UK Hydrological Bulletin: November 2014 – January 2015

The last three months have witnessed notable temporal and spatial variations in weather patterns and a consequential wide range in river flows and rates of aquifer recharge. A feature of the early winter was the enhanced cyclogenesis associated with a powerful Jet Stream — bringing damaging storms and a high frequency of flood alerts, but relatively few extreme river flows. However, temperatures remained seasonally high, contributing to the warmest year on record for the UK. Previous annual rainfall maxima were also exceeded for many raingauges and annual runoff from Great Britain was exceptional — the second highest, albeit marginally, in a series from 1961.

Correspondingly, reservoir stocks were generally very healthy although drawdown for water management purposes (including providing capacity to aid flood alleviation) left stocks below the seasonal average in a few impoundments. Soil moisture deficits, which were generally well above average in the early autumn, declined smartly thereafter allowing aquifer replenishment to accelerate in most areas. The water resources outlook was thus healthy entering 2015 but with saturated catchments and continuing cyclonic weather patterns, flood risk remained high, exacerbated by snow accumulations on high ground, especially in northern Britain.

During November many Atlantic frontal systems followed a more southerly track than is typical of the autumn and, as a consequence, monthly regional rainfall totals departed widely from the norm. Notwithstanding an exceptional daily rainfall total of 123 mm on the 6th on the Isle of Skye, much of north-west Scotland reported less than half the average November rainfall. By contrast, totals for parts of southern England approached twice the average, and the regional total substantially exceeded that for the Highland Region, an uncommon circumstance.

Following spates early in November river flow recessions across much of Scotland continued for up to four weeks or more, resulting in seasonally depressed flows late in the month — in Wester Ross for example. In Northern Ireland however, the River Lagan reported its third highest peak flow in a series from 1972. Aided by the steep decline in soil moisture deficits through November, (see Figure 1) very healthy runoff rates also characterised much of the South East. In Essex, the River Colne reported its highest November mean flow for 12 years and, generally, strong groundwater level recoveries were initiated across much of the Chalk outcrop. Notable regional contrasts in monthly rainfall patterns continued until the end of 2014: for the fourth successive year Scotland registered well above average December rainfall whilst many areas close to the southern and eastern coasts of the UK reported less than 50%. Flood Alerts (often both fluvial and tidal) were common from the second week and high spate conditions in the west and north persisted in the run-up to Christmas. Exceptional rainfall accumulations on the 21/22nd December (Blencathra in the Lake District reported 93.8mm in 24 hrs) triggered widespread flooding across northern Britain with associated major transport disruption; in Ayrshire the Glasgow-Carlisle rail link was broken.

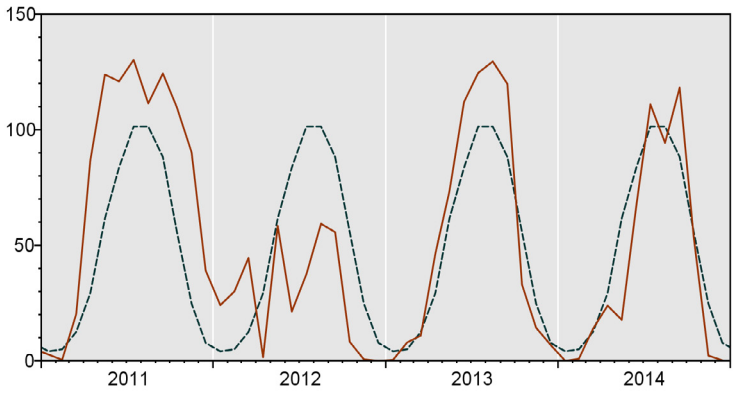

Fig 1 *End-of-month soil moisture deficits (mm) for the Chalk outcrop*

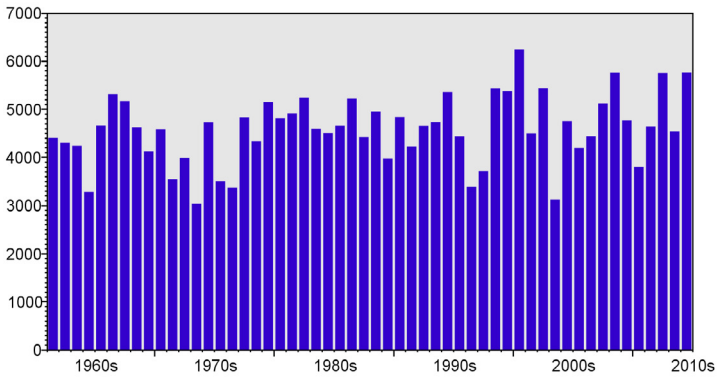

Fig 2 *Annual outflows from Great Britain (m3s-1)*

Despite such interludes, December runoff totals were within the normal range for most index catchments across the country but considering the year as a whole, 2014 was a very notable year in hydrometeorological terms. It was the fourth wettest year on record for

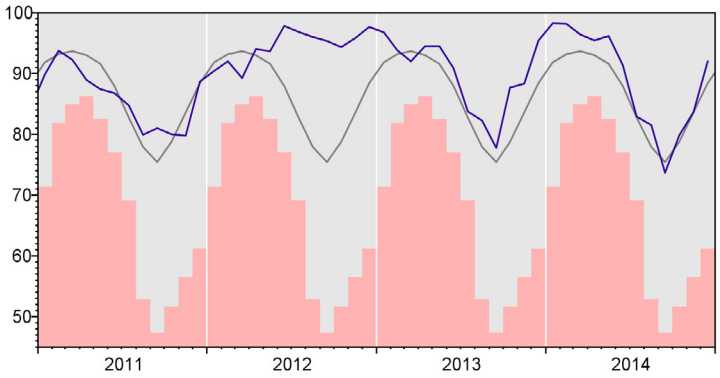

Fig 3 *Monthly reservoir stocks (% of capacity) for England & Wales together with the monthly average (grey trace) and the long term minimum (pink envelope)*

the UK (2000 and 2012 were both appreciably wetter) and, at a local scale, the Centre for Ecology & Hydrology's Met. Station registered its highest annual rainfall in a 53-year series. New annual runoff maxima were established for a substantial proportion of index rivers in southern England, and for the Tay in Scotland. For the Thames, notwithstanding modestly below average December flows, the annual runoff still exceeded the previous maximum in a series from 1883. Late-2014 groundwater levels were generally well above average and exceptionally high in many slow-responding PermoTriassic sandstones outcrops — in large part a legacy of the outstanding recharge through the winter of 2013/14. With the vigorous Jet Stream, now feeding very cold air as well as a further sequence of intensifying low pressure systems across the UK during January, many rivers remained in high spate. The continuing flood risk culminated on the 14/15th when heavy and sustained frontal rainfall — Tyndrum (Argyll and Bute) recorded 69.4 mm in 24 hrs — triggered more than 30 Flood Warnings and around 150 Alerts across the country. Snowfall during this episode was significant in the uplands and, in western coastal areas particularly, the flood risk was exacerbated by a storm surge coinciding with high tide. Over 200 schools were closed in Scotland and many roads (including parts of the A9) were impassable whilst in southern England pluvial flooding disrupted local road transport (e.g. in Sturminster Newton and Brokenhurst). During the third week, around 20,000 people were without water in Northern Ireland due to industrial action — necessitating the deployment of tankers and the distribution of bottled supplies. Generally however, the seasonally high precipitation ensured that stocks in most reservoirs were within 10% of capacity and groundwater levels were considerably above average across most major outcrop areas.

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24/1/2015

The Hydrological Bulletins are prepared by the Centre for Ecology & Hydrology for initial publication in ***Circulation*** – the Newsletter of the British Hydrological Society [www.hydrology.org.uk]