

Water Resources Update

February 2024



Report prepared by Charlotte Tomlinson, 10th March 2024.

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

Executive Summary

Blenheim is now in the 9th month of below-average rainfall, with 206.8 mm recorded from June 2023 to February 2024. This is the lowest rainfall total for this 9-month period in 94 years (1930-2024).

Summer 2023/24 is also setting records. Blenheim recorded 32.8 mm of rainfall this summer, the 2nd lowest summer rainfall total in 94 years. The lowest summer rainfall total of 27.2 mm was recorded during the notable 2000-01 drought. Summer 2023/24 has also recorded the largest summer water deficit on record, with a potential water deficit of -422.9 mm (records begin in 1996).

While some areas recorded close to average rainfall in December, January and February rainfall have been well below average throughout the region. Marlborough generally only needs 6-8 weeks of dry weather to cause water shortage issues, which we are now seeing particularly to the south of the region. Total summer rainfall was below 50% of average on the Wairau Plains, as well as in the Wairau Valley, Waihopai, Rarangi, Taylor Pass, Awatere Valley, Seddon, Flaxbourne, and the Molesworth.

Water restrictions have been generally moderate through summer, with small amounts of rainfall arriving at opportune times to delay full restrictions on the largest rivers in Marlborough. In the Awatere, there have been 28 days of Class B restrictions this irrigation season (to the end of February), while Class A has been restricted to 80% of full use for 7 days this season. The Wairau River Class A has remained unrestricted through summer this irrigation season.

Shallow soil moisture remains very low in Blenheim, with an average of 15.1% for February. This is well below the long-term average of 18.9%. The national soil moisture maps show large parts of Marlborough have extremely dry soils, and "extremely drier than normal" soils are present in parts of the Marlborough Sounds and large parts of the Wairau and Awatere Valleys.

The first week of March will bring some rain to Marlborough, but likely not enough to ease the long-term soil moisture deficit. Although the El Niño Southern Oscillation (ENSO) is expected to return to neutral by the end of autumn, El Niño conditions will continue as the atmosphere catches up with ocean conditions. From mid-March into April, dry conditions are expected to continue in the region, along with more north-westerly winds than average.

Climate

February was filled with warm days and cool nights, with a higher than average daily temperature variation of 12.7°C. The mean temperature in Blenheim was 18.0°C, which is 0.1°C above the long-term average. The 6th of February was the hottest day of the month, recording 38.4°C in the Upper Clarence, 37.8°C in the Awatere Valley at Awapiri, and 32.3°C in Blenheim.

Blenheim recorded 287.4 sunshine hours, making February 2024 the 7th sunniest on record in the 94 years 1930 to 2024.

Rainfall

Blenheim at the Marlborough Research Centre recorded 12.6 mm of rainfall in February, bringing the summer rainfall total to 32.8 mm, which is just 24% of the long-term average. This is the 2nd lowest summer rainfall total for Blenheim in 94 years (1930-2024). The lowest summer rainfall total of 27.2 mm was recorded during the notable drought of 2000-01.

Low rainfall coupled with high evapotranspiration (see Figure 1) led to summer 2023/24 having the largest summer water deficit on record (records begin in 1996). The potential water deficit in Blenheim was -422.9 mm for summer 2023/24, which is 156% of the long-term average. In comparison, the 2000-01 drought recorded a potential water deficit of -392.9 mm in Blenheim (see Table 1 below).

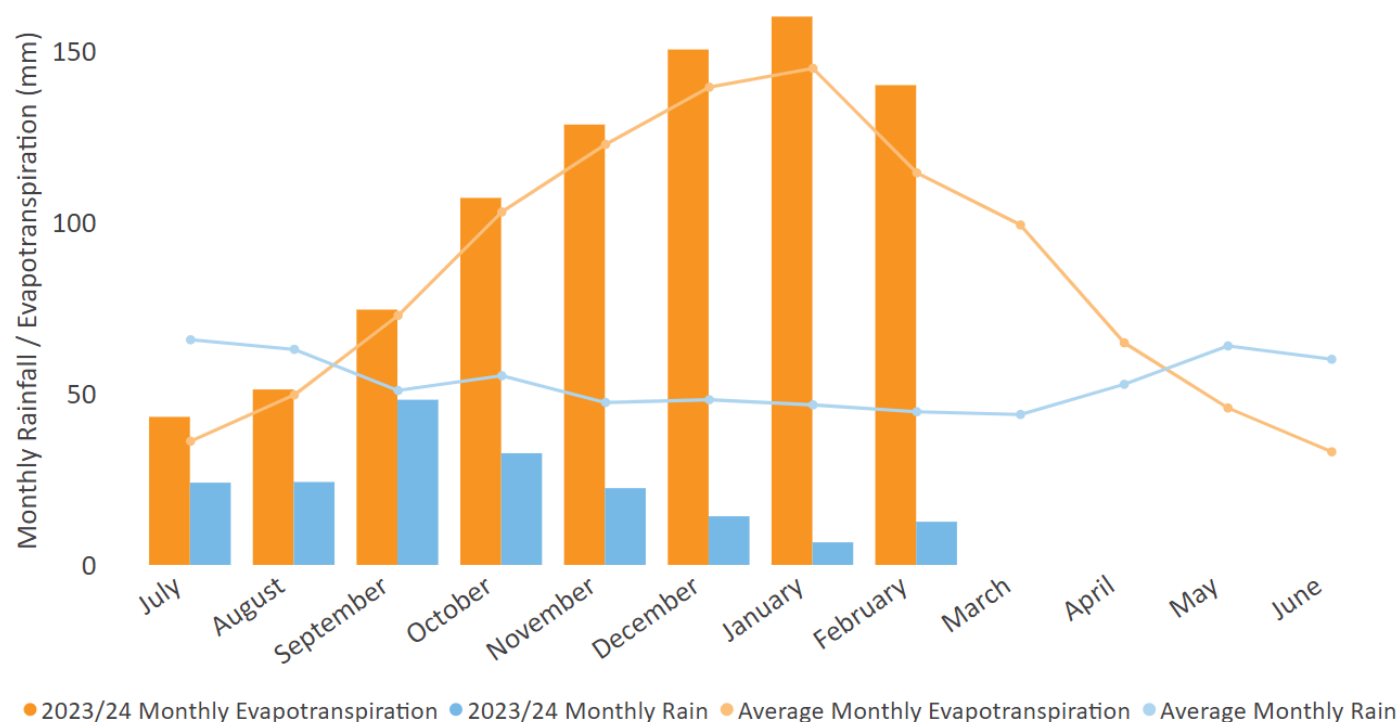


Figure 1. Monthly rainfall and evapotranspiration in Blenheim (Marlborough Research Centre) for the 2023-24 hydrological year, compared to average monthly totals.

Table 1. Rainfall, potential evapotranspiration, and potential water deficit in Blenheim for 3 notably dry summers: 2023/24, 2014/15, and 2000/01.

Summer	Rainfall (mm)	Penman Evapotranspiration (mm)	Potential water deficit (mm)
2023/24	33.4	456.3	-422.9
2014/15	51.4	387.5	-336.1
2000/01	27.2	420.1	-392.9

Of note for Blenheim are the extended dry conditions - all 9 months from June 2023 to February 2024 have recorded lower than average rainfall. Total rainfall in Blenheim for this 9-month period was 206.8 mm, only 42% of the long-term average of 495.6 mm. This is the lowest rainfall total for the June to February period in 94 years (1930-2024).

The map to the right (Figure 2) shows summer rainfall for monitoring sites around the region, as a percentage of average summer rainfall. The lowest rainfall areas are the lower Wairau Plains and the lower Waihopai Valley, with between 20-30% of average summer rainfall. Areas with less than 50% of average summer rainfall include the Branch catchment, the mid-Wairau Valley, Rarangi, Taylor Pass, the Awatere Valley, Flaxbourne area, and the Molesworth. The Te Hoiere/Pelorus area has received between 80-100% of average summer rainfall.

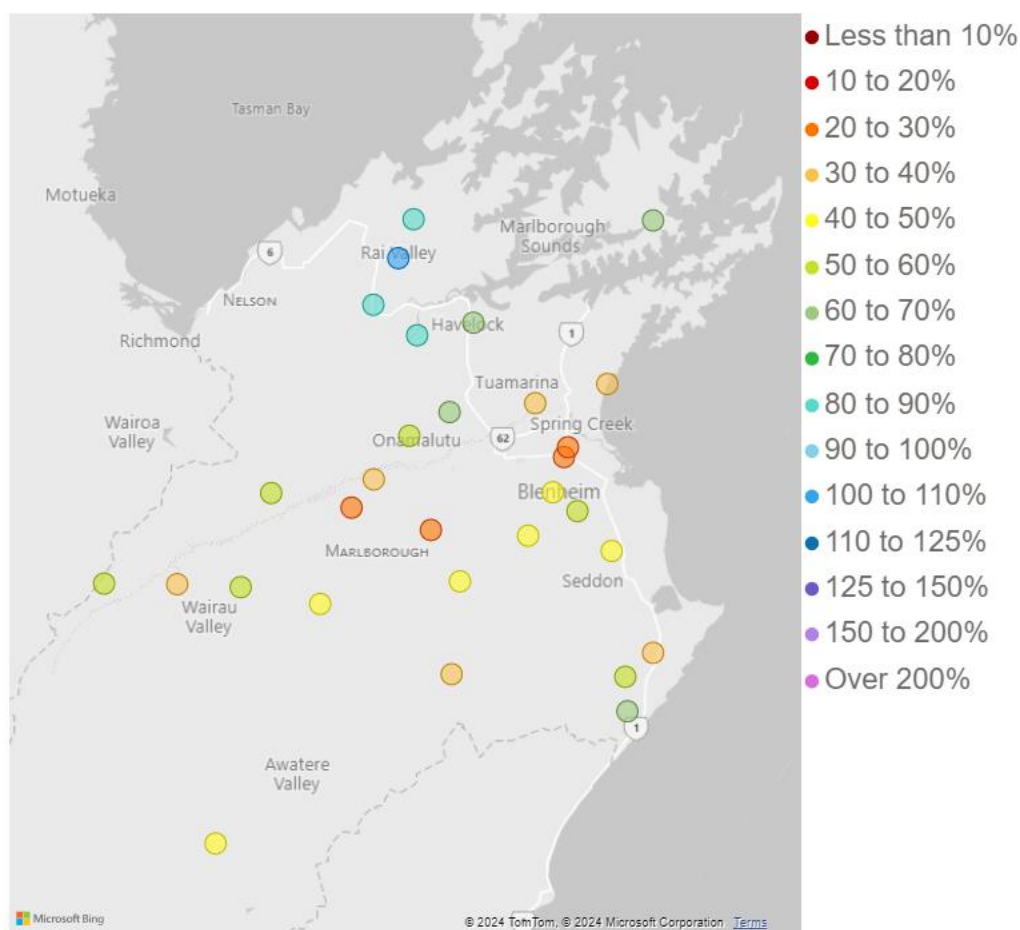


Figure 2. Summer 2023/24 rainfall at monitoring sites around Marlborough, as a percentage of average summer rainfall.

Figure 3 shows monthly rainfall from July 2023 onwards at 4 key sites in Southern Marlborough, compared to monthly averages. All 4 sites have recorded lower than average monthly rainfall throughout the summer months. As previously mentioned, Blenheim at the Research Centre has recorded the 2nd lowest summer rainfall total in 94 years (1930-2024), and the rainfall site at the MDC office recorded a similar summer rainfall total of 29 mm. Also of note is the Branch at Branch Recorder site which has received 100 mm of rainfall in summer 2023/24, the lowest summer rainfall total since the site was established in 1974. Interestingly, the majority of this rainfall was recorded in December (90 mm), with the last two months recording just 10 mm of rain at the site.

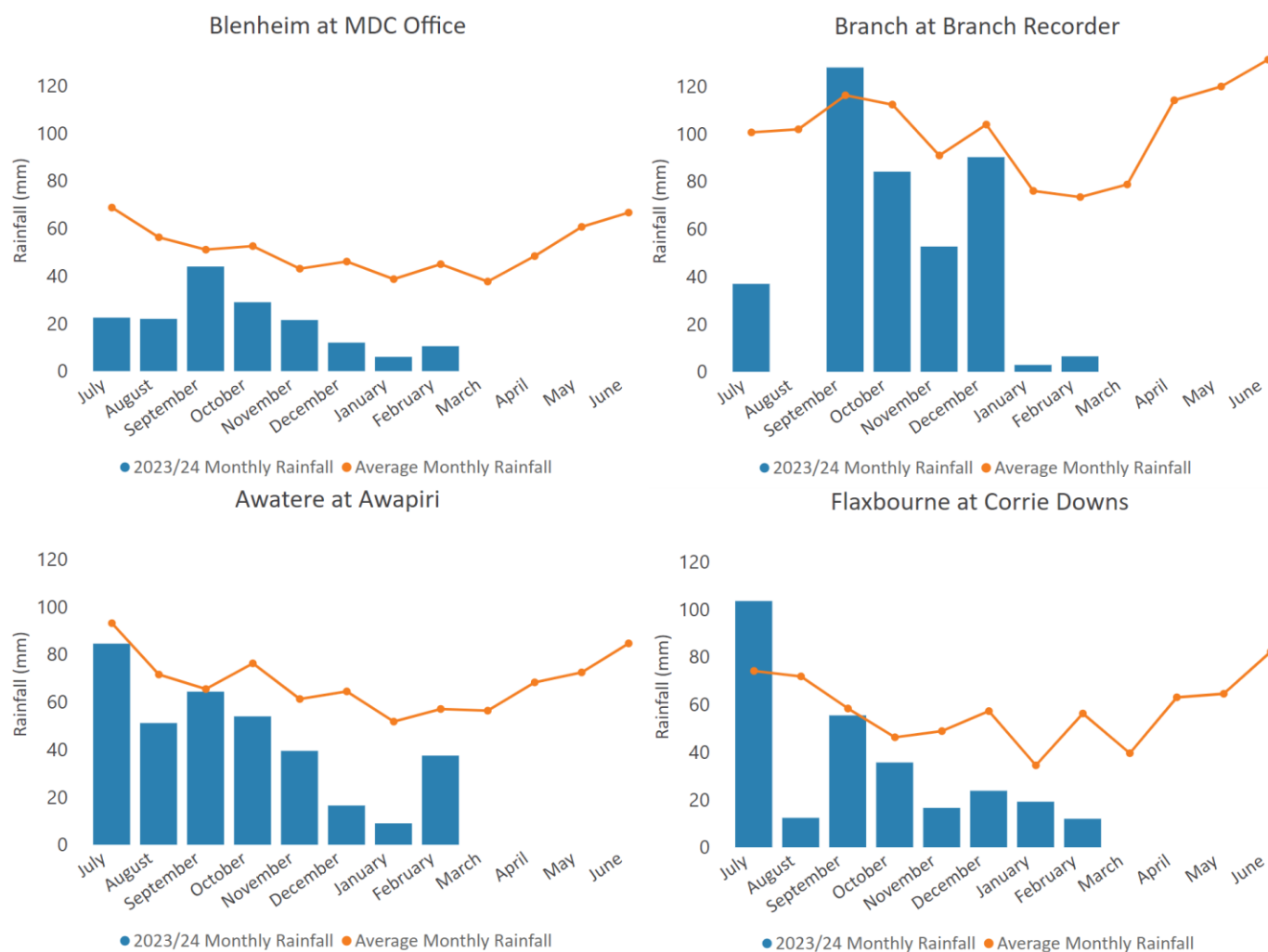


Figure 3. Monthly rainfall totals for the 2023-24 hydrological year from 4 key sites around Southern Marlborough, compared to average monthly rainfall totals.

Figure 4 shows monthly rainfall from July 2023 onwards at 4 key sites in Northern Marlborough, compared to monthly averages. The Tunakino/Rai Valley area received above average rainfall in December 2023, although rainfall so far in 2024 has been well below average. Top Valley on the northbank of the Wairau catchment has recorded 201 mm of rainfall for summer 2023/24, which puts it in the driest 10% of summers since the site was established in 1985.

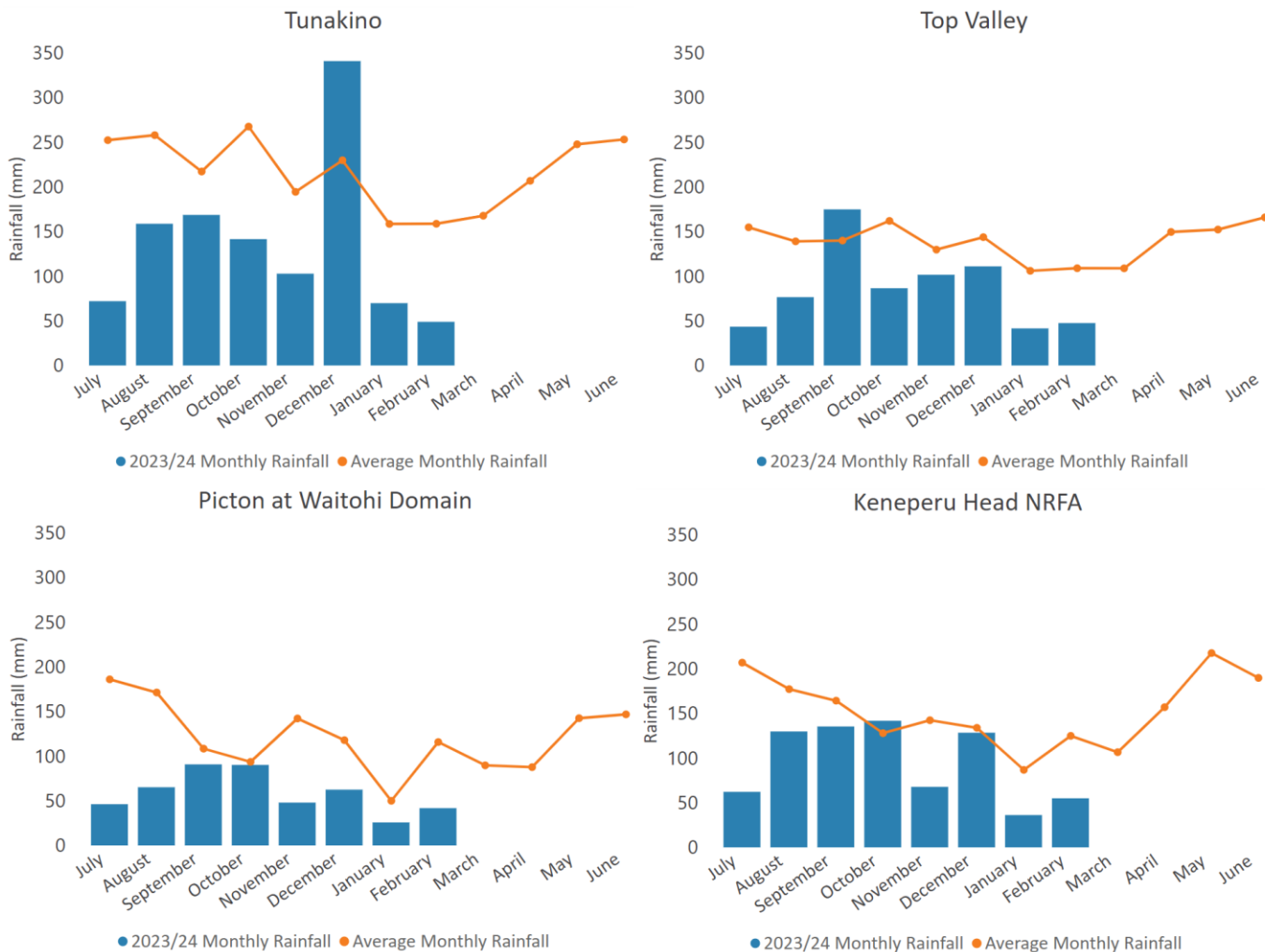


Figure 4. Monthly rainfall totals for the 2023-24 hydrological year from 4 key sites around Northern Marlborough, compared to average monthly rainfall totals. Note the adjusted scale when compared with the graphs in Figure 3 above.

A full list of monthly rainfall totals for the 2023/24 hydrological year at all rainfall monitoring sites can be found in Table 2.

Table 2. Monthly rainfall totals (mm) for the 2023-24 hydrological year at monitoring sites in Marlborough.

Site	July	August	September	October	November	December	January	February
Awatere at Awapiri	85	51	64	54	40	17	9	38
Awatere Glenbrae NRFA	44	18	53	48	20	24	16	12
Beneagle at Farm Stream	49		59	44	31	42	12	21
Blenheim at MDC Office	23	22	44	29	22	12	6	11
Branch at Branch Recorder	37		128	84	53	90	3	7
Branch at Mt Morris	34	70	215	188	106	176	74	54
Flaxbourne at Corrie Downs	104	12	56	36	17	24	19	12
Kaituna Rainfall at Higgins Bridge	41	76	116	121	45	104	39	42
Kenepuru Head NRFA	62	130	135	142	68	128	36	55
Koromiko NRFA	46	79	117	103	53	76	47	32
Lake Elterwater Climate	97	12	59	39	20	30	17	17
Lansdowne NRFA	46	64	80	45	42	18	14	22
Malings	56	101	227	239	59	129	81	98
Mid Awatere Valley NRFA	39	38	50	37	28	21	5	26
Molesworth NRFA	41	38	72	62	35	15	18	42
Omaka at Ramshead Saddle	44	52	72	50	58	52	14	29
Onamalutu at Bartletts Creek Saddle	68	156	175	104	58	89	41	36
Onamalutu at Hilltop Road NRFA	48	96	175	119	53	126	53	40
Picton Climate at Waitohi Domain	46	65	91	90	48	63	26	42
Pudding Hill NRFA	54	39	77	81	47	16	27	48
Rai at Rai Falls	44	119	234	183	102	273	70	47
Rai Valley NRFA	50	128	180	163	101	312	67	37
Rarangi at Driving Range	31	52	63	71	24	18	26	17
Red Hills	36	49	161	113	79	90	62	54
St Arnaud NRFA	57	70	120	125	97	146	79	65
Taylor at Taylor Pass Landfill	40	27	47	39	25	21	14	20
Taylor at Tinpot	85	48	112	58	49	49	14	23
Te Rapa	174	19	84	55	53	52	43	60
Top Valley at Staircase Ridge	43	77	175	87	102	111	42	48
Tor Darroch NRFA	47	61	114	100	89	71	52	38
Tunakino	72	159	169	142	103	341	70	49
Upper Clarence NRFA	106	31	50	37	49	10	6	36
Waihopai at Craiglochart	26	55	60	38	56	13	12	14
Waihopai at Spray Confluence	38	65	101	58	75	35	28	22
Waikakaho	49	57	73	71	35	32	24	20
Waikawa at Boons Valley	61	69	124	109	82			
Wairau Valley at Southwold	51	75	80	48	42	27	17	19
Wakamarina at Twin Falls	44	104	176	198	95	205	78	63
Ward NRFA	136	18	55	41	26	31	24	32
Wye at Charlies Rest	35	68	113	83	68	53	24	34

River Flows

After a summer of low rainfall, even the most resilient of river systems are now impacted by the ongoing dry conditions. The Wairau River at Tuamarina had a mean flow of about 19 m³/s in February, compared to an average of 52 m³/s. The rivers in the north-east (Pelorus, Rai) are now sitting at 25% of their long-term mean February flows after a dry January and February. The Awatere River at Awapiri had an average flow of just under 2.5 m³/s in February, which is 29% of the long-term February average. A full summary of river flows for February 2024 can be seen below in Table 3.

Table 3. A summary of river flows in Marlborough for February 2024.

Site Name	February Mean Flow (m ³ /s)	February Long-Term Mean Flow (m ³ /s)	% of long-term mean	Flow Record Begins	Catchment Area (km ²)
▲					
Rai River at Rai Falls	1.70	6.97	24	1979	211
Pelorus River at Bryants	2.98	12.23	24	1977	375
Kaituna River at Higgins Bridge	0.49	1.91	26	1989	135
Branch River at Weir Intake	5.28	16.51	32	1958	551
Goulter River at Horseshoe Bend	1.70	5.70	30	2010	154
Waihopai River at Craiglochart	2.23	7.85	28	1960	745
Ohinemahuta River at Domain	0.03	0.78	4	2013	33
Are Are Creek at Kaituna Tuamarina Track	0.11	0.29	39	2007	32
Tuamarina River at Para Road	0.23	0.80	28	2004	100
Wairau River at Tuamarina	18.70	51.77	36	1960	3430
Omaka River at Gorge	0.15	0.56	27	1993	91
Taylor River at Borough Weir	0.02	0.18	9	1961	65
Flaxbourne River at Corrie Downs	0.01	0.13	9	2003	71
Awatere River at Awapiri	2.48	8.46	29	1977	983

Baseflow in the Awatere River continued to track in the lower quartile through February. A small fresh on the 2nd of February saw restrictions briefly lifted, although full Class B restrictions began again on the 6th. Class A water users were rationed to 80% of their total daily allowance for a week from the 21st of February, in order to maintain the environmental flow of 2 m³/s at the river mouth. Two minor freshes in the river at the end of the month again saw Class B restrictions briefly lifted. Class B restrictions have been in place for 28 days this irrigation season (to the end of February).

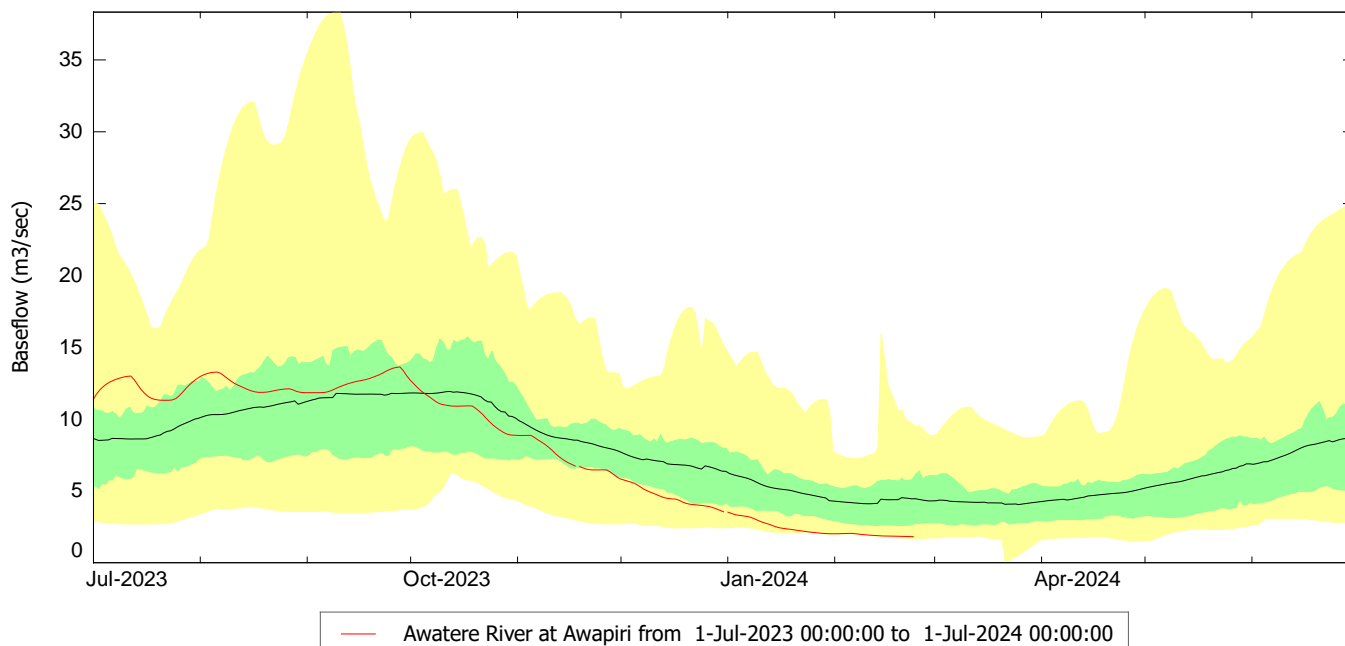


Figure 5. Awatere River at Awapiri baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023/24 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

The Waihopai River at Craiglochart baseflow receded into the lower quartile in February. A small fresh at the start of the month delayed Class B restrictions somewhat, which came into effect mid-month. Small amounts of rainfall briefly lifted Class B restrictions towards the end of the month. Class B restrictions have been in effect for 13 days this irrigation season (to the end of February).

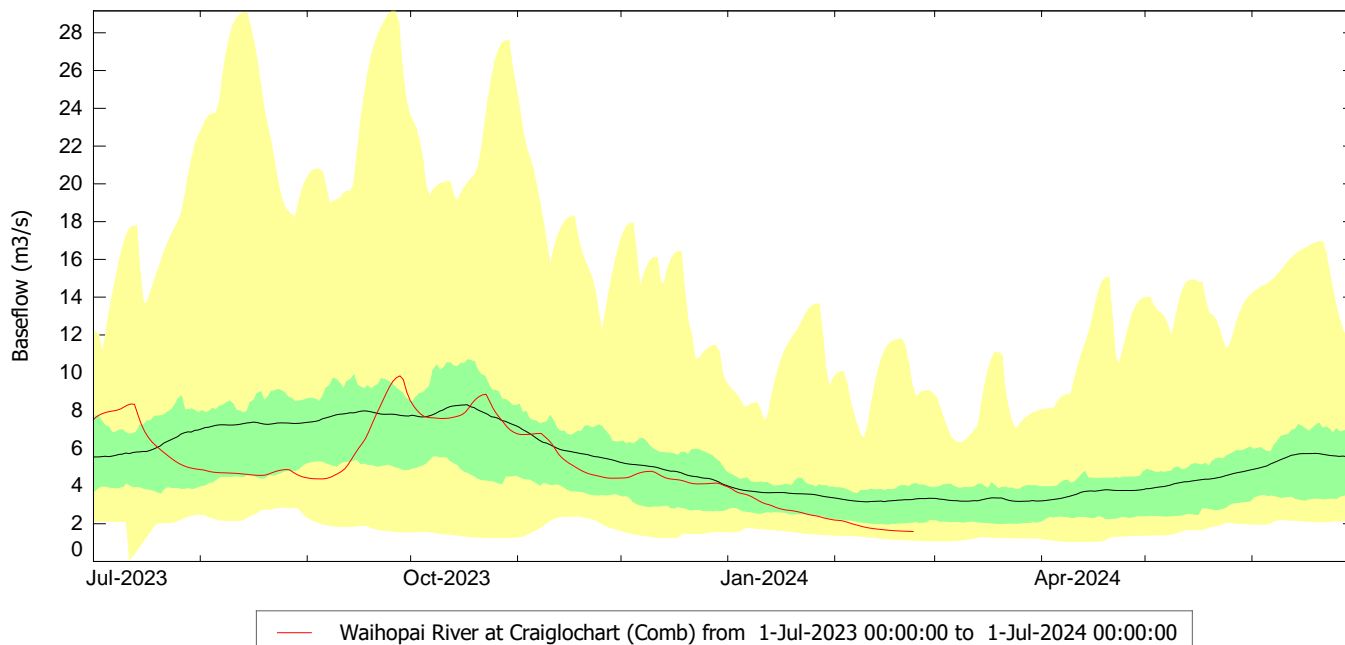


Figure 6. Waihopai River at Craiglochart baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023/24 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

Baseflow in the Wairau River at Tuamarina has receded into the lower quartile in February, although a small fresh at the start of the month delayed water restrictions somewhat. Class B

water users were restricted from taking water from about mid-February onwards. While mean daily flow declined throughout the month, and looked to be approaching 8 m³/s, Class A restrictions did not eventuate in February due to small rain events in the catchment.

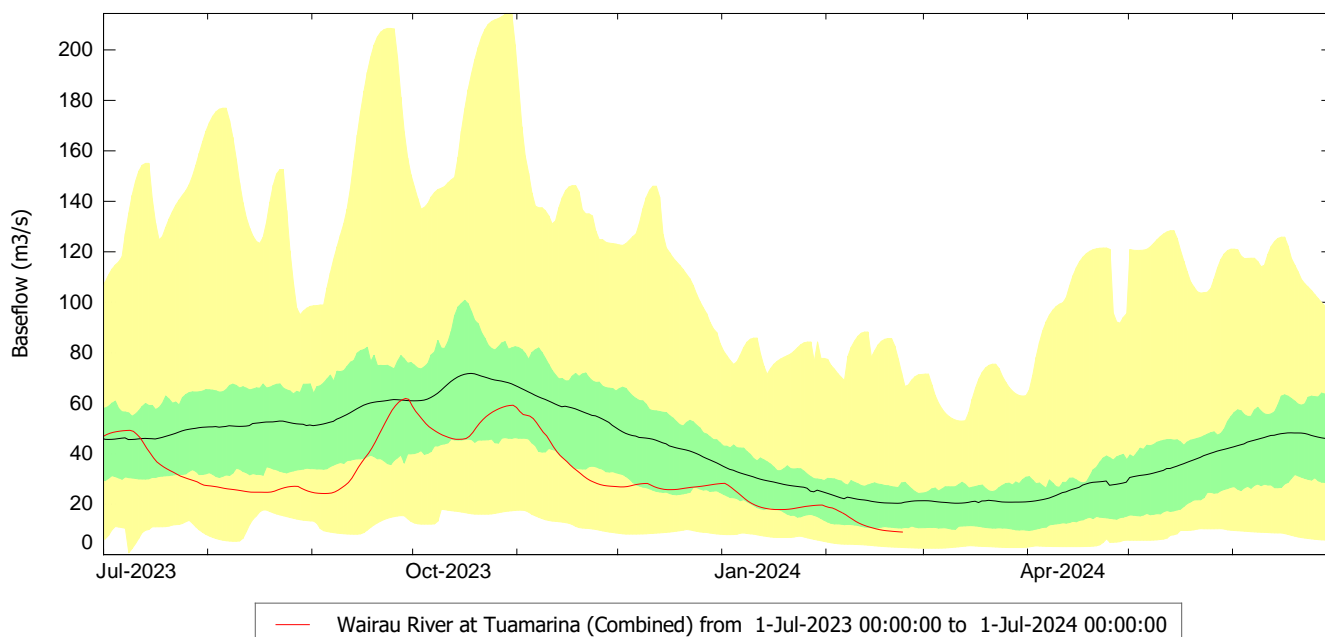


Figure 7. Wairau River at Tuamarina baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023/24 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

After a small rain event in early February, flow in the Rai River continued to decline through February, with baseflow nearing the lower quartile. Class B consent holders were restricted from taking water from about mid-month. A small rain event in the last week of the month saw flows lift slightly, allowing Class B users a few more days of water use at the end of the month.

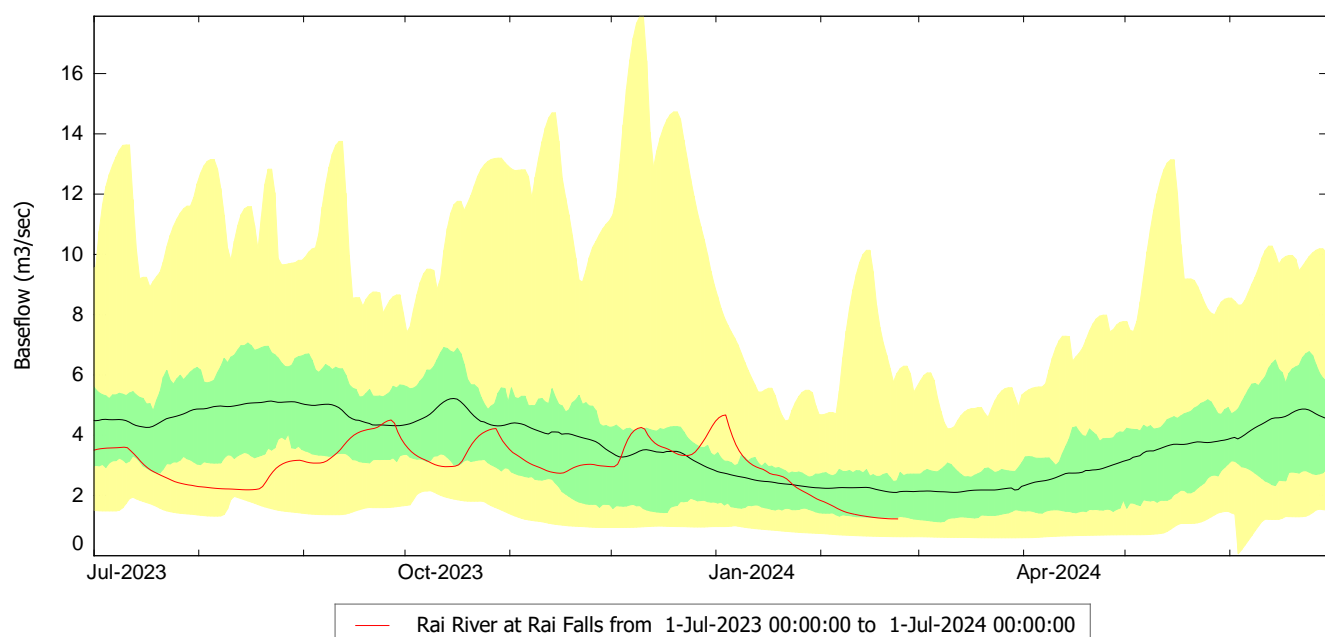


Figure 8. Rai River at Rai Falls baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023/24 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

Soil Moisture

Average shallow soil moisture at Grovetown Park was 15.1% in February, well below the long-term average of 18.9%. Minimum moisture for topsoil is about 14%, meaning soils were about as dry as possible in February.

The 10 mm of rainfall on the 2nd of February raised the soil moisture just one percent, from 14.6 to 15.7% (see Figure 9 below).

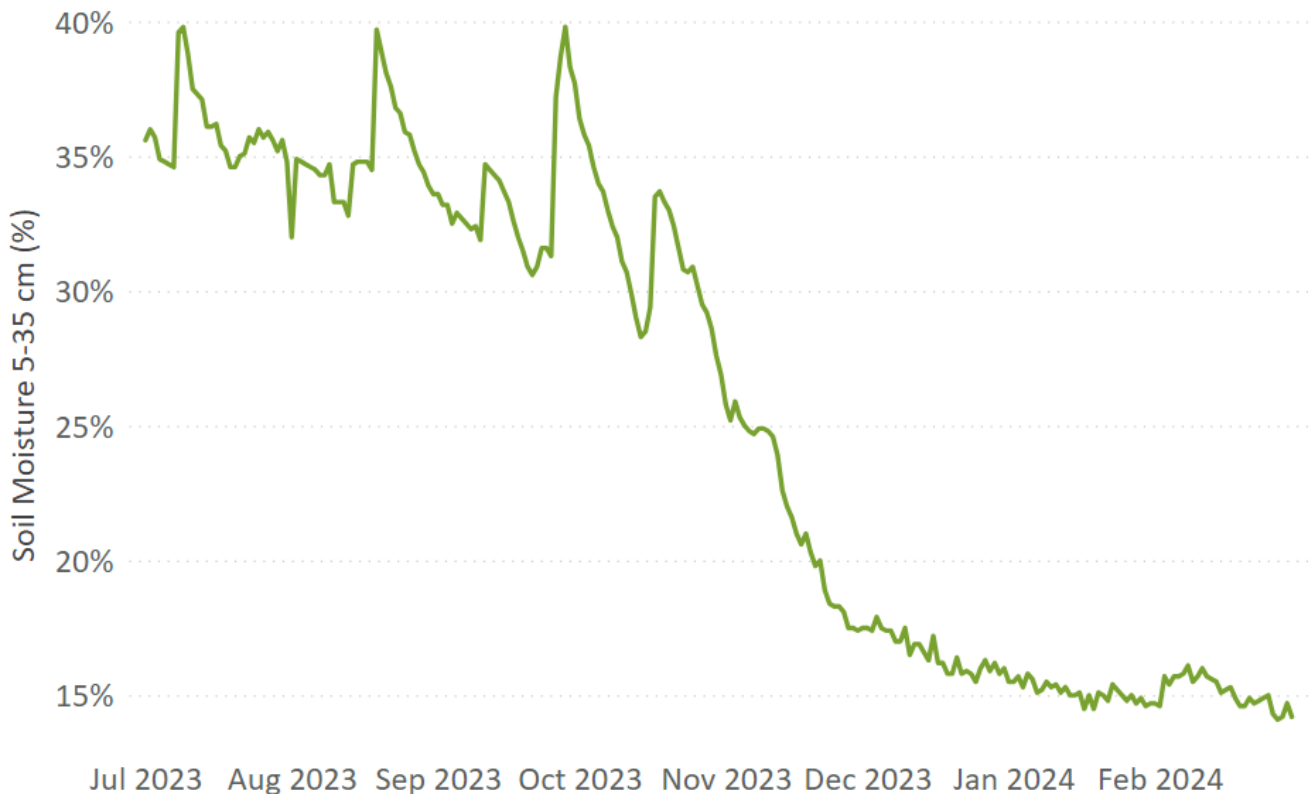


Figure 9. Shallow soil moisture at the Marlborough Research Centre (Blenheim) from 1st July 2023 to 29th February 2024.

The soil moisture deficit maps from NIWA (Figure 10) show large parts of Marlborough have extremely dry soils (no water available for uptake by plants), which is consistent with local data. Marlborough, alongside parts of the Wairarapa, Canterbury, Otago and Northland look to have the driest soils as of late February.

The soil moisture anomaly map (Figure 11) shows how much wetter or drier current soil moisture is than normal. Soils are “extremely drier than normal” in the area shown in dark orange, including the Marlborough Sounds and large parts of the Wairau and Awatere Valleys.

Soil moisture deficit (mm) at 9am on 29/02/2024

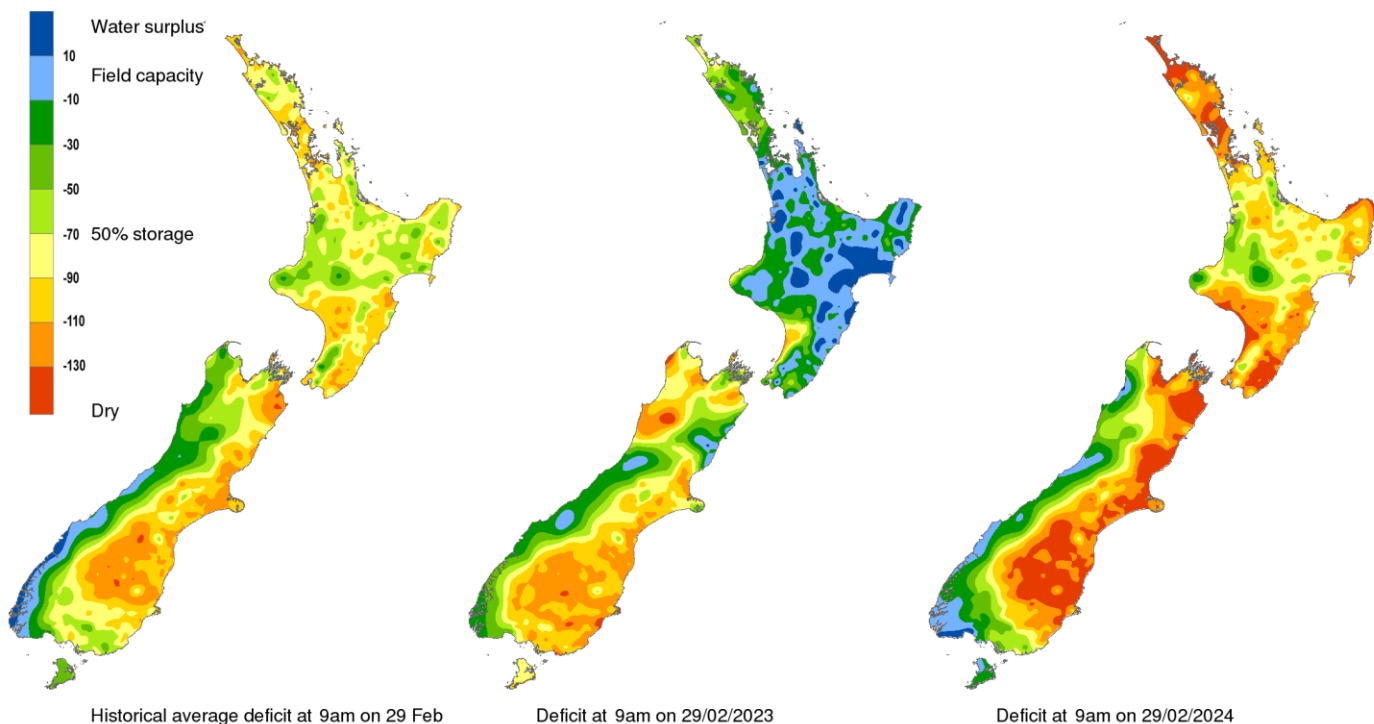


Figure 10. Soil moisture deficit maps of New Zealand, retrieved from NIWA on 29/02/2024

Soil moisture anomaly (mm) at 9am on 29/02/2024

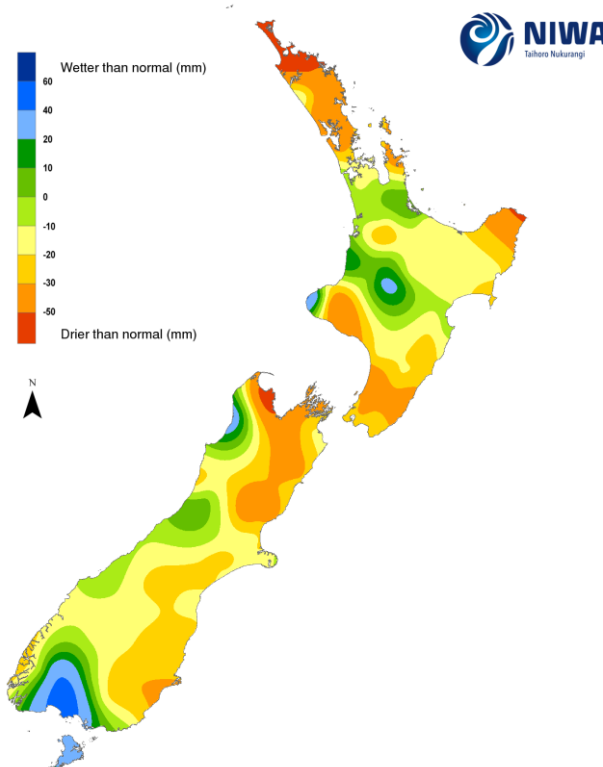


Figure 11. Soil moisture anomaly map of New Zealand, retrieved from NIWA 29/02/2024

Climate Outlook March to May 2024

The first week of March will bring some rain to Marlborough, but likely not enough to ease the long-term soil moisture deficit. A cold spell in early March may also bring strong winds to the region. Dry conditions are expected in eastern areas (including Marlborough) for the rest of March and into April.

NIWA35
Forecast weekly (7-day) rainfall anomalies (% of normal)
Ensemble mean
Model initiation: 00 UTC Tue 05/03/2024

"Normal" is the percentage difference between a climatology and forecast. The climatology is a 7 day rolling sum of a 35 day rolling average from 1991-2020 from the VCSM.

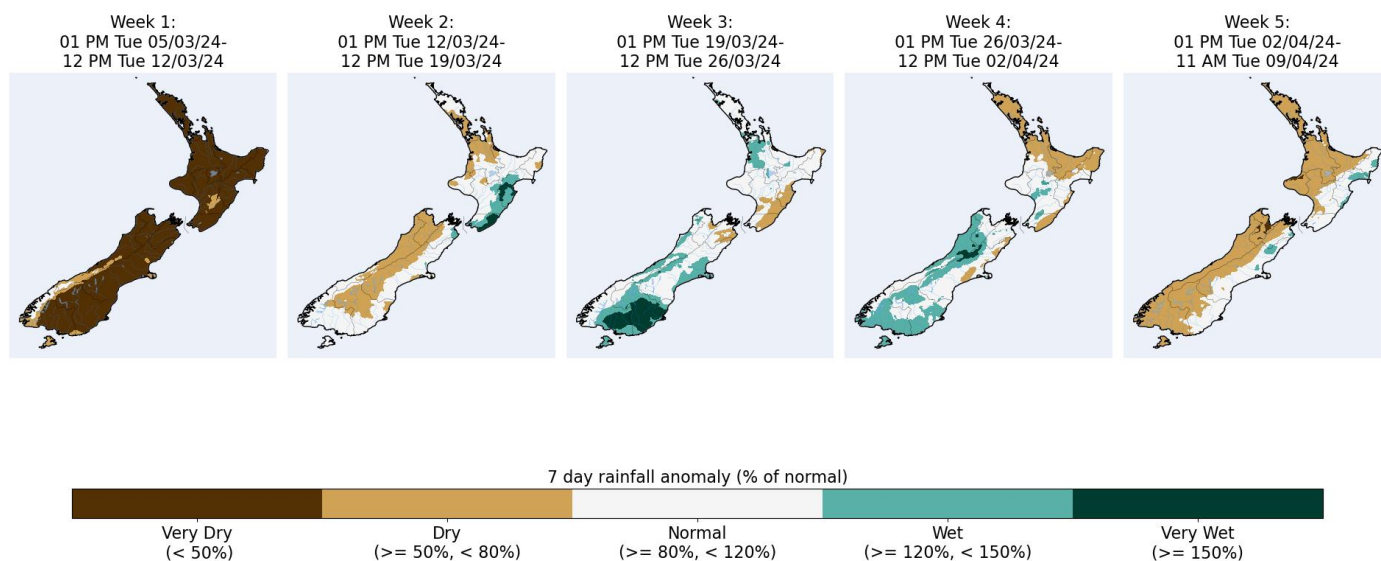


Figure 12. Marlborough/Nelson/Tasman weekly forecasted rainfall anomalies from the 5th of March to the 9th of April. Retrieved from NIWA on the 7th of March 2024.

El Niño conditions in the central Pacific Ocean peaked in December, with the El Niño Southern Oscillation (ENSO) expected to return to neutral conditions by the end of autumn. The ocean-atmosphere lag means El Niño conditions are likely to continue through autumn, with more north-westerly winds than average forecasted through the season.

The Madden-Julian Oscillation is forecast to return to the Southwest Pacific around mid-March, leading to increase chances of tropical cyclone activity. Although New Zealand has normal to reduced risk for ex-tropical cyclones as a whole this season, increased awareness of possible tropical cyclone activity is encouraged.

The predictions for Marlborough/Tasman from March to May are:

- Temperature – equally likely to be average or above average
- Rainfall – near average (45% chance)
- Soil Moisture – below average (50% chance)
- River Flows – equally likely to be below average or average