UK Hydrological Bulletin: May – July 2013

After the hydrological pyrotechnics of last year, runoff patterns were more subdued through the first half of 2013, but temperatures were seasonally very unusual: an exceptionally hot July followed a notably cool spring. River flows and aquifer replenishment were generally within the normal range through the spring and early summer and overall water resources remained healthy. However, the persistence of high pressure during most of July — with an associated prolonged heatwave — changed the complexion of the landscape and the arid conditions triggered sustained river flow recessions.

By mid-July heat stress had become a significant health issue, the parched soils were impacting on agriculture and fire risk in the countryside had increased markedly; there was also significant ecological stress as headwater streams dried up. Although, overall reservoir stocks, and groundwater resources, remained well within the normal summer range, heatwave-related surges in water demand stretched water treatment and distribution capacities. Late July witnessed a further transformation: heavy rainfall and intense thunderstorms terminated lengthy sequences of rainless days in most areas, disruptive flash flood events were very common and, approaching month-end, flood alerts were widespread across northern Britain

May was a very unsettled month with a distinctly autumnal feel. It was the coldest May since 1996 and successive incursions of polar airmasses contributed to substantial snow accumulations on high ground. The third week was especially unsettled; a sequence of deep Atlantic depressions brought heavy rainfall and gale force winds which impacted most severely in western areas. On the 13/14th, parts of Carmarthonshire recorded rainfall totals in excess of 70 mm. Moderate snow accumulations then contributed to, mostly modest, floodplain inundations during the third week — but the Tywi and Eden were among a number of rivers where peak flows exceeded the previous May maximum; in Northern Ireland, the River Faughan also established a new highest flow for the month in a series from 1976.

The very cool May contributed to the coldest spring since 1962 for the UK and in the Central England Temperature series, average temperatures over the March-May period have not been appreciably lower since 1891. Correspondingly, many crops were slow to become established and transpiration losses were moderate. Nonetheless, the development of soil moisture deficits was far more typical of average conditions than in either 2011 or 2012 (see Figure 1). Correspondingly, river flows followed typical seasonal recessions albeit with runoff rates below average in most regions. However, many groundwater-fed streams were still flowing healthily — a legacy of the record aquifer recharge in 2012. For the Coln, which drains part of the Cotwolds, flows had remained above the daily average for over a year (Figure 2), the longest such sequence in a 50-year series. For the spring as a whole, outflows from Britain were appreciably below average for the fifth successive year; a tendency

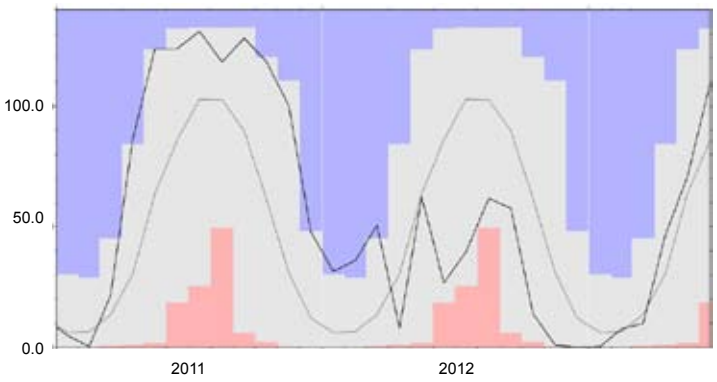

Fig 1 *End- of- month soil moisture deficits for the English Lowlands (the blue and pink envelopes represent the pre-2011 monthly max. and min.; the grey trace is the long term average). Data source: MORECS*

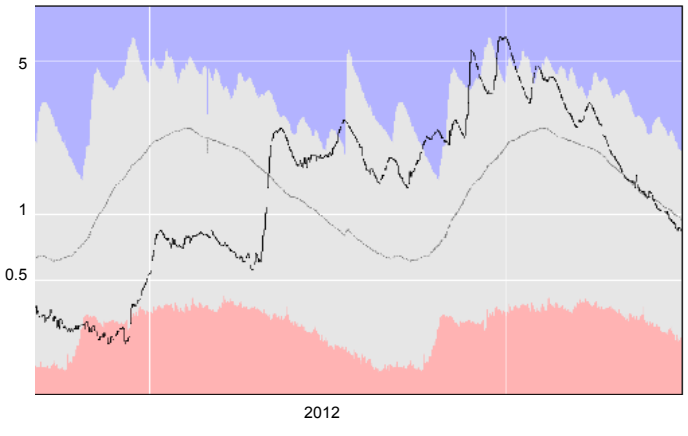

Fig 2 *Daily mean flows for the River Coln at Bibury (the blue and pink envelopes represent the pre-2011 monthly max. and min.; the grey trace is the long term average).*

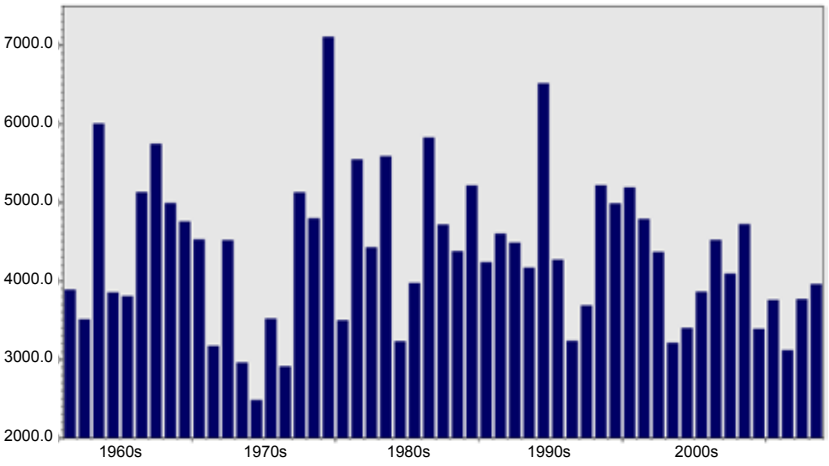

Fig 3 *Spring (March-May) outflows from Great Britain 1961–2013*

to decline may be recognised from the late 1970s (see Figure 3).

June was another relatively cold month with rainfall totals generally below average; England registered its driest June since 2006 with some, mostly eastern, areas recording monthly rainfall totals of less than 15 mm. For the UK as a whole, only May registered above average rainfall over the first six months of 2013 and, by the end of June, moderate rainfall deficiencies had developed across much of the country. The most notable shortfalls were in the west; north-west England recorded its third lowest January–June rainfall in the last 40 years. Despite the limited rainfall, reservoir stocks and groundwater resources generally remained well within the normal seasonal range.

Early in July the Jet Steam adopted a more northerly track, allowing the Azores high pressure cell to extend across almost all of the UK — heralding an exceptionally warm and dry episode which lasted through most of the month. Many areas reported 20, or more, successive days without a trace of rainfall (but there were some observations of virga – precipitation that evaporates before reaching the ground). Heatwave conditions extended across much of the country; temperatures even nudging 30°C at Aviemore, and daily maxima exceeded 28°C for lengthy periods.

As soil moisture deficits climbed steeply, the countryside — verdant in the early summer — took on a very parched complexion. The arid conditions triggered a spate of woodland and heathland fires and substantial increases in both spray irrigation and domestic demand — reportedly rising by 30% in some localities. Seasonal river flow recessions steepened with a corresponding contraction in the stream network; in the fourth week, the Environment Agency rescued fish isolated in headwater reaches of the River Teme (Herefordshire) as both water levels and oxygen content, declined.

A southward excursion of the Jet Stream late in July brought an abrupt termination to the rainless episode in most, but not all, areas. With synoptic patters dominated by low pressure, very humid air was drawn across the UK from the south, resulting in frequent, and locally violent, thunderstorms. On the 22/23rd Nottingham recorded a rainfall total of 67.8 mm in 24 hrs – nearby Market Bosworth (Leics) registered 21 mm in less than an hour — and on the 26/27th many localities (including Manchester and Durham) reported 24-hr totals of 30–50 mm. Much of the rainfall was convective and its intensity overwhelmed local drainage capacities; urban flash flooding was common and transport disruption considerable — the rail service between Edinburgh and Berwick were interrupted on the 23rd. Seasonally notable spates were also common in rivers draining impermeable catchments, particularly across Scotland and northern England. Weather patterns remained unsettled with further, mostly urban, flooding in southern Britain but Flood Alerts were widespread across Scotland during the final week of July.

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