greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Climate and Water Resource Summary for the Wellington Region

Autumn 2016

Contents

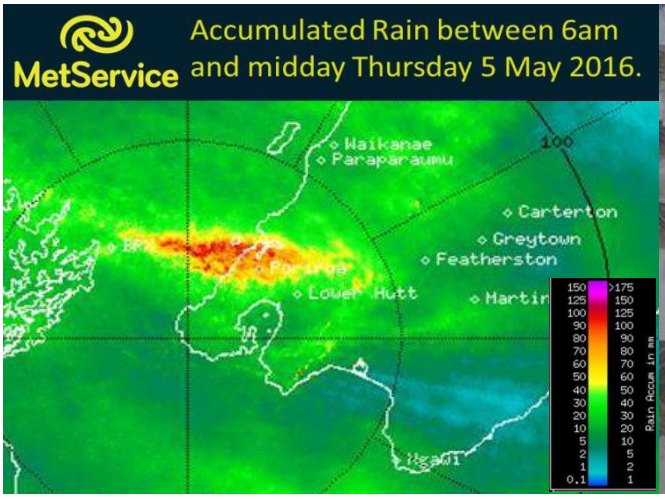


Image from MetService showing the very intense rainfall that fell over Porirua in a 6-hour period.
Image: MetService

Surface flooding on Warspite Ave in Cannons Creek/Waitangirua
Photo: Ayla Parker

Torrential rain wreaked havoc across Porirua on the morning of 5th May 2016. Areas of flooding occurred in Titahi Bay, Elsdon, the CBD, Waitangirua and Cannons Creek as the deluge occurred after a prolonged period of dry weather and stormwater drains struggled to cope with the very intense rainfall and other factors such as autumn leaves.

A number of roads were submerged and schools closed across the city. The Fire Service was kept busy attending over 50 callouts between 9am and midday.

In this report you will find:

More information

For more information on monitoring sites and up-to-date data please visit http://www.gw.govt.nz/environmental-science/. Several climate sites are operated by NIWA and/or MetService, and GWRC is grateful for permission to present the data in this report.

Disclaimer

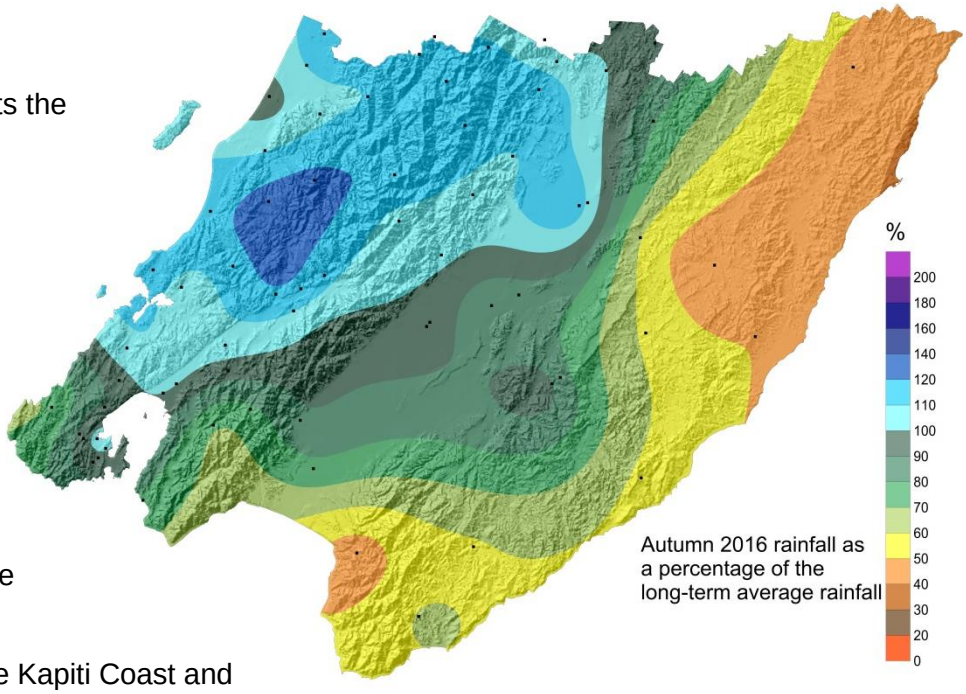
Report release date: June 2016

Autumn 2016 (March to May inclusive) was drier than average for most of the region. The south and east of the Wairarapa were the driest areas with west coast areas being the wettest.

Autumn rainfall

The map to the right presents the rainfall recorded during the autumn 2016 season as a percentage of the long term average.

There is a clear pattern of decreasing rainfall from west to east across the region during autumn. The eastern Wairarapa hill country and coast received the least rainfall with 40-60% of the seasonal average occurring along the coast.



Recorded rainfall shows there was below average autumn rainfall across most of the region. The eastern hills of the Wairarapa and the southern Ruamahanga valley show the lowest seasonal rainfall compared to normal.

Rainfall was highest over the Kapiti Coast and Porirua and in to the Tararua Range due largely to a succession of north-westerly rainfall events during May that brought periods of heavy rainfall.

Rainfall maps for each individual month of autumn on the next page show the influence that the heavy rainfall events that occurred during May had on total autumn rainfall.

Another way to consider the season's weather is to look at the number of days that it rained. If more than 1mm of rain is recorded in a day this is called a 'Rain Day' and if there is more than 25mm this is termed a 'Heavy Rain Day'. The table below shows that the Kapiti Coast was the only area to equal or exceed the average number of 'rain' and 'heavy rain' days in both lowland and hilly areas. The eastern Wairarapa had 14 fewer 'rain' days than normal over the season.

Number of Rain Days and Heavy Rain Days during autumn across the region (with the long-term average shown in square brackets.) Most places experienced close to the average number of rainy days.

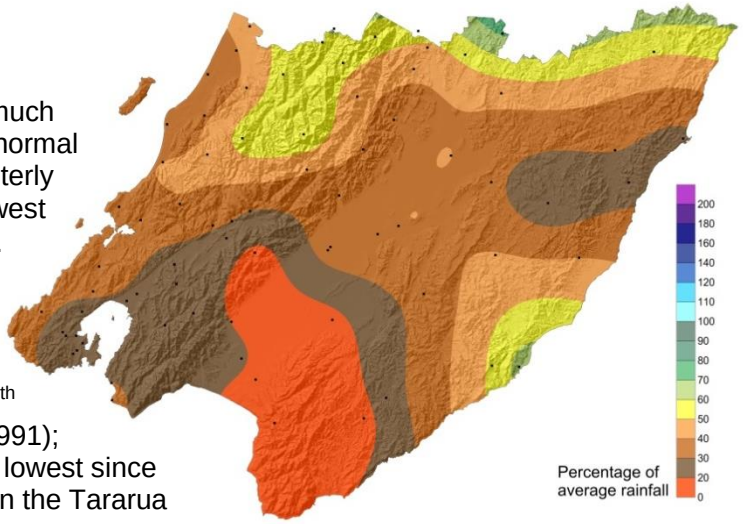
	Kapiti Coast		Porirua	Hutt Valley & Wellington		Ruamahanga		Eastern Wairarapa
	Lowland	Hills	Lowland	Lowland	Hills	Lowland	Hills	
Rain Days (>1mm)	28 [25]	40 [39]	22 [25]	22 [27]	33 [36]	24 [24]	41 [46]	22 [36]
Heavy Rain Days(>25mm)	2 [2]	13 [10]	3 [2]	3 [2]	5 [5]	2 [1]	17 [13]	1 [2]

Rainfall by the month

The maps below show the percentage of average rainfall for each month. Autumn was characterised by very dry conditions across the whole region throughout March and April and a starkly contrasting wet May at most locations.

March

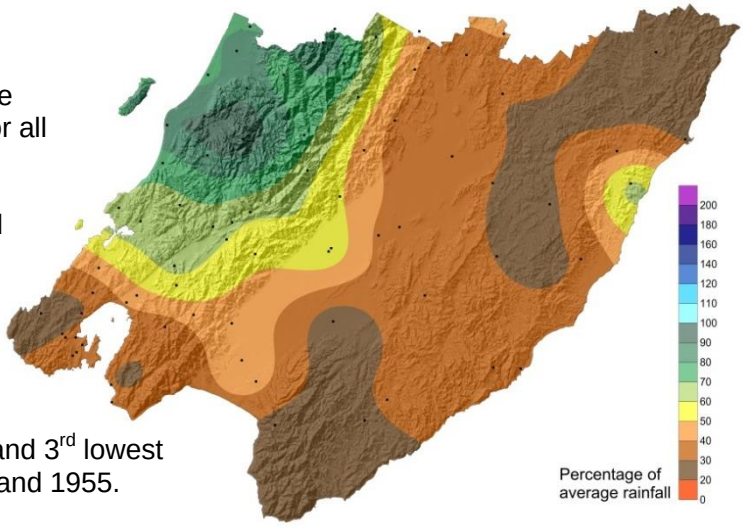
Near record low rainfall was recorded across much of the region during March due to higher than normal pressure to the east producing more north-easterly winds than usual – negating the tendency for west to south-westerly conditions during an El Niño.



The March rainfall total of 40mm recorded at Kaitoke was the 2nd lowest since records began in 1951. Other notable lows were at: Wainuiomata (3rd lowest since 1890); Karori (9th lowest since 1878); Porirua (3rd lowest since 1991); Otaki (2nd lowest since 1984); Featherston (4th lowest since 1962); Longbush (6th lowest since 1955); and in the Tararua Range at Carkeek (6th lowest since 1974).

April

April was a month of settled weather across the region and rainfall was again below average for all monitoring sites.

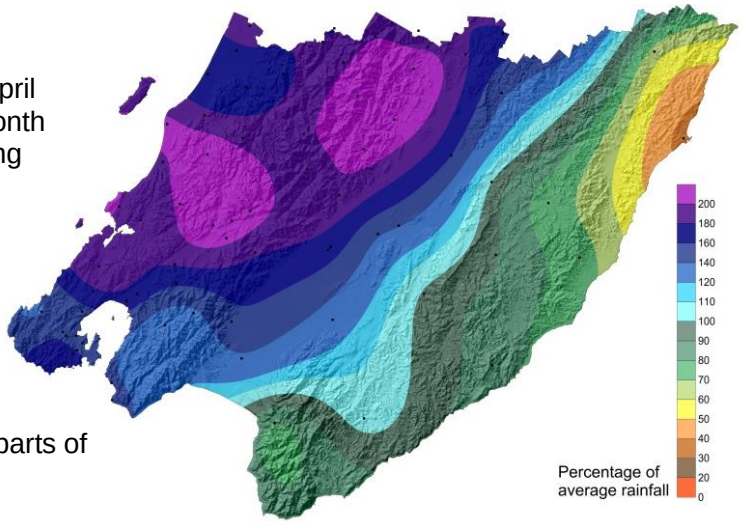


With the exception of gauges at Masterton and Tanawa Hut (north-eastern hills) the rainfall totals during April were higher than those of March.

Rainfall recorded at Wainuiomata was the 3rd lowest April total since records began in 1890. Totals at Karori and Tanawa Hut were the 5th and 3rd lowest respectively since those sites opened in 1878 and 1955.

May

May got off to a dry start, continuing on from April conditions. However, the second half of the month saw a succession of low pressure systems bring stormy weather.



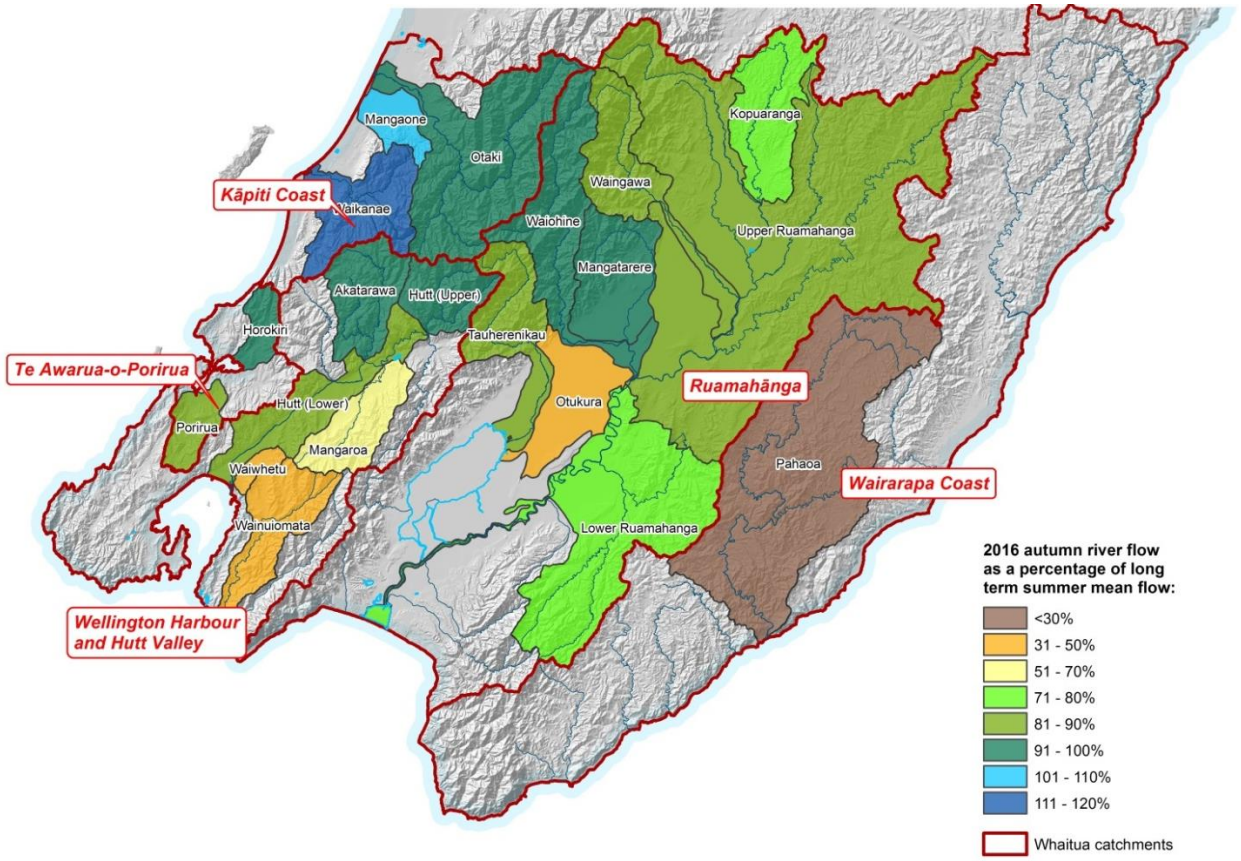
In contrast to the first two months of autumn, rainfall totals during May were near record at a number of sites. Rainfall at Kaitoke and Otaki were the 2nd wettest May totals since records began in 1951 and 1984 respectively.

Very heavy and intense rainfall occurred over parts of Porirua on the 5th May (see next page).

River flows

The map below shows autumn river and stream flows for various monitored catchments as a percentage of the average flow.

Most rivers and streams across the region experienced lower than average flows during autumn with the exception of rivers draining the high peaks of the Tararua Range. The Waikanae River had the highest average flow – being 119% of normal. The Pahaoa and Wainuiomata Rivers were the driest with autumn flows of 2 and 42% of their respective average.



The map shows river and stream flows recorded during autumn 2016 as a percentage of the long-term average. All monitored catchments produced autumn flows that were much lower than normal. The Pahaoa River in the eastern hill country was particularly low at around 2% of its normal autumn flow.

Deluge – 5th May

A short but very intense period of rainfall occurred over Porirua city on 5th May. While rain fell over all of Wellington, Hutt Valley and Kapiti – the most intense band crossed over Porirua between Titahi Bay and the eastern suburbs of Cannons Creek and Waitangirua.

GWRC rainfall monitoring sites at Tawa, Whenua Tapu and Battle Hill noted moderate rainfall but the most intense rainfall occurred between these locations. Wellington Water Ltd, as part of a catchment investigation, had access to temporary rain gauges installed in the Cannons Creek and Waitangirua areas – right in the centre of the storm.

Very intense rainfall totals of 33mm over 30 minutes, 47mm over 1 hour, and 73mm over 2 hours were recorded. Rainfall of this intensity is considered around a 1 in 100-year event.

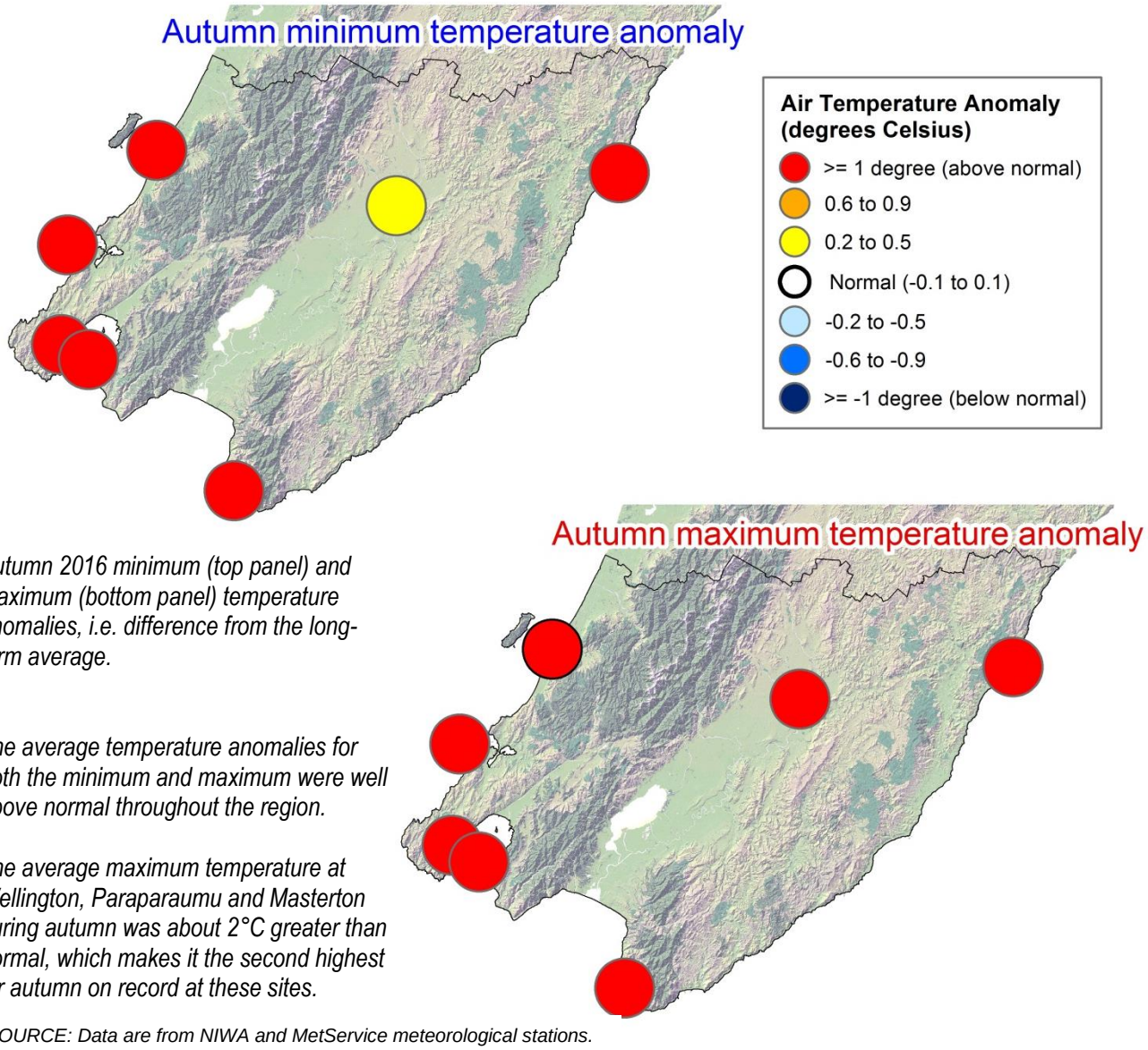
Autumn air temperatures

Air temperature is measured at a number of meteorological monitoring sites across the region. It is useful to look at patterns in seasonal anomalies (i.e., differences from normal) in average extremes of temperature (i.e. daytime maximum and night time minimum) across the region to help interpret how dominant and widespread the climate anomalies have been.

The anomalies between the average daily minimum and maximum temperatures recorded during autumn and the historical averages for this season are shown below for sites across the region. The ranges of extreme maximum and minimum temperatures (i.e., daily minima and maxima - not monthly averages) are presented in the climate statistics table at the end of the report.

Both maximum and minimum temperatures were well above average across the entire region.

In terms of the overall average autumn temperatures, those recorded at the Masterton and Wellington airport meteorological sites were the highest on record (since 1992 and 1962 respectively). Paraparaumu had its second warmest autumn on record since 1953. Other sites had high temperature records in individual months, with all three months being consistently warm across the whole region.



Autumn 2016 minimum (top panel) and maximum (bottom panel) temperature anomalies, i.e. difference from the long-term average.

The average temperature anomalies for both the minimum and maximum were well above normal throughout the region.

The average maximum temperature at Wellington, Paraparaumu and Masterton during autumn was about 2°C greater than normal, which makes it the second highest for autumn on record at these sites.

SOURCE: Data are from NIWA and MetService meteorological stations.

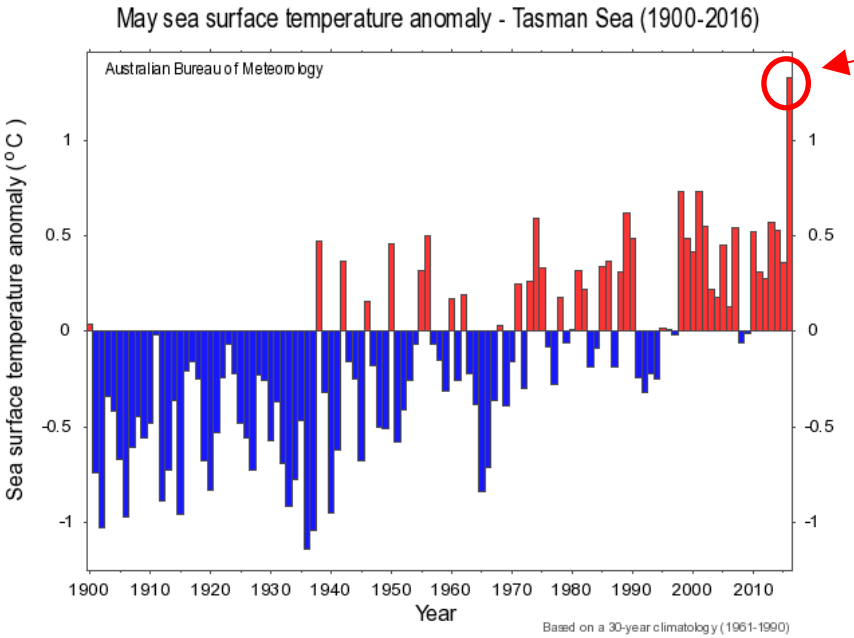
Global climate drivers

Climate variability and climate change

People often ask if the variable weather patterns in our region are a result of climate change. While natural climate variability has always been quite pronounced in our region, weather extremes are expected to get worse as a result of human-induced climate change and "global warming" caused by greenhouse gas emissions (http://www.royalsociety.org.nz/expert-advice/papers/yr2016/climate-change-implications-for-new-zealand/).

Some key observations about climate variability and change in our region during autumn 2016:

- This has been the warmest autumn on record at several locations, including Wellington and Masterton. The atmospheric warming was accompanied by very warm oceanic temperatures to the west of New Zealand (shown in the figure below), and is consistent with expected climatic changes as a result of increased anthropogenic (i.e., caused by humans) CO_2 in the atmosphere.
- The effects of climate change are already being felt as they are superimposed onto natural climate fluctuations.
- The 2015/16 El Niño phenomenon has been the strongest since the 1997/98 event, and contributed to significant water stress over most of the Wairarapa. The El Niño is now officially over and the Equatorial Pacific Ocean is expected to remain on the borderline between neutral and La Niña for the remaining of the year.
- Global atmospheric temperatures tend to increase during El Niño events because the ocean releases more heat into the atmosphere. New Zealand however tends to be cooler than normal during El Niños due to localised southerly air flow, but the 2015/2016 event was associated with atmospheric blocking (i.e., high pressure cells) and a strong warming of both water and air around and over most of the country in both summer and autumn.



Evolution of sea surface temperature anomalies for the Tasman Sea over the last 116 years.

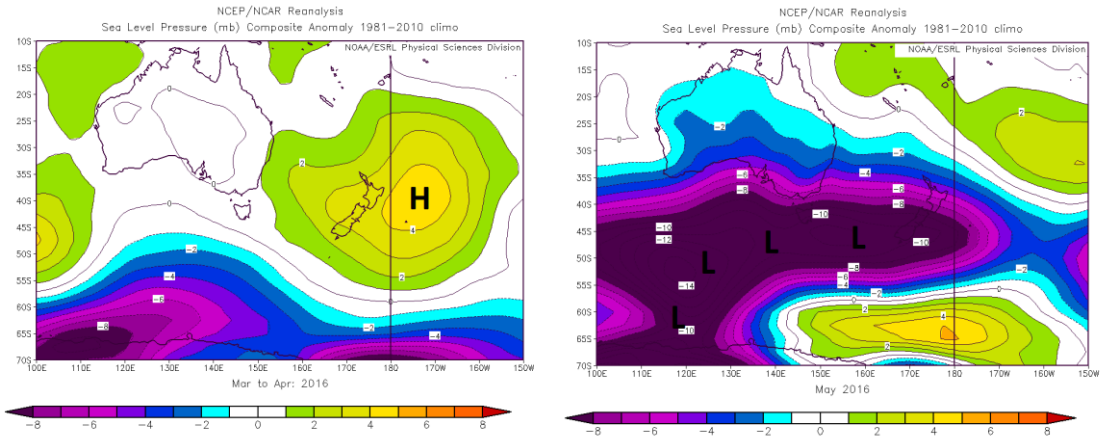
A warming trend is evident shifting from blue (colder than average) to red (warmer than average) over the more recent decades. May 2016 appears as the warmest on record by a very large margin of almost double the previous record.

Source: BoM (Australia).

Global climate drivers and extreme weather events

Climate drivers are global mechanisms that can influence the weather in our region. The El Niño/Southern Oscillation[1] (ENSO) phenomenon, which has been in its positive (El Niño) phase since April 2015, is now neutral.

As predicted, the El Niño contributed to an overall dry autumn for most of the region, particularly in eastern and southern Wairarapa. The dry pattern that had been persisting since February was abruptly interrupted in mid to late May by a succession of low pressure systems bringing stormy weather, resulting in rainfall totals that were around twice the long-term average for May. The figure below shows a stark contrast in the atmospheric pressure between March-April (left) dominated by a high pressure (indicated by H) to the northeast of New Zealand, and May (right) dominated by a series of troughs (indicated by L) between Antarctica and southwestern New Zealand.

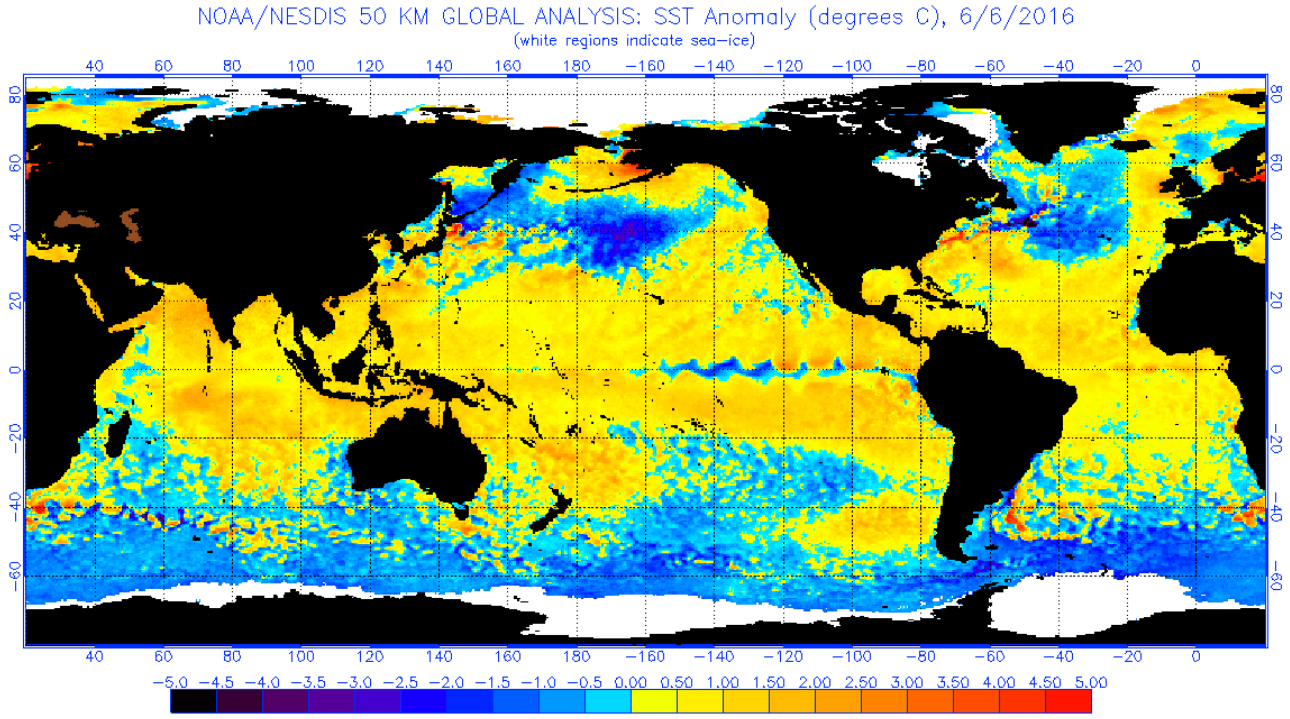


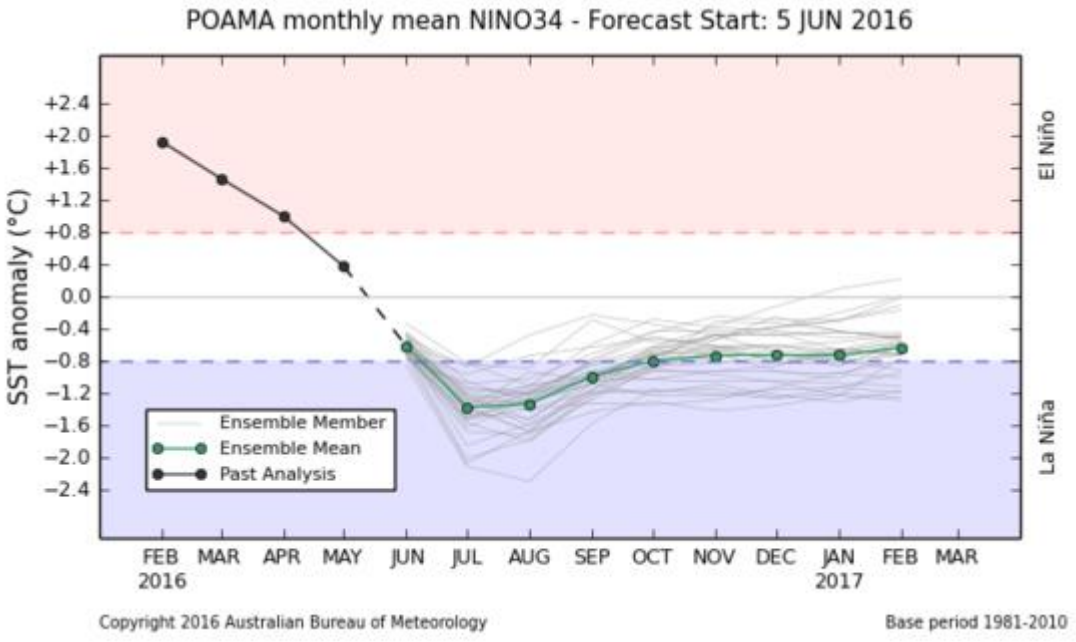
Sea level pressure anomalies during March-April 2016 (left) and May 2016 (right). A persistent high pressure to the northeast of New Zealand was responsible for the predominance of weak winds and very warm temperatures for most of autumn (left). This pattern was abruptly interrupted by a series of low pressure centres (right) bringing heavy rainfall to the western coast. Source: NCEP reanalysis, USA.

The ENSO phenomenon is now neutral and expected to remain borderline between neutral and La Niña for the remaining of 2016. The figure below shows the latest sea surface temperature (SST) anomalies (by NOAA) and the latest ENSO forecasts produced by models from the Bureau of Meteorology in Australia (BoM).

The SST map shows warm waters to the north of New Zealand, and colder than average waters to the south towards the area covered by sea ice (in white). The ENSO model predictions show a downward direction with the mean ensemble (green line) dipping into La Niña conditions in winter and then remaining borderline between neutral and La Niña conditions. The Bureau of Meteorology in Australia has activated its La Niña watch status in response to these predictions.

[1] https://www.niwa.co.nz/education-+-and-training/schools/students/enln





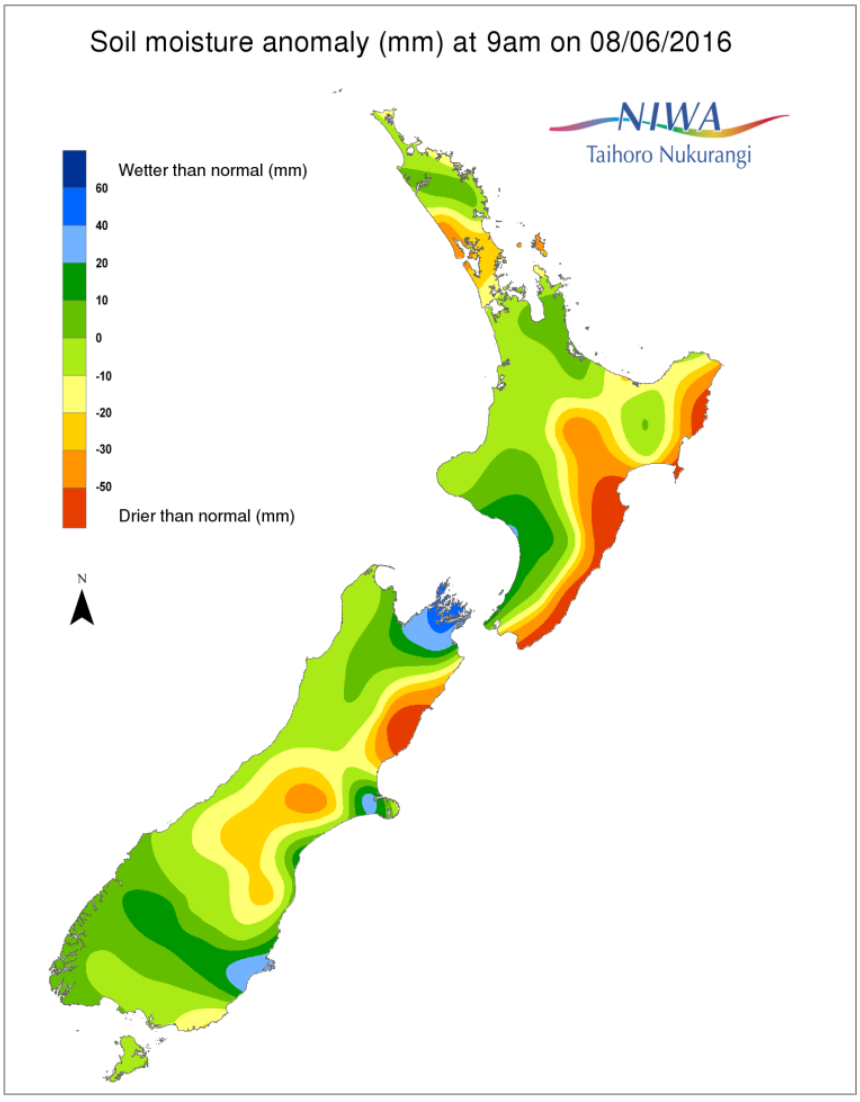
Upper panel: Latest Sea Surface Temperature anomalies, as of 6 June 2016. The sea ice around Antarctica is seen in white. The sea ice extent is slightly below average south of New Zealand, in sharp contrast to the above normal extent observed at this time last year. Source: NOAA.

Lower panel: Predicted evolution of the Equatorial Pacific sea surface temperature anomalies associated with the ENSO event. Neutral conditions and/or a weak La Niña are predicted for the remaining of the year. Source: BoM, Australia.

Seasonal climate outlook for winter 2016

Even though the largely above average rainfall in May helped curb the water stress over the region, the figure below shows that as of 8th June soil moisture is still below normal for this time of the year over most of the Wairarapa. The satellite-derived vegetation indices show that the drought-stress potential inferred by the state of vegetation and topsoil is much higher compared to the same time last year. In light of these factors, the level of water recovery during the cold season will be a fundamental determinant of how conditions will likely unfold later in the year.

As discussed earlier, the ENSO phenomenon is expected to be in the borderline between neutral and La Niña for the remaining of the year, and a La Niña watch is in place. This expected development is accompanied by warm sea surface temperatures to the north and west of New Zealand, which are predicted to remain warm during winter, and colder water around Antarctica. These conditions are favourable for a return to normal rainfall for most of the season, with higher likelihood of warm temperatures and wet conditions in the west due to the influence of the water temperatures. The colder waters around Antarctica also mean that very cold spells with severe frost could also be seen throughout the season, especially over the Wairarapa where the soils are dry and hence more conducive to frost.



Above: Red and orange areas show soil moisture well below average in the Wairarapa as of 8 June 2016 (NIWA).

Climate Outlook for winter 2016:

Above average temperature is expected for the western part of the region, with normal to above normal temperature over the Wairarapa.

Greater variability of mild and cold conditions is likely, noting that severe frosts can occur particularly over the Wairarapa where the soils are dry.

There is also a greater likelihood of heavy rainfall and severe wind storms in the west.

The forecasts are qualitative only, as it is not possible to accurately estimate the actual amount of seasonal rainfall.

Whaitua[1]		Climate Outlook for winter 2016
Wellington Harbour & Hutt Valley	**Temperature:** **Rainfall:**	Above average, greater variability of mild and cold temperatures. Normal to above average, heavy rainfall events likely.
Te Awarua-o- Porirua	**Temperature:** **Rainfall:**	Above average, greater variability of mild and cold temperatures. Normal to above average, heavy rainfall events likely.
Kāpiti Coast	**Temperature:** **Rainfall:**	Above average, greater variability of mild and cold temperatures. Normal to above average, heavy rainfall events likely.
Ruamāhanga	**Temperature:** **Rainfall:**	Normal to above average, greater variability of mild and cold temperatures. Higher chance of severe frost events. Around average. Heavy easterly rainfall events possible.
Wairarapa Coast	**Temperature:** **Rainfall:**	Normal to above average, greater variability of mild and cold temperatures. Higher chance of severe frost events. Around average. Heavy easterly rainfall events possible.

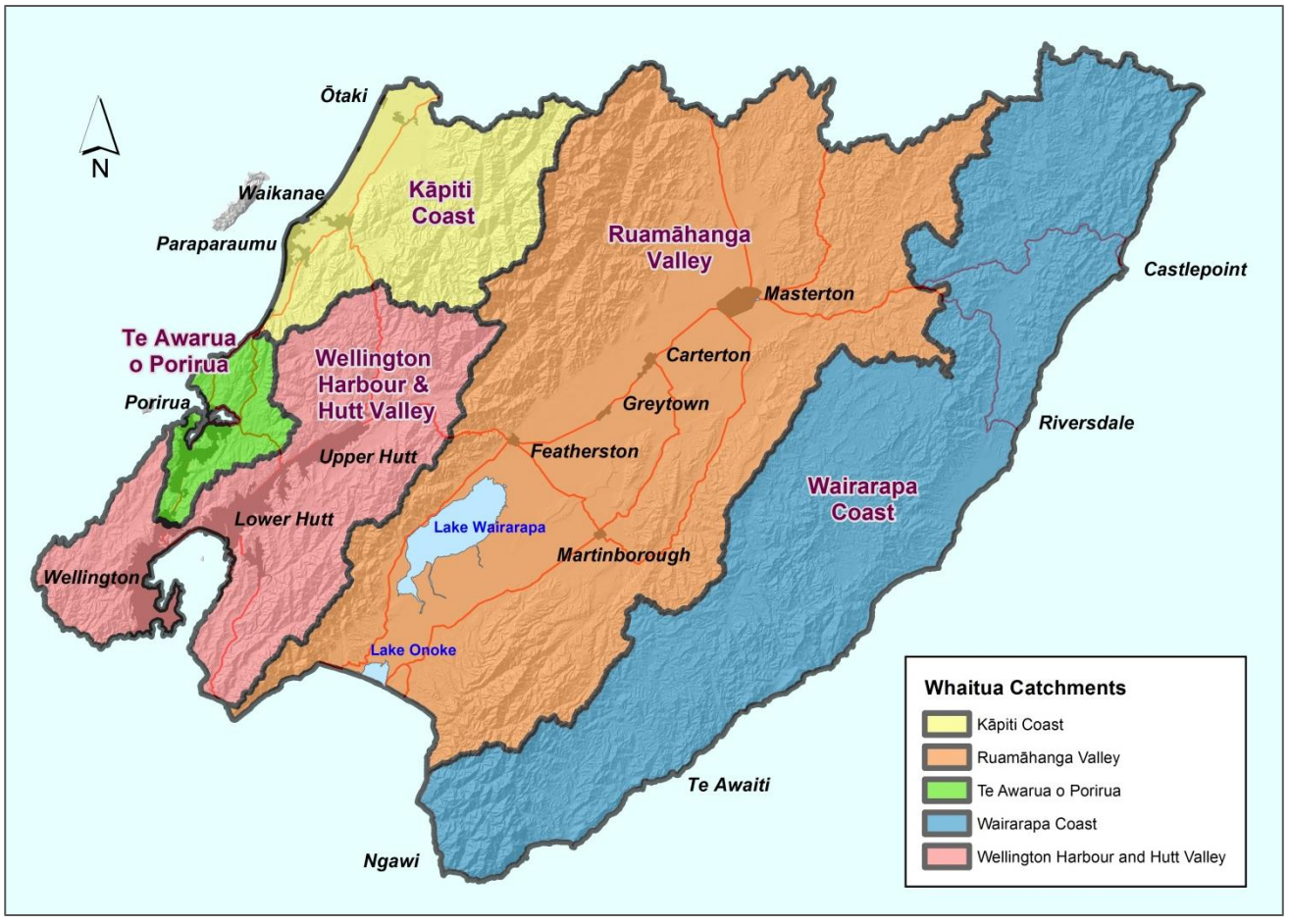
[1] *Whaitua catchment areas are shown on the map on the next page*

This climate outlook was prepared by the Environmental Science department, GWRC, based on internal expertise, and information provided by NIWA, MetService and international centres such as the International Research Institute for Climate and Society of Columbia university (http://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/). This guidance is qualitative only, and GWRC takes no responsibility for the use or accuracy of this information. For more details on long-term climate forecasts at a national level the reader should refer to NIWA in the first instance (https://www.niwa.co.nz/climate/sco)

What happened in each whaitua catchment?

Climate and water resource summaries are provided in the following sections for each of the five Wellington region whaitua catchment areas (as shown below). The whaitua catchments provide an important sub-regional basis for environmental management in the Wellington region[2], and roughly coincide with the different climate and water resource zones.

Click the following links for autumn 2016 summaries on:

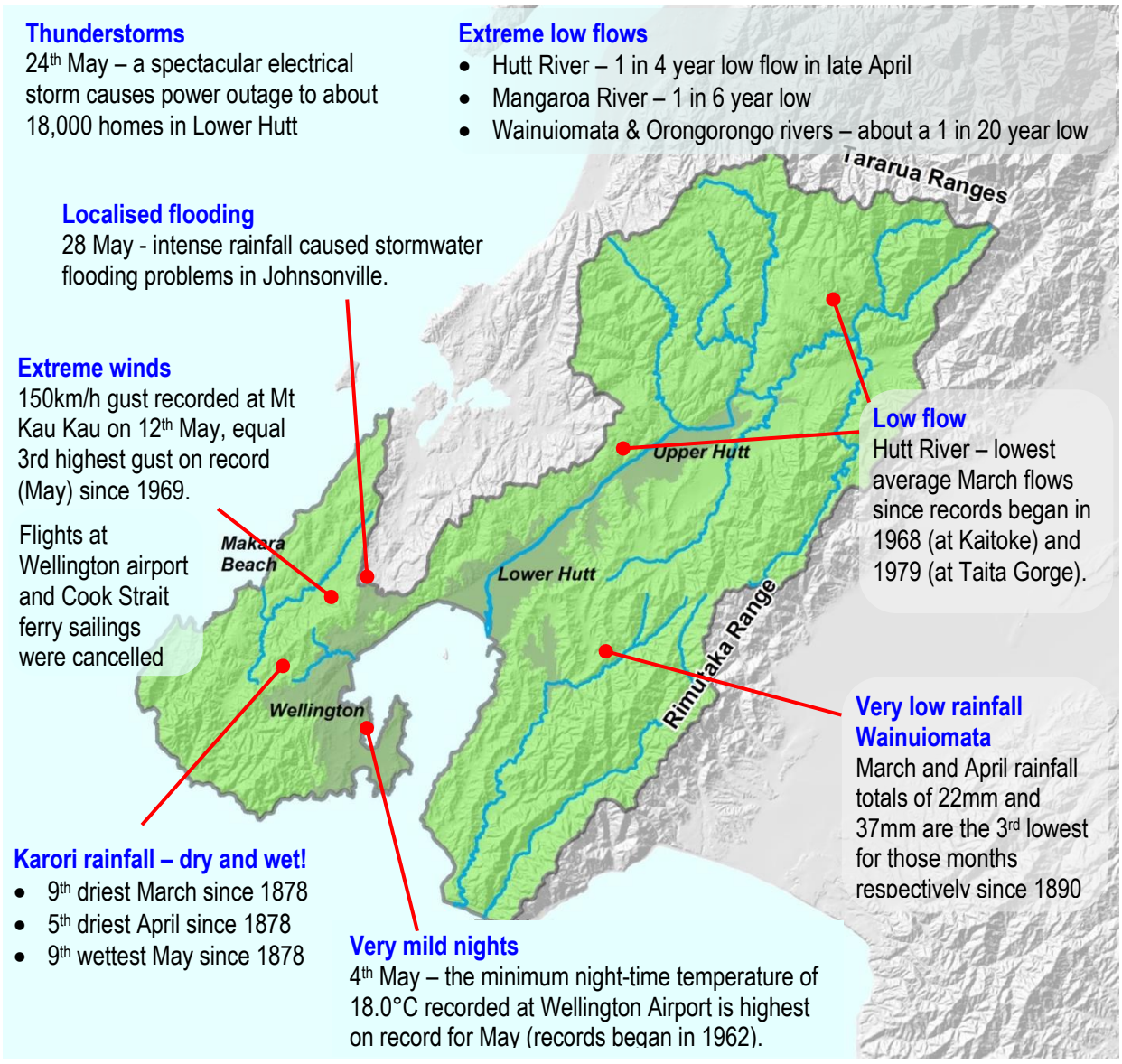


Map of the five whaitua catchment areas in the Wellington region. Each whaitua roughly coincides with a climatic zone, expressing the marked east-to-west contrast that we experience in our region.

[2] http://www.gw.govt.nz/whaitua-committees/

Wellington Harbour and Hutt Valley climate summary

- **Warmest on record**
- **Long dry spells abruptly changing into areas of heavy rainfall late in May**
- Some notable winds gusts, and record high night time temperatures.

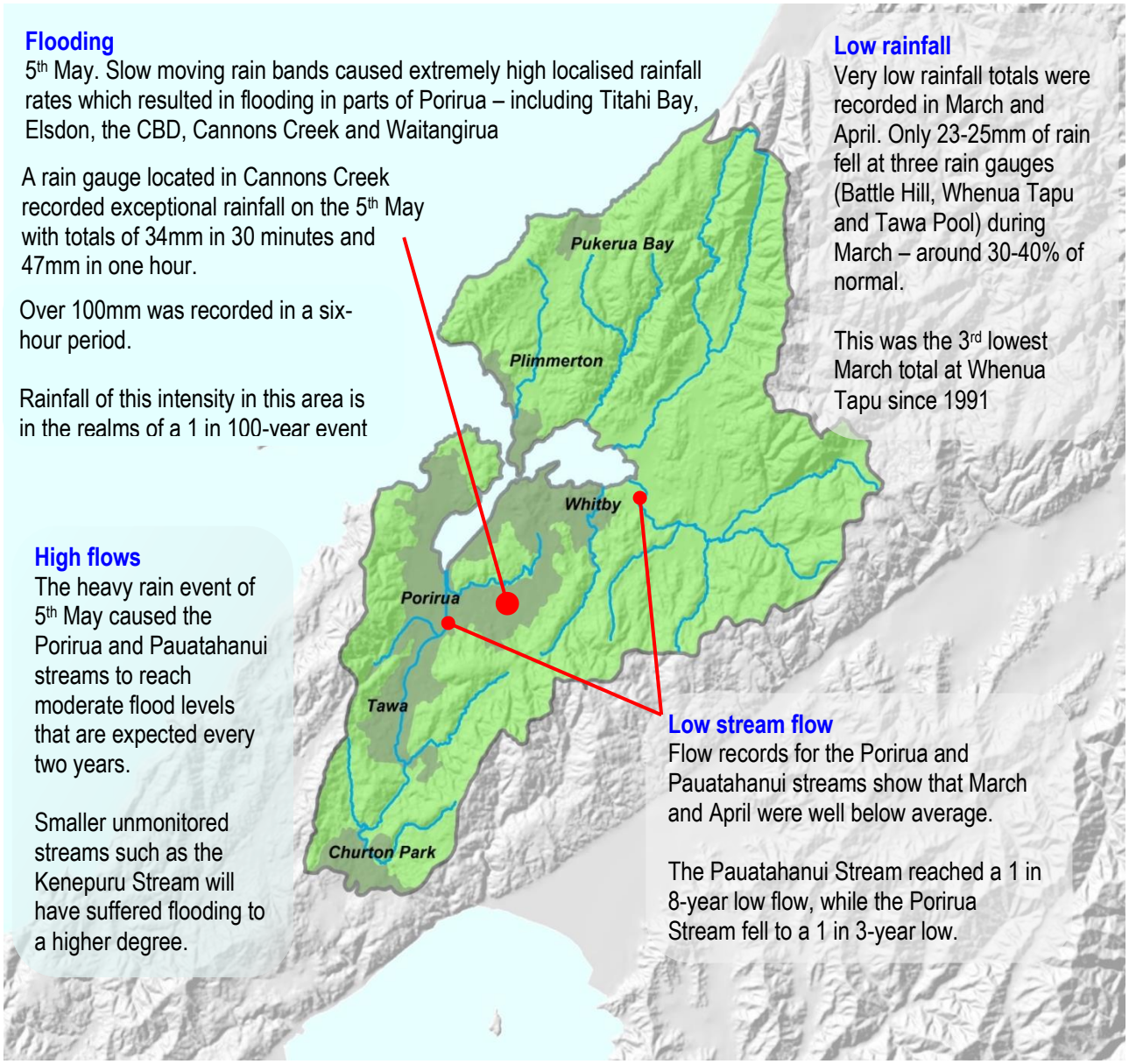


Want to look at the summary tables and graphs?

Climate
Rainfall
River flows
Groundwater levels

Te Awarua-o-Porirua climate summary

- **Warmer than average**
- **Long dry spells abruptly changing to a number of heavy rainfall events in May**



Want to look at the summary tables and graphs?

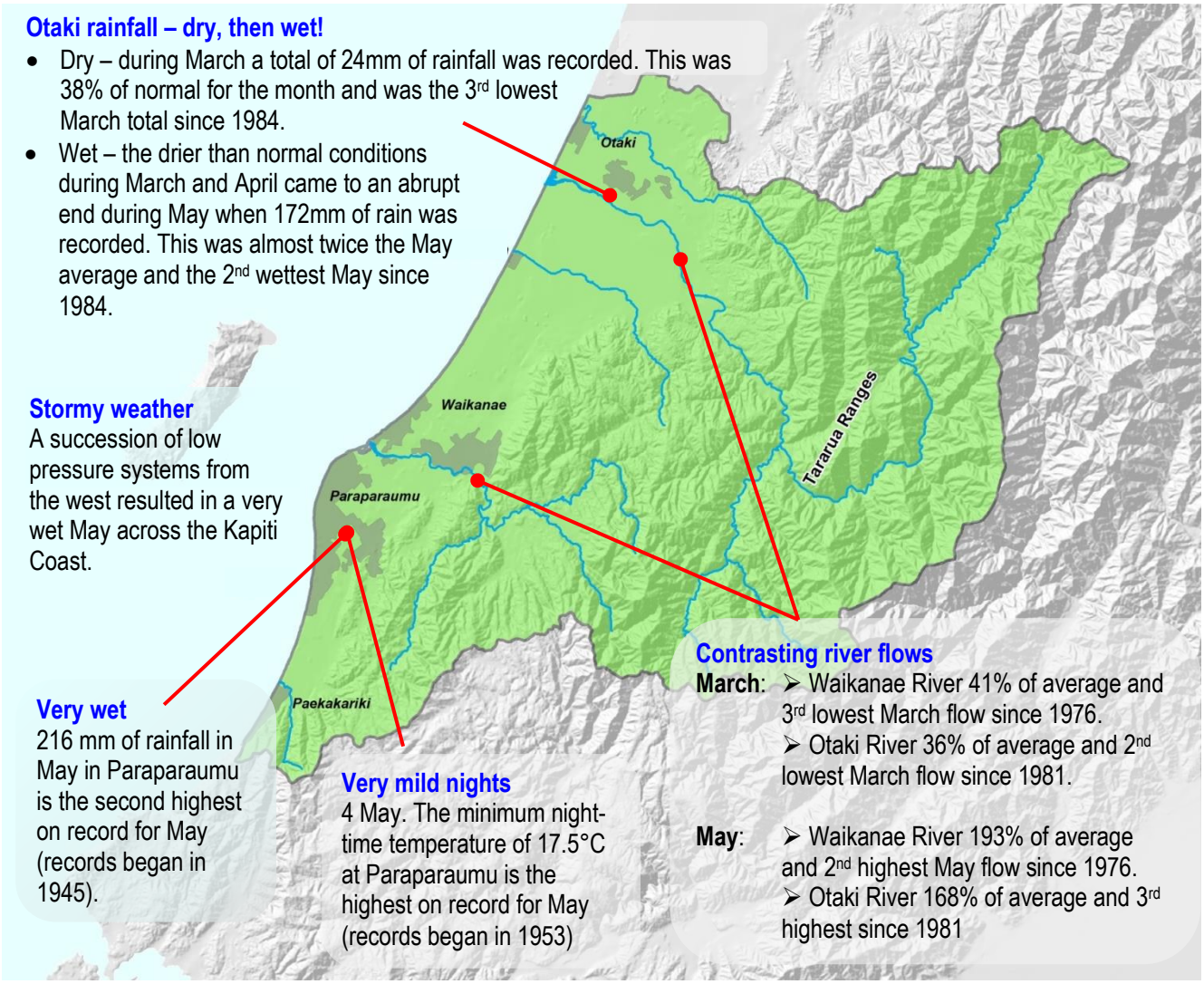
Climate

Rainfall

River flows

Kāpiti Coast climate summary

- **Warmer than average**
- **Long dry spells changing to a succession of heavy rainfall events in May**
- **Record warm night time temperatures**

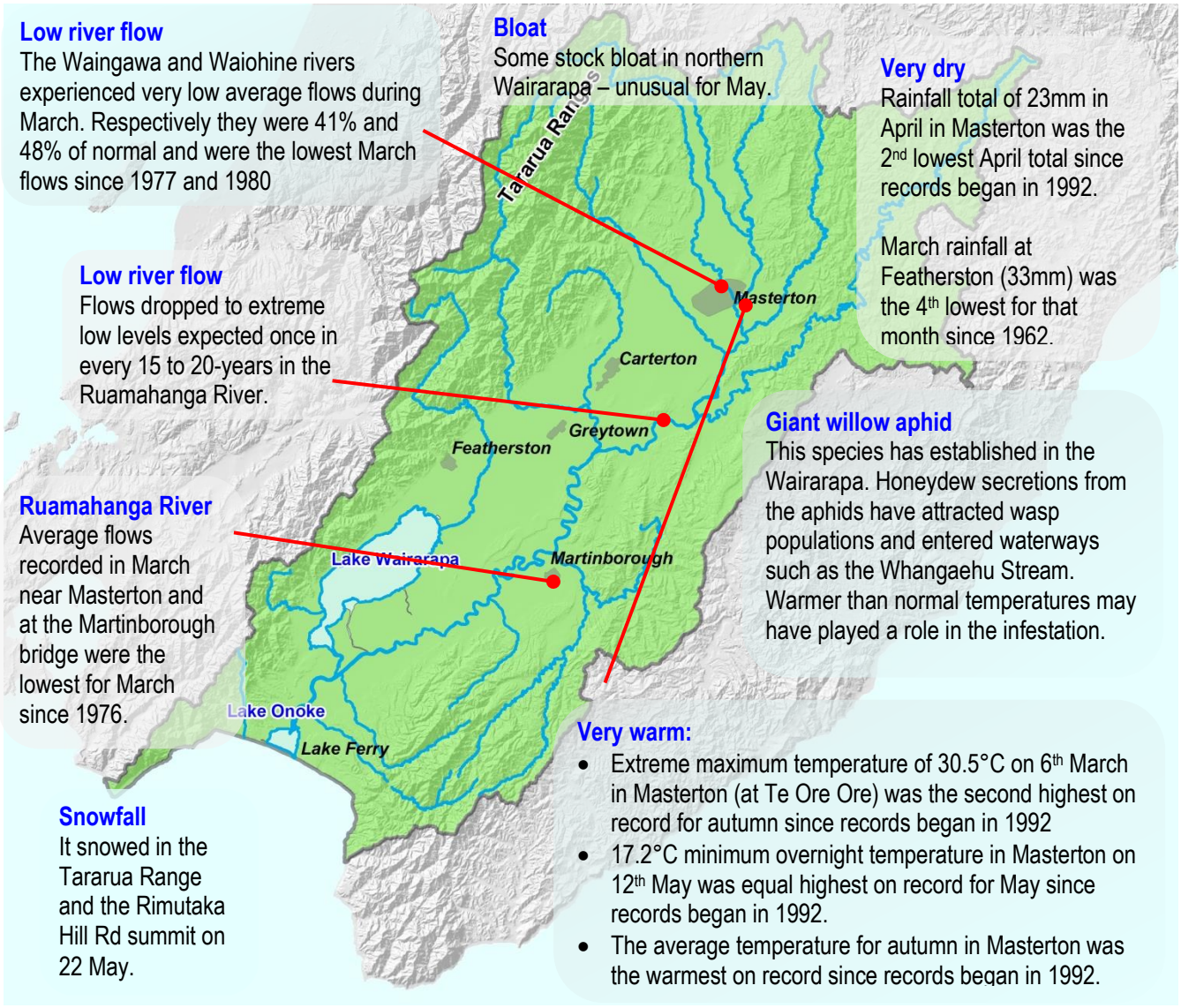


Want to look at the summary tables and graphs?

Climate
Rainfall
River flows
Groundwater levels

Ruamāhanga Valley climate summary

- **Warmest on record**
- **Drier than average**
- Hot days and warm nights, with an impressive 17 days above 25 degrees

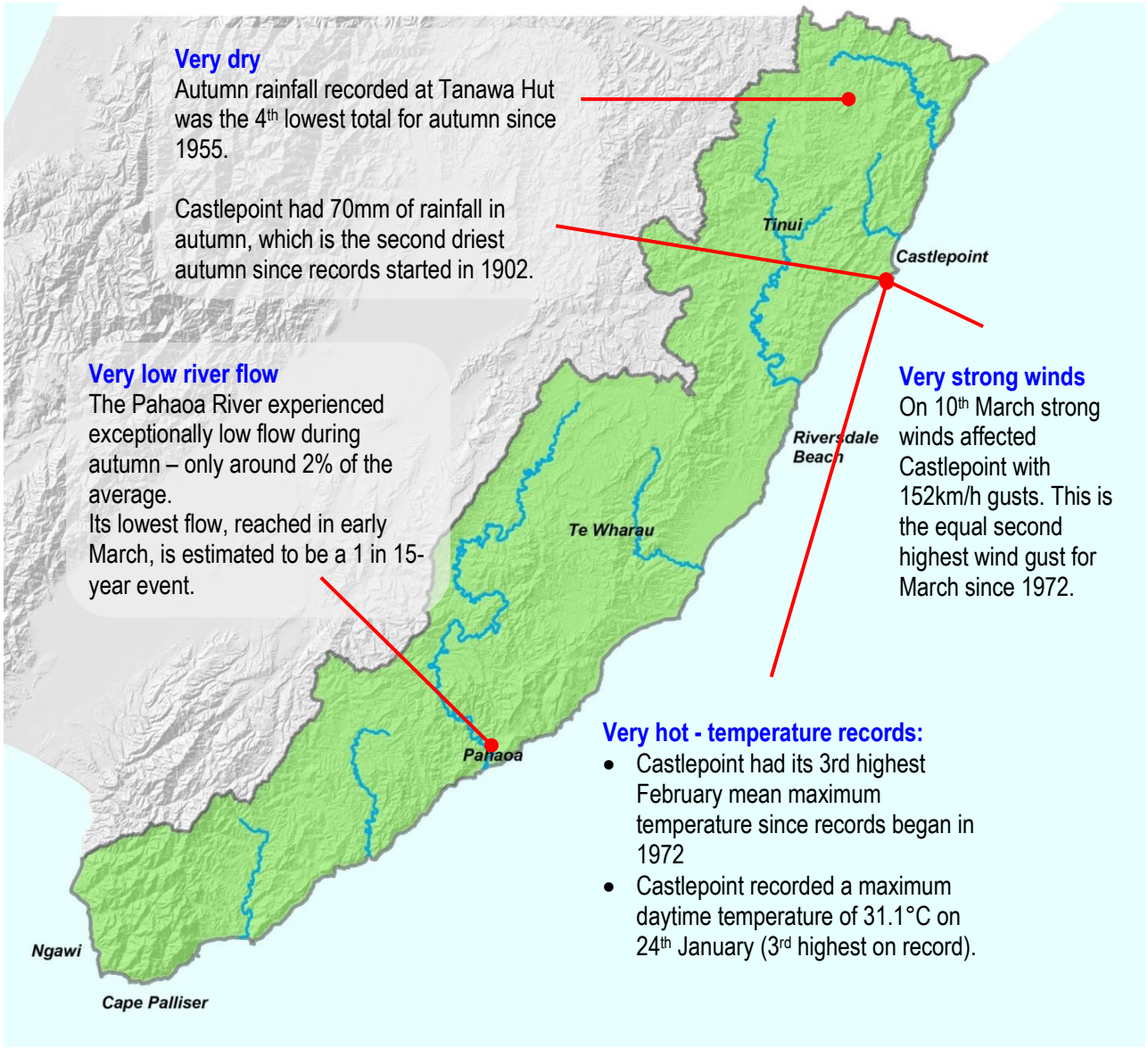


Want to look at the summary tables and graphs?

Climate
Rainfall
River flows
Groundwater levels

Wairarapa Coast climate summary

- **Warmer than average**
- **Much drier than average (second driest autumn)**
- Some notable wind gusts and overall hot days and warm nights



Want to look at the summary tables and graphs?

Climate

Rainfall

Soil moisture

Climate statistics

A climate summary for selected monitoring sites within each whaitua catchment area is presented below for autumn 2016. Numbers shown in red denote record/near record breaking extreme warm temperatures compared to the long-term historical records, and/or positive departures from the mean temperatures. Blue text denotes the opposite (cold).

The predominance of red clearly shows warmer than average conditions for all whaitua catchments, with a very large number of days above 25 degrees in Masterton. A high incidence of severe gales is noted for Mt Kau Kau, Kelburn, Rimutaka Hill and Castlepoint.

Whaitua	Location[1]	Extreme Max Temp (°C)	Extreme Min Temp (°C)	Mean Max Temp Departure from average (°C)	Mean Min Temp Departure from average (°C)	Severe Gale days (>102 km/h wind gusts)	Hot days (Maximum Temp > 25°C)
Wellington Harbour & Hutt Valley	Kelburn AWS (MS)	25.3	3.8	1.7	1.5	7	1
	Wellington Airport AWS (MS)	26.4	4.4	1.5	1.3	2	2
	Mt Kau Kau (MS)	---	---	---	---	16	---
	Shandon Golf Club	27.0	4.0	---	---	0	1
	Lower Hutt (Waterloo)	28.9	3.6	---	---	0	11
	Wainuiomata	28.2	-0.1	---	---	0	2
	Upper Hutt (Central)	27.7	1.3	---	---	0	9
Te Awarua-o-Porirua	Mana Island AWS (MS)[2]	22.8	4.1	1.7	1.6	1	0
Kāpiti Coast	Paraparaumu Airport AWS (MS)	26.5	2.3	1.8	2.0	1	2
Ruamāhanga	Masterton Airport AWS (MS)[2]	30.5	-0.6	2.3	0.4	1	17
	Martinborough EWS (N)	30.7	-0.5	---	---	---	11
	Tauherenikau (Featherston)	28.9	2.4	---	---	0	3
	Rimutaka Summit AWS (MS)	23.7	-0.3	---	---	17	0
Wairarapa Coast	Castlepoint AWS (MS)	28.5	3.9	1.2	1.0	15	5
	Ngawi (MS)	30.6	5.0	1.7	1.1	3	4

[1] *Sites owned by MetService = MS,Sites owned by NIWA = N, all other sites are owned by GWRC*

[2] *The departures from average for Masterton Airport AWS and Mana Island AWS are only approximate, based on an inferred climatology obtained via interpolation from nearby sites.*

Click the following links to return to climate summaries for:

- Wellington Harbour & Hutt Valley
- Te Awarua-o-Porirua
- Kāpiti Coast
- Ruamāhanga
- Wairarapa Coast

Rainfall statistics

Rainfall was lower than normal across the whole region in March and April, with many monitoring sites receiving less than one-third of the average March rainfall.

A very wet May at most sites (except those on the Wairarapa Coast) led to autumn totals near average at many locations. Sites in the Ruamāhanga valley and the Wairarapa Coast areas trended below average for all of autumn.

Whaitua	Location	March		April		May		Autumn	
		(mm)	(%)	(mm)	(%)	(mm)	(%)	(mm)	(%)
Wellington Harbour & Hutt Valley Click to see cumulative rainfall plots	Kaitoke	40	26	96	58	459	216	595	112
	Lower Hutt	19	27	40	48	211	200	270	106
	Wainuiomata	22	17	37	25	224	108	283	59
	Karori	23	26	31	31	226	185	279	90
	Wellington City	18	29	30	42	211	227	259	112
Te Awarua-o-Porirua Click to see cumulative rainfall plots	Battle Hill	23	29	57	63	204	153	283	92
	Whenua Tapu	24	38	49	73	219	234	292	131
	Tawa	25	40	33	49	246	237	305	115
Kāpiti Coast Click to see cumulative rainfall plots	Otaki	24	38	68	91	172	192	263	118
	Waikanae	31	38	83	91	202	191	316	109
	Paekakariki	26	39	67	66	204	180	297	105
	Tararua (Otaki catchment)	237	67	270	78	893	213	1400	126
Ruamāhanga Click to see cumulative rainfall plots	Masterton	35	51	32	48	128	178	195	89
	Featherston	33	41	47	58	157	163	237	92
	Longbush	23	33	28	40	85	90	135	58
	Tararua (Waiohine catchment)	167	53	251	82	779	197	1197	115
Wairarapa Coast Click to see cumulative rainfall plots	Tanawa Hut	51	51	25	24	69	55	144	43
	Stoney Creek (Awhea)	14	13	26	24	149	111	189	55
	Ngaumu (Pahaoa)	17	19	19	24	71	73	107	41

Click the following links to return to climate summaries for:

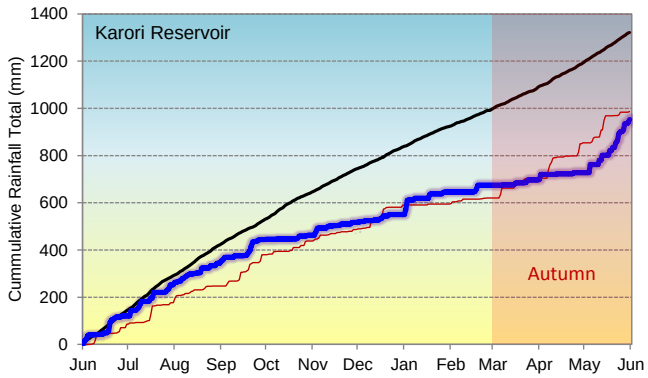
- Wellington Harbour & Hutt Valley
- Te Awarua-o-Porirua
- Kāpiti Coast
- Ruamāhanga
- Wairarapa Coast

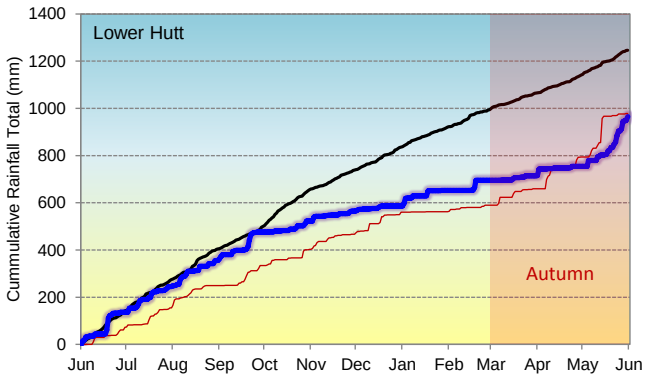
Cumulative rainfall plots

Wellington and Hutt Valley

Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line).

The plots highlight that from around mid-September to May the rainfall accumulation has been significantly lower than the average. The trend of accumulation at both sites is similar to the previous (2014/15) year with spring, summer and autumn rain being lower than normal.

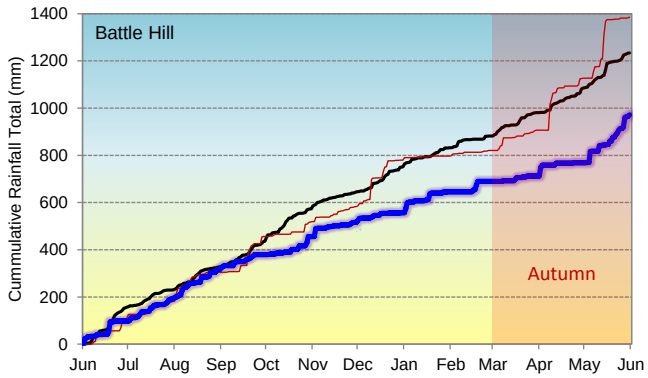


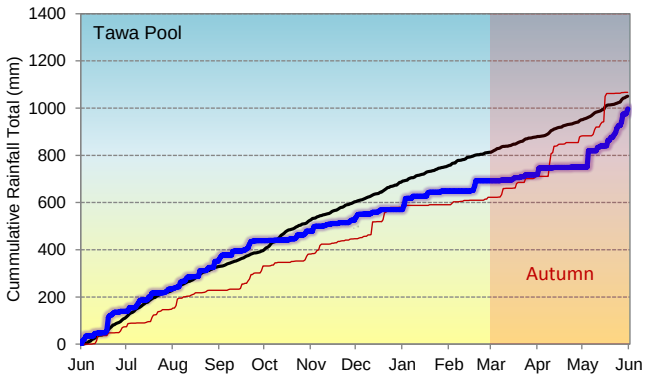


Porirua Harbour

Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line).

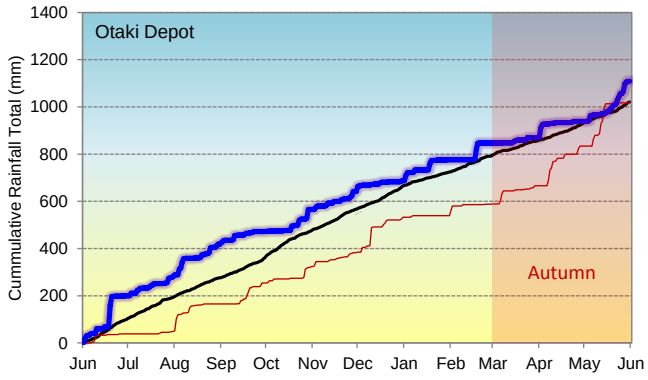
The plots highlight that rainfall accumulation in the current 2015/16 year is below average at Battle Hill and near average at Tawa Pool. At the start of May, both sites were showing a well below average trend. But a very wet second half of May pushed the totals up.

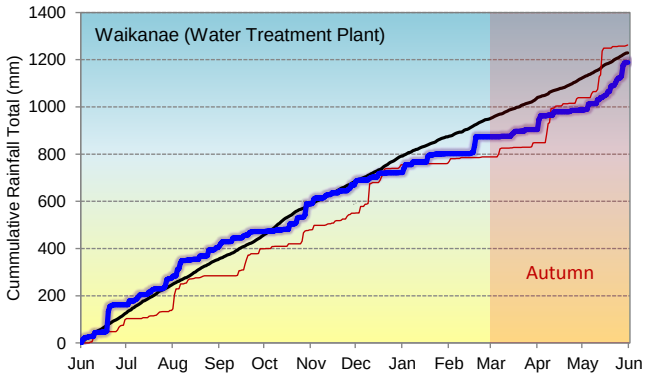




Kapiti Coast

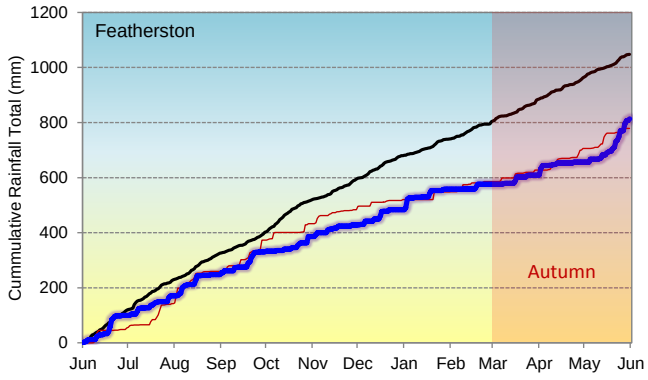
Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). Rainfall recorded at Otaki and Waikanae was close to the average accumulation throughout the year. December to April saw the Waikanae accumulation drop below average but the wet conditions during May brought it back towards normal.

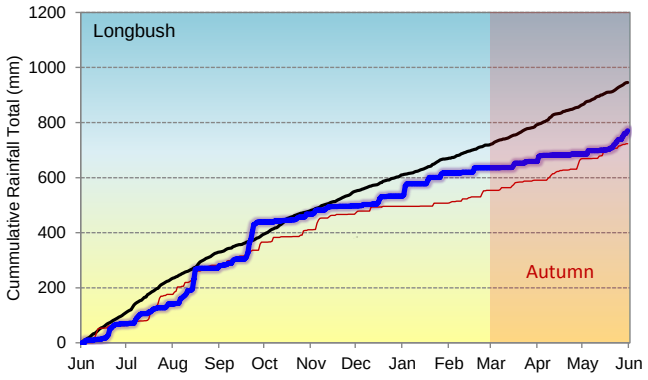




Ruamahanga

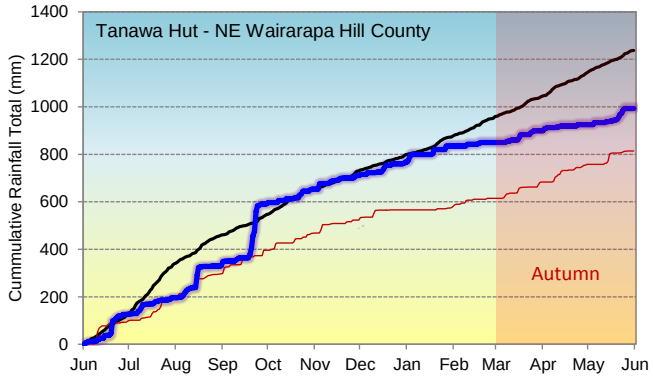
Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). Rainfall in the lower Ruamahanga valley (Featherston) has been tracking below average for most of the 2015/16 year. Rainfall accumulation at Longbush has been trending lower than normal since the start of summer





Wairarapa Coast

Cumulative rainfall total 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). Apart from a very wet September 2015, the rainfall accumulation at Tanawa Hut has trended at a below average rate. Autumn rainfall has been low.



River flows - averages

Percentage of average river flow for each month and whole of autumn 2016.

Flows across the region have been largely below average over the autumn season. However, statistics for the individual months show that March and April had very low flows, while May was well above average. March average flows were exceptionally low across the region and continued on at very low levels into April with the exception of the Kapiti Coast where flows were closer to average levels.

		Flow as a percentage of average			
Whaitua	**River**	**March**	**April**	**May**	**Autumn**
Wellington Harbour & Hutt Valley	Hutt River - Kaitoke	29	44	169	92
	Hutt River - Taita Gorge	23	35	159	87
	Akatarawa River	35	53	165	97
	Mangaroa River	22	25	98	60
	Wainuiomata River	26	29	58	42
Te Awarua-o-Porirua	Porirua	42	38	128	82
	Pauatahanui	24	31	169	104
	Horokiri	42	64	126	92
Kāpiti Coast	Otaki	36	66	168	98
	Mangaone	67	92	149	109
	Waikanae	41	83	193	119
Ruamāhanga	Kopuaranga	24	19	128	73
	Waingawa	28	41	168	88
	Waiohine	31	48	170	92
	Mangatarere	21	20	189	96
	Ruamahanga	21	31	127	69
Wairarapa Coast	Pahaoa	1	2	3	2

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River flows - averages

Minimum and maximum river and stream flows recorded during autumn.

Flows began to drop to low levels at many locations during autumn. On the western side of the region the Pauatahanui Stream and the Hutt, Mangaroa, Wainuiomata and Otaki rivers fell to 1 in 5-year low flows or greater. Low flows were more extreme in a number of stream and rivers in the Wairarapa – notably the Pahaoa River on the east coast (1 in 15-year) and the Waiohine and Ruamahanga rivers.

Whaitua	River	7-day Minimum Flow			Maximum Flow		
		Flow (m^3/s)	Date Begins	Return Period (years)*	Flow (m^3/s)	Date	Return Period (years)
Wellington Harbour & Hutt Valley	Hutt (Kaitoke)	1.171	26-Apr	4	138	28 May	1
	Hutt(Taita Gorge)	2.543	26-Apr	5	457	29 May	1
	Akatarawa	1.019	26-Mar	2	148	29 May	1
	Mangaroa	0.206	7-Mar	6	34	28 May	1
	Wainuiomata	0.112	26-Apr	10	8.6	28 May	1
Te Awarua-o-Porirua	Porirua	0.121	25-Apr	3	34	5 May	2
	Pauatahanui	0.056	26-Mar	8	38	5 May	2
	Horokiri	0.086	26-Mar	2	13	28 May	1
Kāpiti Coast	Otaki	4.115	1-Mar	5	306	3 May	1
	Mangaone	0.094	26-Mar	1	3.4	3 May	1
	Waikanae	0.867	26-Mar	3	90	28 May	1
Ruamāhanga	Kopuaranga	0.212	2-Mar	5	21	26 May	1
	Waingawa	1.072	1-Mar	5	108	20 May	1
	Waiohine	2.429	1-Mar	10	338	12 May	1
	Mangatarere	0.124	29-Feb	4	18	20 May	1
	Tauherenikau	1.05	4-Mar	4	109	28 May	1
	Otukura	0.037	3-Mar	3	0.7	3 Apr	1
	Ruamahanga (Upper)	1.624	2-Mar	15	160	26 May	1
	Ruamahanga (Lower)	4.826	2-Mar	20	440	29 May	1
Wairarapa Coast	Pahaoa	0.006	9-Mar	15	1.9	31-May	1

** Analyses have been completed on provisional data which may be subject to change once it is processed and archived.*

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Groundwater levels

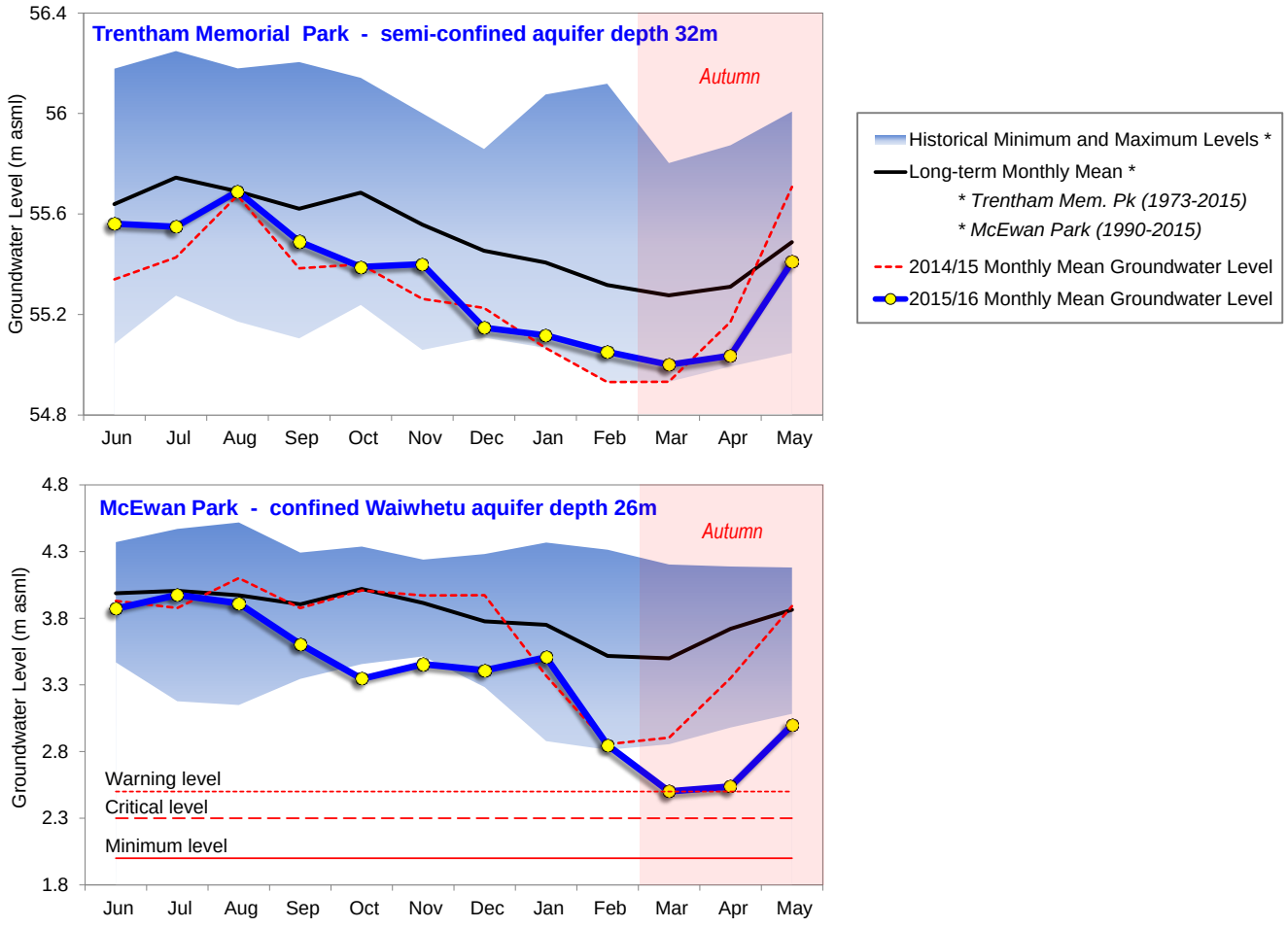
Wellington and Hutt Valley

Autumn 2016 groundwater levels in two Hutt Valley bores compared to their long-term averages, the previous year's levels and historical extremes (blue envelope).

The plots at these two groundwater monitoring sites show that levels have been sitting below average since around September 2015.

The Waiwhetu aquifer (McEwan Park) reached historically low levels with those recorded in March, April and May being the lowest since the 1980's.

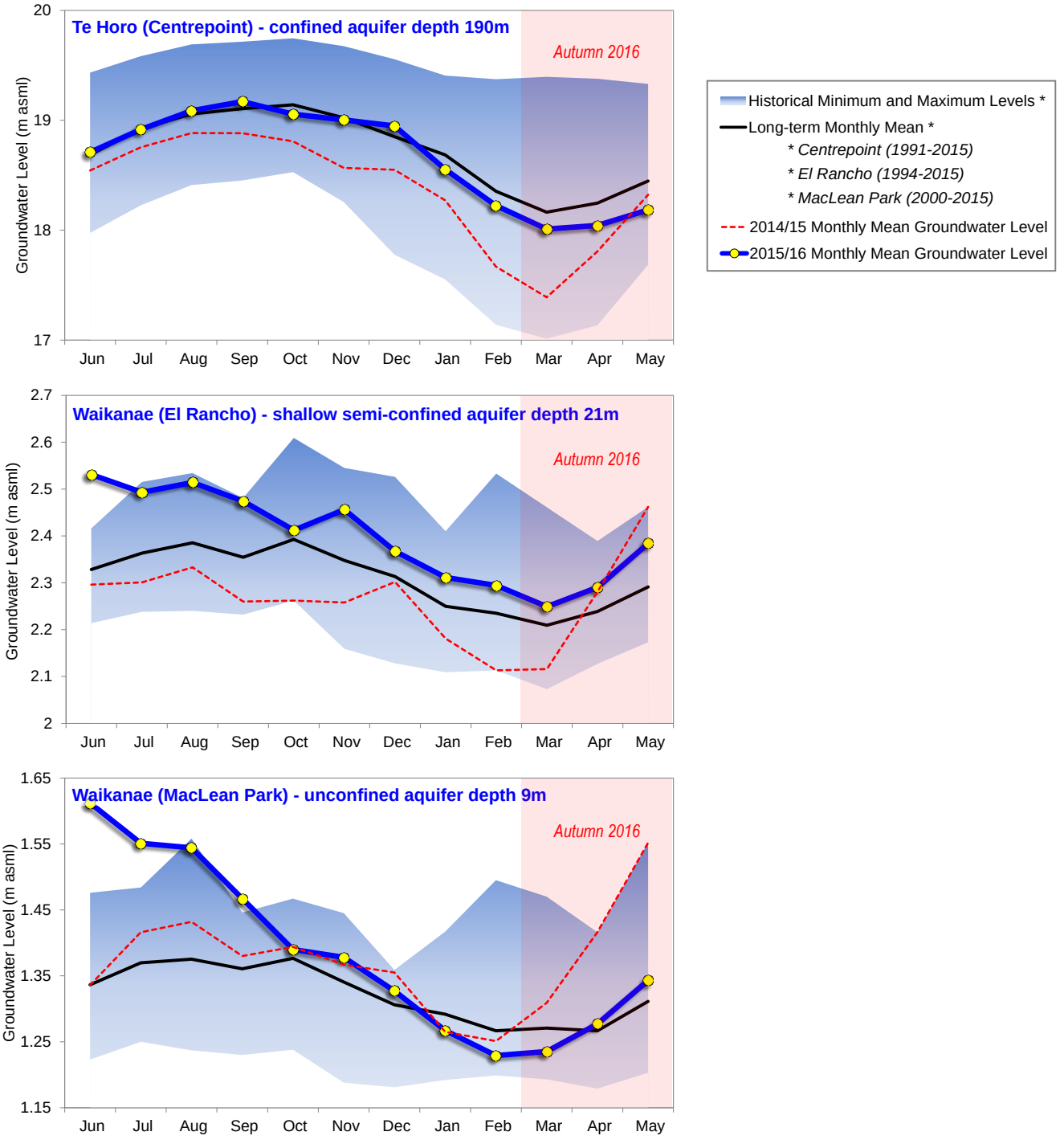
The Waiwhetu aquifer is a highly productive groundwater resource that supplies about 40% of Wellington's water demand. It is therefore monitored closely to ensure enough water is left in it to maintain pressure so that seawater cannot enter via the harbour springs. The first warning level was breached during March, although this is not critical and merely serves to warn that levels are getting low and a close watch should be kept.



Kapiti Coast

Autumn 2016 groundwater levels in three Kapiti Coast bores compared to long-term averages, the previous year and historical extremes (blue envelope).

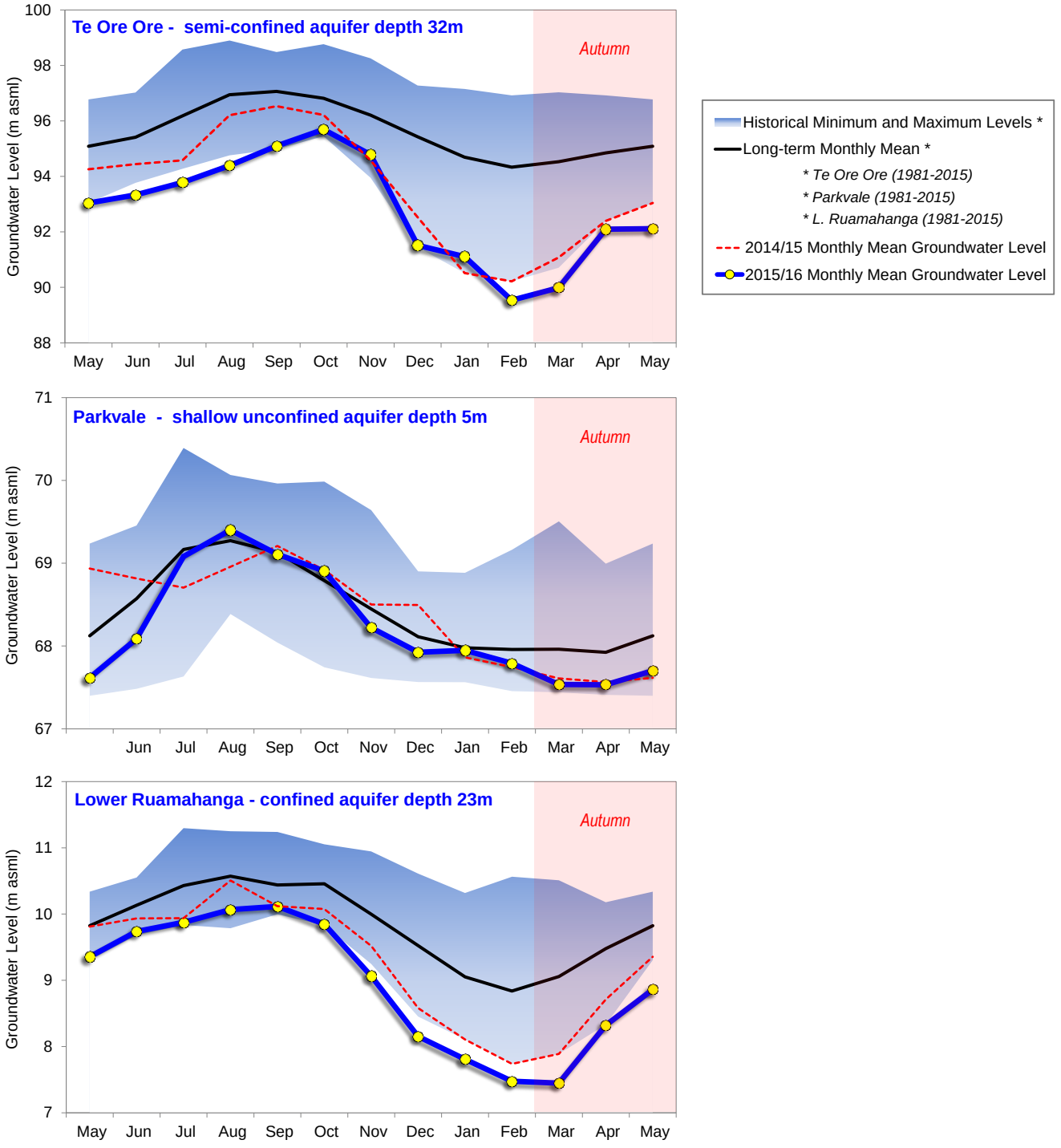
The plots highlight that groundwater levels have been around average levels during autumn. This contrasts to the previous year (2014/15) when groundwater levels in the Te Horo and Waikanae semi-confined aquifers were very low at the start of autumn.



Ruamahanga

Autumn 2016 groundwater levels in three Ruamahanga valley bores compared to their long-term averages, the previous year's levels and historical extremes (blue envelope).

Levels at all three sites were low during autumn. The Te Ore Ore and Lower Ruamahanga bores reached the lowest levels on records (since 1981) during the autumn months.

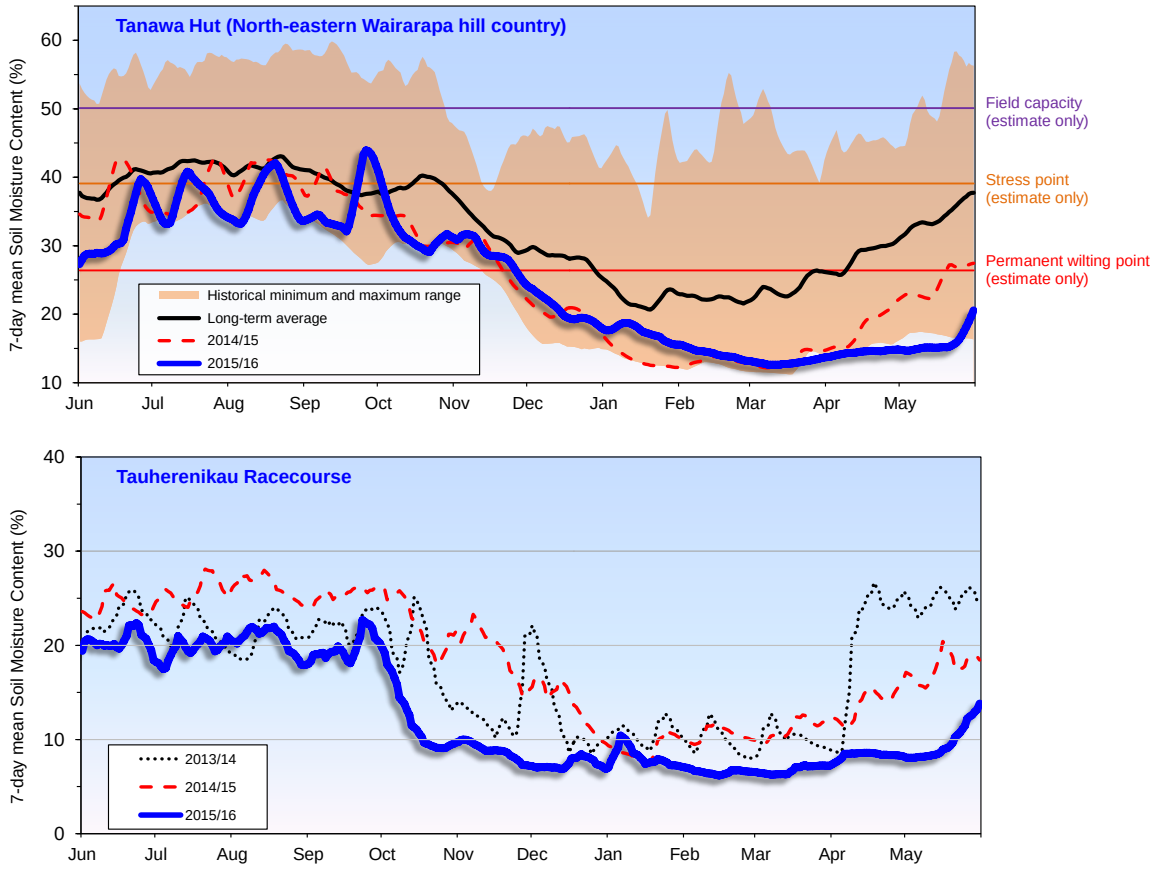


Soil moisture content

Wairarapa Coast

Autumn 2016 soil moisture content at monitoring sites at Tanawa Hut in north-east Wairarapa (Wairarapa Coast whaitua) and Tauherenikau racecourse (Ruamāhanga whaitua) are plotted below.

Soil moisture at Tanawa Hutt reached very low levels during autumn when compared to long-term mean and minimum record (since 2002). Levels at Tauherenikau have been consistently low in relation to the two previous years of soil moisture record.



Drought monitoring

NIWA maintains a 'drought monitor' website that provides more information on soil moisture conditions (and other hydrological and climatic information relevant to drought assessment):

https://www.niwa.co.nz/climate/information-and-resources/drought

Climate Briefings

Additionally to the operational (seasonal) reports, the Environmental Science department, GWRC, produces monthly climate briefings specifically targeting the farming community in periods of significant climate anomalies such as an El Niño year. Those can be accessed at the bottom of the Climate and Water Resource webpage:

http://www.gw.govt.nz/seasonal-climate-and-water-resource-summaries-2/

The Greater Wellington Regional Council's purpose is to enrich life in the Wellington Region by building resilient, connected and prosperous communities, protecting and enhancing our natural assets, and inspiring pride in what makes us unique

For more information contact the Greater Wellington Regional Council:

Wellington office
PO Box 11646
Manners Street
Wellington 6142

04 384 5708

Upper Hutt office
PO Box 40847
Upper Hutt 5018

04 526 4133

Masterton office
PO Box 41
Masterton 5840

06 378 2484

Follow the Wellington Regional Council

info@gw.govt.nz
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