

Water Resources Update

November 2023

Report prepared by Charlotte Tomlinson, 8th of December 2023.

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

November saw lower than average rainfall across the district. Blenheim recorded 22.4 mm of rainfall in November, under 50% the long-term November average. In Blenheim, total rainfall for the calendar year to date (January to November) is 448 mm, much lower than the average annual rainfall of 644 mm. Low rainfall this month contributed to a higher than average moisture deficit for November of -106 mm, as recorded at the Marlborough Research Centre.

Mean river flows were below average in November, ranging from 19% to 78% of their average November mean flow. In the Wairau River low rainfall over winter led to a dry catchment and baseflow was in the lower quartile from mid-July to mid-September. Moderate rain in the catchment raised baseflow throughout spring, although it was still below average over this time. In late November, the Wairau River dropped below 30 m³/s, and class C water permit holders were restricted from taking water for a period of 7 days before a small fresh in early December raised the flow back above the cutoff for the meantime.

With low rainfall, soil moisture declined at the Grovetown Park weather station, reaching 17.5% by the end of November, meaning there is little available shallow soil moisture left.

Unusually warm oceans across the globe are impacting global circulation patterns and altering the effects of El Niño on New Zealand. Air flows have been and are likely to continue to vary more than those associated with a typical El Niño season. The north-east of the South Island has a moderate chance of below-average rainfall over summer.

As of the 5th of December, the New Zealand Drought Index (NZDI) is showing both northern and southern Marlborough as 'dry', with values of 0.76 and 0.78 respectively. An NZDI value of 1.5 or greater indicates climatic drought conditions.

Looking ahead to the Christmas and New Year period, the NIWA/MPI drought forecast shows very dry conditions (but not drought) are likely to occur in the 35 days (from December 5th to January 8th) in the southern Wairau Valley and the lower Awatere Valley. This map is updated daily and can be found at <https://shiny.niwa.co.nz/drought-forecast/>.

Rainfall

Lower than average rainfall continued through November. Total spring rainfall was below the median for all of the long-term rainfall sites in Marlborough (30+ years of data). A full list of monthly rainfall totals for the 2023/24 hydrological year can be seen in Table 1.

Rainfall was well below average in Northern Marlborough, with sites such as Tunakino and the Wakamarina recording just over 50% of their average November rainfall (see Figure 2).

Rainfall at the Marlborough Research Centre here in Blenheim was 22.4 mm for the month, just under 50% the long-term November average of 50.2 mm. Total rainfall for the calendar year is set to be lower than average, with 448 mm recorded in Blenheim from January to November. The average annual rainfall is 644 mm, so with one month left in 2023 it's unlikely December rainfall will bump the total up to meet the average.

Low rainfall in November contributed to a higher than average moisture deficit of -106 mm at the Marlborough Research Centre. This compares to the long-term average moisture deficit of -76 mm. Monthly rainfall and evapotranspiration from July 2023 onwards can be seen in Figure 1 below, compared to the monthly average.

Blenheim Monthly Rainfall & Evapotranspiration

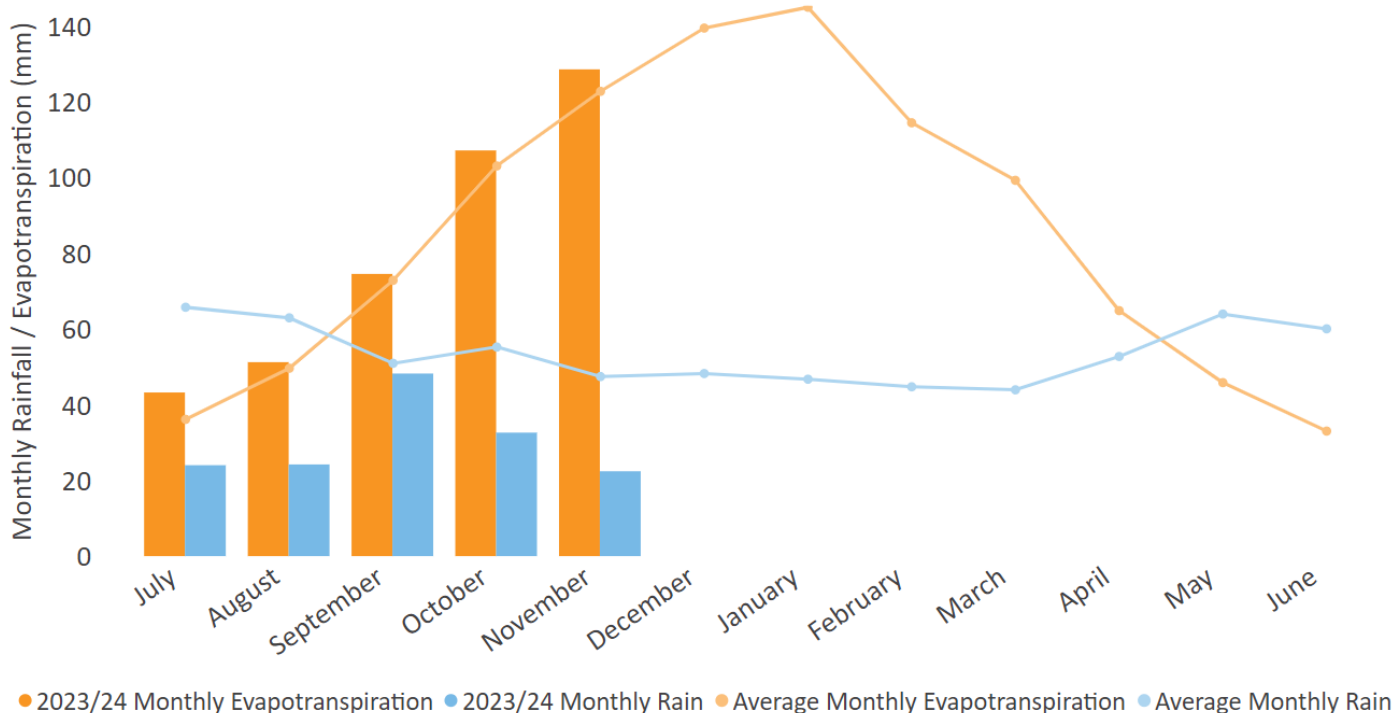


Figure 1. Monthly rainfall and evapotranspiration in Blenheim (Marlborough Research Centre) for the 2023-24 hydrological year, compared to average monthly totals.

Site	July	August	September	October	November
Awatere at Awapiri	85	51	64	54	40
Awatere Glenbrae NRFA	44	18	53	48	20
Beneagle at Farm Stream	49		59	44	29
Blenheim at MDC Office	23	22	44	29	22
Branch at Branch Recorder	40	65	136	74	46
Branch at Mt Morris	34	70	193	168	94
Flaxbourne at Corrie Downs	104	12	56	35	16
Kaituna Rainfall at Higgins Bridge	41	76	116	121	45
Kenepuru Head NRFA	62	130	135	142	68
Koromiko NRFA	46	79	117	103	53
Lake Elterwater Climate	97	12	59	39	20
Lansdowne NRFA	46	64	80	45	42
Malings	56	101	227	239	59
Mid Awatere Valley NRFA	39	38	50	37	28
Molesworth NRFA	41	38	72	62	35
Omaka at Ramshead Saddle	44	55	68	47	56
Onamalutu at Bartletts Creek Saddle	64	147	165	98	55
Onamalutu at Hilltop Road NRFA	48	96	175	119	53
Picton Climate at Waitohi Domain	46	65	86	82	44
Pudding Hill NRFA	54	39	77	81	47
Rai at Rai Falls	44	119	234	181	97
Rai Valley NRFA	50	128	180	163	101
Rarangi at Driving Range	31	52	63	71	24
Red Hills	36	49	161	113	79
St Arnaud NRFA	57	70	120	125	97
Taylor at Taylor Pass Landfill	40	27	47	39	22
Taylor at Tinpot	85	48	99	52	46
Te Rapa	174	19	84	48	47
Top Valley at Staircase Ridge	43	77	184	91	106
Tor Darroch NRFA	47	61	114	100	89
Tunakino	72	159	169	142	103
Upper Clarence NRFA	106	31	50	37	49
Waihopai at Craiglochart	26	55	60	38	43
Waihopai at Spray Confluence	38	65	86	52	68
Waikakaho	49	59	73	71	36
Waikawa at Boons Valley	61	69	124	109	82
Wairau Valley at Southwold	51	75	80	42	37
Wakamarina at Twin Falls	44	104	176	195	87
Ward NRFA	136	18	55	41	26
Wye at Charlies Rest	35	68	103	75	63

Table 1. Monthly rainfall totals (mm) for the 2023-24 hydrological year at monitoring sites in Marlborough.



Figure 2. Monthly rainfall totals for the 2023-24 hydrological year from 6 key sites around Marlborough, compared to average monthly rainfall totals. Note the adjusted scale for the Tunakino and Top Valley sites.

River Flows

Mean river flows were below average across Marlborough in November, ranging from 19% to 78% of their average November mean flow. A summary of river flows for November 2023 can be seen below in Table 2.

Site Name	November Mean Flow (m ³ /s)	November Long-Term Mean Flow (m ³ /s)	% of long-term mean	Flow Record Begins	Catchment Area (km ²)
▲					
Rai River at Rai Falls	5.05	12.80	39	1979	211
Pelorus River at Bryants	7.83	20.03	39	1977	375
Kaituna River at Higgins Bridge	1.21	3.75	32	1989	135
Branch River at Weir Intake	12.19	27.38	45	1958	551
Goulter River at Horseshoe Bend	3.95	5.10	78	2010	154
Waihopai River at Craiglochart	7.36	14.59	50	1960	745
Ohinemahuta River at Domain	0.23	0.97	24	2013	33
Are Are Creek at Kaituna Tuamarina Track	0.17	0.43	39	2007	32
Tuamarina River at Para Road	0.45	1.49	30	2004	100
Wairau River at Tuamarina	51.22	119.22	43	1960	3430
Omaka River at Gorge	0.39	1.03	38	1993	91
Taylor River at Borough Weir	0.14	0.41	34	1961	65
Flaxbourne River at Corrie Downs	0.04	0.20	19	2003	71
Awatere River at Awapiri	9.64	14.73	65	1977	983

Table 2. A summary of river flows in Marlborough for November 2023.

The Flaxbourne River had a mean monthly flow of 36 l/s in November, compared to about 200 l/s in an average November. Class A water takes cease below 25 l/s (0.025 m³/s) in the Flaxbourne River. Figure 3 shows the baseflow for the Flaxbourne River, which has been in the lower quartile from early September to the present.

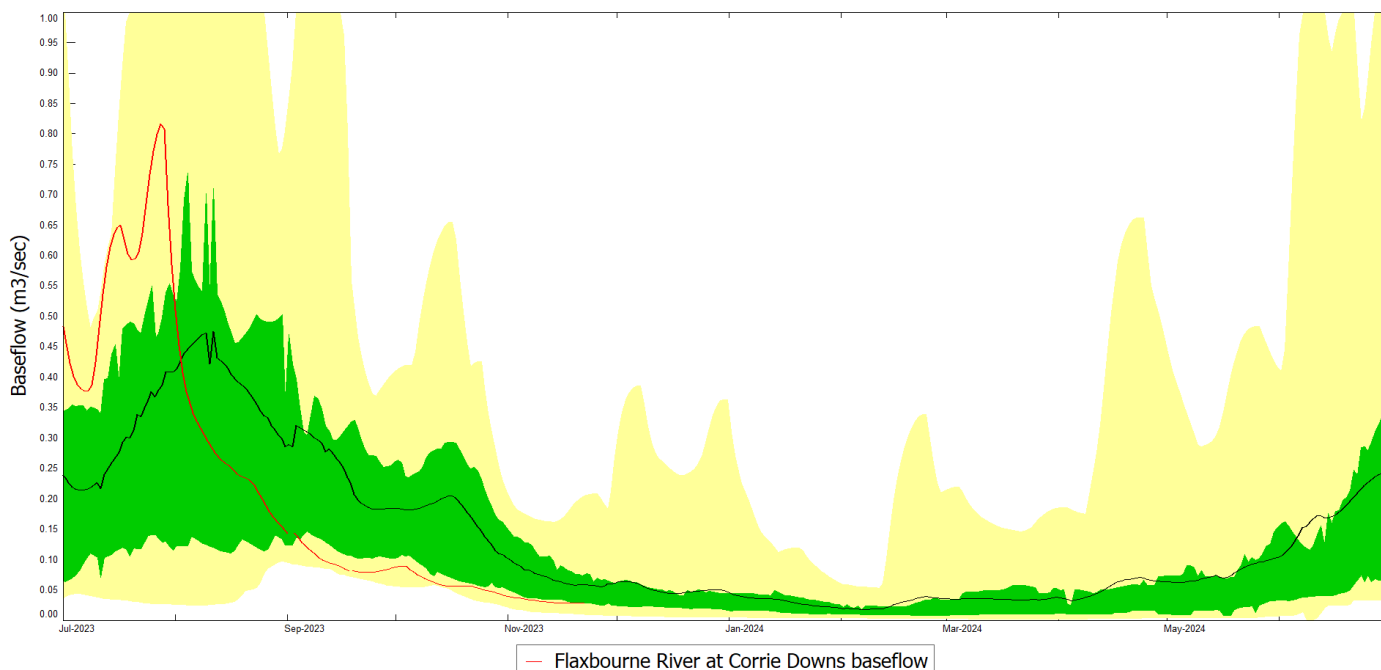


Figure 3. Flaxbourne River at Corrie Downs baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

The Awatere River at Awapiri had a mean flow of 9.6 m³/s in November, which is 65% of the November long-term mean flow. A wetter catchment through winter saw baseflows above average until the beginning of October, when they started to decline (see Figure 4 below). No water restrictions have been triggered in the Awatere River as of early December.

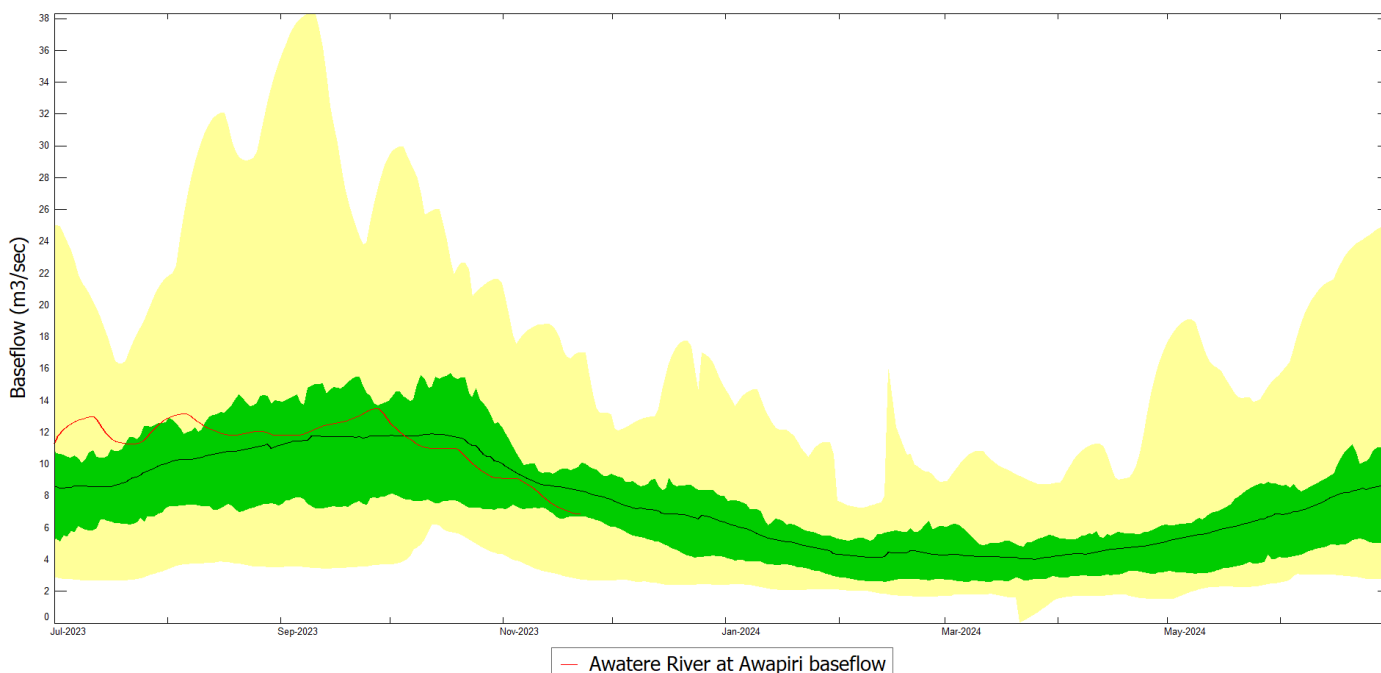


Figure 4. Awatere River at Awapiri baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

In the Wairau River at Tuamarina flows declined through the second half of the month, reaching approximately 22 m³/s by the end of November. This meant Class C water permit holders were restricted from taking water for 7 days as flow was below 30 m³/s at the recorder site. However it should be noted that a small fresh came down the river on December 4th, with maximum flow of 160 m³/s, lifting these restrictions for a time. Figure 5 below shows baseflow in the Wairau River starting in July of this year. Low rainfall over winter led to a dry catchment and baseflow was in the lower quartile from mid-July to mid-September. Moderate rain in the catchment raised baseflow throughout spring, although it was still below average over this time. As of early November, baseflow declined into the lower quartile once again.

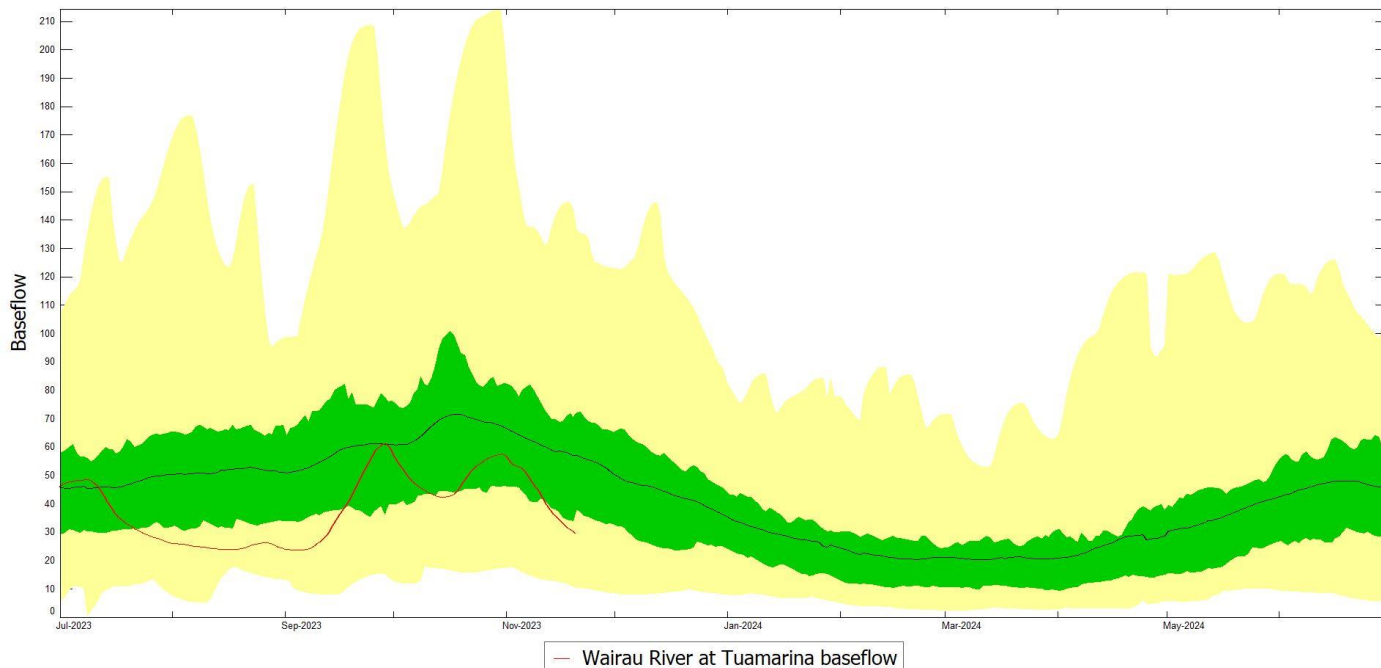


Figure 5. Wairau River at Tuamarina baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

Soil Moisture

Shallow soil moisture at the Grovetown Park weather station on the 1st of November was 25.8% (see Figure 6 below). With low rainfall throughout the month, soil moisture fell to 17.5% by the end of the month. Available soil moisture is depleted when soil moisture reaches about 14.5%, so there is little available moisture left as of November 30th.

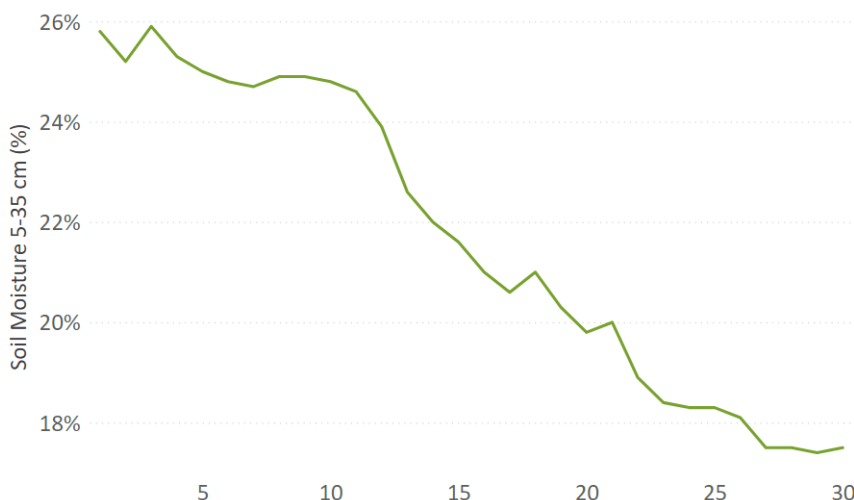


Figure 6. Shallow soil moisture in November 2023.

The soil moisture deficit map (Figure 7) shows the outer Marlborough Sounds and coastal Wairau and Awatere Valley areas are dry, and also slightly drier than the historical average deficit for the start of December.

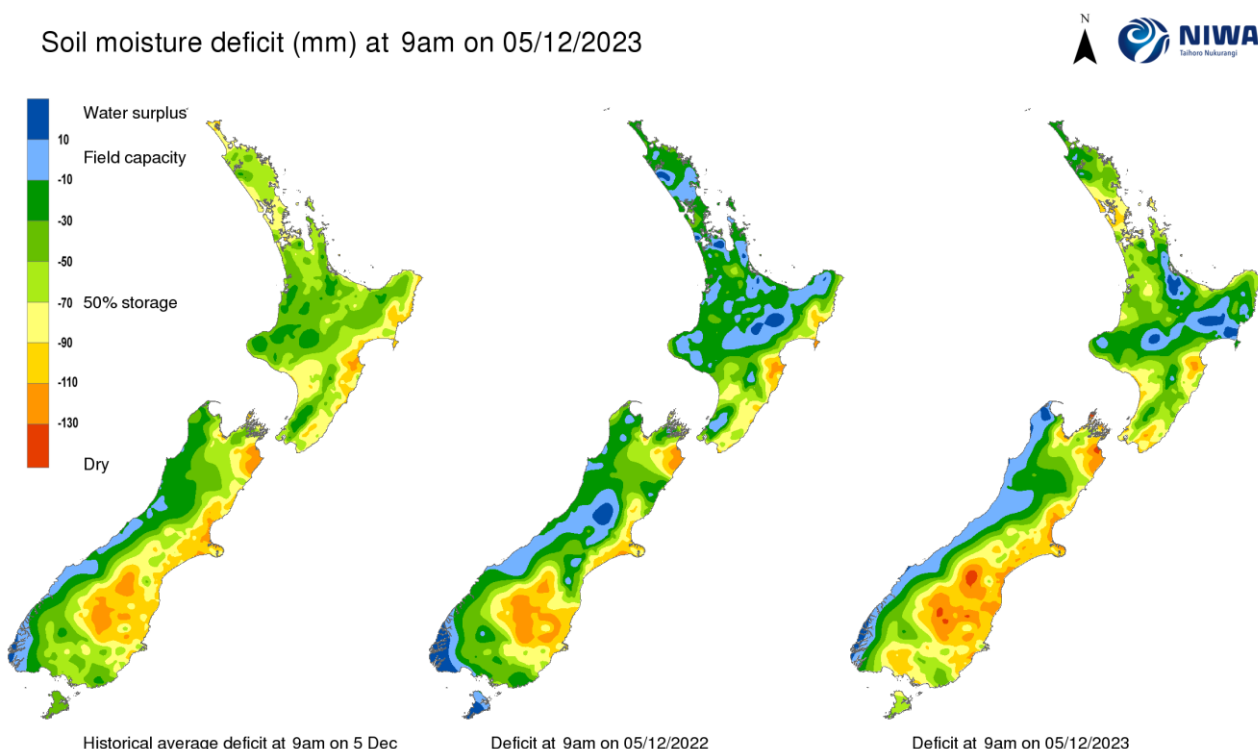


Figure 7. Soil moisture deficit maps of New Zealand, retrieved from NIWA on 05/12/2023

The soil moisture anomaly map (Figure 8) shows that soils are drier than normal in the coastal plains of Marlborough, with the largest discrepancy in the outer Marlborough Sounds, where soils are between 30 and 50 mm drier than normal.

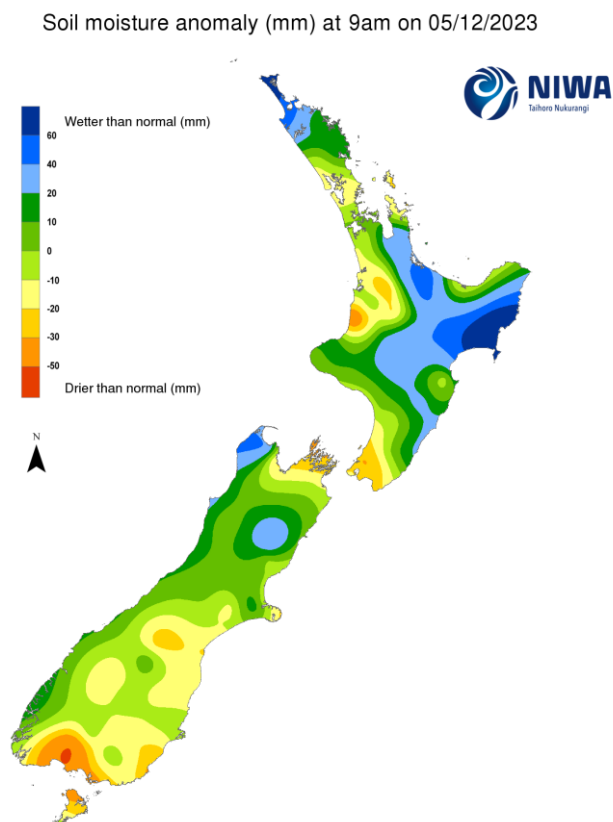


Figure 8. Soil moisture anomaly map of New Zealand, retrieved from NIWA 05/12/2023

Climate Outlook December 2023 – February 2024

El Niño continued through November and is virtually certain to persist through the summer months and into autumn. However, many people will be asking if the weather patterns we are seeing actually match that of an El Niño. For example, in November rainfall was high in the east of the North Island, whereas a typical El Niño would bring wetter conditions to the west of the country.

The answer lies in unusually warm oceans (globally and in the western equatorial Pacific), which are contributing to global circulation patterns that are not associated with a typical El Niño. This ‘non-traditional’ El Niño is bringing more variable air flows than historic El Niño summers. That being said, more north-westerly winds than normal are expected across the country over the coming months. The north-east of the South Island has a moderate chance of below-average rainfall over summer.

The New Zealand Drought Index (NZDI) incorporates 4 climatic drought indicators, producing 5 classifications (dry, very dry, extremely dry, drought, and severe drought). It is particularly helpful in comparing current conditions to previous dry years, as historic data is available from 2007 onwards. Figure 9 below shows the NZDI values for southern Marlborough from 2007-present (there is a separate NZDI value for northern Marlborough). As of the 5th of December, the NZDI value for southern Marlborough is 0.78, putting it in the ‘dry’ category, with northern Marlborough also in the dry category with an NZDI value of 0.76. An NZDI value above 1.5 indicates drought conditions, such as in 2018, 2019, and 2020. It’s important to note that this is an indicator of climatic drought, and effects on agriculture will vary depending on several factors, such as the duration of dry/drought conditions, effects on water supply, and mitigation measures taken. The drought monitor can be found at <https://niwa.co.nz/climate/information-and-resources/drought-monitor>.

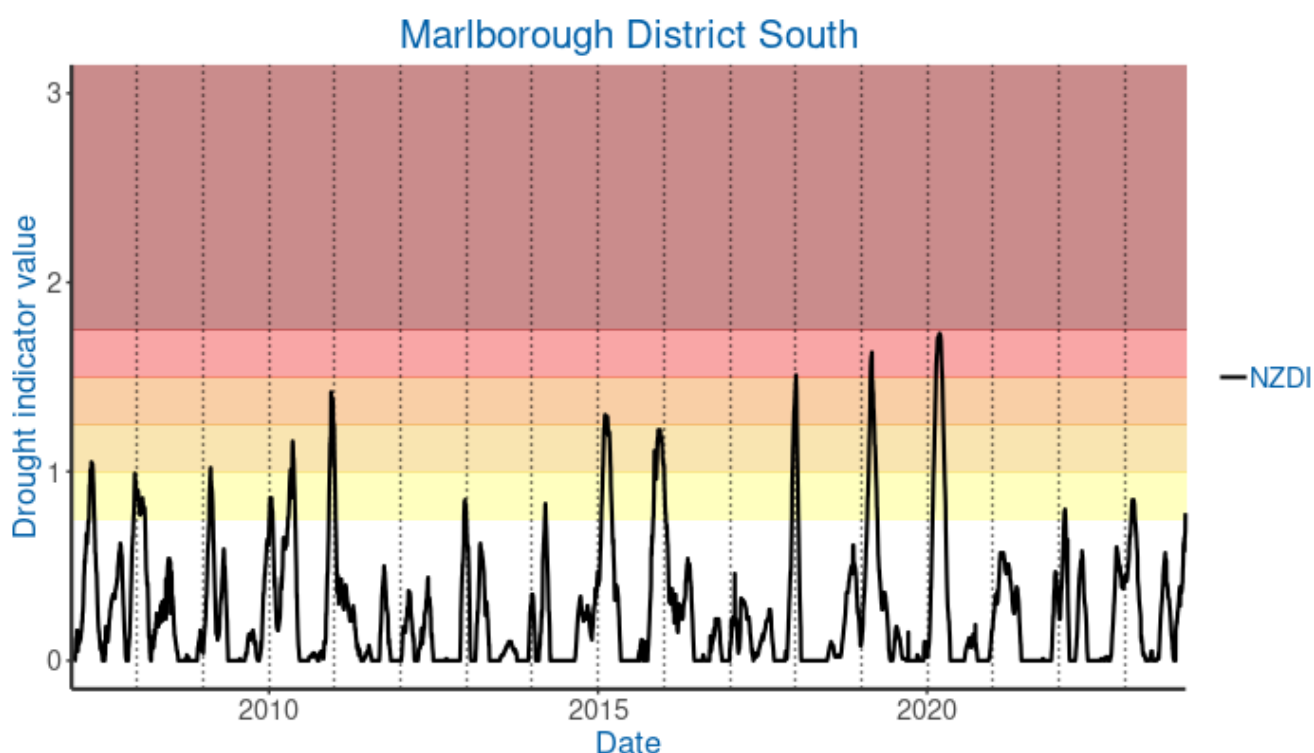


Figure 9. Marlborough District South NZDI values from 2007 to present.

The NIWA/MPI drought forecasting dashboard shows very dry conditions (but not drought) are likely to occur within the next 35 days in the southern Wairau Valley and the lower Awatere Valley (the areas shown in orange on the central map in Figure 10 below). This map is frequently updated and can be found at <https://shiny.niwa.co.nz/drought-forecast/>.

NIWA35
Risk of areas experiencing dryness or drought within 35 days
Model initiation: 00 UTC Tue 05/12/2023
Valid: 01 PM Tue 05/12/23 - 01 PM Mon 08/01/24 NZDT



"Dryness" refers to the categories of "Very Dry" and "Extremely Dry" in the NZDI categorisation. "Drought" refers to the categories of "Drought" and "Severe Drought" in the NZDI categorisation.

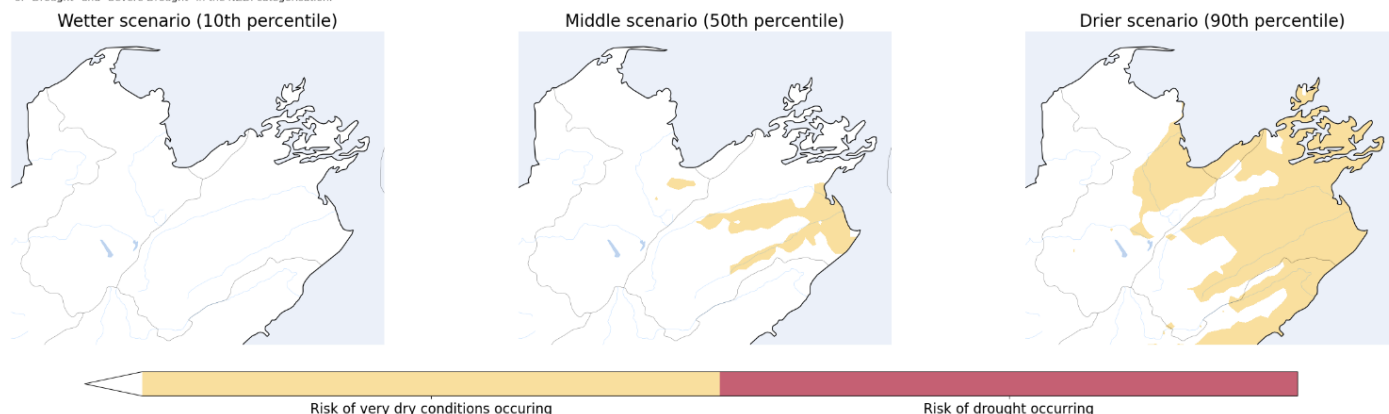


Figure 10. Marlborough/Tasman risk of areas experiencing dryness or drought within 35 days, from the 5th of December 2023 to the 8th of January 2024.

The predictions for Marlborough/Tasman from December to February are:

- Temperature – near or above average
- Rainfall – near average
- Soil Moisture – near or below average
- River Flows – near or below average