

UK Hydrological Bulletin: August – October 2016

The late summer and early autumn of 2016 was characterised by rainfall and runoff patterns that were seasonally typical at the national scale but with marked regional and more local spatial contrasts, the latter often reflecting the impact of convective storms. There was a general tendency for the normal west-to-east rainfall contrasts to be accentuated and above average early autumn soil moisture deficits have delayed the seasonal recovery in runoff and recharge rates in many areas. Nonetheless, runoff at the national scale remained well within the normal range (Fig 1) and the continuing legacy of the remarkable 2015/16 winter rainfall meant that most reservoir stocks and groundwater levels across the major aquifers remained close to, or above, the normal early autumn range.

As is often the case in late summer, August rainfall totals exhibited substantial spatial variability. Much of northern England and western Scotland registered well above average monthly totals; the Lake District was particularly wet. By contrast, parts of central England and the South East, Essex particularly, recorded less than half average rainfall – extending a relatively arid episode that began in the second week of July. At Wallingford, the Centre for Ecology’s Met. Station recorded its lowest July-August rainfall since 1964. Nonetheless, monthly catchment runoff totals were generally within the normal late-summer range and some notable spates were recorded.

On the 12th a Flood Warning was in operation on the river Oykel (northern Scotland) and, on the 20th, flood alerts were operating in north-west England, Yorkshire and, following a 58mm daily rainfall total at Capel Curig (Snowdonia), parts of Wales. Later in the month thunderstorms across central and eastern England generated moderate floodplain inundations and locally severe flash flooding (e.g. in Swindon where levels in the river Cole rose rapidly and the intensity of the rainfall caused Swindon Town’s league match to be abandoned on the 27th). The following day, urban runoff from Luton contributed to a severe trash blockage which caused the river Lee to reach dangerously high levels.

The large late-summer spatial variations in rainfall continued into September with some western catchments (e.g. in Cornwall) reporting monthly rainfall totals >50% above average whilst parts of the extreme south east of England recorded <50%. Regional counterbalancing meant that, for the UK as a whole, the monthly total was close to the long term average and river flow patterns mostly remained well within the normal early autumn range. Some moderate floodplain inundations did occur during the second week (e.g. in a zone from north Wales to southern Scotland where a daily rainfall total of 67.4mm was recorded at Eskdalemuir).

More notably, very warm conditions in mid-month across southern Britain, triggered some exceptional convective storms. Overnight on the 15/16th two thunderstorms generated rainfall totals of around 70 mm at Maidenhead and Brightwell-cum-Sotwell (Oxfordshire) – initial analyses indicate a return period approaching 100 years for the latter event. Local flash flooding was again common but, generally, above average early autumn soil moisture deficits moderated river flows, across the English Lowlands particularly.

They also served to delay the recovery in groundwater levels across most aquifer outcrop areas. However, the continuing benefit of last winter’s remarkable recharge ensured that in most parts of the country groundwater levels remained close to, or above, average for the time of year (Fig 2), with seasonally

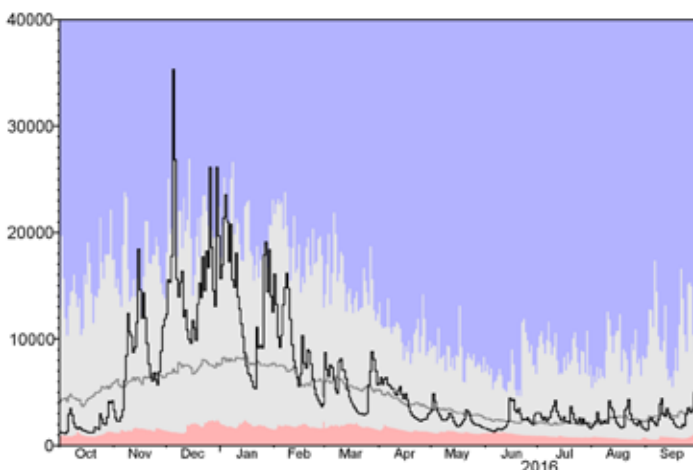


Fig. 1 Daily outflows from Great Britain (black trace) together with the pre-2016 daily average (grey trace), daily max. (blue envelope) and min. (pink envelope). Units: m^3s^{-1}

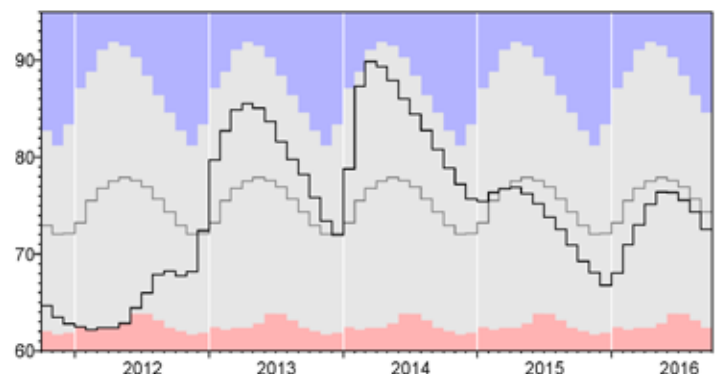


Fig. 2 Monthly groundwater levels (MaOD) in the Chalk at Stonor Park (Chilterns)

very high levels in parts of the slow-responding Permo-Triassic sandstones of the Midlands and southern Scotland.

After a damp start in many areas, high pressure dominated synoptic patterns for most of October with precipitation confined to fog-drip in a few localities for much of the month. A short-lived cyclonic episode in mid-month brought heavy rainfall to much of England, Wales and, particularly, Northern Ireland where a 78.6 mm daily total was recorded at Killylane reservoir (near Larne) on the 14th. Correspondingly many rivers were in spate and, locally (e.g. in Belfast and Aboyne), rainfall intensities overwhelmed road drainage and sewerage capacities resulting in moderate urban flooding. Generally recessions then became re-established as Atlantic low pressure continued to be deflected to the north of the UK. With significant soil moisture deficits persisting in many areas aquifer and reservoir replenishment was again relatively modest. Fortunately, reservoir stocks across the UK — a few, mostly southern, impoundments (e.g. Ardingly) excepted — were considerably above the mid-autumn average entering October (see Fig 3) and the water resources outlook remained generally healthy.

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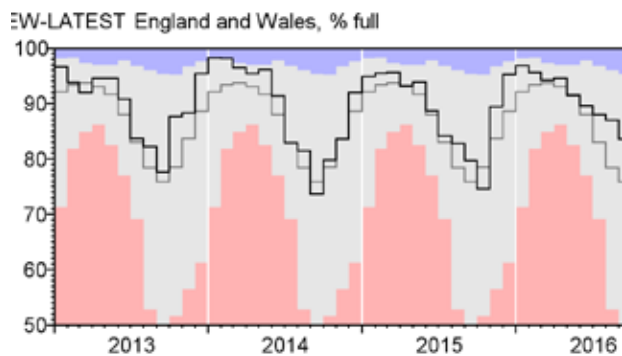


Fig. 3 Estimated end-of-month reservoir stocks for England and Wales