

UK Hydrological Bulletin:

May – July 2019

The capricious nature of the UK climate was underlined through the late spring and early summer of 2019 which was characterised by exceptional spatial and temporal variations in rainfall and runoff. Well below average rainfall in April and May resulted in outflows from Great Britain approaching the lowest on record for early June (Fig. 1) – triggering drought concerns in some groundwater-fed streams and rivers, and agricultural stress, particularly across the English Lowlands where soil moisture deficits were substantially above average. A major synoptic change then heralded a dramatic runoff recovery with widespread, locally severe, flooding in mid-June and a seasonally unusual replenishment of reservoir stocks together with modest recoveries in some groundwater levels. For much of July, the normal north-west/south-east rainfall gradient across the UK was exaggerated as frontal systems favoured tracks across Scotland. To the south, record temperatures were recorded in a brief heatwave during the final week before thunderstorms contributed to a widespread risk of flooding. The associated increased runoff ensured that some reservoir stocks were generally a little above the average for early August.

At the national scale, May rainfall was appreciably below average for the fourth successive year but seasonally wet conditions in eastern Scotland contrasted with only around half of the average rainfall across much of southern Britain where significant deficiencies could be traced back to the early summer of 2018. For the Anglian region, such deficiencies could be expected around once every twenty years on average. The associated dry soil conditions added to agricultural stress as stocks in farm reservoirs dwindled. It was also expected to signal an end to the 2018/19 recharge season across most major aquifers (but see below).

At month-end, runoff from Great Britain approached the lowest on record for the late spring (Fig. 1) and soil moisture deficits were generally well above average. With overall reservoir stocks for England & Wales modestly below average and late-May groundwater levels, in parts of East Anglia particularly, being at their lowest since 1997 the developing drought

conditions became a concern. A mitigating factor was the generally healthy reservoir storage, most major impoundments being within 10% of the late-spring average.

June was a remarkable month in hydrological terms. An unusually persistent synoptic pattern resulted in a sequence of slow-moving low pressure systems crossing the southern half of the country. Many central areas registered more than twice the average June rainfall; for Wales it was the fourth wettest June in a series from 1910. Generally, runoff rates increased sharply across much of the UK. On the 4th, the river Mourne (Northern Ireland) recorded its 2nd highest June flow in a series from 1982. Flooding became extensive during the second week when three-day rainfall accumulations exceeded 75 mm over substantial areas (Fig. 2). In Wainfleet (Lincolnshire), a 48-hour rainfall total of 98 mm caused the river Steeping to break its banks; around 100 residents were evacuated. Flood Warnings were extensive by

mid-month and outflows from Britain as a whole were the highest on record for the time of year. (Fig. 1). High intensity rainfall events triggered significant surface flooding and transport disruption; they also had damaging ecological impacts — in the Farne Islands puffin chick mortality was exceptionally high. Seasonally rare aquifer recharge was evident in some responsive wells and boreholes e.g. at Ampney Crucis (in the Cotswolds) where groundwater levels were well above the average for late June. By contrast, in East Anglia, June levels at the Dial Farm borehole were the second lowest in a fifty-year series. Fortunately, most reservoir

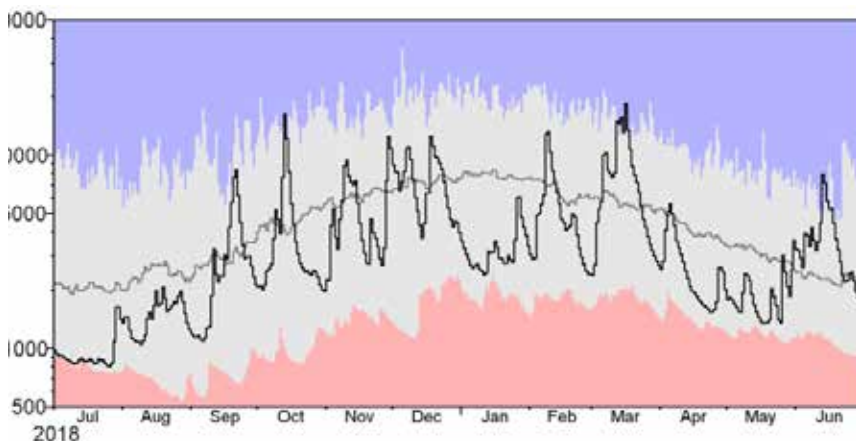


Fig 1 Daily outflows from Great Britain (m^3s^{-1}) – black trace. The blue and pink envelopes are daily maximum and minimum for the 1961–018 period; the grey trace is the daily average.

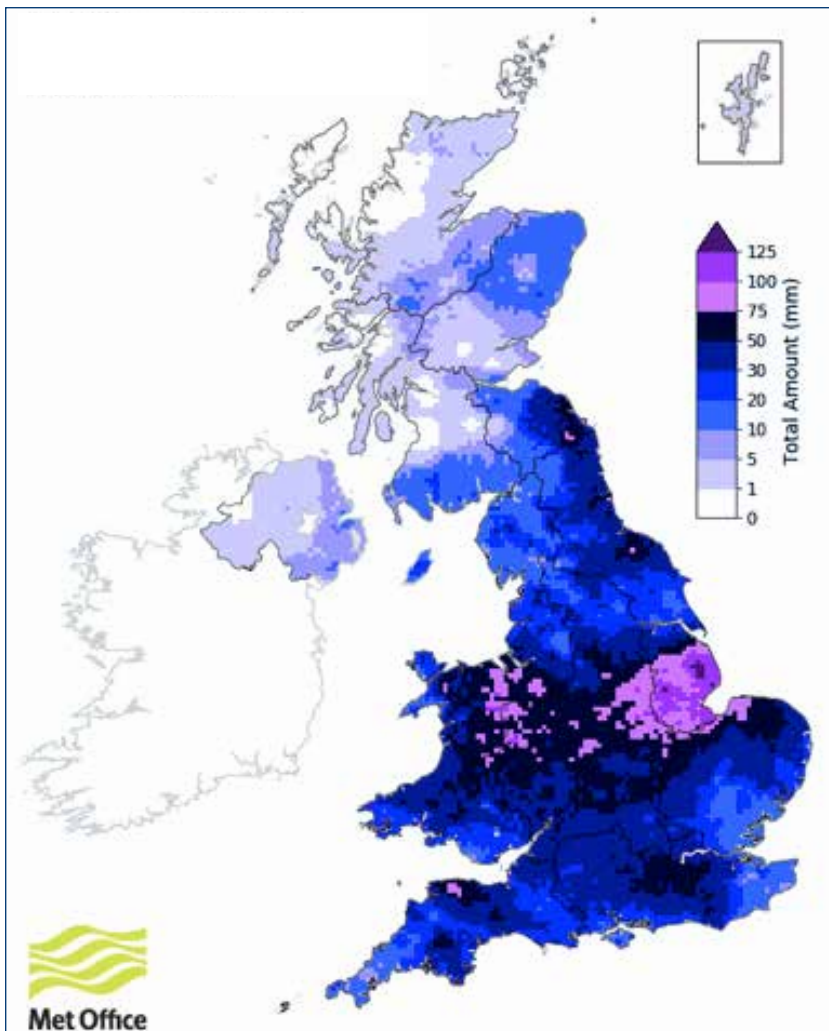


Fig 2 Accumulated rainfall totals (mm) 10-12 June 2019

stocks increased modestly through June — an unusual circumstance — and overall stocks for England & Wales stood marginally above average at month-end.

Northern Britain aside, high pressure remained dominant through the first half of July; soil moisture deficits increased substantially and river flows generally declined. Flows in some, mostly southern, groundwater-fed streams fell well below average — primarily a legacy of limited rainfall over the winter and spring of 2018/19. This, together with a surge in irrigation and garden watering led to a Drought Order application by Southern Water to ease pressure on the River Test.

By contrast, a pivotal change in synoptic patterns during the third week heralded another exceptionally wet episode; the frequency and spatial spread of the associated flood warnings was very unusual for mid-summer. Locally intense downpours on the 19th caused widespread transport disruption (e.g. in London and across the southern Pennines) and outstanding 24-hr rainfall totals included 93 mm in Achnagart (in northern Scotland) on the 22nd, 91 mm in Rochdale (28th) and, in North Yorkshire, a reported 50 mm in an hour (30th). After record-breaking temperatures on the

25th (38.7 °C at Cambridge establishing a new UK maximum), Flood Warnings were again widespread late in the month. In the Peak District, exceptional rainfall over a saturated catchment rapidly filled Toddbrook reservoir and damaged the spillway — with the associated risk of dam failure triggering the evacuation of Whalley Bridge (Derbyshire) on August 1st.

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