

# North Island Monthly Fire Danger Outlook (2021/2022 season)

## Issue: September 2021

### Current fire danger situation

In general, monthly fire dangers and fire climate severity are low across much of the North Island (Figures 6-9). The exceptions being the Hawke’s Bay where moderate conditions exist.

### Fuel and soil moisture status

As of 19 September, soil moisture levels are currently near normal for the majority of the North Island. The exception to this is the southern part of Hawke’s Bay and eastern Taranaki district as well as eastern Northland where soil moisture is below normal for the time of year. In the Hawke’s Bay region “dry” shading has emerged on the [New Zealand Drought Index map](#).

Most of the North Island is currently experiencing low fire danger due to low Fire Weather System Codes and indices (BUI, DC, DMC and FFMC refer appendix for definitions) that result from winter precipitation, and lower temperatures (slower drying rates). The Lower DC and DMC means minimal burning of moderate, heavy or subsurface fuels is likely. Fine fuels will generally be damp but can dry quickly and carry surface fires during occasional dry windy periods.

The exceptions to the majority of the North Island are the Bay of Islands and Hawkes Bay where DMC and DC’s are not high but are well above normal and do have the potential for moderate burning of medium, heavy and subsurface fuels. More significantly, this means they have a head start on the drying process as we move toward summer.

### Forecast climate and weather

Late September is expected to bring periods of unsettled weather to the North Island with occasional heavy rain. A trend toward high pressure is likely during the last few days of the month, continuing into early October. The frequency of fronts and windiness during October may be reduced compared to September, but there will still be disturbed weather at times. Looking later into the spring

season, a La Niña event has a 50-60% chance for development. La Niña tends to bring more northeasterly winds to New Zealand with wetter conditions in the north and east and drier conditions in the south and west. However, last summer’s La Niña was an exception. For more information, see page 3 & 4.

### What to watch for

As summer takes hold the westerlies are expected to ease and we are likely to see gradual increase in the indices for increased fuel availability. At this point in the season there is no strong indication that any areas in the North Island will have substantially higher than normal wildfire potential, but some areas may have a slightly higher than normal fuel availability and fire danger as depicted below.

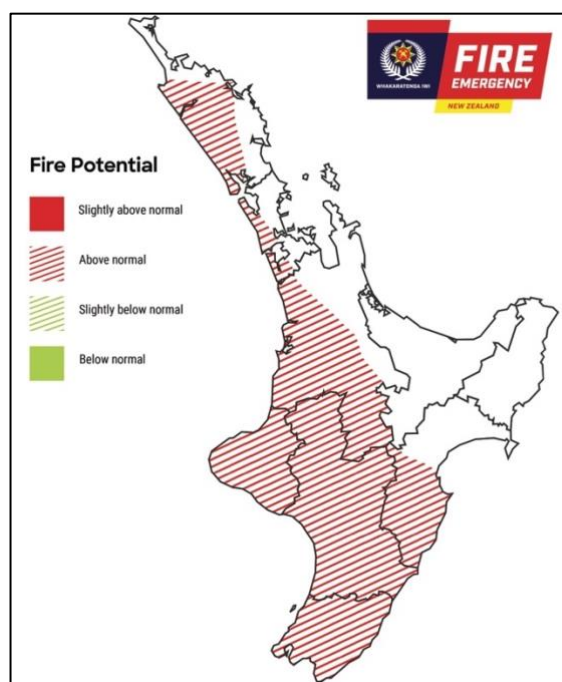


Figure 1: Locations identified as areas of interest that may develop an elevated risk of high to extreme fire danger over the next three months.

## Current climate

Winter 2021 was New Zealand’s warmest winter on record. The warmth has continued into September with the majority of the North Island experiencing near average to above average temperatures.

August was dry month for large parts of the North Island, particularly eastern areas such as western Bay of Plenty, Hawke’s Bay and parts of Waikato and Northland. In the last two weeks, above normal (120-149% of normal) or well above normal (>149% of normal) rainfall was observed for large areas of the North Island, with near normal rainfall (80-119% of normal) for parts of Auckland, Waikato, Hawke’s Bay and Wellington, and below normal rainfall (50-79% of normal) for the rest of Waikato and Wellington.

Soil moisture levels across much of the North Island are at field capacity and are about normal for this time of year. The exception to this is the southern part of Hawke’s Bay and eastern Tararua district as well as eastern Northland where soil moisture is below field capacity and lower than normal for the time of year.

## Climate drivers

A mix of climate drivers have affected the weather during September. Westerly and northeasterly winds have brought numerous fronts and low pressure systems to the country, which are expected to continue into late September before giving way to high pressure before the end of the month. A trend toward more high pressure is

likely during October as fronts become less frequent, however there will still be unsettled conditions at times.

During August, upper-oceanic heat content decreased across the equatorial Pacific for the third consecutive month. The distribution of anomalies is currently closest to a central Pacific type of La Niña, similar to that of this time last year. A negative Indian Ocean Dipole, referring to well above average sea surface temperatures in the tropical eastern Indian Ocean, continued during September. An Atlantic Niño, characterised by warmer than average ocean temperatures in the central and eastern equatorial Atlantic, also persisted.

These teleconnections, or climate patterns related to one another across long distances, support an ocean-atmosphere system that is likely to continue to trend in a La Niña-like direction. La Niña or El Niño Southern Oscillation “cool” neutral conditions are about equally likely (45-50% chance each) during spring before the chance for La Niña peaks at 50-60% during summer.

If La Niña develops, it will become a dominant climate driver during the upcoming fire season. La Niña is often associated with more westerlies over New Zealand during spring and north-easterlies during summer, but each La Niña event comes with unique characteristics.

La Niña events tend to bring warmer temperatures and more moisture/humidity to the northern and eastern parts of both islands, although last summer was an exception.

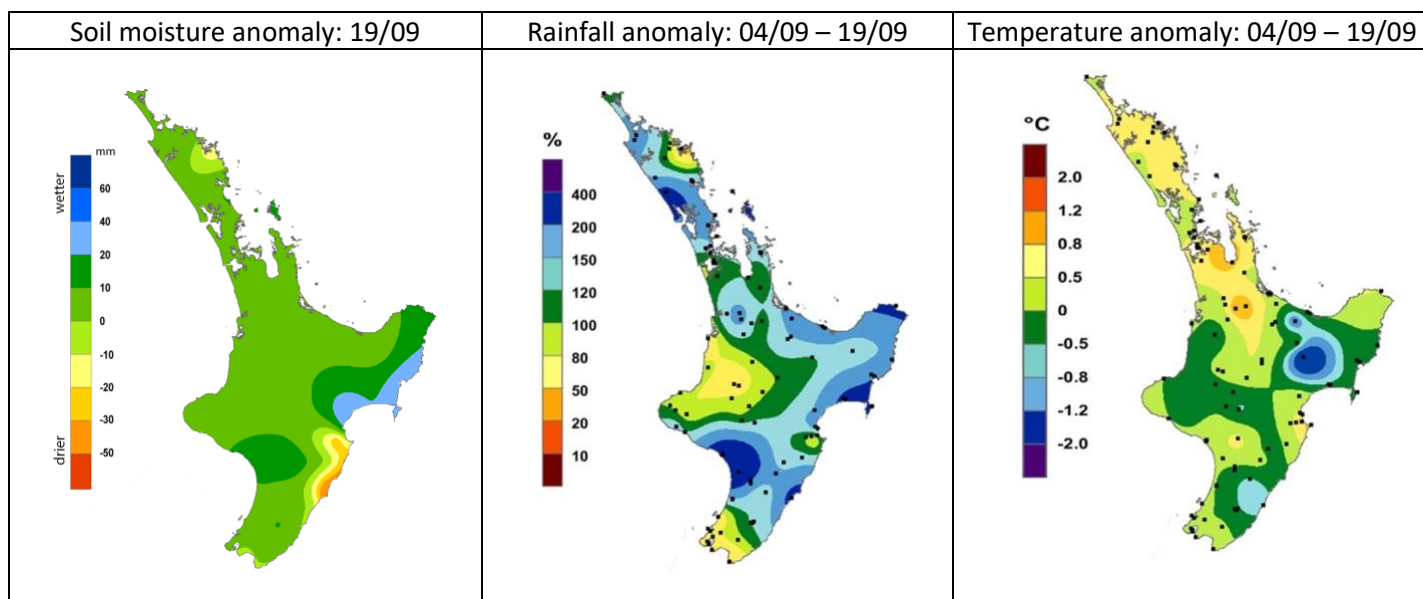


Figure 2: Maps showing the current soil moisture anomaly as well as temperature and rainfall as a difference from normal over the last 15 days.

## Fire season analogues

To help understand what fire weather conditions may be like this summer, we can look at analogues. Analogues are historical years with similar climatic conditions to the current year.

This summer's analogue years featured historical years that had La Niña-like patterns in the ocean and/or atmosphere (Figure 3). The subjective analogue seasons are selected with expert interpretation from NIWA. The objective analogue seasons are automatically selected via a computer analysis. Where the two methods agree, confidence tends to be higher.

The early signal is for a summer with higher fire weather indices relative to the long-term average, particularly across the interior and west of the North Island. Summer 2020-21 is one of the strongest analogues, placing 1<sup>st</sup> on the forecaster-selected analog list (top) and 4<sup>th</sup> on the computer-selected analog list (bottom). Also high up the analog ranking is 2012-13 and 2007-08, which featured drought conditions in parts of the North Island. Overall, it's an early sign that many regions across the island will need to be prepared for longer dry periods that can enhance fire weather conditions.

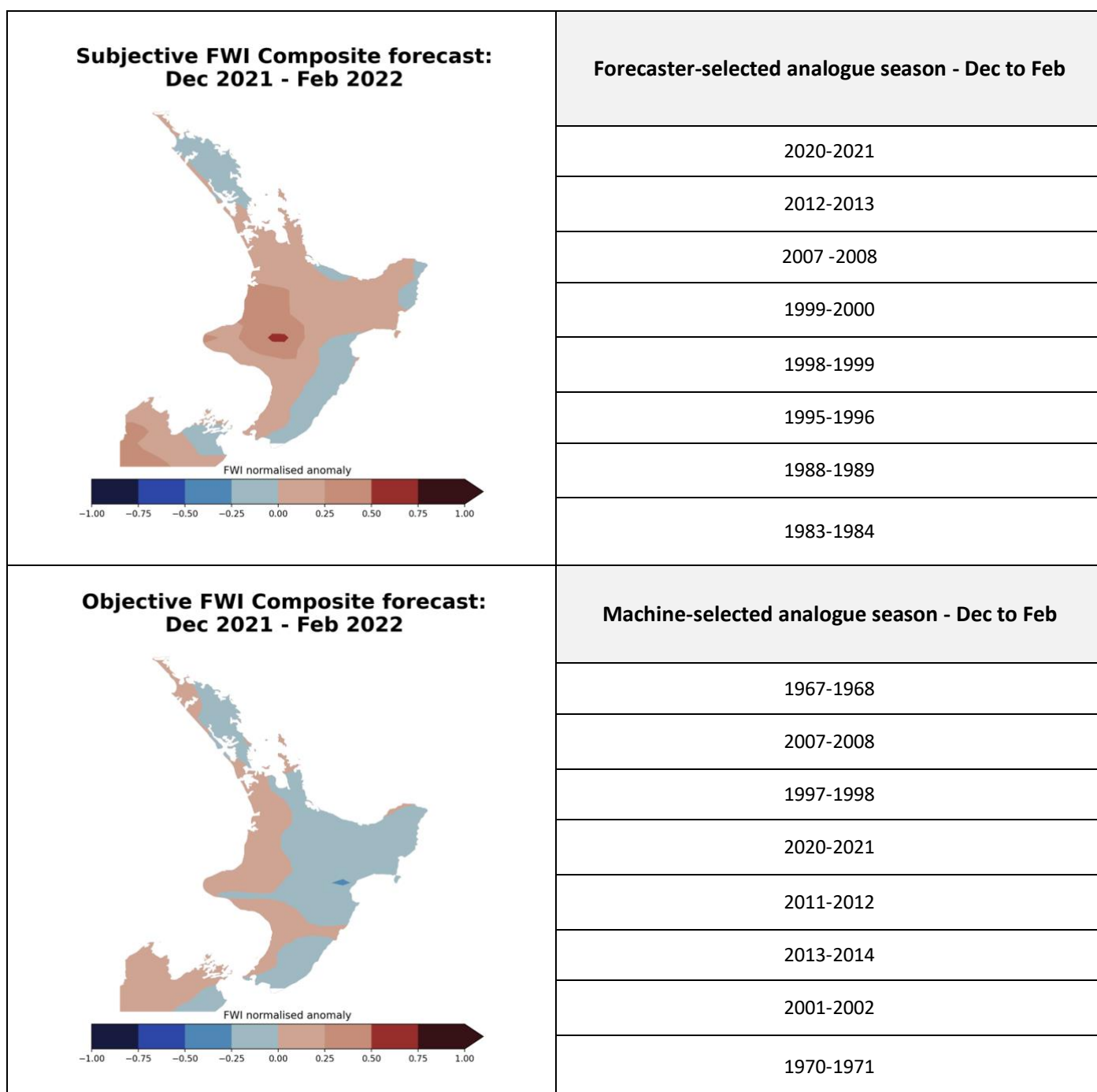


Figure 3: Analogue fire seasons as selected with expert interpretation from NIWA (top) and automated computer analysis (bottom). The fire weather index is a combination of the initial spread index and build-up index, and is a numerical rating of the potential frontal fire intensity. In effect, it indicates fire intensity by combining the rate of fire spread with the amount of fuel being consumed. Here, the fire weather index anomaly is calculated by averaging historical analogue years together and comparing to the average fire weather index between 1991-2020 for relevant season

## Climate outlook: October

October's prevailing air flows are expected to begin to favour northeasterly, a change from September's westerlies. Above average temperatures are expected in October while rainfall patterns are expected to be mixed, with large parts of the North Island leaning below normal while Northland and the Bay of Plenty may see near normal or above normal rainfall. Wind speeds are expected to be slightly reduced from normal, another change from September. Relative humidity levels are expected to be near normal in the North Island and may be slightly elevated for eastern areas.

## Climate outlook: October - December

Late 2021 may have more easterly quarter winds than normal with patterns of high pressure near and southeast of NZ. Temperatures are most likely to be near to above average in the North Island. Rainfall looks to be near to below normal in many regions, driest relative to normal in the south and west. Sub-tropical lows may bring a chance for periodic downpours. Wind speeds may be slightly lower than normal. Relative humidity levels may be reduced across the South Island.

The tropical cyclone season for the Southern Hemisphere runs from November to April, with the odd one occurring outside this period. On average, about 10 tropical cyclones form in the South Pacific between November and April. The Tropical Cyclone Outlook for the upcoming season ahead will be published in October.

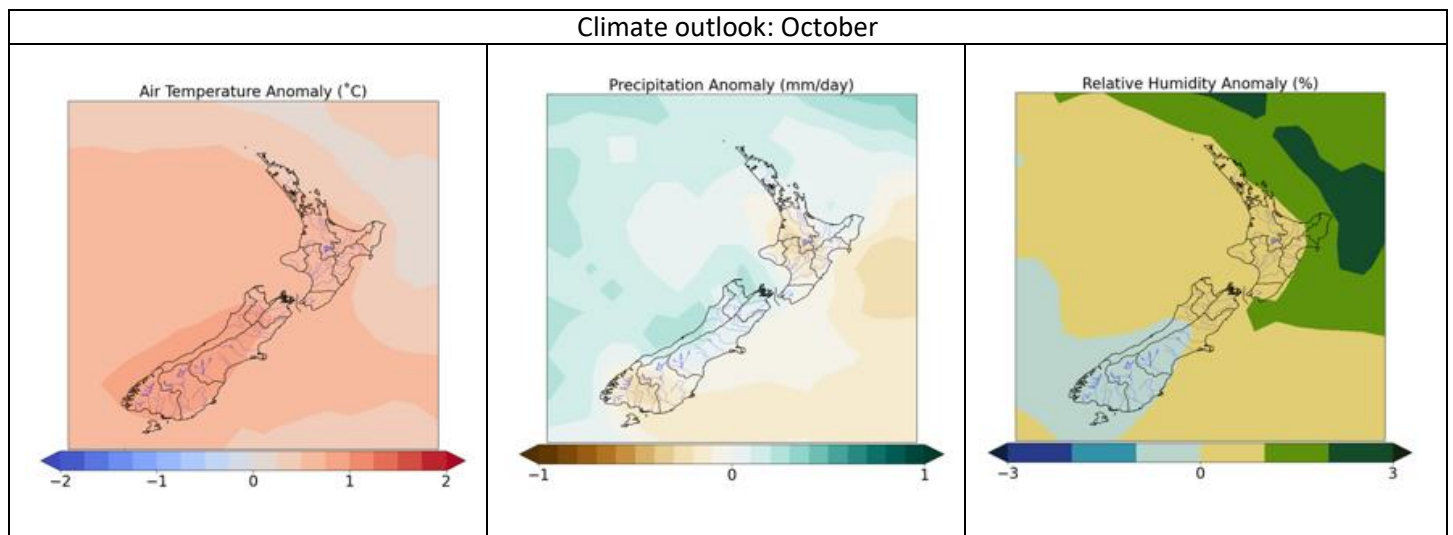


Figure 4: Climate outlook for October showing forecast temperature (left), rainfall (middle) and relative humidity (right) anomalies.

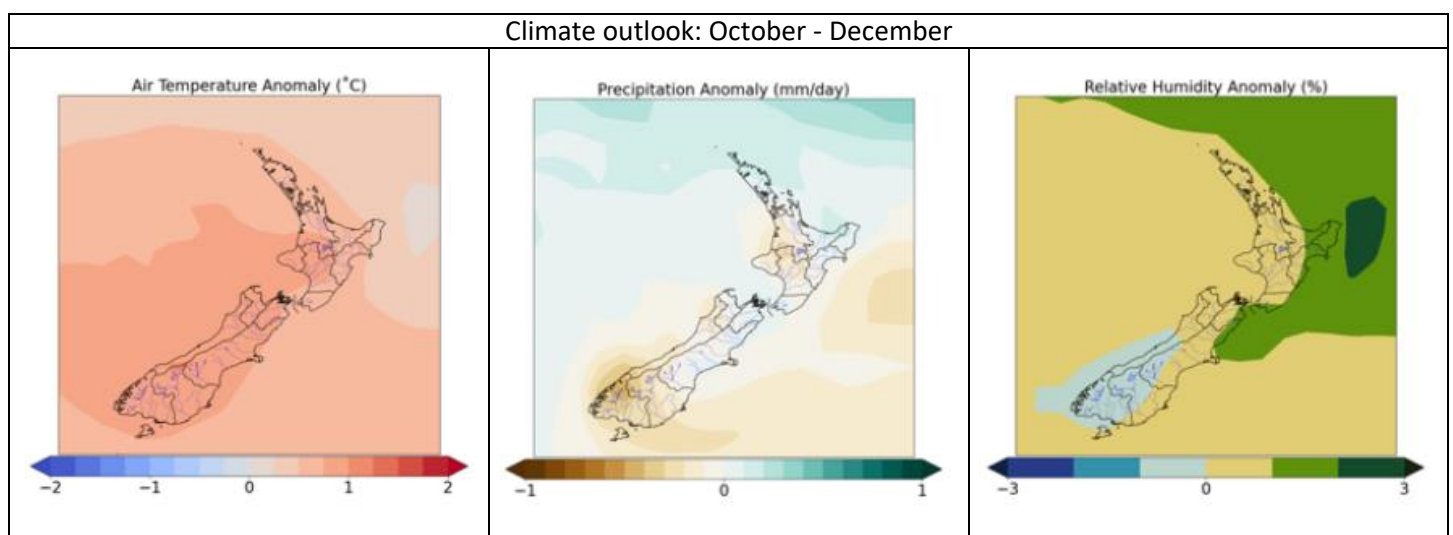


Figure 5: Climate outlook for October-December showing forecast temperature (left), rainfall (middle) and relative humidity (right) anomalies.

## Expected impact on fuels and fire danger

Looking to October and beyond will see increased availability of medium, heavy and subsurface fuels as they dry out. Fine fuels will be dry more frequently and ignitions will become easier, similar or slightly more than average this season. Anticipated lower wind speeds are likely to see less frequent wind driven fires.

Generally moderate fire danger through the spring does sometimes see reduced level of care with management of fire risk that can result in some people getting caught out, especially when conditions change. During spring these will usually occur in the fine fuels that dry out very quickly, such as scrub and logging slash that has cured (brown needles). This may result in some districts being busy with a significant number of spring fires but it is not expected that these will be deep burning or difficult to extinguish.

Looking beyond October based on the climatic outlook most areas are likely to have normal or slightly higher than normal Fire Danger in Western parts of the North Island. This is likely to be from normal or lower than normal rainfall resulting in normal or above normal availability of medium, heavy and subsurface fuels, with about normal or lower than normal spread rates due to normal or below normal winds. Eastern parts of the North Island with the Easterly flows are expected receive more moisture and have about normal fire danger.



Wind driven Fire in light flashy scrub fuel – because it is almost all fine fuels this is something that could occur in windy spring conditions within extended dry periods.

## Grass growth & curing

Most of the North Island has experienced good growing conditions. Warm winter/spring with average or above rainfall makes for good growing conditions, from which we can expect many areas will have increased fuel loads, especially where grazing has not kept up with the grass growth.

Grass fuels generally only burn in exceptional conditions (low humidity and high winds) if they are less than 50% cured i.e. less than 50% brown or dead material. Subject to weather and topography influences, grass fire ease of ignition, intensity and spread rates increase steadily as the curing percentage increases. At 50% cured grass produces slow moving fires and small flames, with 100% cured grass able to produce extreme flame lengths and intensities.

Curing for most pasture species occurs as a natural process with summer drying and seed set, the timing of this will vary between regions and seasons. Some areas will also be subject to frost curing where there is a build-up of dead material over winter. This is then replaced by a green spring flush but also some species, especially tussocks, have lower moisture levels in their live materials in order to survive severe winter frosts. This is why we often see tussock fires in the early spring.

Many fires start in fine fuels such as grass which ignite easily and rapidly spread to other fuels. Grass fuel loads and curing rates should be monitored closely as a critical factor in assessing fire danger.



Fire in young second rotation pine plantations have a dangerous mix of fine fuels from new growth and weeds such as gorse plus considerable dead heavy fuels from the logging harvest waste. Credit: Air Attack Magazine

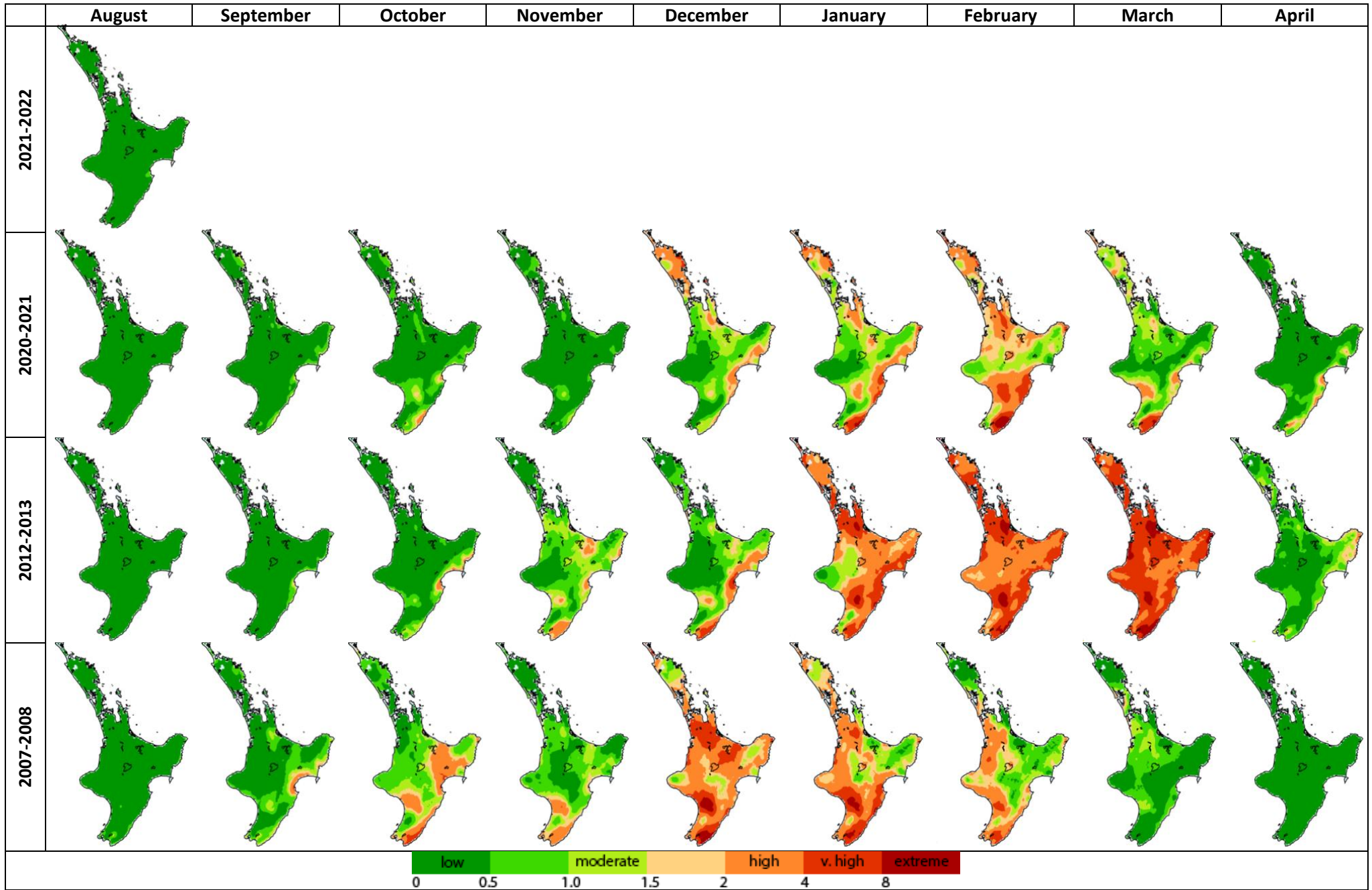


Figure 6: Monthly average severity rating for August and the years 2020/21, 2012/13 and 2007/08. These are analogue years for the current season and give us an insight what the upcoming season may be like.

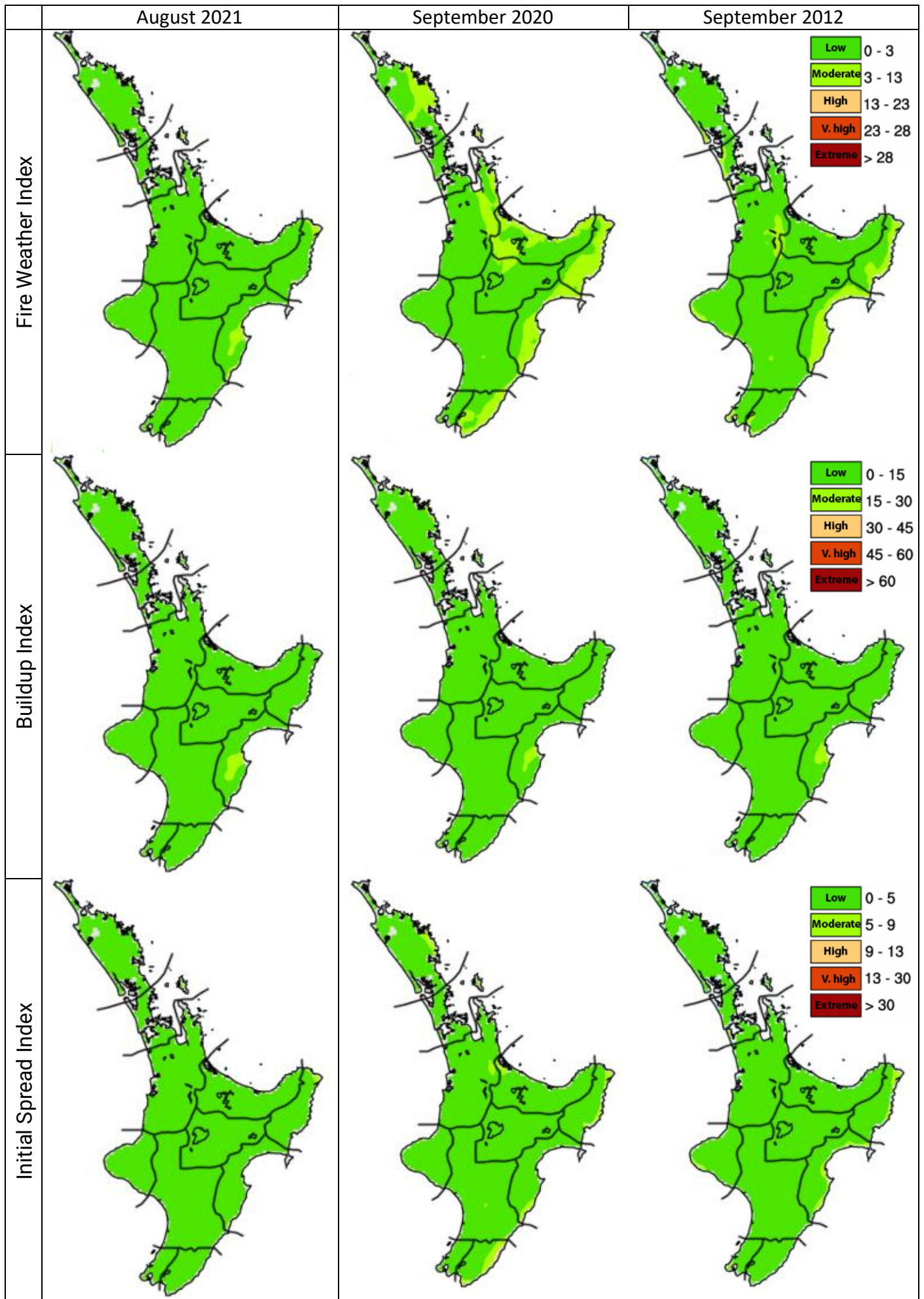


Figure 7: Previous (left row) and expected (middle and right rows) monthly average for the Fire Weather Index (top), Buildup Index (middle) and Initial Spread Index (bottom).

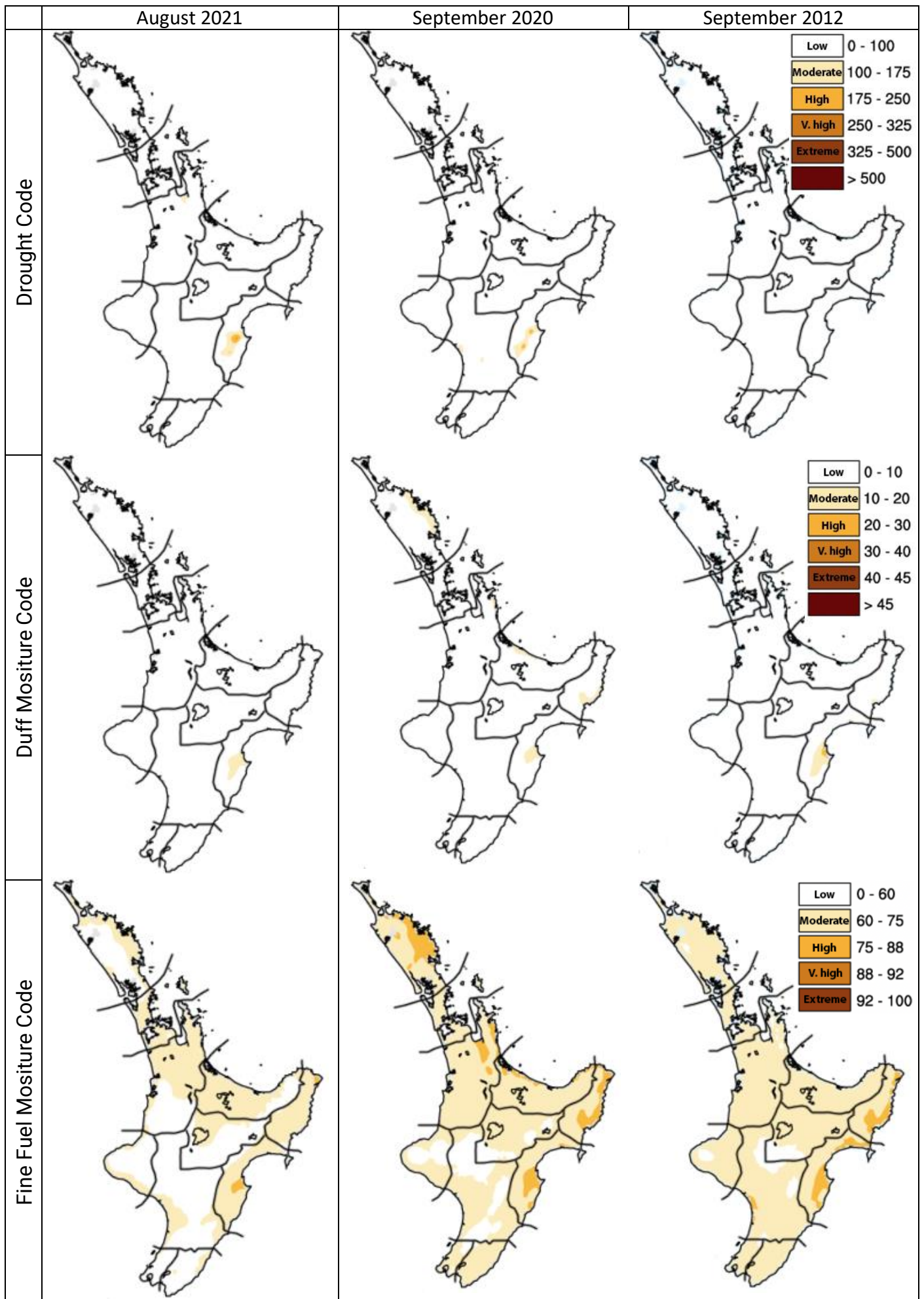


Figure 8: Previous (left row) and expected (middle and right rows) monthly average for the Drought Code (top), Duff Moisture Code (middle) and Fine Fuel Moisture Code (bottom).



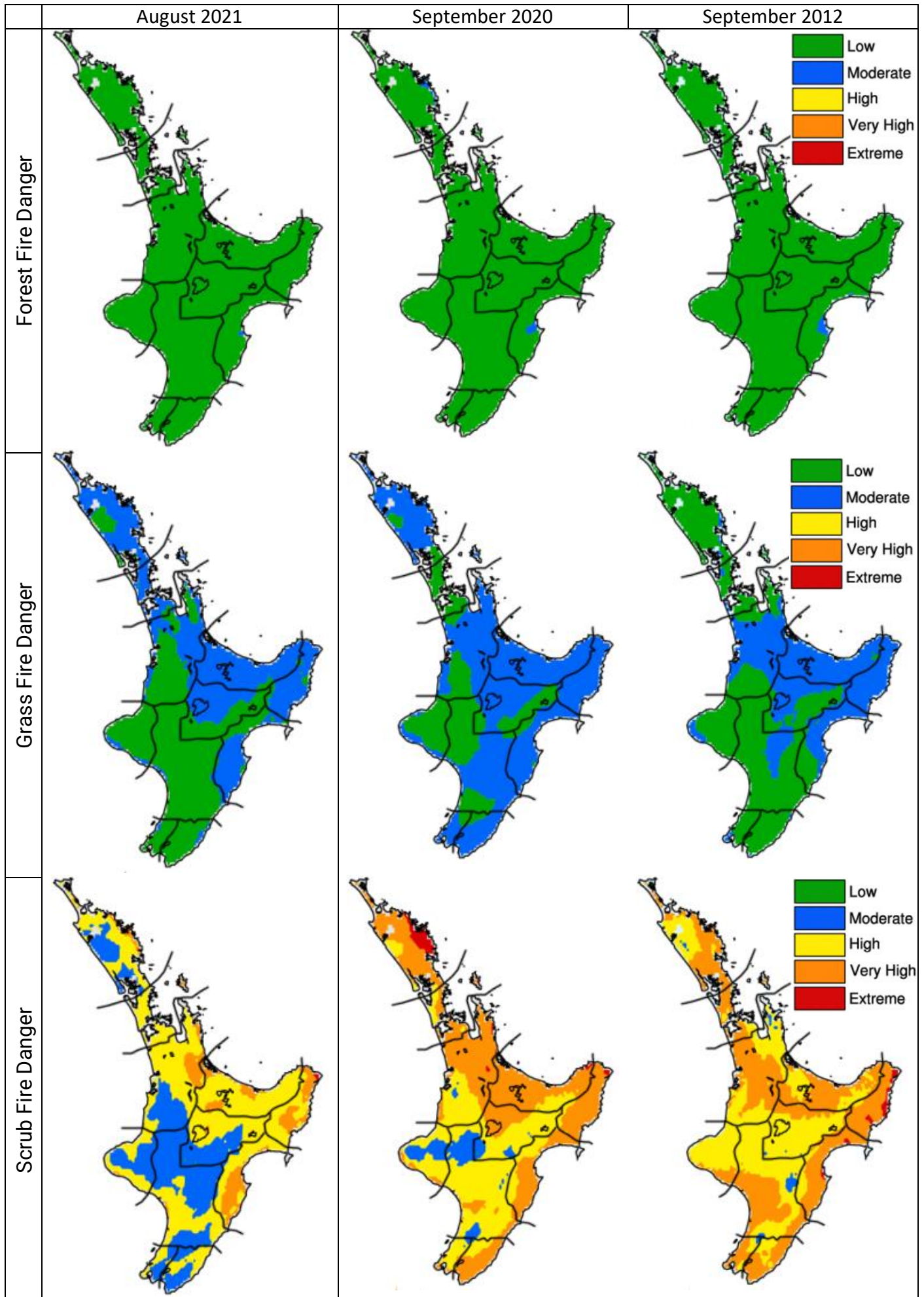


Figure 9: Previous (left row) and expected (middle and right rows) monthly average for the Forest Fire Danger (top), Grass Fire Danger (middle) and Scrub Fire Danger (bottom).

## Background information on fire weather indices and codes

### Fine Fuel Moisture Code:

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:** 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+	Extreme & extensive

**Drought Code:** A rating of the average moisture content of deep, compact, organic soil layers, and a useful indicator of

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

seasonal drought effects on forest fuels and amount of smouldering in deep duff layers and large logs.

**Buildup Index:** 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:

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:

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:** 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:** 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

This document was prepared by NIWA in collaboration with FENZ

