New Zealand Seasonal Fire Danger Outlook 2017/18

ISSUE: South Island, November 2018

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Current fire danger situation & outlook:

Low to moderate fire dangers and fire climate severity currently exist in most areas of the South Island (Figures 1 & 5). This is reflected in the current FWI System codes and indices, which indicate that fuel moistures are high, and noticeably damper than at the same time last year (Figures 5-6 & 7-8).

Soil moisture levels are currently at, or close to, capacity for this time of the year (Figure 3). However, soil moisture is currently showing signs of drying for parts of Marlborough, North and South Canterbury, and Central Otago. Soils are drier than normal for Tasman and Buller Districts, Marlborough, Kaikoura, Fiordland and Steward Island (Fig. 4).

One of the major climate drivers for New Zealand is the El Niño–Southern Oscillation (ENSO). The ENSO Outlook has changed from WATCH to El Niño ALERT. International models suggest that we are still in a Neutral phase, with the possibility of transitioning towards a weak El Niño over the next three-month period (88% chance over November 2018 – January 2019). A non-conventional El Niño is indicated, with its impacts on the country likely to be different from the traditional text book El Niño. For example, we will likely experience variance from the typical south westerly air flow patterns experienced during traditional El Niño events (i.e. such as 1997-98 or 1982-83).

For the month of November, New Zealand is likely to experience changeable weather, which is typical of spring. November is forecast to have multiple rounds of long dry spells with wet weather interspersed in between. Compared to last month, November is likely to be windier than usual, with strong westerly winds and fast-moving fronts being more common. But we will likely experience winds from the east periodically as well.

Over the next three months (November 2018 – January 2019), New Zealand is forecast to experience higher pressure than normal over the country and lower pressure than normal to the southwest. As a result, temperatures are expected to be above or near average across the country. Near normal or below normal rainfall is also forecast, with the exception of the west of the South Island which is more likely to get its normal amount. A drier and warmer than average three months would mean a low chance of recovery for areas currently experiencing low soil and fuel moistures.

As we move into summer, the combination of warm temperatures, low rainfall and strong gusty winds will dry out soils and vegetation, elevating the fire risk and contributing to fast moving fires. Warm dry conditions will also trigger the maturing of grasslands and set the curing process in motion. Areas of lush green grass will begin to drop seed and begin turning yellow over the next few months. Fire dangers and severity for November are expected to remain low for most of the South Island, except along the east coast, where High to Extreme fire danger could result. There are no specific areas to currently watch out for very high to extreme fire potential.

The fire season years of 2004/05 and 2006/07 are possibly good indicators for what to expect during a weak El Niño this coming fire season (Figure 9). As we transition from spring to summer, expect to see fire dangers increase, especially for Marlborough, Canterbury, Otago and Southland. We may also be in for a similar season to last year, where rain events kept the fire danger and fire climate severity low until the Christmas holiday period, before increasing dramatically after New Year's for eastern locations in the South Island.

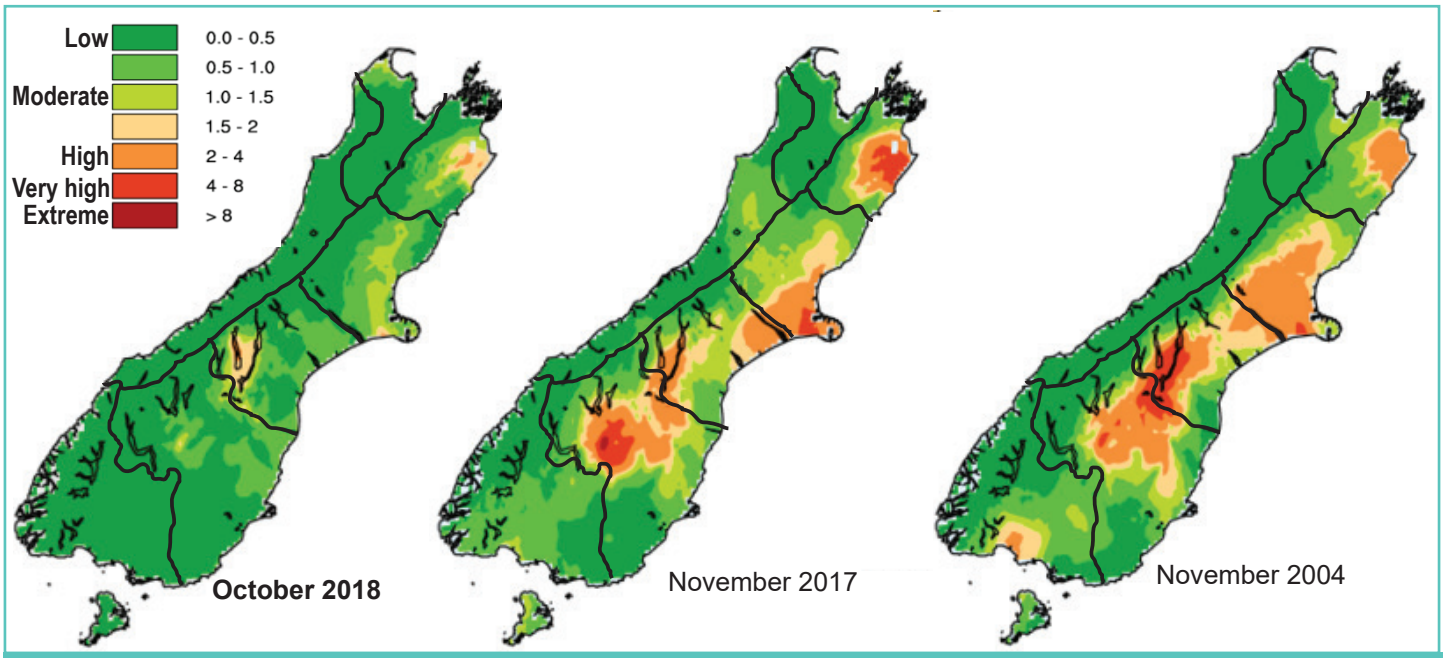

Figure 1. Monthly average Severity Rating for: current (left), last year (middle), & 2004/05 Neutral year followed by a weak El Niño (right).

EXPECTED CLIMATE OUTLOOK:

The ENSO (El Niño – Southern Oscillation) currently remains neutral in the tropics. However, the ENSO Outlook has changed from WATCH to El Niño ALERT, indicating that all the typical precursors for this event are in place, and that there is a good chance for this event to form.

International climate models indicate that the tropical Pacific will transition towards El Niño over the next three-month period (an 88% chance over November 2018 – January 2019). The probability of El Niño conditions remains high throughout autumn (March – May 2019). Some long-range models are also forecasting the possibility for El Niño to continue into winter, and even potentially next fire season. This event is known as a "protracted El Niño".

This El Niño event is likely to be weak, and the impacts on New Zealand's weather may not run true to a typical El Niño climate pattern. It is not expected to be of a similar intensity to what was experienced during 2015-16, 1997-98 or 1982-83, and therefore different impacts are expected. This means we will likely see deviations from the typical south westerly air flow patterns typically experienced during traditional El Niño events. But ENSO is just one of several climate drivers that can influence New Zealand's rainfall and temperature patterns.

November marks the start for the tropical cyclone season (November 2018 to April 2019), and NIWA's outlook indicates the risk for New Zealand to be near normal. This means at least one ex-tropical cyclone passes within 550 km of New Zealand each year. Last year New Zealand experienced three. Significant rainfall, damaging winds, and coastal damage can occur during these events, and reducing fire risk in affected areas. A protracted El Niño event is likely to have an impact on delaying the tropical cyclone season.

This month: November 2018

Weather is expected to be volatile during spring, and the coming month is no exception. November will likely experience week-to-week variations. It will have a cold and wet start early in the month, with cooler south-westerlies and areas of low pressure forecast, bringing above average rainfall to southwestern parts. This is followed by high pressure building over the North Island, resulting in west to northwest flows for the South Island, and wet conditions for the western and lower South. A warm spell will follow for most in the second week of the month due to a settled Southern Ocean with occasional Tasman Lows affecting the South Island. After this warmer spell, the second half of the month then looks very changeable.

It is expected that sea surface temperatures (SSTs) will continue to warm over November, which will have an impact on December's air temperatures (likely to keep them warm).

Further ahead: November 2018 – January 2019

For the next three months (November 2018 – January 2019) westerly air flow anomalies are expected, though periodic easterly air flows are possible. Temperatures are forecast to be above average or near average for all regions of New Zealand. Below normal or near normal rainfall is forecast for most regions of New Zealand, except for the west of the South Island where near normal rainfall is most likely. Soil moisture levels and river flows are forecast to be near normal or below normal for the north of the South Island. For the west of the South Island, near normal soil moisture levels and river flows are forecast. For the east of the South Island, below normal soil moisture levels are river flows are forecast. Above average or near average sea surface temperatures (SSTs) are expected in New Zealand coastal waters during the next three months.

Regional breakdown (Figure 2):

Temperatures are most likely to be:

- equally likely to be above average (40% chance) or near average (40%) for Tasman, Nelson, Marlborough, Buller, Coastal Canterbury, east Otago, West Coast, Alps and foothills, inland Otago and Southland.

Rainfall totals are most likely to be:

- below normal (40%) or near normal (35%) for Tasman, Nelson, Marlborough and Buller;
- near normal (45%) for West Coast, Alps and foothills, inland Otago and Southland;
- near normal (40%) or below normal (35%) for coastal Canterbury and east Otago.

Soil moisture levels are most likely to be:

- near normal (45%) or below normal (40%) for Tasman, Nelson, Marlborough and Buller;
- near normal (55%) West Coast, Alps and foothills, inland Otago and Southland;
- below normal (50%) for coastal Canterbury and east Otago.

Last month: October 2018

Looking back, October experienced changeable weather. New Zealand experienced higher than average pressures. This lead to drier than average conditions for many locations; however, this was counteracted by a couple of wet and windy events that dragged rainfall totals back to near normal. Temperatures also saw a similar variable ride. A late snow event towards the end of the month boosted parts of southern Canterbury and Otago to above 140% of normal October precipitation values, standing out as two of the few wetter than average locations. Temperatures were on general average for the month. Around New Zealand's coastline, sea surface temperatures (SSTs) varied, but increased

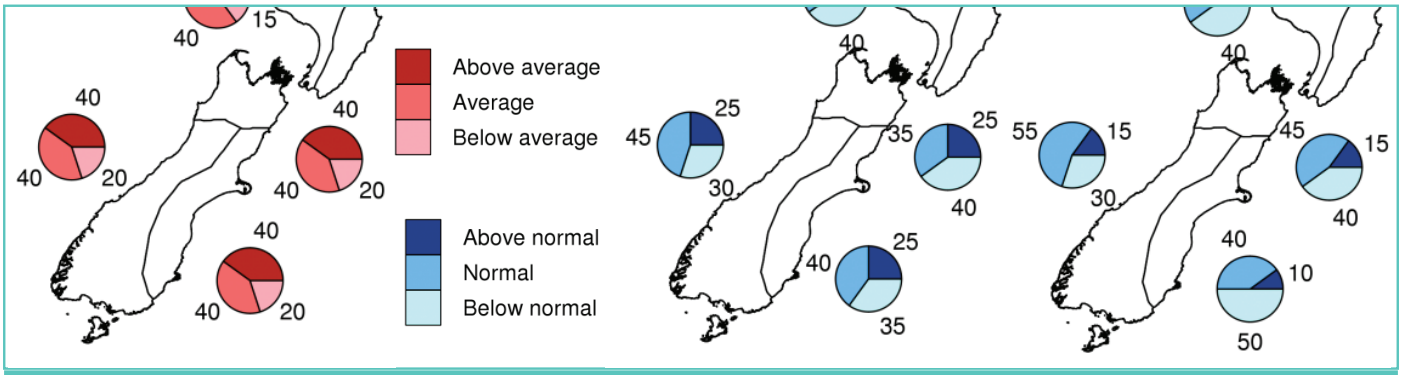

Figure 2. Outlook for Nov 2018 - Jan 2019: air temperature (left), rainfall (middle), available soil moisture (right). Source: NIWA.

dramatically at the end of the month. The prolonged high pressure at the start of the month allowed the Tasman Sea to climb to almost 2 degrees above average. Warmer than average subsurface ocean waters strengthened and expanded eastward during October.

Soil moisture (Figure 3 & 4)

In the South Island, soil moisture levels are at or near field capacity for much of the West Coast, Fiordland, eastern Otago, and Southland (figure 3). Soil that are showing signs of drying (near 50% capacity) are located in Marlborough, North and South Canterbury, and parts of Central Otago. Soils are drier than normal in the Buller and Tasman districts, Marlborough, Kaikoura, North Canterbury, Fiordland and Stewart Island (Figure 4).

Grass growth:

During spring, grasses are undergoing a period of growth, and much of the country side is looking green and lush. Typically, if a fire started in these fuels, fire spread would be difficult. Any burning will produce small flame heights and low intensities for easy suppression.

In some areas, the presence of dead matted material from the previous season's growth (thatch) can contribute to the ease of a fire starting and spreading. The material is often hidden underneath lush green grass that appears to have low curing (30 - 50%). However, thatch can increase a fires ability to carry and sustain a fire. These fires will typically produce small flame heights and spread in a patchy manner.

Dead material can also come about from frost curing. As we transition from spring into early summer, the potential for a fire to ignite and spread is increased as the curing process kicks off in these fuels (formation of seed heads and loss of seeds).

Wetter than normal soils, combined with mild winter conditions, have led to abundant grass growth in many areas. Once this dries out, these higher than normal fuel loads could contribute to increased fire intensities.

The finer details:

Grassland curing will affect fire behaviour in several ways: it increases the amount of dead material present and affects fuel moisture content. The result is an increased chance of fire ignition, fire intensity and rates of spread.

The moisture content of fine grass fuels (as well as pine litter and other fine fuels) also dramatically affects the ignition potential and ability of a wildfire to spread. High amounts of moisture increase the heat and thermal conductivity of fuel, so that more heat is required for the fuel to reach its ignition temperature. As grasses cure, and become drier, less heat is required to ignite and sustain a fire.

What does El Niño mean for NZ

Remember El Niño is only part of the story:

New Zealand's climate is influenced by two key natural cycles: the El Niño-Southern Oscillation (ENSO) and the Interdecadal Pacific Oscillation (IPO). Both these operate over the Pacific Ocean and beyond, and cause fluctuations in the prevailing trade winds and in the strength of the subtropical high-pressure belt. Although ENSO events have an important influence on New Zealand's climate, they account for less than 25% of the year to year variance in seasonal rainfall and temperature. El Niño events are typically (but not always) associated with stronger and/or more frequent westerly winds over summer in New Zealand, following more south-westerlies in spring. Such a circulation pattern can lead to wetter than normal conditions to the west of the Southern Alps and drier conditions in northern and eastern regions of both Islands.

Note though that indications for the current El Niño event potentially developing suggest that it will not follow these typical climate patterns. If it develops, it is likely to only be a weak to moderate event, as a result of the ocean and atmosphere being decoupled, rather than linked as with stronger El Niños. This means we will likely see deviations from the typical south westerly air flow patterns (to more southeast to northeast air flows), and the Southern Ocean influences continuing to influence weather across the country.

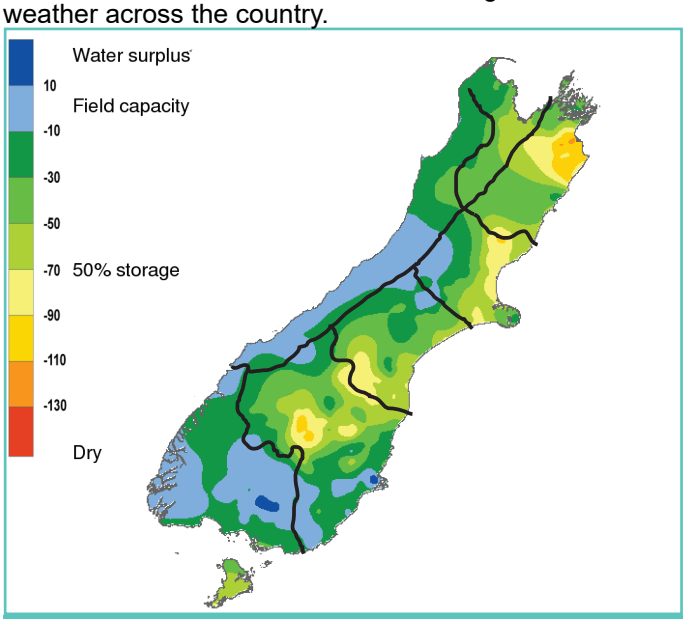

Figure 3. Soil moisture deficits as of 02/11/2018.
Source: NIWA.

Note: Soil moisture deficit means the amount of water needed to bring the soil moisture content back to field capacity, which is the maximum amount of water the soil can hold.

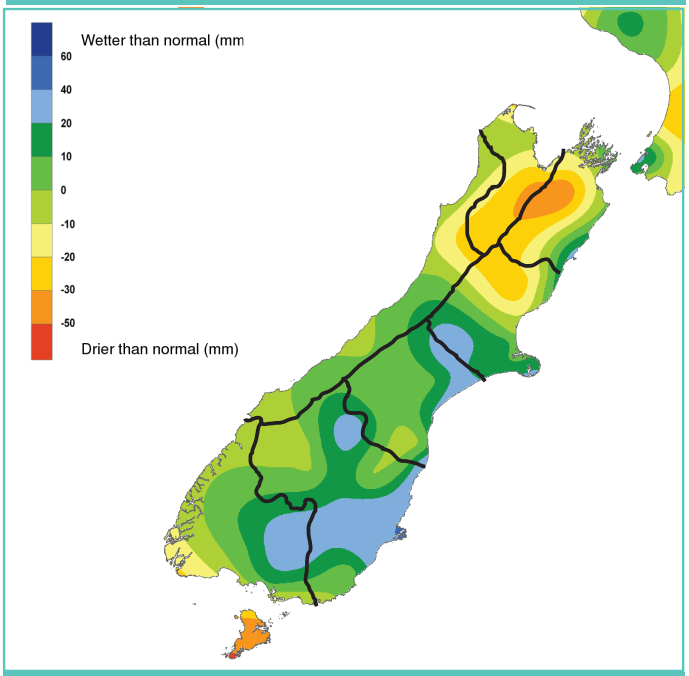

Figure 4. Soil moisture anomaly as of 02/11/2018.
Source: NIWA.

Note: Soil moisture anomaly means the difference between the historical normal soil moisture deficit (or surplus) for a given time of year and actual soil moisture deficits.

The purpose of these monthly outlooks is to provide a heads up on the progression of fire danger as we transition from spring to summer and, later, into autumn. It aims to forewarn fire agencies of current and potential fire danger conditions that can be used as a prompt for local and regional discussions on fire potential (which depends on fuel conditions (i.e. grass curing), risks of ignitions, recent fire history and fire management resources available in an area, as well as climate and fire weather).

Continue your pre-planning (if you haven't done so already), by discussing where conditions are at, where they are heading, and how this can drive awareness about what this might mean for fire risk in your patch and for your neighbours.

Comparisons of fire dangers for individual indicator stations for different regions are not shown in this outlook due to the low fire danger and severity across the country. As fire dangers increase, more detailed regional outlooks will recommence highlighting where Buildup Index (BUI), Drought Code (DC) and Cumulative Daily Severity Rating (CDSR) values sit in comparison with previous fire seasons.

For those who are interested in tracking fire season trends for all your weather stations, the graphs are still available monthly on the Scion Rural Fire Research website (https://www.scionresearch.com/rural-fire-research/tools/new-zealand-seasonal-fire-danger-outlooks). If tracking on a more frequent basis (as opposed to the monthly analysis done here), you can contact Scion for the data.

Background info on FWI codes and indicies:

Fine Fuel Moisture Code (FFMC)

An indicator of the relevant ease of ignition and flammability of fine fuels.

0 - 74	Difficult
75 - 84	Moderately easy
85 - 88	Easy
89 - 91	Very easy
92 +	Extreme easy

Duff Moisture Code (DMC) A rating of the average moisture content of loosely compacted organic soil layers (duff/humus) of moderate depth, and medium-sized woody material

0 - 10	Little mopup needs
11 - 20	Moderate
21 - 30	Difficult
31 - 40	Difficult & extended
41 +	Difficult & extensive

Drought Code (DC) A rating of the average moisture content of deep, compact, organic soil layers, and a useful indicator of seasonal drought effects on forest fuels and amount of smouldering in deep duff layers and large logs.

0 - 100	Little mopup needs
101 - 175	Moderate
176 - 250	Difficult
251 - 300	Difficult & extended
301 +	Difficult & extensive

Buildup Index (BUI)

Combines the DMC and DC, and represents the total amount of fuel available for combustion.

0 - 15	Easy control
16 - 30	Not difficult
31 - 45	Difficult
46 - 59	Very difficult
60 +	Extremely difficult

Initial Spread Index (ISI) Combines the effect of wind speed and the FFMC, providing a numerical rating of potential fire spread rate.

0 - 3	Slow rate of spread
4 - 7	Moderate fast
8 - 12	Fast
13 - 15	Very fast
16 +	Extremely fast

Fire Weather Index (FWI)

Combines the ISI and BUI to indicate the potential head fire intensity of a spreading fire (on level terrain).

0 - 5	Low fire intensity
6 - 12	Moderate
13 - 20	High
21 - 29	Very High
30 +	Extreme

Daily Severity Rating (DSR) A numerical rating of the daily fire weather severity at a particular station, based on the FWI. It indicates the increasing amount of work and difficulty of controlling a fire as fire intensity increases. The DSR can be averaged over any period to provide monthly or seasonal severity ratings.

Monthly Severity Rating (MSR) is the average of the DSR values over the month. DSR and MSR captures the effects of both wind and fuel dryness on potential fire intensity, and therefore control difficulty and the amount of work required to suppress a fire. It allows for comparison of the severity of fire weather from one year to another.

0 - 1	Low fire behaviour potential
1 - 3	Moderate fire potential
3 - 7	High to very high fire potential
7 +	Extreme fire behaviour potential

Acknowledgements:

Fire Danger interpretation was from information gathered from the Average Monthly Maps for: Severity Rating, FWI, BUI, ISI, DC, DMC, FFMC. These maps were obtained from the National Rural Fire Authority Fire Weather System powered by Eco Connect.

Information on the Expected Climate Outlook was gathered from:

- MetService, Rural Monthly outlooks: www.metservice.com/rural/monthly-outlook
- NIWA, Seasonal Climate outlook: www.niwa.co.nz/climate/sco
- Australian Bureau of Meteorology Climate outlooks http://www.bom.gov.au/climate/ahead/?ref=ftr

Front Cover Image:
2018 Pumps refresher training. (Veronica Clifford, Scion).

If you are keen to submit a weather and fire related photo that will appear on the front page, please email:

- a high resolution image(s)
- with details on the location and the photographer's name and organisation.
- to: Veronica.Clifford@scionresearch.com

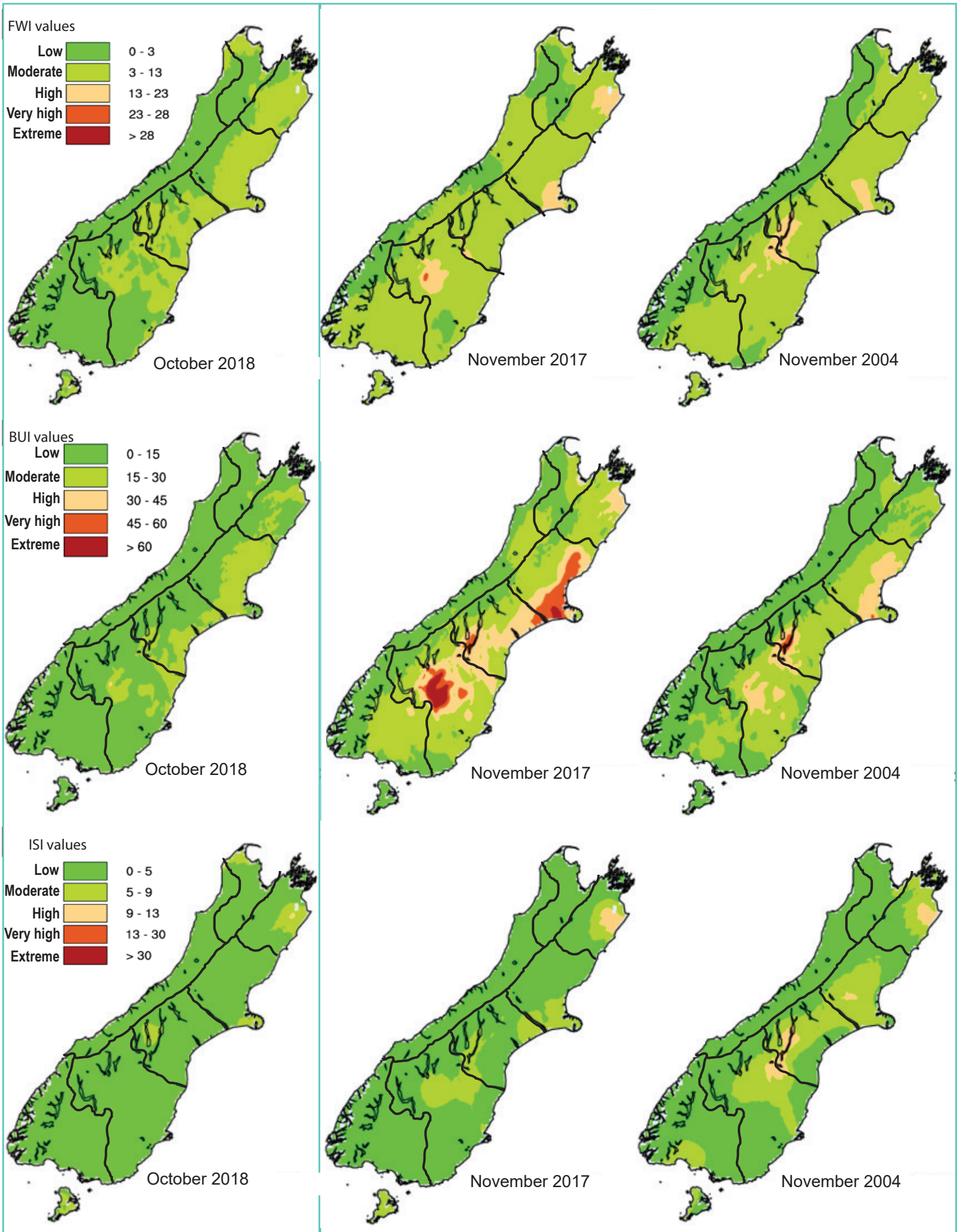

Figure 5. Current Monthly Average for the: Fire Weather Index (top), Buildup Index (middle) and Initial Spread Index (below).

Figure 6. Average Monthly values of: Fire Weather Index (top), Buildup Index (middle) and Initial Spread Index (below); for the same time as last year (left) and during the 2004/05 Neutral year followed by a weak El Niño (right).

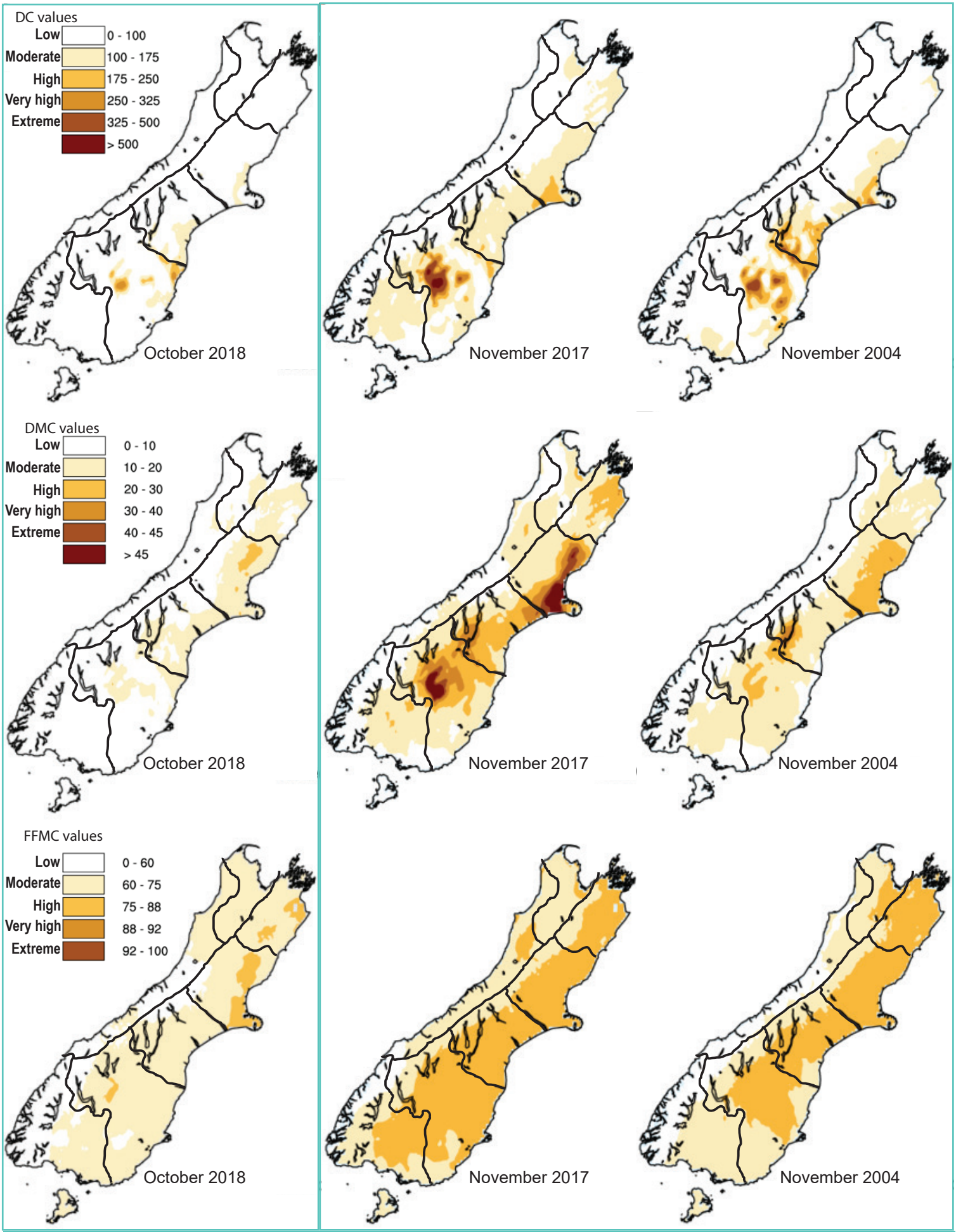

Figure 7. Current monthly average for the: Drought Code (top), Duff Moisture Code (middle) and the Fine Fuel Moisture Code (below).

Figure 8. Average monthly values of: Drought Code (top), Duff Moisture Code (middle) and Fine Fuel Moisture Code (below); for the same time as last year (left) and during the 2004/05 Neutral year followed by a weak El Niño (right).

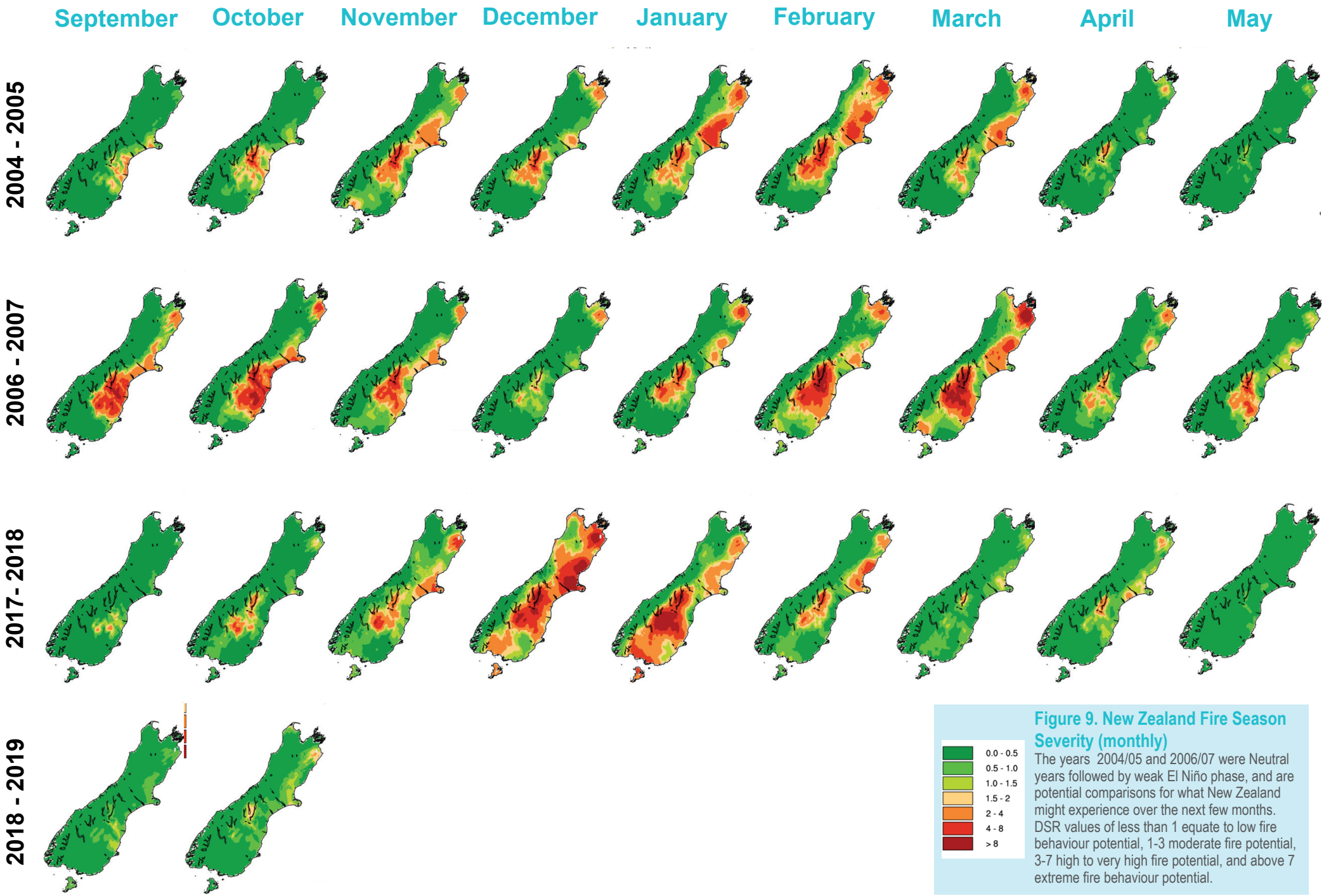

Figure 9. New Zealand Fire Season Severity (monthly)

The years 2004/05 and 2006/07 were Neutral years followed by weak El Niño phase, and are potential comparisons for what New Zealand might experience over the next few months. DSR values of less than 1 equate to low fire behaviour potential, 1-3 moderate fire potential, 3-7 high to very high fire potential, and above 7 extreme fire behaviour potential.