

England and Wales drought 2010 to 2012

Much of central, eastern and southern England and Wales experienced a prolonged period of below average rainfall from 2010 to early 2012

The drought was due to a sequence of dry months from winter 2009/10 to March 2012, particularly in the spring, autumn and winter seasons. For England and Wales, this was one of the ten most significant droughts of one to two years duration in the last 100 years. Across southern England, the two-year period April 2010 to March 2012 was the equal-driest such two year period in records from 1910, shared with April 1995 to March 1997.

Impacts

The dry spell from January to June 2010 resulted in low reservoir levels and hosepipe bans across north-west England affecting six million consumers. Fortunately, wet weather in July in the north-west and August in the south-east then eased the situation.

The exceptionally dry spring of 2011 had adverse effects on agriculture and the environment, with eastern counties worst affected. Conditions were difficult for both livestock farmers and growers. River and groundwater levels became very low, resulting in widespread environmental impacts. During May 2011, wild fires affected parts of Highland Scotland, Northern Ireland, mid-Wales, Lancashire and Berkshire.

Drought conditions were declared across parts of central and eastern England in early June 2011. Although these were alleviated by the rather indifferent summer of 2011, the dry autumn and winter 2011 resulted in renewed concerns for farming, water resources and the environment generally. In autumn 2011, farmers struggled to harvest crops from the dry ground.

By March 2012, the area declared to be in drought was further extended to include much of southern, central and south-east England. Several water companies in these areas introduced hose-pipe bans in early April 2012. The sustained warmth and dry weather in late March also resulted in wild fires in parts of south Wales, Surrey and the Scottish Borders. Further significant drought impacts through the summer of 2012 were only avoided as a result of exceptional rainfall from April to July 2012.

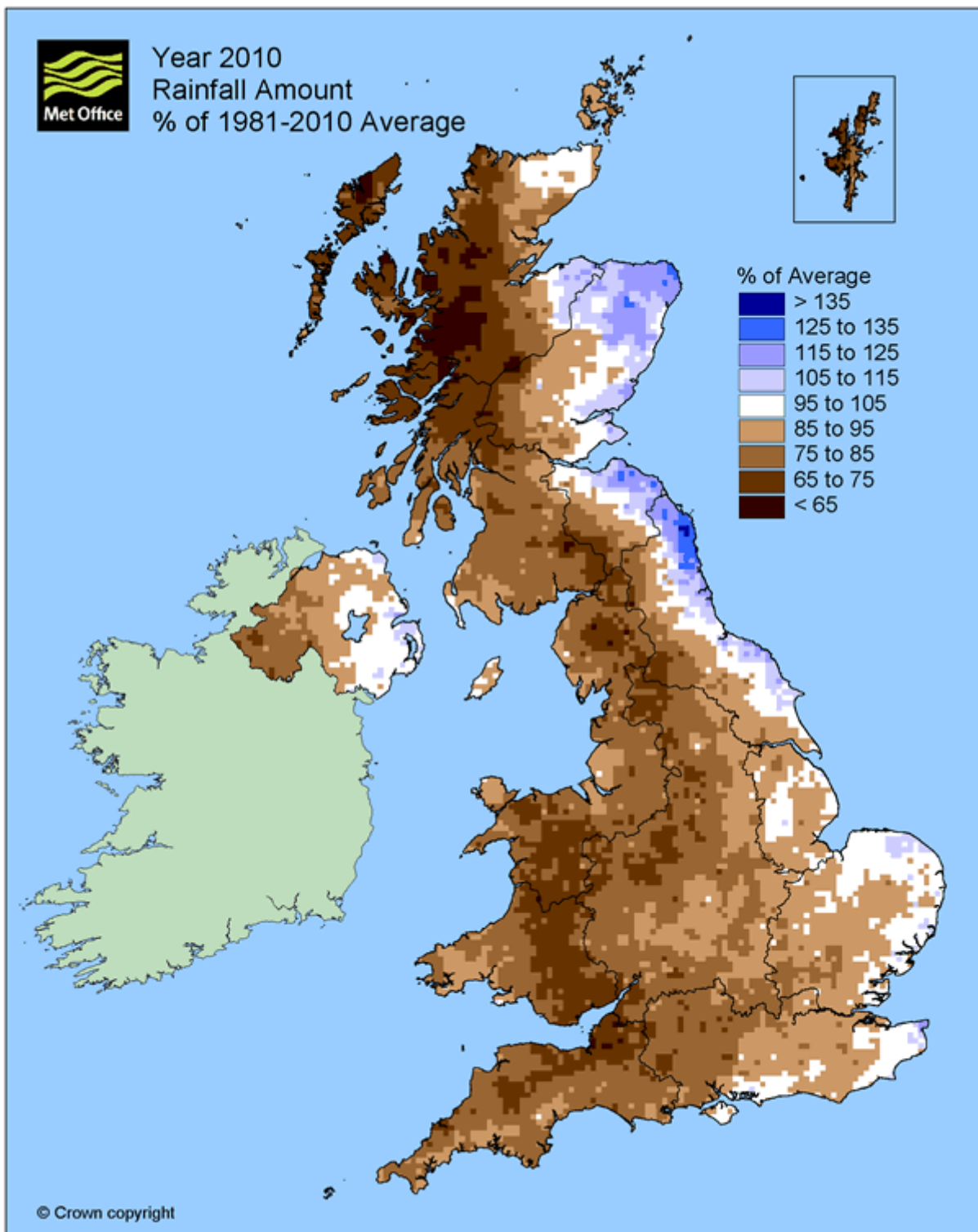
Weather data

After the exceptionally wet November of 2009, winter 2009/10 was very cold with blocked weather patterns and winds often from an easterly direction. This meant that western areas received less rainfall than average. A dry spring followed, so that by June and July the areas of concern in terms of drought were principally north-west England and north Wales - which experienced their driest January to June since 1929.

The situation eased during the summer of 2010, which was somewhat wetter than average. However central southern areas experienced a drier than average autumn, and December 2010 was exceptionally cold, with only 30% of average precipitation widely.

Overall, 2010 was a dry year - the driest since 2003 and 11th driest in the series from 1910 for the UK overall. The driest areas were generally in the west, consistent with frequent blocked weather patterns and absence of rain-bearing Atlantic fronts.

The following map shows rainfall for the year 2010 overall.



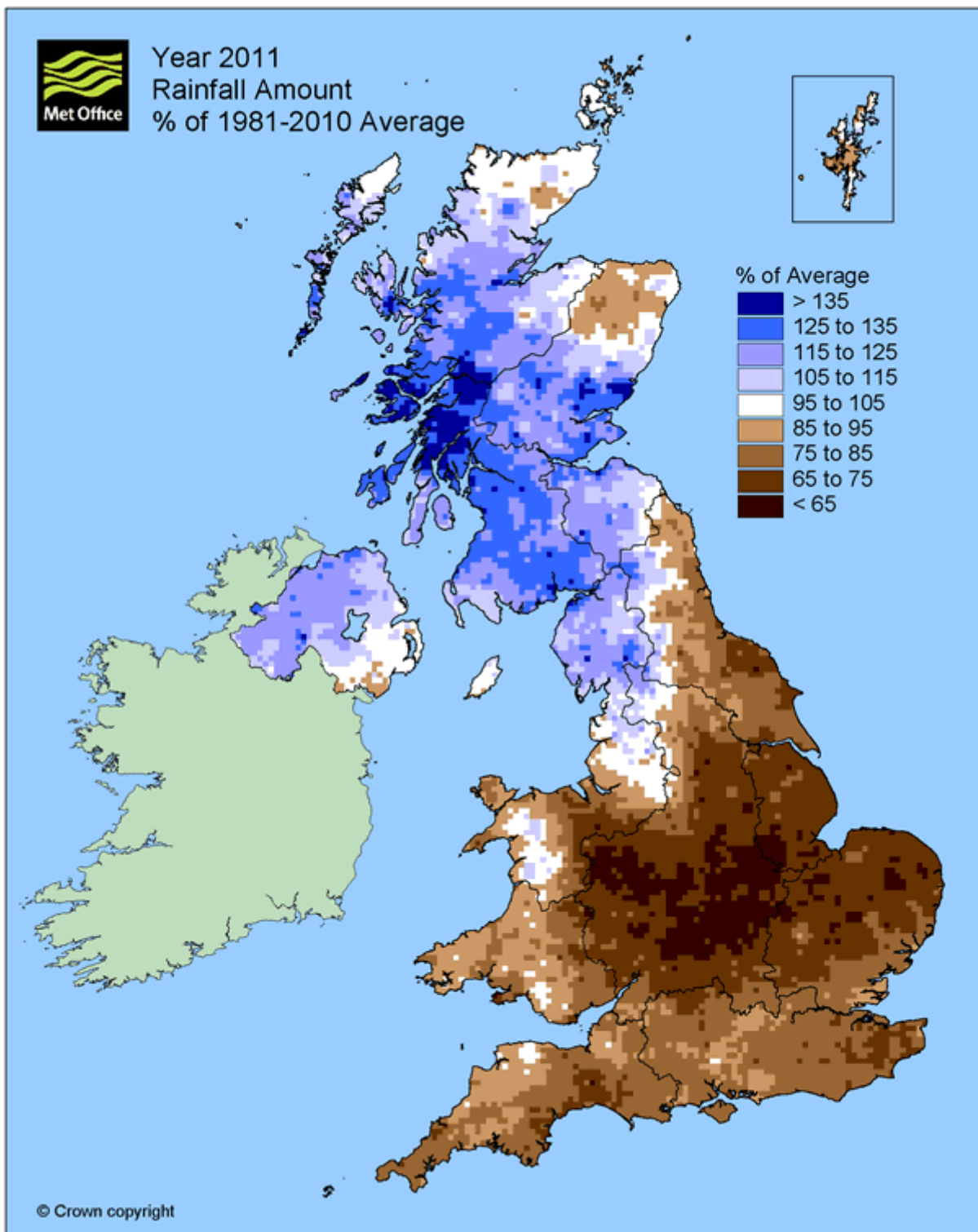
Winter 2010/11 was again significantly drier than average, mainly due to the dry December. This was followed by an exceptionally dry spring - the driest in the series from 1910 across East Anglia and south-east England. It was also the driest spring since 1893 in the England and Wales precipitation series (HadEWP). Some locations recorded less than 25 mm of rain for the whole season.

Summer 2011 was

rather indifferent and wetter than average for the UK overall (parts of Kent recording more rain on 5 June 2011 than for the whole of spring). However, an area of central England remained stubbornly drier than average. Autumn 2011 was again dry in south-eastern areas - across southern England it was the driest autumn since 1985. December was stormy in the north but rainfall totals were only near average in the south.

Overall, 2011 saw an exaggeration of the normal north-west / south-east rainfall gradient across the UK. Some locations in north-west Scotland recorded over 4,000 mm of rain for the year and for Scotland overall it was the wettest year in the series from 1910. In contrast, parts of south-east England recorded less than 400 mm and for East Anglia it was the driest year since 1921.

The following map shows rainfall for the year 2011 overall.



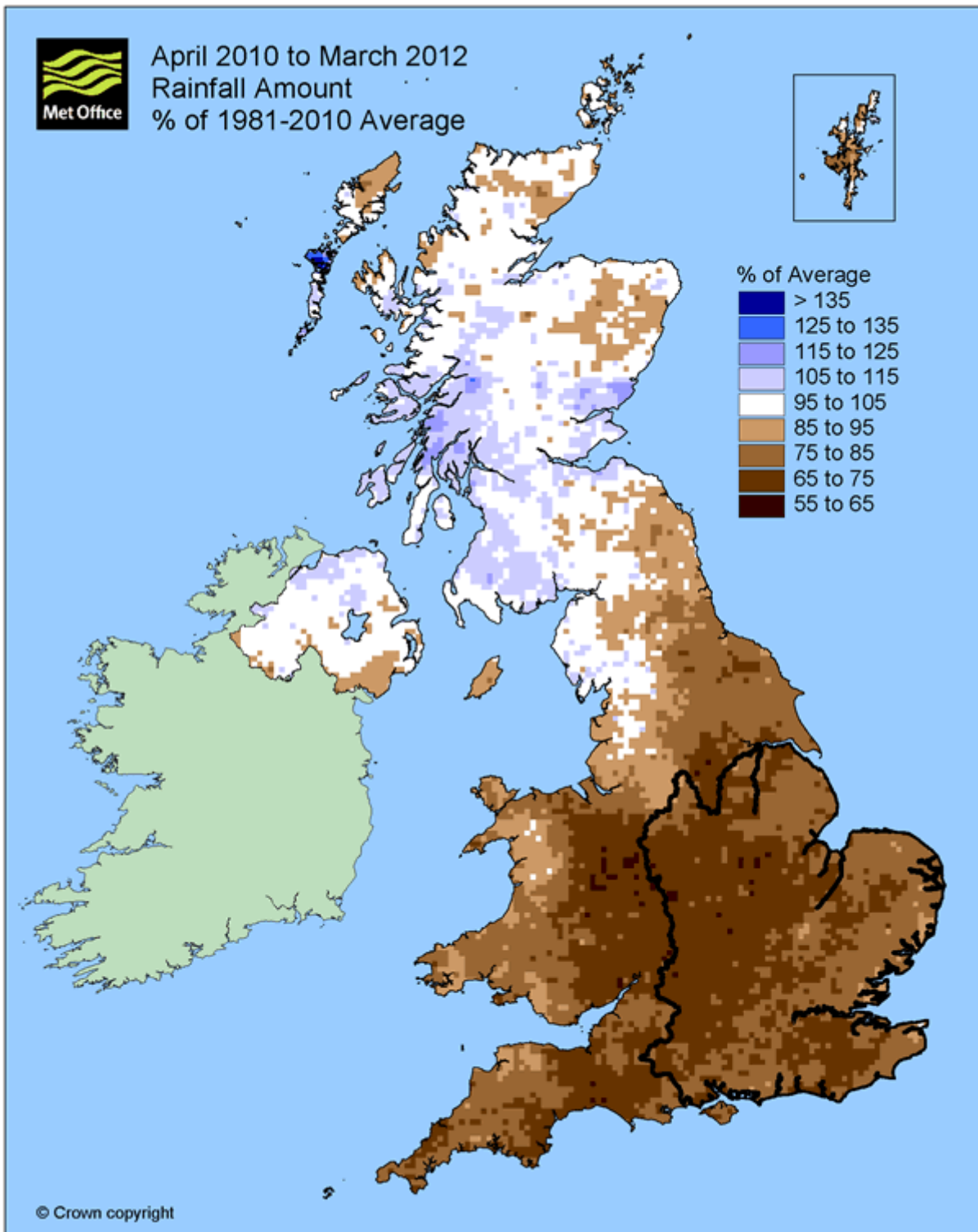
Significant winter rainfall was required across southern England to allow the water resource situation to recover - but this did not occur. The north-west / south-east rainfall gradient in autumn 2011 persisted through winter 2011/12 with below average rainfall across southern, central, and eastern England and eastern Scotland. March 2012 was also a very dry month - the driest March since 1953 across the

UK overall.

Over the 24 months April 2010 to March 2012, most of England and Wales received less than 85% of average rainfall, with a large area of the Midlands less than 75%. The map shows rainfall totals as a percentage of average for this period.

Across 'Lowland England' (shown in bold on the map), 12 of the previous 24 months saw 60% or less of average rainfall. In this area, groundwater (mainly from chalk aquifers) is an important water resource. Groundwater resources usually decline in summer and recharge in winter. As a result of persistent below-average rainfall, particularly through two consecutive winter 'half-year' periods (October to March 2010/11 and 2011/12), groundwater levels were exceptionally low for the time of year by March 2012.

A contributing factor to the drought was the warmth experienced in both spring and autumn 2011. These were the equal-warmest and second warmest such seasons in the Central England temperature (CET) series



from 1659 - a series of over 350 years. In April 2011, daily maximum temperatures were often 5 °C above average, while in a heat wave from late September to early October 2011, a new UK October temperature record of 29.9 °C was set on the 1st at Gravesent (Kent).

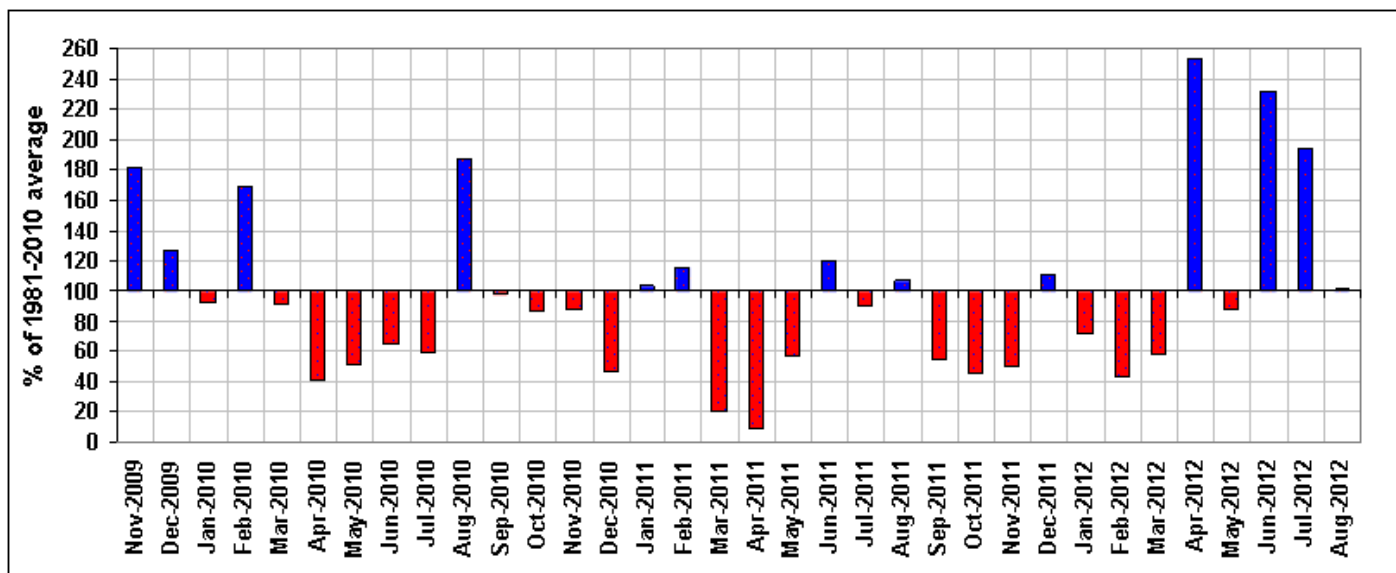
The unusual warmth resulted in increased evaporation, causing drier soils and making conditions difficult for agriculture. Dry soils also prevented infiltration of

rainfall for the recovery of groundwater levels during winter 2011/12.

Comparison with previous droughts

There are many droughts in the UK's historic record. However, the key characteristics of *duration*, *areal extent* and *intensity* vary, making comparisons complicated. Some droughts occurred over one or two winter seasons, others were most intense during the summer, coinciding with heat waves.

The table below makes a simple comparison of key droughts of one to two year duration for the last 100 years across Lowland England. A comparison is made both with the accumulated rainfall deficit, and the percentage of the long-term average (LTA) rainfall, for the duration of each drought. Across Lowland England, the deficit built up over the 2010-12 drought's duration was 354 mm (the 1981-2010 LTA annual rainfall is 702 mm, so



the LTA for any 24 month period is 1,404 mm).

Table 1: Droughts across Lowland England since 1910, ranked by rainfall deficit

Start month	End month	Duration (months)	Total rainfall (mm)	Deficit (mm)	Total rainfall as % of 1981-2010 Average
Apr-1995	Apr-1997	25	1,004	451	69
Aug-1920	Dec-1921	17	630	401	61
Mar-1990	Feb-1992	24	1,006	398	72
May-1975	Aug-1976	16	541	381	59
Apr-2010	Mar-2012	24	1,050	354	75
Apr-1933	Nov-1934	20	829	348	70
Aug-1947	Sep-1949	26	1,181	340	78
Aug-1972	May-1974	22	995	300	77
Feb-1943	Jun-1944	17	662	295	69
Aug-1988	Nov-1989	16	702	262	73
Nov-2004	Apr-2006	18	810	241	77
Dec-1963	Feb-1965	15	639	240	73

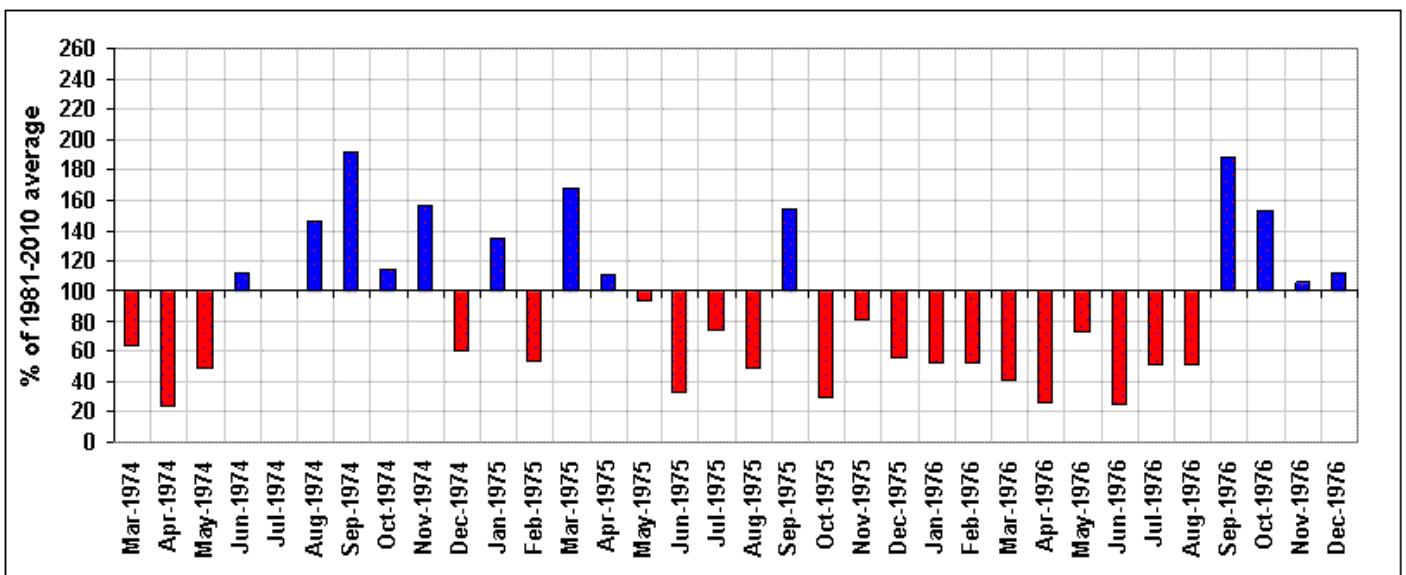
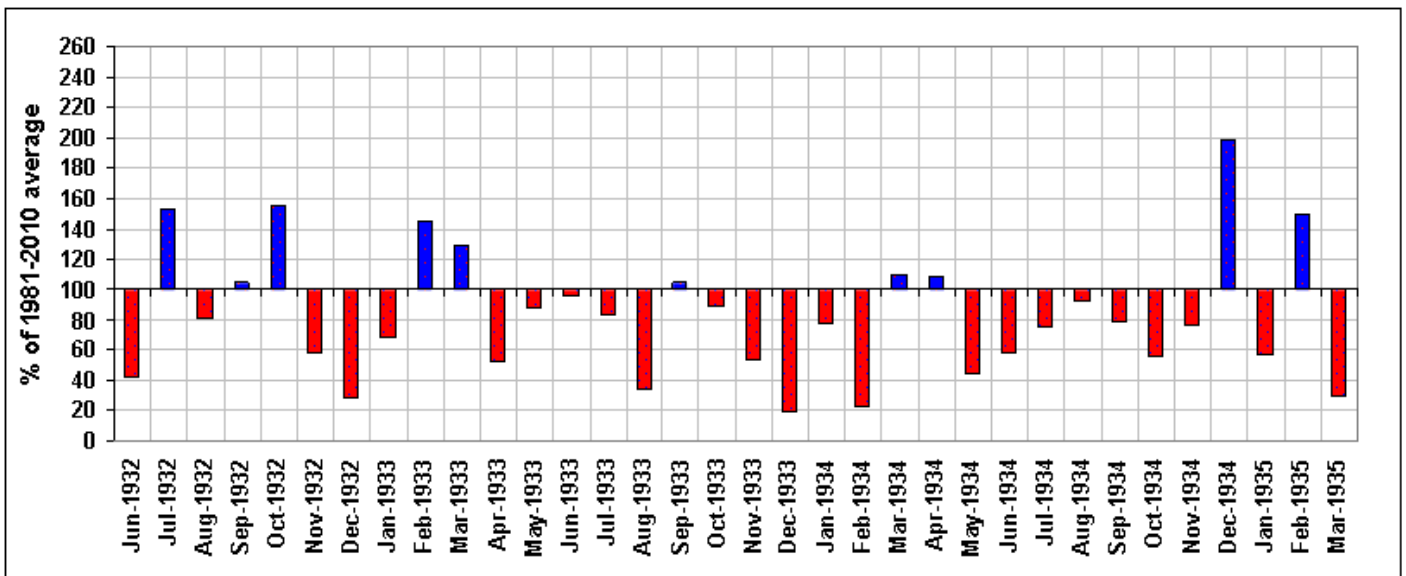
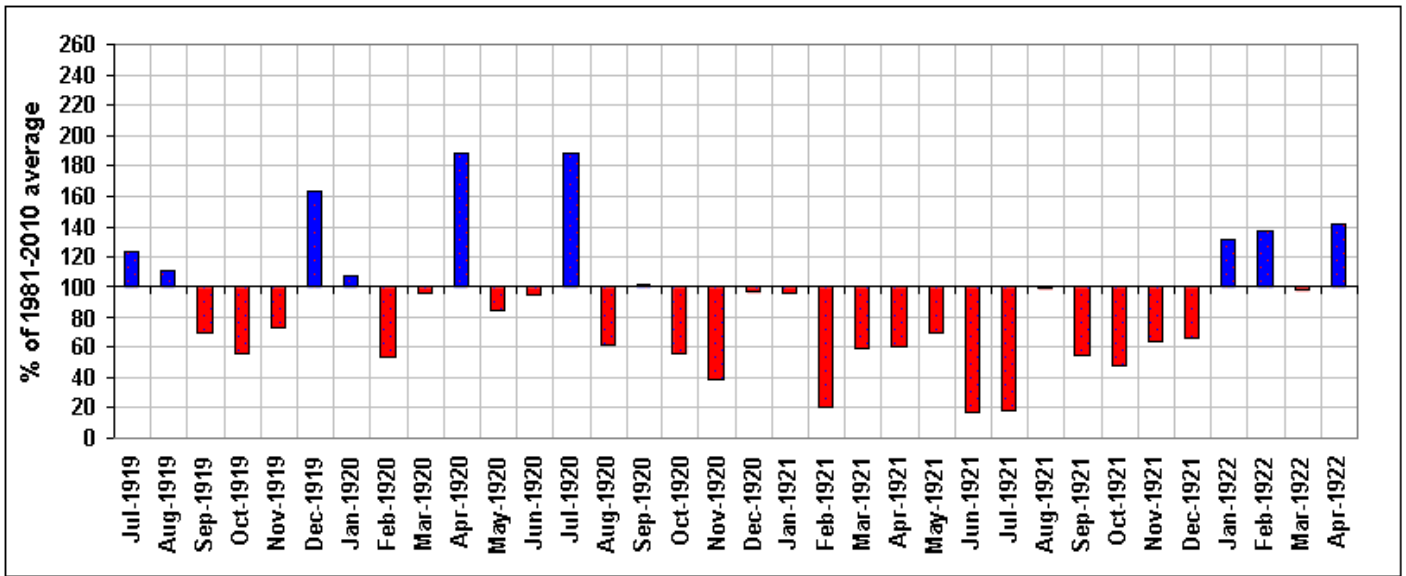
The most notable examples of previous droughts over the one to two year timescale include 1975-76, 1933-34 and 1920-21. More recently, there were also significant droughts in 1990-92, 1995-97 and 2004-06.

The 1975-76 drought was the most significant drought for at least the last 150 years in the UK, and is usually regarded as a 'benchmark' against which all other droughts are compared. Much of England and Wales received less than 65% of average rainfall from May 1975 to August 1976, with some parts of southern England receiving less than 55%. The drought coincided with a major heat wave from late-June to early July 1976, before abruptly ending with the very wet months of September and October 1976.

In comparison, for 2010-12, the worst effects of an intense summer drought were avoided, because summer 2011 was cool and rather wetter than average overall. Most of the dry months occurred in the autumn, winter and spring seasons. Even though the 2010-12 drought was not as severe as that of 1975-76, it is comparable with several other major droughts in the table. Overall, across England and Wales, it is judged as one of the 10 most significant droughts in the last 100 years.

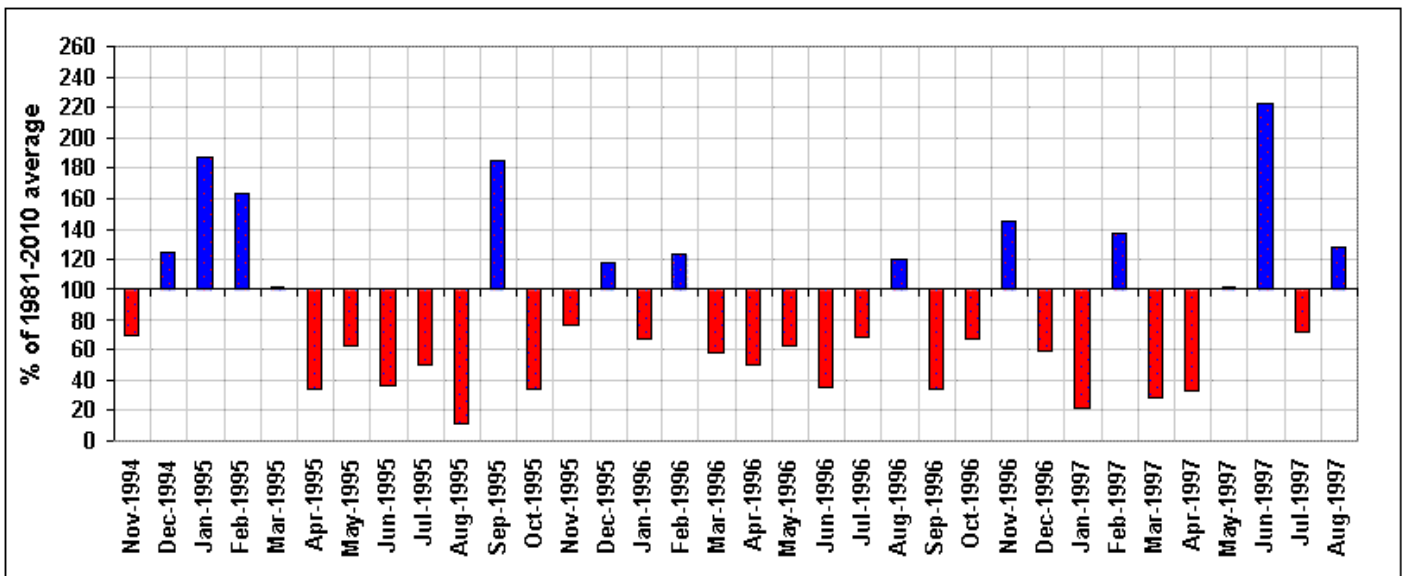
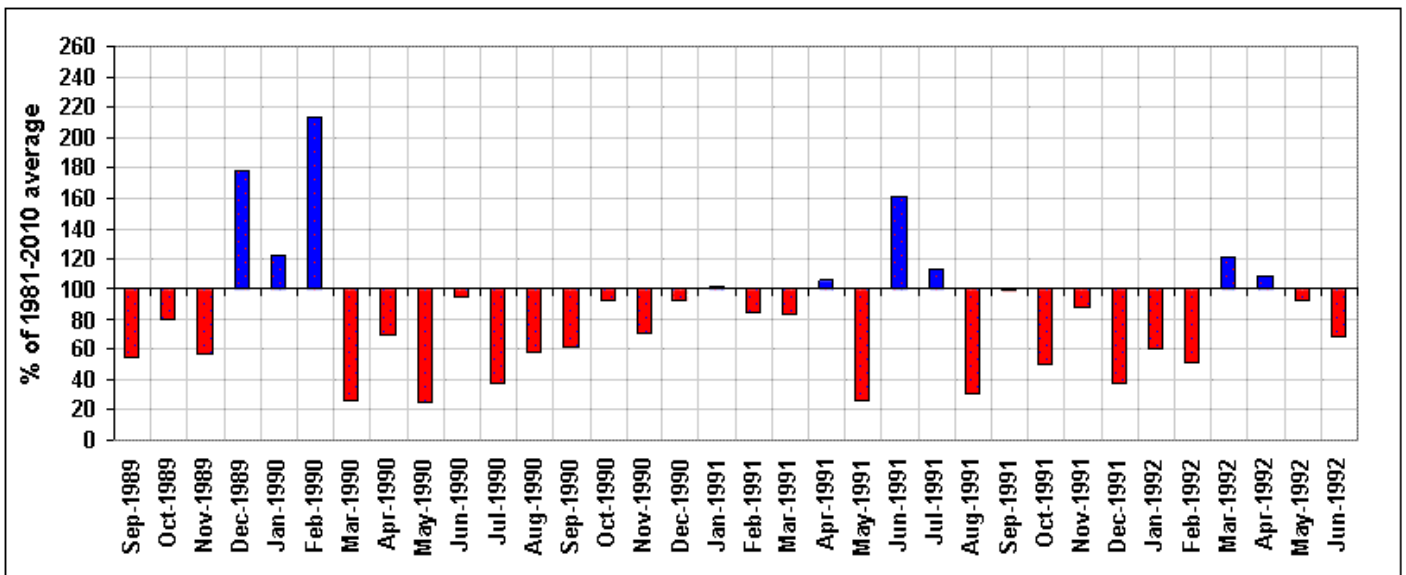
The bar-charts below show monthly rainfall anomalies for 1920-21, 1933-34, 1975-76, 1990-92 and 1995-97.

April 2012 onwards



From April 2012 there was a decisive change in weather patterns across the UK. Rainfall totals for April to July 2012 were the highest on record across England and Wales bringing the drought to an abrupt and dramatic termination. Instead, the focus rapidly turned to flooding problems. This exceptionally wet spell is described as a separate weather event linked from the [Past weather events](#).

For a more detailed summary of the 2010-12 drought, refer to the following publication:



Kendon M, Marsh T, Parry S. 2013. The 2010-2012 drought in England and Wales. *Weather* 68: 88-95.

Last updated: 9 May 2013