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BHS membership

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Cover photo: Snaizeholme Beck, Yorkshire (Duncan Faulkner)

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Please email your material to bhs-circulation@outlook.com—contributions may be edited for length or clarity. Hydrological photographs particularly welcome.

Circulation

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Letter to the Editor

UK Hydrological Bulletin, February-April 2024

STOP PRESS

Good news just in – the Charity Commission have approved the committee's application, so the British Hydrological Society is now registered as a Charitable Incorporated Organisation. Thanks go to all those involved in preparing and submitting the application.

President's perspective

Duncan Faulkner

Cycling over the hills between home and Hebden Bridge yesterday I spotted seven reservoirs, built to supply water to homes, industry and canals, and some now also being used to help manage flooding. Signs of the expertise of past and present hydrologists are scattered throughout our landscape: dams, intakes, canals, flood walls, tree planting, wetland restoration and much more. Our skills are needed more than ever in this time of environmental crisis. We need to speak up, challenging received wisdom where necessary.

There are some excellent opportunities coming up for us to learn from each other, have our voices heard and be inspired to try something new. The Peter Wolf early careers symposium (Digital Futures For Observational and Predictive Hydrology) will have been and gone by the time this issue is printed. Many thanks to Gemma Coxon and team for putting this together.

On 10-11 June is the Royal Society conference, Hydrology in the 21st century: Challenges in science, to policy and practice. Hayley Fowler has led the organising of this high-profile event, which will include speakers from around the world.

And then after the summer break comes our biennial Symposium on 23-24 September at the University of Oxford. Oxfordshire is an epicentre of UK hydrology research and practice, so it seems high time for BHS to gather there. I'm looking forward to the whole event, which will include sessions on data science, initiatives like FDRI and HydroJULES, the Flood Hydrology Roadmap and even one on what we can learn from our failures as well as our successes. We'll be treated to the full Oxford/Hogwarts experience with a dinner in the 16th century Great Hall of Christchurch College.

I'm pleased to say that Professor Berit Arheimer has agreed to give the Penman Lecture, the opening talk at the Symposium. Berit is the current President of the International Association of Hydrological Sciences (IAHS) and works for the Swedish Meteorological and Hydrological Institute.

We are hoping that many BHS members will want to take part in the Symposium, which is an opportunity for both researchers and practitioners to share their work and learn from each other in a supportive atmosphere.

Behind the scenes at BHS, the lengthy process of conversion to a new governance structure (a Charitable Incorporated Organisation) continues. We've submitted our 31-page Charity Commission application, and need to tidy up loose ends. Members should notice little change, but there will be advantages for the Trustees. We have opportunities for new trustees to join the Main Committee from September, replacing those who are due to retire by rotation. See page 25 for how to get involved - I highly recommend saying yes to opportunities like this!



North Pennines spate (V.Shackle)

John Bell, 1933-2023

David Cooper

John with an early neutron probe (UKCEH)



Many members will remember John Bell, who died in June 2023. John was born in 1933 and studied Geology at Nottingham University, where he met his future wife, Gill. After graduating, John worked for the Colonial Development Corporation in Tanganyika to evaluate the possibility of finding coal for the yet to be built railway. In 1957 he transferred to British Guiana to work on alluvial gold dredging on the Potare River, and then a few years later to Capetown, followed by joining the Geological Survey in Nigeria. In 1963 he came home to Britain and joined the Hydrological Research Unit, part of the Hydraulics Research Station, Wallingford. Shortly afterwards (1968) the unit became the independent Institute of Hydrology.

John's early years at Wallingford were spent identifying and setting up sites for long-term catchment experiments including those at Plynlimon (mid-Wales), Grendon Underwood (Buckinghamshire) and the River Cam (Essex-Cambridgeshire border). Measurements of soil water storage were needed, and portable neutron probes were available for this but unwieldy, power hungry, unreliable, heavy and inconvenient. Together with Jim McCulloch, John developed the lighter, low-power Wallingford Neutron Probe—this was licensed for commercial manufacture. John also made advances in improving access tube installation, calibration and data quality control for the instrument.

John was a constant source of encouragement, advice and ideas to improve experimental and analysis methods, coupled with a strong can-do attitude. Group discussions were enlivened by John's anarchic sense of humour, which included naming a Land Rover adapted for the marshy territory of the Plynlimon catchment: a Bog Trotter.

Alongside his formal responsibilities, with Edward Youngs of Rothamsted, John founded the British Soil Water Physics Group—open to like-minded researchers from different institutions. John also took a strong interest in ensuring that the grounds of the offices were a pleasant environment for all staff, and persuaded the management to designate a part for small staff allotments. A rather sudden passion for beekeeping led to John finding a corner of the grounds for a few hives, with all the paraphernalia kept under the floor of one of the labs. He also founded a music club, with lunchtime sessions at which people could share their favourite recordings.

In his later years at Wallingford, John moved to coordinating the Institute's work in overseas development. He kept his interest in soil water alive, especially in two major studies researching drip irrigation of sugar cane in Mauritius, and as part of a major catchment study of the Betwa basin in India.

John was always available to discuss a problem and guide younger members of staff, moulding their interest in soil water behaviour, mentoring, guiding and encouraging the pursuit of what were, with hindsight, some quite risky projects. He rarely lost his temper and had a deep perception of physical phenomena, despite little or no formal training in physics.

Outside of work, John had wide tastes in music and an equally wide series of other interests, including beekeeping and gardening. John and Gill raised four children, who gave them ten grandchildren and two great-grandchildren.

Are you seeing what I'm seeing?

Victoria Coates and Kate Benny—Mott MacDonald

Visual impairments and graphical information

Hydrologists process large quantities of data and strive for professional reports with clear, understandable text and quality graphs and figures that communicate complex information. Graphics can be a clear and succinct method of conveying information; however, visual impairments can lead to different perceptions of graphical information and create confusion, or inability to understand the information.

Visual impairments affect ~10% of the global population. Accessible graphics ensure that people with visual impairments can more easily obtain the same information as everyone else and gain the same understanding and benefits. There are a range of actions which can allow a wider subset of the population to interpret graphical information more clearly, including incorporating key messages conveyed in graphics into the text.

This article focuses on how to make graphical information more accessible for the 1 in 20 men and 1 in 200 women (with European Ancestry) with colour vision deficiency.

What is colour vision deficiency?

Colour vision deficiency is a discrepancy in the way people see colour. The retina in our eyes contains two types of light sensitive nerve cells; rods which see shades and cones which see colour. There are three types of cones - red, green, and blue sensing. People who do not possess any cones cannot see colour and are the true definition of colour blind. For other people, some of the cone types have abnormal sequencing or are not present. These people are colour vision deficient.

Red-green colour vision deficiency

This is the most common form of deficiency. There are four types; the most common is deuteranopia which makes green look more red. Image 1 shows the difference between trichromacy (normal vision) and deuteranopia. Someone with deuteranopia may:

- Find it hard to tell the difference between reds, oranges, yellows, browns and greens.
- See these colours much duller than they appear to someone without colour vision deficiency.
- Have trouble distinguishing between shades of purple.
- Confuse reds with black.

Image 1: Map showing trichromacy (normal) vision and deuteranopia vision

Source: https://www.colourblindawareness.org/



Normal Vision



Deuteranopia

Creating clear graphical information

In documents, websites, maps and presentations, colour should be used with care, so colour vision deficient colleagues can absorb the information. Things to consider:

- Do not only use colour;
- Do not use red-amber-green symbology, rainbow colouring, or pastel shades;
- Use secondary indicators alongside the colour, by circling the words you wish to emphasise, or using a different font or a bold emphasis;
- Use clear lines and boundaries between colours;
- Make sure that graphics are fully labelled or shaded using patterns, such as cross hatching and dashed or dotted lines;
- Think about using grayscale, but do not choose shades that are close together;

Examples of better graphical information

People without colour vision deficiency may think they are using contrasting colours, but to someone with colour vision deficiency they are not.

Figure 1a shows colours that are highly contrasting to those without colour vision deficiency, while Figure 1b is the same figure put through a deuteranopia (green blindness) emulator called Coblis (reference below). The output shows that the orange, green and red look similar. This is a good site to test different colours, but confidential information should not be uploaded to it. You can also use different line styles, rather than just colour.

Figure 1a
Graph A - colours which are not good for individuals with colour vision deficiency

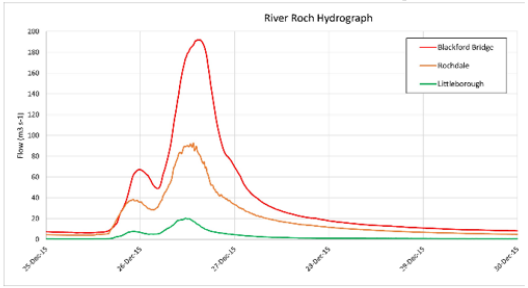
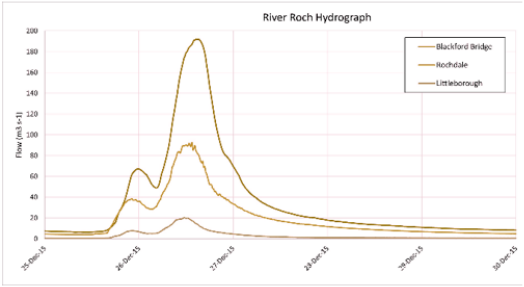


Figure 1b
Graph B - shows how someone with colour vision deficiency would see the graph



Source: http://environment.data.gov.uk/hydrology/

Useful tools and resources

Ordnance Survey has created a colour scheme user-friendly to those with colour vision deficiencies. Access it through the OS Open Zoomstack product (shortly available on the OS app) (https://www.ordnancesurvey.co.uk/newsroom/blog/colour-blind-friendly-mapping and https://www.ordnancesurvey.co.uk/newsroom/blog/try-our-new-os-open-zoomstack-styles-for-colour-blind-users).

GIS software now has schemes which are colour vision friendly, and print and photocopy safe (CIVIDIS colour ramp in ArcPro; ArcMap Pro v3 allows you to check an image for colour compatibility; Color Brewer ramp in QGIS).

The Color Brewer website has a 'colorblind safe' button which allows you to specify how many data classes you want, and either sequential, diverging, or qualitative colours. The output is a list of appropriate colours to use as a HEX code (see the example in Figure 3).

R software has many colour vision deficiency packages including 'viridis' and 'RColorBrewer.' (https://cran.r-project.org/web/packages/viridis/vignettes/intro-to-viridis.html

and https://cran.r-project.org/web/packages/RColorBrewer/RColorBrewer.pdf)

In Windows, you can set a colour filter on your screen in the 'Ease of Access' section of the settings. This includes deuteranopia, protanopia and tritanopia. There are also options to use an inverted, greyscale or inverted greyscale filter.

If you do not have colour vision deficiency, then you can use the colour simulator tool online to see how an image appears to someone with several types of colour vision:

https://www.color-blindness.com/coblis-color-blindness-simulator/

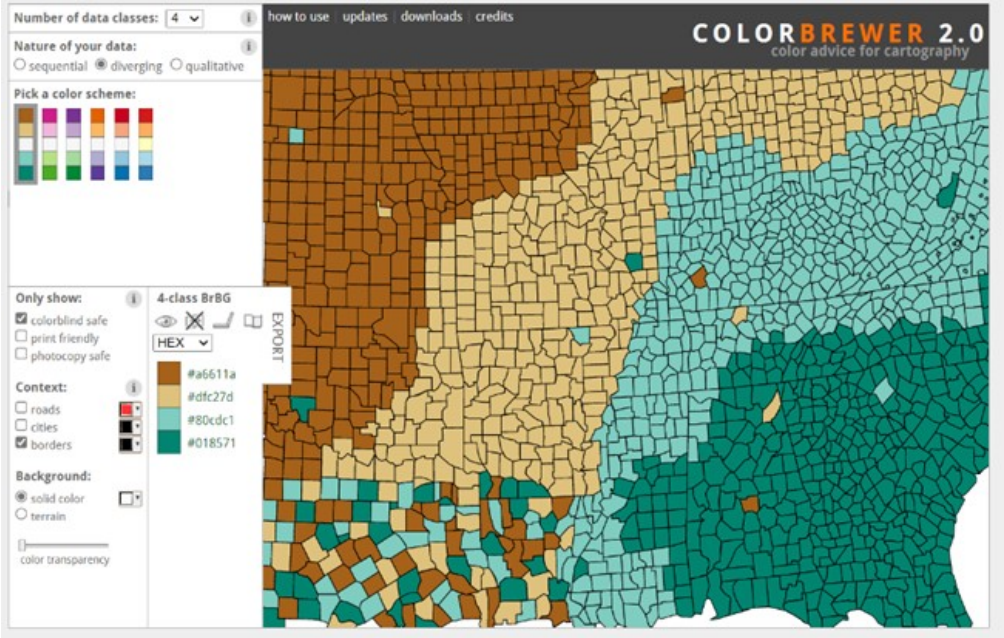


Figure 3: An example map from Colour Brewer 2.0

EGU general assembly 2024

Camilla Negri

The European Geosciences Union General Assembly was held in Vienna 14th-19th April 2024, and I received a BHS travel grant to attend. I showcased part of my PhD research with the Catchment Hydrology sub-group—our session titled "Water quality and availability modelling, risk analysis and decision support under current conditions and future scenarios" kicked off with a guest lecture from Joseph Alcamo ("Expanding the global view of water availability to encompass water quality", https://doi.org/10.5194/egusphere-egu24-18007). The session was of special interest for policy because it was centred around water quality and quantity tools for facilitating effective management of water resources.

Prof. Alcamo emphasized the issue of water availability in future scenarios, and went on to explain how availability and quality are strongly linked, as water quality impairment will affect its availability. He also outlined several challenges facing us when we want to model these issues at the global scale. Finally, the need for more collaboration between water quantity and water quality modellers was highlighted as high priority, especially when modelling climate change. There was also a lively debate about topic communication, with scientists preferring the word "scarcity" over "availability".

The session continued with presentations from scientists working at various scales, including global and European nutrient modelling, catchment modelling, and even mountain rivers, and the issue of scale was further discussed. I presented my work about phosphorus modelling in Irish agricultural catchments "Testing Bayesian Network transferability to diverse agricultural catchments with high phosphorus saturation "

(https://meetingorganizer.copernicus.org/EGU24/EGU24-6414.html). Bayesian belief networks (BBNs) are powerful decision support tools because they use a probabilistic framework to quantify uncertainties and relationships among variables. They enable the integration of diverse data types and facilitate visualizations of causal relationships, aiding in understanding complex systems. BBNs also support scenario analyses, empowering policymakers to assess risks, evaluate alternative strategies, and make informed, evidence-based decisions across various domains. In the context of water quality, BBNs are useful to identify key drivers of degradation, and can be used to evaluate the effectiveness of water management strategies and targeted interventions.

Questions on my modelling work were focussed on the Bayesian modelling application, which I presented in contrast with mechanistic phosphorus models. The final presentation showcased an example of historical water management practices in an arid climate ("Assessing the role of cultural heritage in water management and land adaptation facing climate change: Pantelleria's case study", https://doi.org/10.5194/egusphere-egu24-9545), emphasizing the role of cultural heritage in the context of climate change. Our session was impressive in the breadth of research conducted. Overall, EGU is a great experience and I highly recommend it to Masters and PhD students, who should not be intimidated by the conference size, but rather should take advantage to learn and make connections.



Photo: Dr Shaini Naha

Meeting of the UK Committee on International Hydrology, 29th February 2024

Where hydrology meets diplomacy

Duncan Faulkner

It seemed appropriate to spend this year's bonus leap day trying something new. The BHS chair is a member of the UK Committee on International Hydrology, which has been running, in various guises, since the 1970s. So off I went to a venue near Paddington Station. Other organisations represented round the large table included government departments (FCDO and Defra), inter-governmental (UNESCO), regulators like the EA and equivalents, BGS and UKCEH, the Met Office and international scientific organisations like IAHS and IAH (International Association of Hydrogeologists). Skilful chairing by Harry Dixon (UKCEH) helped avoid anyone drowning in acronym soup.

The committee aims to better coordinate UK contributions to international hydrological and water resources management initiatives, by promoting dialogue between organisations, encouraging collaboration and avoiding duplication.

I was soon to learn that, while some may see hydrology as a science, others view our profession more as a way of projecting power and influence. FCDO (which has merged foreign policy and international development into one department) has its sights set on water, climate and nature. Its climate and environment department has quadrupled in size. An emerging UK government global water strategy will include the water-energy-food nexus, with links to net zero, health and national security. It moves away from direct investment in water and sanitation programmes into promoting more system-wide opportunities. There will be roles for big investors (think insurance companies funding watershed management work in Nigeria) as well as for civil

society campaign groups. The FCDO position is that money for water investment needs to come from the market (e.g. public-private partnerships) and that NGO strategies "haven't worked". I doubt if all BHS members would agree.

All of this will mean opportunities for UK hydrologists - and meteorologists. There are many routes by which British hydrological knowledge can leak out to overseas. SEPA, and the Scottish government's Hydro Nation Information Centre, are helping water regulators in Malawi. JBA has evaluated flood risk for the transport network in Ulaaanbaatar. Jacobs is working on Australian bushfire hydrology. Arup is assessing flood risk for Rohingya refugee camps. The Met Office, with ECMWF and universities, has been modelling tropical cyclones and their impacts over southern Africa. UKCEH is setting up an office in Accra. This is just a small selection.

There are also longer-term, more structured initiatives. The IAHS is running the HELPING decade, as reported in an earlier Circulation, on the theme of linking water science with solutions. Shortly after the UKCIH meeting, BHS selected a new IAHS UK rep, Chris White of Strathclyde University. Chris will act as a link between IAHS and BHS, as well as chairing the UK IAHS Committee. There are opportunities for BHS members to get involved in IAHS initiatives, with a particular shortage of early career reps.

UNESCO may be best known for its World Heritage Sites but its also been running the Intergovernmental Hydrological Programme since 1975. Current IHP initiatives include the Megacity Alliance for Water and Climate, the FRIEND programme and Hydrology for Environment, Life and Policy (HELP), which includes 12 demonstration catchments in the UK. Our own David Hannah is the UNESCO Chair in Water Science at Birmingham, and members may have been involved in activities organised by David's group around World Water Day in March.

By the afternoon I was starting to need some HELP in distinguishing HELP from HELPING. So if you are struggling to work out how all these initiatives and organisations fit together and how they avoid duplication, you aren't alone. And that brings us back to the raison d'être of the UKCIH. There's a lot going on, and much that BHS members can contribute. If anyone is interested in organising a future BHS national meeting on UK involvement in international hydrology, please get in touch.

Further information can be found at https://www.ceh.ac.uk/uk-committee-international-hydrology





Reflections on the UK Hydrology Skills and Satisfaction Survey

Chris Skinner

In 2023, I led the delivery of the UK's first Skills and Satisfaction Survey of the users of hydrology as part of my role in the Environment Agency's Flood Hydrology Improvements Programme (FHIP). The survey's result are a baseline to help inform future actions from the UK Flood Hydrology Roadmap, but they also provide us, as members of the BHS, some important insights. As both the author of the reports and a current trustee for the Society, I wanted to share some of my personal reflections.

Reports are available here: https://engageenvironmentagency.uk.engagementhq.com/w4-skills-survey

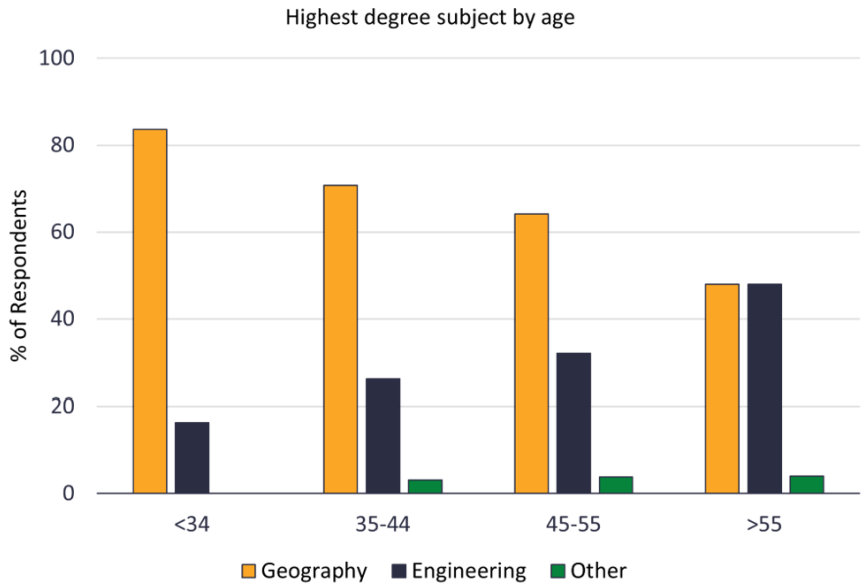
The results of the survey suggest both an opportunity and an existential crisis for the Society. We targeted anyone who uses hydrology in their jobs, and of the 286 people who replied, 64% were not members of the BHS. This is the opportunity – there are at least 183 people in the UK for whom the Society is likely to be relevant, and are potential future members. If we assume the 11% response rate for BHS members applies for non-members too, we could double the size of the membership!

However, digging deeper, we see that younger age groups were less likely to be members than older ones. The opposite was seen for those who are members of CIWEM, an organisation that had exactly the same level of membership as the BHS amongst the respondents. This maps well onto the subject area of the highest degrees held by respondents – over time there has been a shift from engineering focussed degrees (27% of respondents) to those focussed on geography

or environmental sciences (71% of respondents). The figure below shows the age profile for broad subject categories of degree, amongst the survey respondents.

Without getting into the past debates of Roy Ward, Peter Eagleson and others around engineering and geographical hydrology, it is crucial for the future of the Society that we understand this shift, and flex in response. Could a perception that the Society is engineering-focussed (we are a Special Knowledge Group of the ICE after all) be putting off potential members who have a geographical background? It is also vital when interpreting our own Equality, Diversity & Inclusion (EDI) data, as the diversity of graduates varies greatly between subjects (see my previous article with Helen Harfoot in Issue 150).

The challenge of the survey results for the trustees (including me) and for you, the membership, is how do we make the BHS more relevant to that 64% of potential future members?



Forthcoming BHS events

Hydrology in the 21st Century: Challenges in Science, to Policy and Practice – 10-11 June 2024 (London)

This Royal Society Discussion Meeting will bring the UK and International Hydrology communities together to celebrate 40 years of the British Hydrological Society and reflect on how hydrology has advanced in the last 40 years. We will discuss the advances made, the challenges that still remain, and mechanisms to speed up the adoption of new science in policy and practise; something that is vital in our rapidly warming world. The meeting is a timely opportunity to review progress and examine the opportunities that exist to address grand challenges in society that are centred on hydrological understanding, but with the opportunity to bring in transdisciplinary expertise, particularly across policy and industrial practice. Speakers have already been invited, and there is an open poster session on Monday 10 June.

You can register to attend at: https://royalsociety.org/science-events-and-lectures/2024/06/hydrology

BHS National Symposium

23-24 September 2024 (Oxford)

The 2024 British Hydrological Society National Symposium will be hosted at the University of Oxford from 23-24 September 2024.

This event will appeal to the full range of BHS membership, with lots of opportunities to contribute. Registration details and a full programme will be available in late May.

New members of British Hydrological Society

Hannah Bewley

Carl Townley

Yusuf Ogunfolaji

Jaime Twinning

Lewis Russell (Fairhurst)

Charlotte Lyddon

Ikenna Okere (Cromarty Firth Port Authority)

Samuel Horton

Ari Cooper-Davis

Welcome all!

High flows in the River Garry, West Highlands (T.Boase)



Flood estimation and the binary categorization of doom

Anthony Hammond (plus David Cameron, Lisa Chatterjee, Jenni Essex, Eva Kordomenidi, James Molly and Vicky Shackle) JBA Consulting

"Permeable catchment": the term is enough to strike fear into the budding flood hydrologist. If a catchment has a baseflow index (BFIHOST19) above the threshold 0.65, the associated data is sometimes cast aside as if it were a dangerous bug. Urban catchments have a similar effect. Like the bug, perhaps the data are not so dangerous, merely misunderstood, and subject to a rather bad press. Analysis shows that for BFIHOST and URBEXT2000, there is no obvious threshold which indicates a step change in the scaled distributions.

First, the background. The Flood Estimation Handbook (FEH) methods are applied to estimate, for a point along a river, flood peaks associated with a range of return periods. To do this we pool together annual maximum (AMAX) flow samples from catchments similar to our subject (assuming the AMAX have the same underlying distribution except for a scaling factor). We then undertake our statistical analysis on the pooled data.

A useful proxy for quantifying the permeability of a catchment is the baseflow index (proportion of the long-term flow which is base flow). The higher this is, the more permeable the catchment, and 0.65 (estimated using hydrology of soil types (BFIHOST)) is an often-applied threshold to suggest "permeable or not". Similarly, URBEXT2000 quantifies the fraction of urban and suburban catchment area, and >0.03 is often used to denote an urban catchment (and URBEXT>0.6 extremely urbanized).

BFIHOST is not used to select pooling catchments, and many practitioners remove sites with values >0.65 ("permeable"), if the subject site is not permeable. Why?

There is a concern that the AMAX samples from permeable catchments do not have the same underlying distribution – hence their removal (or adjustment). Reasons for this are detailed in the FEH volume 3 section 19.2. As with bugs, not all permeable catchments are dangerous. Firstly, it should be noted that all catchments are permeable. However, the binary categorisation remains. Let's look at the data.
These plots use AMAX from 469 catchments that are "suitable for pooling" in the National River Flow Archive and have 30+ years of data. In most plots the 100-year growth factor is shown (100-year peak divided by QMED), in all cases calculated assuming a Generalised Logistic distribution.

Figure 1. BFIHOST. Distribution of 100-year growth factors, plotted against BFIHOST (left) and with a binary split (right).

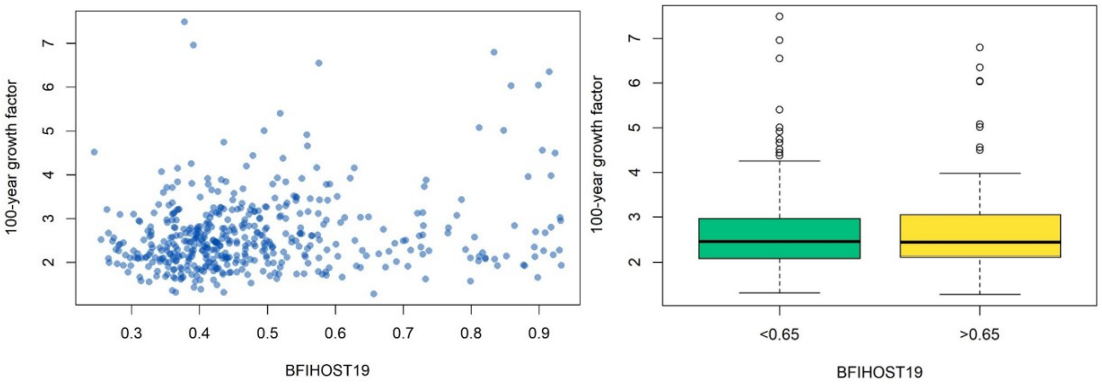
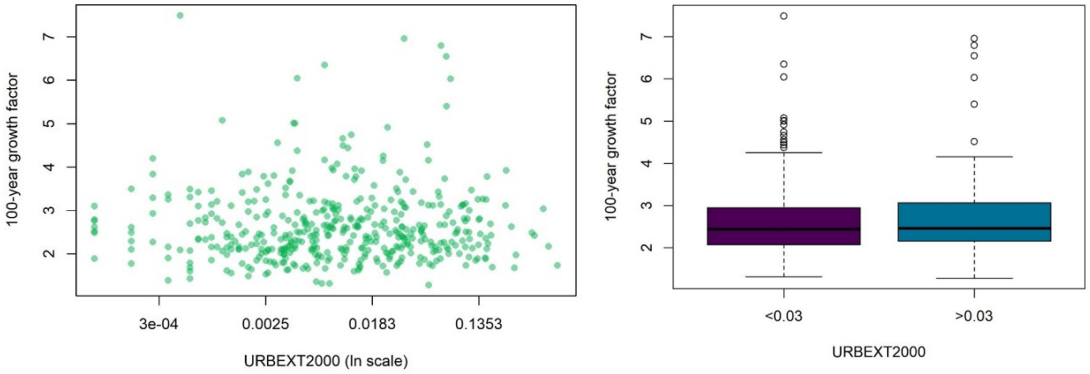


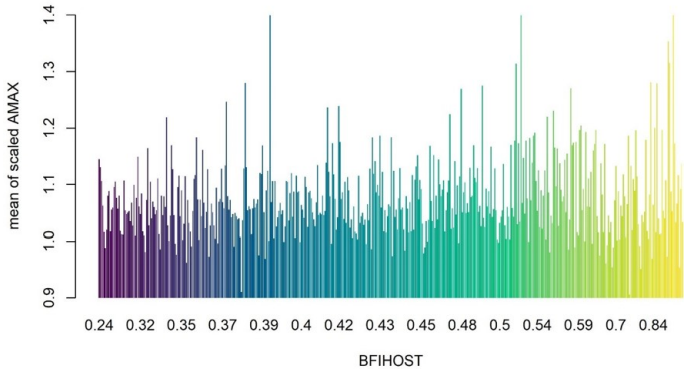
Figure 1 shows there is no obvious threshold where there is a step change in the scaled distributions with variation in BFIHOST. The same is seen if we examine data for URBEXT 2000, as shown in Figure 2.
Plotting the 100-year growth factors against either BFIHOST or URBEXT2000 split into even quartiles similarly shows no threshold at which there is a change in the distribution.

Figure 2. URBEXT. Distribution of 100-year growth factors, plotted against URBEXT (left) and with a binary split (right).



Lastly, we plotted the means of the scaled AMAX samples against their catchment BFIHOST and URBEXT2000 values (Figure 3 shows the BFIHOST plot); there is no discernible trend in scaled mean with increasing permeability or increasing URBEXT2000.

Figure 3. Means of scaled AMAX vs. BFIHOST value. AMAX were scaled by dividing them by QMED.



In conclusion, this brief analysis found no obvious threshold where there was a step change in the scaled distributions, for BFIHOST or for URBEXT2000. It suggests there is no justification for removing AMAX series from a pooled group because BFIHOST or URBEXT2000 exceed a binary threshold.

TRUSTEE VACANCIES VICTORIA COATES

Letter to the editor — *from James Dent*

Problems with land and road drainage

Dear Editor

There has been an increase in what weather and flood forecasters blithely describe as "localised flooding". Recently this has reached epidemic proportions — in our part of mid-Suffolk even 3 or 4 hours of rainfall results in impassable roads, and people are concerned they will become stranded or their vehicles damaged. In wet spells these road floods form almost semi-permanent features. Why is this? I can offer the following suggestions.

Deteriorating land drainage. Maintenance and clearance has been neglected, and a clear pathway for water is often absent.

Lack of river maintenance, decline of Internal Drainage Boards, loss of local knowledge, poorly reasoned conservation and so-called 'environmental management'.

Flood control structures. Historical river control structures are now redundant, and in many cases non-operable.

Lack of road gulley clearance. Local road maintenance budgets are a bare minimum: verges build up, drainage cuts become blocked.

Better development control. Nobody can know if the flood detention structures work, so this aspect of local flood management is just a bureaucratic and theoretical exercise.

These essential tasks require on-the-ground manpower; the membership of BHS must use their professional expertise to exert pressure on the Environment Agency, local authorities, road agencies and DEFRA, to deal with the problem. In my opinion, concentrating on basic issues rather than fanciful theorising about re-wilding and carbon reduction, would be much more useful and appreciated by the general public.

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