England & Wales precipitation

36 inches

919 mm

NRFA: Musings & Reflections

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Hydrometric Data: The Long View

22/10/2013

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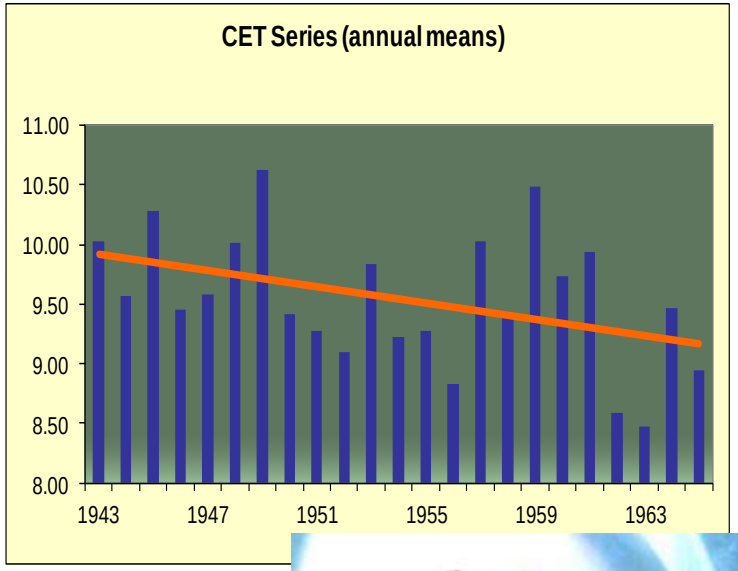
50 years ago – how things have changed

- Early 1960s: heading for another Ice Age?

- Taken together the winters of 1962/63 & 1963/64 were the driest for 180 years
- Severe droughts in 1955 and 1959
- Steep projected increase in water demand

- Still a very patchy gauging station network
- NRFA remained primarily a paper-based archive



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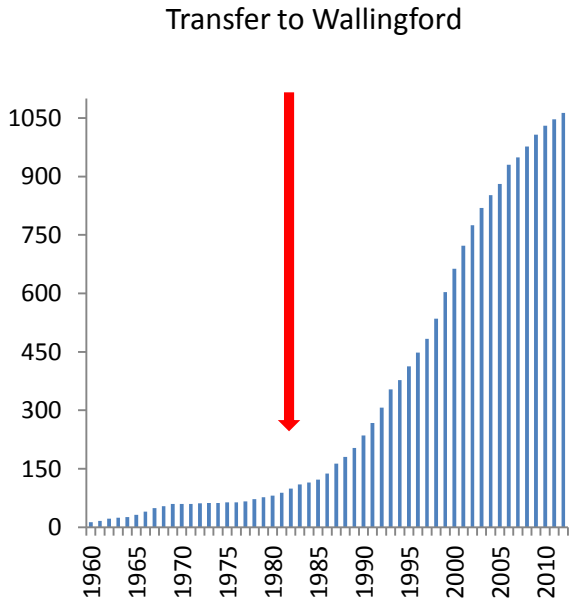
NRFA stewardship and network growth

- 1963-74 WRB – Integrated water management
- 1974-82 WDU – Integrated data management

- Rapid network growth from the late-1960s; predominance of gauging structures and, thence, 'new technology' gauging stations
- 30-year records on the NRFA have increased 50-fold since the early 1960s and by an order of magnitude since 1982
- This implies a major data stewardship challenge



30-yr records on the NRFA

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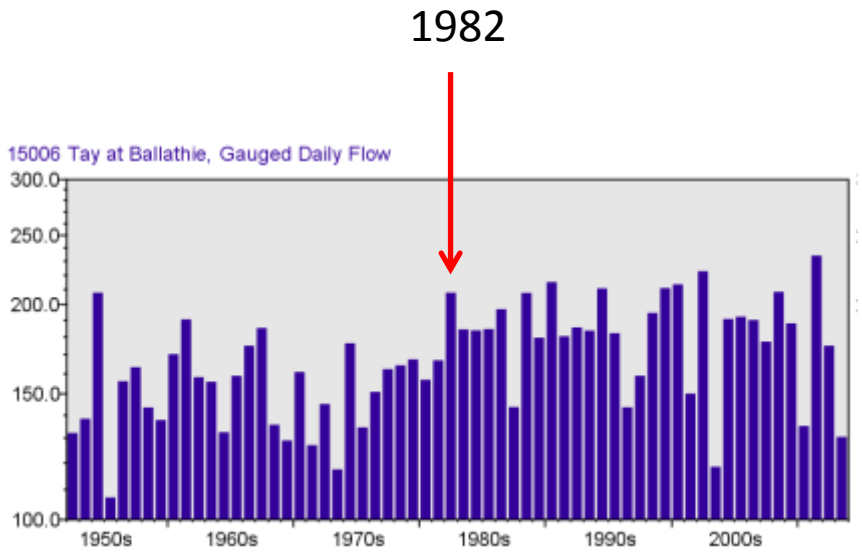
1982 A pivotal year (in retrospect)

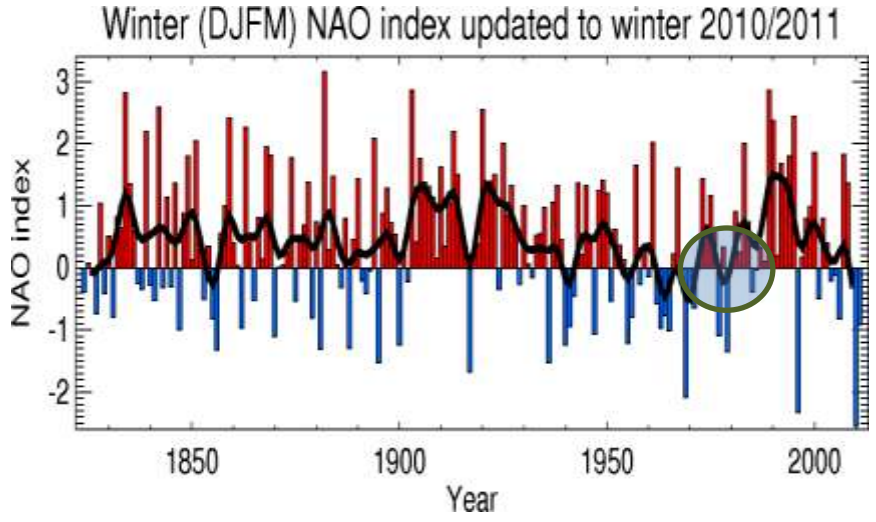
- Transfer of the NRFA to the Institute of Hydrology

- Benefits from planting the NRFA in an active user community, and one with considerable hydrometric experience and expertise



- Climate change was beginning its rise up the scientific and political agendas

- Thereafter, trend detection had an increasing impact on NRFA activities



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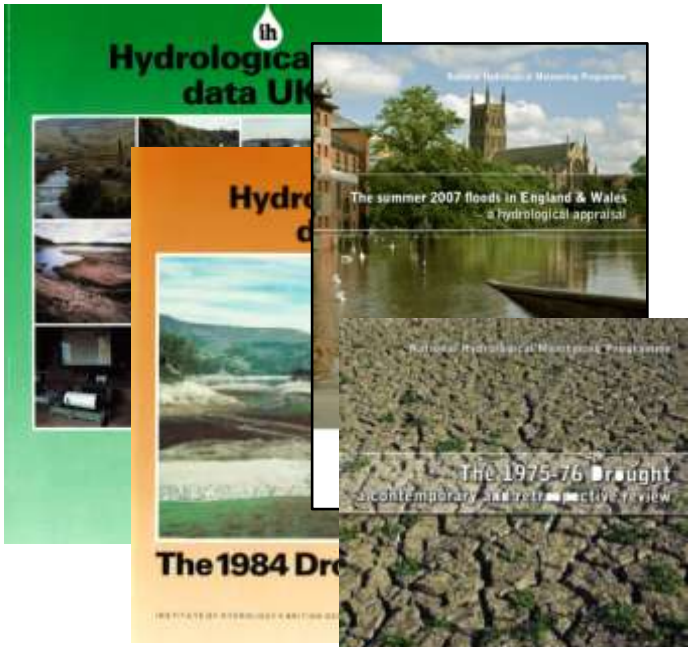
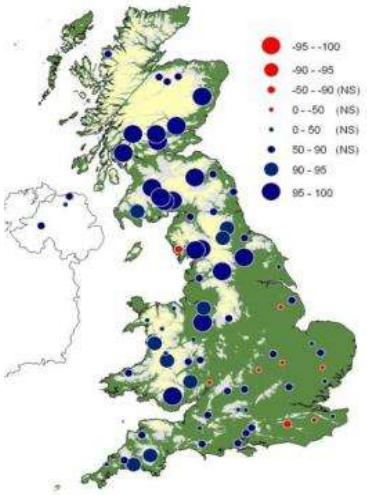
The National Hydrological Monitoring Programme

- Joint CEH/BGS programme - in close collaboration with UK Measuring Authorities and Met Office
- Practice run in 1984; thence formalised in 1988
- Capitalises on the National River Flow and National Groundwater Level Archives
- >300 Monthly Hydrological Summaries published
- Series of Hydrometric Registers
- Documentation of major hydrological events
- **Identify and interpret hydrological trends**
- Support, and provide a context for, CEH and external research initiatives
- Providing advice and guidance to Gov., NGOs, international organisations, the media and the public





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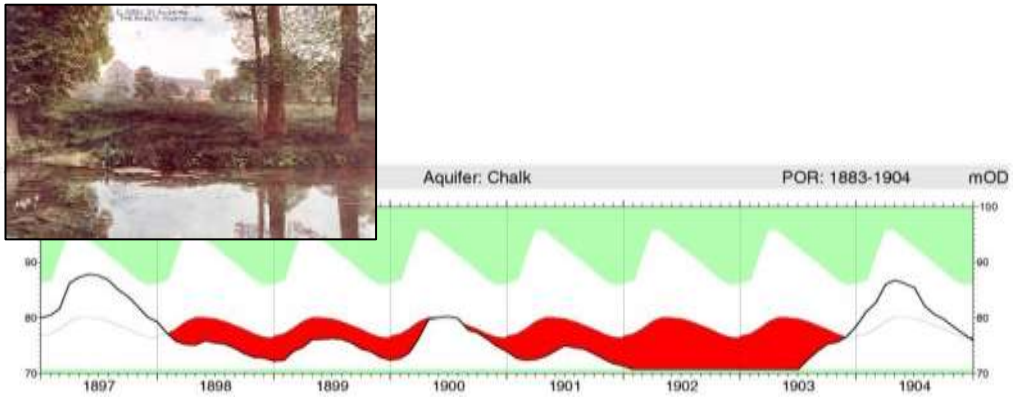
Exploring the past

- Dearth of pre-1950 data on the NRFA

- Active pursuit of long records to provide a fuller context for contemporary runoff variability

- BHS Chronology



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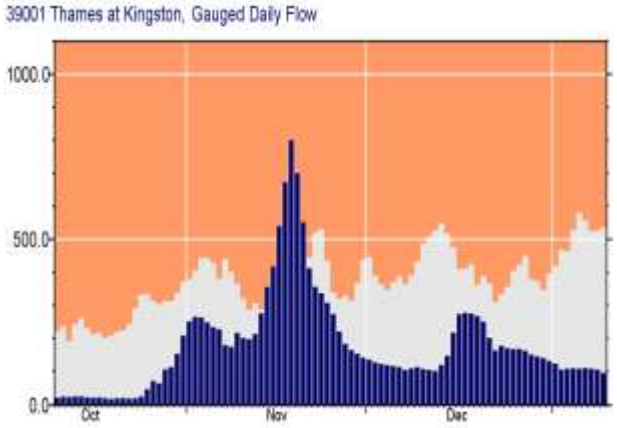
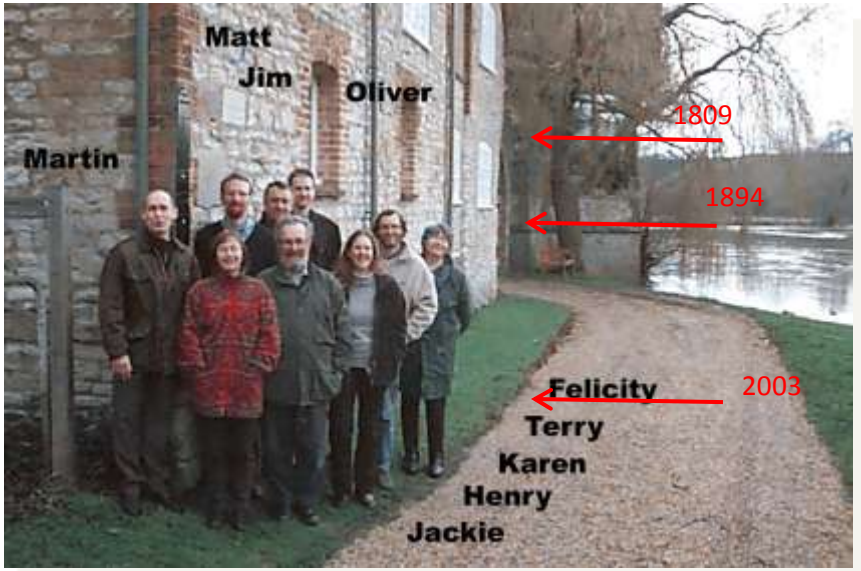
Reviewing historical data

- An important component of NRFA stewardship



1059 cumecs



Ultrasonic station commissioned in 1974; multi-path operation from 1986 and back-up ultrasonic installed in 1991. Full range. Lockages not allowed for and high water temperatures can effect gauge performance at low flows. No peak flows pre-1974 when dmfs derived from Teddington weir (a 70m wide complex of gates, sluices, weirs and locks); tailwater rating used with twice-daily levels (at low tide) to compute flows >85 cumecs. Significant structural improvements since 1883 but high hydrometric accuracy not achievable for pre-1951 record (leakage and lockages result in underestimation of early low flows; mill operation also evident on early hydrographs. Gauged flow fell to zero in August 1976. 1894 peak gdf re-assessed in 2002 (800 cumecs). Increased channel capacity means that bankfull now very rarely exceeded. Baseflow sustained mainly from the Chalk and the Oolites; flashy response from tributaries draining the clay vales. Some effluent derives from outside the catchment but overall runoff is substantially decreased by major PWS abstractions; daily naturalised flows available.

Has hydrology gone mad? 2003-2012

- 2003 intense drought
- 2004 Boscastle flood
- 2004-06 protracted drought conditions
- 2007 summer floods
- 2008 flooding in Northern Ireland & northern Britain
- 2009 Floods in Cumbria and eastern Scotland
- 2010 depressed flows in Scotland & NW England

- **2010-12 a major hydrological episode**

Photo credit: EA South West (Devon)

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2012: an unprecedented transformation?

- Differing meteorological and hydrological perspectives on the transformation
- Prolonged drought from early 2010
- Marked temporal and spatial variations in intensity
- **Peaked at a (normally) critical time for water resources**
- Fragile resources and environmental outlook entering April 2012

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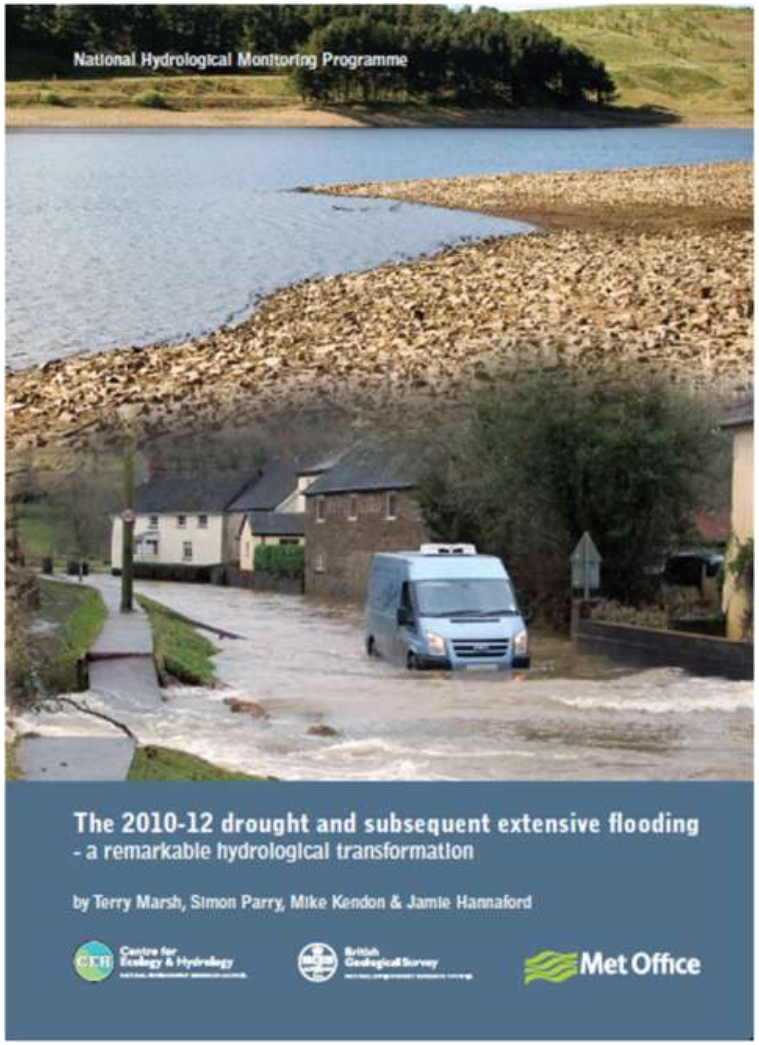
- Thence the wettest nine months on record and a singular runoff recovery

- **The 2010-12 report includes a section on hydrological trends**



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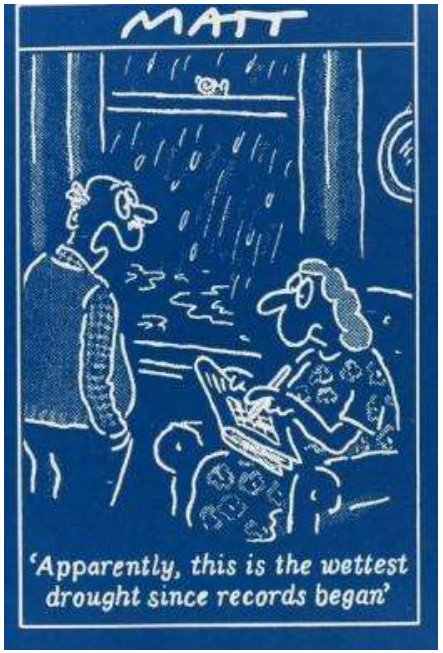
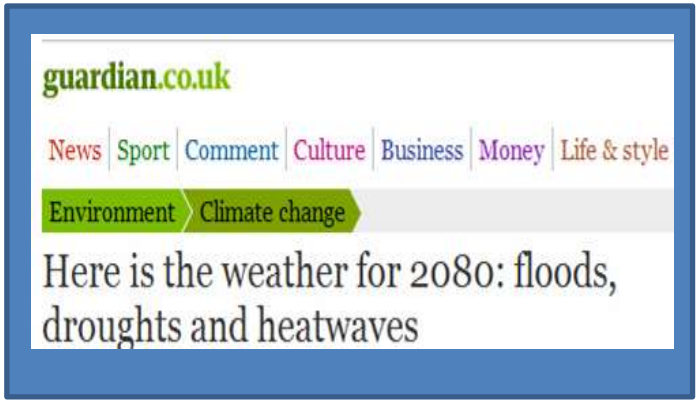
Media perspective





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A different way of looking at it

- Fatalities attributable to flooding in the UK

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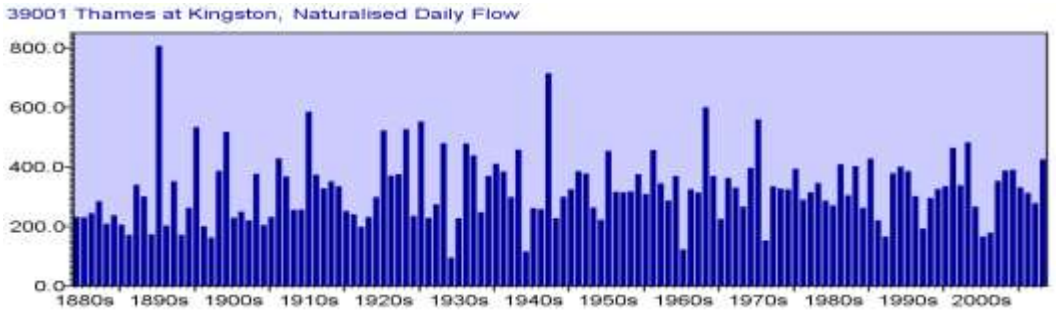
Another personal perspective on flood risk

- 42 years on the Thames floodplain
- Never flooded
- What can we learn from the Thames flood record?

- No upward trend in flood magnitude for the Thames
- A significant decline in maximum levels
- A tribute to river management over many years



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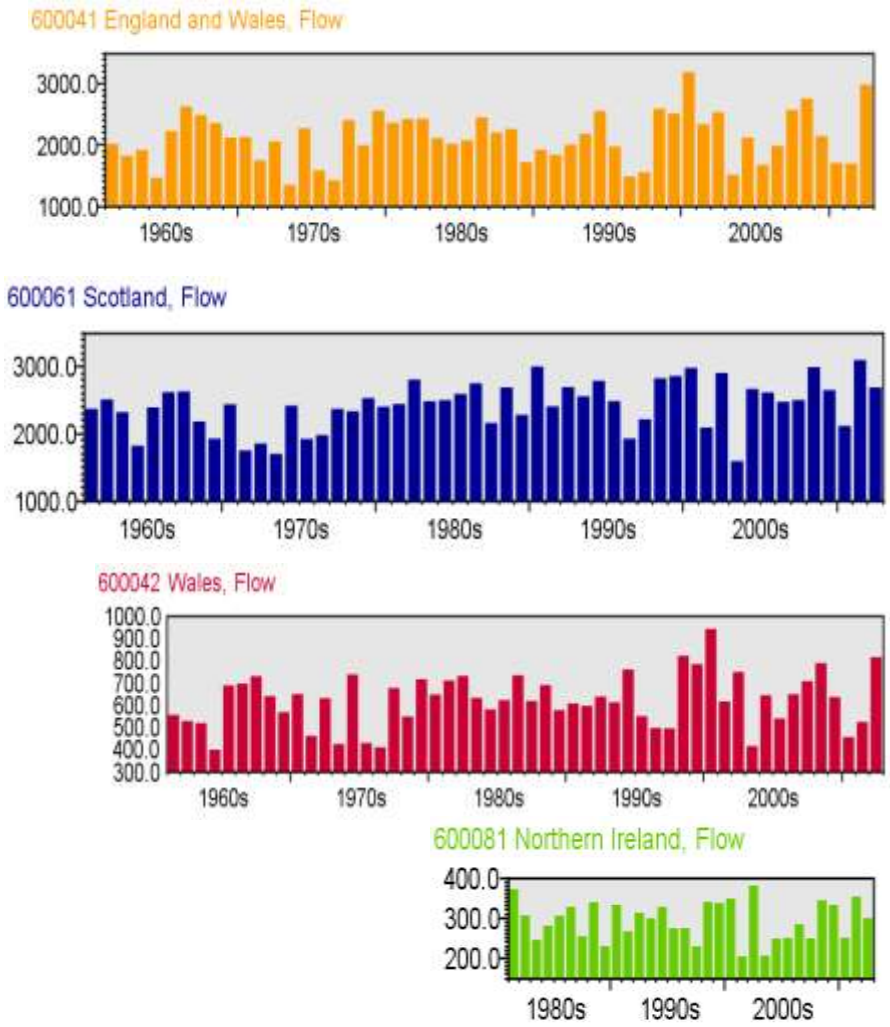
Capturing change - national outflows

- Increasing need for national assessments of runoff
- C70% of the contiguous UK is monitored
- Representative networks of catchments – maximising time series homogeneity
- Few compelling trends are evident
- IPCC Fifth Report:

'... there is currently no clear and widespread evidence for observed changes in flooding except for the earlier spring flow in snow dominated regions'

- BUT modest trends could have a major impact in the UK



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Why is hydrometry like sky diving?

Getting it right 98% of the time isn't good enough

Capturing extremes is difficult (but essential)

- Resources stretched, particularly at times of hydrological stress
- Stage-discharge relations are least convincing in the extreme ranges
- Weir removal may well damage time series homogeneity
- Channel conveyance is changing
- Professional validation of exceptional flows is essential
- Metadata need to be reviewed and updated
- Strategically important gauging stations may have limited (direct) operational value

Back to Basics

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Here’s to the next 30 years

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