greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Climate briefing

Wairarapa November 2015

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1. El Nino – Southern Oscillation (ENSO)

1.1 Current status

The latest development of the current El Niño is seen in Figure 1.1, with fairly warm waters in the Equatorial Pacific Ocean extending all the way to South America as of 14 November. The waters are cool on the eastern coast of New Zealand, which is a normal response of the oceanic circulation to El Niño events. The cool waters around New Zealand help reduce the amount of moisture in the atmosphere over summer, favouring drought conditions on the east coast. To the west of Australia, the warm waters south of the equator work to create more storms that may eventually reach New Zealand, as occurred in Hawkes Bay in September. The actual observed climate results from the equilibrium of these opposing forces. At the bottom panel we can see that the current El Niño is heading towards "very strong", comparable to the 1997-1998 event which was one of the strongest ever measured.

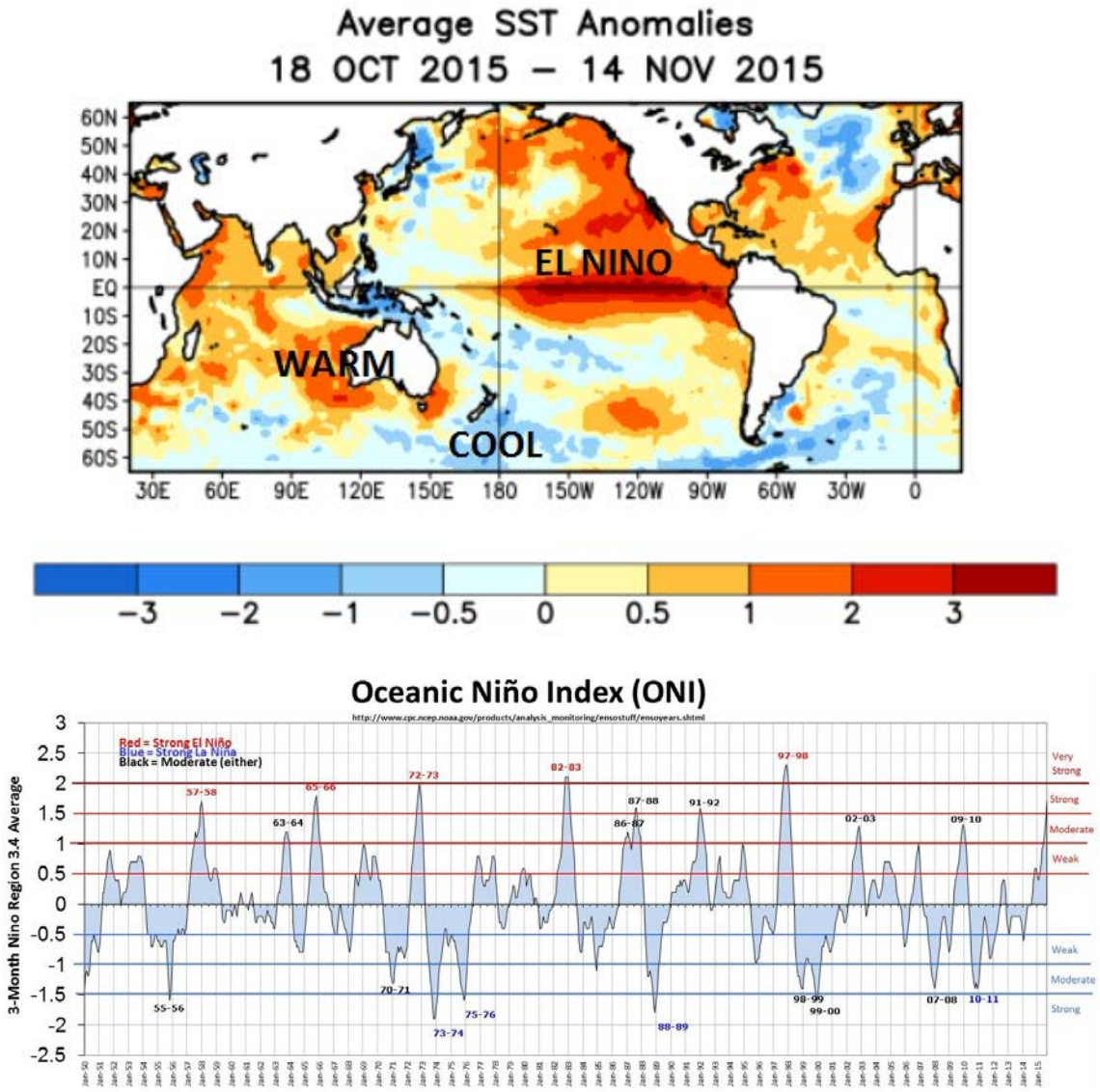


Figure 1.1: Latest water temperature anomalies (upper panel) and how the current El Niño sits in historical perspective. Source: NOAA/USA

1.2 Large scale effects

The next sequence of figures shows what has happened during past historical El Niño summers (nine events since the record 1983 El Niño). Figure 1.2 shows that a high pressure anomaly sits to the south of New Caledonia (northwest of New Zealand, in red) and a low pressure anomaly forms to the south-east of New Zealand during typical El Niño summers. This pressure differential is quite strong, changing the wind patterns and contributing towards droughts on the eastern part of New Zealand.

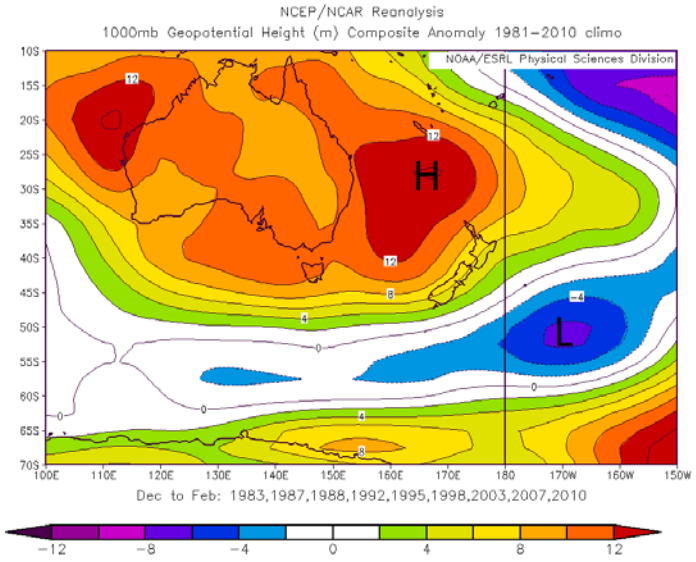


Figure 1.2: Pressure anomalies during typical El Niño summers. New Zealand is seen under the influence of high pressures (in red), which helps reduce the normal rainfall pattern. Source: NCEP Reanalysis/USA

1.3 New Zealand wide effects

As a result of the pressure changes, the westerly winds tend to increase all over New Zealand during El Niño summers (Figure 1.3, in red). We can see that this pattern is stronger in the northern part of the North Island and in the southern part of the South Island. Over the Greater Wellington Region this increase is not as pronounced (yellow tones), reflecting the fact that we sit in a transition area with variable effects.

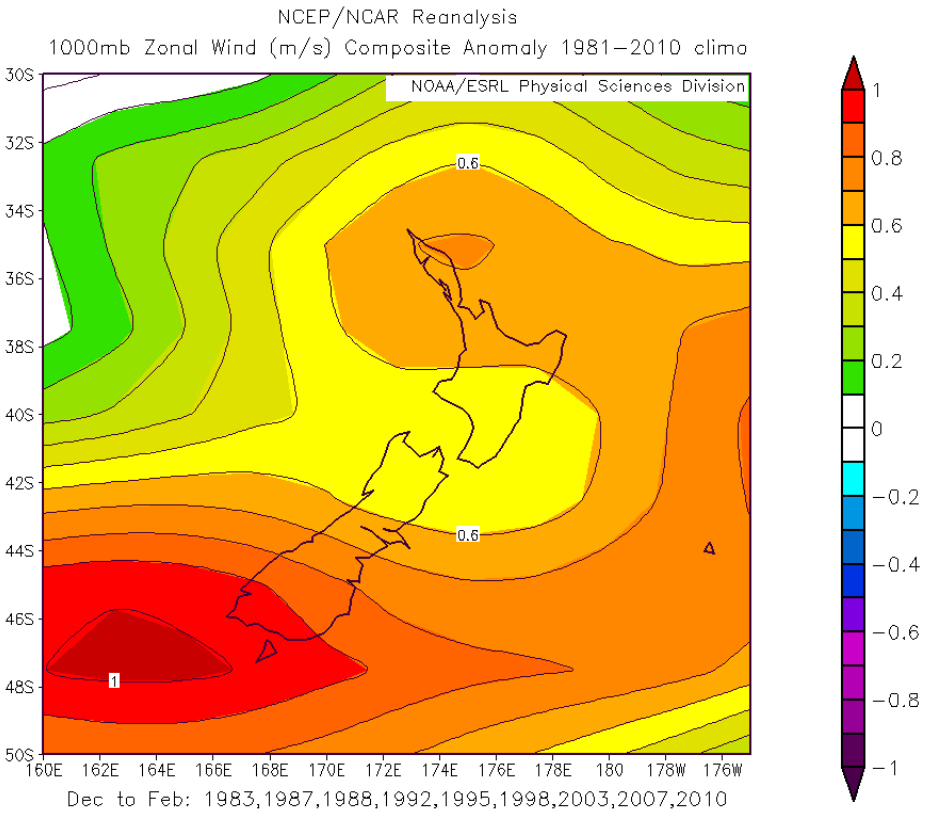


Figure 1.3: Change in the zonal wind (westerlies) observed during typical El Niño summers. A strengthening of the westerlies is seen all over New Zealand (in red). Source: NCEP Reanalysis/USA.

Figure 1.4 shows that the drying effect of summer El Niños tends to concentrate on the northern part of the North Island and the southern part of the South Island (in red), following the proportionally greater increase of westerly winds in those areas, due to the drying effect of the winds. In the Greater Wellington Region there is a modest drying of the relative humidity particularly on the northern Wairarapa coast.

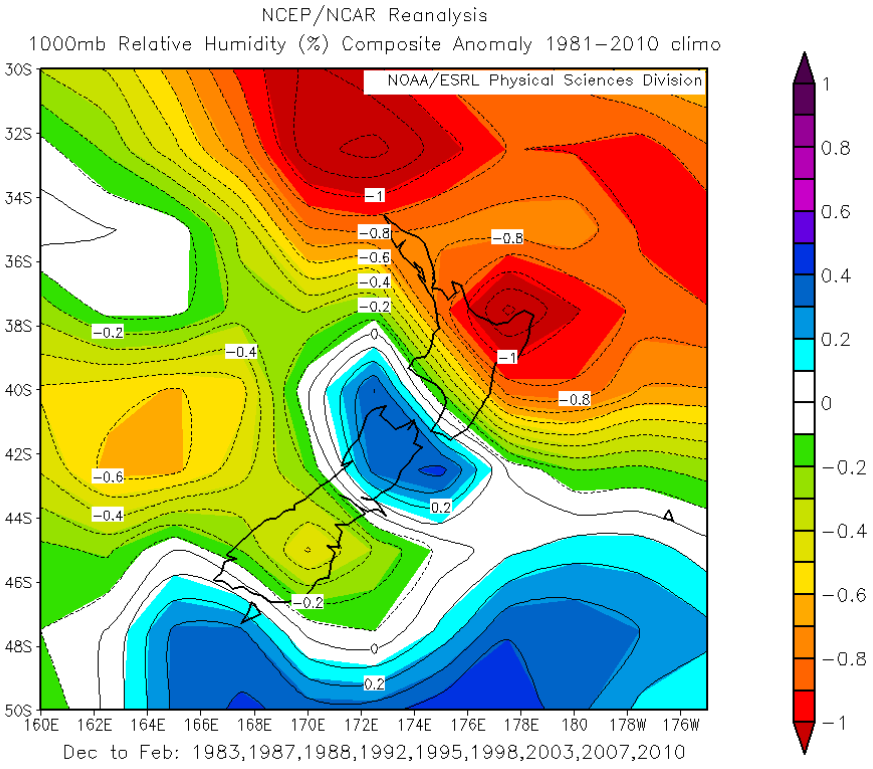


Figure 1.4: Change in the relative humidity observed during typical El Niño summers. Source: NCEP Reanalysis/USA.

During very strong El Niño events, the typical summer pattern is of drought on the whole eastern part of New Zealand, as shown in Figure 21.5. In the Greater Wellington Region the driest area tends to be the northern Wairarapa Coast, where it can rain less than half of the normally expected rainfall over summer.

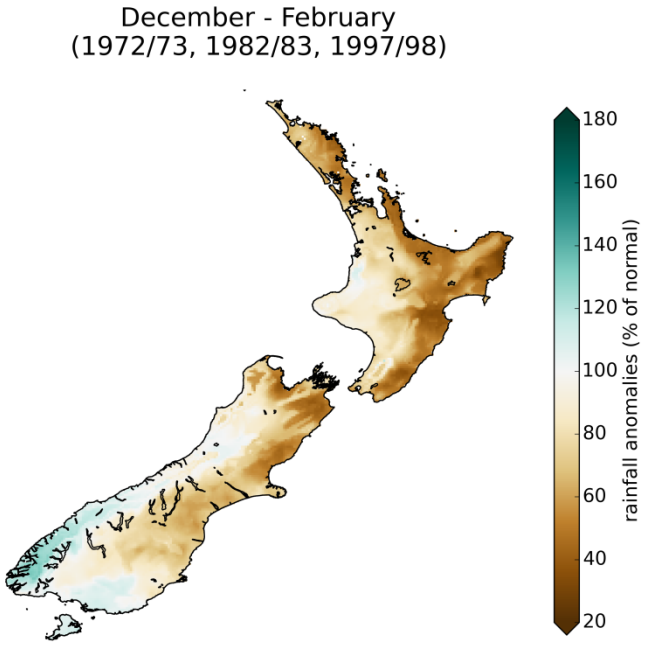


Figure 1.5: Rainfall anomalies during the three previous strongest El Niño on record. Source: NIWA.

1.4 Regional effects

Figure 1.6 shows that there is an increased probability of up to one in a 50-year dry summer in El Niño years for most of the Wairarapa (orange shading, upper left). In autumn, the pattern is broken and the greater chances of drought are confined to the northern Wairarapa coast (orange shading, bottom left).

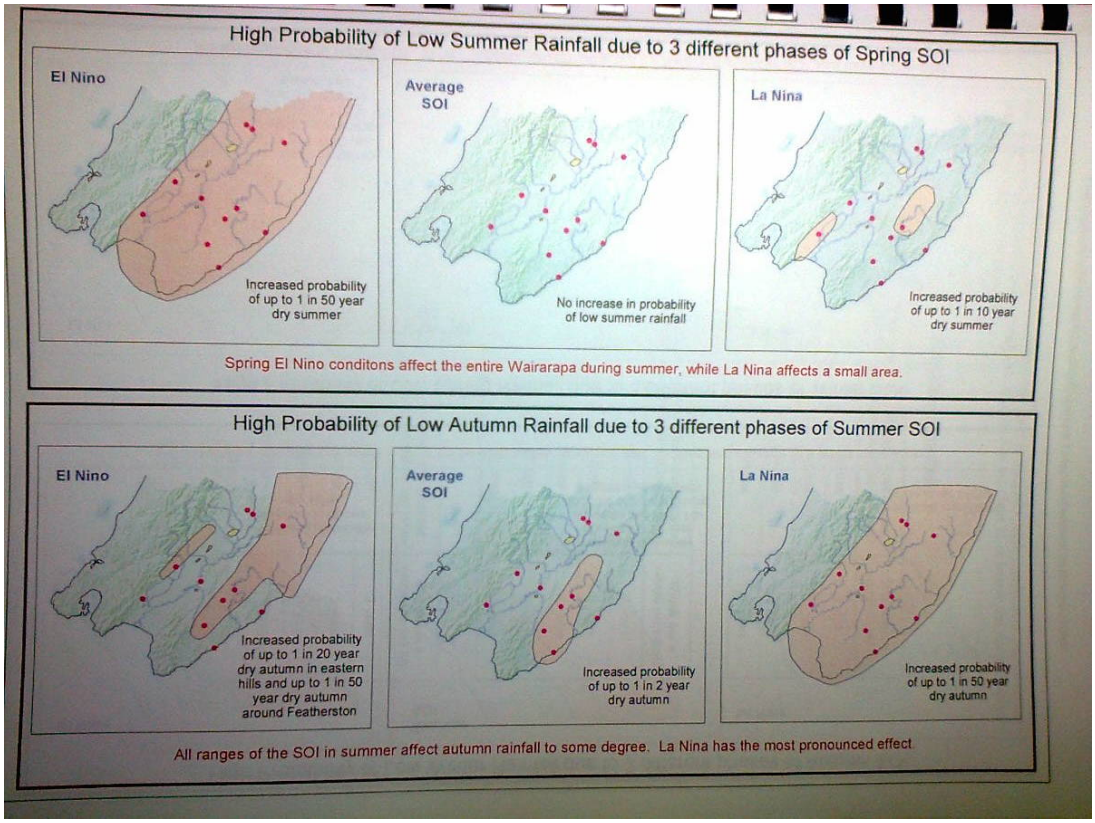


Figure 1.6: Probability of drought in summer and autumn associated with El Niño years. Source: Greater Wellington Regional Council.

2. Current rainfall and soil moisture conditions

This report provides a graphical update of rainfall and soil moisture conditions for selected GWRC monitoring sites in the Wairarapa (Figure 2.1). It has been prepared using data collected up to Tuesday 10 November. Much of the recent data are unaudited and may change in the future when archived. Until then, the data should be considered indicative only. Please note the data disclaimer at the front of this report.

The rainfall plots show total rainfall accumulation (mm) for the year to date (since 01 July 2015). For comparative purposes, cumulative plots for selected historic years with notably dry summers in the Wairarapa have been included, as well as the site mean. Many of the GWRC telemetered rain gauge sites in the lower lying parts of the Wairarapa (ie, not Tararua Range gauges installed for flood warning purposes) have only been operating since the late 1990s so the period of data presented is somewhat constrained to the past two decades. For each historical summer record plotted, an indication of ENSO climate state (El Nino, La Nina or neutral) at that time is also given.

The soil moisture plots show seven day rolling average soil moisture (%) for the year to date (since 01 July 2015). An envelope plot of the historic range of data (and site mean) is also provided to give an indication of how the current soil moisture compares with that for a similar time of the season in past years. While the soil moisture plots are useful for tracking change within the current season and comparing relative differences between years, the absolute moisture content (%) for any given site and date should not be considered accurate. Many of the GWRC soil moisture sites have not yet been fully calibrated to provide accurate absolute measures of soil moisture.

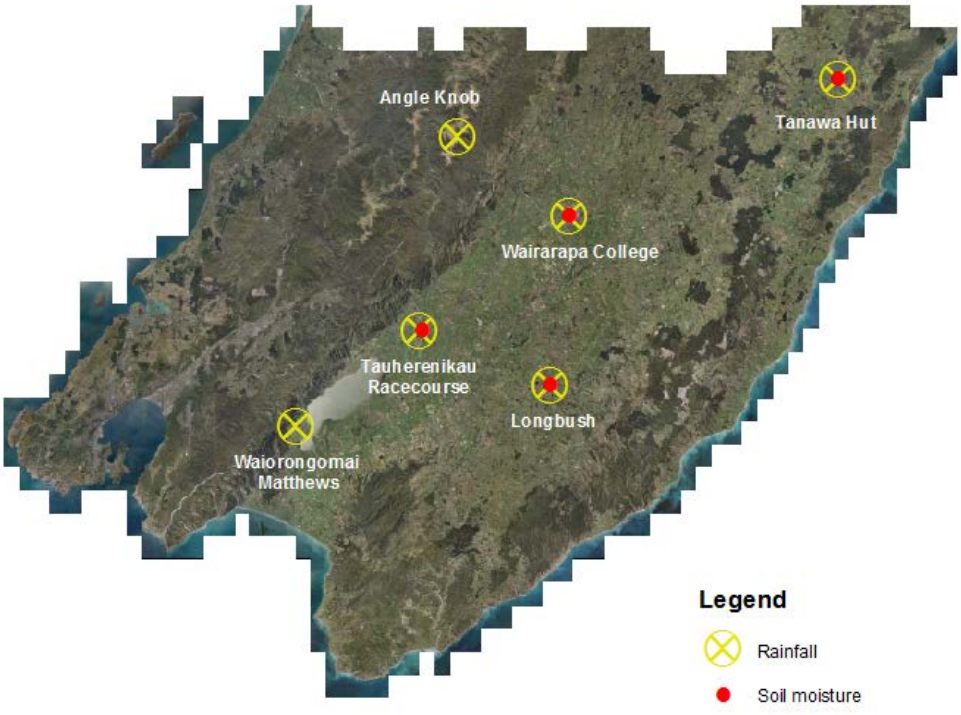
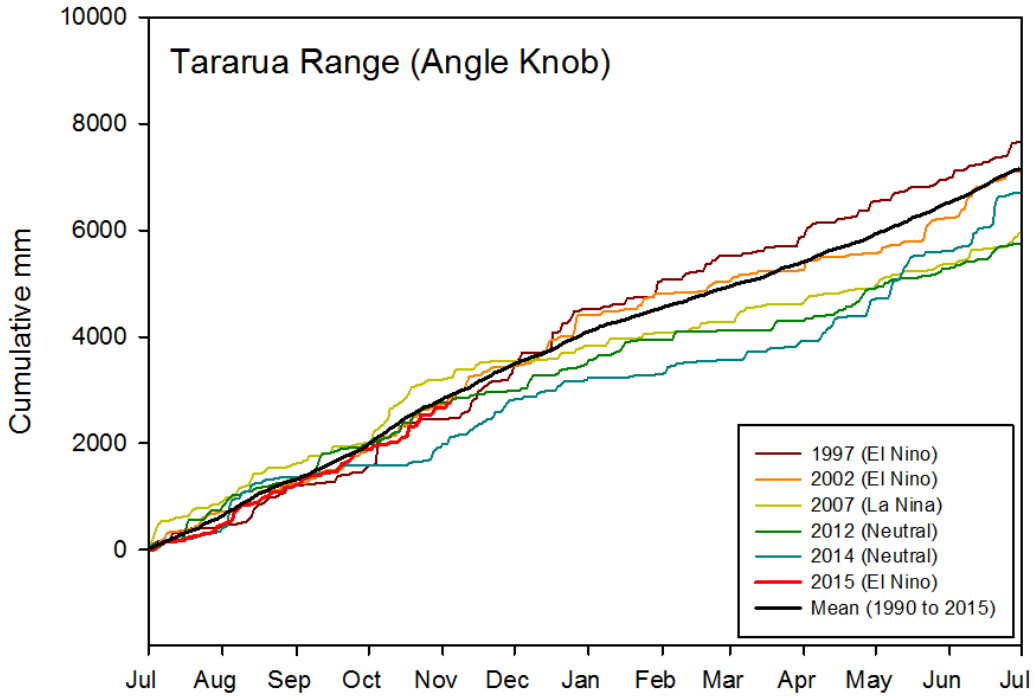
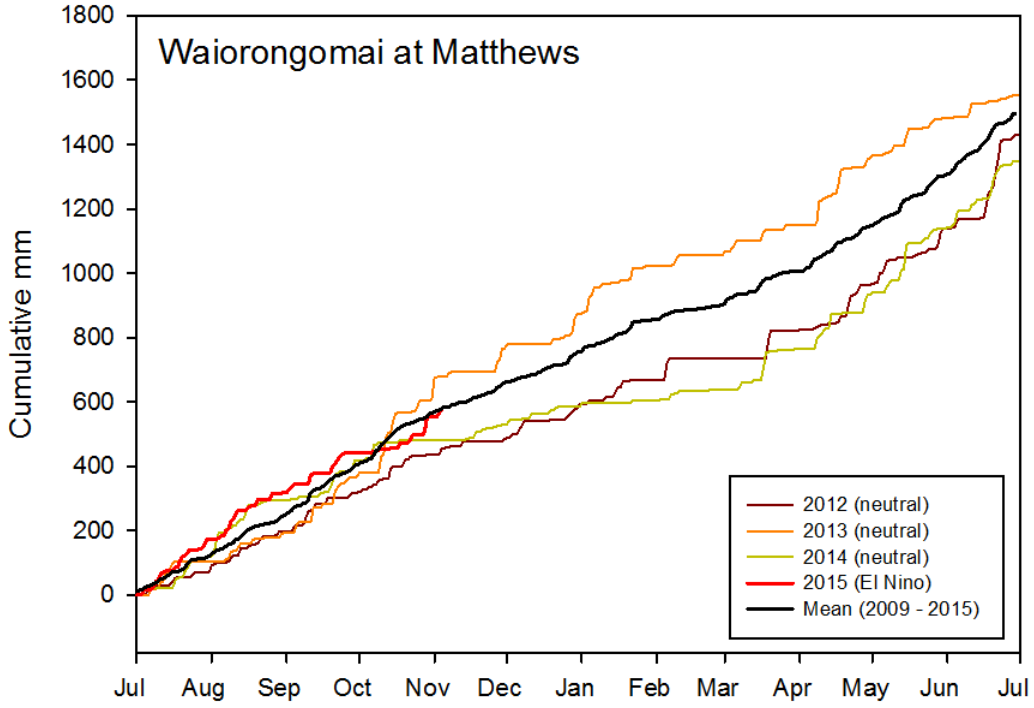
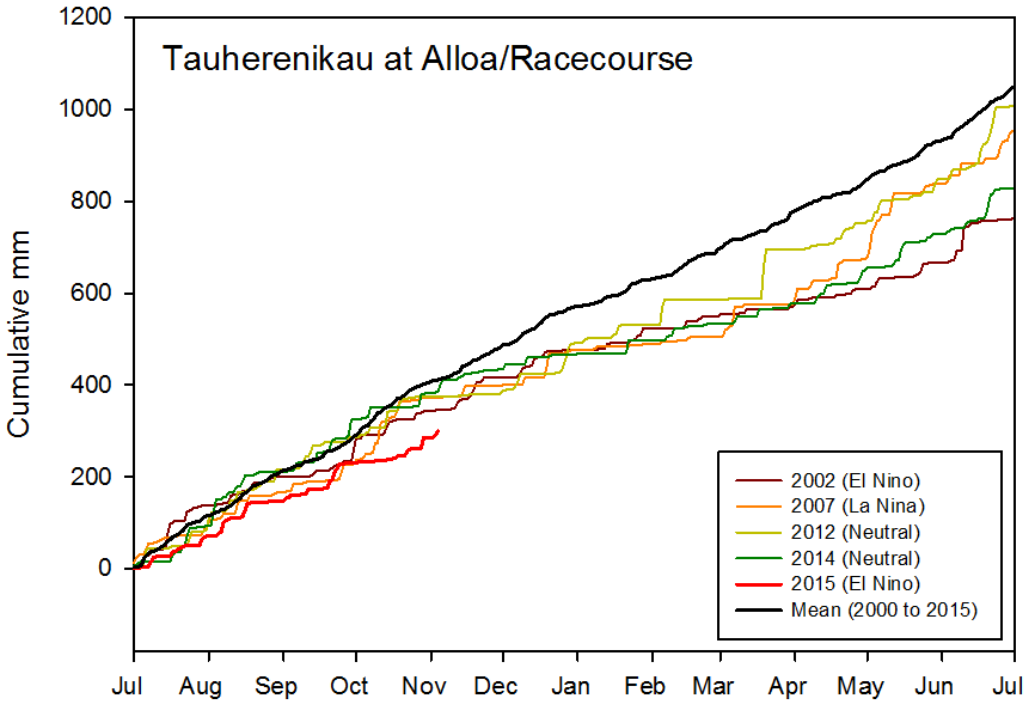


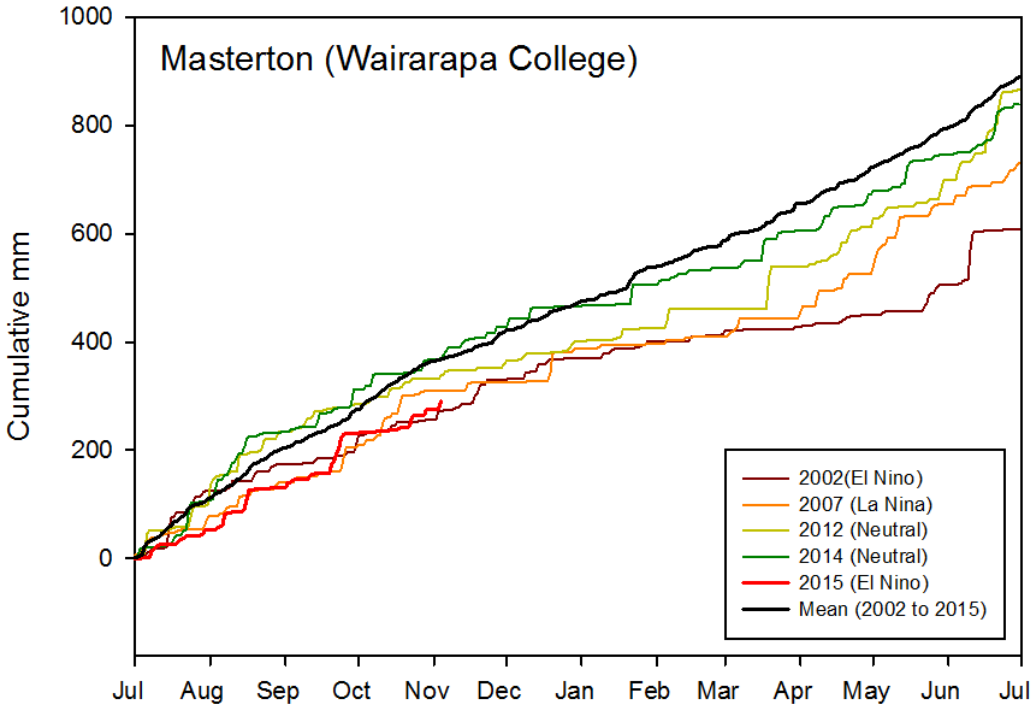
Figure 2.1: Map of rainfall and soil moisture monitoring locations

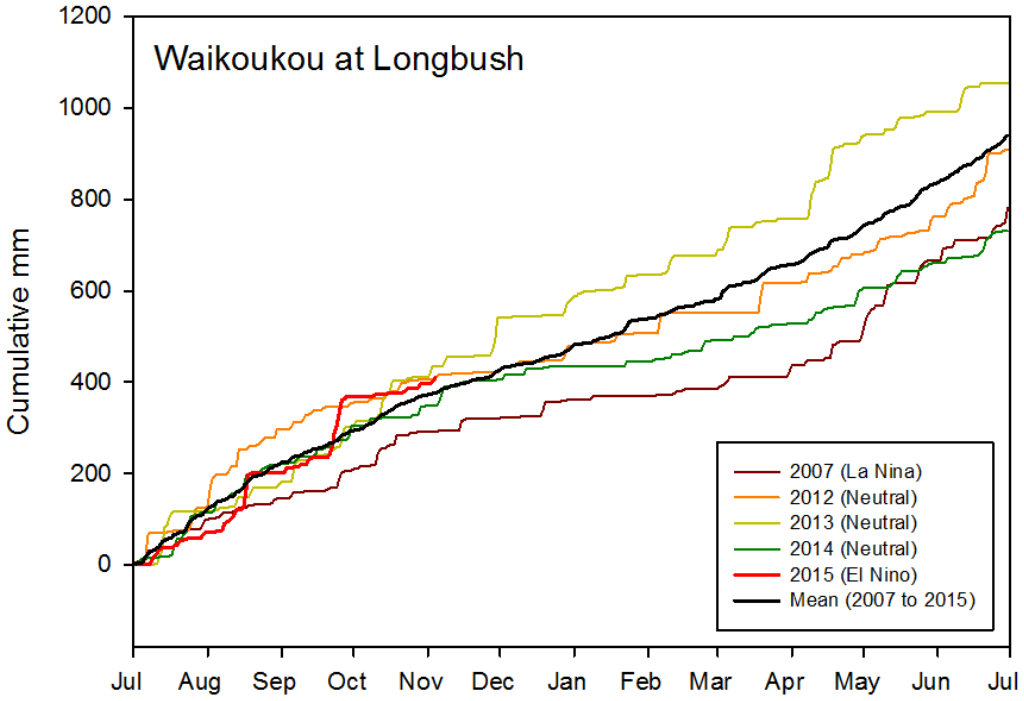
2.1 Accumulated rainfall – year to date since 01 July 2015

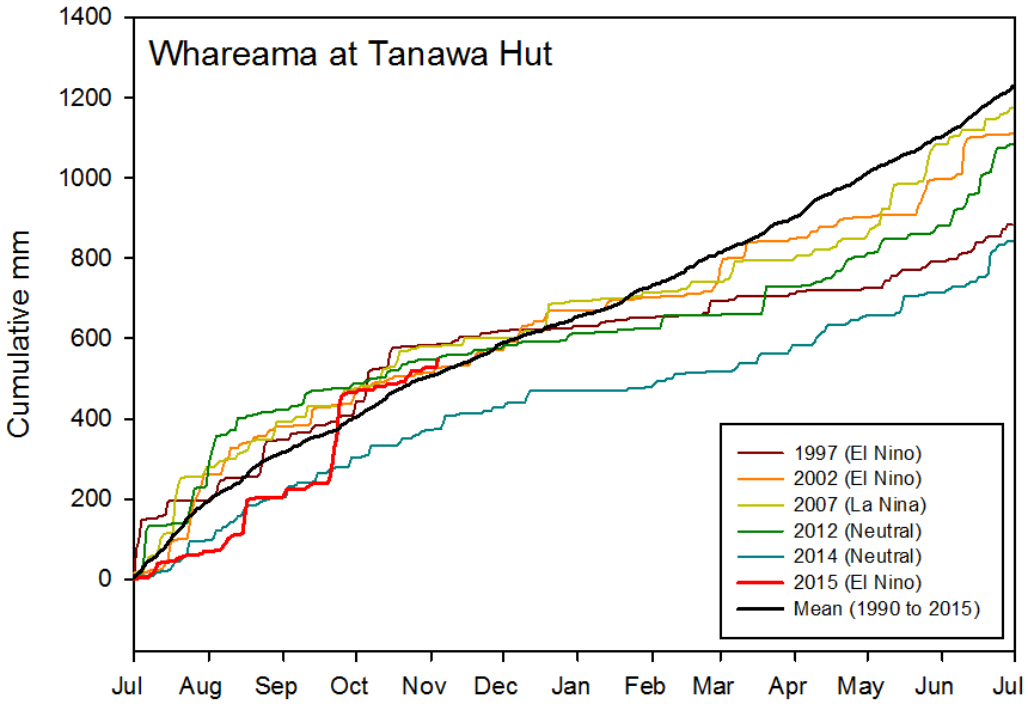




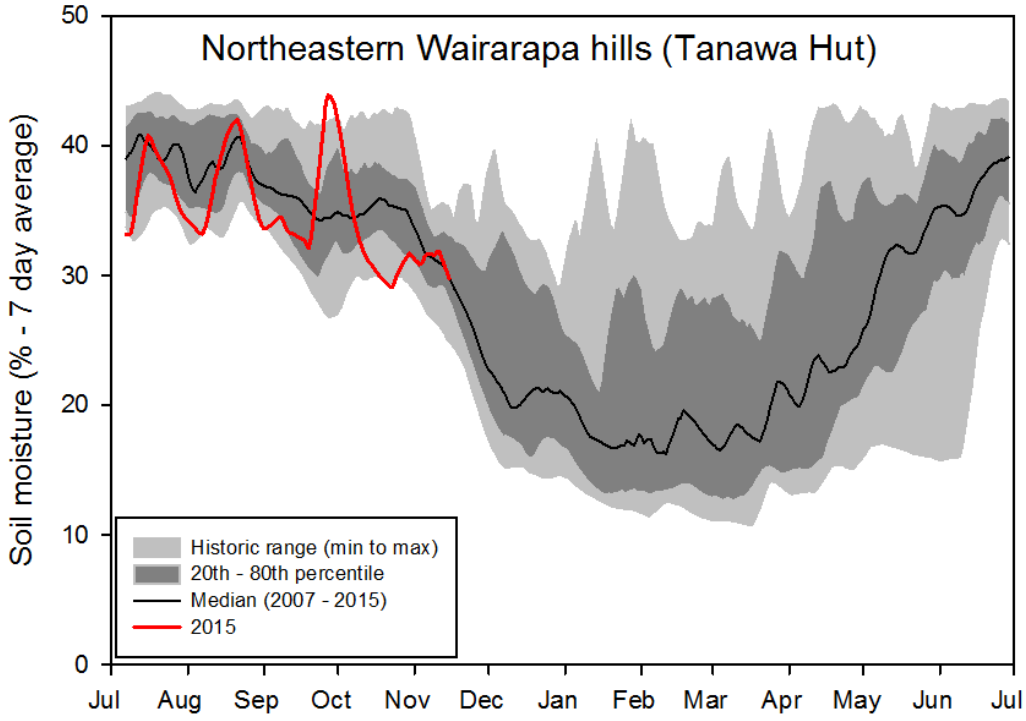

Tauherenikau at Alloa/Racecourse
Cumulative mm
1200
1000
800
600
400
200
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
2002 (El Nino)
2007 (La Nina)
2012 (Neutral)
2014 (Neutral)
2015 (El Nino)
Mean (2000 to 2015)

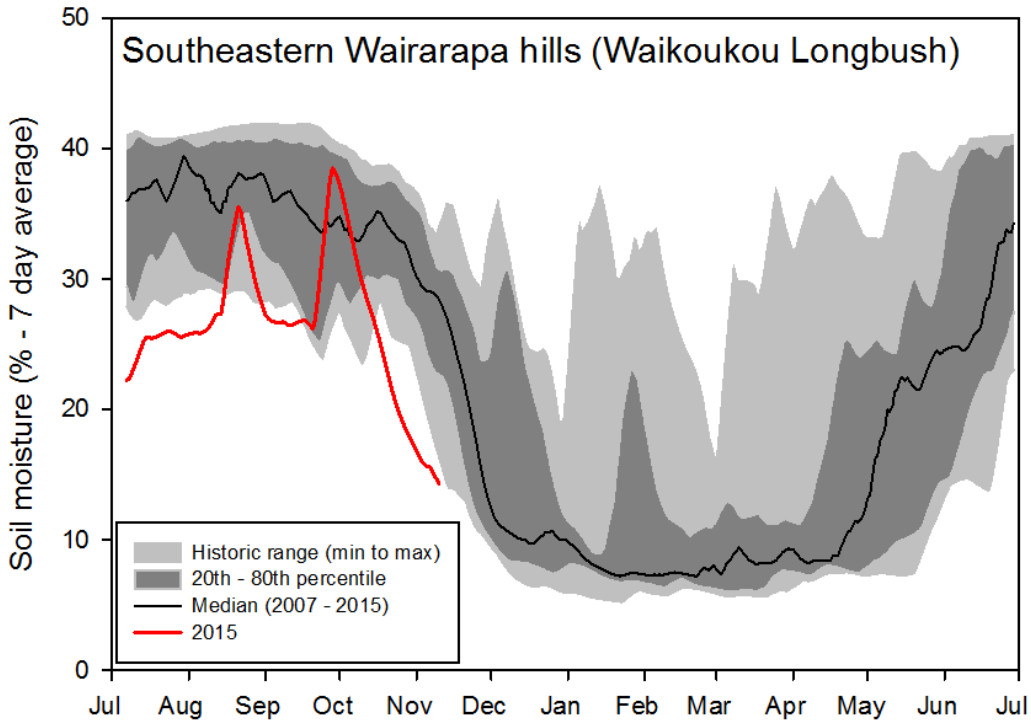

Masterton (Wairarapa College)
Cumulative mm
1000
800
600
400
200
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
2002(El Nino)
2007 (La Nina)
2012 (Neutral)
2014 (Neutral)
2015 (El Nino)
Mean (2002 to 2015)

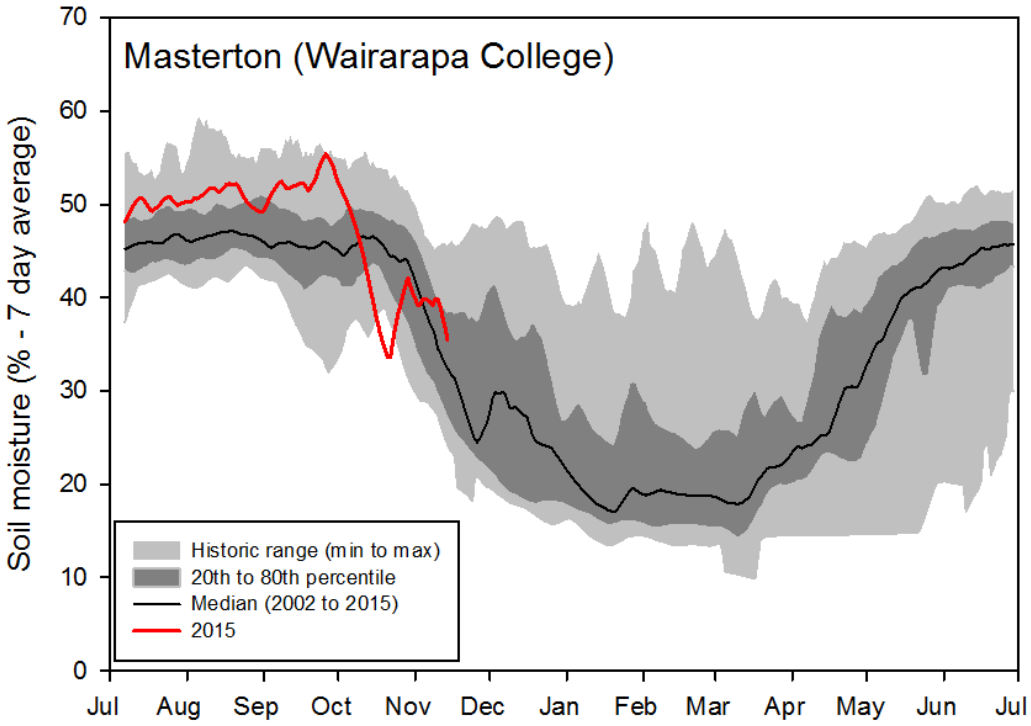

Waikoukou at Longbush
Cumulative mm
1200
1000
800
600
400
200
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
2007 (La Nina)
2012 (Neutral)
2013 (Neutral)
2014 (Neutral)
2015 (El Nino)
Mean (2007 to 2015)


Whareama at Tanawa Hut
Cumulative mm
1400
1200
1000
800
600
400
200
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
1997 (El Nino)
2002 (El Nino)
2007 (La Nina)
2012 (Neutral)
2014 (Neutral)
2015 (El Nino)
Mean (1990 to 2015)

2.2 Soil moisture content – year to date since 01 July 2015






Masterton (Wairarapa College)
Soil moisture (% - 7 day average)
70
60
50
40
30
20
10
0
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Historic range (min to max)
20th to 80th percentile
Median (2002 to 2015)
2015

3. Climate predictions

As shown by Figure 3.7, the current El Niño is expected to continue to strengthen this month, before steadily declining until reaching normal conditions in June 2016. Due to the inertia of how the atmosphere operates, we expect the atmospheric effects of the strong phase of the El Niño to last at least until the middle of winter. As each El Niño is different, and there are many opposing forces clashing to determine the final observed climate (e.g. more storms coming from the Indian Ocean), it is not possible to confidently predict how much it will rain in summer. Based on previous events (Figure 1.5), we can expect a good chance of rainfall being about half of the normal or drier on the Wairarapa coast.

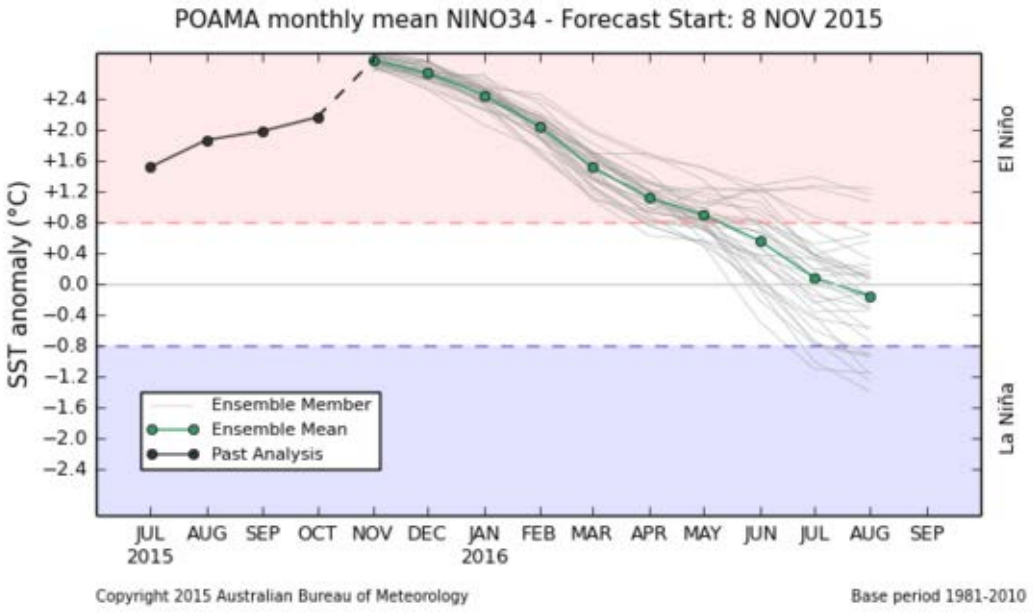


Figure 3.7: Climate projections for the development of the current El Niño. The projections show a return to near normal conditions by August 2016. Source: Bureau of Meteorology, Australia.

3.1 Summary outlook for summer 2016

Whaitua	Climate outlook for summer 2016
Wellington Harbour & Hutt Valley	Temperature: Normal to below normal, higher variability of cool and warm. Precipitation: Normal to below normal.
Te Awarua o Porirua	Temperature: Normal to below normal, higher variability of cool and warm. Precipitation: Normal to below normal
Kapiti Coast	Temperature: : Normal to below normal, higher variability of cool and warm Precipitation: Normal
Ruamahanga	Temperature: : Higher variability of cool and hot, greater diurnal amplitude Precipitation: Below normal, possibly sitting at one in a 50-year dry summer
Wairarapa Coast	Temperature: : Higher variability of cool and hot, greater diurnal amplitude Precipitation: Below normal, possibly sitting at one in a 50-year dry summer

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)

More information will be released in our Climate and Water Resource Summary (expected release date 15 December 2015)