Collaborative delivery of a national peak flow data service for the UK

Catherine Sefton[1*], Stephen Turner[1], Gayatri Suman[1], Amit Kumar[1], Isabella Tindall[1], Katie Muchan[2], Grant Kennedy[3], Glenda Tudor-Ward[4], Gary Galbraith[5] and Jamie Hannaford[1]
[1]UK Centre for Ecology & Hydrology, [2]Environment Agency, England, [3]Scottish Environment Protection Agency, [4]Natural Resources Wales, [5]Department for Infrastructure – Rivers, Northern Ireland

1 Why do we need a national peak flow dataset?

Faughan at Drumahoe, destroyed by flooding, 2017

- Flooding costs the UK economy billions of pounds each year, and peak flow magnitudes are already increasing in parts of the UK;
- Flood estimation and trend assessments need good quality, historically and nationally consistent data;
- High flow measurement is difficult with multiple and variable sources of uncertainty;
- Metadata indicating uncertainty are needed to help users apply data appropriately.

2 How does the collaboration work?

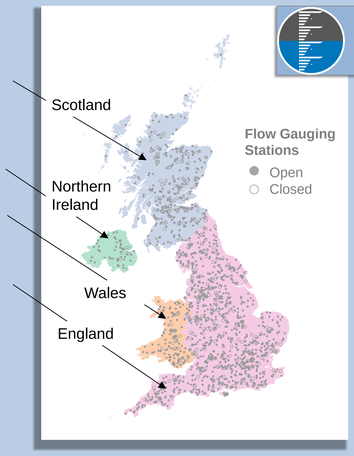
Two submissions of peak flow data a year to the National River Flow Archive (NRFA) by the Measuring Authorities following in-house quality assurance procedures.

sepa Scottish Environment Protection Agency Buidheann Dìon Àrainneachd na h-Alba

Department for Infrastructure An Roinn Bonneagair

Cyfoeth Naturiol Cymru Natural Resources Wales

Environment Agency



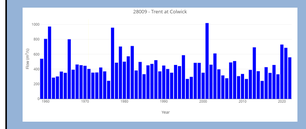
National River Flow Archive

UK Centre for Ecology & Hydrology

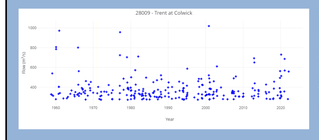
Screening and manual validation by the NRFA, each with raising and resolution of queries in consultation with the Measuring Authorities.

3 Components of a national peak flow dataset

Data

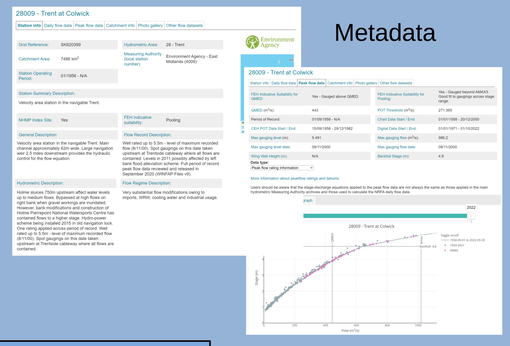


Annual maximum (AMAX): the largest observed flow in each water year (m^3s^{-1})



Peaks-over-threshold (POT): all peaks > a threshold flow, set to include on average about 5 events per water year (m^3s^{-1})

Metadata



4 Improvements

Annual additional of latest water year at more than 900 gauging stations from 2016 – 2023 ✓

- Review of pre-digital and digital ratings and data for historical consistency ✓
- Review of timing and magnitude of peak flows, relative to the historical record, daily mean flows and analogue sites ✓
- Flagging of AMAX events and periods not representative of the flood hydrology of the catchment ✓
- Review of metadata communicating uncertainty to users ✓

5 Data releases

Annual release of a versioned national peak flows dataset for the UK.

https://nrfa.ceh.ac.uk/peak-flow-dataset

Version 12.1, released November 2023.

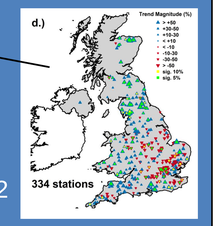
6 Impacts

"The NRFA is a widely valued resource for UK river flow data. At JBA, we rely on its datasets and web interface almost every day, enabling our work on NAFRA2 and numerous projects throughout the UK".
Chief Hydrologist at JBA Consulting and President, British Hydrological Society

2139 downloads in 2023

Recent publications have used the NRFA Peak Flow Dataset for:

- National-scale assessment of trends in peak flows *Hannaford et al., 2021, Hydrol. Res. doi:10.2166/nh.2021.156*
- Assessment of trends using regional magnification factors *Kjeldsen & Prosdocimi, 2021, Adv. Water Resour. doi:10.1016/j.advwatres.2021.103852*
- Estimation of probable maximum floods using ReFH2 *Haxton et al., 2023, Hydrol. Res. doi:10.2166/nh.2023.117*



7 Remaining challenges

Research investment is needed to review and improve peak-over-threshold independence, rescue pre-digital data from charts to improve consistency with instrumented records, and innovate to reduce uncertainty in high flow measurement.

WHY: is the UK national Peak Flow data service important?

BECAUSE: high costs of flood alleviation and recovery mandate good quality, regularly updated data for flood estimation and trend analysis

enquiries@ceh.ac.uk
www.ceh.ac.uk

Sharing is encouraged