NIWA NATIONAL CLIMATE CENTRE

Seasonal Climate Summary

NIWA Taihoro Nukurangi

Aotearoa New Zealand Climate Summary: **Summer 2020-21** Issued: 4 March 2021

Dry for much of the country, near average temperatures

Rainfall	Summer rainfall was below normal (50-79% of normal) or well below normal (<50% of normal) for the majority of the North Island, and much of the northern half of the South Island. Above normal summer rainfall (120-149% of normal) was observed in eastern parts of central and north Otago. Summer rainfall was typically near normal elsewhere (80-119% of normal).
Temperature	Summer temperatures were near average (±0.50°C of average) for the majority of New Zealand. Above average temperatures (+0.51°C to +1.20°C of average) were observed in parts of northern Auckland, Waikato, Bay of Plenty, and a few isolated locations in Hawke's Bay, Tasman, Canterbury and Otago.
Soil moisture	Below normal soil moisture levels were a prominent theme throughout the season, which reflected the lack of rainfall observed in many areas. The main exceptions were coastal parts from Taranaki to Wellington in December, parts of Otago and Southland in January, and parts of the Far North in February where soil moisture levels were temporarily above normal due to notable rainfall events. At the end of summer, soil moisture levels were below or well below normal across most of the country.

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Overview

Summer 2020-21 was characterised by lower than normal mean sea level pressure east of the North Island, with above normal pressure in the Tasman Sea. This pressure set up was associated with a slight southwest airflow anomaly for most of Aotearoa New Zealand. This airflow pattern was influenced by a non-traditional variety of La Niña in the tropical Pacific - typically, New Zealand experiences more northeasterly winds during La Niña summers.

It was a dry summer for much of the country, especially in parts of Waikato, Bay of Plenty, Hawke's Bay, Wairarapa and Marlborough where rainfall totals were well below normal (<50% of the summer normal). Summer rainfall was typically below normal (50-79% of the summer normal) for the remainder of the North Island, although near normal rainfall was observed in parts of Taranaki, Manawatū, Kapiti Coast and Wellington. Summer rainfall was below normal or near normal (80-119% of the summer normal) in most of the South Island. The exception was eastern parts of central and north Otago, where above normal rainfall was observed (120-149% of the summer normal). This was largely as a result of heavy rainfall over several days early in January, which caused widespread flooding issues in Otago (see *Highlights and extreme events* section for further details).

The lack of rainfall compared to normal contributed to below normal soil moisture levels for many parts of New Zealand throughout summer.

Summer temperatures were near average (-0.50°C to +0.50°C of the summer average) for the majority of New Zealand. This was reflected in the nationwide average temperature which was 16.9˚C (0.2°C warmer than the 1981-2010 summer average, using NIWA's seven-station temperature series which begins in 1909). Exceptions to the near average temperatures occurred in parts of northern Auckland, Waikato, Bay of Plenty, and a few isolated locations in Hawke's Bay, Tasman, Canterbury and Otago. These locations observed above average temperatures (+0.51°C to +1.20°C of the summer average). Although mean temperatures were relatively unremarkable, exceptionally hot temperatures were recorded in eastern parts of New Zealand in late-January. Ashburton recorded a maximum temperature of 39.3°C on 26 January, which is equal to New Zealand's 11th-hottest temperature on record. On this day, 11 stations in the eastern South Island recorded maximum temperatures above 37.0°C.

Further Highlights:

- The highest temperature was 39.3˚C, observed at Ashburton on 26 January. This equalled New Zealand's 11th-hottest temperature on record.
- The lowest temperature was -2.3˚C, observed at Lake Tekapo on 27 December.
- The highest 1-day rainfall was 132 mm, recorded at Arthur's Pass on 19 January.
- The highest wind gust was 180 km/h, observed at Cape Turnagain on 12 December.
- Of the six main centres, Tauranga was the warmest, sunniest and driest, Wellington was the wettest and least sunny, and Dunedin was the coolest.
- Of the available, regularly reporting sunshine observation sites, the sunniest four locations in 2021 so far are Taranaki (602 hours), Marlborough (573 hours), Hawke's Bay (564 hours) and Bay of Plenty (559 hours).

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Rainfall: Dry for most, wet in eastern parts of central and north Otago

It was a dry or very dry summer in many parts of the country. Most notably, Taupō and Mt Cook Airport observed their lowest summer rainfall total on record. These locations received just 38% and 32% of their normal summer rainfall, respectively. Masterton also received just 32% of its normal summer rainfall. In contrast, it was a wet summer in eastern parts of central and north Otago, which was partly due to heavy rainfall occurring over several days in early-January. Oamaru received 261 mm, which is equivalent to 55% of its normal annual rainfall. Of this total, 107 mm was recorded in the 5-day period from 1-5 January.

Record[1,2] or near-record summer rainfall totals were recorded at:

Location	Rainfall total (mm)	Percentage of normal	Year records began	Comments
High records or near-records				
Windsor	228	131	2000	3rd-highest
Oamaru	261	196	1941	4th-highest
Low records or near-records				
Taupō	91	38	1949	Lowest
Mt Cook Airport	377	32	1928	Lowest
Waiouru	111	45	1950	2nd-lowest
Matamata	107	45	1951	3rd-lowest
Masterton	59	32	1926	3rd-lowest
Takapau Plains	126	56	1962	4th-lowest

Temperature: Near average summer temperatures across the country

Summer temperatures were near average for most of the country, and no locations observed record or near-record mean temperatures for the season. This is in stark contrast to the last several summers, which produced numerous record or near-record mean temperatures. Notably, many locations observed mean maximum temperatures that were higher than average, combined with mean minimum temperatures that were lower than average (i.e. an enhanced diurnal temperature range compared to normal). It is likely that clearer than usual skies combined with drier than usual soils contributed to this temperature pattern, by enabling enhanced radiative heating (cooling) during the day (night).

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

Location	Mean air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
None observed				
Low records or near-records				
None observed				

[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.

[2] All normal values in this climate summary are compared to the 1981-2010 normals.

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

Location	Mean maximum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
Matamata	25.9	2.3	1999	3rd-highest
Hicks Bay	23.0	1.7	1969	3rd-highest
Waipawa	25.1	1.5	1945	3rd-highest
Ohakune	22.4	2.0	1962	3rd-highest
Whangārei	25.5	1.5	1967	4th-highest
Whangaparāoa	24.1	1.3	1982	4th-highest
Te Kuiti	25.4	1.8	1959	4th-highest
Wairoa	26.1	2.2	1964	4th-highest
Hanmer Forest	24.9	2.4	1906	4th-highest
Low records or near-records				
None observed				

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

Location	Mean minimum air temp. (°C)	Departure from normal (°C)	Year records began	Comments
High records or near-records				
None observed				
Low records or near-records				
Te Kuiti	10.5	-1.8	1959	2nd-lowest
Whakatu	10.7	-1.3	1965	2nd-lowest
Motu	9.4	-0.9	1990	3rd-lowest
Mt Ruapehu, Chateau	5.9	-0.7	2000	3rd-lowest
Matamata	11.4	-0.4	1999	4th-lowest

Summer climate in the six main centres

Tauranga received 845 hours of sunshine, making it the city's sunniest summer since records began in 1932. Summer temperatures were above average for Tauranga and Dunedin, and near average for the remaining main centres. It was a very dry season for main centres in the upper North Island, particularly in Tauranga which received just 38% of its normal summer rainfall. Of the six main centres, Tauranga was the warmest, sunniest and driest, Wellington was the wettest and least sunny, and Dunedin was the coolest.

Summer 2020-21 main centre climate statistics:

Temperature			
Location	**Mean temp. (°C)**	**Departure from normal (°C)**	**Comments**
Auckland[a]	19.6	+0.4	Near average
Tauranga[b]	19.7	+0.6	Above average
Hamilton[c]	18.0	0.0	Near average
Wellington[d]	16.5	0.0	Near average
Christchurch[e]	16.8	+0.2	Near average
Dunedin[f]	15.4	+0.7	Above average
Rainfall			
Location	**Rainfall (mm)**	**% of normal**	**Comments**
Auckland[a]	139	63%	Below normal
Tauranga[b]	100	38%	Well below normal
Hamilton[c]	153	59%	Below normal
Wellington[d]	194	85%	Near normal
Christchurch[e]	128	102%	Near normal
Dunedin[f]	190	86%	Near normal
Sunshine			
Location	**Sunshine (hours)**		
Auckland[a]	778		
Tauranga[b]	845		
Hamilton[g]	707		
Wellington[d]	669		
Christchurch[e]	701		
Dunedin[f]	696		

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

Highlights and extreme events

This section contains information pertaining to some of the more significant highlights and extreme events that occurred during summer 2020-21. Note that a more detailed list of significant weather events for summer 2020-21 can be found in the *Highlights and extreme events* section of NIWA's monthly Climate Summaries. These monthly summaries are available online, and may be viewed at the following website: https://www.niwa.co.nz/climate/monthly

Rain and slips

In early January, heavy rainfall caused significant flooding in parts of the lower South Island. Several locations observed record or near-record summer extreme 1-day rainfall totals. Between 150-200 holidaymakers had to be evacuated when the Otematata River burst its banks. Emergency services cleared about 50 campsites alongside the river. Another 200 people attending the Whare Flat Folk Festival northwest of Dunedin were stranded due to rising water levels on Silverstream. In Central Otago, the water supply for Patearoa was shut down due to the flooding, with a water tanker brought in for affected residents. The Patearoa Bridge was damaged by the floodwaters. In Middlemarch, residents were advised not to flush their toilets and avoid drinking water from bores as it was likely to be contaminated. Similarly, the Dunedin City Council advised residents to avoid flushing their toilets. Many roads were closed due to flooding and slips, including a stretch of SH1 between Maheno and Reidston, SH6 between Kingston and Queenstown, and SH83 from Otematata to Aviemore. A washout of the Kokonga Bridge closed part of SH87 between Kyeburn to Outram.

The highest 1-day rainfall was 132 mm, recorded at Arthur's Pass on 19 January.

Drought, water restrictions, and fire bans

Beginning the week of 11 January, Level 3 water restrictions were imposed in Kaitaia due to low flow in the Awanui River, while restrictions were extended by all three district councils in Wairarapa. Restrictions were also enacted in Kawakawa-Moerewa and Paihia. On 28 January, Level 4 restrictions were imposed in Waimarama by the Hastings District Council.

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

Location	Extreme 1-day rainfall (mm)	Date of extreme rainfall	Year records began	Comments
Islay Downs (Otago)	95	Jan-2nd	1969	Highest
Powder Creek (east Otago)	59	Jan-2nd	1993	2nd-highest
Clyde	63	Jan-2nd	1978	2nd-highest
Roxburgh	54	Jan-2nd	1946	3rd-highest
Ranfurly	53	Jan-1st	1897	4th-highest
Ophir	61	Jan-1st	1924	4th-highest
Lee Flat (Otago)	52	Dec-31st	1954	Equal 4th-highest

Temperatures

From 25-28 January, a very warm air mass originating in Australia combined with westerly Foehn winds resulted in widespread record and near-record temperatures across eastern New Zealand. On 26 January, Ashburton recorded 39.3°C. This was New Zealand's equal-11th hottest temperature on record, and the third-hottest day on record in the country (higher temperatures in New Zealand have only been observed on 7 February 1973, 6 February 2011 and 22 January 1908). Akaroa reached 38.0°C, shattering its all-time record by 2.5°C. Cheviot reached 37.9°C, breaking its all-time record by 0.1°C.

On 26 and 27 January, Christchurch Airport reached a daily maximum temperature of 37.1°C and 35.8°C, respectively. This is only the second time the city has exceeded 35°C on consecutive days since records began in 1863. The previous occurrence was on 5 and 6 February 1973, when the Christchurch Gardens station reached 35.2°C and 35.5°C, respectively.

Between 19-24 February, parts of northern Canterbury experienced a prolonged spell of temperatures exceeding 30°C. Hanmer Forest recorded six consecutive days above 30°C, with the average daily maximum temperature during this period reaching 33.3°C (this is 10.4°C higher than the average February daily maximum temperature at this site). It was the third summer in a row such a streak has been recorded at this location. Culverden and Cheviot recorded four consecutive days above 30°C during this period.

The highest temperatures for summer 2020-21 were observed on 26 January: 39.3˚C was observed at Ashburton, followed by 38.9°C at Wakanui, and 38.0°C at Akaroa.

The lowest temperature during summer was -2.3˚C, observed at Lake Tekapo on 27 December. This was followed by -1.3˚C at Manapouri on 1 December, and -1.1˚C at Mt Cook Airport on 28 December and Middlemarch on 17 February.

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

Location	Extreme maximum (°C)	Date of extreme temperature	Year records began	Comments
High records or near-records				
Masterton	35.6	Jan-27th	1906	Highest
Cheviot	37.9	Jan-26th	1982	Highest
Peel Forest (Canterbury)	37.0	Jan-26th	1973	Highest
Waipara West	37.4	Jan-26th	1973	Highest
Akaroa	38.0	Jan-26th	1978	Highest
Castlepoint	32.1	Jan-27th	1972	2nd-highest
Waipawa	35.4	Jan-27th	1945	2nd-highest
Mahia	32.6	Jan-28th	1990	2nd-highest
Blenheim	36.5	Jan-27th	1932	2nd-highest
Ashburton	39.3	Jan-26th	1928	2nd-highest
Christchurch	37.1	Jan-26th	1863	2nd-highest
Lincoln	37.2	Jan-26th	1881	2nd-highest
Le Bons Bay	31.7	Jan-26th	1984	2nd-highest
Orari Estate	38.3	Jan-26th	1972	2nd-highest
Ohakune	30.5	Jan-27th	1962	3rd-highest

Puysegur Point	25.4	Feb-23rd	1978	3rd-highest
Hanmer Forest	36.8	Jan-26th	1906	3rd-highest
Lake Tekapo	32.9	Jan-26th	1925	3rd-highest
Timaru	37.9	Jan-26th	1885	3rd-highest
Whitianga	31.9	Jan-6th	1962	Equal 3rd-highest
Ngawi	32.6	Jan-27th	1972	Equal 3rd-highest
Tiri Tiri Lighthouse	27.1	Jan-6th	1982	4th-highest
Matamata	31.7	Jan-27th	1999	4th-highest
Rotorua	30.4	Jan-26th	1964	4th-highest
Martinborough	33.1	Jan-26th	1986	4th-highest
Wairoa	36.4	Jan-27th	1964	4th-highest
Waiau	36.5	Jan-26th	1974	4th-highest
Low records or near-records				
Reefton	11.2	Jan-20th	1972	Lowest
Secretary Island	10.9	Feb-11th	1989	Equal lowest
Arthurs Pass	5.8	Jan-20th	1973	2nd-lowest
Te Anau	9.8	Jan-19th	1973	2nd-lowest
Manapouri	10.5	Jan-19th	1973	Equal 3rd-lowest
Whakatu	13.5	Dec-1st	1972	4th-lowest
Mt Ruapehu, Chateau	8.7	Jan-21st	2000	Equal 4th-lowest

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

Location	Extreme minimum (°C)	Date of extreme temperature	Year records began	Comments
Low records or near-records				
Whanganui	3.7	Dec-2nd	1937	2nd-lowest
Balclutha	-0.5	Dec-12th	1964	2nd-lowest
Appleby	1.0	Feb-17th	1932	Equal 2nd-lowest
Porirua	3.8	Dec-2nd	1968	3rd-lowest
Clyde	0.4	Dec-1st	1978	Equal 3rd-lowest
Rotorua	1.9	Dec-2nd	1964	4th-lowest
Motu	0.1	Dec-29th	1990	Equal 4th-lowest
High records or near-records				
Milford Sound	18.3	Feb-24th	1935	2nd-highest
Akaroa	22.2	Feb-24th	1978	2nd-highest
Wānaka	20.4	Feb-24th	1972	2nd-highest
Windsor	18.5	Jan-27th	2000	2nd-highest
Lumsden	20.4	Jan-27th	1982	2nd-highest
Te Anau	18.7	Jan-27th	1973	3rd-highest
Queenstown	19.5	Feb-24th	1871	4th-highest
Tiwai Point	17.7	Jan-27th	1972	4th-highest

Wind

The highest wind gust was 180 km/h, observed at Cape Turnagain on 12 December.

Record or near record summer extreme wind gusts were recorded at:

Location	Extreme wind gust (km/hr)	Date of extreme gust	Year records began	Comments
Secretary Island	161	Feb-24th	1994	2nd-highest
South West Cape	180	Jan-26th	1991	2nd-highest
Kaikohe	80	Feb-15th	1986	3rd-highest
Upper Hutt (Trentham)	96	Jan-19th	1999	3rd-highest
Tara Hills	96	Dec-2nd	1985	3rd-highest
Hāwera	96	Dec-1st	1986	Equal 3rd-highest
Mt Ruapehu, Chateau	104	Feb-16th	2000	4th-highest
Mt Kaukau (Wellington)	146	Dec-01st	1969	4th-highest
Mt Cook (Airport)	141	Feb-24th	2000	Equal 4th-highest

Lightning and hail

On 26 December, thunderstorms and hail brought widespread damage to the Tasman region. The hail shredded vineyards, smashed greenhouses, dented and bruised apples, kiwifruit and hops and severely damaging buildings in Motueka. The cost of the damage is thought to in the tens of millions of dollars.

Snow and Ice

On 11 December, light snow fell in parts of northern Southland, including on SH6 between Lumsden and Kingston and on Gorge Hill between Te Anau and Mossburn. A dusting of snow also accumulated in the Remarkables mountain range.

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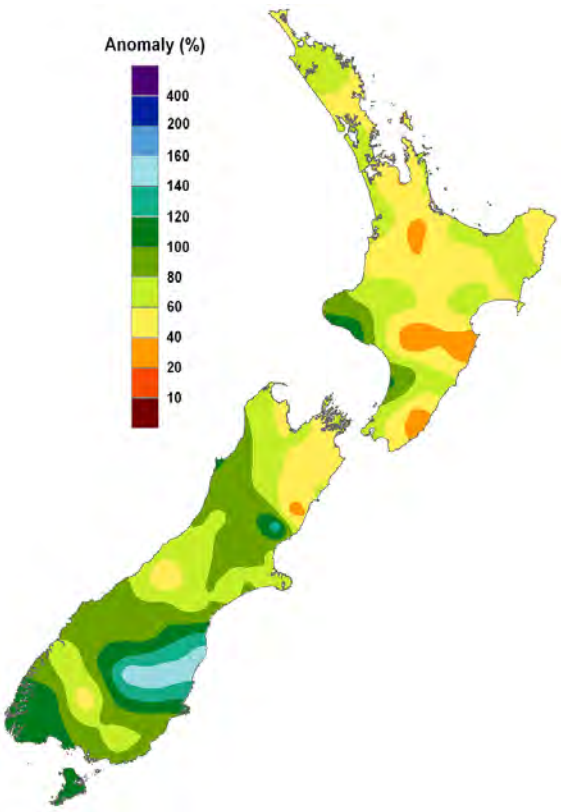
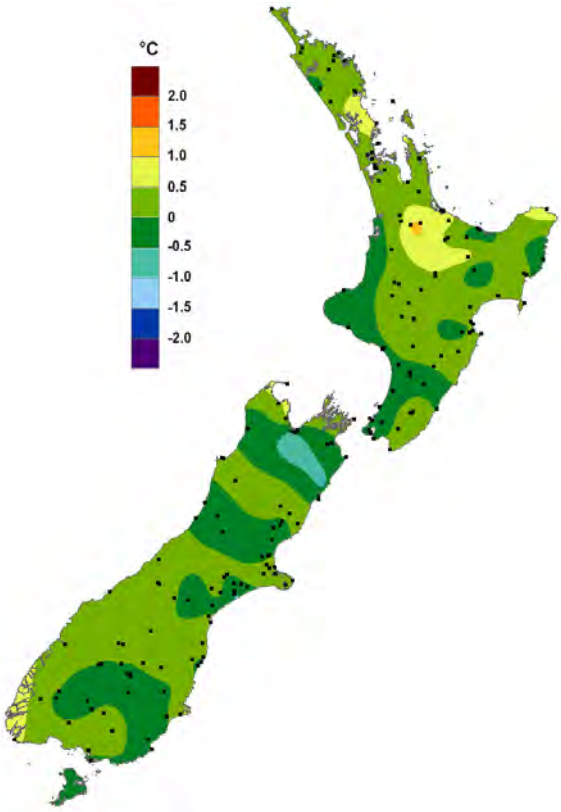


Summer rainfall
Expressed as a percentage of the 1981-2010 normal.



Summer temperature
Expressed as a departure from the 1981-2010 average in degrees Celsius.

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