

# Hydrology of Marlborough Summary May 2023



*Report prepared by Charlotte Tomlinson, 2<sup>nd</sup> June 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

In early May a heavy rain event occurred over much of Marlborough, primarily affecting the Pelorus and Rai Valley area with river levels above mean annual flood in both the Rai and Pelorus rivers. State Highway 6 was closed for part of the day on Saturday the 6<sup>th</sup> of May due to flooding. 230 mm of rain was recorded in 24 hours at the Tunakino rain gauge, with a return period of about 5 years.

Flooding also occurred in the Wairau, with two consecutive flood peaks of 2,000 m<sup>3</sup>/s on the 6<sup>th</sup> of May and 2,200 m<sup>3</sup>/s on the 10<sup>th</sup>. Both of these flood peaks in the Wairau were slightly above the mean annual flood of 1,950 m<sup>3</sup>/s. The heaviest rainfall recorded in the Wairau was in the upper Branch catchment on the 9<sup>th</sup> of May, with 128 mm recorded in 24 hours at the Branch at Mt Morris site.

Rainfall was well above average for most parts of the region in May, with the exception of the east coast catchments where rainfall was slightly below average. At the Grovetown Park Station in Blenheim 82.4 mm of rain was recorded in May, which is 139% of the long-term average. The Branch at Recorder site recorded 398 mm total rainfall which is over three times the May average.

The moderate flooding in early May plus further rainfall later on in the month kept river flows elevated throughout the region. As a result, mean river flows for May were above average, ranging from 130-400% of the long-term average May flows.

Shallow soil moisture at the Grovetown Park site rose from 29.2% on May 1<sup>st</sup> to 37% by the 31<sup>st</sup>, which is close to the field capacity of topsoil.

Sea temperatures around New Zealand continue to be warmer than normal, and additional moisture could bring some heavy rainfall, snow, and strong winds to New Zealand in June. In May neutral ENSO conditions continued, but with indicators trending closer to an El Niño phase. It is expected that El Niño will continue to develop throughout winter. El Niño impacts on the New Zealand climate include stronger and more frequent westerly winds over summer, leading to a higher chance for drier than average conditions on the east coast, and above average rain in the west.

## Flooding in early May 2023

A heavy rain event occurred over much of Marlborough in early May, with rain watches and warnings issued by the MetService. On the 4<sup>th</sup> to 6<sup>th</sup> of May a band of moisture with tropical origins moved onto the Top of the South, with an Orange Heavy Rain Warning issued for most of the region. The main front moved eastwards over the country on Tuesday the 9<sup>th</sup> of May, bringing further rain to Marlborough. A second Orange Heavy Rain Warning was issued for this day.

The highest recorded rainfall from these events was in the Te Hoiere (Pelorus) area, with 230 mm recorded in 24 hours at the Tunakino rain gauge overnight on the 5/6<sup>th</sup> of May (a return period of about 5 years).

This rainfall led to peak river flows around midday on Saturday the 6<sup>th</sup> of May (see Figure 1 below). Peak flow in the Rai River at Falls was 420 m<sup>3</sup>/s, which is above the average annual flood of 330 m<sup>3</sup>/s. The Pelorus River above the campground had maximum flow of 1,200 m<sup>3</sup>/s, which is also above the average annual flood of 990 m<sup>3</sup>/s. State Highway 6 was closed for part of Saturday the 6<sup>th</sup> of May due to flooding.

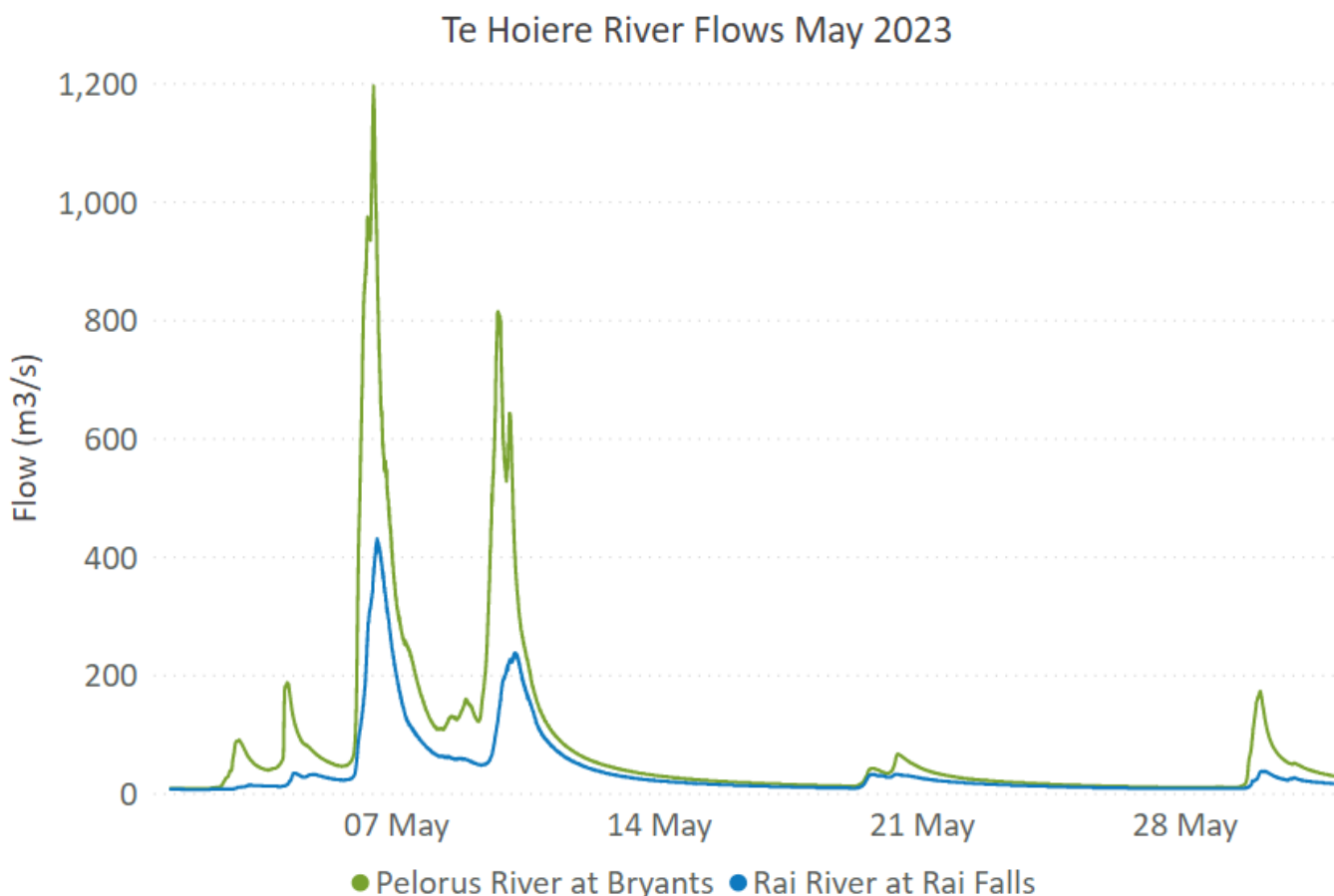


Figure 1. Pelorus and Rai river flows, May 2023.

In the Wairau catchment, the rainfall from the 4-6<sup>th</sup> of May led to minor flooding in the Wairau tributaries. None of the tributaries had flow above their average annual flood level. This led to a moderate flood peak of 2,000 m<sup>3</sup>/s in the Wairau River at Tuamarina on the 6<sup>th</sup> of May (see Figure 2 below).

The heaviest rain recorded over this extended event was in the upper Branch catchment on the 9<sup>th</sup> of May, with 128 mm recorded in 24 hours at the Branch at Mt Morris site. A slightly lower 24 hour total of 95 mm was recorded in the lower Branch catchment. The maximum flow in the Branch following this rain is still to be verified, but was above the average annual flood of 520 m<sup>3</sup>/s. The other major tributaries of the Wairau (Waihopai, Goulter, and Ohinemahuta rivers) all had maximum flows below average annual flood levels. This led to a second flood peak of 2,200 m<sup>3</sup>/s in the Wairau River at Tuamarina on the 10<sup>th</sup> of May. Both of the flood peaks in the Wairau were slightly above the mean annual flood of 1,950 m<sup>3</sup>/s.

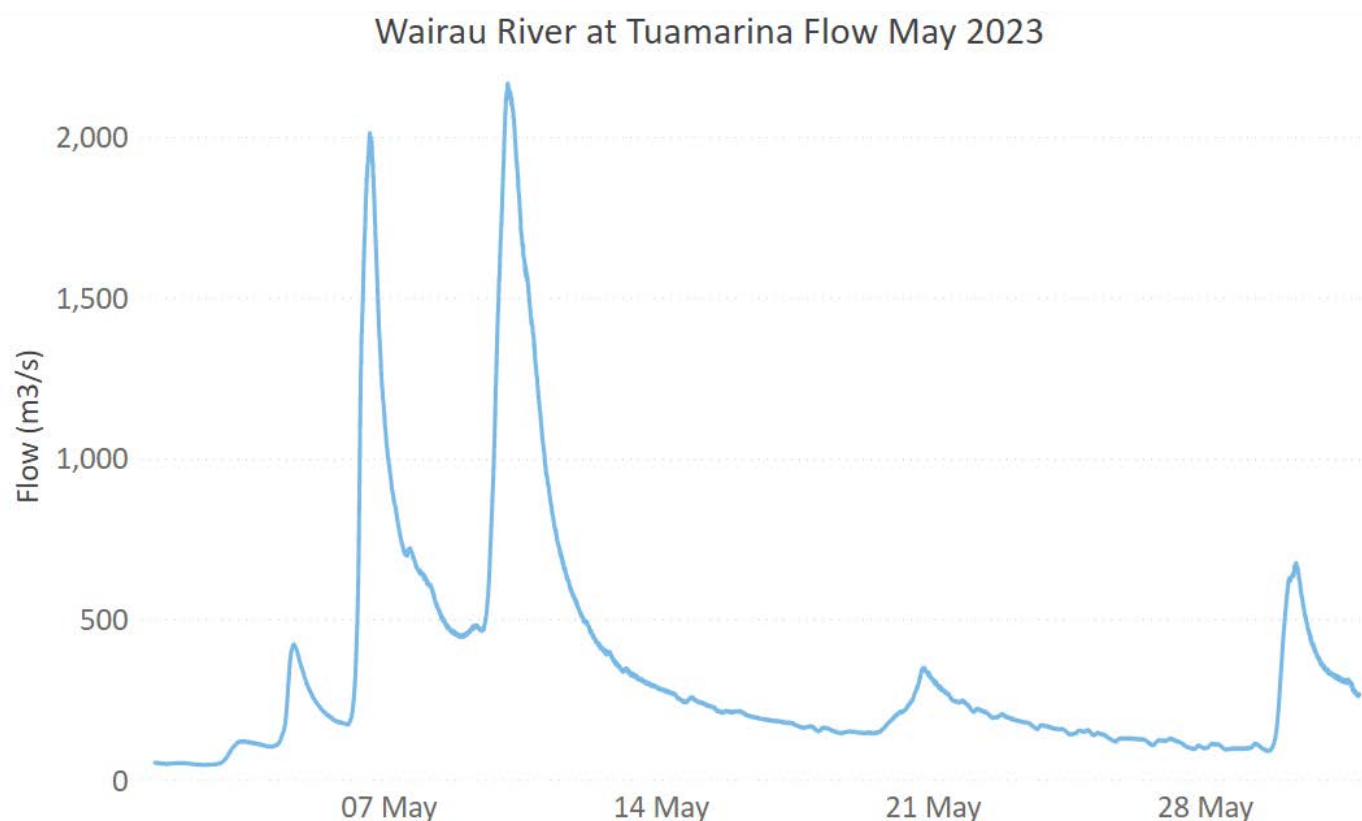


Figure 2. Wairau River at Tuamarina flow, May 2023.

## Rainfall

Rainfall was well above average for most parts of the region in May (see Figure 3 below). In Blenheim 82.4 mm was recorded at the Grovetown Park Station, which is 139% of the long-term average.

The Branch at Recorder site recorded 398 mm total rainfall in May, which is over three times the May average. Most of this rain fell during the event at the start of the month.

Rain at Tunakino was twice the average for May, with 572 mm recorded. Again, most of this rain fell in the first two weeks of the month, with 230 mm recorded in just 24 hours on the 5/6<sup>th</sup> of May. At Kenepuru Head total May rainfall was 310 mm, about 100 mm higher than average.

The East Coast was the only part of the region with below average rainfall in May, with both the Flaxbourne and Te Rapa (Waima) rain gauges recording below their average monthly totals.

Figure 3. Monthly rainfall totals for 2022/23 from 6 key sites around Marlborough, compared to average monthly rainfall totals. Note the adjusted rainfall scale for the Tunakino and Kenepuru Head NRFA sites.



Table 1. 2022/23 monthly rainfall totals (mm) at rainfall monitoring sites in Marlborough.

Site	July	August	September	October	November	December	January	February	March	April	May
Awatere at Awapiri	258	108	50	19	162	61	36	103	84	60	133
Awatere Glenbrae NRFA	169	57	39	11	37	42	50	46	38	29	60
Beneagle at Farm Stream	261	94	78	21	95	62	78	57	47	46	83
Blenheim at MDC Office	220	104	38	13	78	48	56	38	44	37	82
Branch at Branch Recorder	242	283	90	25	137	67	41	140	90	148	398
Flaxbourne at Corrie Downs	272	66	93	21	64	70	54	109	42	55	45
Kaituna Rainfall at Higgins Bridge	287	363	87	104	192	58	101	111	103	122	254
Kenepuru Head NRFA	469	516	192	159	182	127	179	247	168	172	311
Koromiko NRFA	337	287	186	130	126	148	233	111	139	122	171
Lake Elterwater Climate	289	67	106	23	53	72	67	113	48	51	38
Lansdowne NRFA	298	239	88	25	130	50	42	87	74	113	234
Malings	201	276	91	95	151	54	14	90	186	99	206
Mid Awatere Valley NRFA	181	78	29	7	98	71	25	90	97	42	137
Molesworth NRFA	152	99	39	12	75	77	18	89	62	51	119
Omaka at Ramshead Saddle	210	141	72	20	112	65	73	73	93	65	185
Onamalutu at Bartletts Creek Saddle	459	451	142	135	160	106	88	111	111	176	402
Onamalutu at Hilltop Road NRFA	462	448	135	169	167	88	110	98	107	199	287
Picton Climate at Waitohi Domain	262	332	132	95	128	100	194	147			173
Pudding Hill NRFA	98	124	49	23	90	62	60	51	12	43	69
Rai at Rai Falls	394	913	177	193	254	65	145	151	142	299	484
Rai Valley NRFA	419	735	209	158	263	110	188	173	181	250	453
Rarangi at Driving Range	324	186	68	58	121	79	76	77	86	50	115

Site	July	August	September	October	November	December	January	February	March	April	May
Red Hills	236	251	114	28	167	113	46	140	112	174	463
St Arnaud NRFA	208	199	138	67	177	84	42	84	129	112	240
Taylor at Taylor Pass Landfill	165	87	55	15	85	48	53	46	37	56	78
Taylor at Tinpot	310	138	105	47	118	78	104	81	66	82	125
Te Rapa	378	86	133	31	71	90	52	165	93	85	40
Top Valley at Staircase Ridge	388	410	114	57	161	68	67	137	134	185	446
Tor Darroch NRFA	248	164	79	20	139	91	36	91	131	106	219
Tunakino	431	1241	224	184	253	117	192	183	206	356	572
Upper Clarence NRFA	93	34	28	14	68	47	20	22	32	26	46
Waihopai at Craiglochart	212	114	54	20	90	51	21	88	67	61	142
Waihopai at Spray Confluence	235	163	69	10	109	90	21	77	82	85	207
Waikakaho	358	6	94	54	117	87	95	57	69	74	194
Waikawa at Boons Valley							243	169	122	202	174
Wairau at Narrows	292	246	79	51	103	65	43	54	51	98	197
Wairau Valley at Southwold	310	273	77	39	102	48	41	108	56	95	227
Wakamarina at Twin Falls	318	590	183	186	228	67	100	139	128	228	376
Ward NRFA	294	65	87	24	80	67	36	115	54	57	59
Wye at Charlies Rest	215	208	95	22	114	75	43	119	89	94	225

## River Flows

As mentioned above, there was moderate flooding in many rivers throughout Marlborough in early May. There was also further rainfall later on in the month, which kept river flows elevated. As a result, mean flow for the month was above average in all of the rivers listed below (Table 2). The Waihopai River had a mean flow of 53 m<sup>3</sup>/s, which is 416% of the long-term mean flow for May.

The rivers in the drier eastern catchments such as the Taylor and the Flaxbourne also had higher than average flows this month, with 132% and 196% of the long-term mean flow respectively.

A summary of river flows for May 2023 can be seen below in Table 2.

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

Site Name	Mean Flow 2023 (m <sup>3</sup> /s)	Long-Term Mean Flow (m <sup>3</sup> /s)	% of long-term mean	Flow Record Begins	Catchment Area (km <sup>2</sup> )
Rai River at Rai Falls	38.52	11.83	326	1979	211
Pelorus River at Bryants	83.99	21.27	395	1977	375
Kaituna River at Higgins Bridge	10.42	4.36	239	1989	135
Branch River at Weir Intake	55.29	22.29	248	1958	551
Goulter River at Horseshoe Bend	27.89	9.67	288	2010	154
Waihopai River at Craiglochart	53.04	12.75	416	1960	745
Ohinemahuta River at Domain	2.72	1.04	262	2013	33
Are Are Creek at Kaituna Tuamarina Track	0.93	0.55	170	2007	32
Tuamarina River at Para Road	3.22	1.45	222	2004	100
Wairau River at Tuamarina	345.18	93.05	371	1960	3430
Omaka River at Gorge	3.02	0.77	394	1993	91
Taylor River at Borough Weir	0.66	0.50	132	1961	65
Flaxbourne River at Corrie Downs	0.62	0.32	196	2003	71
Awatere River at Awapiri	28.59	11.63	246	1977	983

## Soil Moisture

Shallow soil moisture at the Grovetown Park site was 29.2% on May 1<sup>st</sup>, which is slightly above the average soil moisture value. Regular rainfall throughout the month saw the soil moisture rise to 37% by the 31<sup>st</sup> of May, which is very close to the field capacity for topsoil.

As of the 31<sup>st</sup> of May 2023, the map below (Figure 3) shows soils in the north of the region nearing a water surplus, while soils on the east coast are slightly below field capacity. Soils are generally holding more moisture than the historical average for this time of year (left map in Figure 3 below). The soil moisture anomaly map (Figure 4) shows that most soils are slightly wetter than normal for this time of year.

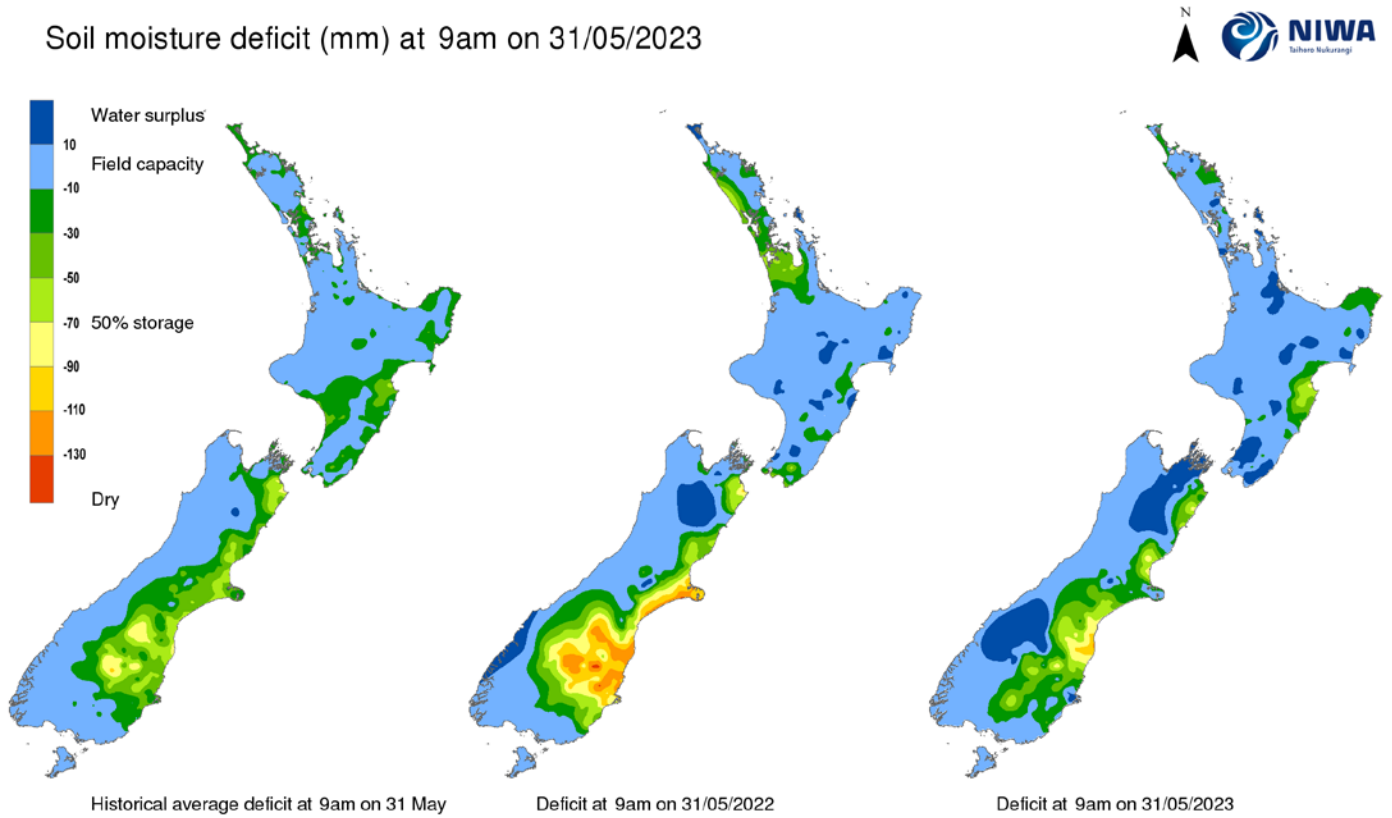


Figure 3. Soil moisture deficit maps of New Zealand, retrieved from NIWA on 31/05/2023.

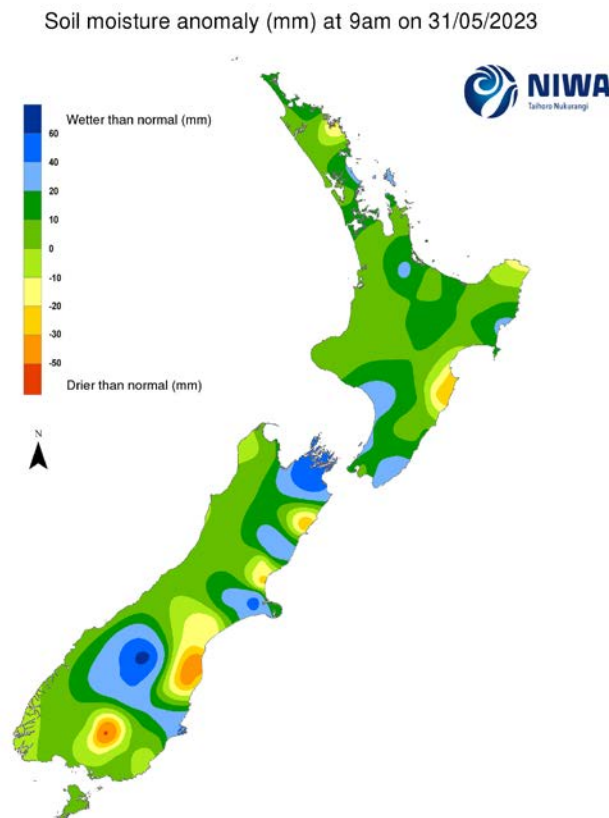


Figure 4. Soil moisture anomaly map of New Zealand, retrieved from NIWA 31/05/2023.



## NIWA Seasonal Climate Outlook June – August 2023





The western Pacific continues to experience warmer than average sea temperatures. Expect this additional moisture to bring some heavy rainfall, snow, and strong winds to New Zealand in June. Higher than average air pressure is forecast to develop in the Tasman Sea during July/August, leading to more south-westerly winds, and below normal rainfall in the north and east of both islands.

Neutral ENSO conditions continued in May, with oceanic and atmospheric indicators trending closer to the El Niño threshold. El Niño will continue to develop throughout winter, with potential for a strong event developing by spring. ENSO conditions account for less than 25% of the annual variance in seasonal rainfall and temperature patterns in New Zealand, however this can still be a significant effect depending on the strength of the El Niño/La Niña phase.

El Niño impacts on the New Zealand climate include stronger and more frequent westerly winds over summer, leading to a higher chance for drier than average conditions on the east coast, and above average rain in the west. A strong El Niño event occurred in 2015/16, with dry weather occurring over much of Marlborough. For example, total rainfall recorded at Awatere at Awapiri from 1 July 2015 - 30<sup>th</sup> June 2016 was 464 mm, the lowest 12 month total recorded in the 28 years 1995-2023.

More information on the impacts of El Niño and La Niña on New Zealand's climate can be found at <https://niwa.co.nz/climate/information-and-resources/elnino/elnino-impacts-on-newzealand>

The predictions for Marlborough/Tasman from June to August are:

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