UK Hydrological Bulletin: August – October 2011

Fortunately, in the context of the 2011 drought, the second driest spring (March–May) in the 112-year England & Wales rainfall series[1], was followed by a decisive synoptic change during early June — heralding a summer during which cyclonic weather patterns were dominant. For the UK as a whole the summer was both wet and relatively cool: average temperatures over the June–August period were the lowest since 1993 and rainfall was above average for the fifth year in succession.

However, regional contrasts, which have been a feature of rainfall patterns throughout the year thus far, were exceptional. This was exemplified in August when rainfall for the Tweed basin was the third wettest since 1963 whilst some areas to the south remained notably dry: Shrewsbury recorded only 12 mm of rain over the month, contributing to the lowest summer rainfall total for the Midlands for 15 years; the Western Isles in Scotland were also very dry.

[1]Unless otherwise stated all rainfall comparisons are based on time series maintained by the National Climate Information Centre (Met Office).

The associated regional contrasts in soil moisture conditions were reflected in summer river flows. Flood Alerts were widespread in both July and August in Scotland where soils were close to saturation. To the south however, soil moisture deficits continued to increase, albeit erratically, and river flows were generally well below average across southern Britain and parts of Northern Ireland. By the late summer, a zone of especially depressed runoff extended from Cornwall to the Humber. In Somerset, runoff for the River Tone was the lowest for the March–August period since the extreme drought of 1976. Low river flows, often accompanied by low oxygen levels, necessitated fish rescues e.g. in the River Tarrant (Dorset) and River Redlake (Shropshire); aeration equipment was also deployed (e.g. in the Hatfield Waste Drain near Doncaster).

The early autumn rainfall generally served to accentuate the existing spatial contrasts. September was wet in Scotland, particularly in the west where the remnant of Hurricane Katia produced a 2-day rainfall of 142 mm at Invergulas during the second week. Across much of the English Lowlands however, monthly rainfall totals were less than 50% of average. Regional contrasts are remarkable over a range of timespans. In the March–September timeframe, Scotland exceeded its previous maximum rainfall whilst the Midlands registered its second lowest rainfall (after 1990) in a series from 1910; rainfall deficiencies were especially notable in Leicestershire, Warwickshire and Shropshire.

With declining baseflow contributions from groundwater (see below) September river flows were again depressed across much of southern, central and eastern England where the failure of high level springs increased through the month. Runoff over the water-year (October-September) was been notably low in index catchments across the Midlands, south Wales and south-west England: the Trent registered its 4th lowest runoff, whilst the Taw registered its 2nd lowest, both in records beginning in 1958. Nevertheless, the frequency of modest, and short-lived, summer spates generally ensured that river flows remained above drought minima – see the 50-year series of estimated Q95 outflows from the English Lowlands (Figure 1).

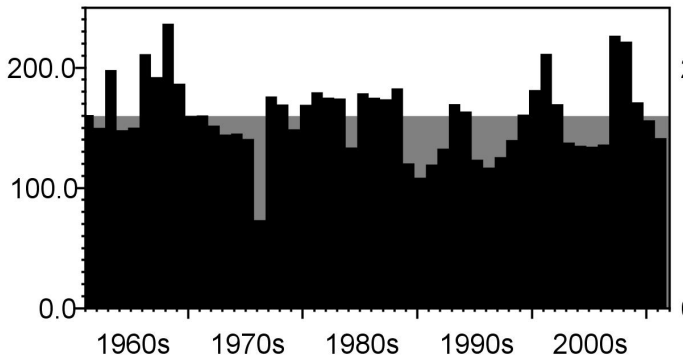

Fig 1 *Estimated Q95 (for the water-year) outflows from the English Lowlands (in m^3s^{-1}); the grey infill is the long term average*

Early October reservoir stocks were very healthy across most of northern Britain but well below average in many gravity-fed reservoirs in parts of southern England (see Figure 2) and the Midlands where stocks at Charnwood (Leicestershire) were only around 40% of capacity. After very sustained recessions, groundwater levels are now substantially below average across most major aquifer outcrop areas, and nearing natural base levels in a few index wells and boreholes, e.g. at Alstonfield in Magnesian Limestone of Staffordshire and Rockley in the Wiltshire Chalk (see Figure 3).

In most of the drought-afflicted areas, no short term recovery in reservoir stocks and, particularly, groundwater levels can be expected. Whilst soils remain close to saturation across much of northern Britain,

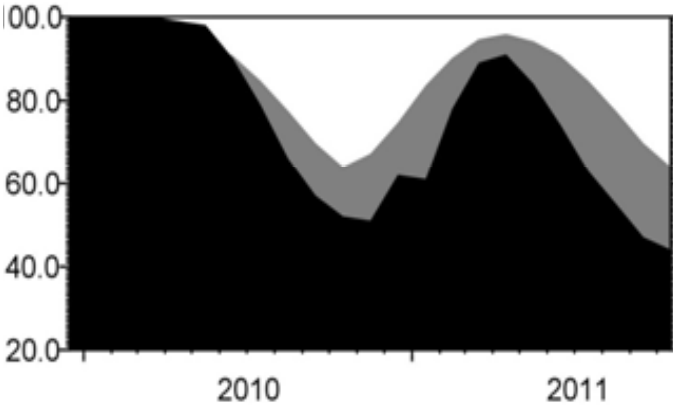

Fig. 2 *Monthly reservoir stocks (as a % of capacity) for Wimbleball Reservoir (Somerset); the grey infill is the long term average*

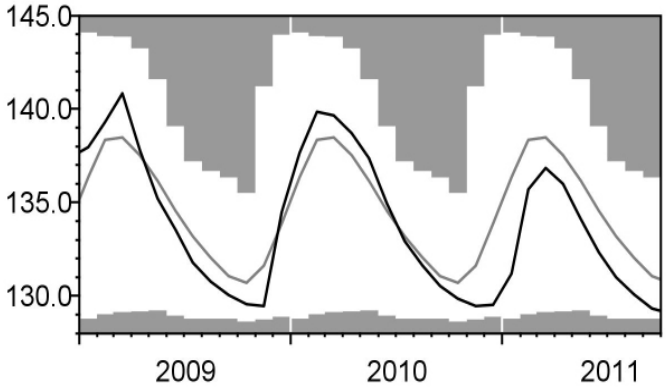

Fig 3 *Groundwater levels (metres aOD) in the Chalk at Rockley*

soil moisture deficits (SMDs) at the end of September across much of eastern, central and southern England were the equivalent 10-12 weeks of average residual rainfall. October was a remarkably mild month but, again, whilst much of Scotland and Northern Ireland was notably wet, below average rainfall characterised many areas to the south. The limited rainfall and seasonally high temperatures, and the associated desiccated soil conditions caused significant problems for farmers – the lifting and sowing of crops in particular – and has further delayed the seasonal recovery in runoff and recharge rates. Late October saw a sequence of active Atlantic frontal systems crossing the UK bringing substantial rainfall totals to western areas, Bodmin (Cornwall) recorded a 2-day total of 70.6 mm on the 23/24th, and flood alerts were common in northern and western Britain. However rainfall across the English Lowlands, whilst very welcome, was generally of a moderate magnitude. The recent unsettled spell will need to herald a sustained change in synoptic patterns to allow rain-bearing frontal systems to track across those regions with long term rainfall deficiencies and help to ensure that surface and groundwater resources are restored to their normal range by the spring of 2012.

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