

# UK Hydrological Bulletin: February – April 2016

THE LATE WINTER AND EARLY SPRING OF 2016 was much drier and, relative to the seasonal average, much cooler than the remarkable hydrometeorological conditions experienced over the November 2015 – January 2016 period. After a wet start to February, accompanied by another exceptional runoff episode, broad-scale flood risk generally diminished rapidly into the early spring. Nonetheless, with many catchments remaining close to saturation, the passage of several deep low pressure systems and a significant number of convective storms, moderate floodplain inundations remained common. The record antecedent rainfall ensured that reservoirs stocks remained close to capacity in most areas during the late winter and, with groundwater levels still rising in most areas, the water resources outlook was also very healthy during the early spring. Of broader strategic significance is the increase of around 12% (relative to a 1961–99 baseline) in the winter half-year runoff from Great Britain during the 21st century thus far — which raises questions about the most appropriate design base for both water resources and flood management in the future.

February was the driest of the winter months and much of eastern Britain recorded well below average rainfall but notably wet conditions continued in many of the flood-stricken western areas. Storm Henry brought gale force winds and heavy rainfall to north-west Britain on the 1st/2nd (when Kinlochewe in Wester Ross recorded 95 mm) and daily totals exceeding 50 mm were common in the South West later in the week. Flood Warnings were extensive in most regions of the country by the 9th and a new dimension was added to the flood threat as rising groundwater levels (see Fig.1) triggered several further alerts — these were, however very limited in spatial extent and trivial by comparison to the protracted groundwater flooding experienced in early 2014.

For the UK as a whole, February concluded the wettest four-month sequence in the entire National Climate Information Centre's series which begins in 1910. In some regions, the margin by which previous four-month maxima were eclipsed was very substantial — exceeding 13% in the case of north-west England. Winter (December–February) rainfall totals were also unprecedented across much of northern Britain and Wales and, countrywide, ranks second wettest to 2013/14. Correspondingly, many broad-scale runoff records were also superseded. Estimated winter outflows for 2015/16 from Great Britain clearly eclipsed the previous maximum in a series from 1961 (Fig 2) and, in some regions, the margin of exceedance was extreme — over 35% in the case of the Aberdeenshire Dee which has a continuous flow record from 1930.

Generally, weather conditions in March contrasted markedly with those of the preceding four months.

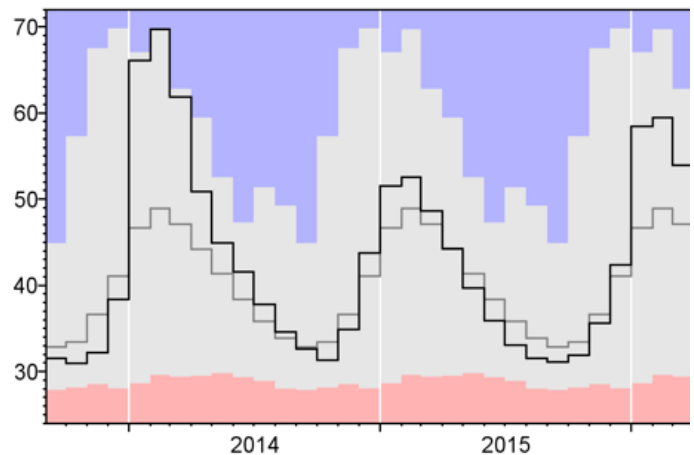


Fig 1 Monthly groundwater levels at Compton House, West Sussex (the grey trace is the long-term monthly average and the blue and pink envelopes are the monthly extremes)

Average temperatures were, remarkably, around three degrees cooler than those for December and the UK rainfall total was close to the long term average albeit with marked regional differences. Much of western and northern Britain was notably dry with less than

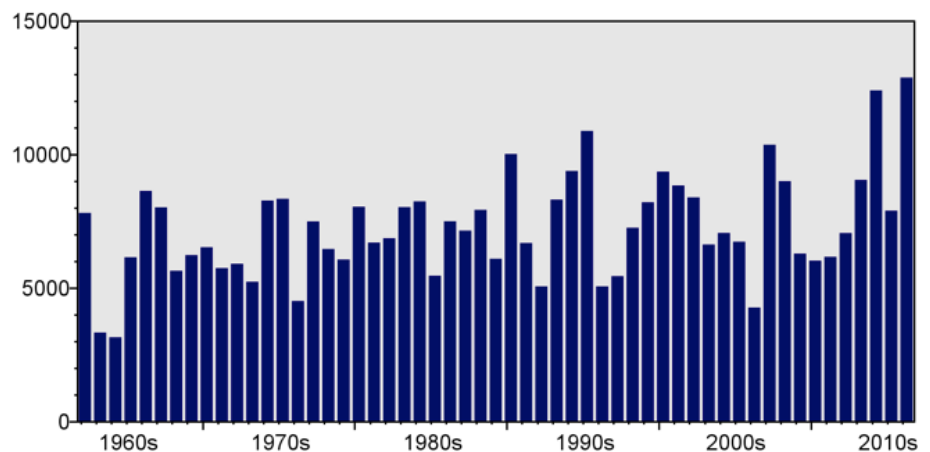


Fig 2 December-February average outflows from Great Britain ( $m^3s^{-1}$ )

half the monthly average rainfall across parts of central Scotland, whilst well above average totals were registered across much of central, southern and eastern England. Northern Ireland recorded near-average March rainfall but an indirect endorsement of the extreme wetness of the preceding months is provided by the winter half-year total: the highest on record — as remarkably, the preceding two winter half years also rank in the wettest three in a series from 1910.

Modest floodplain inundations were common during the first ten days of the month but, with high pressure dominating synoptic patterns, steep and sustained river flow recessions resulted in seasonally depressed flows during the fourth week. The Lagan (Northern Ireland), Eden (Cumbria) and Naver (northern Scotland) were among those rivers which approached their minimum recorded flows for the time of year. Subsequently the passage of storm Katie triggered a steep recovery in runoff rates; in southern England new March flow maxima were established for the Otter (on the 27th) and Mole (28th), both in series of at least 45 years.

April was seasonally very cool — a consequence of persistent low pressure in the Atlantic and high pressure across western Europe drawing a very cold polar airflow across the UK. Its predominance brought appreciable snowfall to Scotland and, on occasions, much further south. Sustained frontal rainfall on the 2nd triggered flood alerts across northern England and continuing healthy groundwater outflows helped maintain modest spate conditions in many groundwater-fed streams across southern Britain.

In mid-month frontal rainfall with embedded convective cells resulted in considerable surface flooding and transport disruption (e.g. in the Thames Valley and East Anglia) and contributed to repetitive but modest floodplain inundations. This was particularly true of the lower Kennet in Berkshire where storm runoff from the impermeable fractions of the catchment was a significant factor. Reservoir stocks entering April remained greater than 90% of capacity across much the greater part of the country and, generally, groundwater levels were seasonally very healthy with a few exceptions, including parts of the slower-responding southern Chalk outcrops (where, typically, peak levels may not be reached until the late spring or early summer).

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