Met Office

Fire Weather Conditions during Spring 2011

For: Natural England and the Countryside Council for Wales

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Author: Karl Kitchen

Prepared by: Karl Kitchen, Senior Scientist

Reviewed by: Catrina Johnson, Manager, Scientific Consultancy

Authorised for issue by: Catrina Johnson

Contents

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Information was also gleaned from "John E Phillips, The use of GIS, remote sensing and fire simulation modelling for assessing the damage from wildfires on moorland on the Brecon Beacons in Wales (dissertation)", "Nick Oxborough & Rob Gazzard, Swinley Forest Fire (report)", "Olisa Ogbechie & Julia McMorrow, MODIS-detected fire regime for Great Britain: 2007 -2011 (poster presented at Wildfire 2011)", "Penny Anderson Associates, National Trust Close Moss Fire Damage Assessment May 2011".

Various internet news reports on wildfires were also searched and used where they provided further information on the fires studied.

Background

The spring of 2011 saw widespread elevated wildfire severity conditions across much of England, Wales and parts of Northern Ireland. These persistently high wildfire severity conditions peaked On 2 May and 3 May 2011 when the Met Office Fire Severity Index (FSI) indicated exceptional fire weather for much of England. The unusually high wildfire weather conditions were generally driven by persistently high temperatures and the lack of any significant rainfall. On 2 May the exceptional fire severity conditions were prevalent across the southern half of England as the conditions were exacerbated by the combination of winds in the region of 35 kilometres per hour and low relative humidity. On 3 May, the focus of exceptional fire severity shifted to the northern half of England.

This report provides information on the weather conditions leading up to the first week in May for the whole of the UK, with particular emphasis on the month of April. The report describes the impact that this weather would have on expected fire behaviour. A number of case studies have been examined and compared against the predictions from the site specific version of Met Office's FSI model and the soil moisture deficit analyses produced by the Met Office Rainfall and Evaporation Calculation Scheme (MORECS).

Weather and Fire Behaviour

The main weather elements that impact fire behaviour in the UK are temperature, rainfall, relative humidity and windspeed. The persistent lack of rainfall will act to dry out progressively deeper layers of the soil. This is particularly relevant where the main substrate is flammable, such as within peat or a significant layer of decaying organic material. A substrate of decaying organic material would be typical of a forest floor. Relative humidity and temperature will influence the moisture content of, and hence the ease of ignition of, the dead litter layer found on the surface. Increased windspeed will act to spread the fire more quickly.

The weather conditions leading up to any wildfire are as important as the prevailing conditions at the time of ignition. Increases in wildfire severity conditions will become evident as any drought prolongs. Persistently high temperatures will increase the ignition potential of surface vegetation.

The Spring of 2011

Meteorologically, the spring period is defined as the months of March, April and May. The following information for the spring of 2011 relates to that period.

Figure 1 shows the mean temperature anomaly across the UK. The anomaly is the difference in temperature, observed during this period, compared to the same period between the thirty years of 1971 through to 2000.

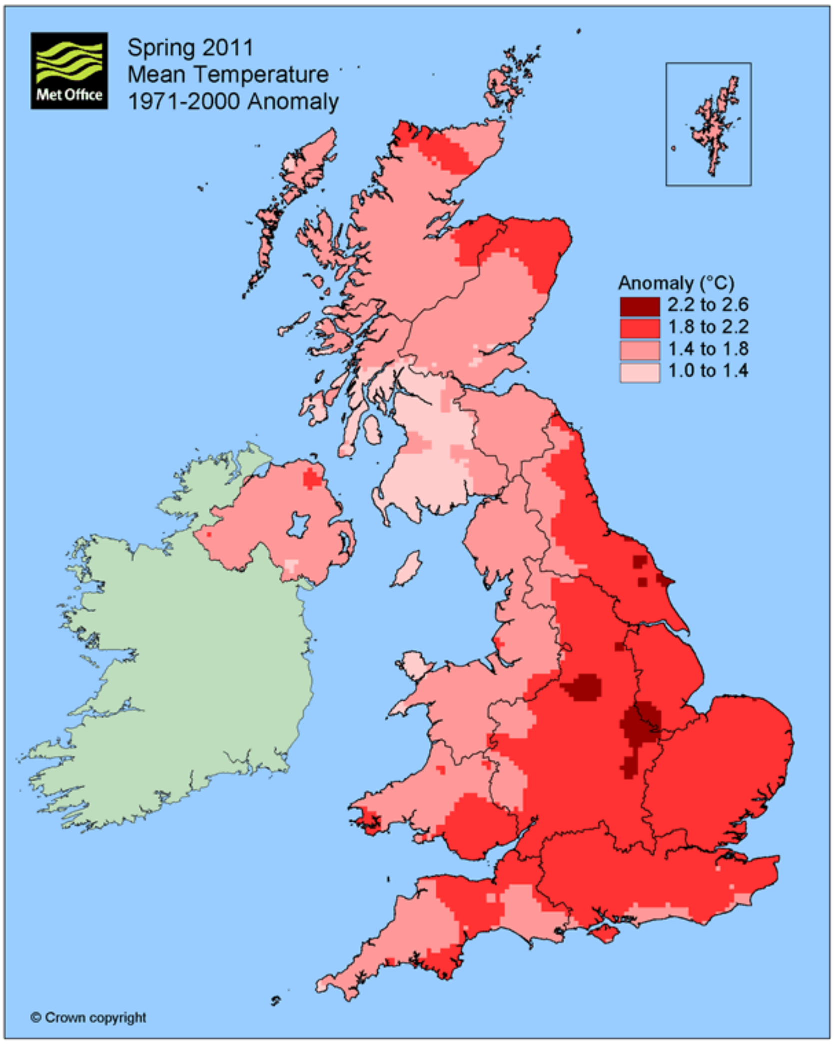

Figure 1 – Mean temperature anomaly for spring 2011

Considering the whole of the UK, spring 2011 was the equal warmest spring for one hundred years. Considering the longer Central England Temperatures records, the value for spring 2011 is the equal warmest for three hundred and fifty years, matched only by 1893. Temperatures were particularly higher in the east and south east of England, which experienced a mean temperature anomaly of between 1.8˚C and 2.2˚C over the spring period

Figure 2 shows a significant north / south divide between the rainfall seen in England and Wales when compared to Scotland. It shows the percentage of rainfall expected when compared to the long term average for the spring period.

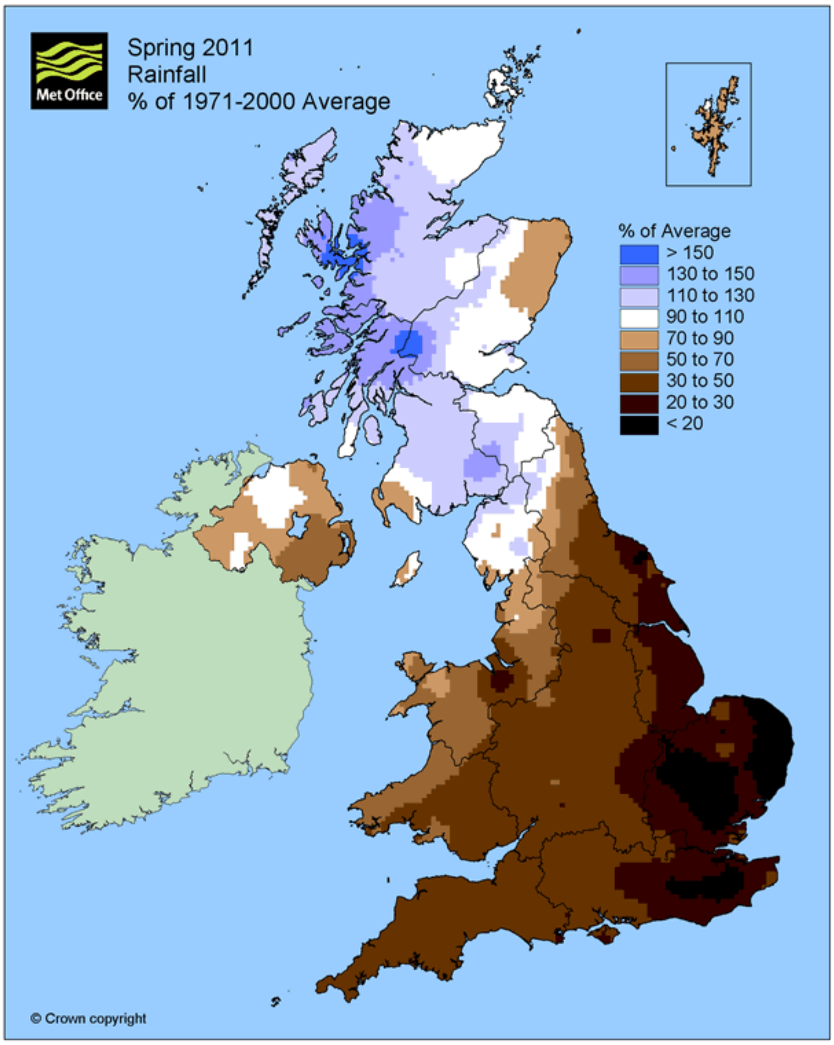

Figure 2 – Percentage of long term rainfall for spring 2011

Much of East Anglia saw less than 20% of the long term average precipitation, with much of the rest of the eastern side of England experiencing less than 30% of the average. For England and Wales, it was the equal-driest period for one hundred years, matched only by 1990.

April 2011

Throughout much of April, the UK's weather was dominated by an area of high pressure. Typically, at this time of year, high pressure systems would bring very warm, dry and sunny weather. The period was also accompanied by spells of relatively high winds. Figure 3 shows the general situation on 27 April, which is similar to other times of the month.

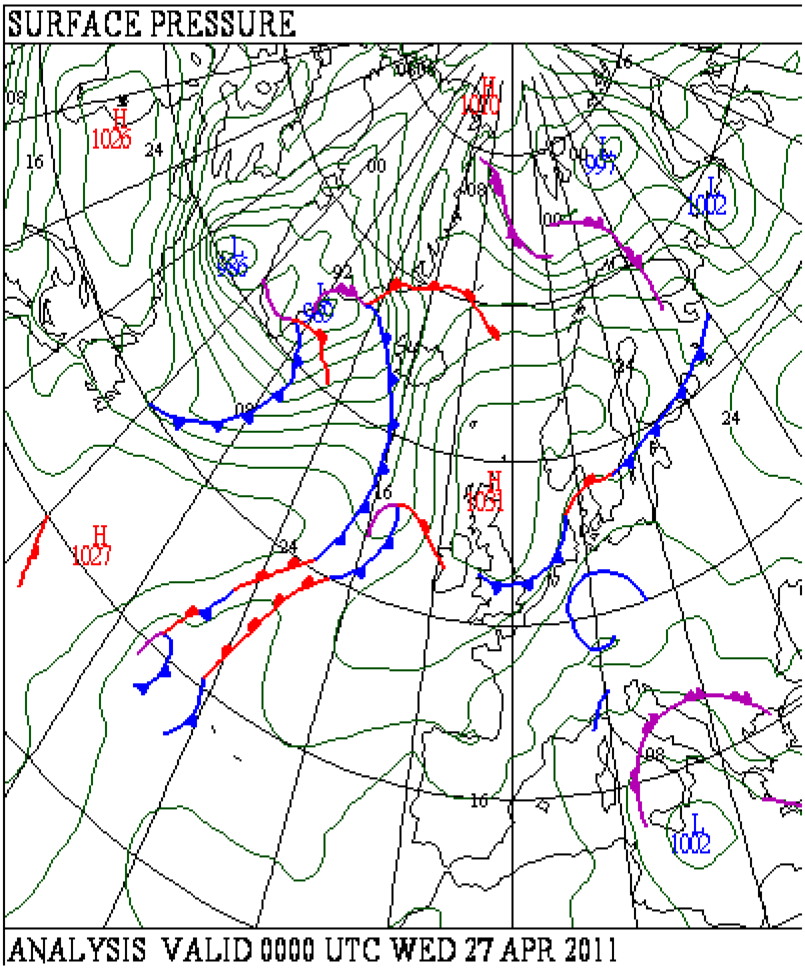

Figure 3 – General weather pattern typical of April 2011

Figure 4 shows the anomaly for the average maximum daily temperature recorded throughout April. Again the anomaly is determined from the 1971 to 2000 long term average. April 2011 was the warmest April across the whole of the UK for one hundred years, exceeding the long term average by 3.7˚C. During April, a maximum temperature of 27.8˚C was recorded at Wisely, Surrey. When compared against the Central England Temperature record, April 2011 was the warmest for three hundred and fifty years. In the South East, the average maximum temperature was more than 6˚C above normal.

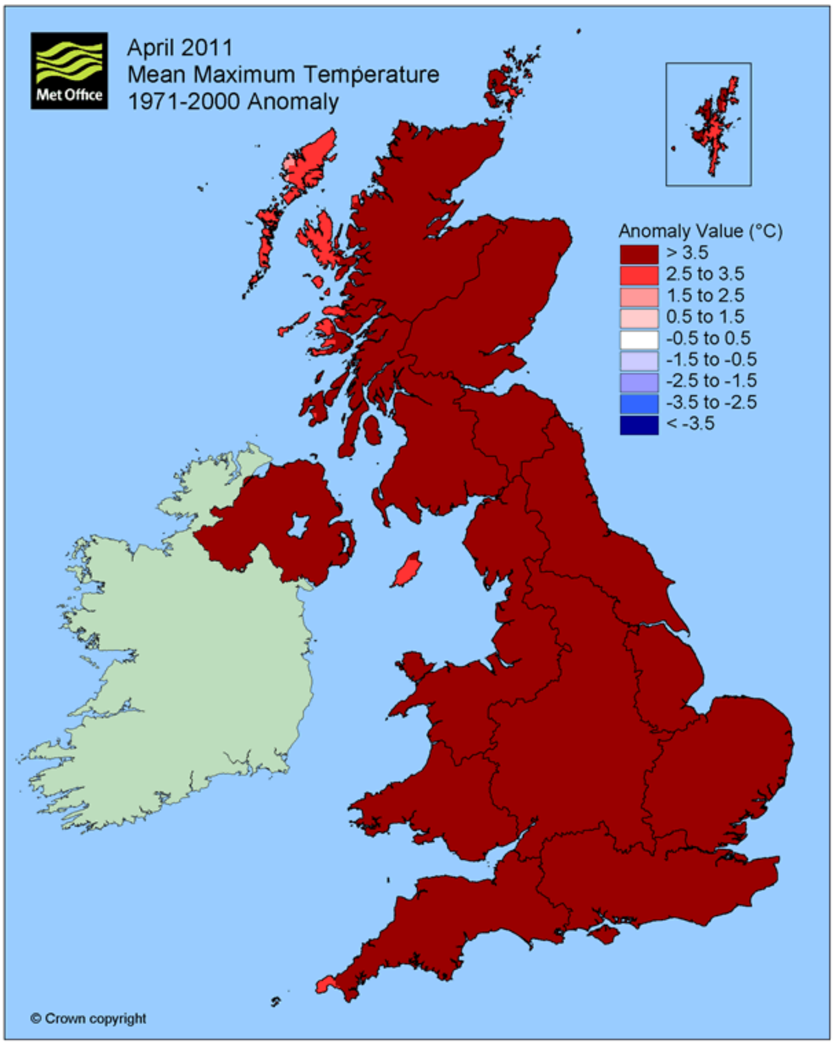

Figure 4 – Maximum temperature anomaly for April 2011

Figure 5 shows the rainfall pattern across the UK for April 2011. Much of Central and Eastern England experienced less than 10% of the long term average rainfall expected for this period. For England, April 2011 was the 6th driest for one hundred years, with many parts of Eastern England receiving less than 1mm of rainfall.

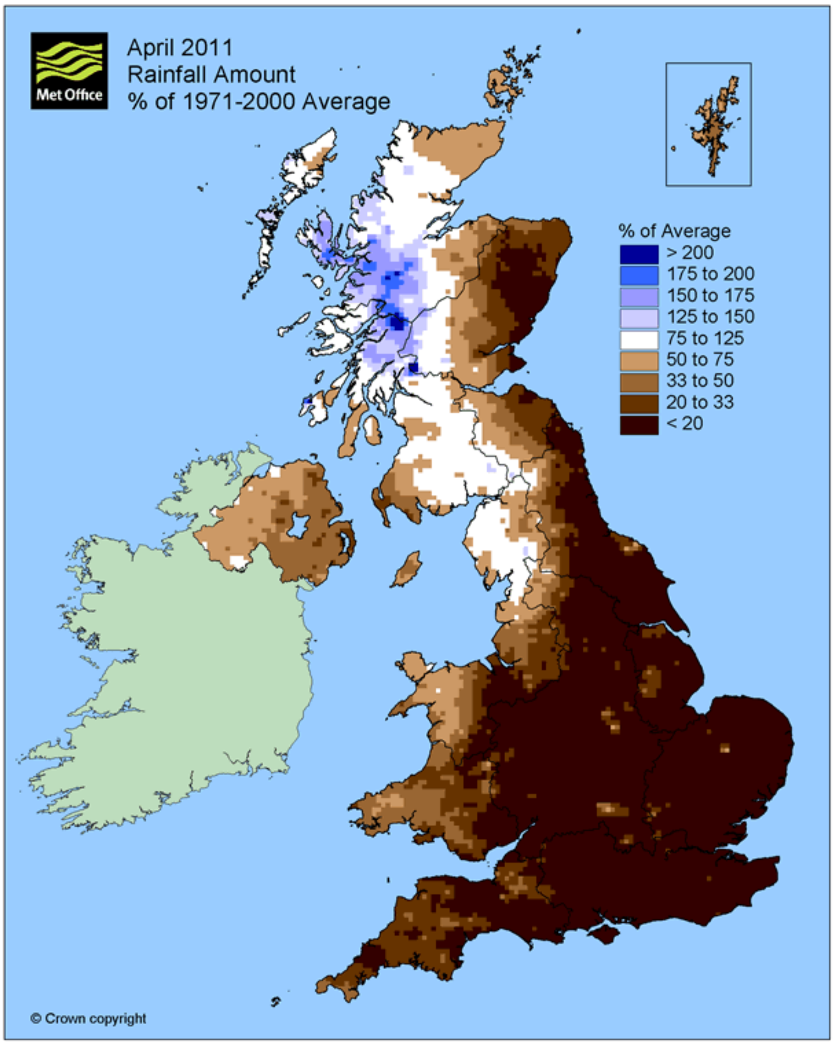

Figure 5 – Percentage of long term rainfall for April 2011

The dominant high pressure system which persisted over much of the UK during April 2011 also ensured exceptionally sunny conditions. Figure 6 shows the percentage of sunshine hours during April, when compared to the 1921 – 2000 long term average. Most of the UK saw 150% of the average sunshine and for England; it was the sunniest April since 1929.

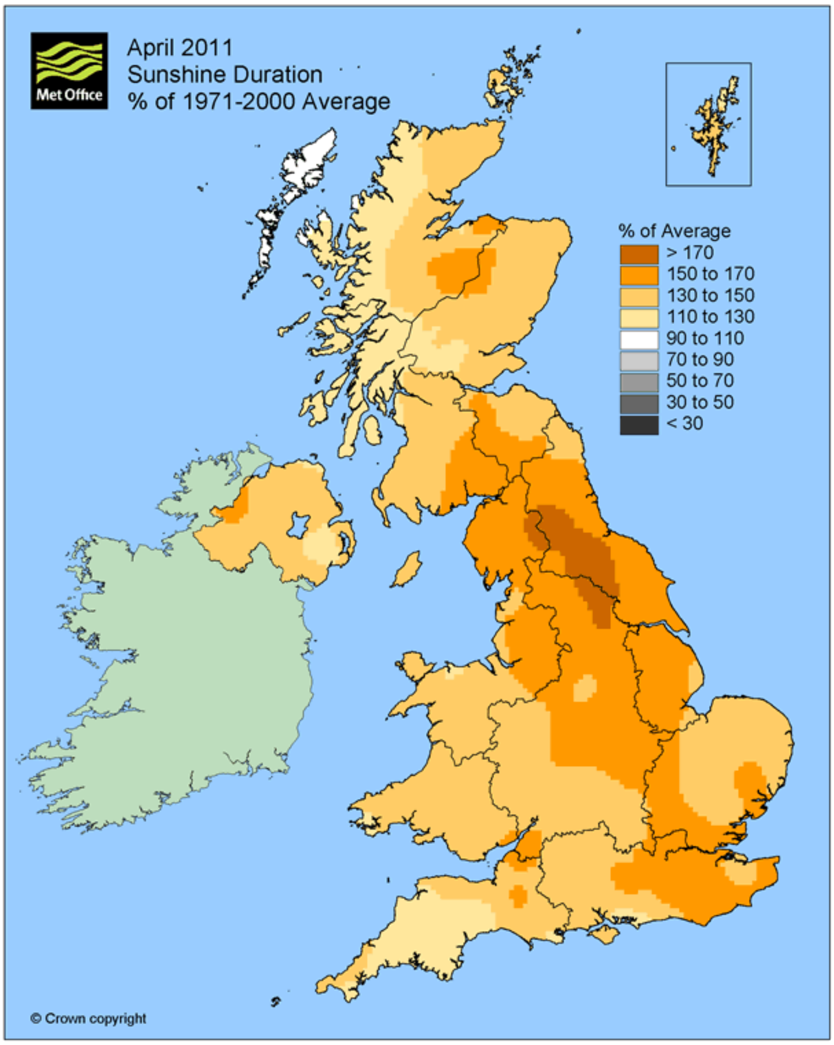

Figure 6 – Percentage of sunshine hours for April 2011

The weather conditions throughout April set the scene for elevated wildfire severity conditions during that month, and leading into early May. To help put the weather conditions of April 2011 into context Figure 7 shows the last one hundred April values for temperature and rainfall. The values are plotted as a percentage of the long term average. The further to the right a year appears, the warmer it is; the further to the left, the cooler it is. Also, the higher it appears on the chart, the wetter it is; the lower it appears, the drier it is. April 2011 is clearly shown in the lower right section of the chart, demonstrating how exceptionally dry and warm it was.

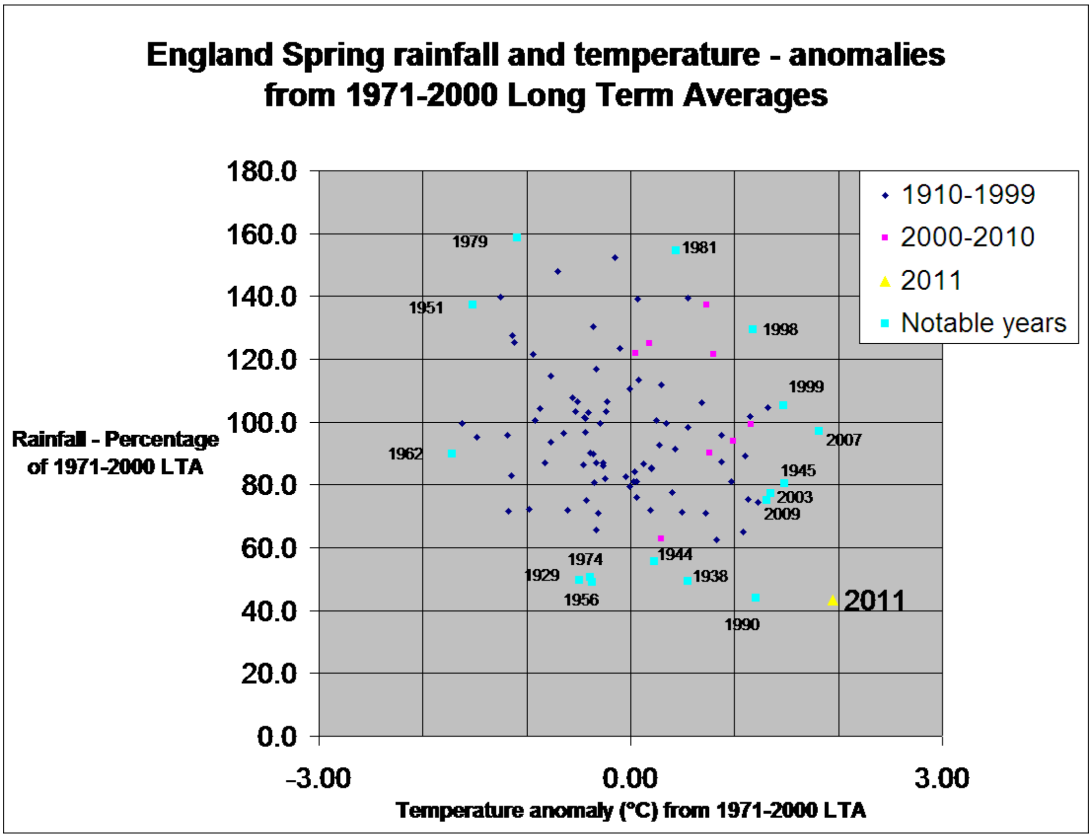

Figure 7 – April weather conditions for the last one hundred years.

It is this combination of the exceptionally dry weather, coupled with exceptionally warm conditions, which lead to exceptional wildfire severity conditions during early May.

The Met Office provides a 10km grid scale forecast of the Fire Weather Index on a daily basis for the whole of England and Wales. The operational model uses forecast weather data from a different source than the observed weather as used in the following site specific analyses. The forecast on 2 May for England and Wales is shown in Figure 8 and clearly shows that exceptional fire behaviour conditions (shown as level 5 on the map) were predicted across large parts of Southern and Central England. This is consistent with the reanalysis performed in this report using observed weather data.

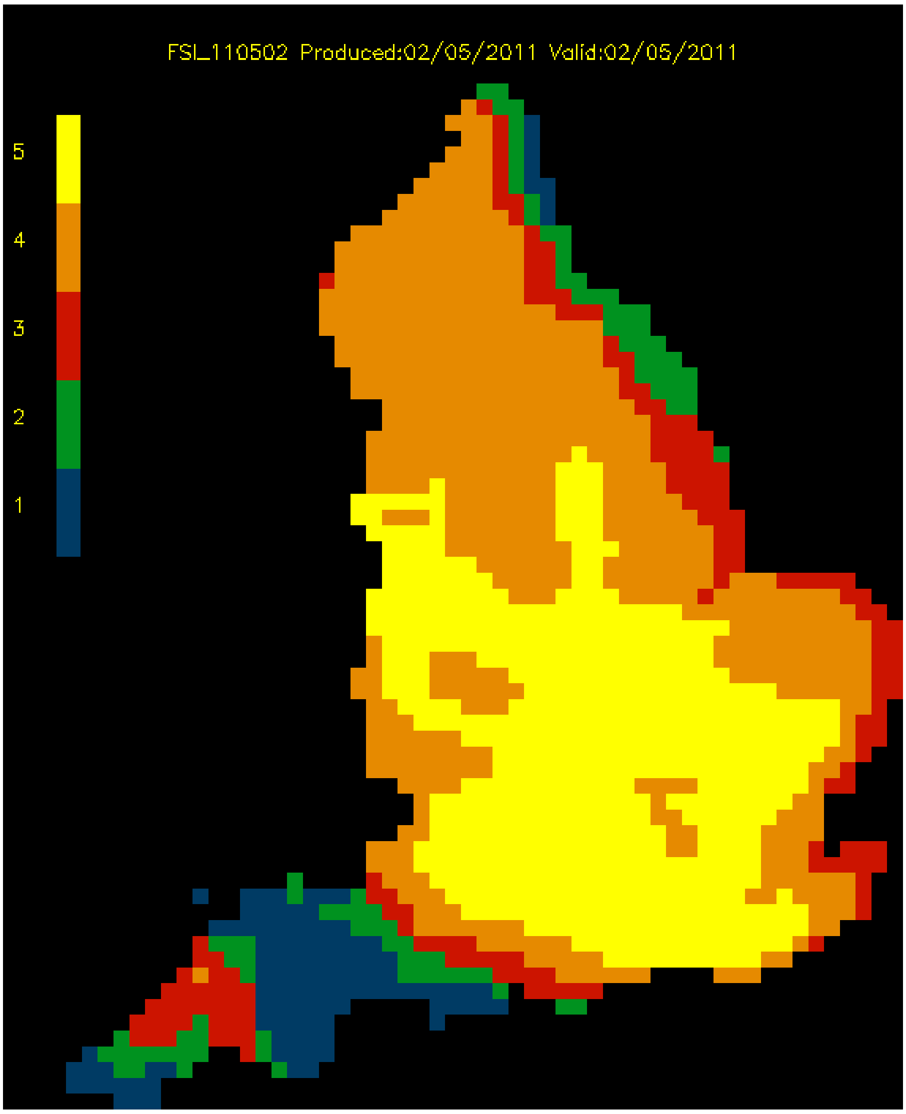

Figure 8 – Forecast of fire behaviour issued on the morning of 2 May 2011

Wildfire Studies – Introduction

There were many wildfires recorded throughout the UK during the early part of May. At this time, peak fire weather conditions coincided with the early May bank holiday. Many hundreds of these fires were judged to be exceptional in their nature, an observation supported by the prediction of exceptional fire weather conditions at that time. This report focuses on just a few of these wildfires. Some of these are the more significant events which occurred. Others are in areas which, whilst conditions were elevated, may not be judged to be particularly exceptional in terms of fire behaviour or prevailing weather conditions. Others, such as Torside, may have become significantly more severe had they not been extinguished with at an early stage.

The list of sites included in this study are shown in Table 1, together with the start and finish dates of each fire, their location and details of the area burnt.

Site name	Area/County	Grid ref	Start date	Finish date	Area burnt
Marsden Moor	West Yorkshire	SE019115	Saturday, 9 Apr	Sunday, 10 Apr	315ha
Fylingthorpe	North York Moors National Park	NZ914031 (estimated)	Monday, 25 Apr	Tuesday, 26 Apr	1 ha
Cliff Ridge Wood	North York Moors National Park	NZ583109 (estimated)	Sunday, 1 May	Sunday, 1 May	<1 ha
Torside	Peak District National Park	SK0799990	Sunday, 1 May	Monday, 2 May	31 ha
Canford Heath	Dorset	SZ021956	Wednesday, 4 May	Wednesday, 4 May	<1 ha
Mynydd Isaf	Brecon Beacons National Park	SN670161	Monday, 2 May	Sunday, 7 May	900 ha
Swinley Forest	Berkshire	SU852648	Monday, 2 May	Monday, 9 May	300 ha
Anglezarke	Lancashire	SD640185	Friday, 29 Apr	Wednesday, 4 May	1,017 ha
Wainstalls	Yorkshire	SE041314	Saturday, 30 Apr & Monday 2 May	Sunday, 8 May	82 ha

Table 1 – List of wildfire events chosen for inclusion in this report

For each location, an overview of the fire and fuel consumed is provided. This information has come from a number of sources and differing levels of detail are available for each fire. Information on the key weather elements are provided, showing the timeseries of data from the beginning of the year through until the end of May 2011. Also, results from the single site version of the Fire Severity Index model are shown, providing an estimate of underlying soil moisture conditions and a measure of surface fire behaviour characteristics. Comments on all of this information are provided for the duration of the wildfire studied.

Anglezark, Lancashire

Details

Ste name	Anglezarck, Lancashire
Grid reference	SD 640185
Site description	Moorland with blanket bog. CROW access land
Fire started	Friday, 29 April
Fire under control	Wednesday, 4 May
Area burnt	1, 017ha

The fire started near Belmont Reservoir and travelled east towards where satellite images picked up the fire front as four hotspots at 1pm on 29 April. More than 100 fire fighters, 18 fire engines and three specialists were involved in the operation to fight the fire, as well as the police helicopter, a Fire and Rescue Services helicopter, a mountain rescue team and United Utilities. Specialist equipment was used to transfer water from Anglezarke Reservoir.

Weather Conditions

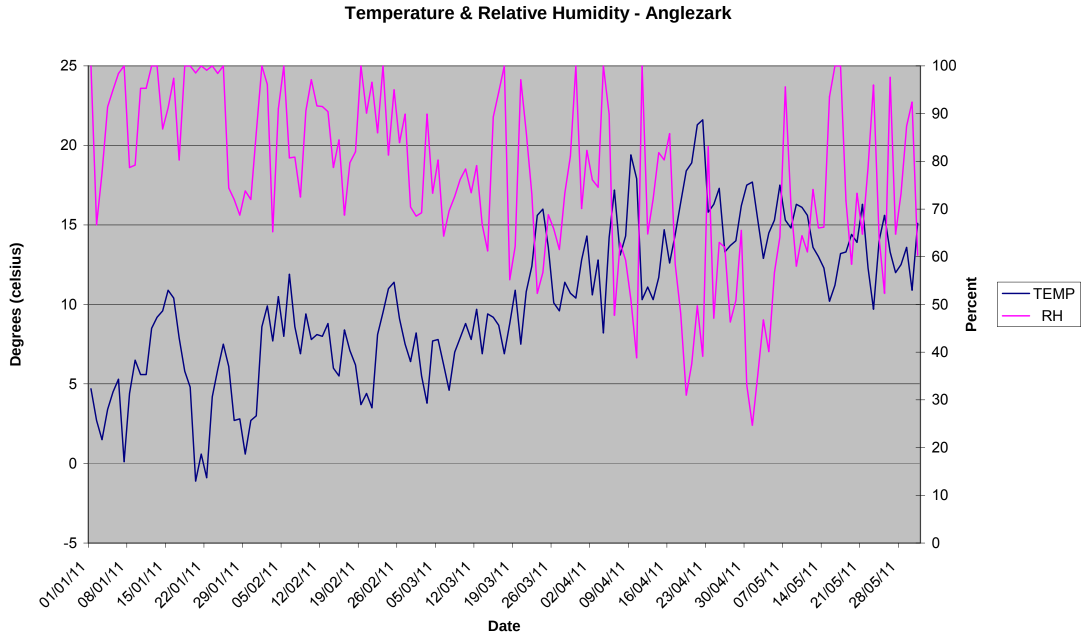

Figure 9 – Temperature and relative humidity for Anglezark

During the period shown, the temperature peaked at 21.6 degrees Celsius on 22 April, which coincided with a relative humidity of around 50%. At the time the fire started on 29 April, temperatures had cooled somewhat to around 16 degrees Celsius, though coupled with extremely low relative humidity, which reached 24.7% on 1 May – the lowest value recorded during the period until the end of May. Temperatures remained around 17 degrees Celsius throughout the wildfire event, and relative humidity gradually climbed to over 50% the day after the fire was brought under control.

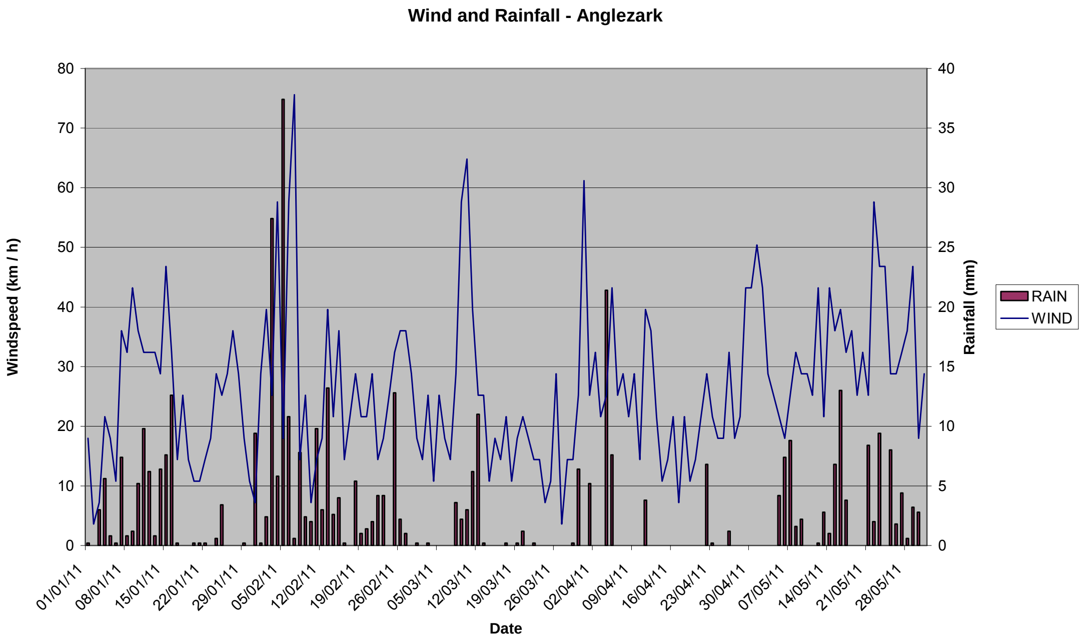

Figure 10 – Windspeed and precipitation for Anglezark

The wind speeds reached a maximum of 50 km / hr on 1 May, midway through the wildfire event and dropped to around half of that speed on the day the fire was brought under control. There was no rainfall during the wildfire, and the previous significant rainfall event was 4 April with 21mm falling during the 24 hours, providing a relatively prolonged dry period ahead of the wildfire. Rain fell on 5 May, corresponding to the last day of the wildfire.

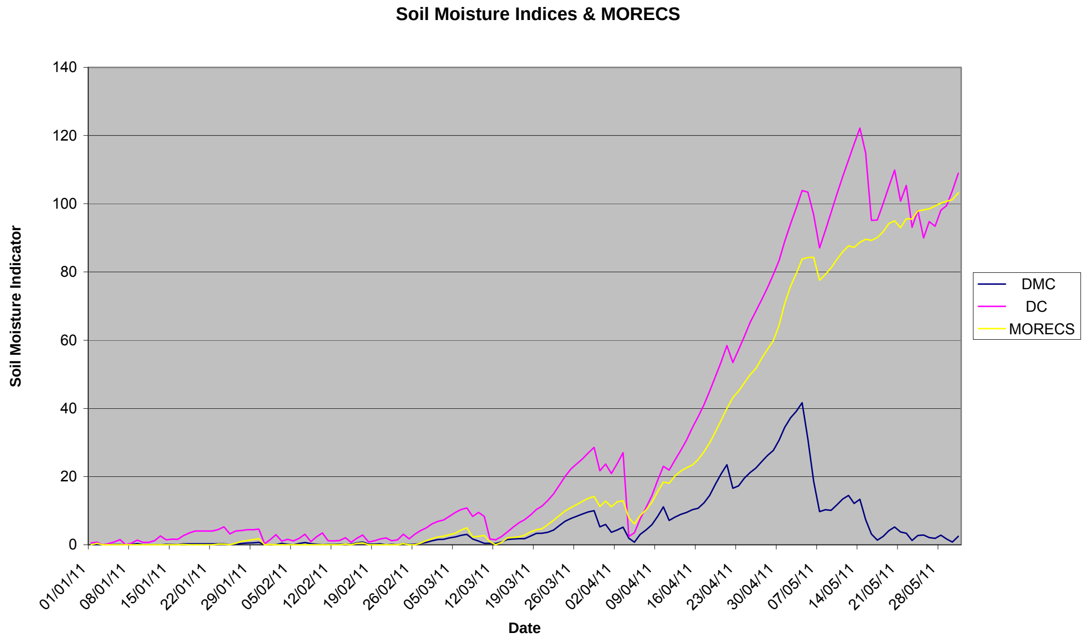

Figure 11 – Soil moisture codes and MORECS for Anglezark

Both the Duff Moisture Code and the Drought Code climbed steadily throughout April, reaching a peak on the final day of the wildfire. They fell on 5 May with the onset of rainfall. MORECS reacted in a similar manner to the Drought Code, both continuing to climb steadily after the initial reduction following the cessation of the wildfire.

Fire Behaviour Indicators

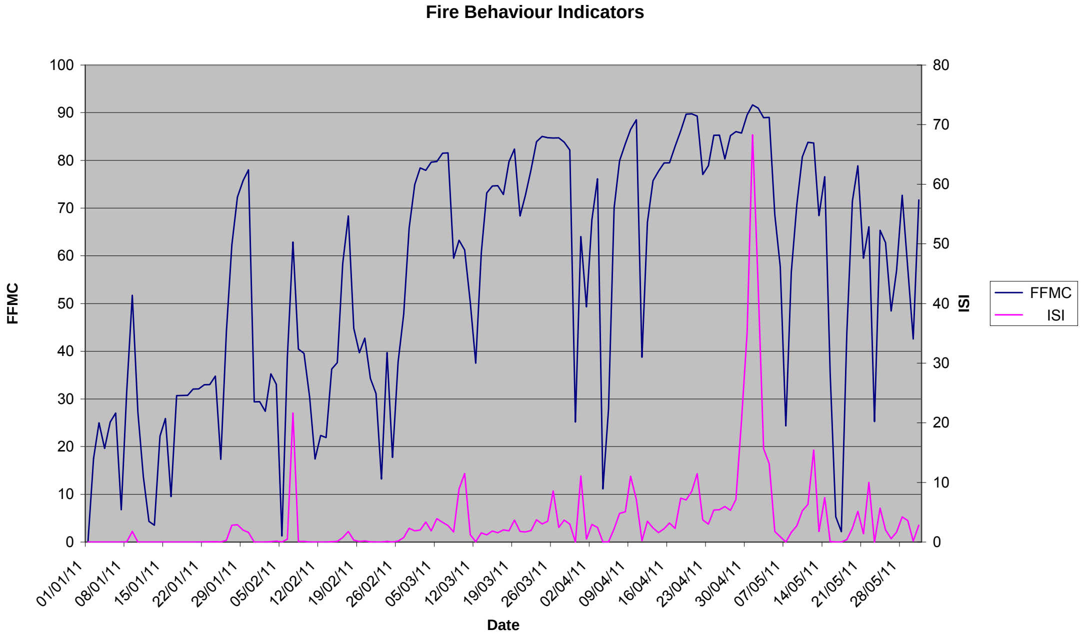

Figure 12 – Fire behaviour indicators for Anglezark

The Fine Fuel Moisture Code remained high throughout the event, exceeding 90 midway through, on 1 May. The Initial Spread Index also peaked that day, driven by the significantly higher winds. On 5 May, both indicators of surface fire behaviour dropped markedly, the Initial Spread Index falling to almost zero.

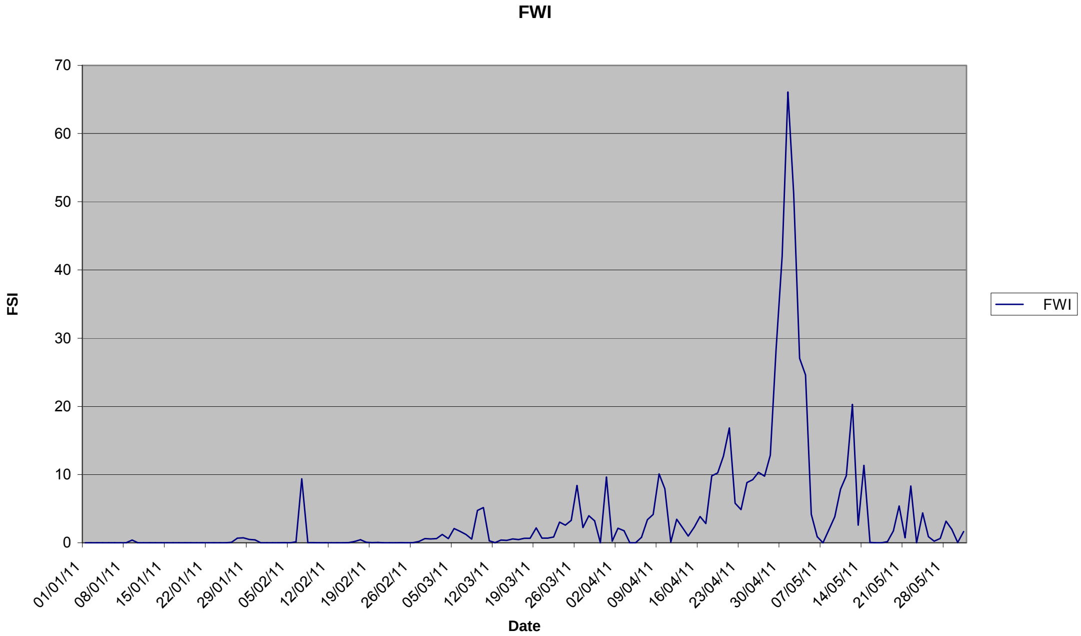

Figure 13 – FWI for Anglezark

The overall indicator of fire behaviour, the Fire Weather Index, rose markedly the day after the fire started to a value of 42, and peaked on 1 May, reaching a highly unusual level of 66. This is an indication of exceptional wildfire behaviour. The Fire Weather Index plummeted on 5 May, to a value of 4, which is an indication that such a wildfire would be much more readily controllable.

Wainstalls, Yorkshire

Wainstalls, Yorkshire

Details

Ste name	Wainstalls, Yorkshire
Grid reference	SE041314
Site description	Grouse moor with 1m to 3m peat layer close to a SSSI site.
Fire started	Saturday, 30 April & Monday 2 May
Fire under control	Monday, 9 May
Area burnt	82 ha

The first fire began on 30 April. The line of fire was between 0.5 km and 1 km in width. The conditions on the day were very hot with a wind speed of 20 mph. The fire was moving 'as fast as a fireman could comfortably walk'. From the time the fire began at the forest it took one hour to reach the wind turbines. Twenty fire-fighters attended with four fire engines and a specially-equipped wildfire unit. A helicopter was also called in.

Weather Conditions

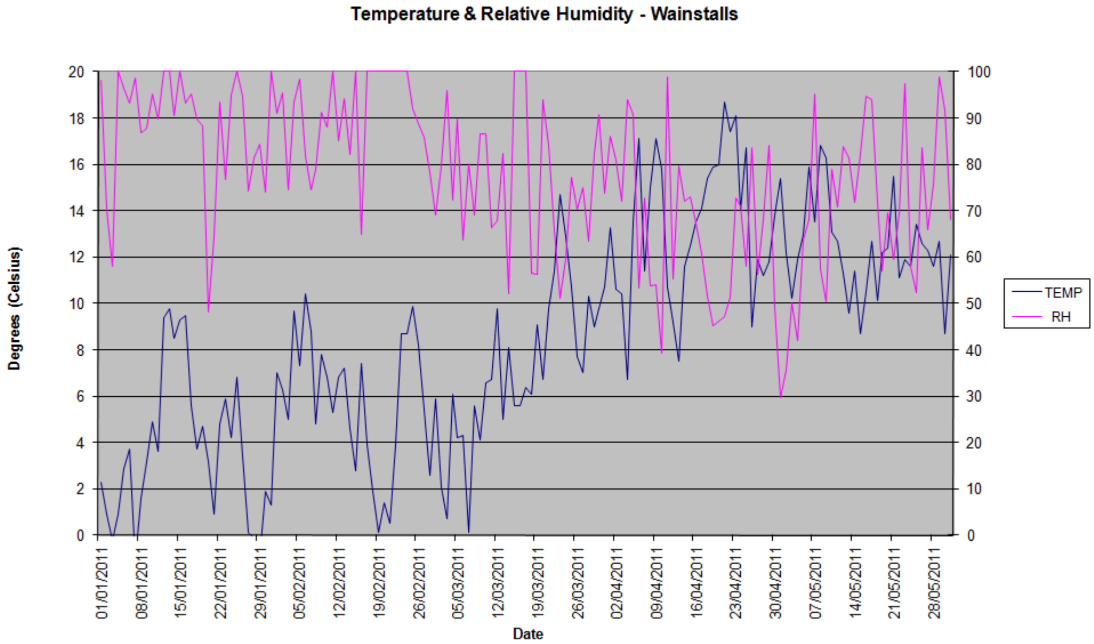

Figure 14 – Temperature and relative humidity for Wainstalls

During the ten day event, temperatures peaked at a fairly moderate 16.8 degrees Celsius on 8 May and were at a minimum of 10.2 degrees Celsius on 3 May. At the onset of the wildfire, relative humidity was still a comfortable 49% though dropped to a low of 35% on 2 May. Relative humidity rose during the second half of the wildfire and remained above 50% from 5 May.

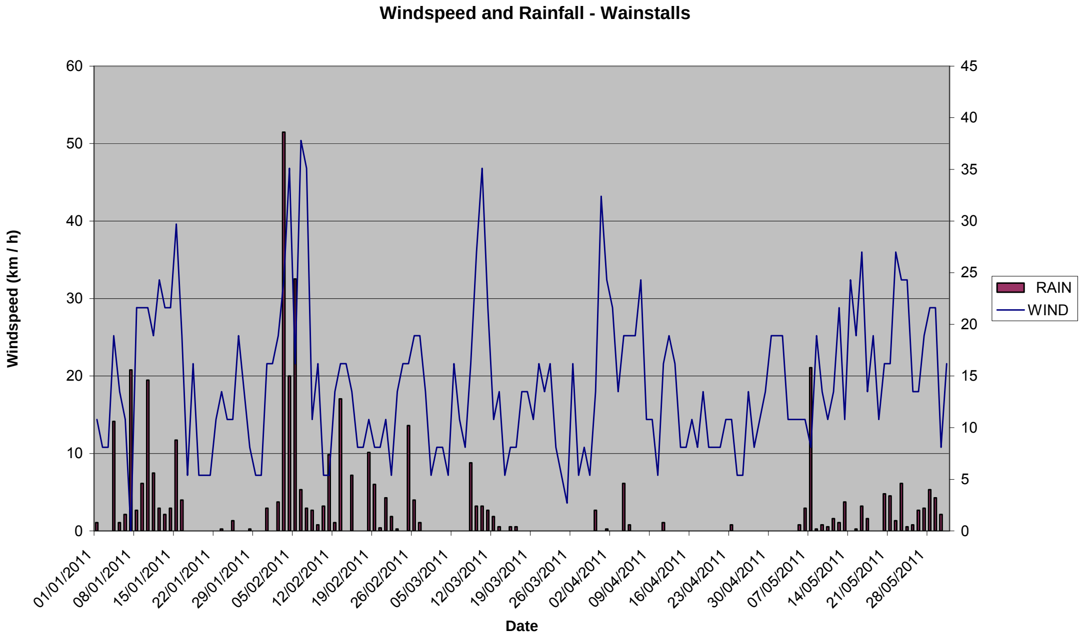

Figure 15 – Windspeed and precipitation for Wainstalls

Windspeeds were fairly moderate throughout the event, not exceeding 25.2 km/ hr at any point. However, the start of the fire followed a prolonged dry spell, with little significant rain since the middle of February, and only a handful of days with a few millimetres of precipitation throughout March and April. A fairly significant 15.8mm of rainfall was recorded on 7 May, which surprisingly perhaps was still during the wildfire event. It may be that the rainfall recorded at the station did not reach the location of the fire.

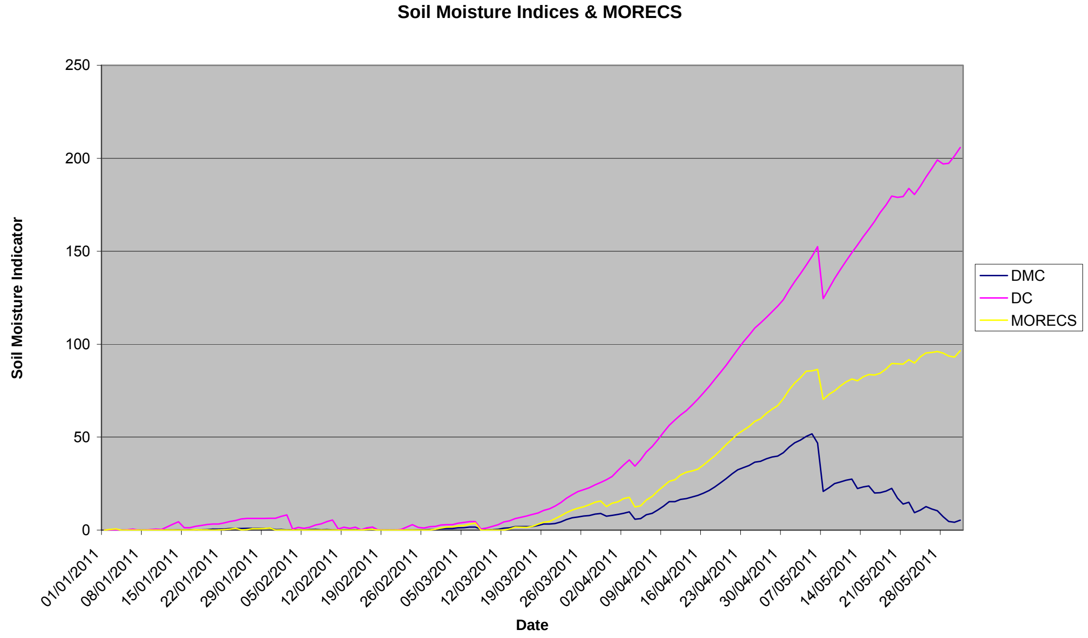

Figure 16 – Soil moisture codes and MORECS for Anglezark

All three soil moisture indicators show a gradual drying of the soils through to 6 May, reducing at that point for a number of days in response to the moderate rainfall. The Drought Code and MORECS both then increase steadily again as the month progresses, though the Duff Moisture Code continues to fall in response to the light precipitation during the period, which would not affect the soil moisture at the deeper levels.

Fire Behaviour Indicators

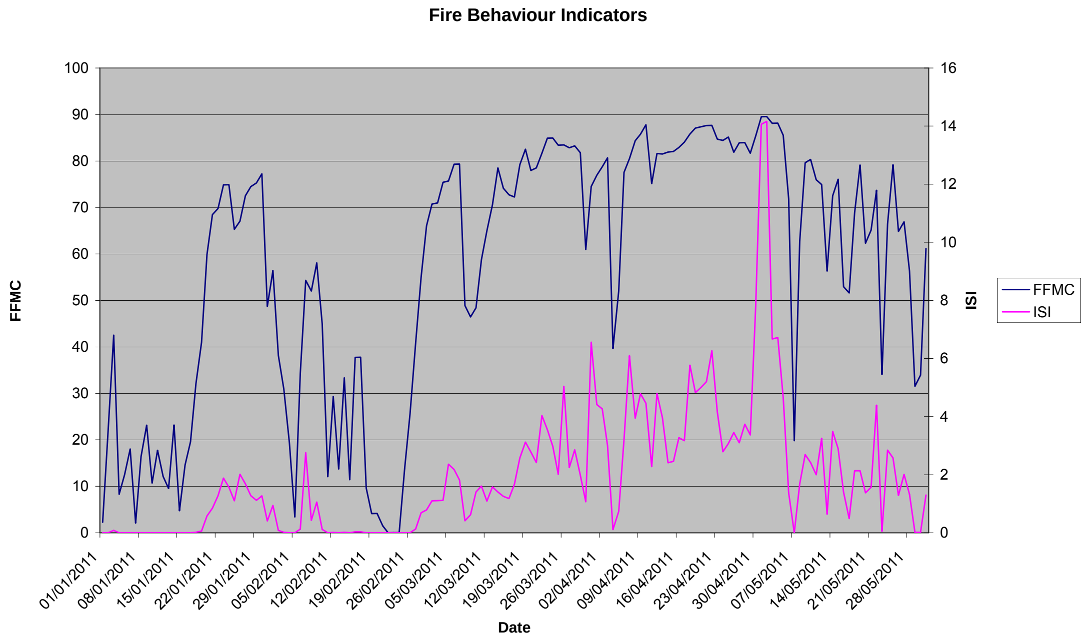

Figure 17 – Fire behaviour indicators for Wainstalls

The Fine Fuel Moisture Code peaked on 1 and 2 May, reaching almost 90, indicating extremely dry surface fuel conditions. This coincides with the drop in relative humidity at that time. The moderate winds also increased the Initial Spread Index at that time, reaching a significant value of over 14 for the two days from 1 May. These factors would likely be significant contributory factors to the start of the fire event. However the Initial Spread Index dropped markedly on 3 May, whilst the Fine Fuel Moisture Code began to drop on 6 May, falling to negligible values after that day, though the wildfire reportedly persisted until 9 May.

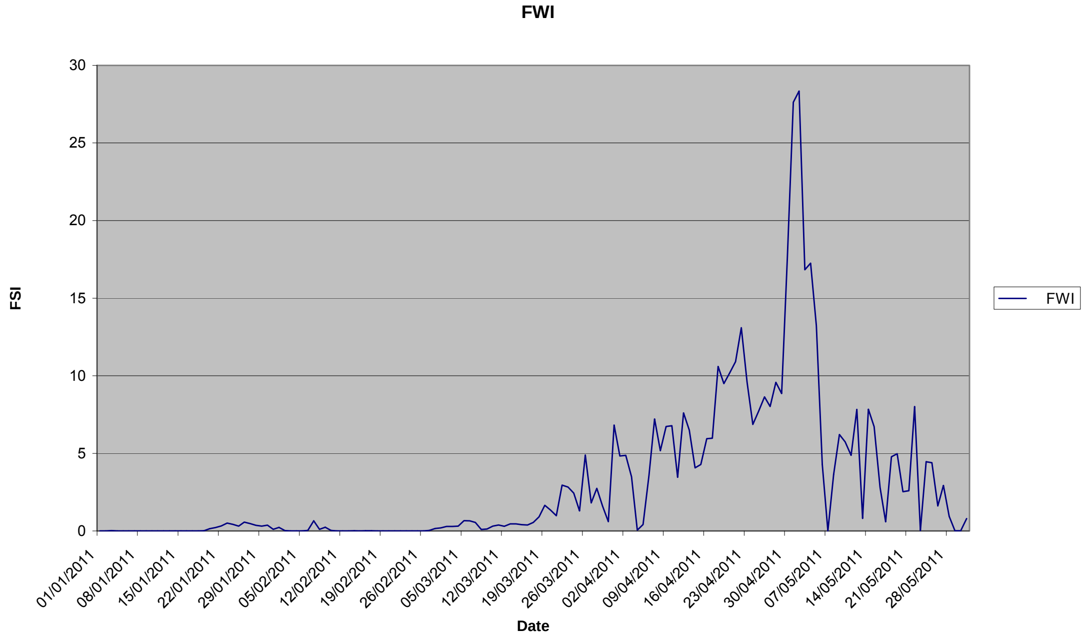

Figure 18 – FWI for Wainstalls

The overall indicator of wildfire behaviour rose markedly on the day the fire started, reaching 17.7 on 30 April, peaking at over 28 on 2 May. However, it fell markedly on 6 May, and actually reached zero on 7 May in response to the rainfall and other weather changes. This drop is three days before the fire was brought under control, which is unusual. Again, it may be possible that the rainfall recorded at the nearby station did not reach the site of the wildfire.

Mynydd Isaf, Brecon Beacons National Park

Details

Ste name	Mynydd Isaf, Brecon Beacons
Grid reference	SN670161
Site description	Moorland with SSSI and CROW access land
Fire started	Monday, 2 May
Fire under control	Sunday, 7 May
Area burnt	900 ha

The wildfires at Mynydd Isaf occurred during a particularly dry period in the spring of 2011, when temperatures were also above average. This caused much of the vegetation to dry out, particularly the Molinia grasses and Calluna heaths, which contained a high amount of dead material from the previous year making them more vulnerable to fires.

The fire was started near a road on the 2nd May, and initially spread north and east over Molinia grasses and heaths. The fire stopped spreading north when it reached a road along the north edge of the study area, which contained little flammable material for the fire to keep burning. The progression of the fire towards the east continued, and spread at an increasing rate after the first day, over habitats dominated by Calluna heaths and Molinia grasses. The fire eventually reached the areas of blanket bog in the east on the fourth or fifth day (exact date unknown), before eventually ceasing when it was extinguished by rainfall.

Weather Conditions

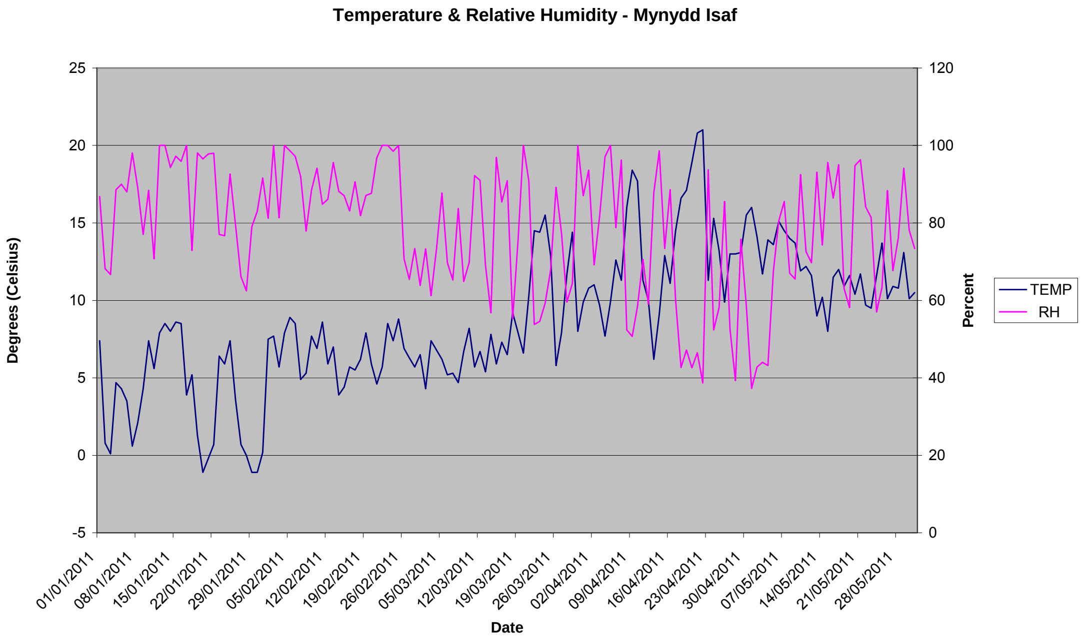

Figure 19 – Temperature and relative humidity for Mynydd Isaf

When the wildfire started, temperatures were a fairly moderate 14.1 degrees Celsius, fluctuating between 11.7 and 15.1 degrees Celsius throughout the event. Relative humidity was fairly low for the first three days of the event, at around 40%, rising to more moderate levels and reaching over 85% by the end of the event.

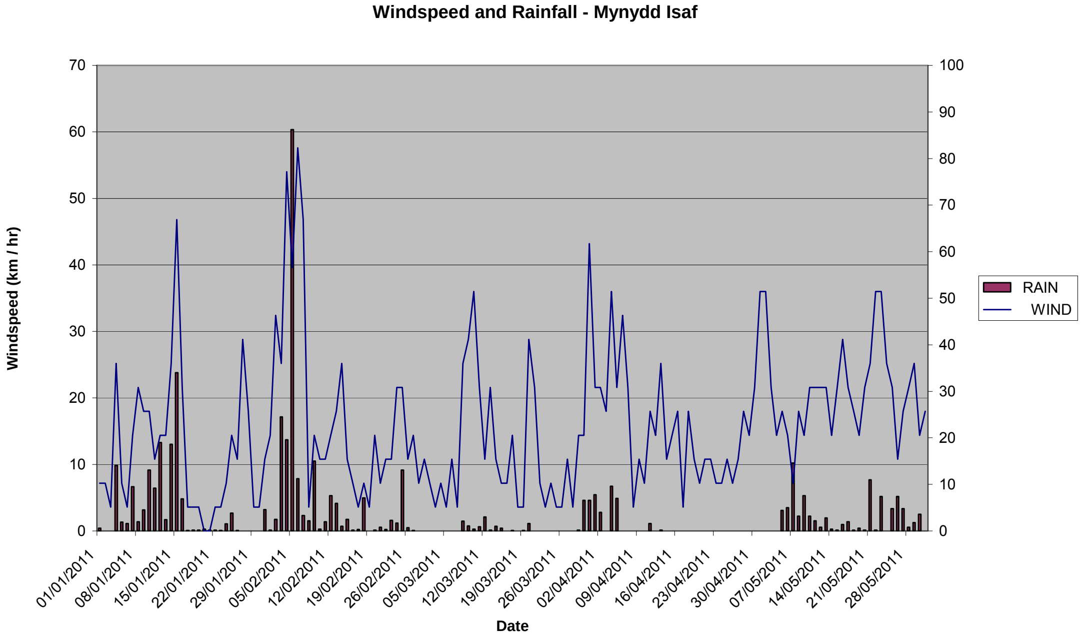

Figure 20 – Windspeed and precipitation humidity for Mynydd Isaf

Windspeeds were at their highest during the event on the first day, with midday speeds of 36km / hr on 2 May. They dropped significantly on the last day of the fire, falling to 7.2 km / hr on 7 May. Whilst some rain fell during early April, the most significant rainfall event in the area was in the first week of February, which led to a significant dry spell ahead of the wildfire. Rain fell on 5 May, with more significant amounts of just over 14mm on 6 May, and subsequently brought the fire under control.

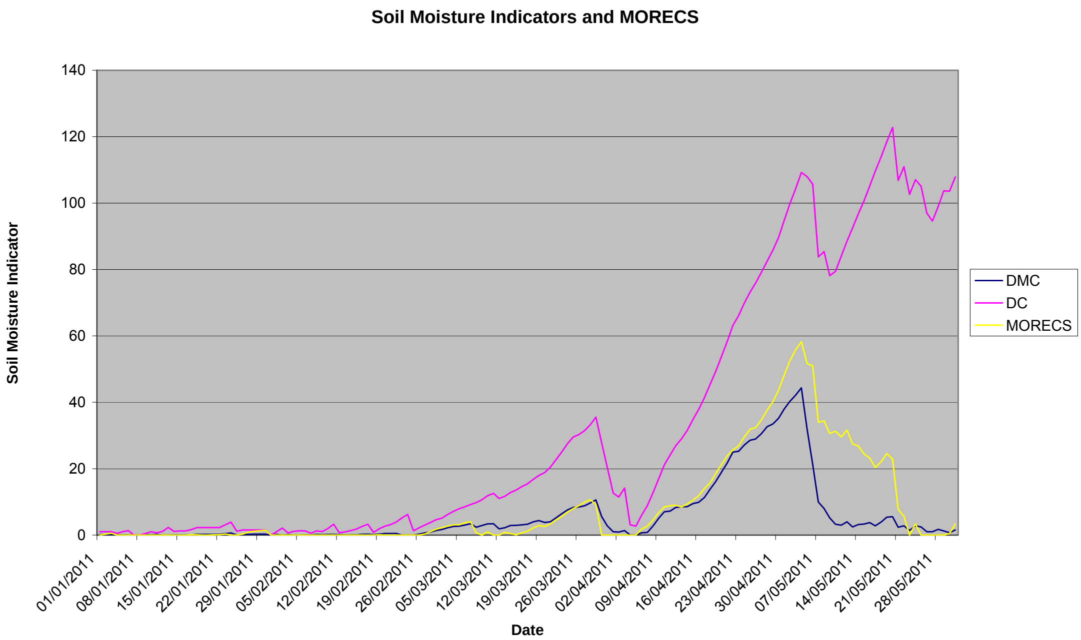

Figure 21 – Soil moisture codes and MORECS for Mynydd Isaf

All three moisture codes rose steadily ahead of the wildfire. They peaked on 4 May, just after the start of the fire. They then fell during the latter half of the event, as the fire was brought under control, the Duff Moisture Code (representing the upper surface of the soil layer) falling fairly quickly.

Fire Behaviour Indicators

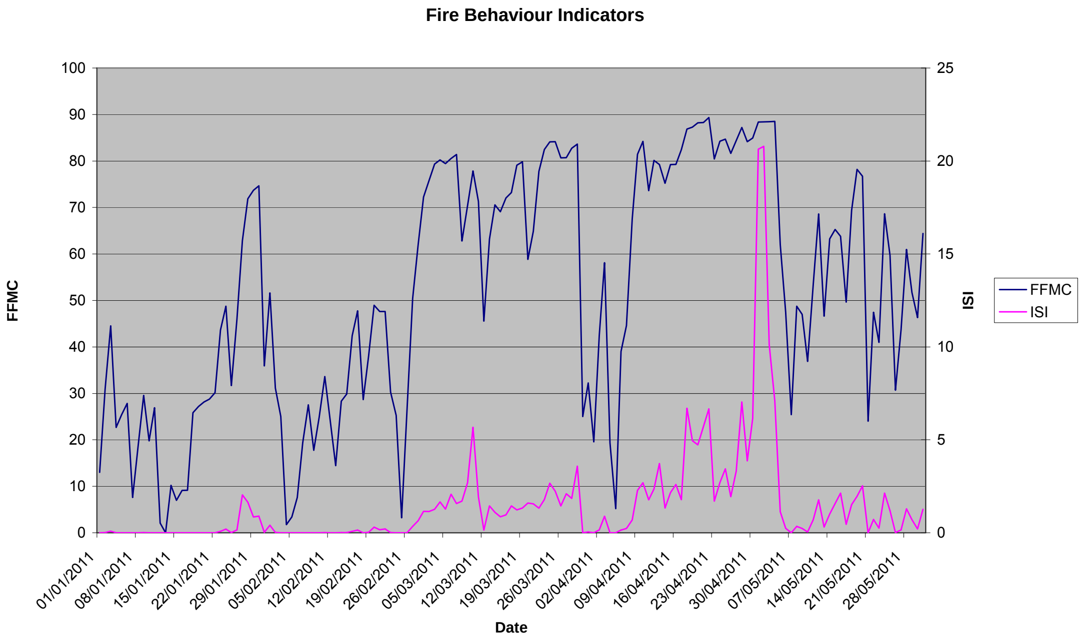

Figure 22 – Fire behaviour indicators for Mynydd Isaf

The Fine Fuel Moisture Code reached a value of 88 during the early period of the fire, representing dry surface litter conditions. Whilst this in itself is not highly unusual, it was coupled with a dramatic spike in the Initial Spread Index, on the day of, and the day before, the wildfire started. A value of 20 is unusual for this area, as can be seen in the 5 month timeseries in Figure 22. The Initial Spread Index fell quickly and remained low for the latter period of the event.

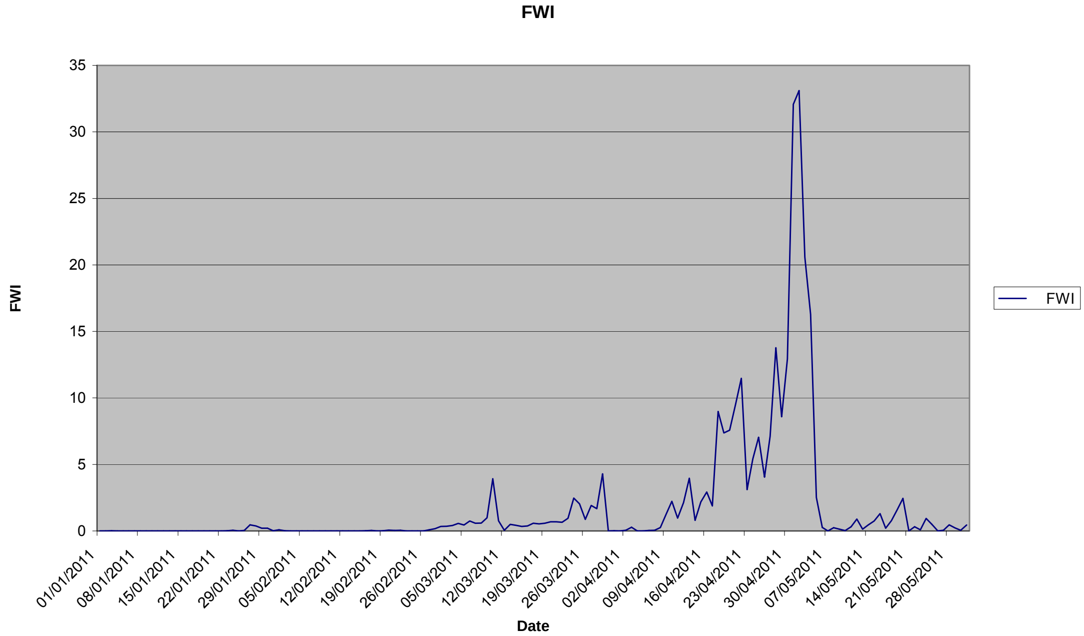

Figure 23 – FWI for Mynydd Isaf

The significant peak in the overall Fire Weather Index was actually on 1 May, the day ahead of the start of the fire. On 2 May when the fire started, it was still relatively high at a value of over 20. This demonstrates the ease with which a fire would start and spread readily. It then fell, and by 5 May the Fire Weather Index reached fairly low levels, which would indicate that the most problematic period of tackling the fire were past, though the fire continued for a further two days.

Canford Heath, Dorset

Details

Ste name	Canford Heath, Dorset
Grid reference	SZ021956
Site description	Lowland heathland with a cover of heather, grass, gorse and bracken. SSSI, SPA, SAC and CROW access land
Fire started	Wednesday, 4 May
Fire under control	Wednesday, 4 May
Area burnt	<1 hectare

The event was a heath fire with over fifteen appliances in attendance. The landscape is composed of a varied topography leading to frequently changing wind directions, possibly due to the influence of the valley. The event comprised a main fire with two small subsidiary fires.

Weather Conditions

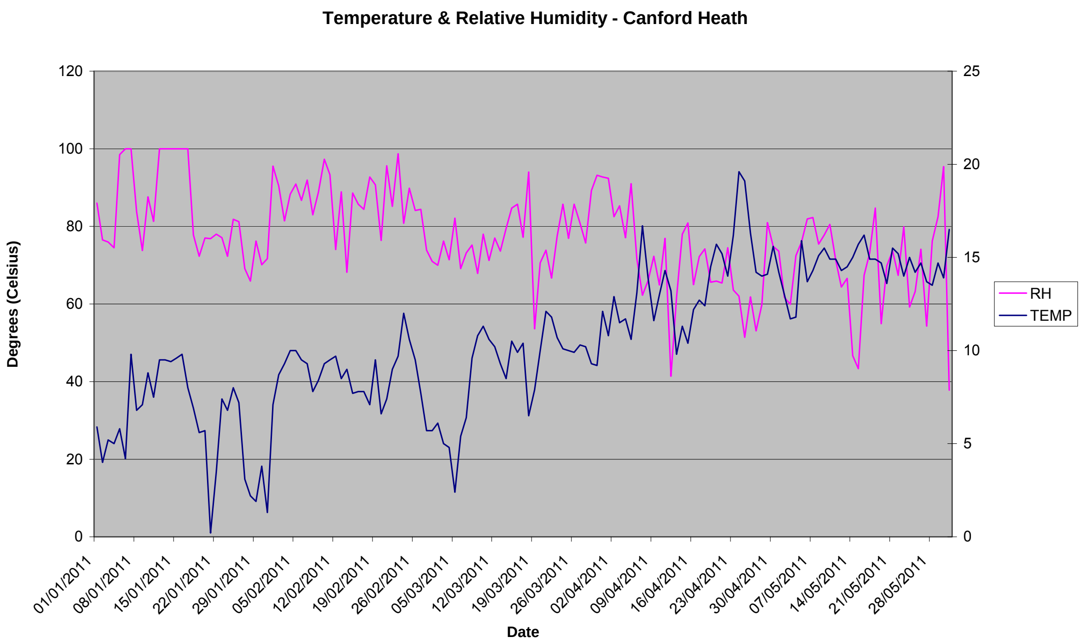

Figure 24 – Temperature and relative humidity for Canford Heath

The temperature on 4 May was a fairly moderate 11.8 degrees Celsius, having fallen from the peak of almost 20 degrees Celsius the week before. Relative humidity was also fairly moderate at 72.5% and had not fallen significantly in the period ahead of the fire.

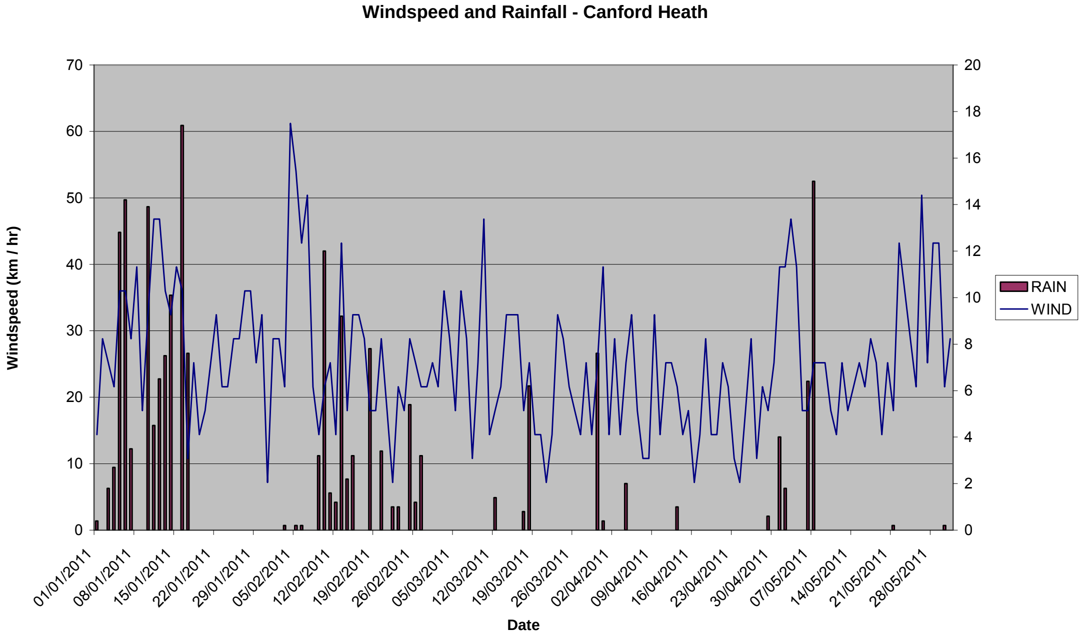

Figure 25 – Windspeed and precipitation for Canford Heath

The windspeed was almost 40 km / hr on the day the fire started, having peaked at almost 47 km / hr the preceding day. Whilst there had been occasional short periods of rain, the more significant rainfall in the area fell during the middle of February, providing for a long dry period ahead of the fire.

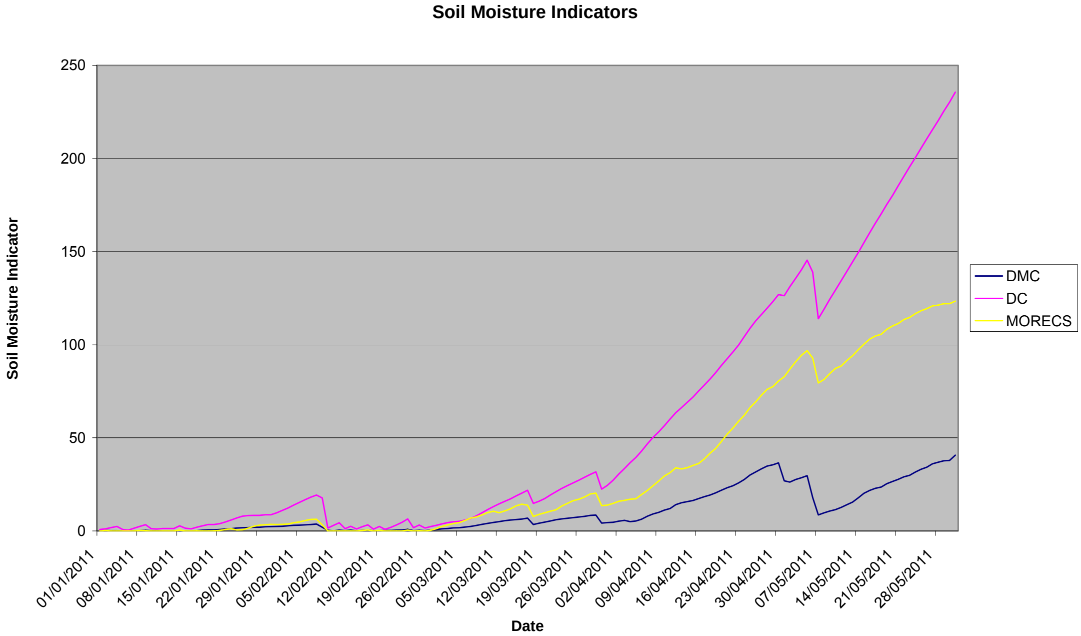

Figure 26 – Soil moisture codes and MORECS for Canford Heath

The Duff Moisture Code and the Drought Code were reaching their highest value the day after the fire, before falling in response to the rain which fell on 6 and 7 May. MORECS mimics the behaviour of the Drought Code, beginning to rise again a few days after the rain event.

Fire Behaviour Indicators

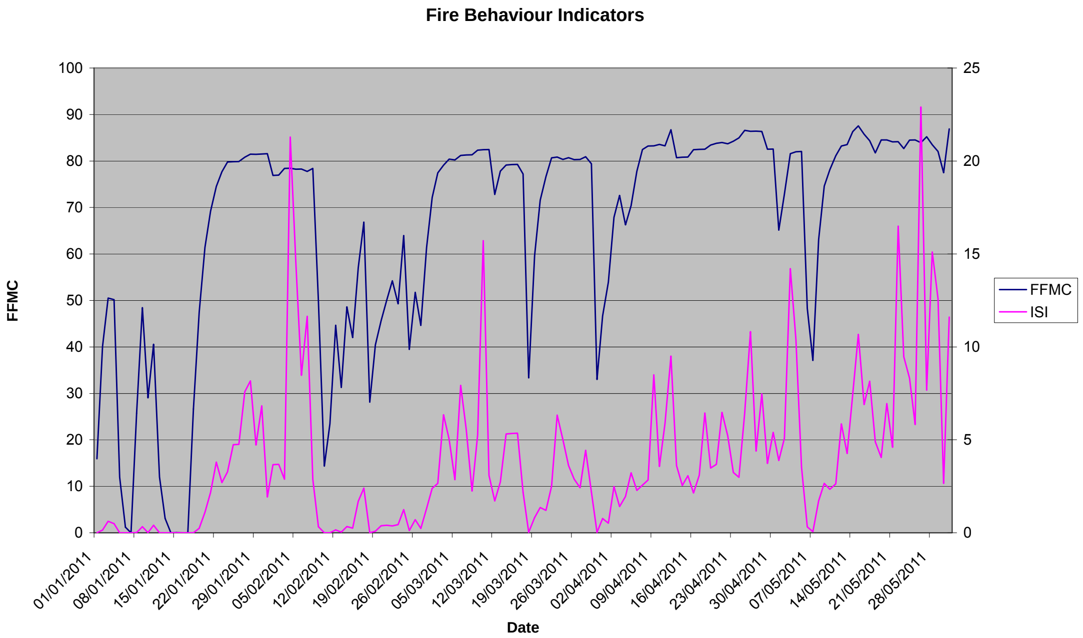

Figure 27 – Fire behaviour indicators for Canford Heath

The Fine Fuel Moisture Code reached 82 on the day of the fire. This is lower than it had been the previous week. However, on the day of the fire, the Initial Spread Index rose with increasing windspeed. Whilst the index was higher the day before the fire, it reached a value of just over 10 on 4 May.

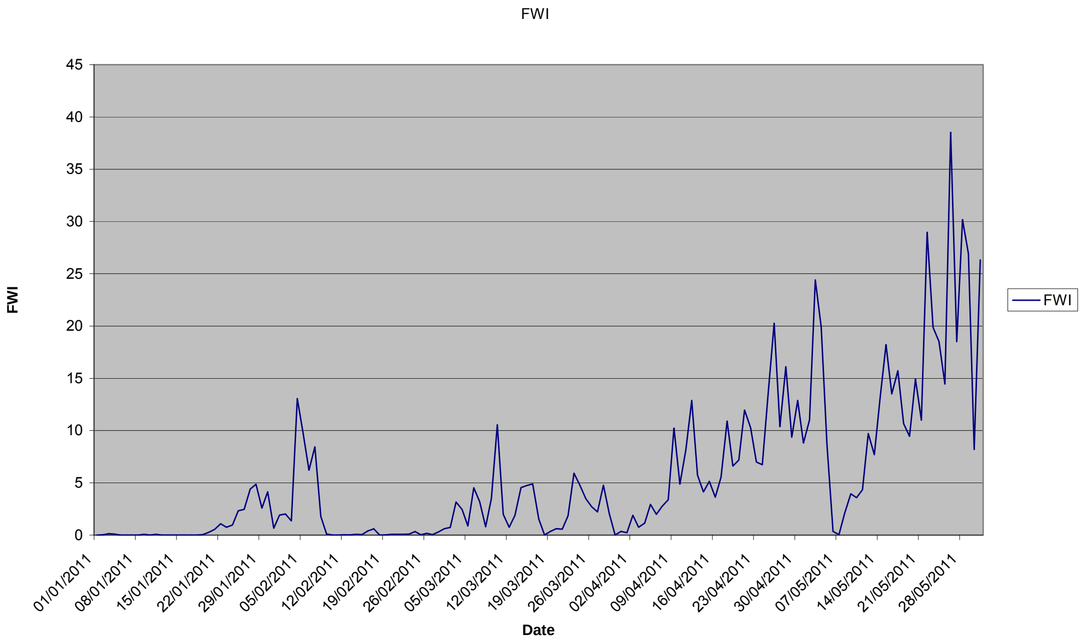

Figure 28 – FWI for Canford Heath

The overall wildfire behaviour indicator reached a value of 20 on the day of the fire, having fallen by 5 points from the previous day. Whilst this was amongst the highest values recorded until that date during the year, much more significant values of the Fire Weather Index can be seen later in May, when it reaches a value of 38 on 26 May.

Torside, Peak District National Park & Marsden Moor, West Yorkshire

Details

Ste name	Torside, Peak District
Grid reference	SK799990
Site description	Moorland. Peat, heather/bilberry, grass and woodland present. SSSI, SPA, SAC, predominantly CROW access land.
Fire started	Sunday, 1 May
Fire under control	Monday, 2 May
Area burnt	31 ha

Fire and Rescue Services were on site forty minutes after the fire was reported. An hour after the Fire and Rescue Services arrived, the neighbouring landowner, United Utilities called in a helicopter to help fight the fire, to avoid it spreading to their land. This, and the quick response in fighting the fire by the Fire and Rescue Services, United Utilities, Peak District rangers and gamekeepers, helped to control the fire in its early stages, which averted a larger scale fire.

Ste name	Marsden Moor, West Yorkshire
Grid reference	SE019115
Site description	Moorland with peat layer more than 0.5m deep. Blanket bog with Molinia, heather and blueberry. SSSI, SPA, SAC and CROW access land.
Fire started	Saturday, 9 April
Fire under control	Sunday, 10 April
Area burnt	315 ha

There were two points of ignition that drew together into a single fire. Between thirty and fifty fire fighters and six tenders were present plus a Fire and Rescue Services wildfire unit, over a 24 hour period. National Trust also called in a helicopter. Windy conditions and dry grass and litter spread the fire. It was a surface fire that didn't get into the peat, although patches of peat were left exposed after the fire.

Weather Conditions

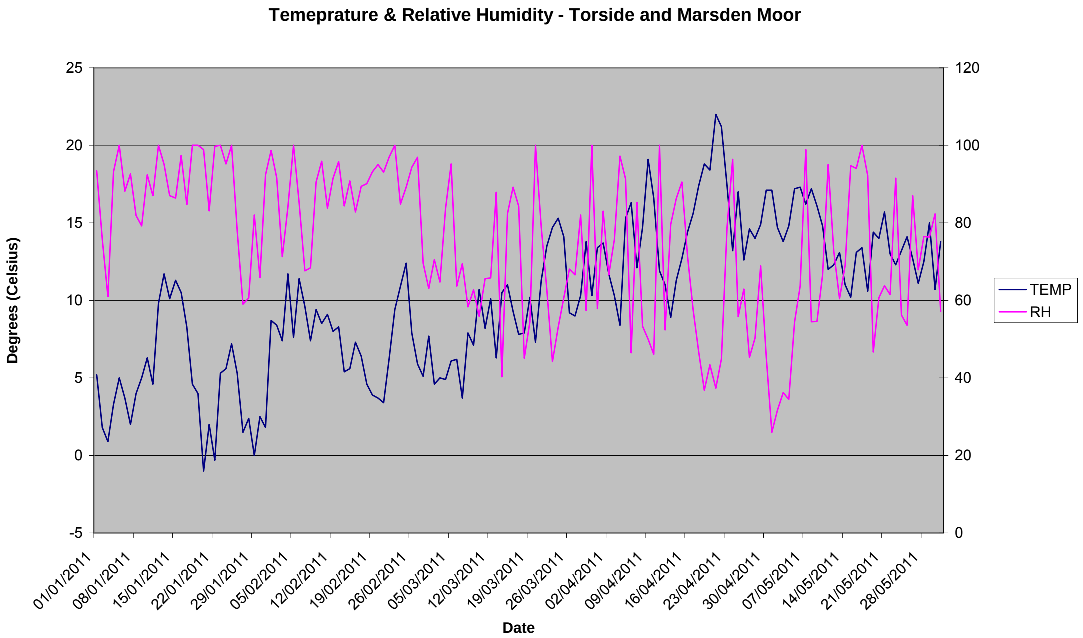

Figure 29 – Temperature and relative humidity for Torside and Marsden Moor

On the 9 April, at the start of the fire at Marsden Moor, temperatures reached an unusual 19.1 degrees Celsius, the highest of the year until that point. This was coupled with a drop in relative humidity to 50% and less over the two day period.

Between 1 and 9 May, during the wildfire event at Torside, temperatures remained between 14 and 17 degrees Celsius for the whole period. On the day the fire started, relative humidity reached an extremely low value of just 26%, indicating extremely dry air on the day. It increased to around 55% by 5 May, spiking at near saturation during a rainfall event on 7 May.

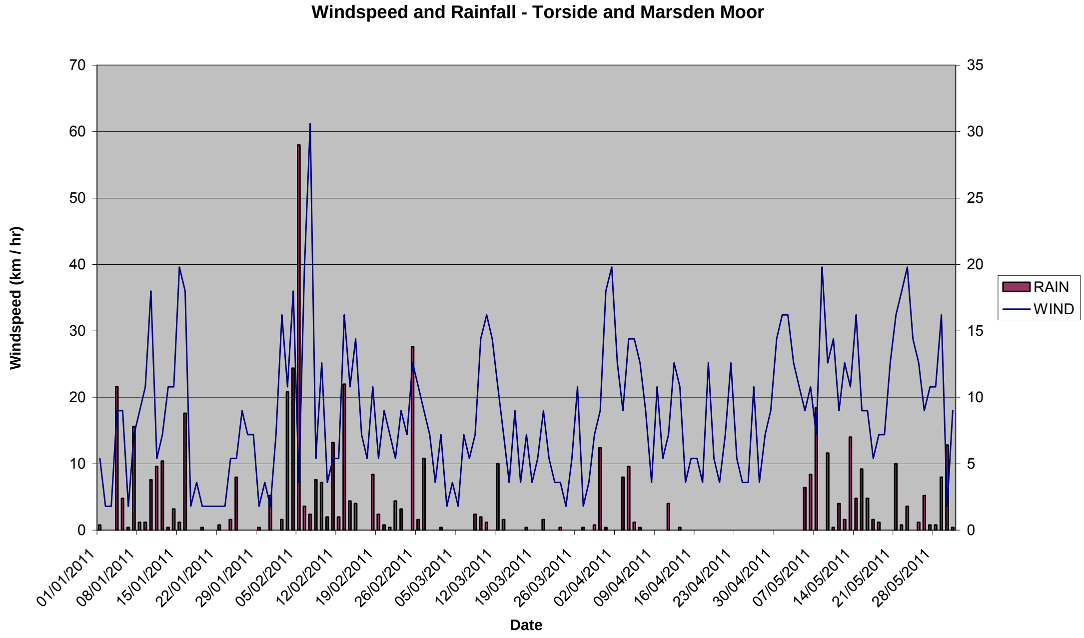

Figure 30 – Windspeed and precipitation for Torside and Marsden Moor

Windspeeds were a fairly typical 21.6 km / hr on 9 April, the start of the Marsden Moor fire, falling to half that speed on 10 April, when the fire was brought under control. The most significant rainfall event ahead of the Marsden Moor fire was in late February, though some modest amounts had fallen during the week ahead of 9 April.

At the start of the Torside event, on 1 May the windspeed was a fairly brisk, though not unusual, 32.8 km / hr. They remained at that level for the following day before dropping. They peaked again on 8 May to almost 40 km / hr, near the end of the wildfire event. Little rain had fallen since the last week of February, though there were some short occasions of moderate rain ahead of the fire. Rainfall was detected at the recording station from 5 May until the 9 May, though this may have been localised, or insufficient to dampen the fire.

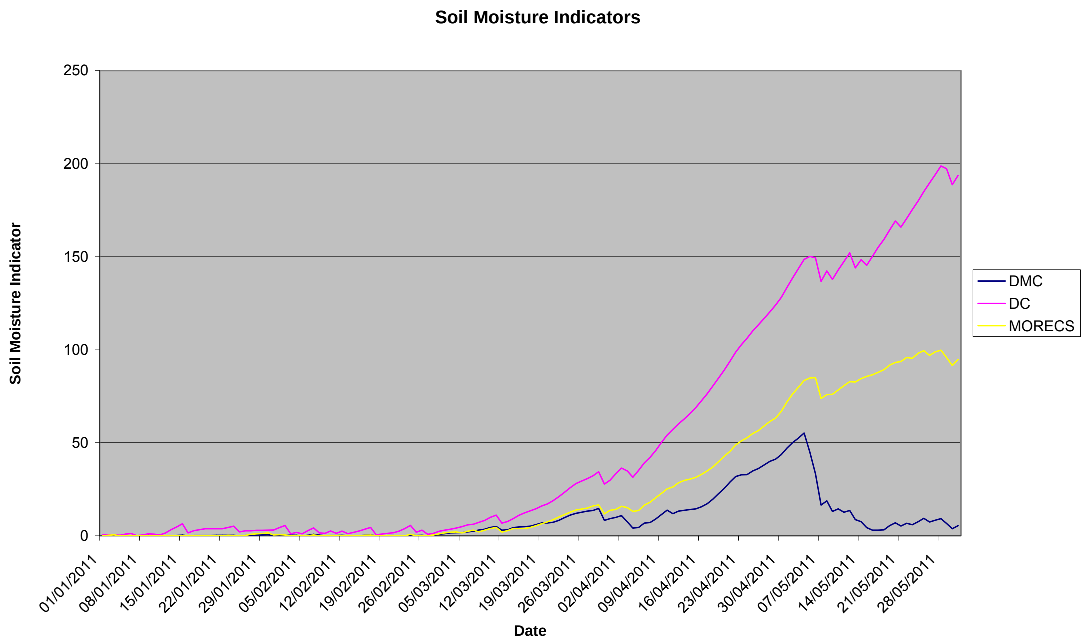

Figure 31 – Soil moisture codes and MORECS for Torside and Marsden Moor

On 9 and 10 April, at the time of the Marsden Moor fire, the soil moisture conditions appeared relatively moist, not yet having risen in response to the warm dry spell. However, by 1 May, at the start of the Torside fire, the conditions had dried more significantly, peaking around 5 May, the central period of the wildfire. The near surface conditions, represented by the Duff Moisture code, appeared to have fallen from that point onwards as the rain fell, though the Drought Code and MORECS suggest that the underlying soils continued to dry out throughout the rest of May.

Fire Behaviour Indicators

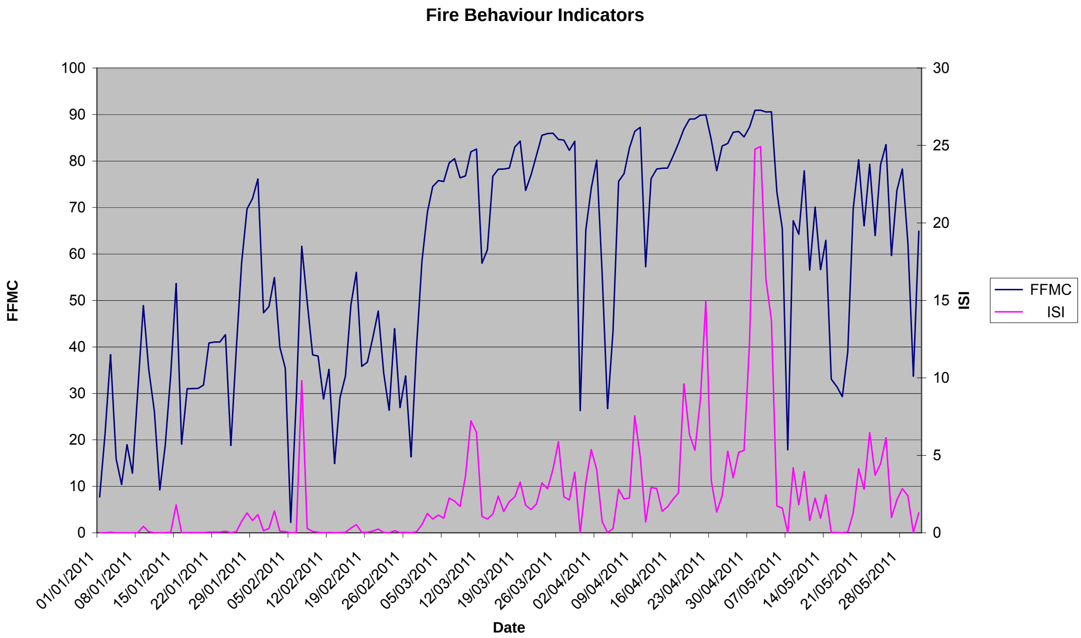

Figure 32 – Fire behaviour indicators for Torside and Marsden Moor

On 9 and 10 April, at the time of the Marsden Moor fire, the surface fine fuels could have dried out to some extent, as the Fine Fuel Moisture Code reached a value of around 88. The likely rate of spread of any fire would be moderate with the slightly elevated (though not unusual) windspeeds, as represented by an Initial Spread Index of 7.5 on the day the fire started.

At Torside on 1 May the Fine Fuel Moisture Code exceeded 90, coupled with a dramatic Initial Spread Index value of almost 25, which persisted for two days. However, both surface fire behaviour indicators fell fairly dramatically by 5 May, reaching normal levels from that point on, though the wildfire continued for a further four days.

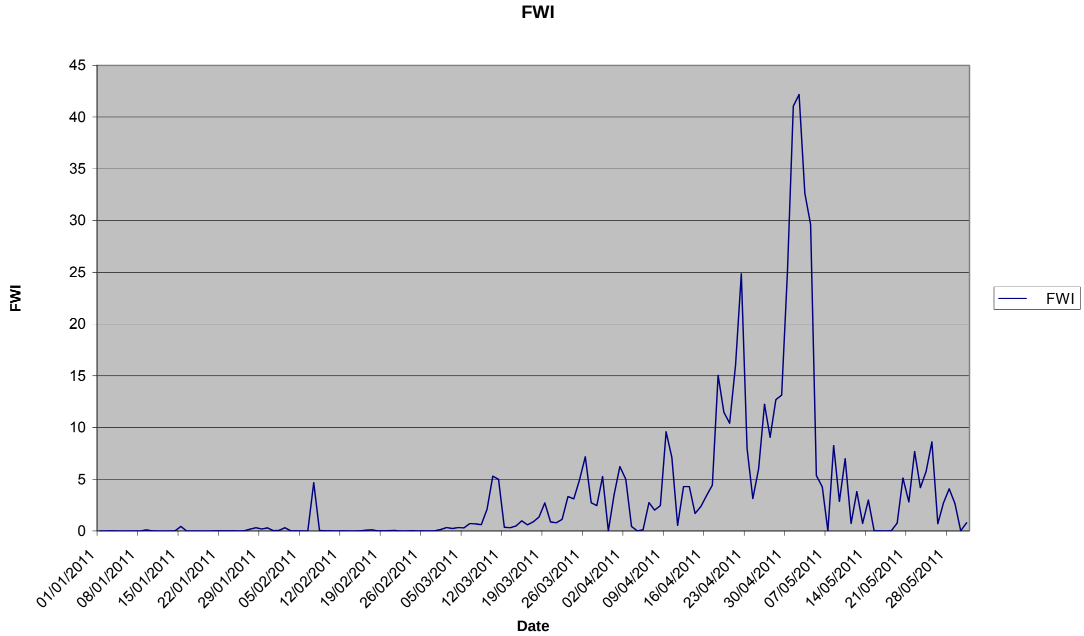

Figure 33 – FWI for Torside and Marsden Moor

The Fire Weather Index was almost 10 on the day the Marsden Moor fire started, falling only slightly the following day. It reached very low levels by 11 April, the day after the fire was extinguished. At Torside, the Fire Weather Index reached a value of 41 on 1 May, the day the fire started, and remained just as high for the following day. It fell substantially on 5 May, though the fire persisted for four more days.

Swinley Forest, Berkshire

Ste name	Swinley Forest, Berkshire
Grid reference	SU852648
Site description	Softwood plantation, predominantly Corsican pine. Some scrub and small open heath. SSSI, SPA and CROW access land.
Fire started	Monday, 2 May
Fire under control	Monday, 9 May
Area burnt	300 ha

A joint surface and treetop fire spread through pine trees, with radiated heat causing the flames to jump fire breaks. Three hundred fire fighters attended from Berkshire and six other Fire and Rescue Services. The fuel loading throughout the forest was high, and fire development and spread was significantly influenced by wind direction and speed, temperature and humidity. In the early stages of the incident, a high wind speed (in excess of 35 km/h) and a changing wind direction combined with very low relative humidity (below 40%) and high temperatures (over 30°C).

As the incident progressed, several fire fronts were created, acting independently of one another. On the second day of the incident a joint surface and crown fire erupted in a thicket of 5m high pines. This fire spread through 7 ha of forest in twenty minutes, with radiated heat causing flames to jump 5 m and 10 m fire breaks. This was only brought under control when the fire encountered a change in the density and type of fuels, the wind speed dropped and the fire faced a downhill slope.

On the fourth day the incident also showed the unpredictable fire development and spread. At the start of the day, very little smouldering was observed; by 3pm – the peak of fire activity – the forest was shrouded in smoke and there were considerable pockets of smouldering fire.

Weather Conditions

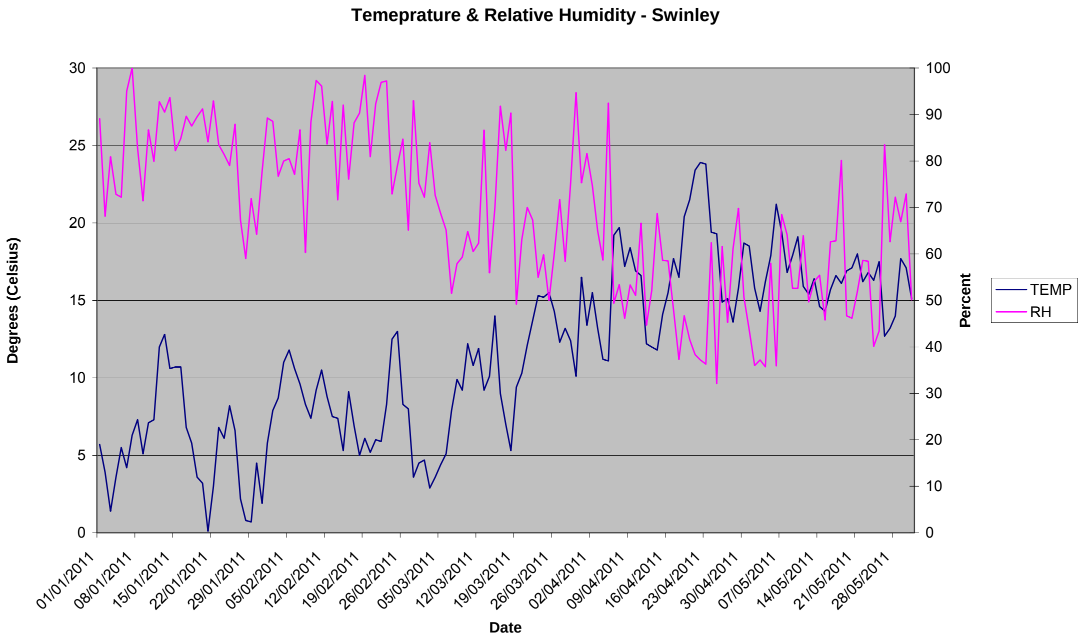

Figure 34 – Temperature and relative humidity for Swinley Forest

On 2 May, when the fire started, temperatures had fallen from their peak the week before, to a moderate 15.8 degrees Celsius. They climbed again, reaching 21 degrees Celsius by 6 May during the event. The relative humidity shows a dramatic fall on the day the fire started, to 36%. It remained low before climbing to over 68% by 7 May, two days before the end of the fire.

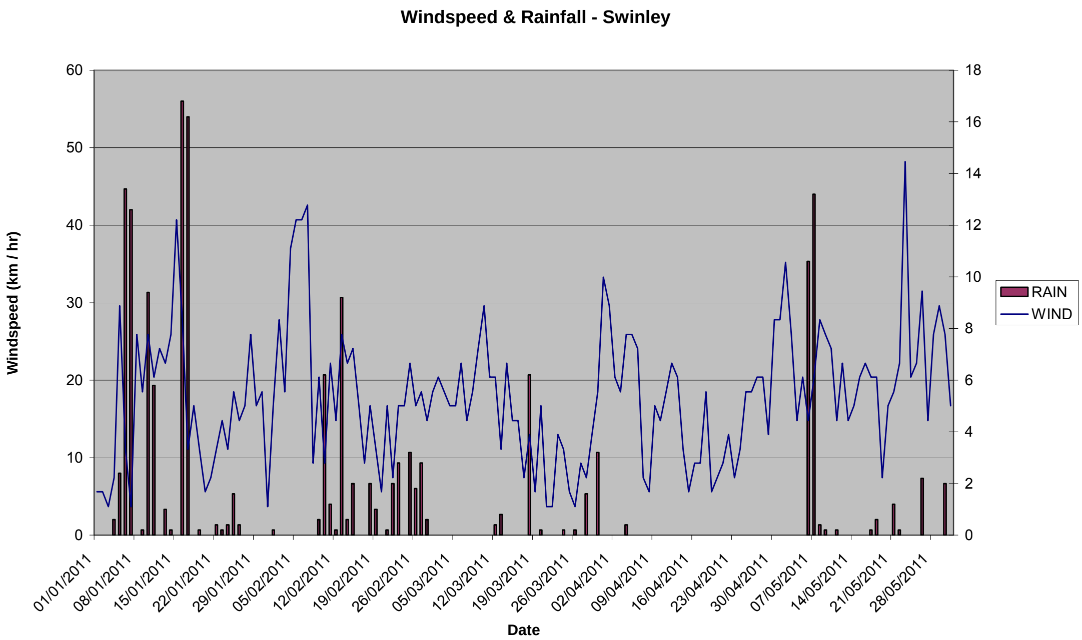

Figure 35 – Windspeed and precipitation for Swinley Forest

The windspeed picked up on the day of the fire start, reaching 35 km / hour. They fell somewhat the following day though remained between14 and 25 km / hour for the duration of the fire. March and April saw little rainfall, the earlier most significant rain having fallen during February, providing dry conditions ahead of the fire. More significant rain arrived on 6 and 7 May, though the deeper rooted fires within the duff layer persisted until 9 May.

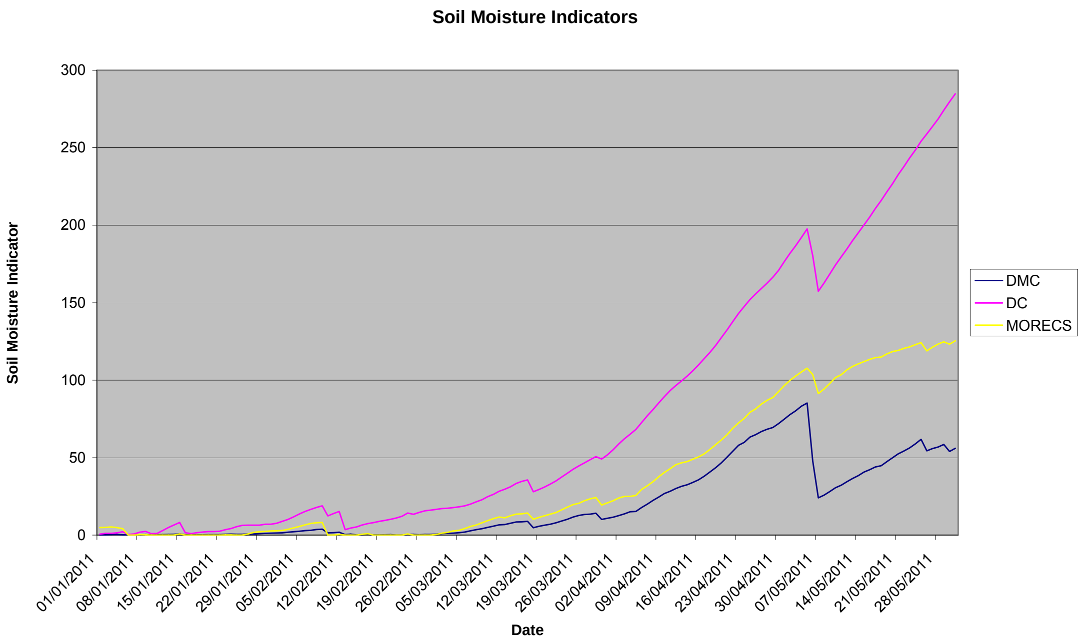

Figure 36 – Soil moisture codes and MORECS for Swinley Forest

The soil layers dried out progressively, in the lead up to the wildfire, peaking on 6 May, before falling in response to the rainfall, after which they continued to climb once again. The Drought Code value of 200 is high for the time of year.

Fire Behaviour Indicators

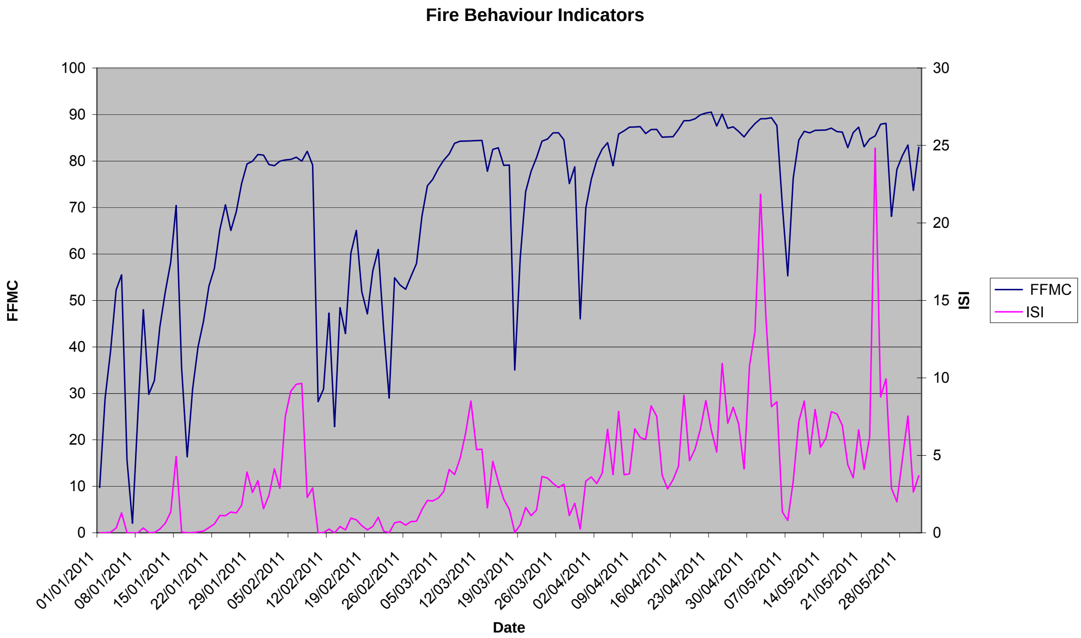

Figure 37 – Fire behaviour indicators for Swinley Forest

The Fine Fuel Moisture Code peaked at 89 on the day the fire started on 2 May. This was coupled with a high Initial Spread Index of almost 22. Whilst the winds eased steadily throughout the period, the surface conditions remained very dry for the first four days of the event, before falling to lower levels.

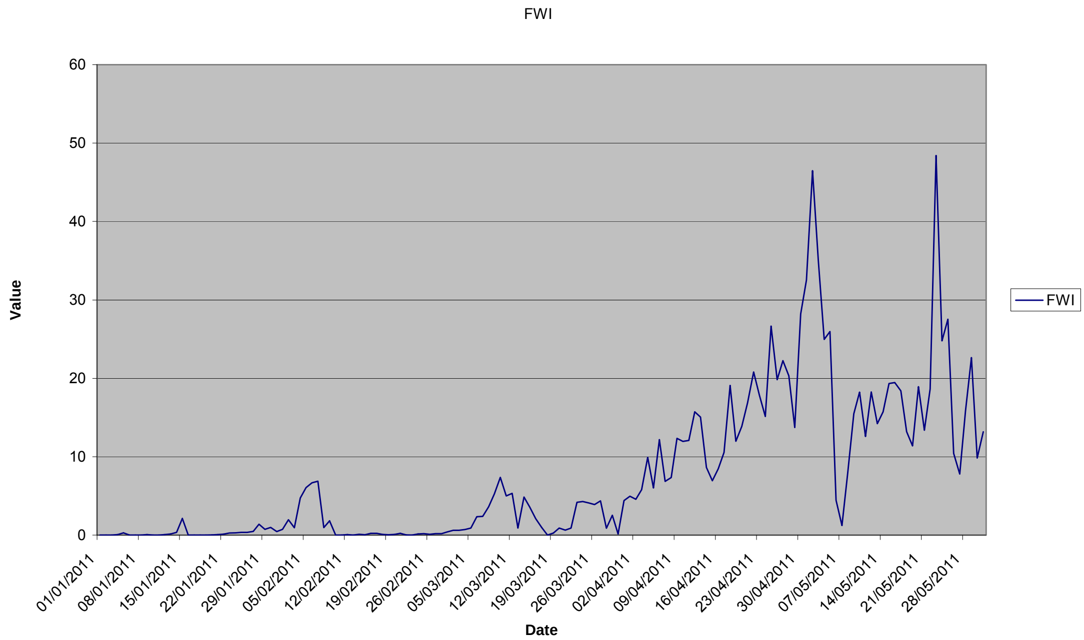

Figure 38 – FWI for Swinley Forest

The overall fire weather indicator, the Fire Weather Index shows the nature of the conditions on 2 May quite dramatically, reaching a value of 46 on the day the fire started. It remained high at a value of 35 the following day, before falling to a still relatively high figure of 25 for the subsequent two days. It fell quickly on 6 May, though the deeper rooted duff fires persisted for another four days beyond that point.

Conclusions

- Overall, the FSI demonstrate considerable skill in identifying the start of the fires
- On many occasions, the FSI indicators fall on the day when the fire was brought under control.
- In other situations, the fire persists beyond the point that the FSI indicators fell. In the case of Swinley, this was due to the deep rooted nature of the difficult to control duff layer fires.
- The weather conditions and the FSI indicators reflect the severity of the fires in most cases.
- The FSI can reflect the conditions when a fire may start. The end of the fire will depend on its extent and nature by the time the fire weather conditions improve, as indicated by the wildfire at Swinley, for example.