Disparate catchments

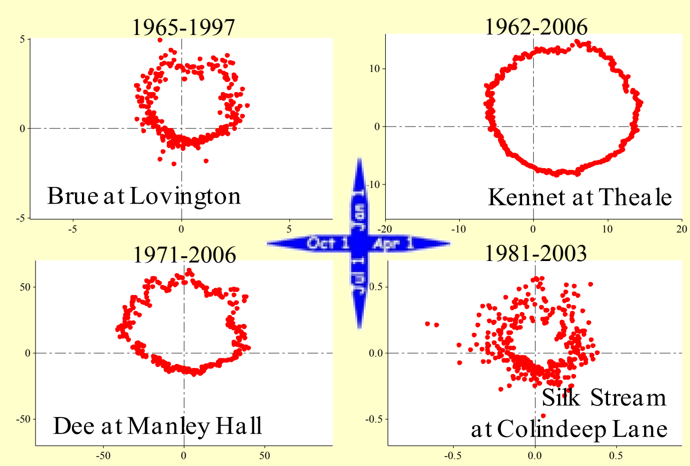
disparate (adj): unequal; essentially unalike. fiddly (colloq): requiring time or dexterity. regime (n): character, conditions, pattern of behaviour.

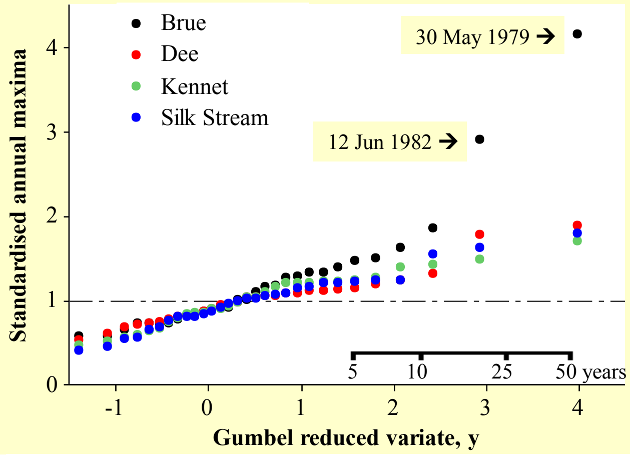
Desperate cases include the peaky Bree at Lovington (Station 52010), the pervious Lynette at Theale (39016), the Palaeozoic Edie at Manley Hall (67015) and that most urbane of catchments: the Silk Stream at Wisteria Lane (39049).

Circular diagrams can be used to summarise the seasonal distribution of floods, although the depiction below is of daily mean flows. The upward axis points to the start of the calendar year. The radial displacement from the origin indicates the long-term mean DMF on that day of the year. Due (but fiddly) allowance is made for leap years.

Even with respectable lengths of record, we seldom get a clear impression of catchment differences from a frequency analysis of annual maximum (AM) floods. In the extreme value plots below, AMs have been standardised by dividing by the index flood, i.e. *QMED*. The analysis is for 30 water-years commencing 1 Oct 1978.

The lower halves of the plots are unremarkable. For three of the catchments, the upper halves show only mild flood *growth*. It is likely that the growth rate is being moderated by storage: by reservoirs & llyns in the Dee, and by groundwater in the Kennet. The mild growth for the Silk Stream may reflect that urbanisation has pushed up *QMED* proportionately more than larger floods. In contrast, the EV plot for the Brue is excited by notable floods on 30 May 1979 and 12 June 1982: events that prompted construction of the Bruton flood storage reservoir in 1984.



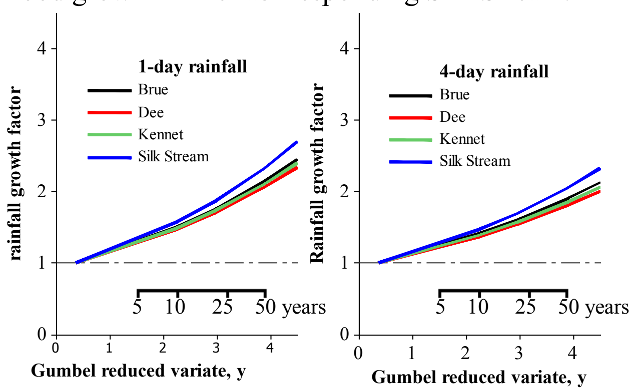


The smoothest pattern is for the highly permeable Kennet, while the most erratic is for the heavily urbanised Silk Stream. Comparing the lower right quadrant from each diagram, the seasonal cycle is seen to be notably later in the Kennet.

Whilst the plots summarise typical flow regimes, they are also helpful in assessing disparate catchments more generally. We have learned to transfer BFI from low-flow to flood studies, so why not use the seasonal distribution of DMFs to help pinpoint disparities? Floods are just *abnormally* high flows; it never hurts to know what normal is.

Hydrograph disturbances are also under-analysed. On permeable catchments, spikes may reflect riparian areas responding readily to rainfall. In special measurement campaigns in urban watercourses, sharp rises in water level can expose past development that is unwashed by SUDS.

It does not hurt to look at rainfall growth. The curves below are from the 1999 FEH procedure. Direct comparisons of rainfall & flood growth are seldom very informative; the choice of index variable (here, the median of annual maxima) on which to anchor the comparison is arbitrary. But the steep growth of 1-day maximum rainfalls points to the particular scope to underestimate flood growth in the fast-responding Silk Stream.



The two sets of diagrams above are joined to highlight that, in UK conditions, distinguishing flood growth behaviour is intrinsically much more difficult than distinguishing flow regimes. ➔

The message is clear. If (for pooling) we want to improve our judgement of hydrologically similar catchments, we should exploit both daily mean flows and the circular analysis of flood dates.

There may be said to be two classes of people in the world; those who constantly divide the people of the world into two classes, and those who do not.

Robert Benchley (US humorist), *Of all things*, 1921