

Hydrology of Marlborough Summary for August 2022

Report prepared by Charlotte Tomlinson, 6th October 2022.

Data from the Marlborough District Council's Environmental Monitoring network was primarily used in preparing this report and supplemented with data from sites operated by the Marlborough Research Centre, MetService, NIWA, and FENZ.

Executive Summary

Marlborough continues to experience a very wet winter, with a prolonged rainfall and subsequent flood event in mid-August. An 'atmospheric river' brought moist tropical air to northern Marlborough, while a blocking high to the east of the country meant this system remained over the area from the 17th to the 21st of August. The long duration of high intensity rainfall is what made this event so unique and caused widespread flooding and damage.

The MetService gauge-corrected rain radar map below (*Figure 1*) shows the areas with highest rainfall in dark red. The Bryant Range, Rai, and Pelorus areas experienced extremely high rainfall over the 3 days, with the Richmond Ranges as well as the Branch and Waihopai catchments receiving large rainfall amounts towards the end of the 3-day event. A comprehensive flood report is being prepared to cover this event in detail.

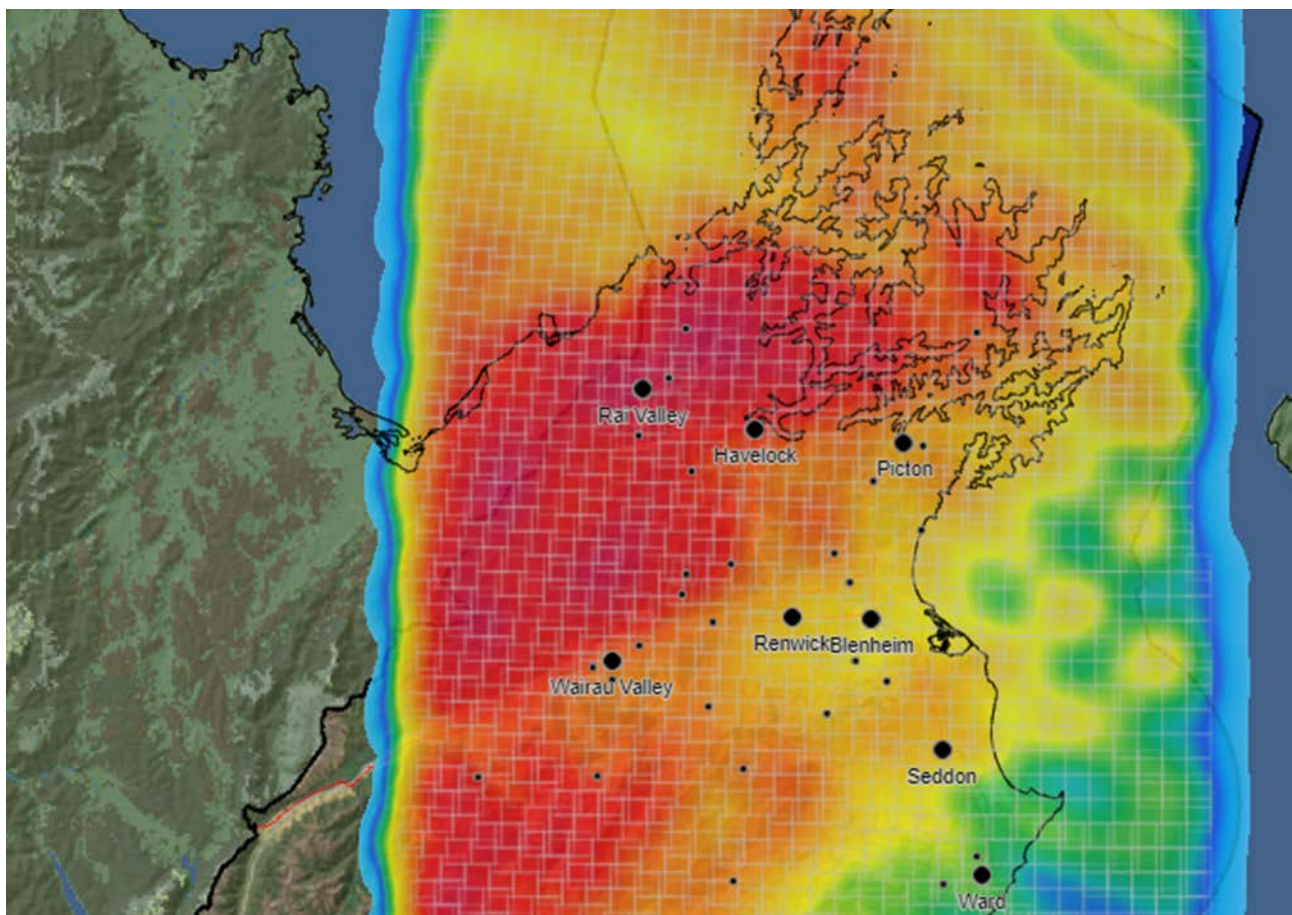


Figure 1. MetService gauge-corrected rain radar map, 16th to 21st August 2022.

Rainfall

Record rainfall totals were recorded in northern Marlborough over the rainfall event from the 16th to 21st of August. As can be seen below (*Figure 2*) the Tunakino, Rai at Rai Falls, and Wakamarina rainfall sites have all recorded the highest August rainfall total on record, well surpassing previous monthly maximums.

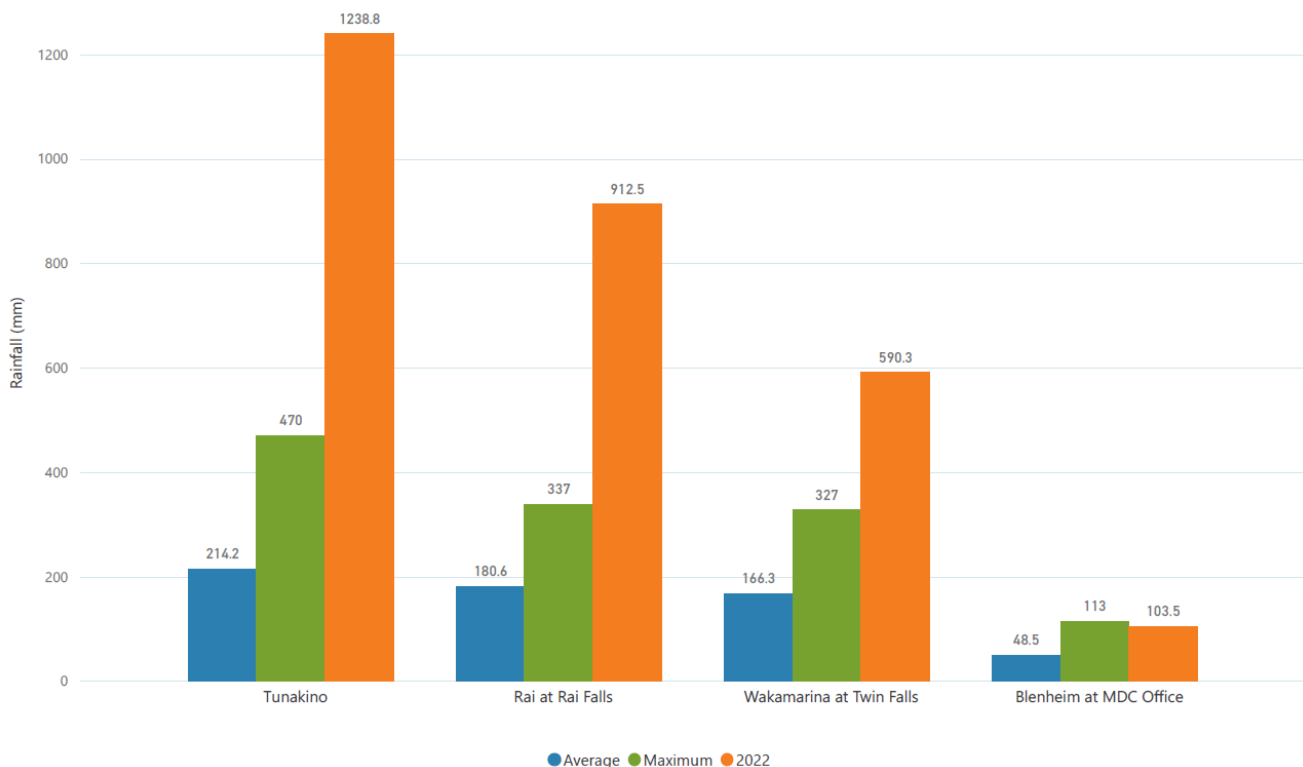


Figure 2. August 2022 rainfall at sites in Northern Marlborough.

The Tunakino raingauge recorded 1,238 mm of rain in August, of which 1,138 mm (over 1 metre) fell within the rainfall event. The rainfall measured at the Tunakino raingauge in this event now holds the record at that site for the highest 1-day, 2-day, 3-day and 4-day rainfall totals over 43 years of data collection.

High rainfall totals were also seen this month in the Upper Wairau, for example at the Branch rainfall site (see Figure 3 below), which recorded well over twice the average August rainfall.

Rainfall in the eastern areas of Marlborough (see Flaxbourne and Awatere at Awapiri rainfall graphs below) has returned to near average for August, after very high rainfall in July.

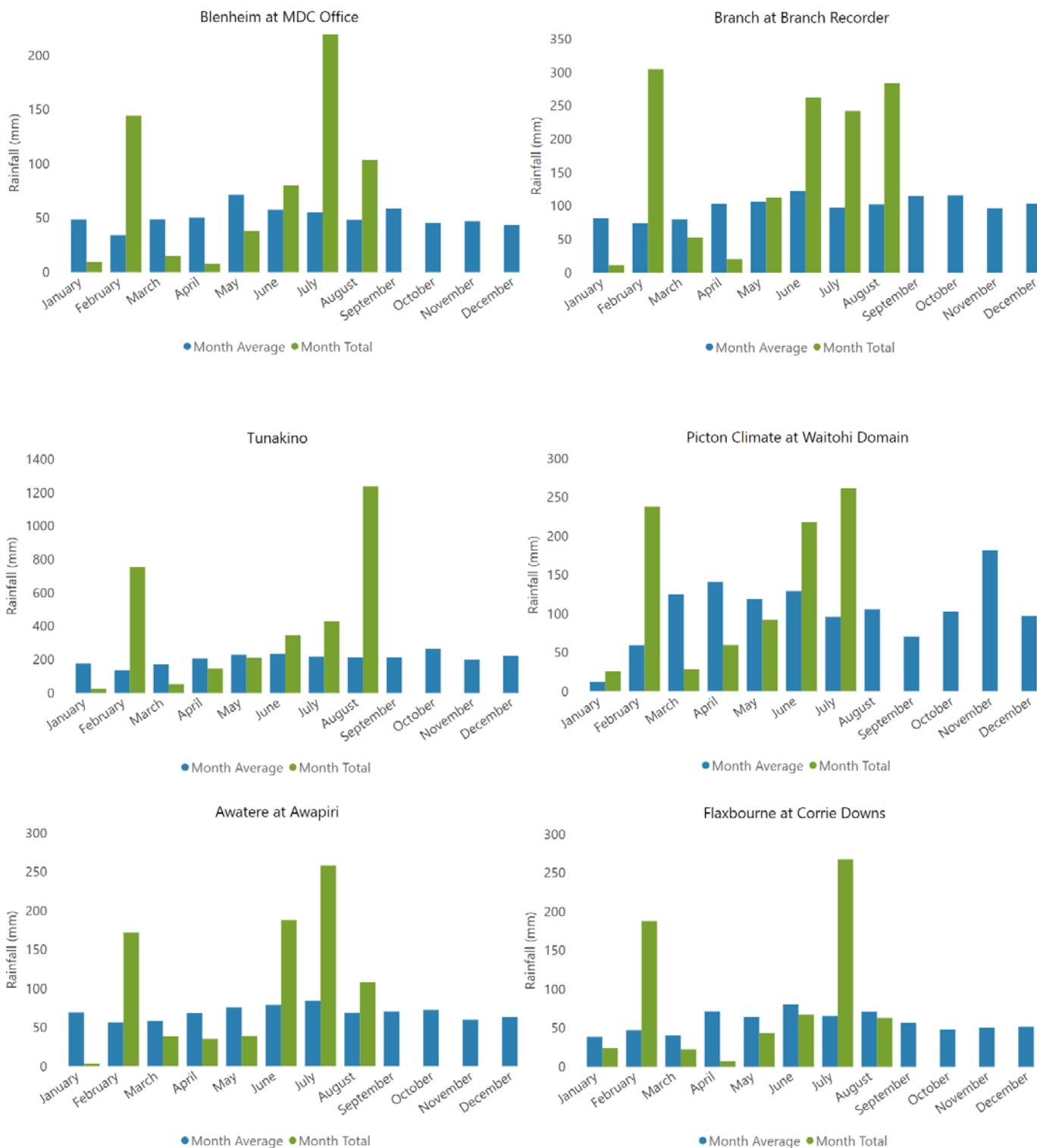


Figure 1. Year-to-date monthly rainfall totals from key sites around Marlborough, compared to average monthly rainfall totals.

Table 1. Monthly rainfall totals in Marlborough for and Year-to-date Rainfall Totals.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Tunakino	25.1	754.7	53.6	145.3	210.4	343.7	431.1	1238.8	3202.7
Rai at Rai Falls	32.1	544	48.1	118.4	214.4	338	394.2	912.5	2601.7
Rai Valley NRFA	26.8	590.6	48	148	200.4	346	418.8	735.2	2513.8
Wakamarina at Twin Falls	36.8	418.2	27.2	90.6	199.8	358.9	318.1	590.3	2039.9
Kaituna Rainfall at Higgins Bridge	13	283	31.5	81.5	111.5	254	287	365	1426.5
Kenepuru Head NRFA	7.4	373.2	51	95.8	105.4	360.6	469.2	516.2	1978.8
Koromiko NRFA	30.4	300.6	43.6	45	98.8	243.8	337	286.8	1386
Picton Climate at Waitohi Domain	25.6	237.9	28.4	59.6	92.2	218.2	261.6	315.8	1239.3
Waikawa at Boons Valley	67	164	20	40.5	77	114	138.5	143	764
Waikakaho	12.8	250.5	49	25.1	67.1	177.4	357.5	212.3	1151.7
Wairau at Narrows	8	215.5	25.5	36.5	83.9	156.6	291.5	246	1063.5
Rarangi at Driving Range	9.1	251.1	34.5	17.5	64.3	160.4	323.5	185.6	1046
Lansdowne NRFA	14	262.6	42.6	42.2	70.6	161.4	297.6	239	1130
Wairau Valley at Southwold	9.7	245.1	35.2	42.2	76.9	184.5	294.8	249.5	1137.9
Onamalutu at Hilltop Road NRFA	18.6	356.4	47.2	84.8	106		462	447.6	1522.6
Onamalutu at Bartletts Creek Saddle	13.3	331	47	85.5	118.9	326.2	458.6	450	1830.5
Top Valley at Staircase Ridge	16.9	357	58.9	114.5	116.3	320	388.4	430.1	1802.1
Red Hills	21.5	217	78.5	46	136.9	246.6	235.5	250.5	1232.5
St Arnaud NRFA	30.6	214	79.4	58.4	173.6	338.4	208.4	199.4	1302.2
Malings	25.5	373.5	23	87.5	142.5	307.5	200.5	275.5	1435.5
Branch at Branch Recorder	10.8	304.3	52.7	20.4	112.6	262.2	241.8	283.4	1288.2
Wye at Charlies Rest	20.7	250	32.9	29.7	93.6	194.7	215.2	197	1033.8
Waihopai at Spray Confluence	6.1	199.3	34.4	36.3	73	186.7	235.1	163.4	934.3
Tor Darroch NRFA	19.4	216.2	32.4	49.2	76.2	170.4	247.8	163.8	975.4
Waihopai at Craiglochart	8.7	204.1	19.5	29.3	56	125	206.2	114	762.8
Omaka at Ramshead Saddle	7.3	191.4	21	53.4	63.4	140.2	210	148.7	835.4
Taylor at Tinpot	8.5	216.4	22.4	37.8	75.2	141.5	309.8	125.1	936.7
Taylor at Taylor Pass Landfill	8	145.6	13.9	9.3	56.4	88.6	226.5	109	657.3
O Dwyers Road NRFA	13.2	210.6	29.4	19.4	55.8	121.8			450.2
Wither Hills NRFA								87.2	87.2
Blenheim at MDC Office	9.5	144.5	15	8	38	62.5	219.5	103.5	600.5
Beneagle at Farm Stream	9.5	157.4	21.3	12.8	75.9	86.4	251.2	87	701.5
Flaxbourne at Corrie Downs	24	188	22	7.1	43.7	67.4	267.4	63	682.6
Awatere at Awapiri	3.4	166.9	45.9	40.3	35.3	153.6	151.5	64.5	661.4
Awatere Glenbrae NRFA	8.4	161.2	28.4	12	35.4	60.8	168.6	57.4	532.2
Mid Awatere Valley NRFA	2	158.6	26.8	21.4	54	128.8	180.8	77.6	650
Molesworth NRFA	8.8	180.4	20.2	11.8	58.6	182.4	152.4	99.2	713.8
Lake Elterwater	19.2	203.8		10.7	47.5	61.3	288.5	63	694
Ward NRFA	29.4	192	40	22.6	65.8	77.2	294	65	786
Te Rapa	52.1	251.4	46.8	30.8	70.6	72.3	367.3	81	972.3
Pudding Hill NRFA	11.2	211	16.6	15.6	76.4	144	98.2	124	697
Upper Clarence NRFA	12	180.2	19.4	5	42	91.2	92.6	34.2	476.6

River Flows

Rivers in Marlborough followed a general trend throughout August, with highest river flows in the north of the region, and comparatively lower flows in the eastern rivers. All rivers throughout the region have a mean flow well above their monthly average, reflecting the high rainfall over the winter months.

Table 2. A summary of river flows in Marlborough for August 2022.

River	Site	August mean flow 2022 (m ³ /s)	August mean flow all records (m ³ /s)	% of monthly average	Records begin	Catchment area (km ²)
Pelorus	Bryants	133.59	24.86	537	1977	375
Rai	Rai Falls	77.07	15.74	489	1979	211
Kaituna	Higgins Bridge	22.73	7.63	298	2006	133
Branch	Intake Weir	73.15	24.56	298	1958	550
Wairau	Barnetts Bank	533.59	118.09	452	1960	3,430
Wairau	Dip Flat	114.58	28.48	402	1951	505
Onhinemahuta	Domain	5.39	1.67	323	1998	33
Waihopai	Craiglochart	65.90	18.99	347	1960	764
Awatere	Awapiri	38.24	18.82	203	1977	987
Omaka	Gorge	4.06	2.17	187	1994	90
Taylor	Borough Weir	2.12	1.43	149	1961	64
Flaxbourne	Corrie Downs	4.18	1.26	331	2003	70

The Pelorus River recorded three large flood peaks during the rainfall event 16-21st August, with an estimated peak flow of 1,700 m³/s. This flood has an Average Recurrence Interval (ARI) of 17 years. The Rai River had a similar pattern of three flood peaks, as can be seen below in Figure 4. The estimated peak flow was 865 m³/s, with an ARI of 60 years. This is also the largest flood on record for the Rai River.

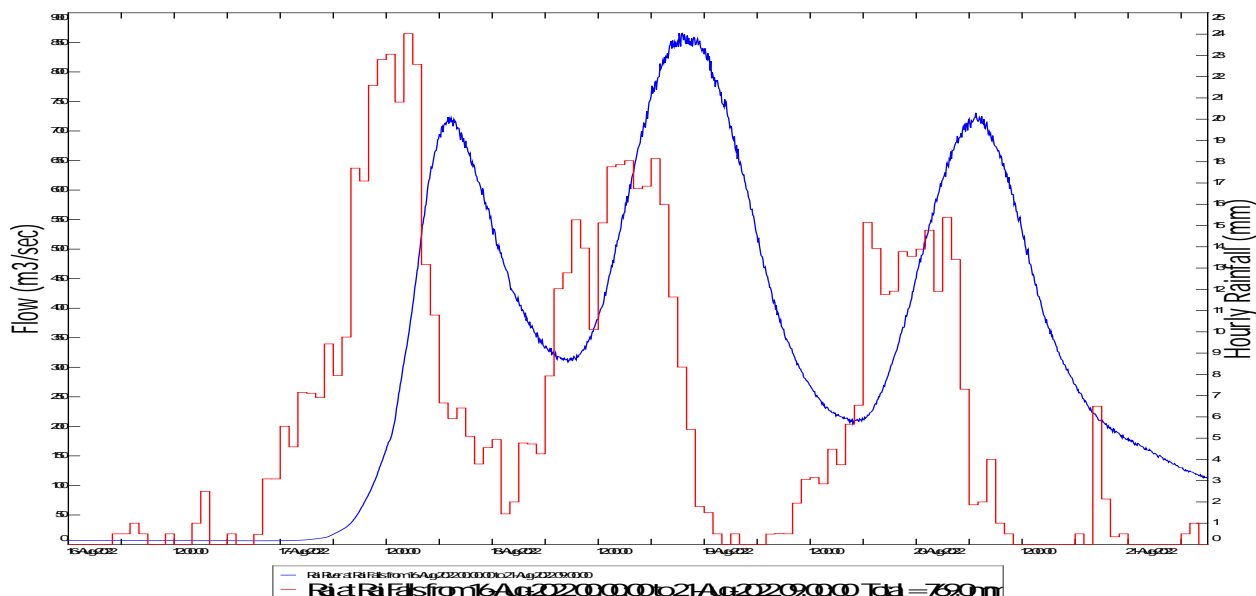


Figure 1. Rai River flow (m³/s), along with hourly rainfall totals for Rai Falls, 16th to 21st August 2022.

Soil Moisture

High rainfall throughout the region over the winter months has led to soils at field capacity in Marlborough, as can be seen in the right-hand image below (Figure 5). The soil moisture anomaly map (Figure 6) shows Marlborough soils are wetter than normal for this time of year, especially on the east coast.

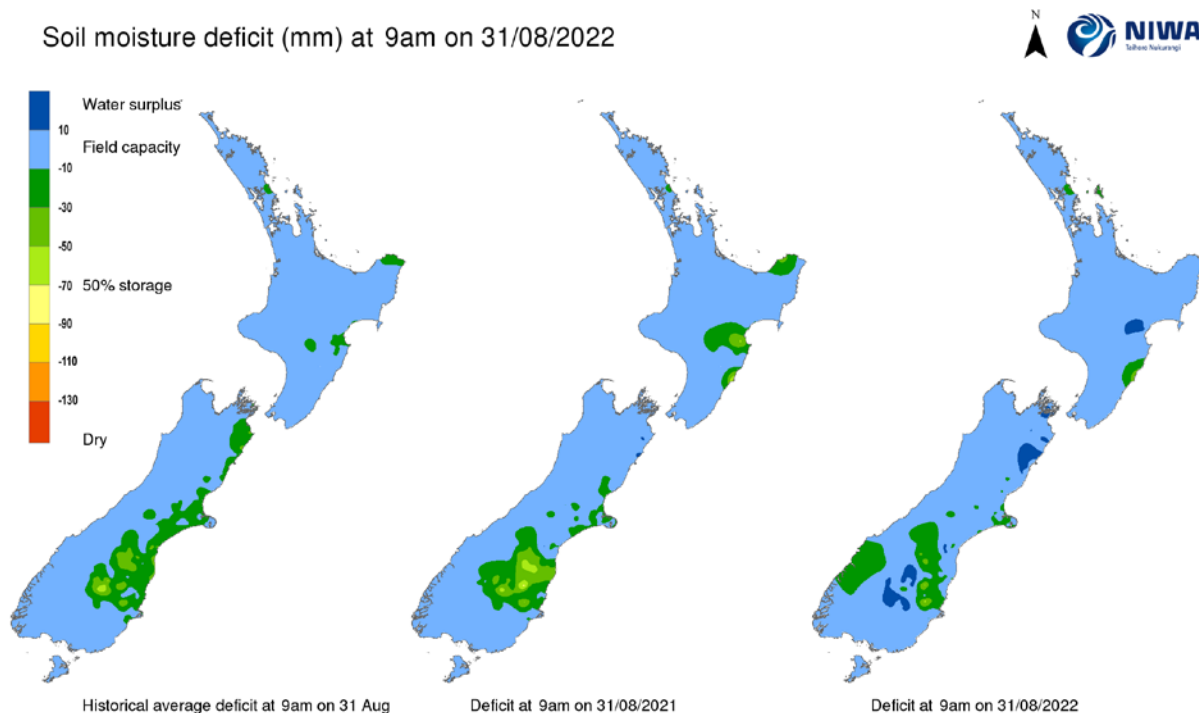


Figure 2. Soil moisture deficit maps of New Zealand, retrieved from NIWA on 31/08/2022

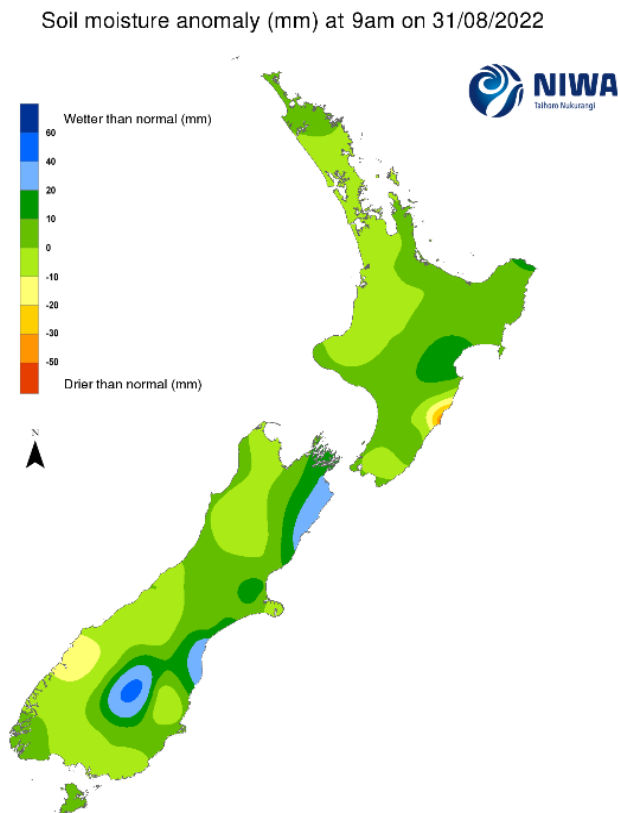


Figure 6. Soil moisture anomaly map of New Zealand, retrieved from NIWA 31/08/2022.

Seasonal Climate Outlook August-November 2022

The current negative Indian Ocean Dipole (IOD) event will be an important climatic driver in early spring, with warmer and more active waters in the north Tasman Sea likely to bring more frequent northerly rain events to New Zealand.

La Niña conditions re-strengthened throughout August and are also expected to be an important driver for the New Zealand climate this spring. This could lead to a ‘triple dip’, meaning La Niña conditions span three consecutive Southern Hemisphere summers.

River flows remain high following on from a wet winter, but over the next 3 months river flows and soil moisture are expected to return to near normal.

The predictions for Marlborough/Tasman from September to November are:

🌡️ Temperature – above average

☁️ Rainfall – near average

🌿 Soil Moisture – near average

🌊 River Flows – near average