

# UK Hydrological Bulletin:

## August – October 2013

In the first nine months of 2013, rainfall for Britain exceeded the 1971–2000 monthly average only in May and the driest summer since 2003 contributed to significant rainfall deficiencies, particularly over timespans of four and eight months, by the end of September. Estimated outflows from Britain were the third lowest since 1972 for the beginning of October and, with soils notably dry, especially in many central and eastern areas, no early recovery in river flows and aquifer recharge rates was expected. However, a decisive synoptic change then allowed a sequence of active Atlantic frontal systems to cross the UK: these had a transforming effect through October. Steep runoff recoveries occurred in most northern and western catchments during the fourth week and wild weather conditions on the 27/28th were accompanied by very widespread flood alerts. In most regions, the water resources outlook is healthy but seasonal recoveries in groundwater levels are still awaited in the less responsive aquifers.

August was the warmest since 2004, and rainfall totals were below average across most of the country — appreciably so in parts of England and eastern Scotland. A sustained dry spell through the latter part of the month concluded the driest summer for a decade, and one that contrasted markedly with the run of wet summers since 2006. The settled spells during August were punctuated by some wet interludes. River flows responded briskly on the 5th with notable summer spates in western rivers, including the Cynon (Wales) and Lune (north-west England) and, on the 15th, when the Tywi (Wales) exceeded its previous highest August flow by a significant margin. On the 24th, a locally intense downpour in south Essex (at Shoeburyness 58 mm was recorded — much of which fell in four hours) caused significant surface flooding and transport disruption.

Reservoir stocks at the end of August were above average for England and Wales as a whole and very healthy in some impoundments in Wales and northern England; in contrast, stocks in some reservoirs in southern England (e.g. Ardingly, Clatworthy and Wimbleball) and eastern Scotland (where stocks have been affected by maintenance works) were around 10% below average. Generally, groundwater levels continued to follow typical summer declines but there were exceptions; in south Wales, levels in the very responsive Carboniferous Limestone boreholes were considerably below their normal range.

Synoptic patterns across most of the country during September were typically autumnal. After a dry and warm start to the month, cyclonic conditions brought locally torrential downpours late in the first week: on the 6th, 24-hr rainfall totals of 62.8 mm at Durham and 71.2 mm at Nunraw Abbey (East Lothian) were reported. More extensive heavy rainfall occurred around mid-month when, driven by a vigorous Jet Stream, a sequence of

active frontal systems crossed the UK; in north-west Scotland, Cluaunie Inn reported a two-day rainfall total of 82 mm. Thereafter, persistent high pressure, centred on Scandinavia, restricted the easterly penetration of Atlantic frontal systems and monthly rainfall totals were generally modest, mostly 50–80% of average at the regional scale.

Across much of the country, September was the fourth successive month registering below average rainfall and, for the UK, the June–September period was the driest since 2003. Particularly notable rainfall deficiencies characterised parts of eastern and southern England (in Anglian region it was the driest for 23 years — see Figure 1). More extended rainfall deficiencies characterised much of northern Scotland: the Highland Region reported its third lowest January–September rainfall since 1984.

A few flood alerts were in operation on the 7th September in southern Scotland and north-east England (in Redcar, flash flooding required the evacuation of 60 homes) but estimated outflows from Great Britain remained below the long-term daily average throughout the entire month (with the exception of the 16th) and sustained recessions over the final fortnight saw flows in responsive rivers (from the Dee in Grampian Region to the Tone in Somerset) approach the lowest on record, for the time of year. An interesting exception was the Dover

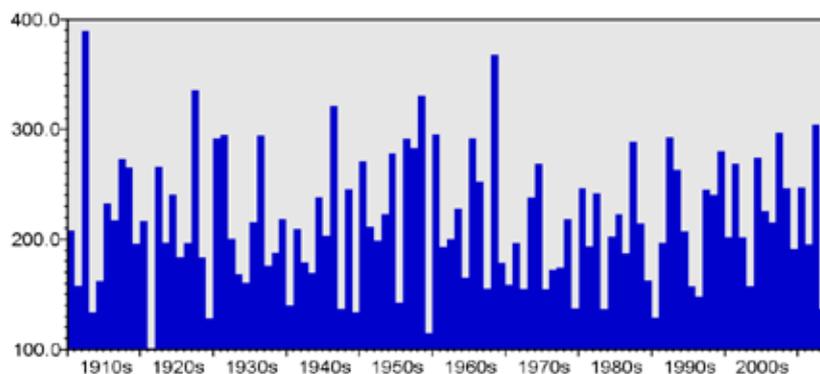


Fig 1 Annual June–September rainfall totals (mm) for the Anglian Region

Beck (Nottinghamshire) where the September runoff total was close to 150% of average and flows have remained well above average throughout a relatively dry 2013 (see Figure 2) – a consequence of sustained high baseflow, itself a legacy of the extreme recharge to the Permo-Triassic sandstones during 2012 .

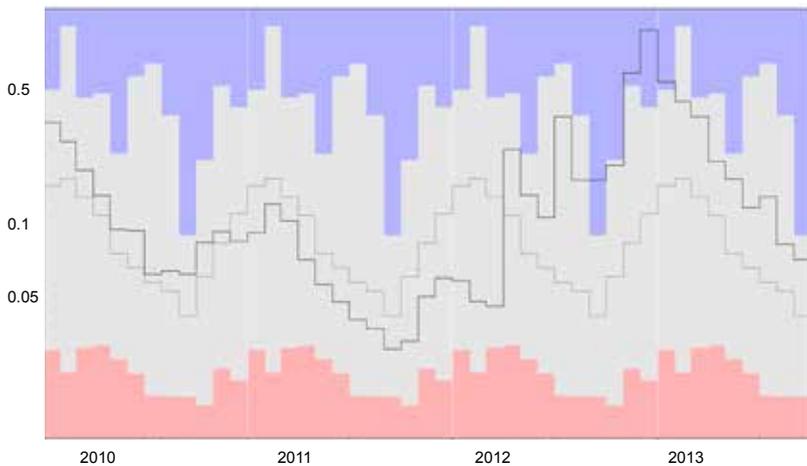


Fig 2 Monthly mean flows ( $m^3 s^{-1}$ ) for the Dover Beck

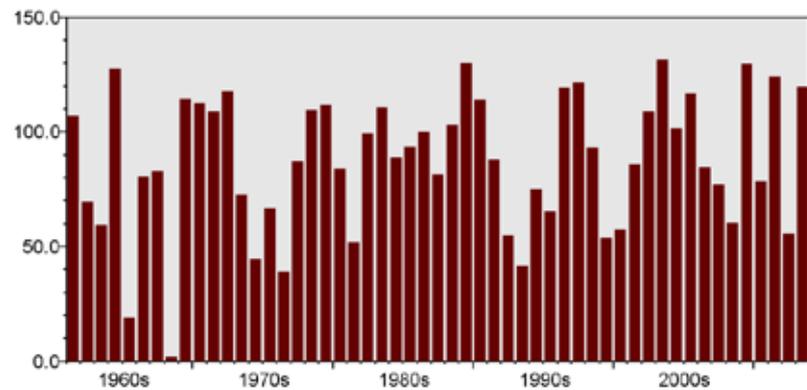


Fig 3 End-of-September soil moisture deficits (mm) for the Chalk outcrop area

With soil moisture deficits well above average across much of eastern Britain, and notably high in central and eastern areas (see Figure 3), the expectation was for a considerably delayed seasonal recovery in runoff and recharge rates. However, with low pressure now dominating synoptic patterns, a cluster of Atlantic frontal systems brought heavy rain to western areas on 2/3rd triggering several flood alerts, e.g, in south Devon and Glen Lyon (Tayside).

Further heavy rainfall, reaching daily totals of >40 mm in parts of Gwynedd, occurred on the 4th and a strong northerly airflow on the 9th brought snow to the Cairngorms and a wintry blast across much of the country. On the 21/22nd, with soils close to saturation away from the English Lowlands, exceptional two-day rainfall totals (Blencathra in Cumbria reported 93.8 mm) triggered widespread spates and extensive flood alerts throughout much of western and northern Britain. An exceptionally unsettled interlude culminated in the ‘St Jude’s Day storm’ (27/28th) which brought damaging winds and sustained heavy rainfall. The latter triggered more than 140 flood alerts with floodplain inundations reported from all regions of England and Wales. Across most of the country reservoir replenishment was very healthy in October but groundwater level recessions have yet to be arrested in some eastern and central areas.

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