greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Climate and Water Resource Summary for the Wellington Region

Summer 2015/16

Contents

High levels of toxic algae were found around the region during summer in parts of the Waipoua, Hutt, Pakuratahi and Otaki rivers. If ingested the algae can kill livestock and dogs and contact can cause vomiting, diarrhoea and skin irritations in humans. Warning signs are erected at sites when toxic algae reaches problem levels.

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: March 2016

Summer 2015/16 (December to February inclusive) was drier than average for most of the region. The south and east of the Wairarapa were the driest areas

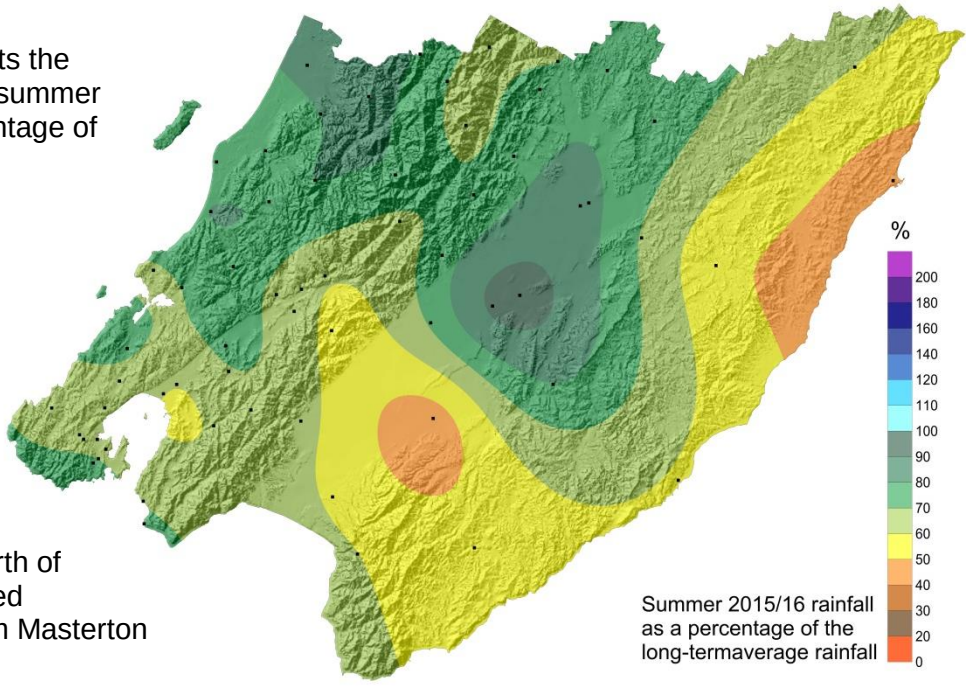
Summer rainfall

The map at the right presents the rainfall recorded during the summer 2015/16 season as a percentage of the long term average.

The only area to reach the average summer rainfall was in Parkvale, near Carterton. Rainfall across the Kapiti Coast ranged between 70% and 85% of normal.

The northern Tararua Range saw about 85% of normal rainfall, while the north of the Wairarapa valley received around 80% of average from Masterton north towards Mt Bruce.

The eastern hills and coast, as well as the southern Wairarapa valley recorded summer rainfall totals as low as 36% in Martinborough and 43% in Castlepoint. The Hutt valley, Porirua and Wellington areas generally received 60-70% of their average summer rainfall.



Summer 2015/16 rainfall as a percentage of the long-term average shows below average summer 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.

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, with the exception of the Kapiti Coast hills, all areas had fewer days than normal where more than 1mm of rainfall occurred. The largest difference was at the eastern Wairarapa monitoring sites where there were 11 fewer rain days.

Number of Rain Days and Heavy Rain Days across the region (with the long-term average shown in square brackets.) Most places experienced less than the typical number of rainy days.

	Kapiti Coast		Porirua	Hutt Valley & Wellington		Ruamahanga		Eastern Wairarapa
	Lowland	Hills	Lowland	Lowland	Hills	Lowland	Hills	
Rain Days (>1mm)	18 [25]	38 [37]	18 [21]	16 [23]	26 [33]	18 [20]	33 [42]	18 [29]
Heavy Rain Days(>25mm)	2 [2]	9 [10]	1 [2]	1 [2]	4 [5]	1 [2]	7 [11]	1 [2]

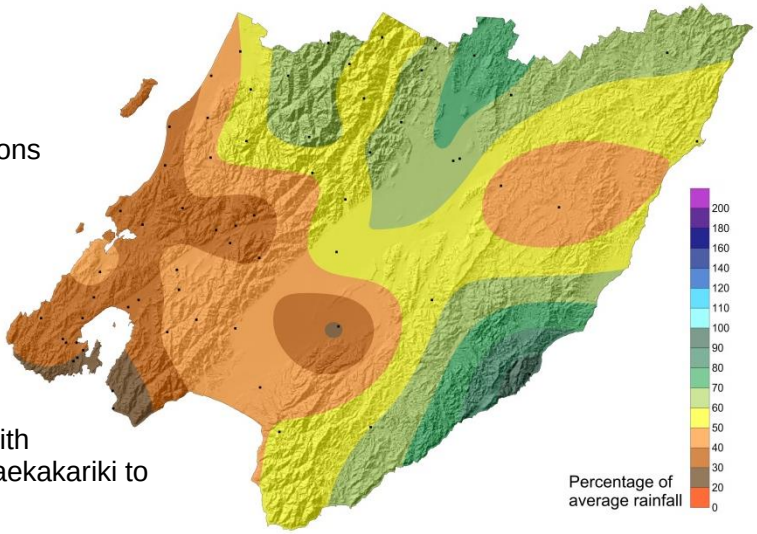
Rainfall by the month

The maps below show rainfall anomalies (percentage of average) by month. Summer was characterised by a generally drier than normal December and February broken up by a normal to above normal January rainfall.

December

During December 2015, strong El Niño conditions continued in the Tropical Pacific.
This brought about a prevalence of high pressure over and to the west of the country.

The south and the west of the region were particularly dry with rainfall monitoring sites in Wellington city and Martinborough recording less than 25% of the average December rainfall. The Kapiti Coast was dry with rainfall totals varying from 30% of normal at Paekakariki to 50% of normal at Otaki.

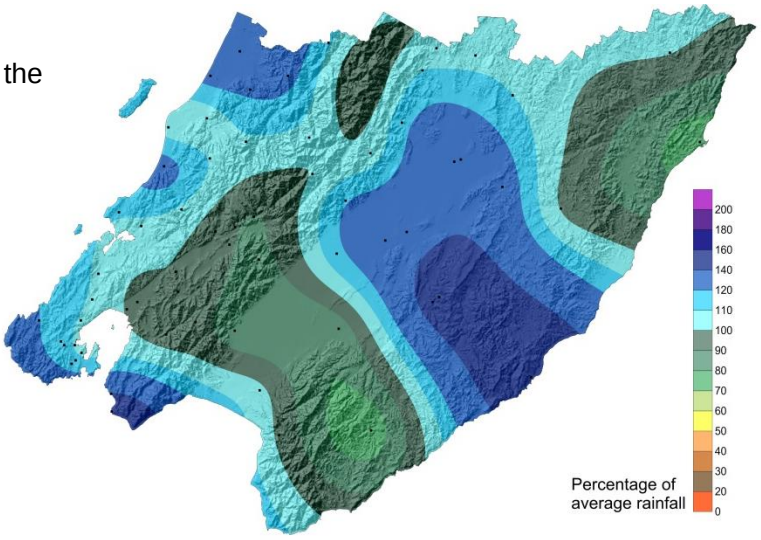


January

Rainfall was above average for many parts of the region during January.

Moist tropical air masses (including two ex-tropical cyclones) brought rainfall from the northeast and southeast that lifted totals above average in parts of the eastern Wairarapa hill country and most of the Ruamahanga valley.

The wettest areas on the south and east coasts recorded 150% of the normal January rainfall totals. Castlepoint, Martinborough and Awhea received 65-75% of average.

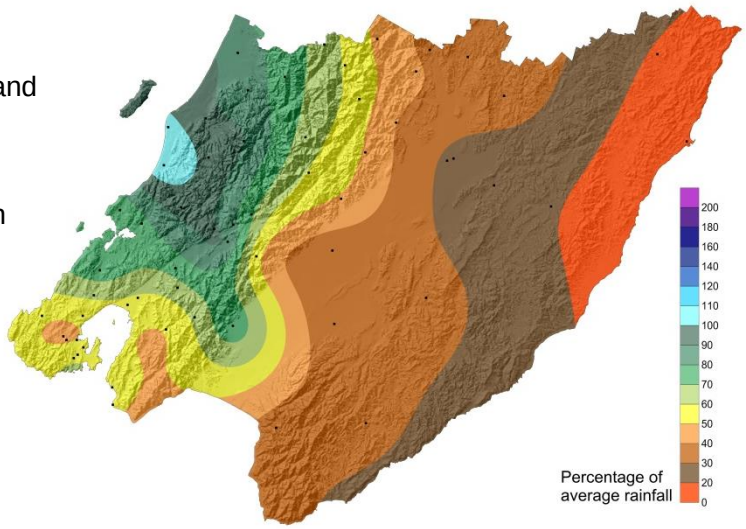


February

Rainfall totals in February over the Wairarapa and east coast were very low.

Less than 20% of average February rain fell in north-eastern areas, rising to around 30-40% in the Wairarapa valley.

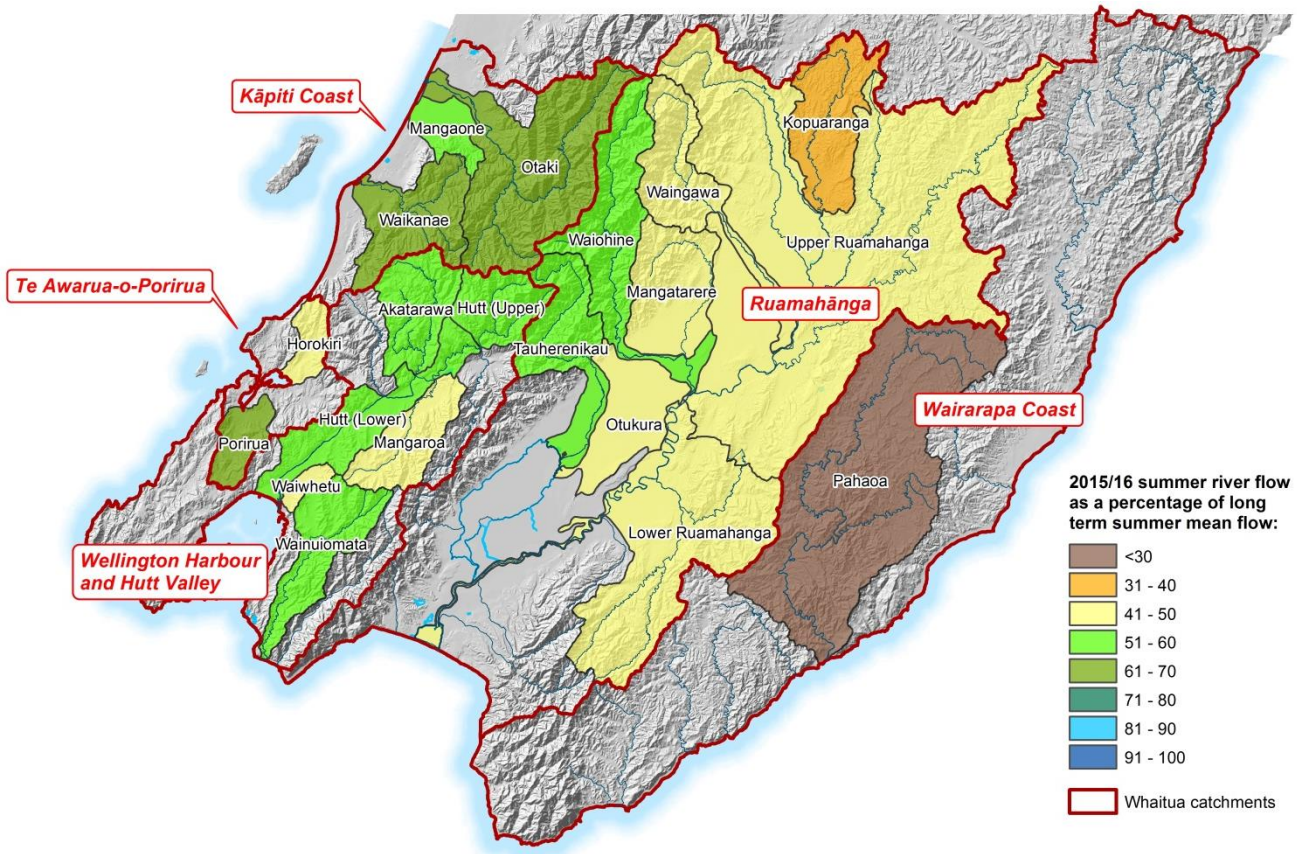
The western side of the region received rainfall amounts ranging from 40% of normal in Wellington up to 90% at Otaki. A small pocket of above average monthly rainfall was recorded at Paekakariki and Paraparaumu.



River flows

The map below shows summer river and stream flows for various monitored catchments as a percentage of the average flow. All monitored rivers had much lower summer flows than average. The Waikanae River recorded the highest summer flow relative to normal but it was still lower than normal at 70%. Catchments in the eastern hills showed the lowest flow relative to average with the Pahaoa River summer flow around 25% of normal.

The Ruamahanga River and a number of its tributaries had around 45% of average flows, while rivers originating in the high peaks of the Tararua Range saw average flows around 55% in the Hutt, Tauherenikau and Waiohine rivers and 65-70% in the Waikanae and Otaki rivers.



The map shows river and stream flows recorded during summer 2015/16 as a percentage of the long-term average. All monitored catchments produced summer flows that were much lower than normal. The Pahaoa River in the eastern hill country was particularly low at around 25% of its normal summer flow.

Toxic algae blooms

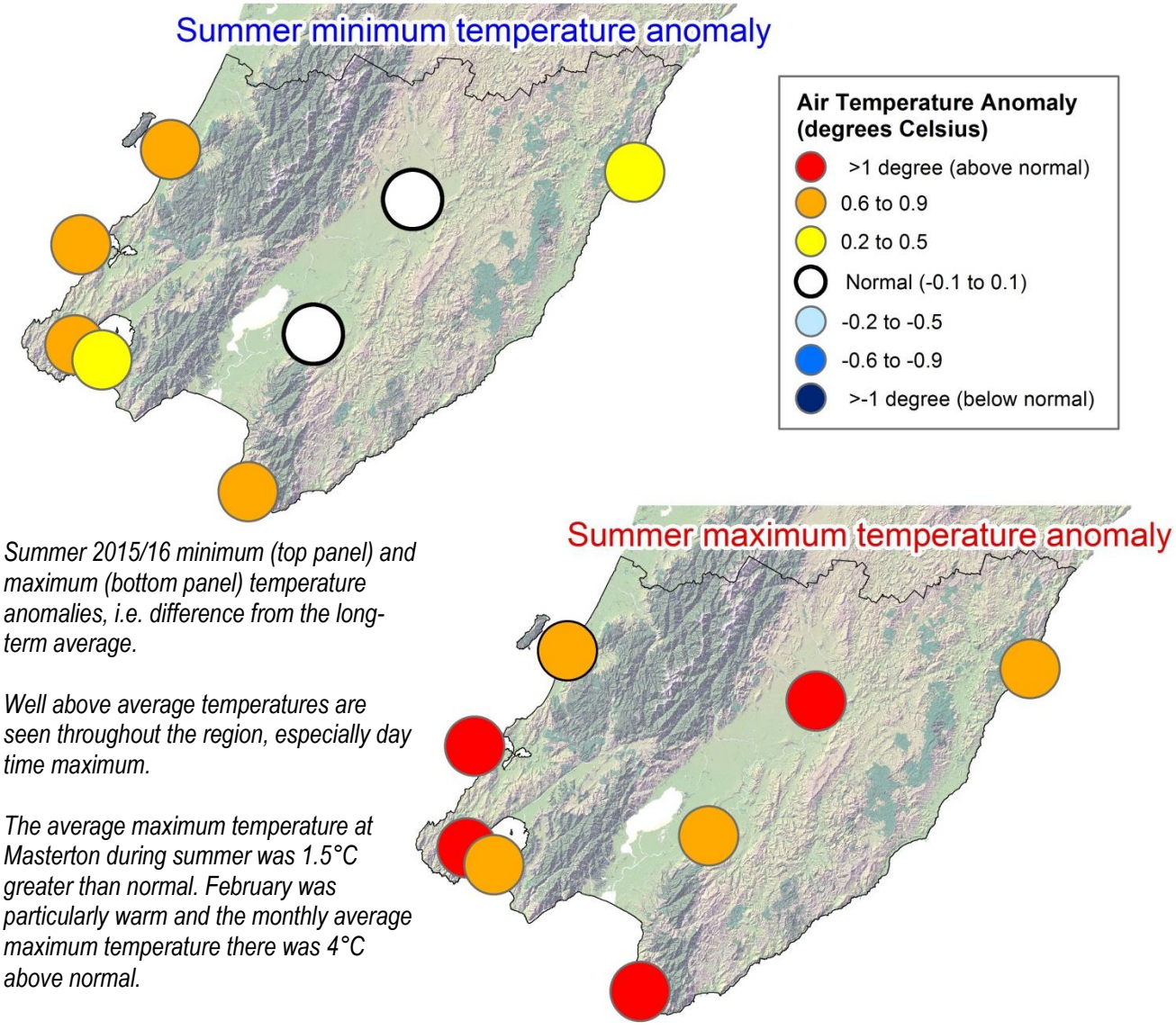
The warm weather and lower than normal river flows during summer created ideal conditions for toxic algal growth in a number of rivers. Toxic algae can kill livestock and dogs when ingested, or cause vomiting, diarrhoea and skin irritations in humans who come into contact with it.

Red alert toxic algae warning signs were put in place for the Waipoua River in Masterton and large parts of the Hutt River, and people were advised to avoid swimming in these areas and to keep dogs away. Warnings (amber alert level) were also posted for the Pakuratahi and Ruamahanga rivers.

Summer 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 anomaly between the average daily minimum and maximum temperatures recorded during summer and the historical averages for this season is shown below. The ranges of extreme maximum and minimum temperatures (i.e., daily minimums and mximums not monthly averages) are presented in the climate statistics table at the end of the report.

Both maximum and minimum temperatures were above average across the entire region, especially the maximum (daytime) temperatures. This pattern is not normally expected during El Niño summers, and it was essentially a result of an extremely hot February with widespread warmest on record temperatures observed across the region, as earlier in the season the temperatures were actually slightly cooler than normal.



Summer 2015/16 minimum (top panel) and maximum (bottom panel) temperature anomalies, i.e. difference from the long-term average.

Well above average temperatures are seen throughout the region, especially day time maximum.

The average maximum temperature at Masterton during summer was 1.5°C greater than normal. February was particularly warm and the monthly average maximum temperature there was 4°C above normal.

SOURCE: Data are from NIWA and MetService meteorological stations.

Global climate drivers

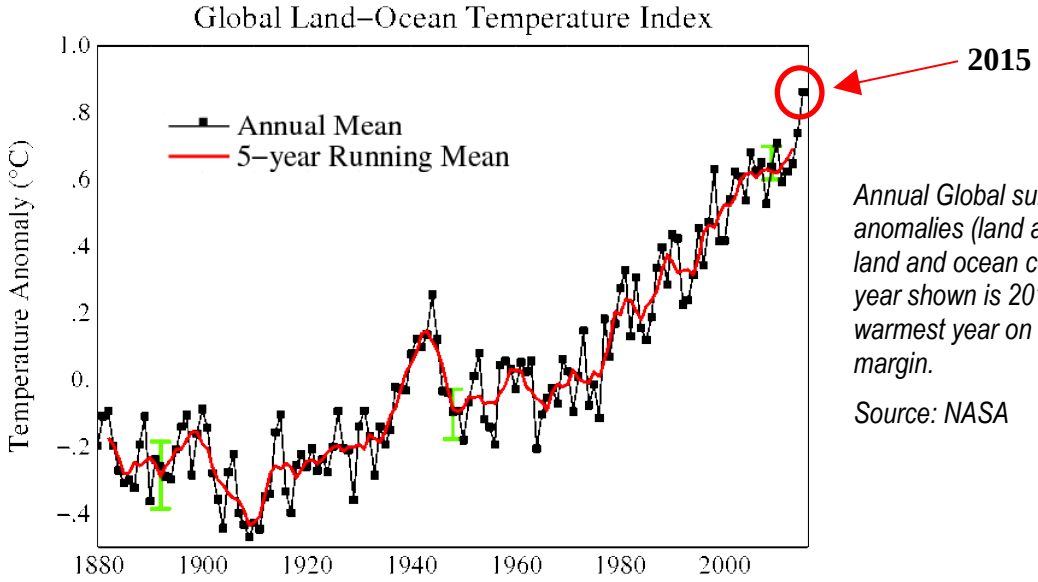
Climate variability and climate change

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 (https://www.niwa.co.nz/natural-hazards/hazards/climate-change).

Some key observations about climate variability and change in our region during summer 2015/16:

- Several historical temperature records (both low and high temperatures) were broken. This 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 superimposed onto natural climate fluctuations
- The current El Niño phenomenon has been the strongest since the 1997/98 event. It is now moderate and slowly declining. Although this El Niño summer was extremely unusual, with bursts of tropical humidity and localised heavy rainfall more common to La Niña (not El Niño) events, the overall summer rainfall ended up being close to what was predicted with very dry conditions on the eastern coast. This El Niño is expected to dissipate towards winter, with its effects possibly lasting until then.
- Global temperatures are increased during El Niño events because the ocean releases more heat into the atmosphere. February was the warmest on record in the Wellington region for data since 1927. January and the previous 2015 year were the warmest on record for the global average temperature.

The figure below shows that the average global surface temperature over land and ocean combined was the highest on record in 2015 by a long margin, after 2014 had already been the hottest on record. These measurements, provided by NASA, are not the only available estimation of global temperatures (there may be more or less warming depending on the stations and techniques used), but they give a very good idea of how pronounced the warming has been. As discussed above, the strong global warming in 2015 has been at least partially helped by the vigorous El Niño, which tends to increase the contribution of the global oceans towards the total warming.



Annual Global surface temperature anomalies (land and ocean) for land and ocean combined. The last year shown is 2015, which was the warmest year on record by a large margin.

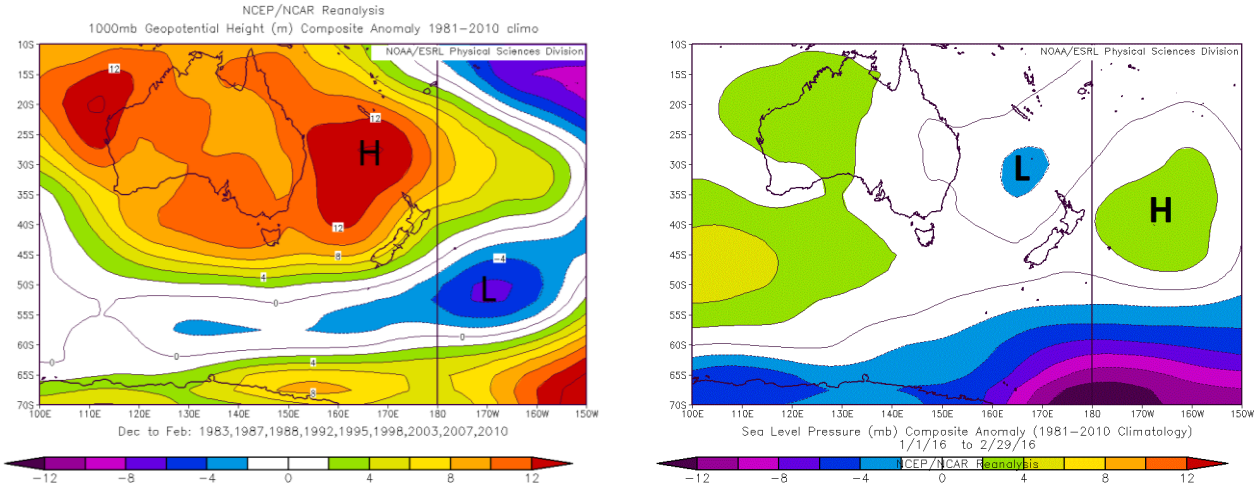
Source: NASA

Global climate drivers and extreme weather events

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

As predicted, the El Niño caused an overall drier summer for most of the region, particularly on the eastern coast. However, another climate driver, the so-called Southern Annular Mode (SAM), partially counteracted the usual effects of ENSO. This has led to the establishment of blocking anticyclones with weak winds and very hot and humid days, with occasional bursts of heavy rainfall in January leading to totals well above the monthly average for that month. In contrast, February was dry and very hot, with widespread highest on record average and extreme temperatures across the Wellington region as well as most of New Zealand.

The figure below shows the difference between the sea level pressure anomalies normally expected during El Niño summers (left) and the observed pattern in January and February. Although December followed the normal El Niño development, we can see that January and February had a pressure anomaly approximately opposite to that expected during El Niño years, with a blocking anticyclone to the northeast of New Zealand (indicated by H).



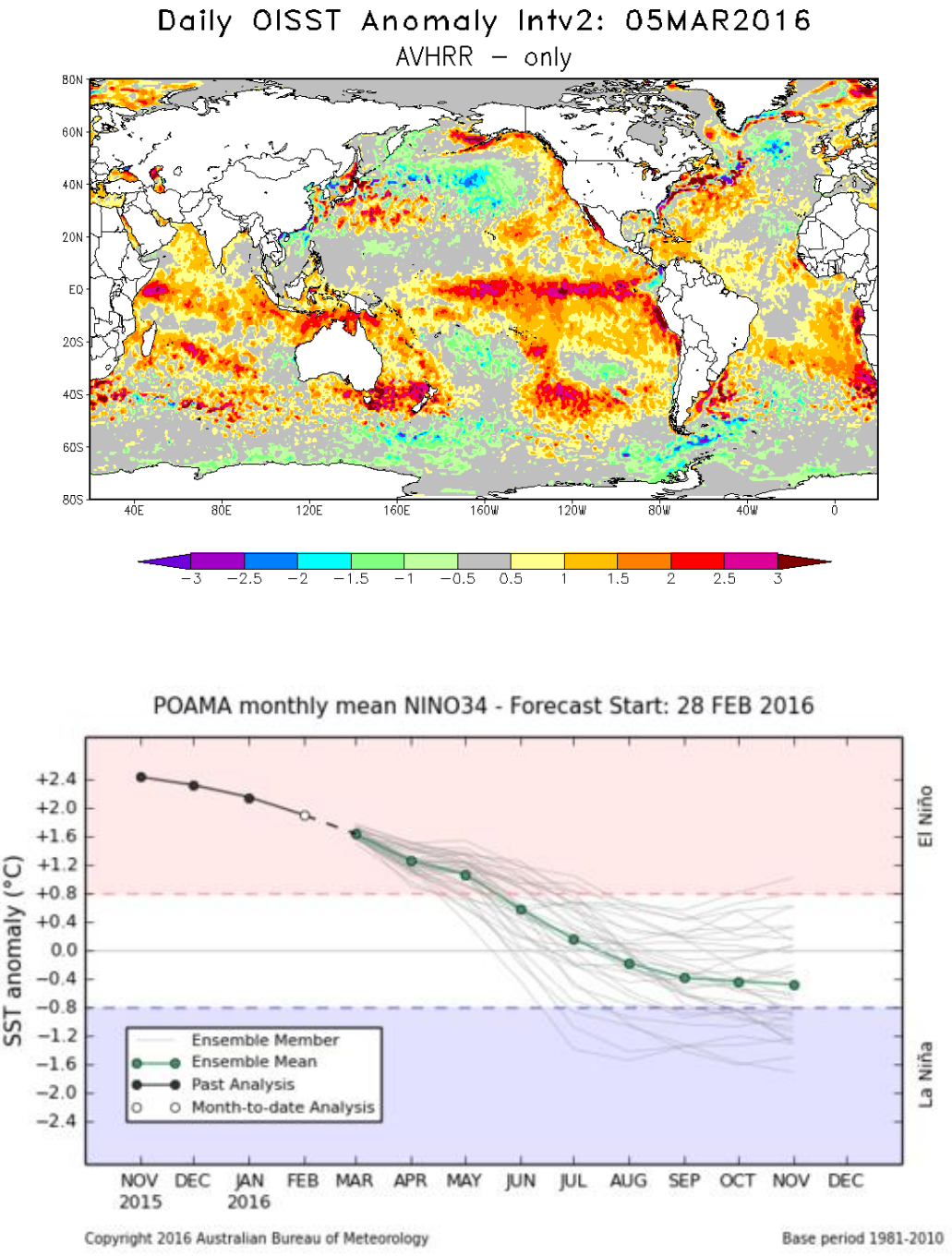
Typical sea level pressure anomalies during El Niño summers (left) and what actually happened in January and February 2016 (right). The normal El Niño pattern produces a high to the northwest and a low to the southeast of New Zealand increasing the south-westerly flows, but the opposite was seen in January and February 2016. Source: NCEP reanalysis, USA.

As mentioned above, the current El Niño phenomenon has been the strongest since 1997/98 but is now only moderate and slowly declining. The figure below shows the latest sea surface temperature (SST) anomalies (by NOAA) and the latest forecasts produced by models from the Bureau of Meteorology in Australia.

The SST map shows very warm waters around New Zealand, and colder than average waters to the south of New Zealand. Normally cold water is expected around New Zealand during El Niño summers, which is the opposite of what was observed. This inversion only occurred from January onwards, helping explain the substantial warming observed in February.

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

The ENSO model predictions show a downward plume with the mean ensemble (green line) reaching neutrality (zero water temperature anomalies) by mid-July. The implication is that the regional anomalies associated with ENSO are expected to slowly dissipate towards winter.



Upper panel: Latest Sea Surface Temperature anomalies, as of 5 March 2016. Source: NOAA.

Lower panel: Predicted evolution of the Equatorial Pacific water warming associated with the ENSO event. A decline back to neutral conditions (green line crossing the zero anomaly) is expected to occur by mid-July. Source: BoM, Australia.

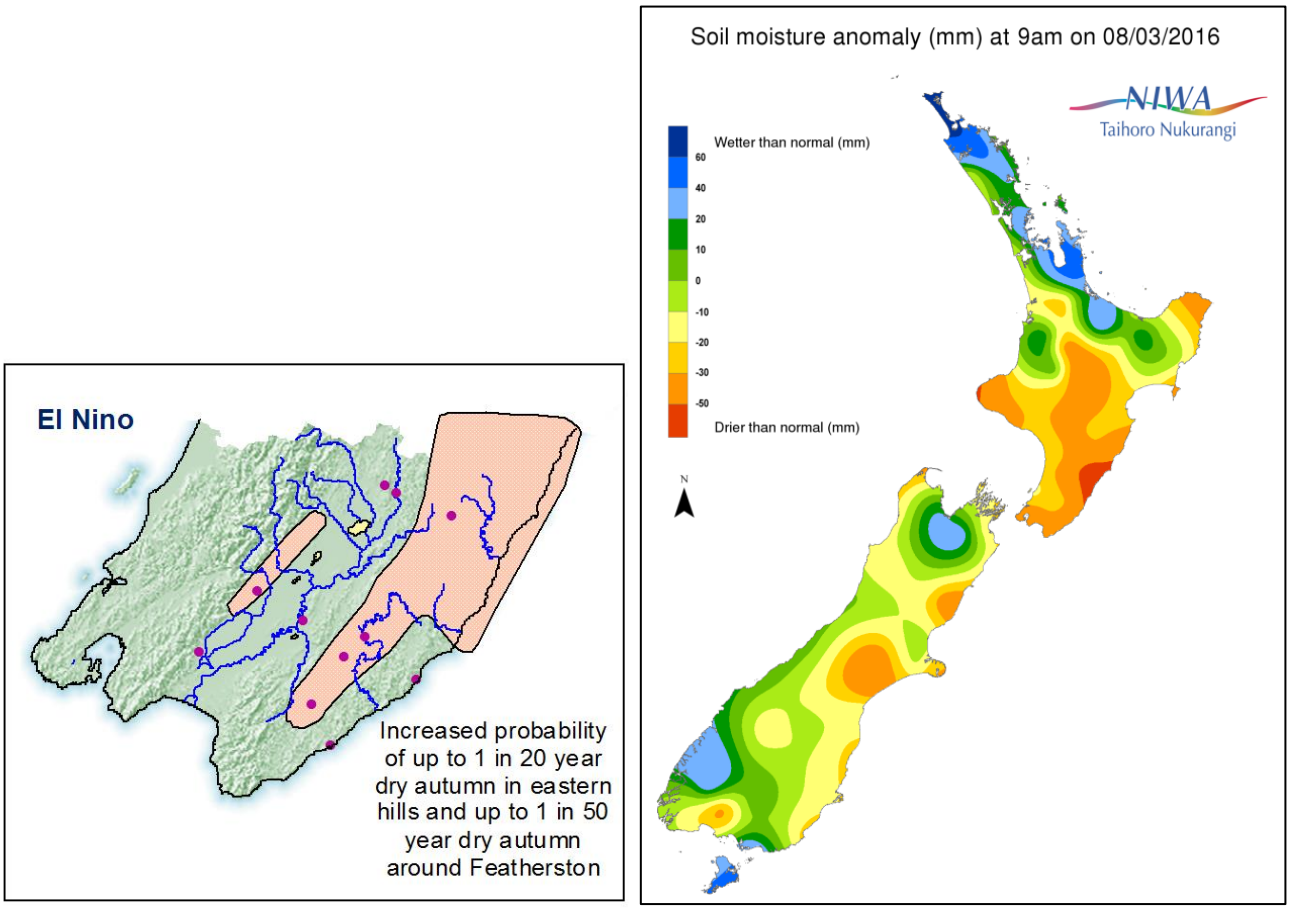
Seasonal climate outlook for autumn 2016

The figure below (left panel) shows that during El Niño years there is an increased probability of dry autumns for most of the Wairarapa.

This is a statistical inference based on many years of observations across the region. However, both the area and severity of the ENSO-related dryness in autumn are less than those expected during summer.

As the current El Niño is already declining, and showing an unusual atmospheric pattern with very warm waters around New Zealand, it is unlikely that the traditional statistical relationship will hold too strongly, and short duration heavy rainfall episodes are possible. Even then, the probability of above average rainfall on a seasonal basis is very small (estimated at only 20% by NIWA).

This means that the soil moisture, which is currently much drier than normal across the region (right hand panel) is unlikely to fully recover in the next season.



Left: Areas of enhanced drought probability during El Niño autumns (GWRC).

Right: red and orange areas show soil moisture well below average as of 8 March 2016 (NIWA).

Climate Outlook for autumn 2016:

Normal or dry conditions are expected for most of the region, which is typical of El Niño autumns. There is a greater likelihood of extreme weather events - in particular; extremes of cool and hot temperatures, heavy rainfall and severe wind storms. As we advance into the season vigorous cold fronts will be amplified by colder than normal waters to the south of New Zealand.

While not commonly observed during El Niño events, heavy easterly rainfall events are also possible due to the unique characteristics of the current ENSO episode.

The forecasts are qualitative only, as it is not possible to accurately estimate the actual amount of seasonal rainfall. Based on previous El Niño events, it is possible that the total seasonal rainfall could sit at one in a 20-year drought in some areas.

Whaitua[1]		Climate Outlook for autumn 2016
Wellington Harbour & Hutt Valley	**Temperature:** **Rainfall:**	Above average, greater variability of hot and cold. Around average, long dry periods alternated by heavy rainfall events.
Te Awarua-o- Porirua	**Temperature:** **Rainfall:**	Above average, greater variability of hot and cold. Around average, long dry periods alternated by heavy rainfall events.
Kāpiti Coast	**Temperature:** **Rainfall:**	Above average, greater variability of hot and cold. Around average, long dry periods alternated by heavy rainfall events.
Ruamāhanga	**Temperature:** **Rainfall:**	Above average, greater variability of hot and cold. Normal to below normal, possibility of significant easterly rainfall events.
Wairarapa Coast	**Temperature:** **Rainfall:**	Above average, greater variability of hot and cold. Normal to below normal, possibility of significant easterly rainfall events.

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

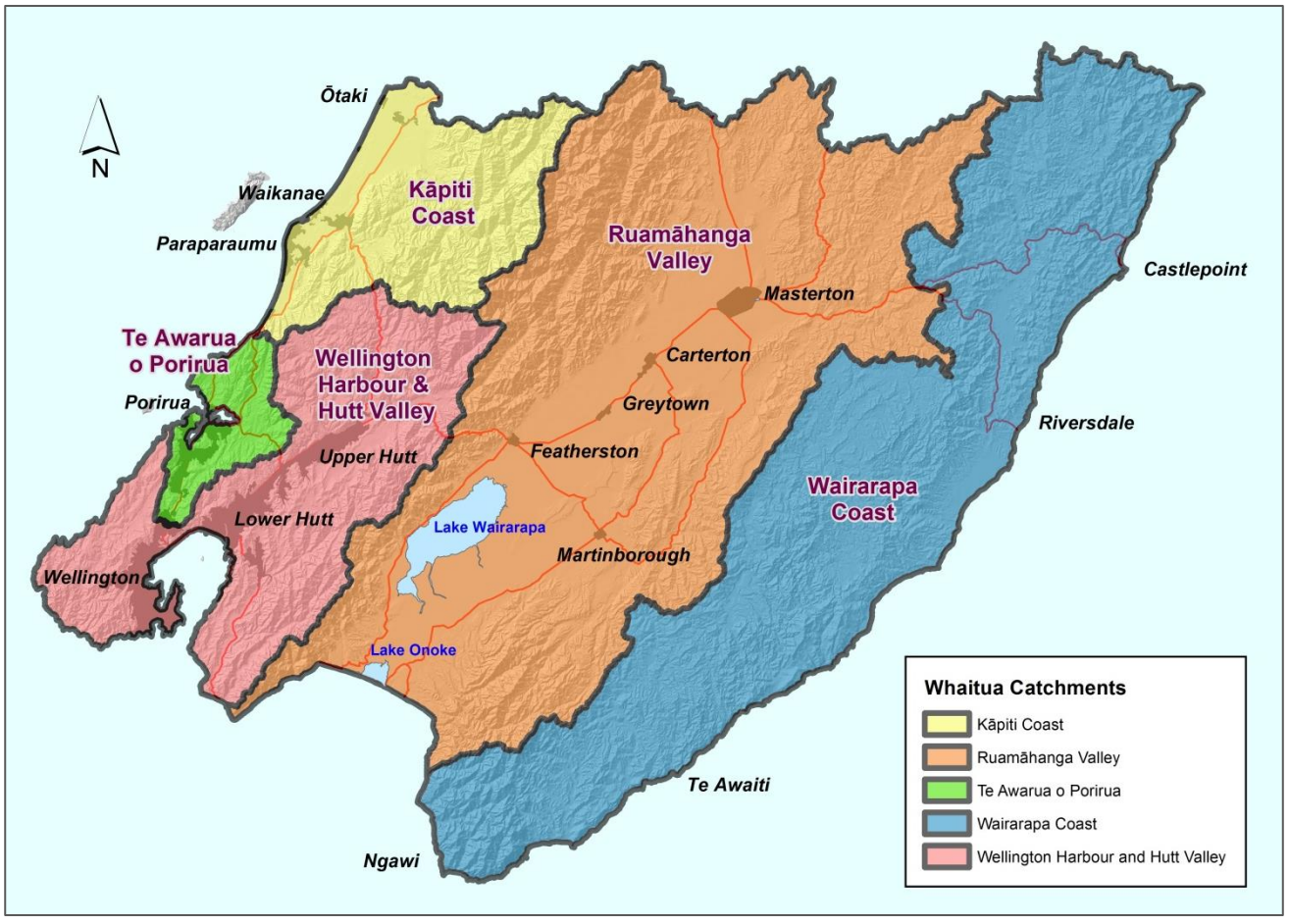
This climate outlook was prepared by the Air and Climate Team of GWRC based on our own expertise, and information provided by NIWA, MetService and international centres such as the International Research Institute for Climate and Society of Columbia university (http://iri.columbia.edu/our-expertise/climate/forecasts/seasonal-climate-forecasts/). 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 summer 2015/16 summaries on:

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

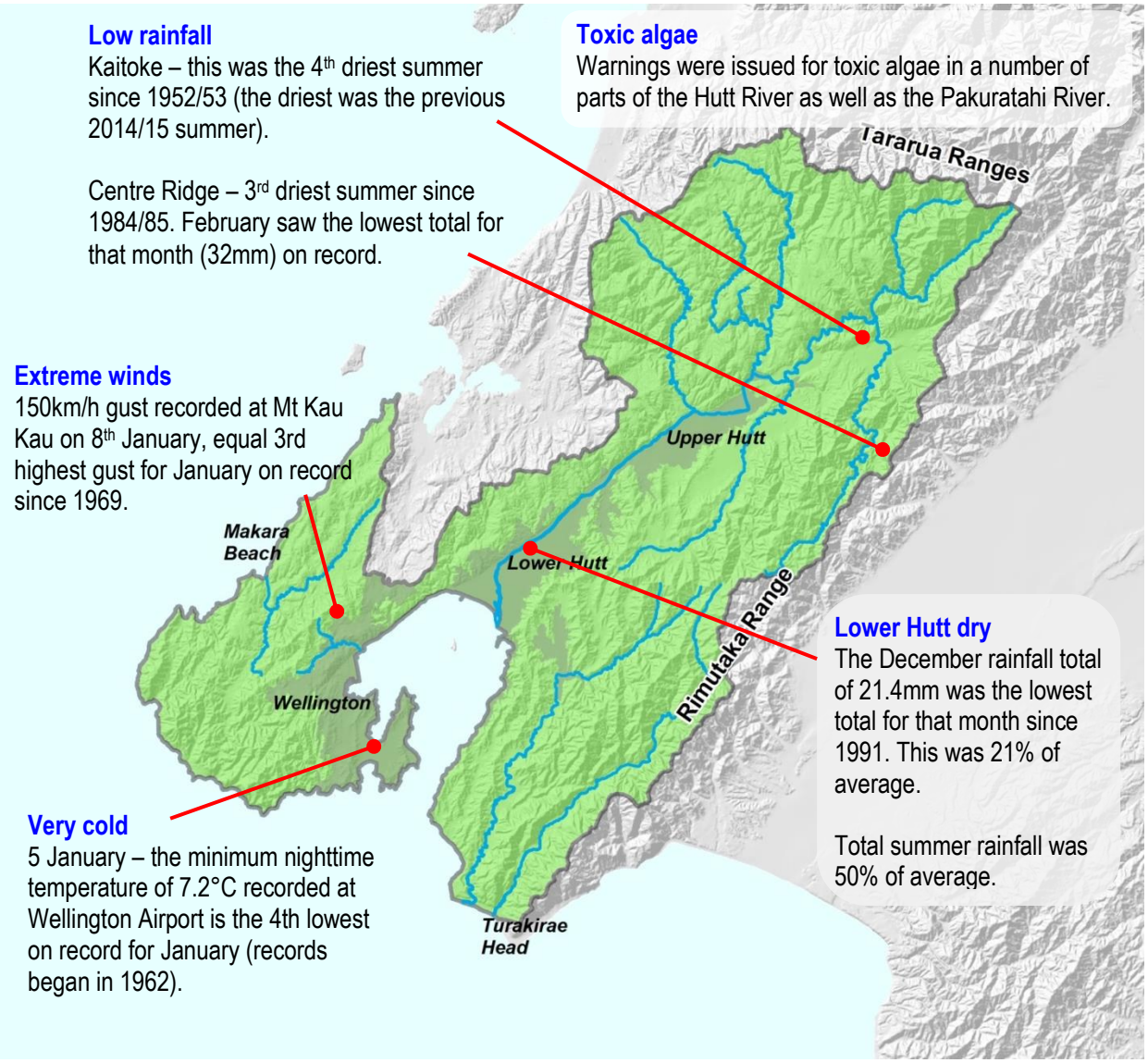


Map of the five whaitua catchment areas in the Wellington region. Each whaitua roughly coincides with a climatic zone, expressing the marked east-to-west contrast that we experience in our region.

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

Wellington Harbour and Hutt Valley climate summary

- **Warmer than average**
- **Drier than average**
- Some notable winds gusts, low overall rainfall and record cold night time temperatures and hot daytime temperatures.
- Widespread hottest February on record since 1927, with 13 days above 25°C at Wellington Airport, which is almost three times the average for the entire year.



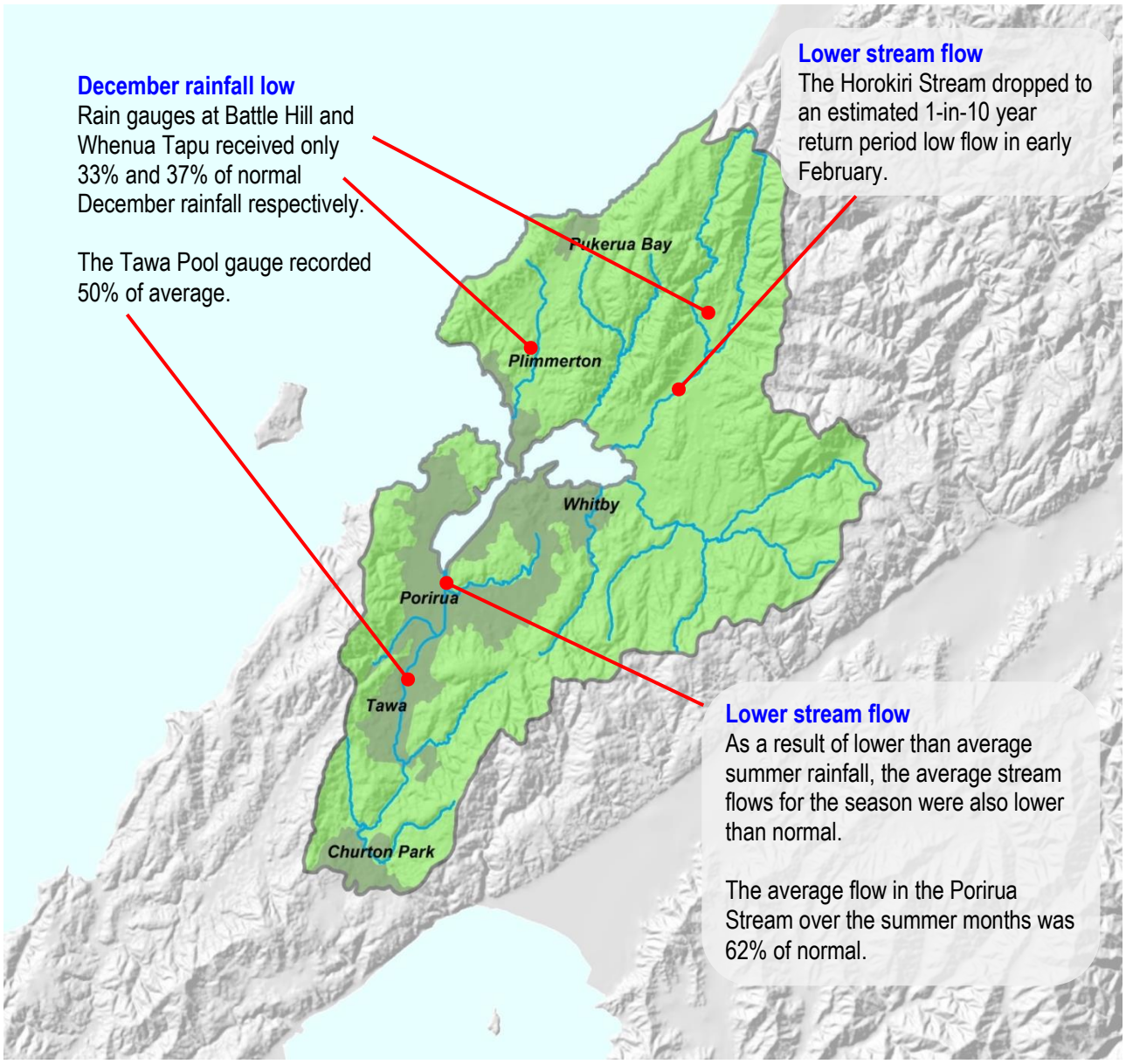
Want to look at the summary tables and graphs?

Climate | Rainfall

River flows | Groundwater levels

Te Awarua-o-Porirua climate summary

- **Warmer than average**
- **Drier than average**
- Widespread hottest February on record since 1927, based on nearby stations



Want to look at the summary tables and graphs?

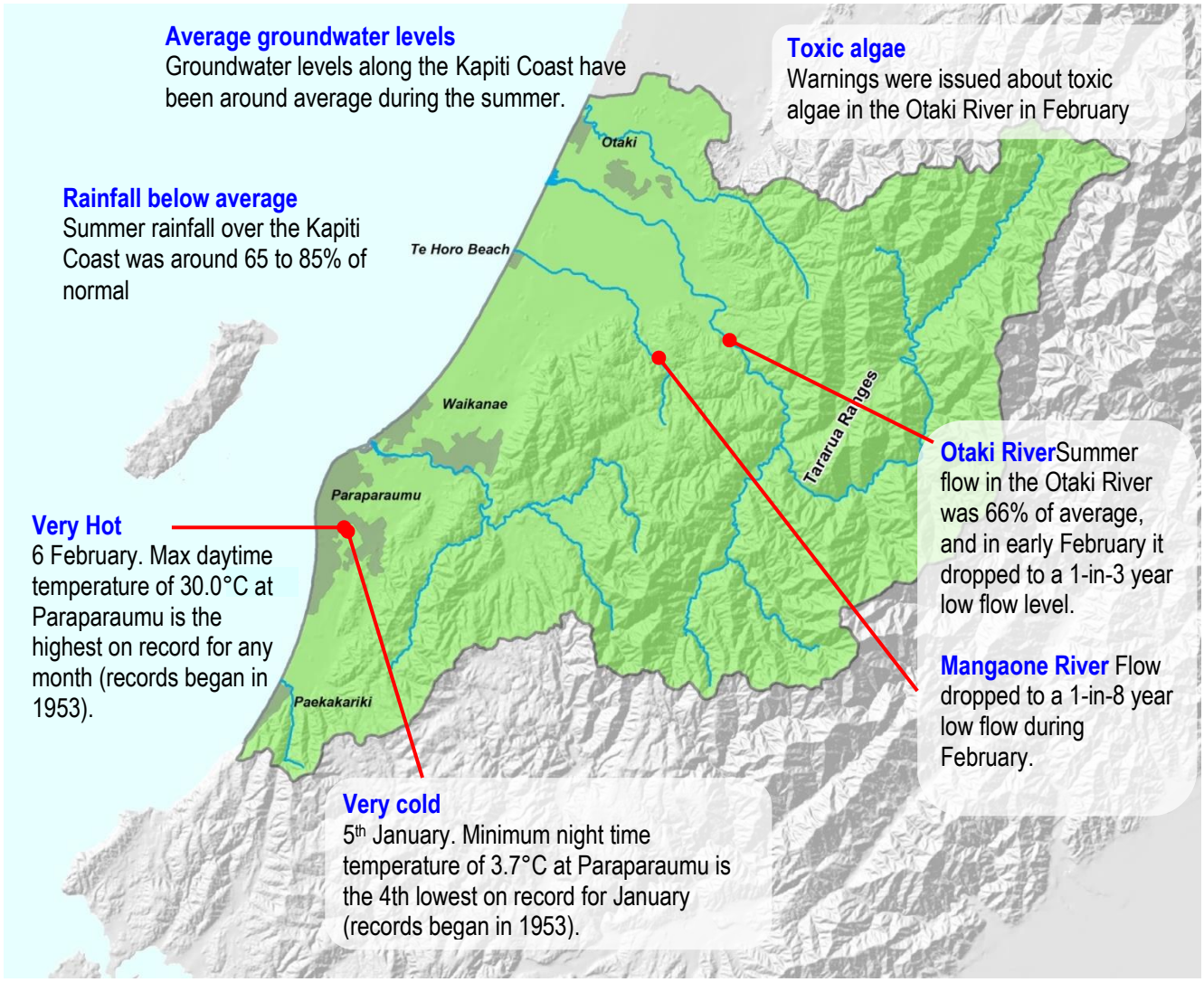
Climate

Rainfall

River flows

Kāpiti Coast climate summary

- **Warmer than average**
- **Drier to near average rainfall**
- Record cold night time temperatures and record hot daytime temperatures.
- Warmest February on record since 1953



Want to look at the summary tables and graphs?

Climate

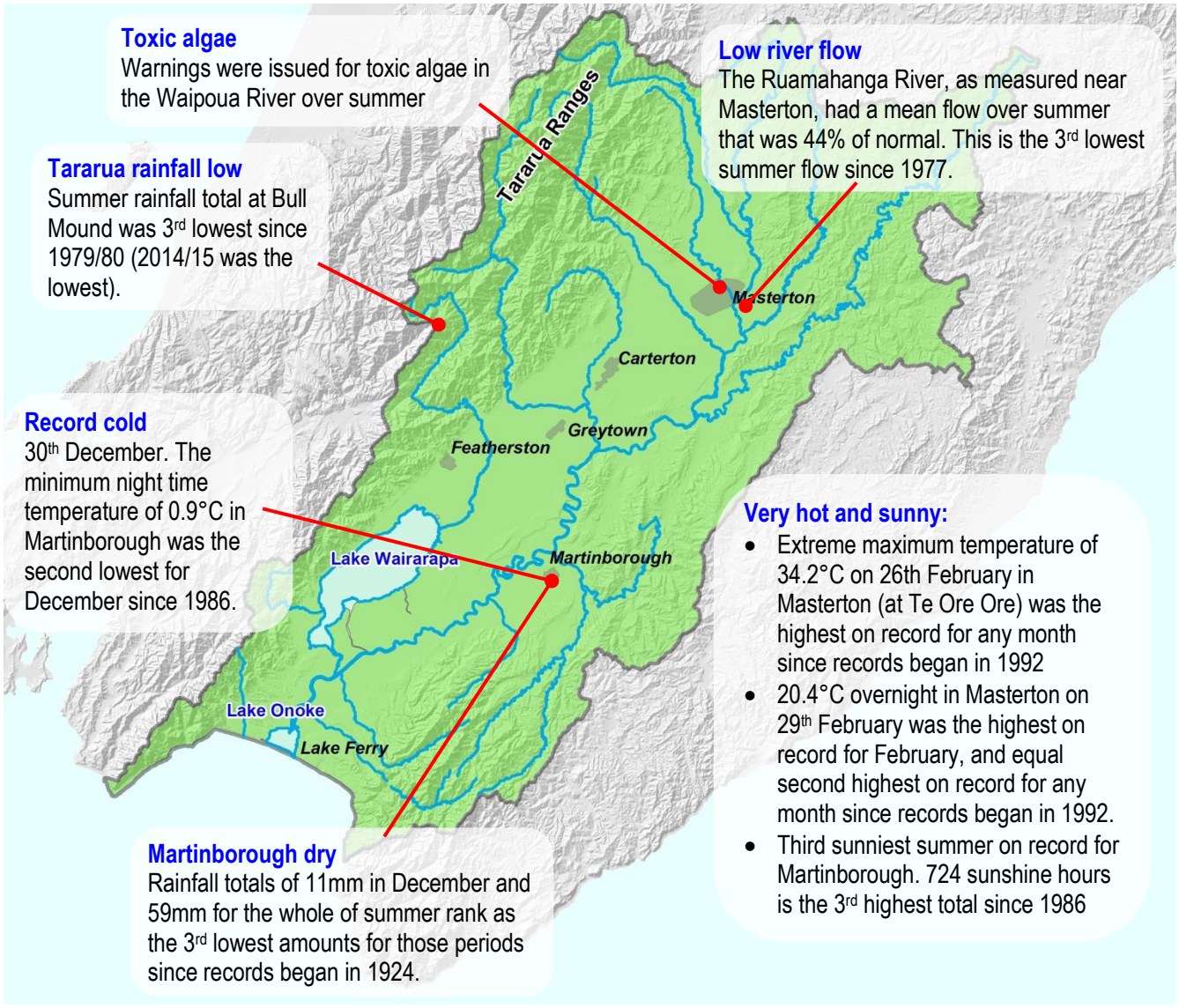
Rainfall

River flows

Groundwater levels

Ruamāhanga Valley climate summary

- **Warmer than average**
- **Variable rainfall to much drier than average**
- Cold mornings and hot and dry days, with hottest February on record since 1992
- An impressive 48 days above 25 degrees in Masterton

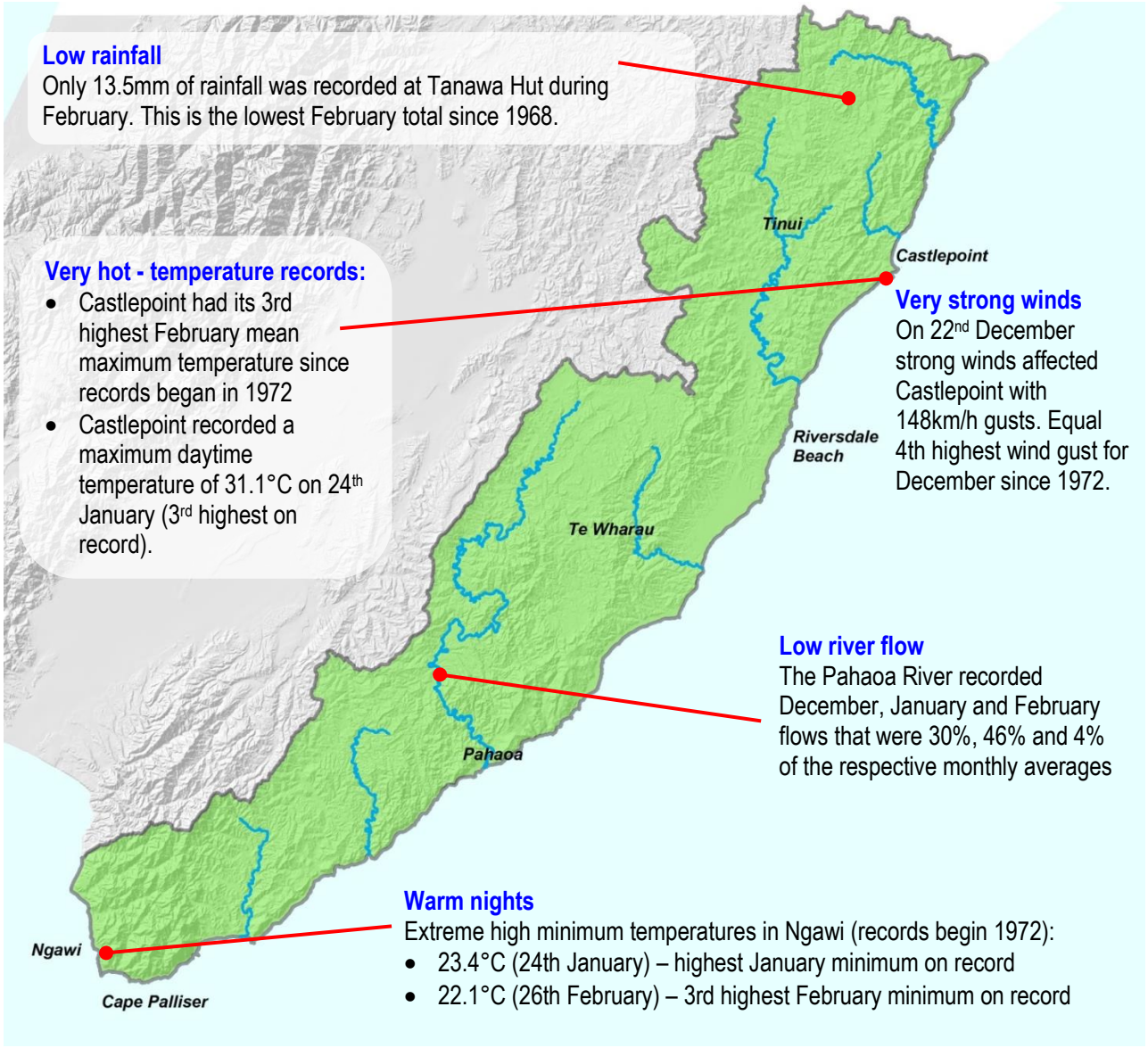


Want to look at the summary tables and graphs?

Climate
Rainfall
River flows
Groundwater levels

Wairarapa Coast climate summary

- **Warmer than average**
- **Much drier than average**
- Some notable wind gusts and overall very hot and dry, with second warmest February on record since 1972



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 summer 2015/16. 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 an impressive amount of days above 25 degrees across the region. Higher 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)	28.3	6.6	1.0	0.8	6	5
	Wellington Airport AWS (MS)	26.3	**7.2**	0.6	0.4	1	13
	Mt Kau Kau (MS)	---	---	---	---	9	---
	Shandon Golf Club	29.5	6.5	---	---	0	16
	Lower Hutt (Waterloo)	31.0	6.0	---	---	0	33
	Wainuiomata	31.5	2.8	---	---	0	24
	Upper Hutt (Central)	31.4	4.6	---	---	0	30
Te Awarua-o-Porirua	Mana Island AWS (MS)[2]	23.9	8.0	1.0	0.8	1	0
Kāpiti Coast	Paraparaumu Airport AWS (MS)	**29.9**	**3.8**	0.9	**0.9**	0	5
Ruamāhanga	Masterton Airport AWS (MS)[2]	**32.0**	2.6	**1.5**	-0.1	0	48
	Martinborough EWS (N)	31.5	**0.9**	0.9	0.1	---	---
	Tauherenikau (Featherston)	31.0	2.5	---	---	---	---
	Rimutaka Summit AWS (MS)	27.4	4.5	---	---	9	2
Wairarapa Coast	Castlepoint AWS (MS)	**31.1**	8.2	0.7	0.5	14	22
	Ngawi (MS)	30.2	8.2	**1.0**	0.6	1	29

[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 totals and percentage of average for each individual month and whole of summer 2015/16. Low December and February rainfall contributed to overall lower than average summer rainfall.

Whaitua	Location	December		January		February		Summer	
		(mm)	(%)	(mm)	(%)	(mm)	(%)	(mm)	(%)
Wellington Harbour & Hutt Valley Click to see cumulative rainfall plots	Kaitoke	54	29	120	83	86	70	260	57
	Lower Hutt	21	21	66	83	43	58	131	50
	Wainuiomata	61	48	89	84	45	42	194	57
	Karori	34	38	95	118	29	38	157	64
	Wellington City	28	40	83	128	24	44	136	71
Te Awarua-o-Porirua Click to see cumulative rainfall plots	Battle Hill	42	33	88	108	45	72	174	67
	Whenua Tapu	32	37	75	108	47	61	153	65
	Tawa	45	50	78	110	44	97	167	80
Kāpiti Coast Click to see cumulative rainfall plots	Otaki	46	48	89	133	71	91	205	85
	Waikanae	53	43	80	94	72	80	204	66
	Paekakariki	33	30	81	117	63	109	177	75
	Tararua (Otaki catchment)	341	74	382	113	201	63	924	85
Ruamāhanga Click to see cumulative rainfall plots	Masterton	41	75	94	140	12	27	147	84
	Featherston	56	69	74	118	18	28	148	70
	Longbush	36	58	85	164	19	35	139	83
	Tararua (Waiohine catchment)	221	55	257	91	148	57	625	66
Wairarapa Coast Click to see cumulative rainfall plots	Tanawa Hut	57	65	69	104	14	18	139	61
	Stoney Creek (Awhea)	55	63	63	64	26	33	144	53
	Ngaumu (Pahaoa)	25	36	62	90	12	20	98	50

Click the following links to return to climate summaries for:

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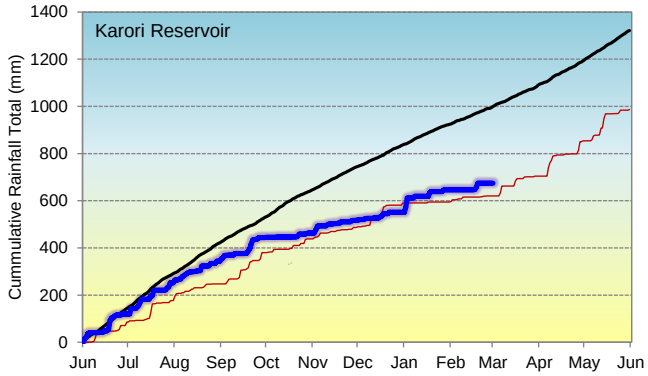
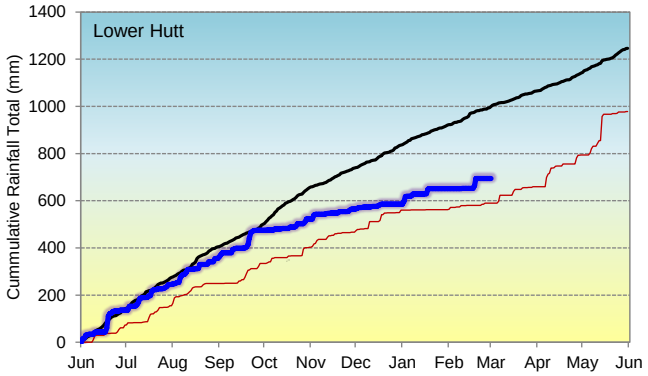
- Kāpiti Coast
- Ruamāhanga
- Wairarapa Coast

Cumulative rainfall plots

Wellington and Hutt Valley

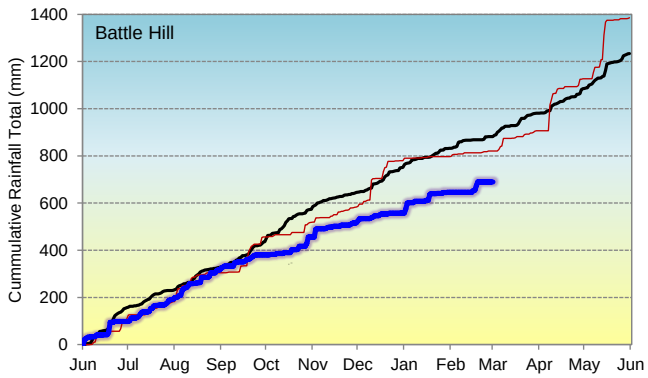
Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). The plots highlight that since around mid-September the rainfall accumulation has been significantly lower than average and that the 2015/16 totals to the end of summer are now quite close to those recorded in the previous year.

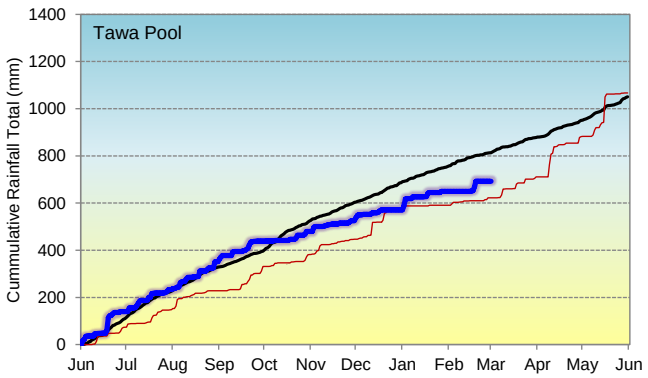




Porirua Harbour

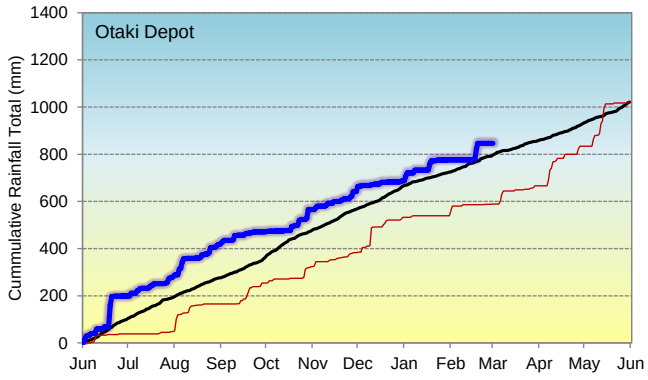
Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). The plots highlight that rainfall accumulation in the current 2015/16 year is below average. At the end of summer the Battle Hill and Tawa Pool totals were 22% and 15% below average respectively.

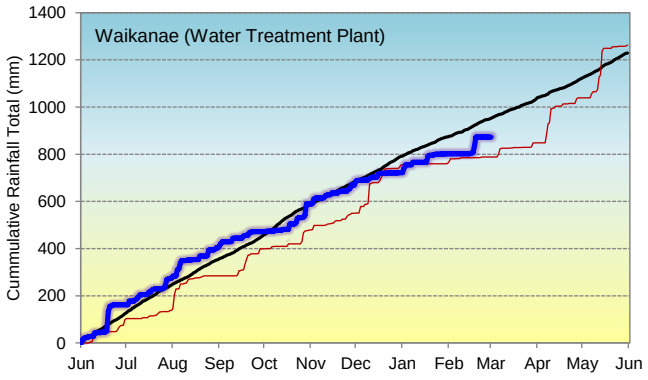




Kapiti Coast

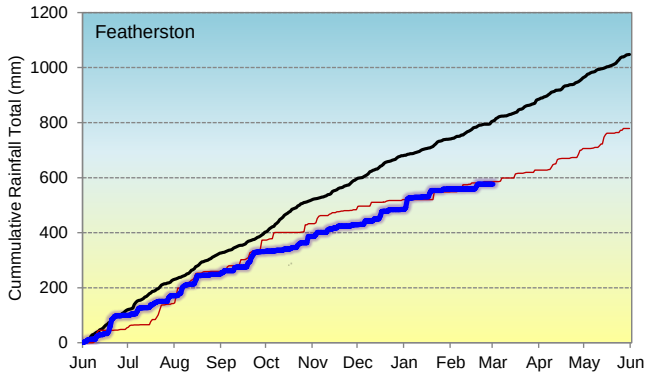
Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). Rainfall at Otaki maintained above the long-term average up to the end of summer. Waikanae rainfall fell slightly below the average from December.

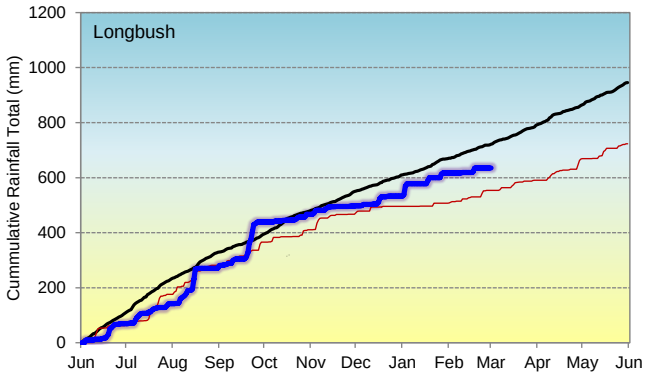




Ruamahanga

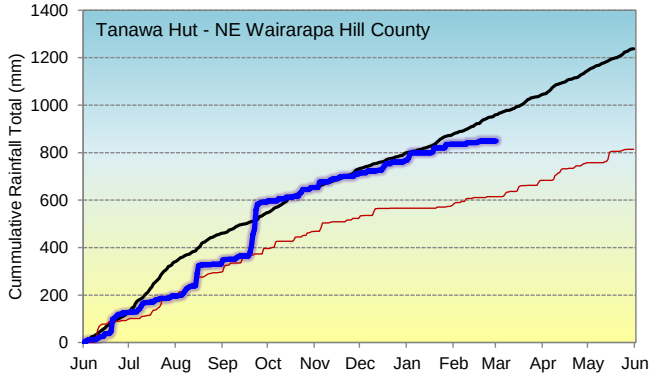
Cumulative rainfall totals for 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). The plots show a difference between the Featherston (Tauherenikau) and Longbush (Waikoukou) sites in terms of rainfall accumulation. Rainfall in the lower Ruamahanga valley is currently tracking 29% below average and is at a similar accumulation as at the same time last year.





Wairarapa Coast

Cumulative rainfall total 2015/16 (blue line), 2014/15 (red line) and long-term average (black line). The rainfall accumulation at Tanawa Hut had been tracking around the average until the very dry February when only 13.5mm of rain was recorded.



River flows

Percentage of average river flow for each month and whole of summer 2015/16. Flows across the region have been below average the whole summer season. The Waiohine had the highest summer flow relative to normal at 71%.

		Flow as a percentage of average			
Whaitua	**River**	**December**	**January**	**February**	**Summer**
Wellington Harbour & Hutt Valley	Hutt River - Kaitoke	45	74	55	56
	Hutt River - Taita Gorge	47	68	58	56
	Akatarawa River	51	62	62	57
	Mangaroa River	46	44	37	43
	Wainuiomata River	60	61	37	54
Te Awarua-o-Porirua	Porirua	51	84	52	62
	Pauatahanui	37	50	33	40
	Horokiri	58	57	25	45
Kāpiti Coast	Otaki	67	79	49	66
	Mangaone	70	54	47	59
	Waikanae	74	56	84	71
Ruamāhanga	Kopuaranga	33	56	18	35
	Waingawa	44	67	30	47
	Waiohine	51	73	41	55
	Mangatarere	46	60	28	46
	Ruamahanga	37	54	25	38
Wairarapa Coast	Pahaoa	30	46	4	23

Click the following links to return to climate summaries for:

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

Minimum and maximum flows recorded during summer. There were no notable high flows during summer but many monitored rivers recorded very low flows. The Ruamahanga River reached low flow levels of a 1-in-12 year return period.

It is worth noting that many of the region's rivers and stream were in recession at the end of February and it is likely that lower flows will occur during autumn.

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)	1.123	10-Feb	4	107	19-Feb	<1
	Hutt(Taita Gorge)	3.553	10-Feb	Annual	211	19-Feb	<1
	Akatarawa	1.082	6-Feb	Annual	52	19-Feb	<1
	Mangaroa	0.376	11-Feb	Annual	9.9	2-Dec	<1
	Wainuiomata	0.123	25-Feb	11	4.5	2-Dec	<1
Te Awarua-o-Porirua	Porirua	0.137	9-Feb	Annual	15	3-Jan	<1
	Pauatahanui	0.057	9-Feb	8	3.5	18-Jan	<1
	Horokiri	0.038	3-Feb	10	2.3	3-Jan	<1
Kāpiti Coast	Otaki	4.429	10-Feb	3	329	19-Feb	<1
	Mangaone	0.055	10-Feb	8	2.5	19-Feb	<1
	Waikanae	1.033	9-Feb	Annual	68	19-Feb	<1
Ruamāhanga	Kopuaranga	0.223	11-Feb	4	3.3	20-Jan	<1
	Waingawa	1.055	10-Feb	7	122	8-Jan	<1
	Waiohine	2.668	11-Feb	8	303	8-Jan	<1
	Mangatarere	0.125	23-Feb	3	6.0	19-Feb	<1
	Tauherenikau	0.981	11-Feb	6	88	19-Feb	<1
	Otukura	0.056	23-Feb	Annual	0.7	6-Jan	<1
	Ruamahanga (Upper)	1.781	11-Feb	12	139	8-Jan	<1
	Ruamahanga (Lower)	5.680	11-Feb	12	273	9-Jan	<1
Wairarapa Coast	Pahaoa	0.073	23-Feb	Annual	15	4-Jan	<1

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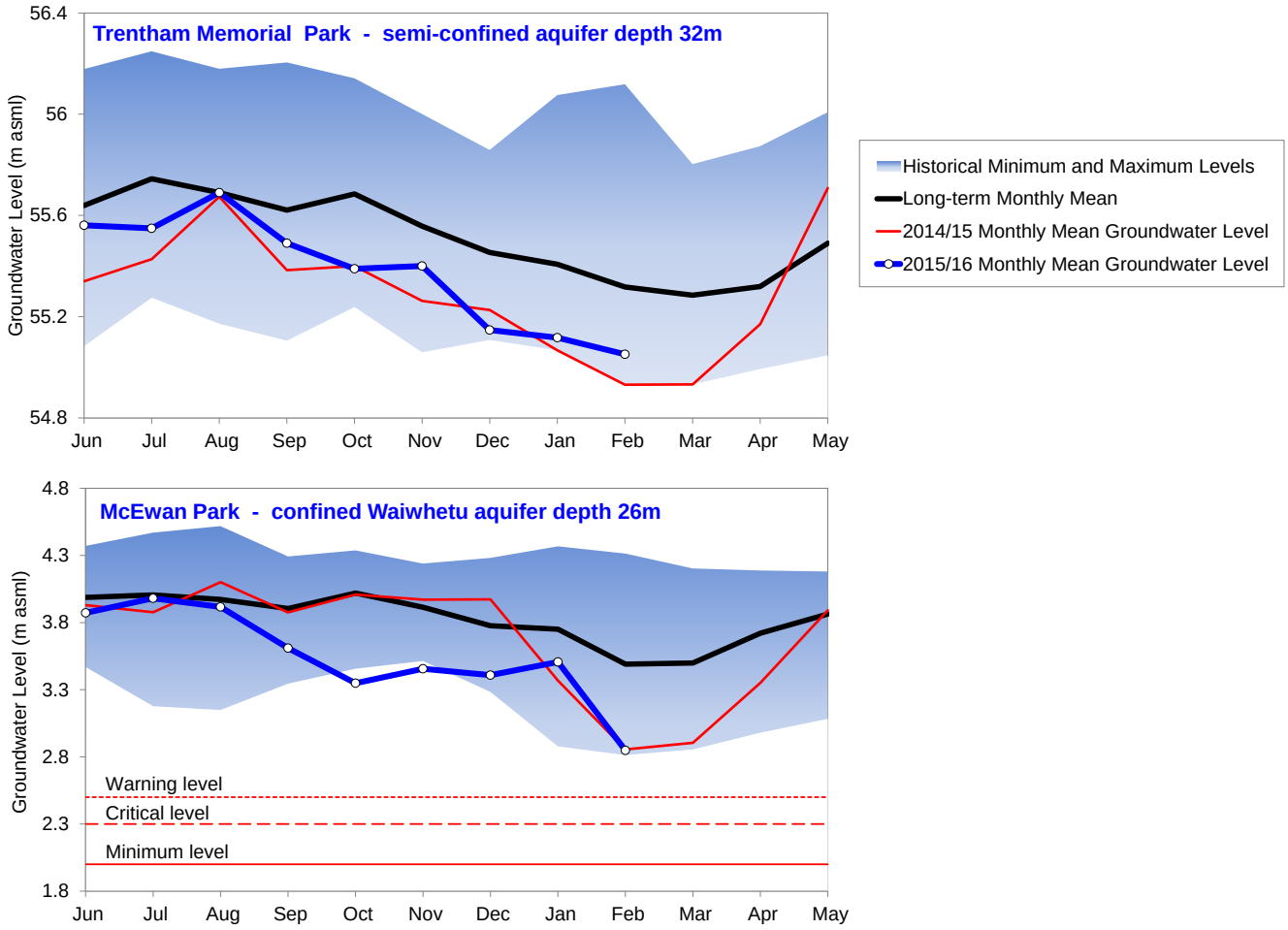
- Ruamāhanga
- Wairarapa Coast

Groundwater levels

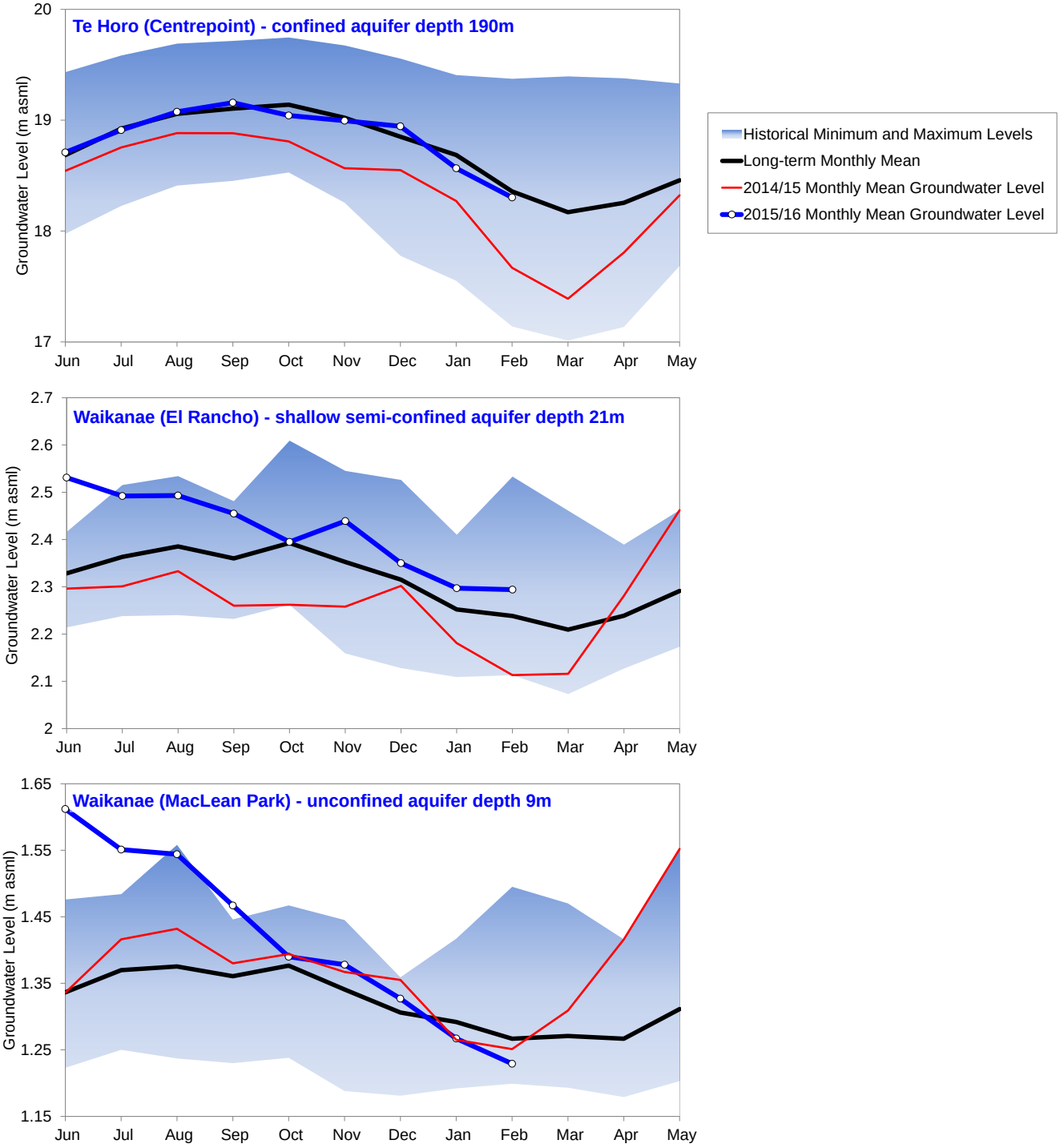
Wellington and Hutt Valley

Summer 2015/16 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 highlight that the groundwater levels were below the long-term average during summer and were close to the low levels recorded the previous year.



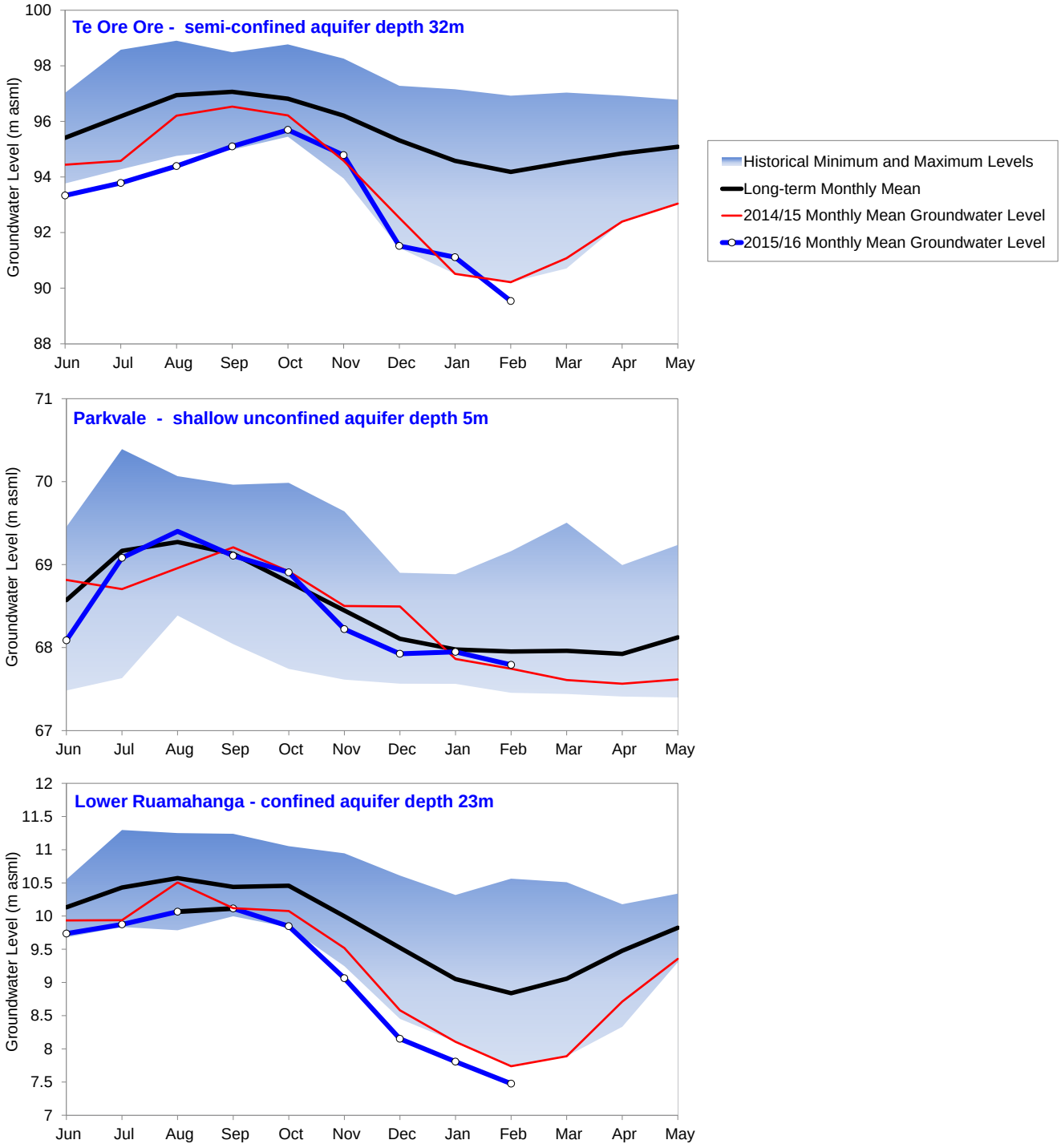
Kapiti Coast

Summer 2015/16 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 summer. The two Waikanae shallow bores show a decline from the record high levels experienced in winter 2015.



Ruamahanga

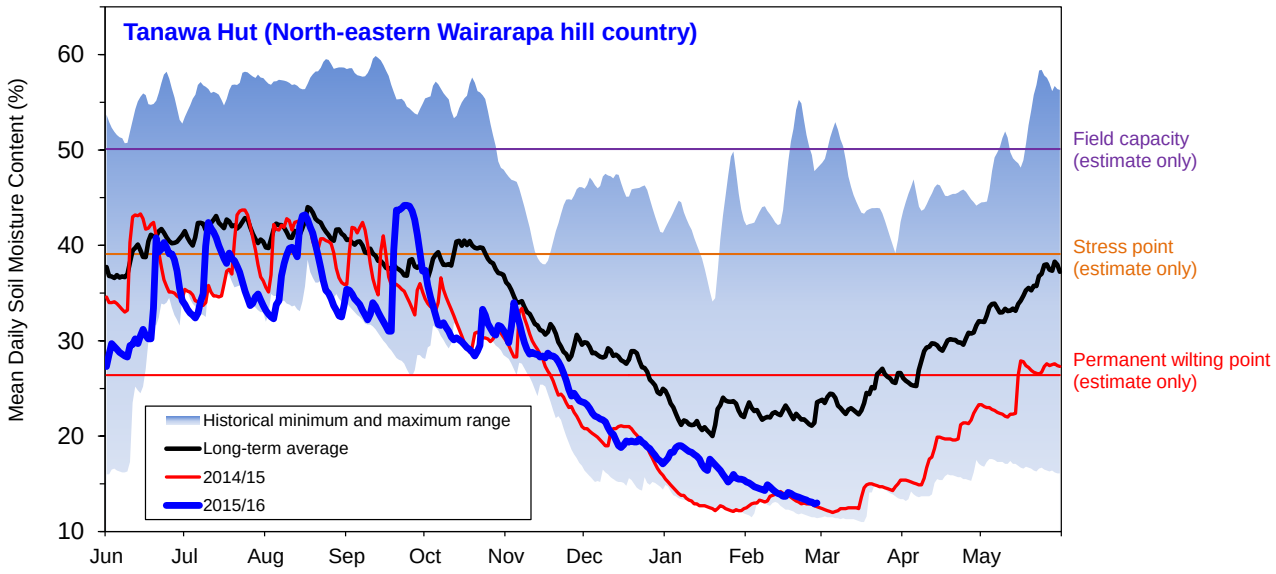
Summer 2015/16 groundwater levels in three Ruamahanga valley bores compared to their long-term averages, the previous year's levels and historical extremes (blue envelope). Levels in the Te Ore Ore and Lower Ruamahanga bores reached record low levels during summer after being consistently low during the previous winter and spring.



Soil moisture content

Wairarapa Coast

Summer 2015/16 soil moisture content at Tanawa Hut in north-east Wairarapa plotted against the historical mean, historical minimum and maximum (7-day average), and the year 2015/16. The plot shows that the soil moisture level started summer at a below average level and remained low during the summer months.



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 at 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

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