widespread near average to below average temperatures for March as a whole, the month actually began on a very warm note. Between 1-4 March, multiple locations across New Zealand set high maximum temperature records or near-records. This was due to warm northerly winds affecting the North Island, while Foehn westerlies and northwesterlies off the Southern Alps brought hot temperatures to Canterbury.

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	30.3	4th	1962	Highest
Hanmer Forest	32.6	2nd	1906	Highest
Ohakune	27.9	1st	1962	2nd-highest
Farewell Spit	26.2	20th	1971	2nd-highest
Five Rivers	28.2	2nd	1982	2nd-highest
Leigh	29.3	8th	1966	3rd-highest
Hamilton (Ruakura)	30.3	3rd	1906	3rd-highest
Te Kuiti	31.1	1st	1959	3rd-highest
Cheviot	32.8	3rd	1982	3rd-highest
Kaitaia	28.6	3rd	1948	Equal 3rd-highest
Auckland (Airport)	27.9	1st	1959	Equal 3rd-highest
Wairoa	31.8	3rd	1964	Equal 3rd-highest
Whatawhata	29.8	1st	1952	4th-highest
Rangiora	31.5	3rd	1965	4th-highest
Le Bons Bay	27.1	3rd	1984	4th-highest
Hicks Bay	26.5	4th	1969	Equal 4th-highest
Hawera	25.9	3rd	1977	Equal 4th-highest
Low records or near-records				
Porirua	13.6	28th	1972	Lowest
Ngawi	12.5	28th	1972	2nd-lowest
Port Taharoa	17.4	24th	1974	3rd-lowest
Stratford	12.1	28th	1972	3rd-lowest
Martinborough	13.6	28th	1986	Equal 3rd-lowest
Paraparaumu	13.8	28th	1972	Equal 3rd-lowest
Hawera	13.8	28th	1977	Equal 3rd-lowest
Hicks Bay	16.4	17th	1972	4th-lowest
Waiau	10.6	29th	1974	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				
Whangaparaoa	20.1	4th	1982	Highest
Mokohinau	20.8	4th	1994	3rd-highest
Cape Reinga	19.9	2nd	1971	Equal 3rd-highest
Kaitaia	21.2	4th	1948	4th-highest
Kaikohe	19.8	4th	1973	4th-highest

Whakatane	20.3	4th	1975	4th-highest
Paeroa	20.4	4th	1971	Equal 4th-highest
Low records or near-records				
Christchurch (Airport)	-1.3	18th	1863	Lowest
Le Bons Bay	3.5	24th	1984	Lowest
Clyde	-1.6	29th	1978	Lowest
Brothers Island	9.4	24th	1997	2nd-lowest
Nugget Point	3.5	24th	1970	Equal 3rd-lowest
Franz Josef	1.6	24th	1953	4th-lowest
South West Cape	5.0	24th	1991	4th-lowest
Whakatu	2.1	25th	1965	Equal 4th-lowest
Rangiora	0.0	18th	1965	Equal 4th-lowest

Wind

The highest wind gust was 148 km/h, observed at Cape Turnagain on 20 March.

On 17 March, gusty winds in New Plymouth resulted in several calls to FENZ for a variety of incidents including: a fallen tree blocking part of SH3, loose roofing iron, trampolines becoming airborne, trees falling on powerlines and a roof, and mobile scaffolding blowing across a street and hitting parked cars.

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
Oamaru	100	23rd	1984	Highest
Reefton	50	23rd	1999	Equal 2nd-highest
Port Taharoa	95	24th	1978	3rd-highest
Te Puke	57	17th	1987	4th-highest
Motu	82	17th	1991	4th-highest
Baring Head	137	29th	1991	4th-highest

Lightning and hail

On 30 March, a lightning strike early in the morning took out power to most customers north of the city of Gisborne in the Gisborne Region. However, power was restored to customers within about 25 minutes.

Snow and Ice

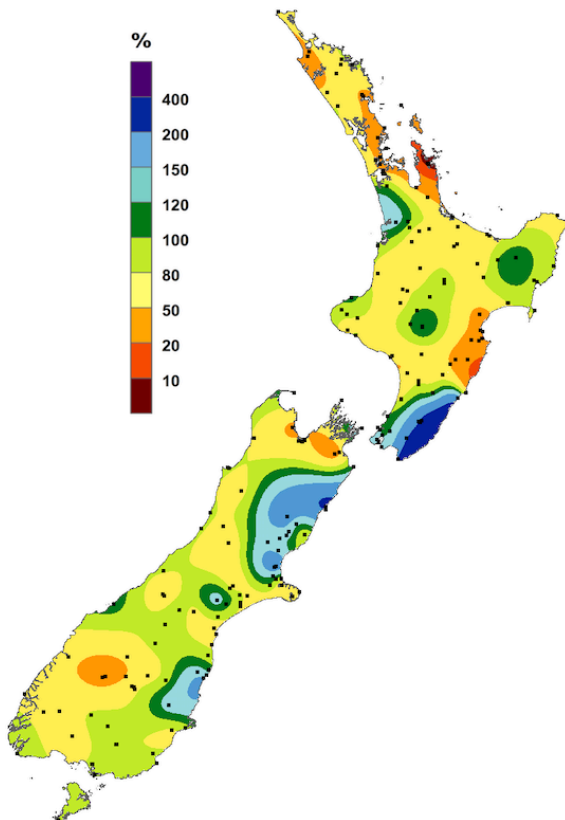
On 23-24 March, light snow occurred behind a southerly change in the lower South Island. Three centimetres accumulated in Naseby, with a dusting on the hills near Mossburn and the Lakes District. Danseys Pass Road was restricted to four-wheel drive only.

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March 2020 rainfall expressed as a percentage of normal (1981-2010 normal).

March was dry for many locations in New Zealand, as below normal to well below normal rainfall was observed in much of the upper North Island, Hawke's Bay, Tasman, Nelson, much of Marlborough, and large parts of Otago. Conversely, rainfall was above normal or well above normal in the lower North Island, northern Canterbury, and a small portion of western Waikato.

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