

SUMMARY The outlook for April is for above normal river flows in central, southern and eastern England. These areas are likely to see normal to above normal river flows over the April-June period. In the north and west of the UK, normal to above normal river flows are most likely in April and for April-June. For Groundwater levels, above normal levels are likely to persist for most of the UK through April, and for the April-June period.

Rainfall:

March continued a sequence of wet months, with above average rainfall in England, Wales, Northern Ireland and eastern Scotland. Western Scotland, and parts of East Anglia saw below average rainfall.

The forecast (issued by the Met Office on 02.04.2024) for April shows similar likelihoods of above- and below-average rainfall in April, but an increased chance of above-average rainfall in April to June.

River flows:

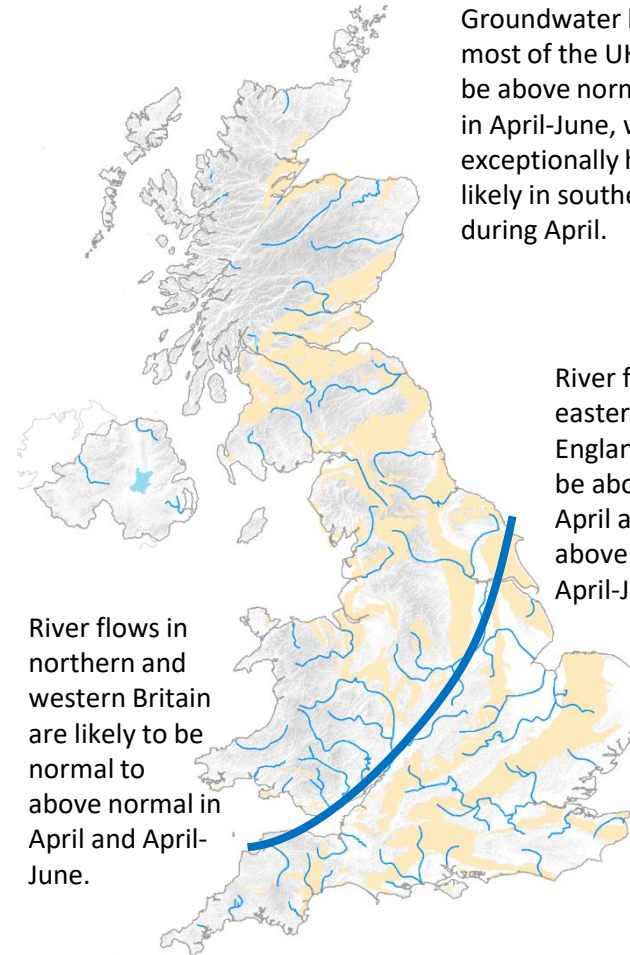
River flows in March were above normal across most of England and Wales, with widespread exceptionally high flows (with some sites recording the highest average March flow in their records). For northern Britain, flows were in the normal range, with some above below normal flows in northern Scotland.

The forecast for April is for above normal flows in central, southern and eastern England, with a likelihood of notably or exceptionally high flows persisting in some catchments. For the north and west, normal to above normal flows are the most likely outcome. The April-June outlook is for normal to above normal flows for the whole of the UK.

Groundwater:

Groundwater levels in March were above normal, except for a few boreholes in northern Britain. Exceptionally high levels were widespread across aquifers in England and Wales, with several boreholes recording the highest March levels in their record.

The outlook for April is for a continuation of above normal levels across most of the UK, with widespread notably or exceptionally high levels, particularly in the Chalk aquifer. The three-month outlook indicates above normal levels will persist in many areas, but in some fast-responding areas such as the Jurassic limestones, levels may begin to recede with more boreholes entering the normal range.



Groundwater levels across most of the UK are likely to be above normal in April and in April-June, with notably or exceptionally high levels likely in southern Britain during April.

River flows for central, eastern and southern England are likely to be above normal in April and normal to above normal over the April-June period.

River flows in northern and western Britain are likely to be normal to above normal in April and April-June.

Shaded areas show principal aquifers

The UK Hydrological Outlook provides an outlook for the water situation for the United Kingdom over the next three months and beyond. For guidance on how to interpret the outlook, a wider range of information, and a full description of underpinning methods, please visit the website: www.hydoutuk.net

About the UK Hydrological Outlook:

This document presents an outlook for the UK water situation for the next 1-3 months and beyond, using observational datasets, meteorological forecasts and a suite of hydrological modelling tools. The outlook is produced in a collaboration between the UK Centre for Ecology & Hydrology (UKCEH), British Geological Survey (BGS), the Met Office, the Environment Agency (EA), Natural Resources Wales (NRW), the Scottish Environment Protection Agency (SEPA), and for Northern Ireland, the Department for Infrastructure – Rivers (DfIR).

Data and Models:

The UK Hydrological Outlook depends on the active cooperation of many data suppliers. This cooperation is gratefully acknowledged. Historic river flow and groundwater data are sourced from the [UK National River Flow Archive](#) and the [National Groundwater Level Archive](#). Contemporary data are provided by the EA, SEPA, NRW and DfIR. These data are used to initialise hydrological models, and to provide outlook information based on statistical analysis of historical analogues.

Climate forecasts are produced by the Met Office. Hydrological modelling is undertaken by UKCEH using the Grid-to-Grid and GR6J hydrological models. Hydrogeological modelling uses the AquilMod model run by BGS.

Supporting documentation is available from the Outlooks website:

<https://hydoutuk.net/about/methods>

Presentation:

The language used in the summary presented overleaf generally places flows and groundwater levels into just three classes, i.e. below normal, normal, and above normal. However, the underpinning methods use as many as seven classes as defined in the graphic to the right, i.e. the summary uses a simpler classification than some of the methods. On those occasions when it is appropriate to provide greater discrimination at the extremes the terminology and definitions of the seven class scheme will be adopted.

| | Percentile range of historic values for relevant month |
|-------------------------|--|
| Exceptionally high flow | > 95 |
| Notably high flow | 87-95 |
| Above normal | 72-87 |
| Normal range | 28-72 |
| Below normal | 13-28 |
| Notably low flow | 5-13 |
| Exceptionally low flow | < 5 |

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From April 2018 the UK Hydrological Outlook is supported by the Natural Environment Research Council funded [UK-SCAPE](#) and [Hydro-JULES](#) Programmes.

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Further information:

For more detailed information about the UK Hydrological Outlook, and the derivation of the maps, plots and interpretation provided in this outlook, please visit the UK Hydrological Outlook website. The website features a host of other background information, including a wider range of sources of information which are used in the preparation of this Outlook. Dynamic access to many of the outputs of the UK Hydrological Portal are available on the [UK Hydrological Outlooks Portal](#).

Contact:

UK Hydrological Outlooks, UK Centre for Ecology & Hydrology, Wallingford, Oxfordshire, OX10 8BB
t: 01491 838800 e: <https://hydoutuk.net/contact>

Reference for the UK Hydrological Outlook:

UK Hydrological Outlook, 09 April 2024, UK Centre for Ecology & Hydrology, Oxfordshire UK, Online, <https://www.hydoutuk.net/latest-outlook/>

Other Sources of Information:

The UK Hydrological Outlook should be used alongside other sources of up-to-date information on the current water resources status and flood risk.

Environment Agency Water Situation Reports: provides summary of water resources status on a monthly and weekly basis for England: <https://www.gov.uk/government/collections/water-situation-reports-for-england>

Flood warnings are continually updated, and should be consulted for an up-to-date and localised assessment of flood risk:

- Environment Agency: <https://flood-warning-information.service.gov.uk/map>
- Natural Resources Wales: <https://flood-warning.naturalresources.wales/>
- Scottish Environment Protection Agency: <https://www.sepa.org.uk/flooding.aspx>

Hydrological Summary for the UK: provides summary of current water resources status for the UK: <https://nra.ceh.ac.uk/monthly-hydrological-summary-uk>

UK Met Office forecasts for the UK: <https://www.metoffice.gov.uk/>

UK Water Resources Portal: monitor the UK hydrological situation in near real-time including rainfall, river flow, groundwater and soil moisture from COSMOS-UK: <https://eip.ceh.ac.uk/hydrology/water-resources/>

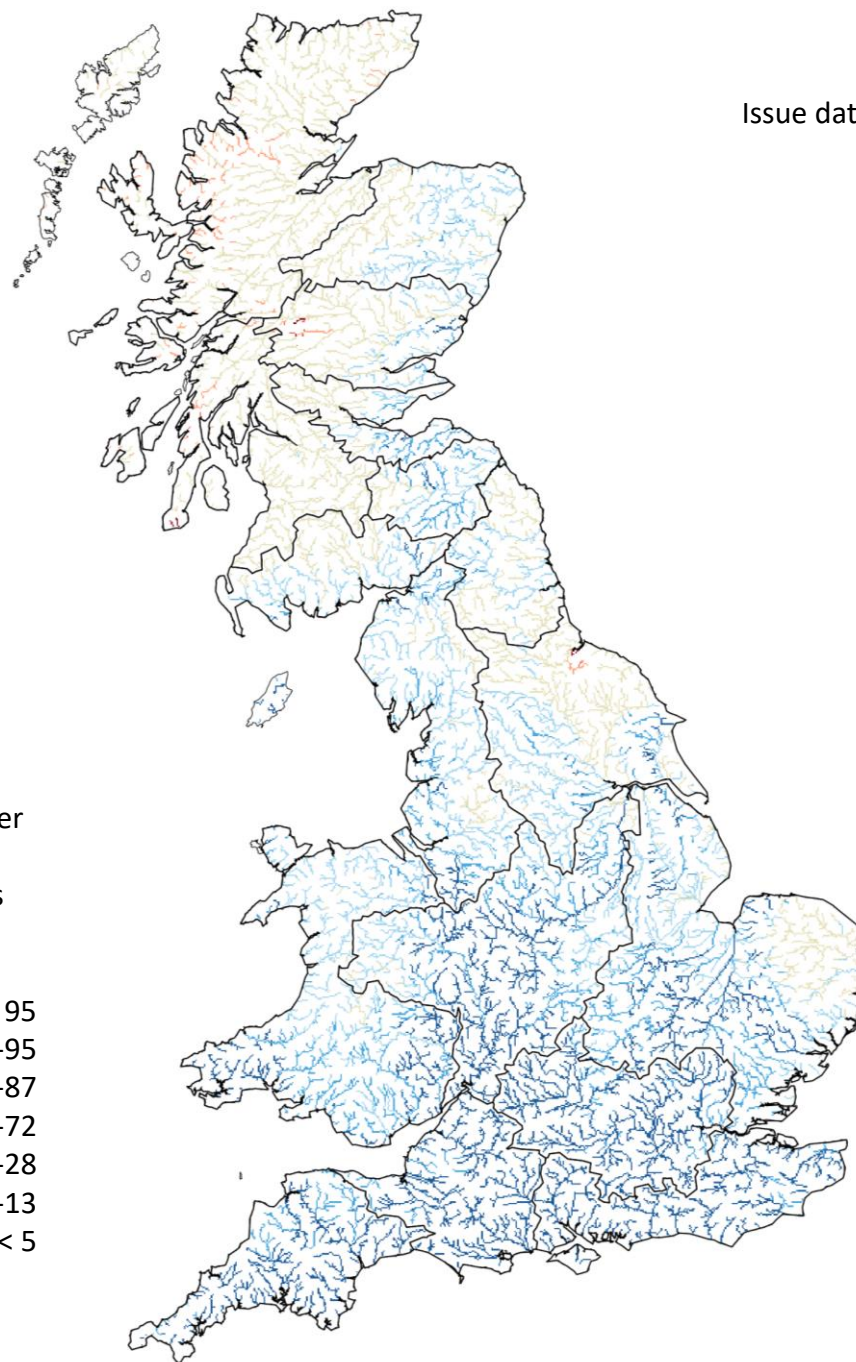
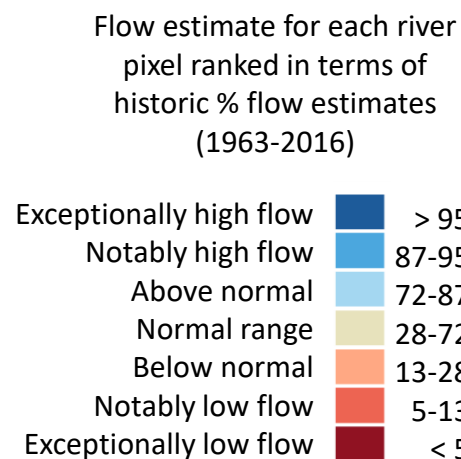
March's mean river flows simulated by the Grid-to-Grid hydrological model

Issue date: 04.04.2024

This map shows the simulated monthly mean flow across Great Britain for last month, ranked in terms of 54 years of historical flow estimates (1963 – 2016).

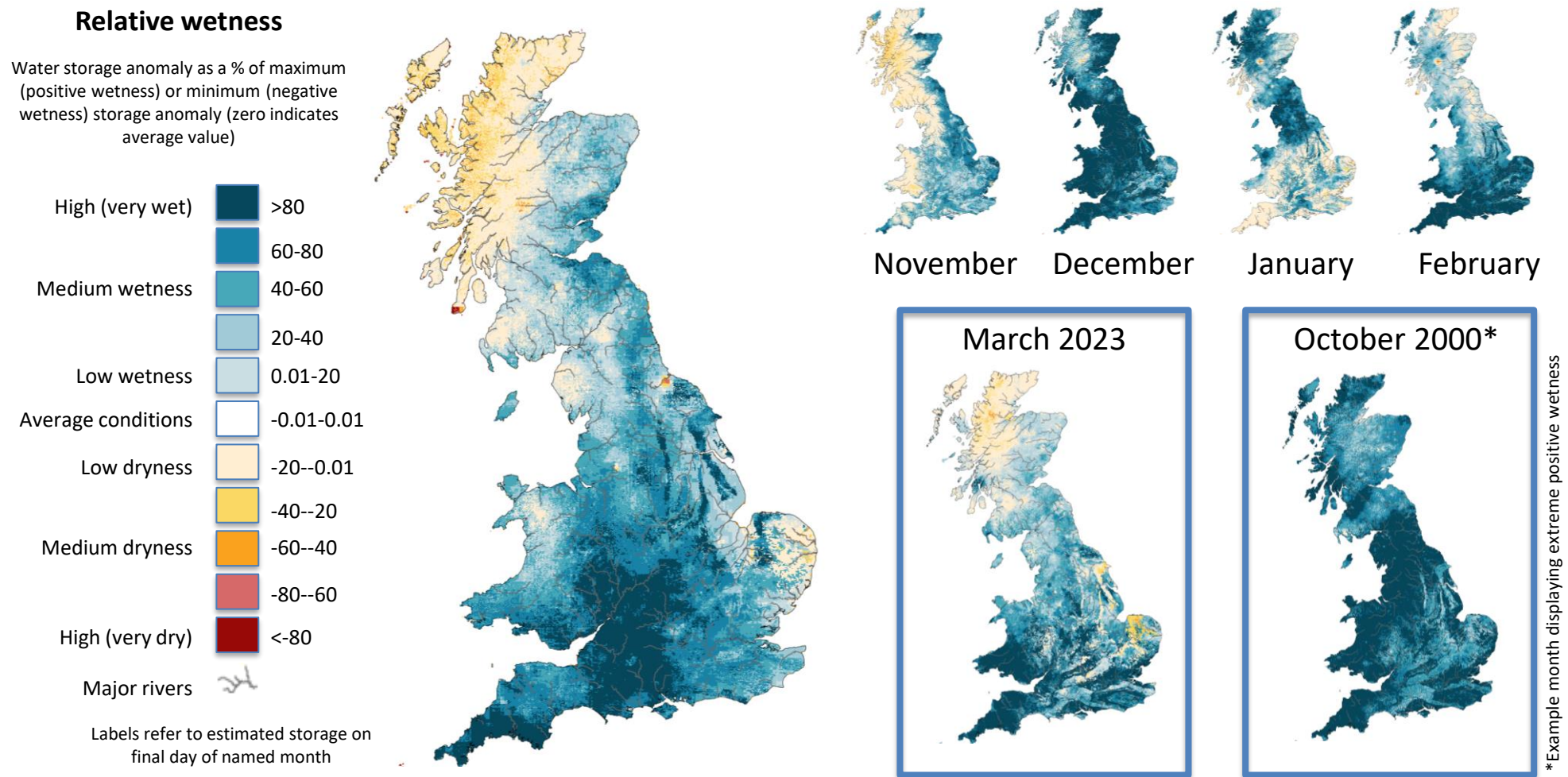
These flows are produced by the 1km resolution Grid-to-Grid (G2G) hydrological model, which is run up to the end of each calendar month using observed rainfall and MORECS potential evaporation as input.

Note that the G2G model provides estimates of natural flows.



These maps are based on Grid-to-Grid (G2G) hydrological model simulated subsurface water storage (water in the soil and groundwater), expressed as an anomaly from the historical monthly mean. To highlight areas that are particularly wet or dry, the storage anomaly is presented relative to historical extremes. Rainfall in WET areas with high positive relative wetness could result in flooding in the coming days/weeks. Areas of negative relative wetness indicate locations which are particularly DRY, and little or no rain in these areas could potentially lead to (or prolong) a drought. Maps of soil moisture only are available on the next page.

SUMMARY: Subsurface water stores are medium to high (medium to very wet) in England and Wales, with lower wetness in the north of England and the southeast Scotland. In the northwest of Scotland, conditions are typical to slightly drier than usual for the time of the year.



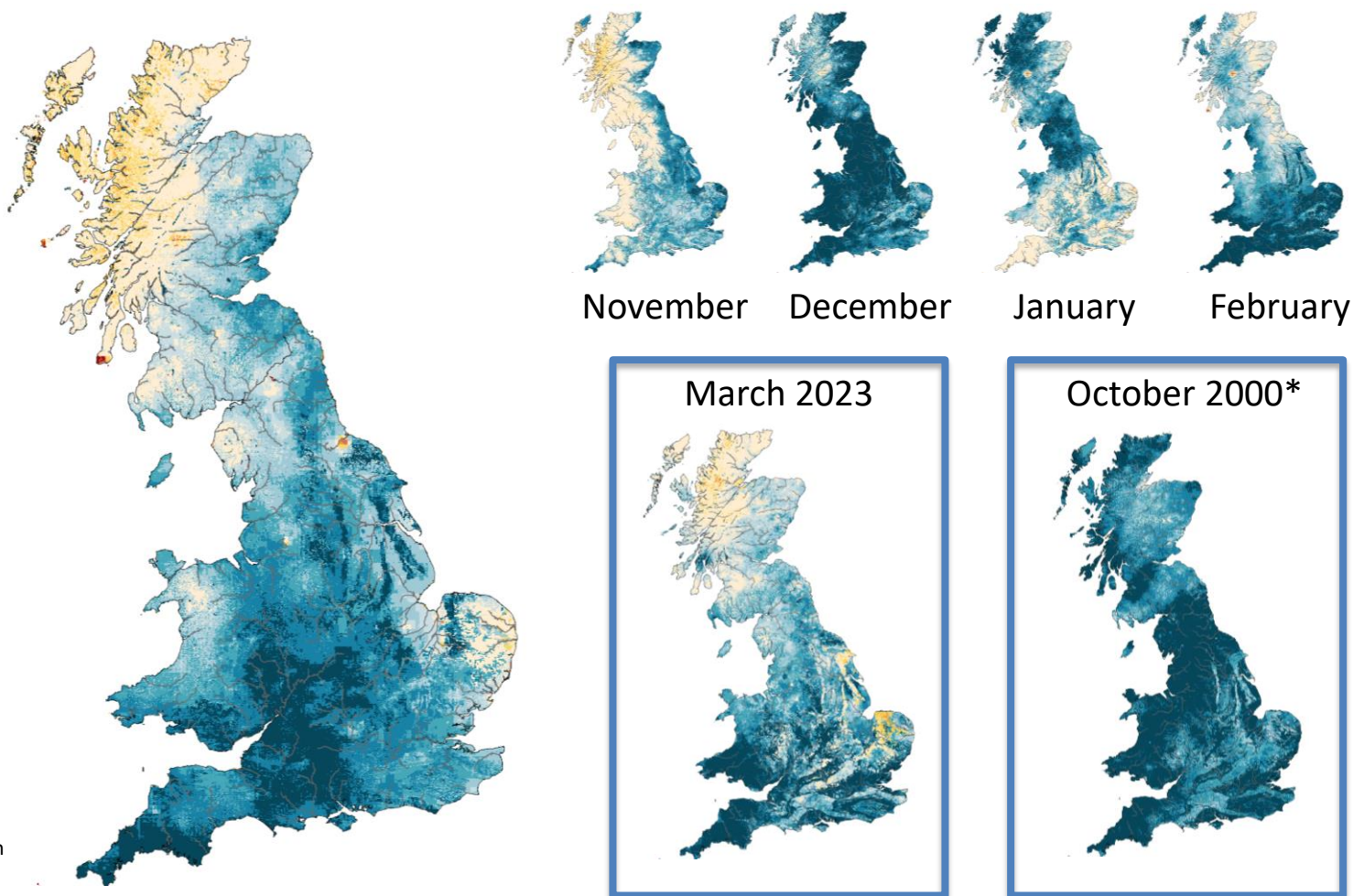
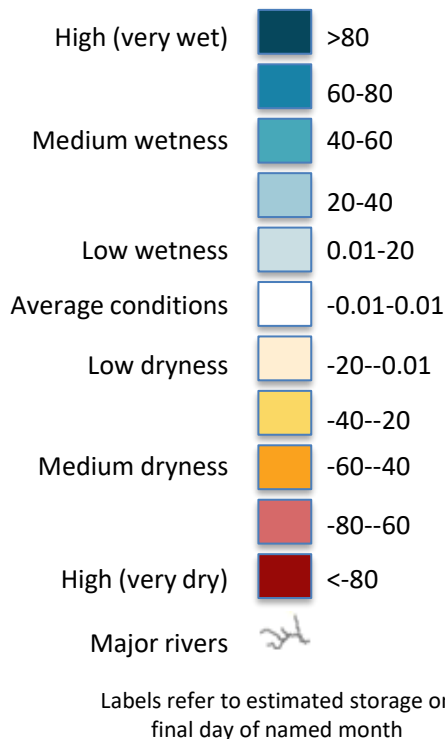
April 2024

These maps are based on Grid-to-Grid (G2G) hydrological model simulated soil moisture, expressed as an anomaly from the historical monthly mean. To highlight areas that are particularly wet or dry, the soil moisture anomaly is presented relative to historical extremes. These maps are not a forecast; rather an indication of current conditions. Soil moisture will often look similar to total storage (shown on the previous slide), since total storage comprises both soil moisture and storage in the saturated zone.

SUMMARY: Soil moisture stores are medium to high (medium to very wet) in England and Wales, with lower wetness in the north of England and the southeast Scotland. In the northwest of Scotland, conditions are typical to slightly drier than usual for the time of the year.

Relative wetness

Soil moisture anomaly as a % of maximum (positive wetness) or minimum (negative wetness) storage anomaly (zero indicates average value)



April 2024

Estimate of Additional Rainfall Required to Overcome Dry Conditions

Based on subsurface water storage estimated for 31 March 2024

Issue date: 04.04.2024

These maps show the Grid-to-Grid (G2G) hydrological model simulated subsurface water storage, expressed as an anomaly from the historical monthly mean (1981-2010), presented on a 1km grid and as regional means. Subsurface storage deficits, i.e. where the subsurface water storage anomaly is less than zero, are highlighted in red/pink.

The subsurface storage deficit (mm) can be interpreted as an estimate of additional rainfall that would be required in future months to overcome dry conditions (i.e. rainfall in addition to what is expected on average). Regional mean values of additional rainfall required are provided in the table below.

Regional estimate of additional rainfall required (mm)

SCOTLAND

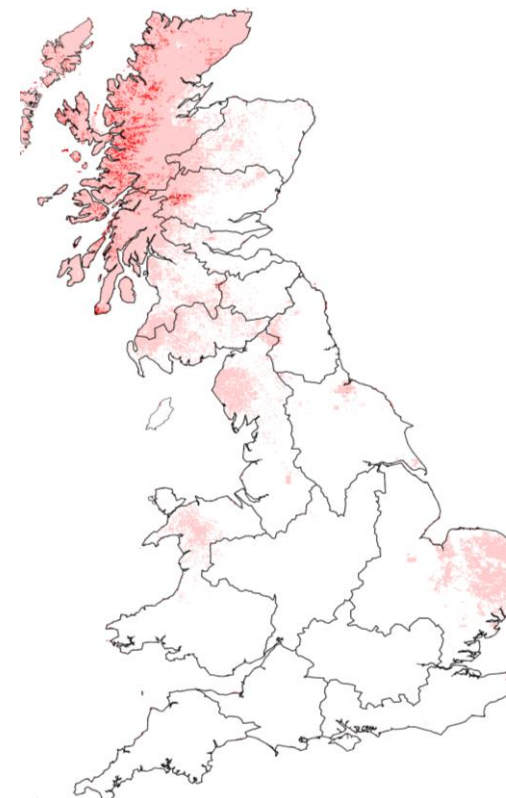
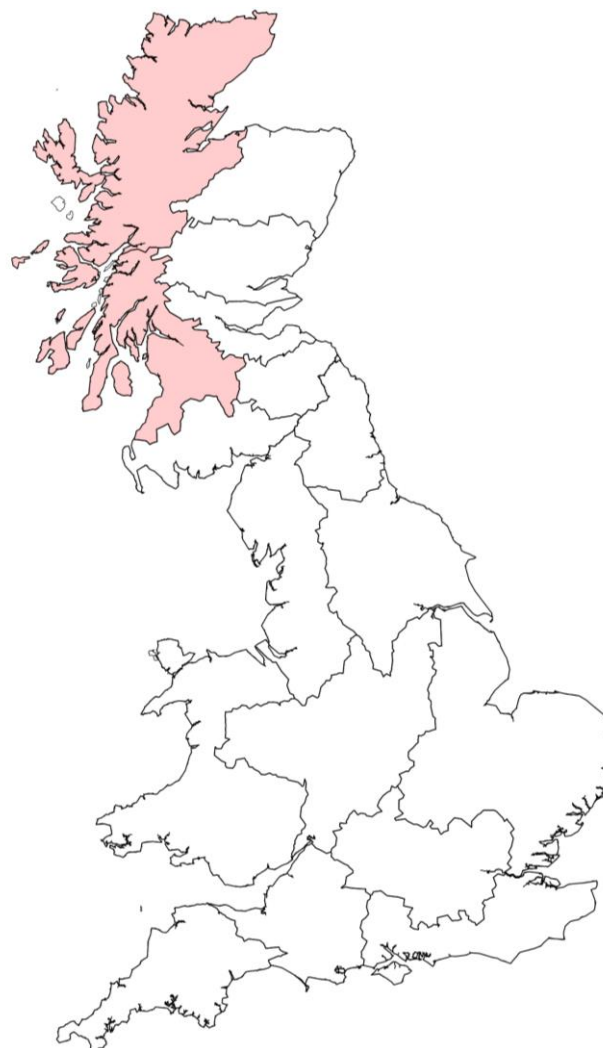
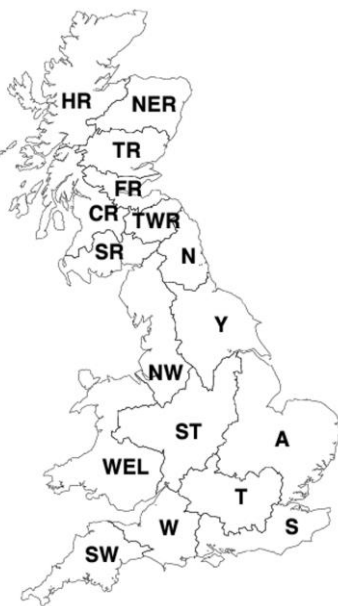
- 13 HR Highlands Region
- 0 NER North East Region
- 0 TR Tay Region
- 0 FR Forth Region
- 5 CR Clyde Region
- 0 TWR Tweed Region
- 0 SR Solway Region

ENGLAND

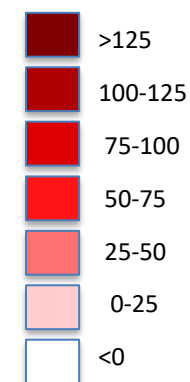
- 0 N Northumbria
- 0 NW North West
- 0 Y Yorkshire
- 0 ST Severn Trent
- 0 A Anglian
- 0 T Thames
- 0 W Wessex
- 0 S Southern
- 0 SW South West

WALES

- 0 WEL Welsh



Water storage deficit (anomaly; mm)



Return Period of Rainfall Required to Overcome Dry Conditions

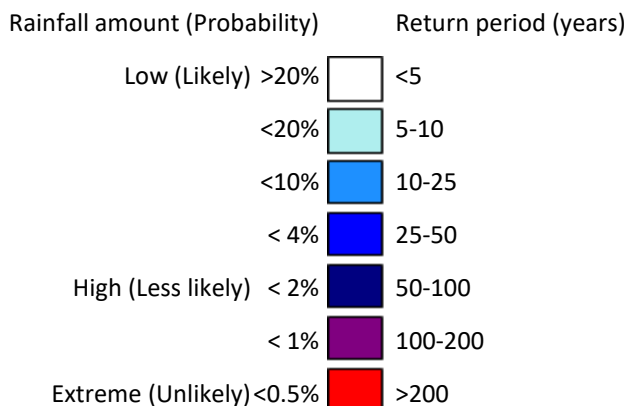
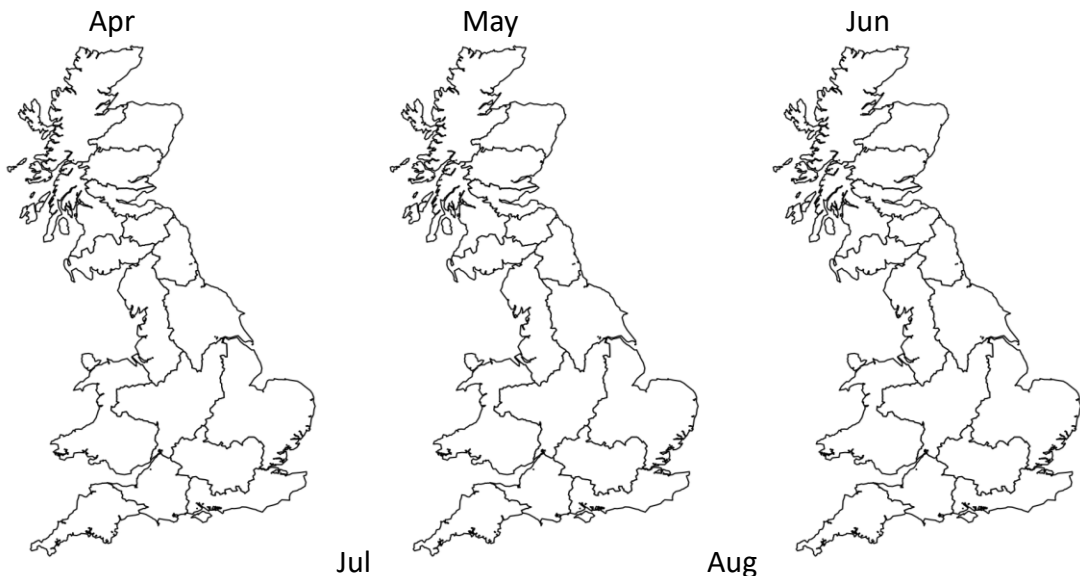
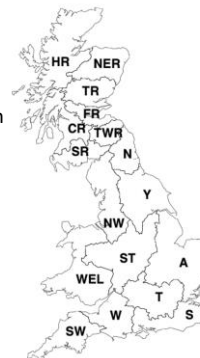
Period: April 2024 - September 2024

Issue date: 04.04.2024

These maps show the return period of the rainfall required to overcome dry conditions simulated using the Grid-to-Grid (G2G) hydrological model. The maps are coloured according to the return period of accumulated rainfall required to overcome the estimated current subsurface water storage deficit over the next one to six months (areas with no storage deficit will always be white). These maps do not provide a drought forecast; instead they indicate whether particularly heavy rainfall would be required to return to normal conditions for the time of year.

SUMMARY:
The only region with a water storage deficit at the end of March is the Highlands but this does not require unusual (>5-year return period) rainfall to replenish.

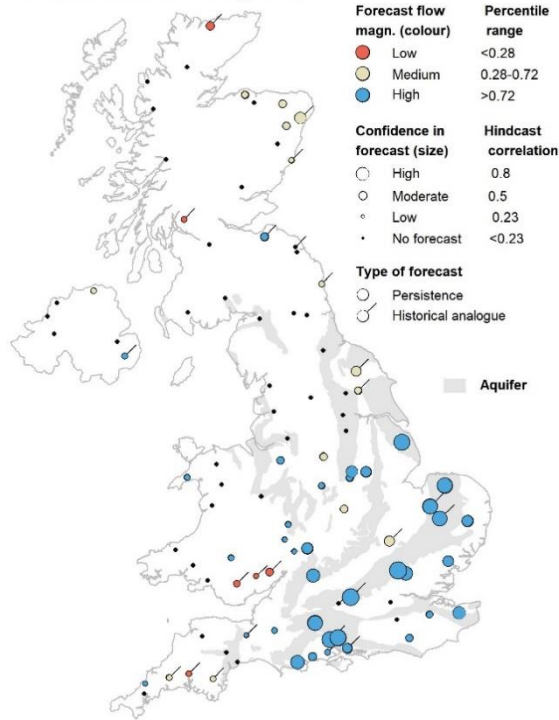
- SCOTLAND**
 HR Highlands Region
 NER North East Region
 TR Tay Region
 FR Forth Region
 CR Clyde Region
 TWR Tweed Region
 SR Solway Region
- ENGLAND**
 N Northumbria
 NW North West
 Y Yorkshire
 ST Severn Trent
 A Anglian
 T Thames
 S Southern
 W Wessex
 SW South West
- WALES**
 WEL Welsh



SUMMARY:

The April and April – June outlooks indicate river flows across the south and east of the country are most likely to be above normal. Elsewhere flows are likely to be within the normal range although there is little confidence in the forecasts in northern and western areas.

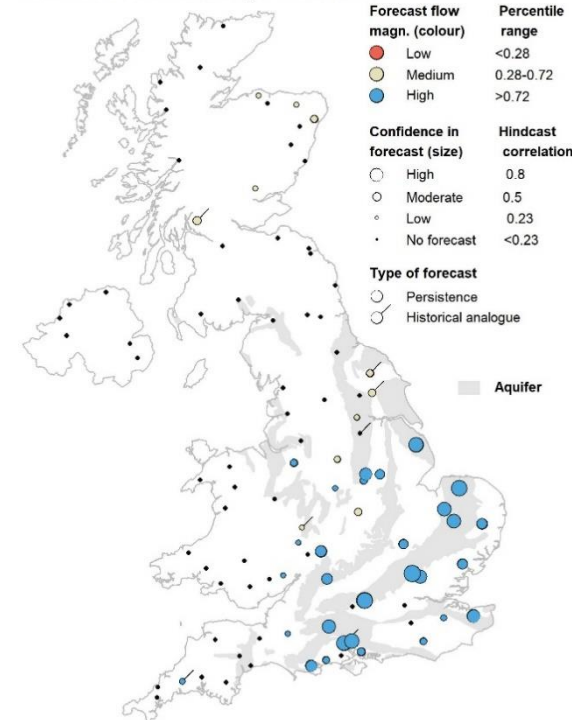
River flow outlook for Apr 2024



1-month flow outlook

Outlooks from hydrological analogues are based on a comparison of river flow during recent months with flows during the same months in previous years at a set of approximately 90 sites from across the UK. These sites are depicted on the two maps. Years with observed flows that most closely resemble current conditions are identified as the best analogues and the outlook is based on extrapolating from current conditions based on these analogues.

River flow outlook for Apr - Jun 2024



3-month flow outlook

It is, however, often the case that a simpler forecast based on the persistence of river flow provides a better forecast than provided by analogy. This is particularly true for slowly responding catchments associated with aquifer outcrops.

Both methods are considered at each site and the forecast from the method with the higher confidence is presented. A simple classification of flows is used (high, medium and low) as indicated by the colours of the dots, with the confidence

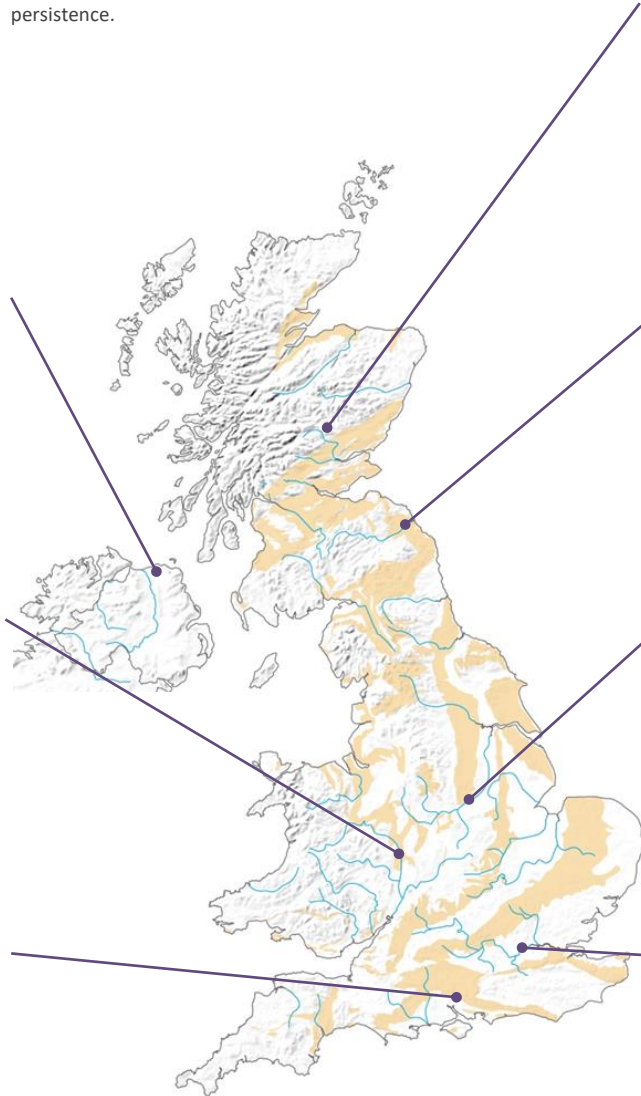
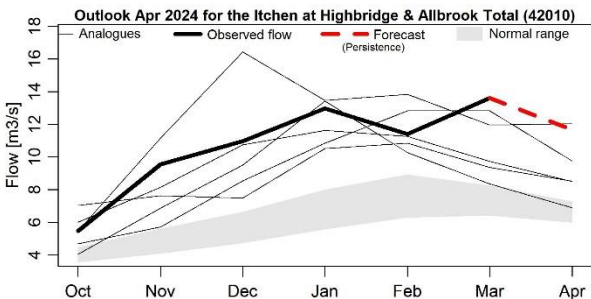
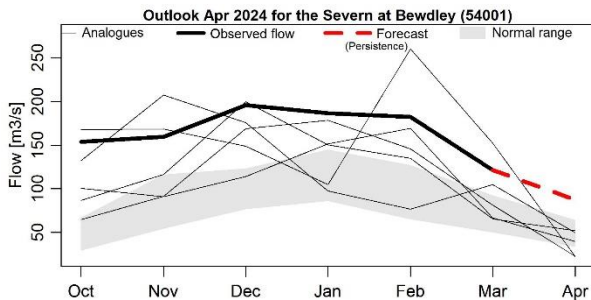
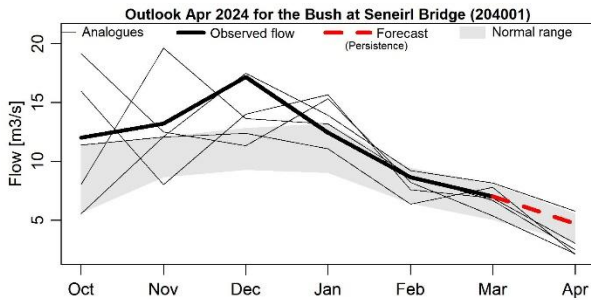
of the forecast being represented by the size of the dot. A tag on the dot indicates which method has been used in each instance.

Period: April 2024

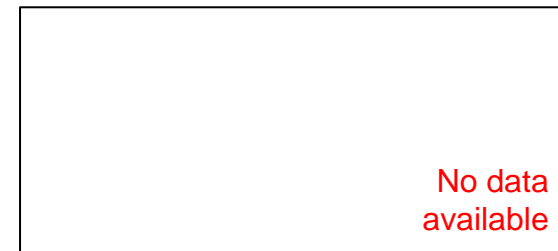
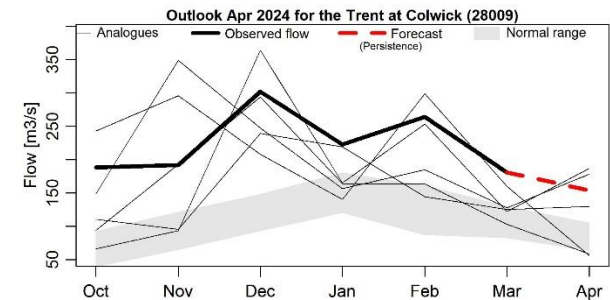
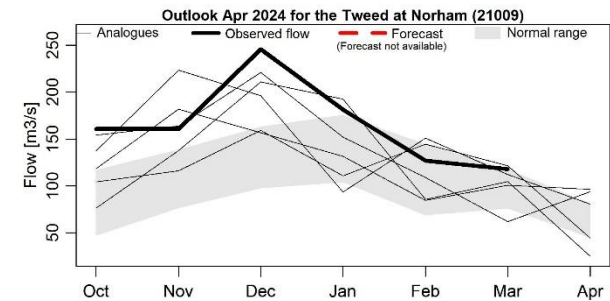
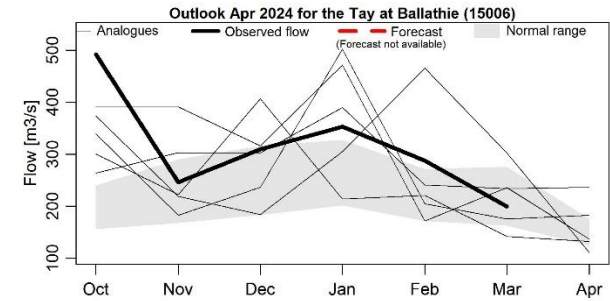
These figures provide insight into the hydrological analogue methodology for a set of sites from across the UK.

In each of the time series graphs the bold black line represents the observed flow during the past six months. The grey band indicates the normal flow range (the normal band includes 44%

of observed flows in each month). The selected analogues are shown as thin lines and the trajectories that flows took in the following month are also shown. The forecast is shown as the dashed red line, and in each plot it states whether this has come from the analogues or has been generated on the basis of persistence.



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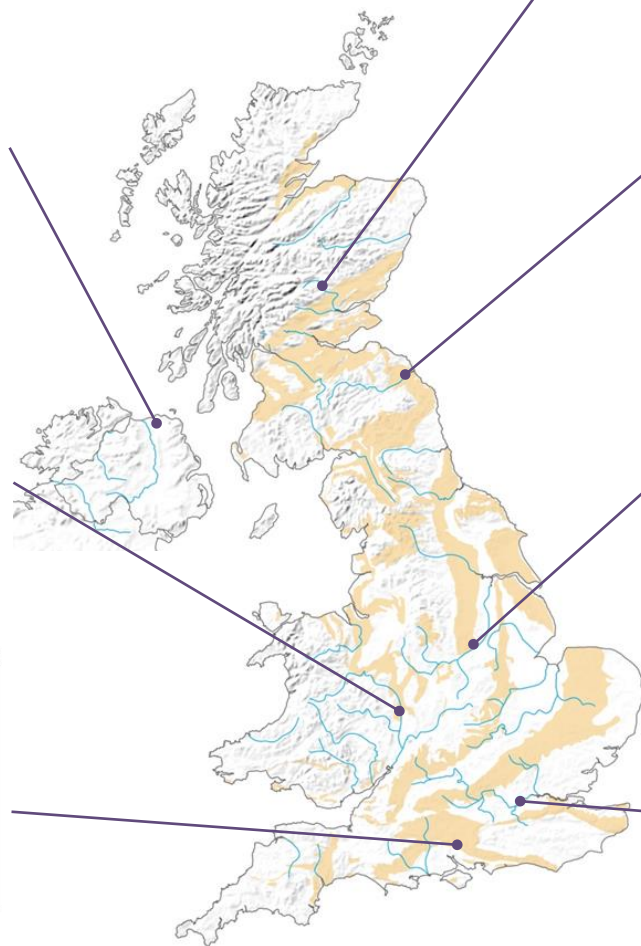
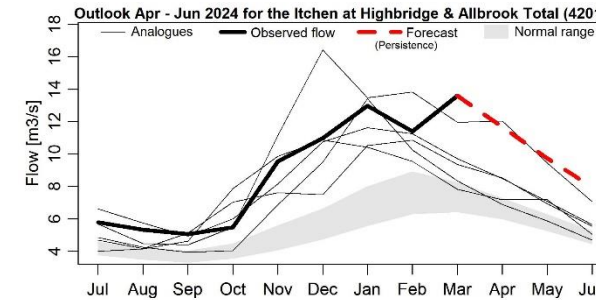
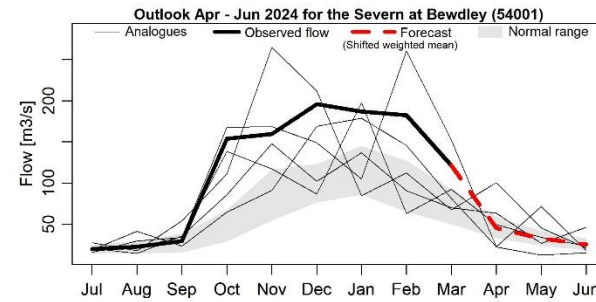
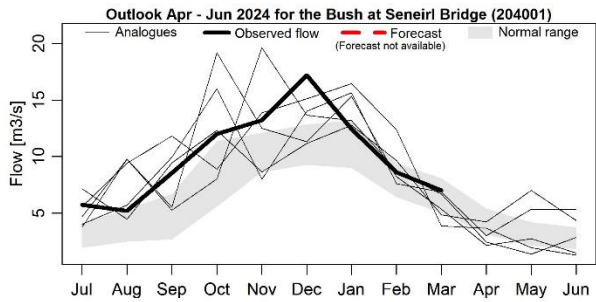


Period: April 2024 – June 2024

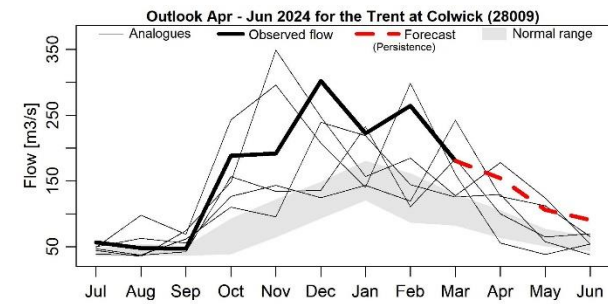
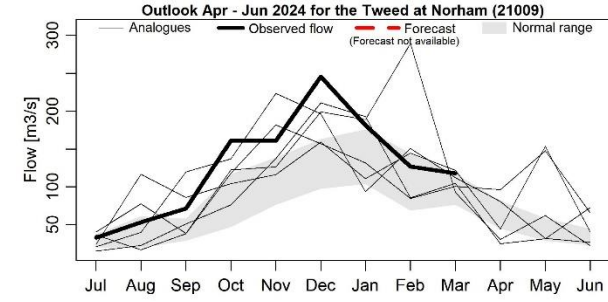
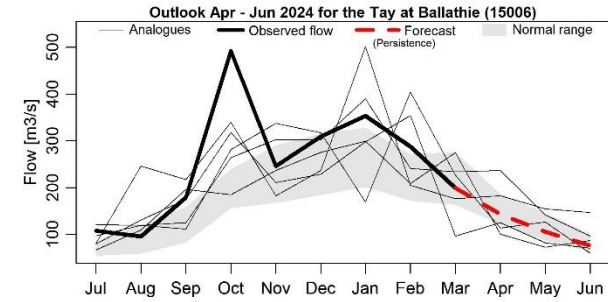
These figures provide insight into the hydrological analogue methodology for a set of sites from across the UK.

In each of the time series graphs the bold black line represents the observed flow during the past nine months. The grey band indicates the normal flow range (the normal band includes 44%

of observed flows in each month). The selected analogues are shown as thin lines and the trajectories that flows took in the following three months are also shown. The forecast is shown as the dashed red line, and in each plot it states whether this has come from the analogues or has been generated on the basis of persistence.



Issued on 08.04.2024 using data to the end of March 2024



No data available

Period: April 2024 – September 2024

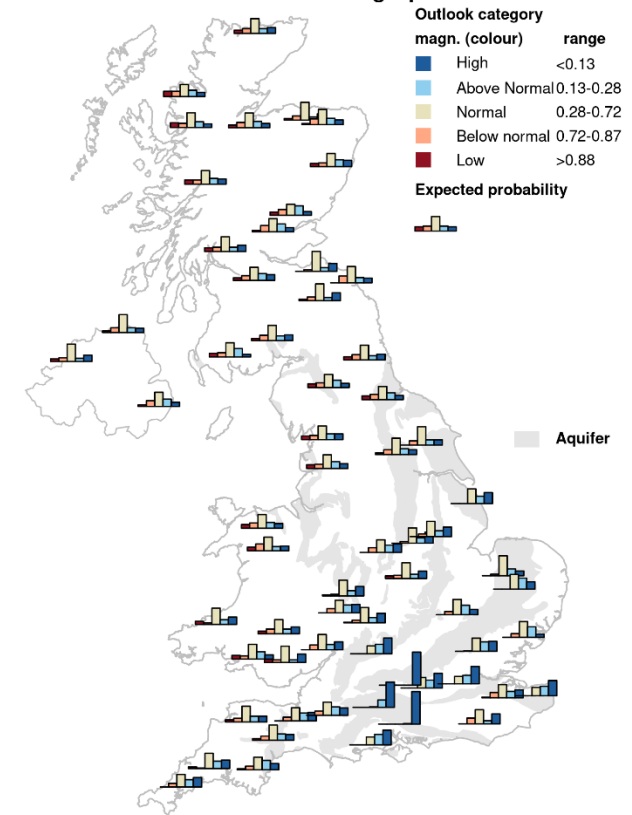
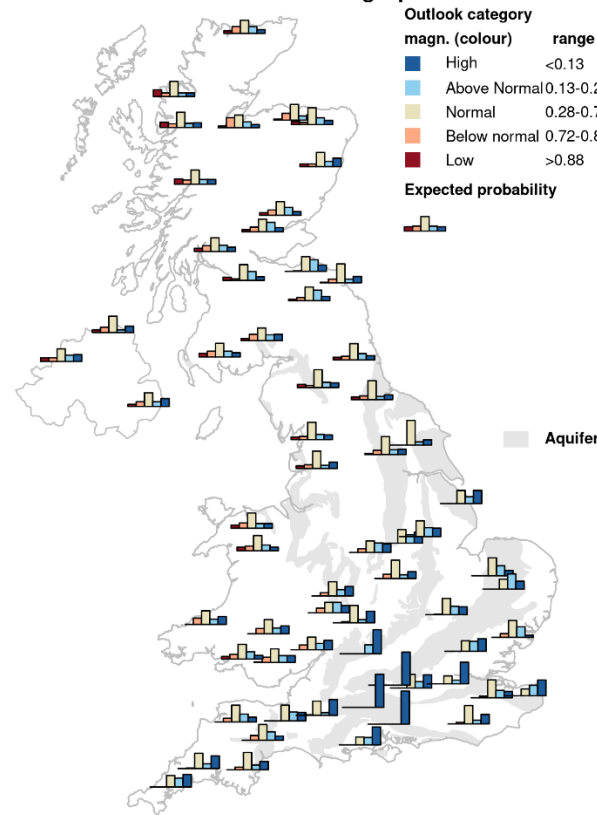
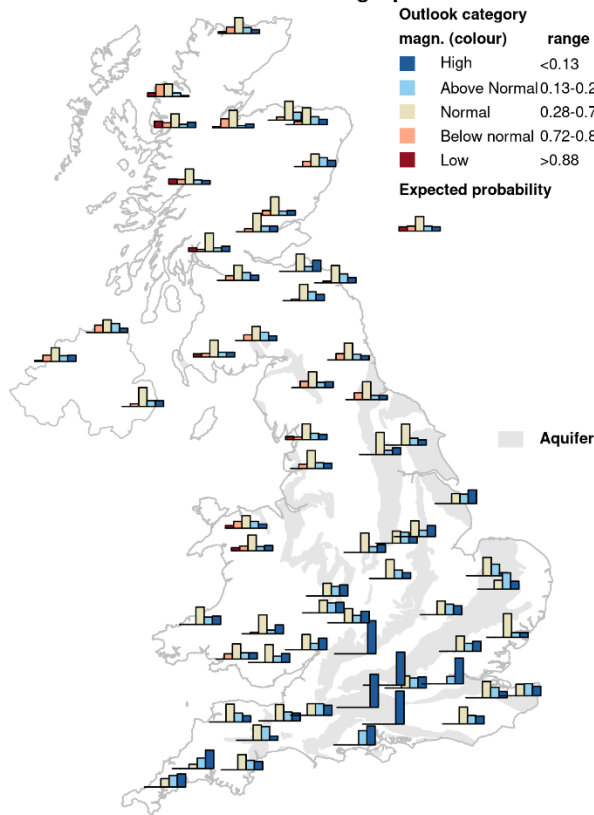
Issued on 04.04.2024 using data to the end of March 2024

The outlook for April indicates that flows are likely to be above normal across the south of the UK, with some catchments likely to have high flows. Elsewhere in the UK flows are likely to be within the normal range. The April-June outlook shows that this pattern is likely to persist over the coming few months, with flows remaining high in some catchments in the south.

1-month river flow outlook starting Apr 2024

3-month river flow outlook starting Apr 2024

6-month river flow outlook starting Apr 2024



This outlook is based on monthly ensembles of historical sequences of observed climate (rainfall and potential evapotranspiration) that form input to a hydrological model. The outputs are probabilistic simulations of the average river flow over the forecast period (1 to 12 months ahead), at each location. The simulations are generated by the GR6J conceptual rainfall-runoff model from INRAE (France) calibrated on observed or naturalised flows.

The bar plot maps show the outlook distribution for 1, 3 and 6-month period for 64 catchments across England and Wales. Each bar plot represents the probabilistic distribution of the simulated river flow compared to the historical river flow, for the same n-month period. The probabilities fall within five categories, classified as: low, below normal, normal, above normal and high.

This outlook is based entirely on historical sequences and therefore does not contain any knowledge of the state of the atmosphere and ocean. It is hence possible that some of the historical sequences used might be inconsistent with current large-scale atmospheric conditions and would therefore be unlikely to occur in the next few months.

Please note that *Outlooks based on modelled flow from historical climate* from October 2023 onwards were generated using GR6J model, whereas until September 2023, they were produced using GR4J model. For more details, please see the section on River flow from historical climate at this link: <https://hydoutuk.net/about/methods/river-flows>



This outlook is based on monthly ensembles of historical sequences of observed climate (rainfall and potential evapotranspiration) that form input to a hydrological model. The outputs are probabilistic simulations of the average river flow over the forecast period (1 to 12 months ahead), at each location. The simulations are generated by the GR6J conceptual rainfall-runoff model from INRAE (France) calibrated on observed or naturalised flows.

The stack diagrams show the variation over time of the outlook distribution for a number of individual catchments. Each graph represents variation over time of the number of simulated river flows, in each month ensemble, that fall within each of seven categories: exceptionally low, notably low, below normal, normal, above normal, notably high and exceptionally high. The categories represent cumulative flow conditions, e.g. For 3-month, the simulated total 3-month flow compared to the historical 3-month flow distribution. The monthly variations can be compared to the long-term average distribution of river flows (shown as columns on

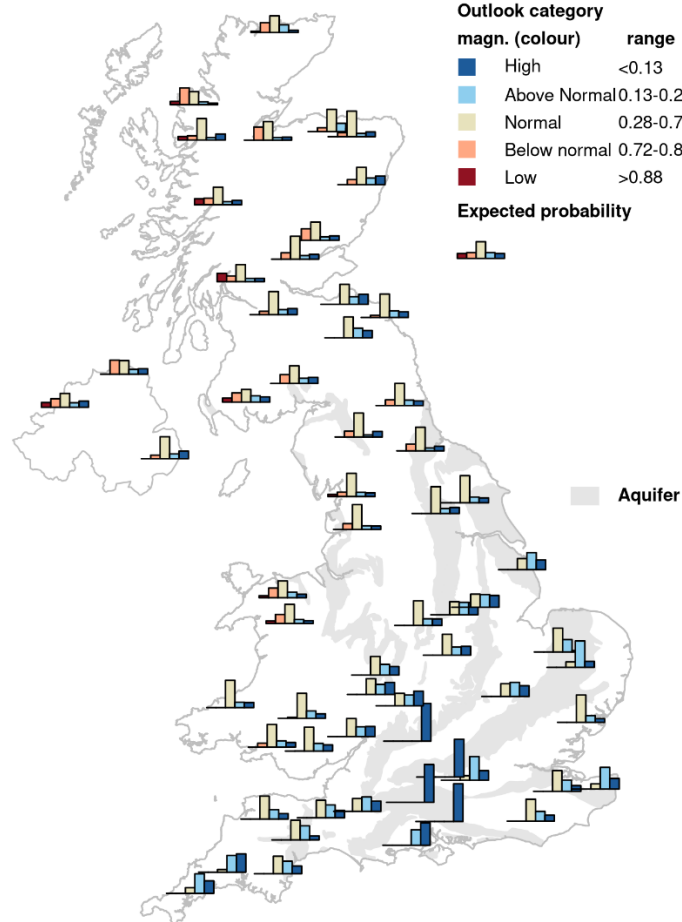
the right of each timeline graph). This outlook is based entirely on historical sequences and therefore does not contain any knowledge of the state of the atmosphere and ocean. It is hence possible that some of the historical sequences used might be inconsistent with current large-scale atmospheric conditions and would therefore be unlikely to occur in the next few months.

The outlook for April indicates that flows are likely to be normal to above normal for southern and eastern parts of the UK, in some catchments flows are likely to be high. Throughout the rest of the UK flows are likely to be in the normal range. The April-June outlook indicates a slight shift towards more normal flows, particularly in southern Wales. Flows for some catchments in the south of England are likely to remain high.

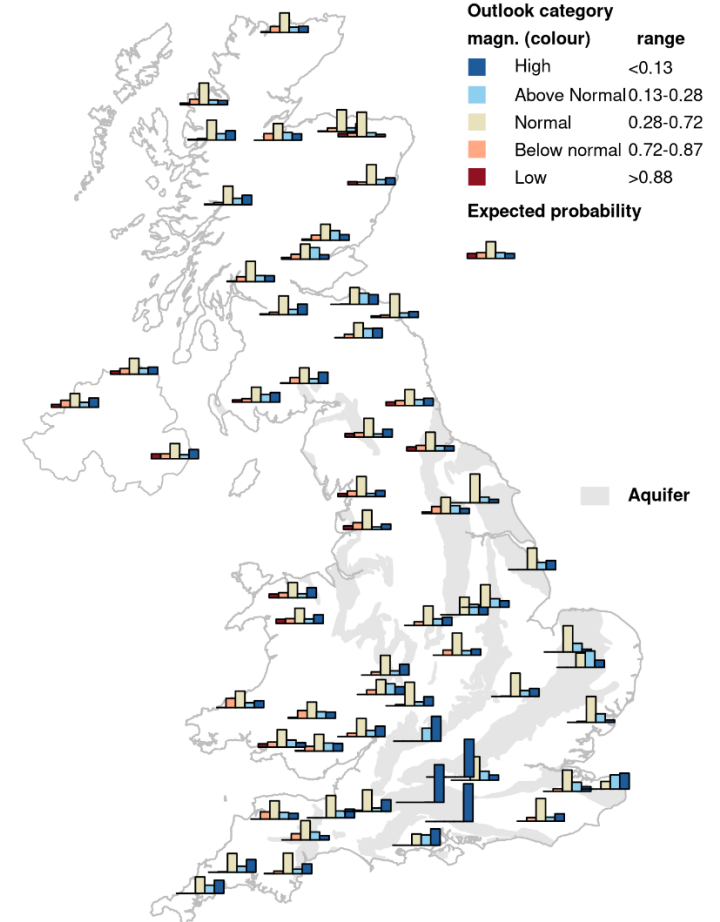
The historical weather analogues method uses Met Office predictions of average weather 1 and 3 months ahead to provide inputs to a hydrological model. Like the ESP method, observed rainfall and temperature data from past years are used to drive the predictions, however, the analogue method constrains the selection of past rainfall using the weather conditions in the meteorological forecasts (which are summarised for this forecast in the Met Office likelihood of impacts blocks underneath the maps). For each member of the Met Office forecast ensemble, the 10 analogues that best match the predicted average weather pattern (surface pressure map) over the forecast period are selected. Precipitation and temperature sequences constructed from the selected analogue scenarios are corrected to account for historic trends and used as inputs to hydrological models. Here, the GR6J model is run using these inputs, creating an ensemble of hydrological forecasts.

The outputs shown in the maps are the likelihoods of different outcomes for the average river flow over the one-month and three-month forecast periods at each location. The outlooks maps show the distribution for 64 catchments across the United Kingdom. Each bar plot represents the likelihood of the simulated river flow compared to the historical river flow, for the same n-month period. The probabilities fall within five categories, classified as: low, below normal, normal, above normal and high. The expected climatological probability of ensemble members in each of these categories is shown under the legend.

1-month river flow outlook starting Apr 2024



3-month river flow outlook starting Apr 2024



Met Office 1-month likelihood of precipitation impact



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Met Office 3-month likelihood of precipitation impact

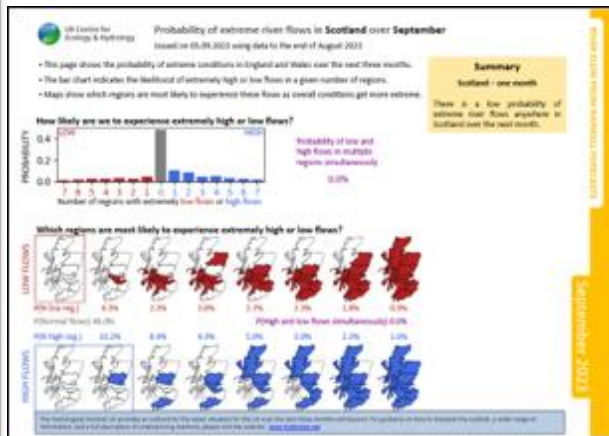


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Forecasts of river flows using Met Office rainfall forecasts

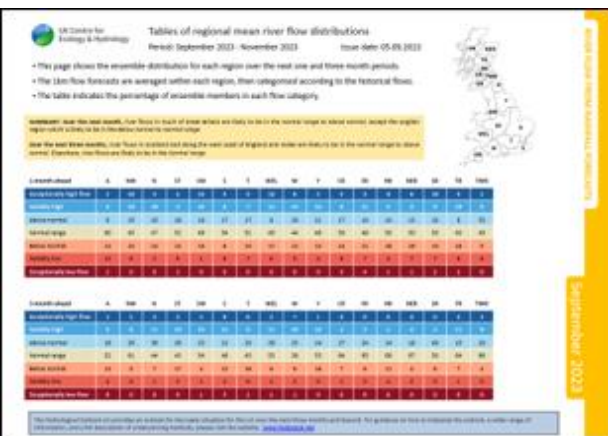
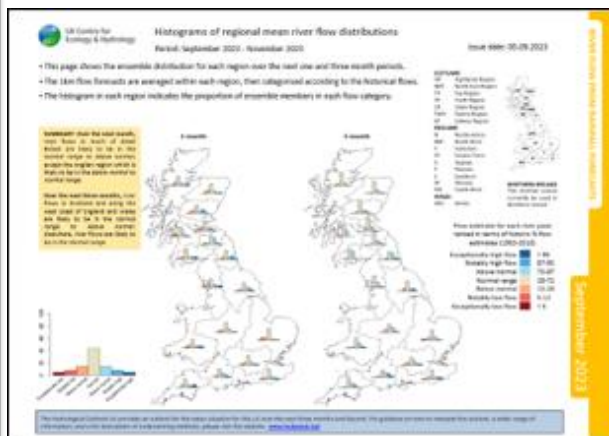
- These (yellow edged) pages summarise river flow forecasts produced by the UKCEH Water Balance Model.
- This model uses an ensemble of rainfall forecasts provided by the Met Office and a hydrological model to forecast river flows for the next one- and three-months ahead.
- A detailed description of these forecast products can be found on the final page, and a full technical description is given in the documentation available via the Hydrological Outlook website.
- Additional forecast products are available on the Hydrological Outlook Portal, via the website.

Probability of extreme river flows



- Use these pages if you are interested in extreme conditions across multiple regions.
- These pages summarise the risk of extremely high or low flows being observed across GB.
- The four pages show the risk for **Scotland** and for **England & Wales** over the next one and three months.
- The slides indicate the **probability of widespread extreme conditions** and which regions are most likely to experience extremely high or low flows.

Regional mean river flow distributions



- Use these pages if you are interested in the ensemble distribution in a single region.
- The first page shows the ensemble distribution as a histogram for each region.
- The second page shows the percentage of ensemble members in each band for each region.

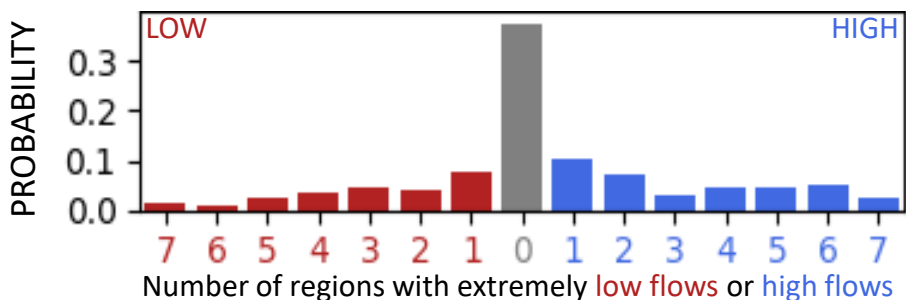
This page shows the **probability of extreme conditions in Scotland** over the next month. The bar chart indicates the likelihood of extremely high or low flows in a given number of regions. Maps show which regions are most likely to experience these flows as overall conditions get more extreme.

Summary

Scotland – one month

Extremely high and low flows are not likely to be experienced in Scotland over the next month. Extremely high flows are more probable than low flows.

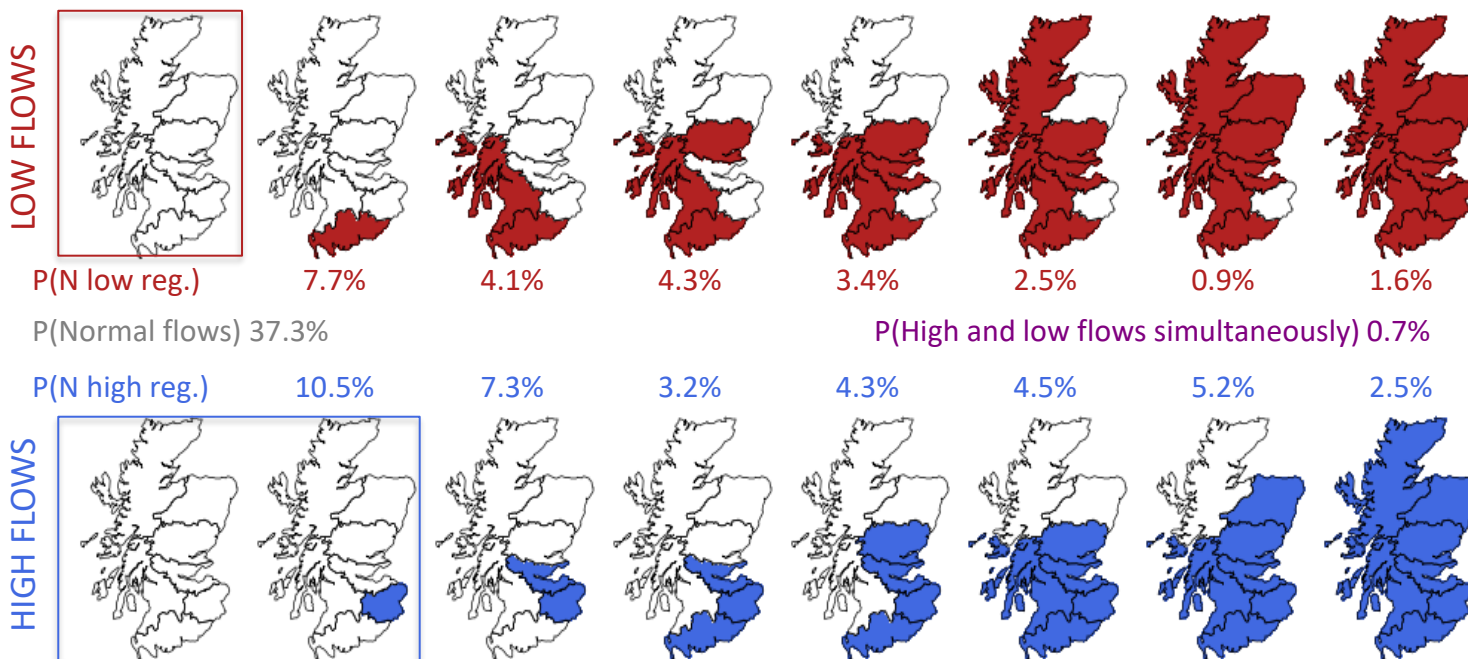
How likely are we to experience extremely low or high flows?



Probability of low and high flows in multiple regions simultaneously

0.7%

Which regions are most likely to experience extremely low or high flows?



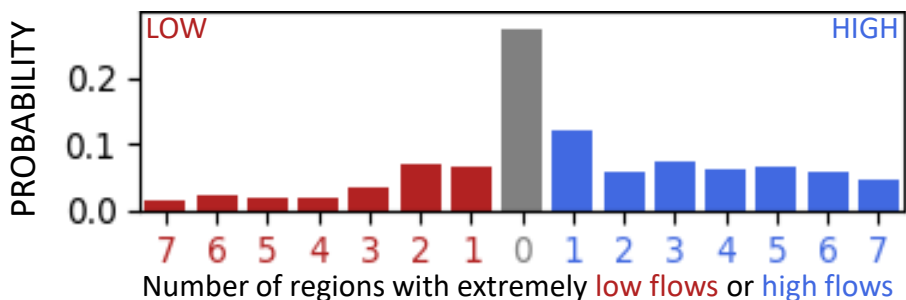
This page shows the **probability of extreme conditions in Scotland** over the next three months. The bar chart indicates the likelihood of extremely high or low flows in a given number of regions. Maps show which regions are most likely to experience these flows as overall conditions get more extreme.

Summary

Scotland – three months

Extremely high or low flows are not likely to be experienced in Scotland over the next three months. Extremely high flows are more likely than low flows, and more likely in the east.

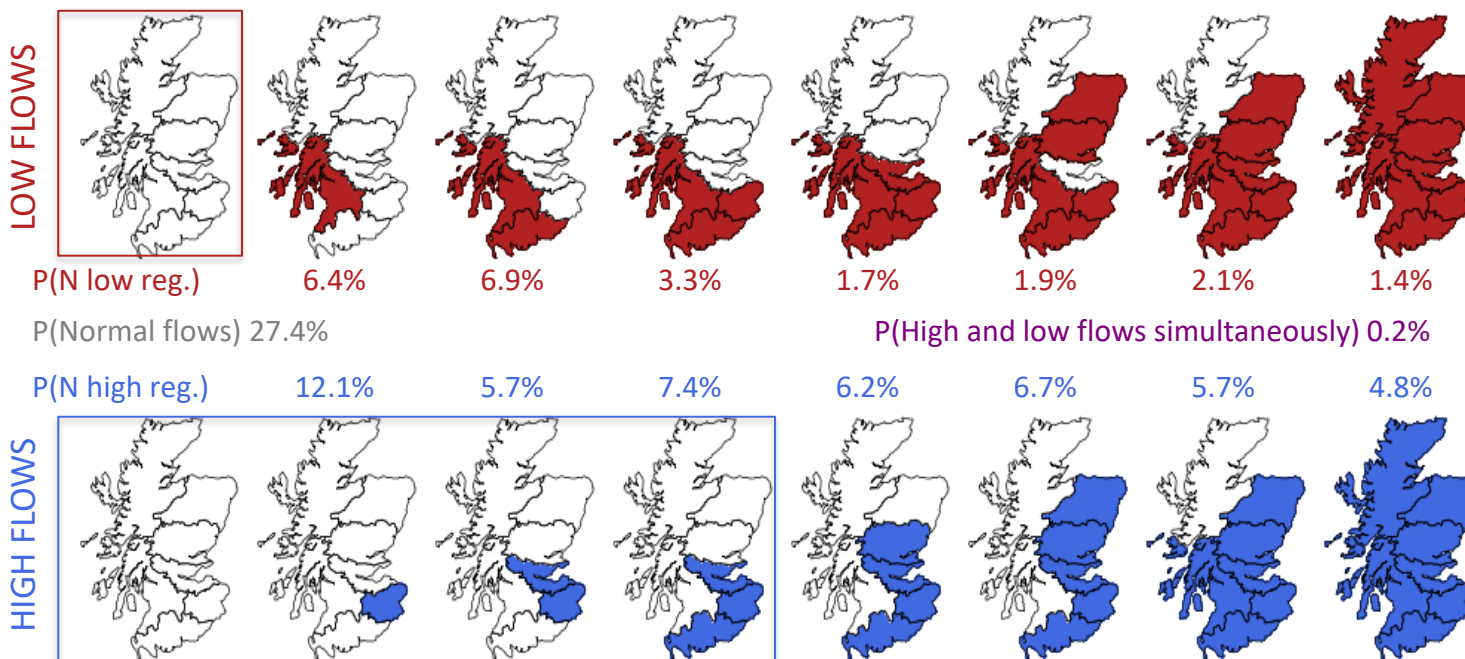
How likely are we to experience extremely low or high flows?



Probability of low and high flows in multiple regions simultaneously

0.2%

Which regions are most likely to experience extremely low or high flows?

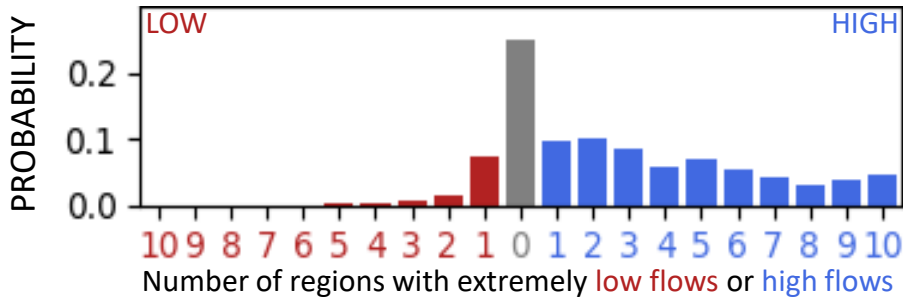


P(High and low flows simultaneously) 0.2%

This page shows the **probability of extreme conditions in England and Wales** over the next month. The bar chart indicates the likelihood of extremely high or low flows in a given number of regions. Maps show which regions are most likely to experience these flows as overall conditions get more extreme.

Summary
England and Wales – one month
 Extremely high flows are likely to be experienced this month, particularly in the south and east of England.

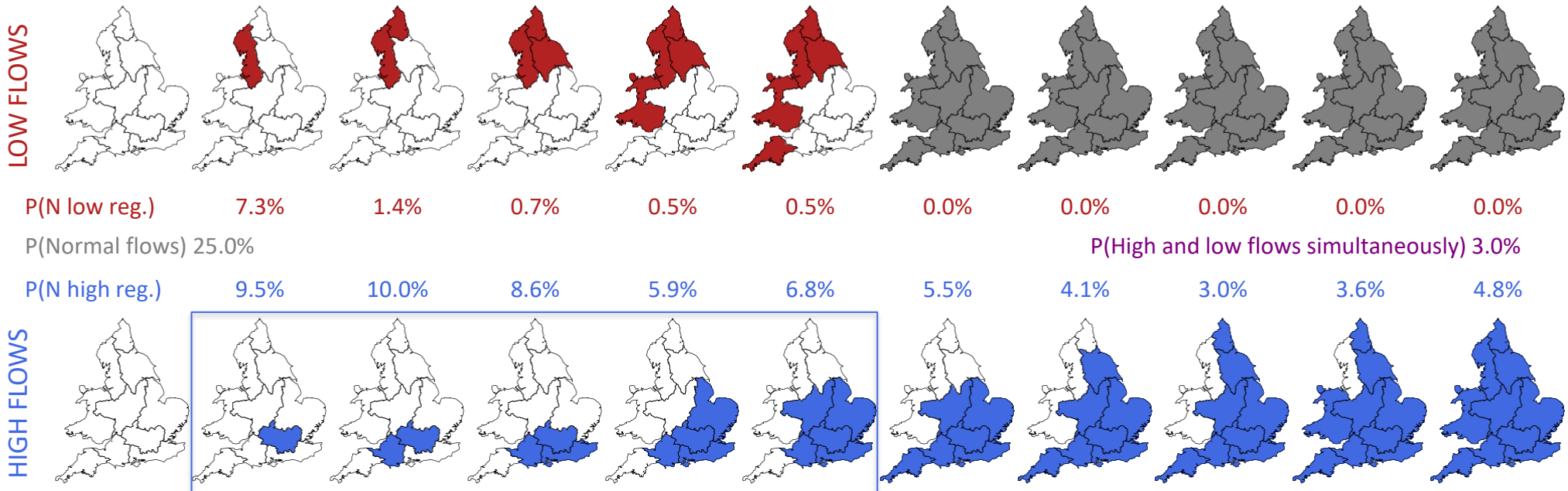
How likely are we to experience extremely low or high flows?



Probability of low and high flows in multiple regions simultaneously

3.0%

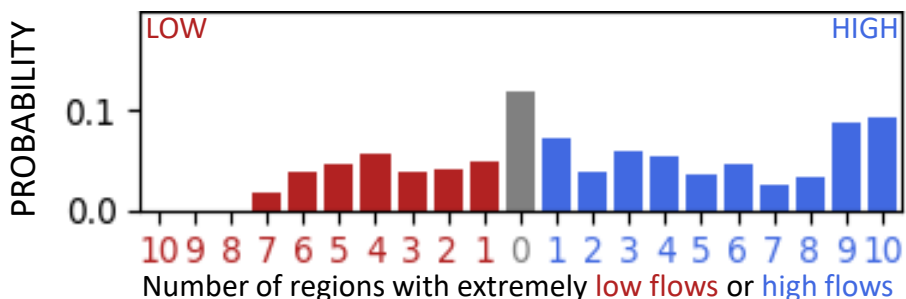
Which regions are most likely to experience extremely low or high flows?



This page shows the **probability of extreme conditions in England and Wales** over the next three months. The bar chart indicates the likelihood of extremely high or low flows in a given number of regions. Maps show which regions are most likely to experience these flows as overall conditions get more extreme.

Summary
England and Wales – three months
 Extremely high flows are likely to be experienced in England and Wales over the next three months.

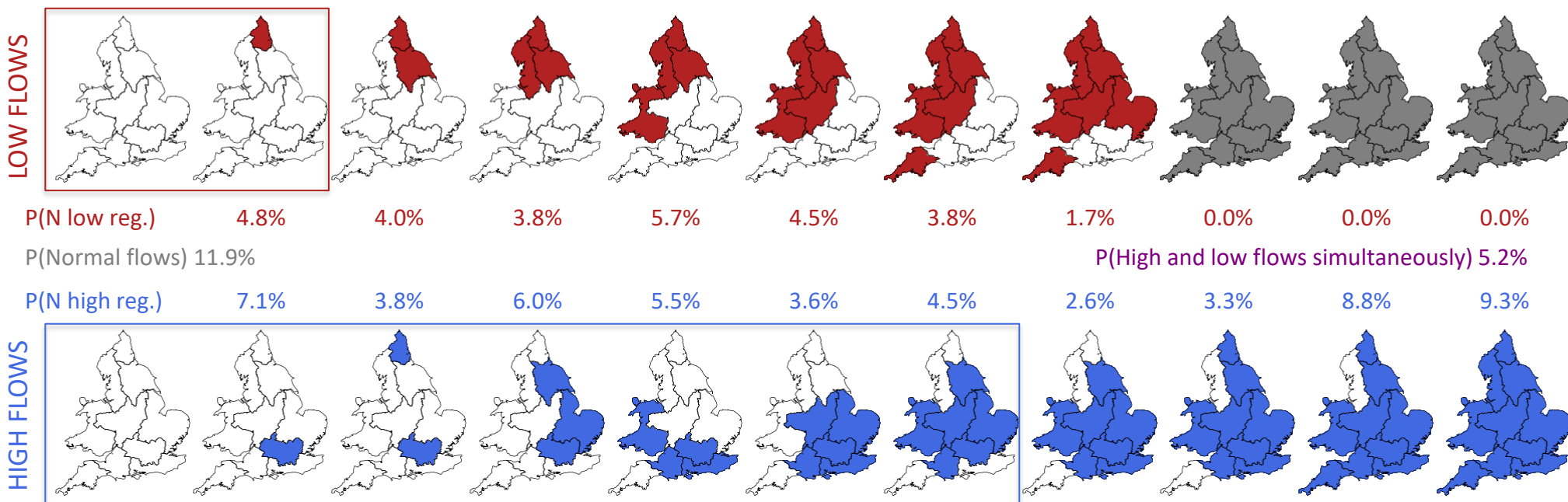
How likely are we to experience extremely low or high flows?



Probability of low and high flows in multiple regions simultaneously

5.2%

Which regions are most likely to experience extremely low or high flows?



Histograms of GB regional mean river flow distributions

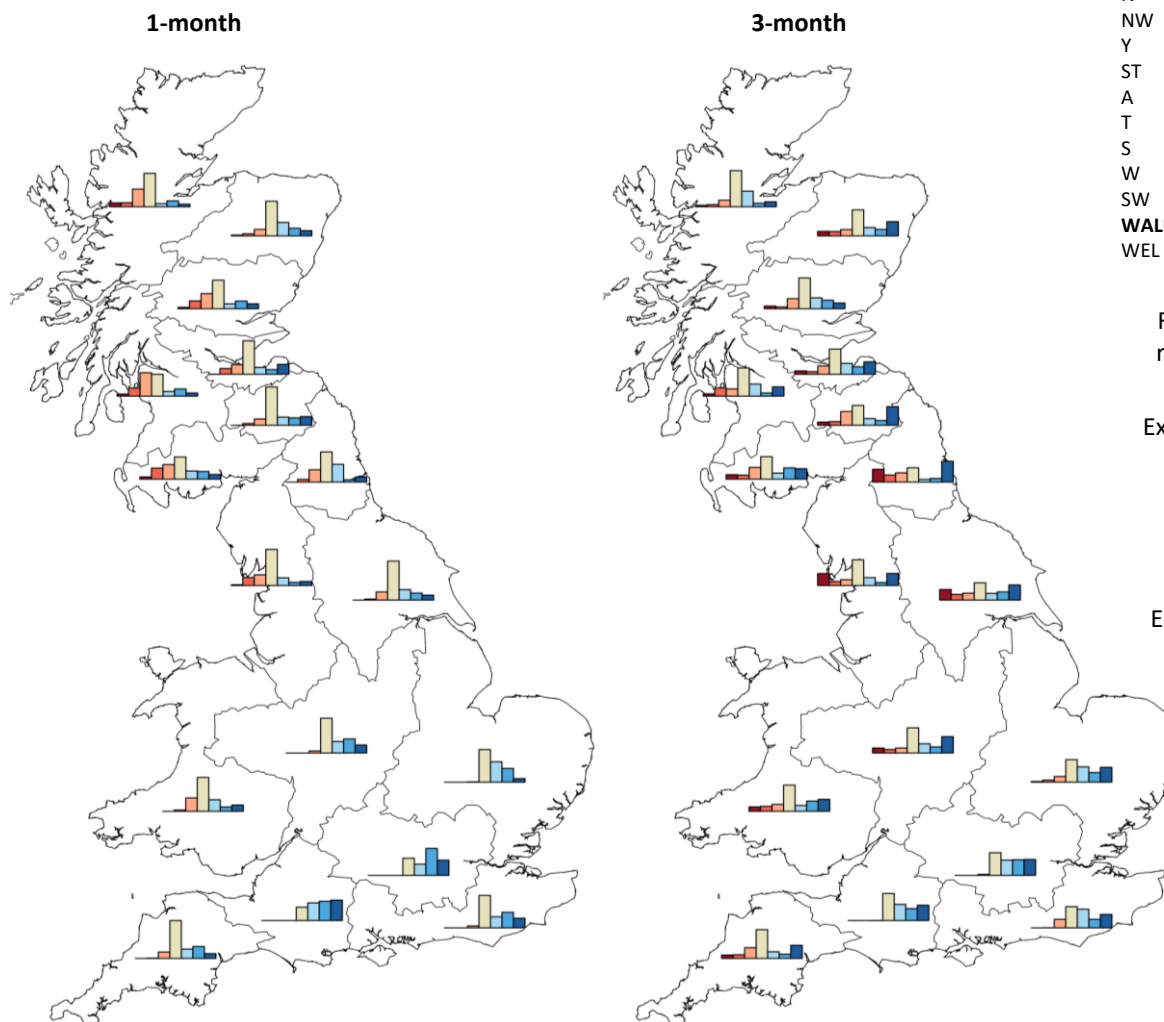
Period: April 2024 - June 2024

Issue date: 04.04.2024

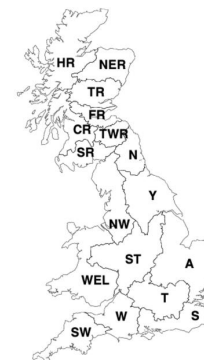
- This page shows the **ensemble flow distribution for each region** over the next 1- and 3-month periods.
- The 1km flow forecasts are averaged within each region, then categorised according to the historical flows.
- The histogram in each region indicates the proportion of ensemble members in each flow category.

SUMMARY: Over the next month, river flows in the south of England are likely to be in the *normal to exceptionally high* range. Elsewhere, river flows in eastern regions are likely to be in the *normal to above normal* range and those in western parts in the *normal to below normal* range.

Over the next three months, river flows in the southeast of England are likely to be in the *normal to exceptionally high* range. Forecasts of river flows in the north of England are highly uncertain and will depend on conditions over the next few weeks. Elsewhere, river flows are likely to be *normal*.

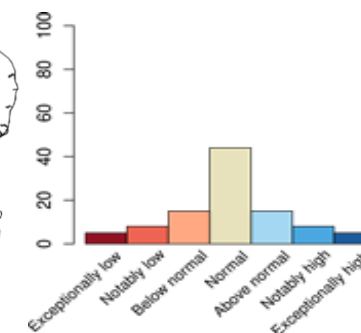


- SCOTLAND**
- HR Highlands Region
 - NER North East Region
 - TR Tay Region
 - FR Forth Region
 - CR Clyde Region
 - TWR Tweed Region
 - SR Solway Region
- ENGLAND**
- N Northumbria
 - NW North West
 - Y Yorkshire
 - ST Severn Trent
 - A Anglian
 - T Thames
 - S Southern
 - W Wessex
 - SW South West
- WALES**
- WEL Welsh



Flow estimate for each river pixel ranked in terms of historic % flow estimates (1963-2016)

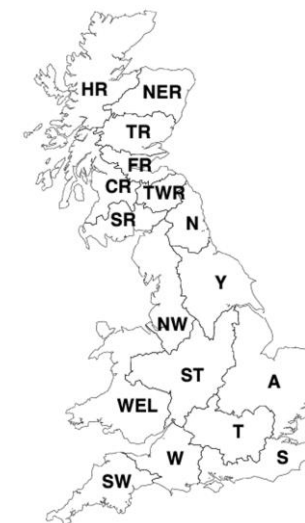
| | |
|-------------------------|-------|
| Exceptionally high flow | > 95 |
| Notably high flow | 87-95 |
| Above normal | 72-87 |
| Normal range | 28-72 |
| Below normal | 13-28 |
| Notably low flow | 5-13 |
| Exceptionally low flow | < 5 |



Tables of GB regional mean river flow distributions

Period: April 2024 - June 2024

Issue date: 04.04.2024



- This page shows the **ensemble flow distribution for each region** over the next 1- and 3-month periods.
- The 1km flow forecasts are averaged within each region, then categorised according to the historical flows.
- The table indicates the percentage of ensemble members in each flow category.

SUMMARY: Over the next month, river flows in the south of England are likely to be in the *normal to exceptionally high* range. Elsewhere, river flows in eastern regions are likely to be in the *normal to above normal* range and those in western parts in the *normal to below normal* range.

Over the next three months, river flows in the southeast of England are likely to be in the *normal to exceptionally high* range. Forecasts of river flows in the north of England are highly uncertain and will depend on conditions over the next few weeks. Elsewhere, river flows are likely to be *normal*.

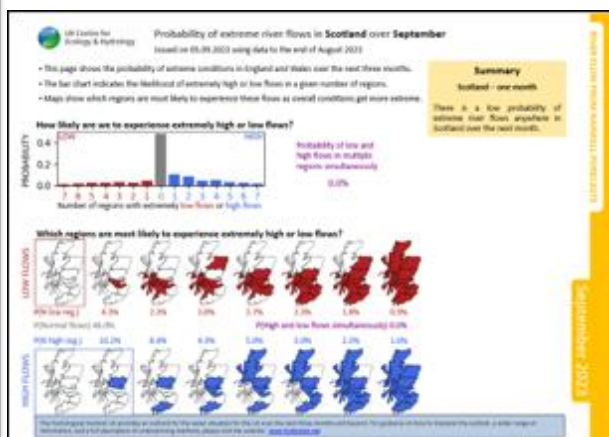
| 1-month ahead | A | NW | N | ST | SW | S | T | WEL | W | Y | CR | FR | HR | NER | SR | TR | TWR |
|-------------------------|----|----|----|----|----|----|----|-----|----|----|----|----|----|-----|----|----|-----|
| Exceptionally high flow | 5 | 6 | 7 | 11 | 7 | 14 | 22 | 9 | 29 | 7 | 4 | 14 | 4 | 8 | 7 | 7 | 12 |
| Notably high | 20 | 4 | 3 | 20 | 17 | 22 | 38 | 6 | 27 | 10 | 10 | 7 | 8 | 11 | 11 | 11 | 10 |
| Above normal | 29 | 11 | 25 | 16 | 13 | 16 | 16 | 16 | 25 | 15 | 7 | 10 | 4 | 19 | 12 | 7 | 12 |
| Normal range | 46 | 51 | 43 | 49 | 54 | 46 | 24 | 48 | 19 | 55 | 31 | 48 | 47 | 49 | 31 | 40 | 54 |
| Below normal | 0 | 15 | 18 | 3 | 9 | 3 | 0 | 19 | 0 | 12 | 33 | 14 | 25 | 9 | 21 | 21 | 9 |
| Notably low | 0 | 11 | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 12 | 8 | 6 | 3 | 16 | 11 | 2 |
| Exceptionally low flow | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 6 | 1 | 3 | 2 | 0 |

| 3-month ahead | A | NW | N | ST | SW | S | T | WEL | W | Y | CR | FR | HR | NER | SR | TR | TWR |
|-------------------------|----|----|----|----|----|----|----|-----|----|----|----|----|----|-----|----|----|-----|
| Exceptionally high flow | 21 | 17 | 30 | 23 | 19 | 19 | 23 | 17 | 22 | 21 | 13 | 18 | 7 | 20 | 15 | 8 | 26 |
| Notably high | 14 | 4 | 5 | 9 | 6 | 12 | 22 | 14 | 17 | 12 | 4 | 11 | 5 | 9 | 16 | 12 | 7 |
| Above normal | 22 | 11 | 4 | 13 | 10 | 26 | 22 | 8 | 23 | 10 | 17 | 16 | 22 | 12 | 9 | 16 | 10 |
| Normal range | 32 | 36 | 20 | 36 | 41 | 30 | 32 | 37 | 38 | 24 | 40 | 36 | 51 | 37 | 32 | 44 | 28 |
| Below normal | 8 | 8 | 13 | 7 | 15 | 12 | 1 | 10 | 0 | 10 | 10 | 12 | 9 | 9 | 17 | 14 | 20 |
| Notably low | 3 | 6 | 10 | 5 | 5 | 0 | 0 | 7 | 0 | 8 | 12 | 4 | 3 | 6 | 6 | 3 | 5 |
| Exceptionally low flow | 1 | 17 | 18 | 7 | 5 | 0 | 0 | 6 | 0 | 15 | 3 | 5 | 2 | 6 | 6 | 4 | 4 |

Forecasts of river flows using Met Office rainfall forecasts

- The data on these (yellow-bordered) pages are based on approximately 400 rainfall scenarios provided by the Met Office, which are used as inputs to a water balance hydrological model.
- River flow forecasts for every 1km grid cell are ranked according to the historical flow estimates and aggregated within each region.
- A full description of this method and these summary products is given in the technical documentation available via the Hydrological Outlook website.

Probability of extreme river flows



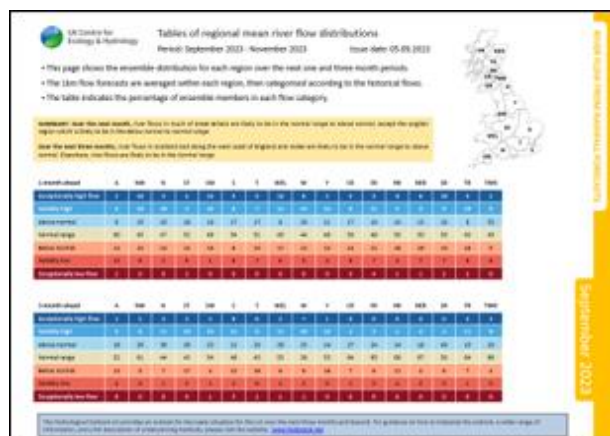
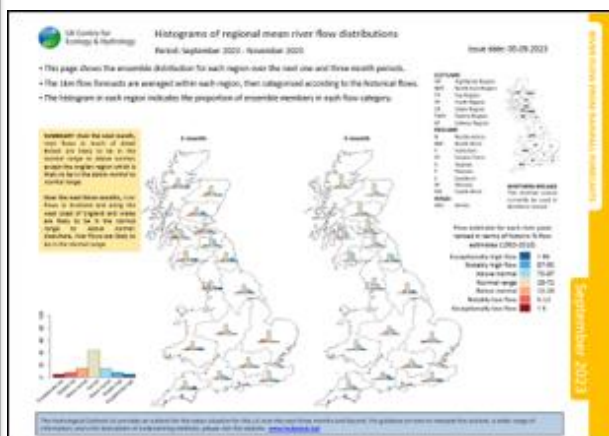
Extreme river flows are defined as those which rank in the lowest or highest 13% of historical flow estimates (1963 - 2016). This definition encompasses the 'Notably' and 'Exceptionally' high/low flow bands used elsewhere in the Outlook.

The bar chart shows the probability of a given number of regions experiencing extremely high/low flows, where scenarios showing both extremely high and extremely low flows in different regions simultaneously excluded. These probabilities are also shown beneath the maps.

Shaded regions on each map are those most likely to experience extreme flows from the set of scenarios with at least a given number of regions experiencing such flows. If shown, grey maps indicate scenarios not observed in the ensemble.

The box drawn around some maps spans the central 50% probability interval, excluding scenarios where extremely high/low flows are observed simultaneously. If these excluded cases constitute a significant probability, details are given in the yellow summary box.

Regional mean river flow distributions



The maps illustrate the ensemble distribution of regional mean river flows. The historical distribution is shown at bottom-left, and allows deviations from the normal distribution to be determined by comparing the forecast distribution to the historical distribution. A summary is given in the yellow box.

The table gives access to the data shown in the histograms. The numbers in the tables are the percentage of ensemble forecasts falling in each of the flow categories. As before results are averaged by region then ranked in terms of 54 years of historical regional flow estimates (1963 – 2016).

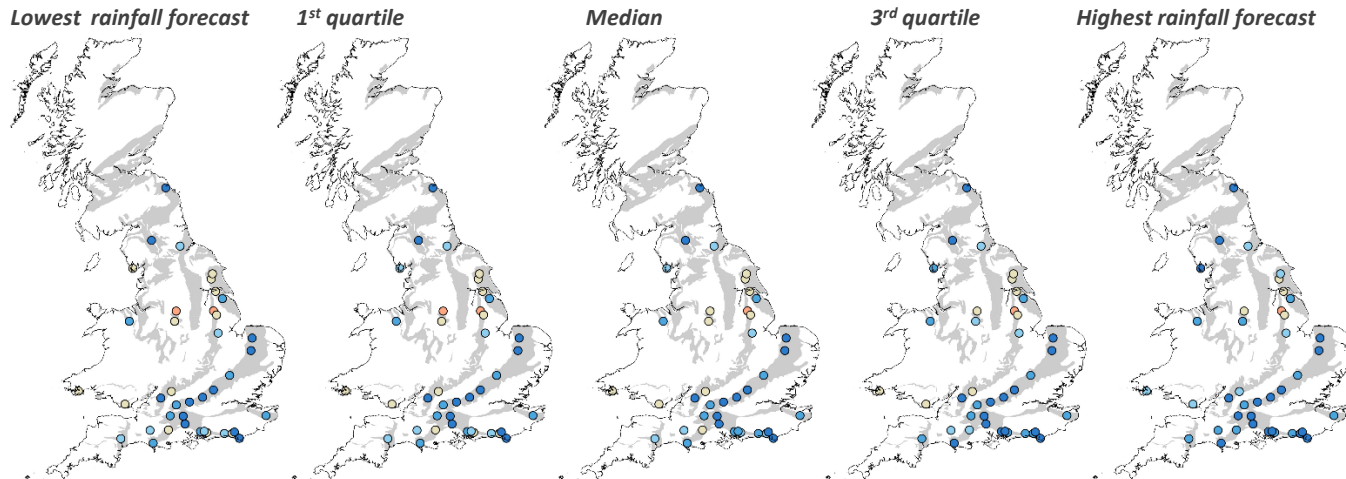
Period: April 2024 – June 2024

Issued on 05.04.2024 using data to the end of March.

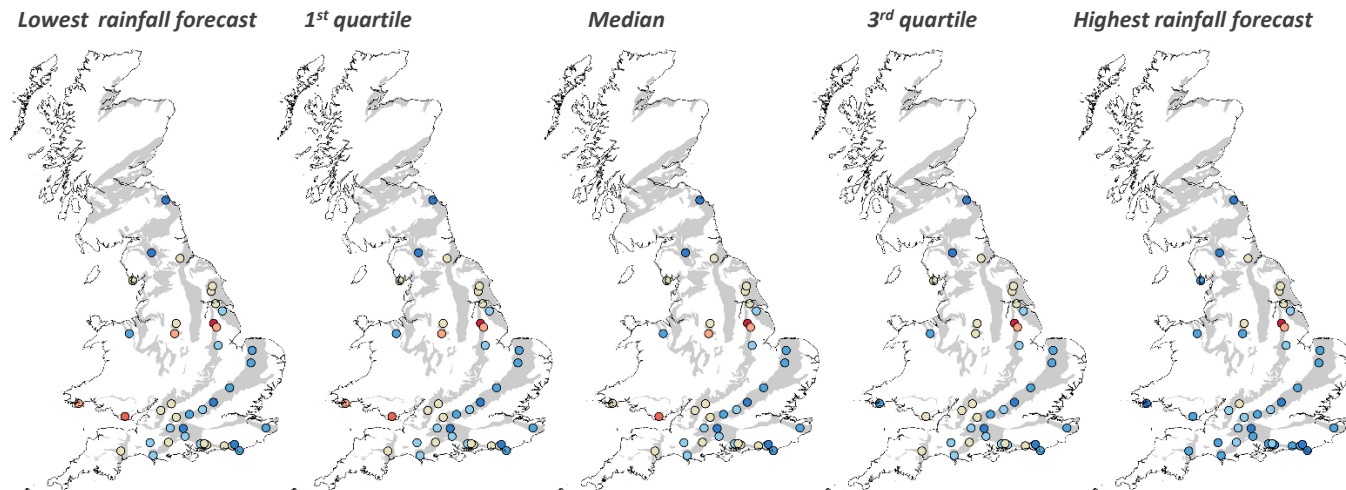
Under median rainfall conditions, groundwater levels over the next month are forecast to range from above normal to exceptionally high across much of the UK over the next month, although in parts central and northern England and south Wales, normal levels are anticipated. The 3-month outlook forecasts a decline in groundwater categories across the UK, and while levels in much of the Chalk will remain above normal, in some fast-responding regions of the Chalk and Jurassic limestone aquifers, normal levels are forecast. Groundwater levels in the Permo-Triassic Sandstones and slower responding regions of the Chalk aquifers are expected to remain similar to that of the one-month forecast. While Magnesian limestone levels will be normal or below normal, the models may underestimate the effect of recent wet weather.

These forecasts are produced by running five members of the Met Office ensemble climate forecast through groundwater models of observation borehole hydrographs at 42 sites across the country. The sites are distributed across the principal aquifers.

Based on the distribution of observed historical groundwater levels in a given month, seven categories have been derived for each site: very low, low, below normal, normal, above normal, high, and very high. The forecast groundwater level is assigned to one of these seven categories depending on where it falls within the distribution of the historically observed values.

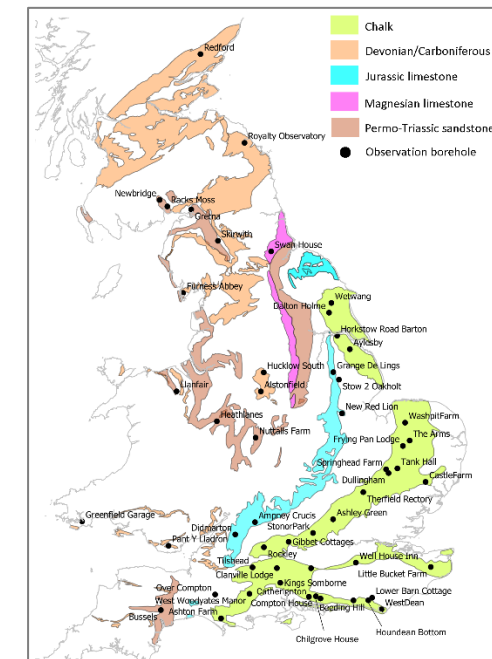


1-month outlook



3-month outlook

| Key | Percentile range of historic observed values for relevant month |
|---------------------------|---|
| Exceptionally high levels | > 95 |
| Notably high levels | 87-95 |
| Above normal | 72-87 |
| Normal | 28-72 |
| Below normal | 12-28 |
| Notably low levels | 5-13 |
| Exceptionally low levels | < 5 |



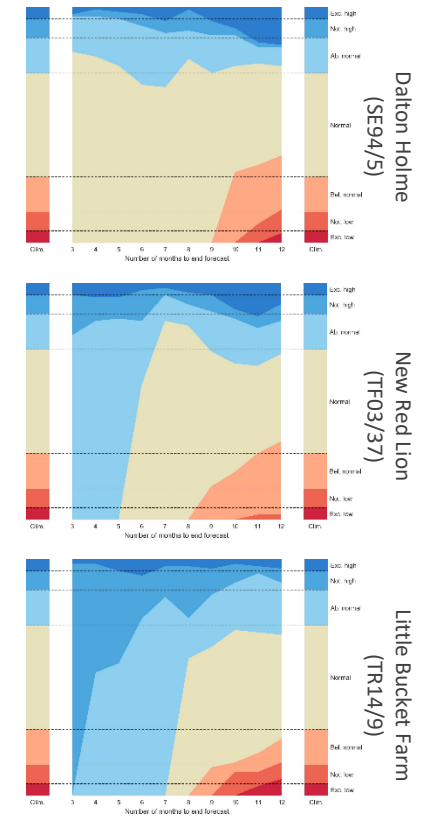
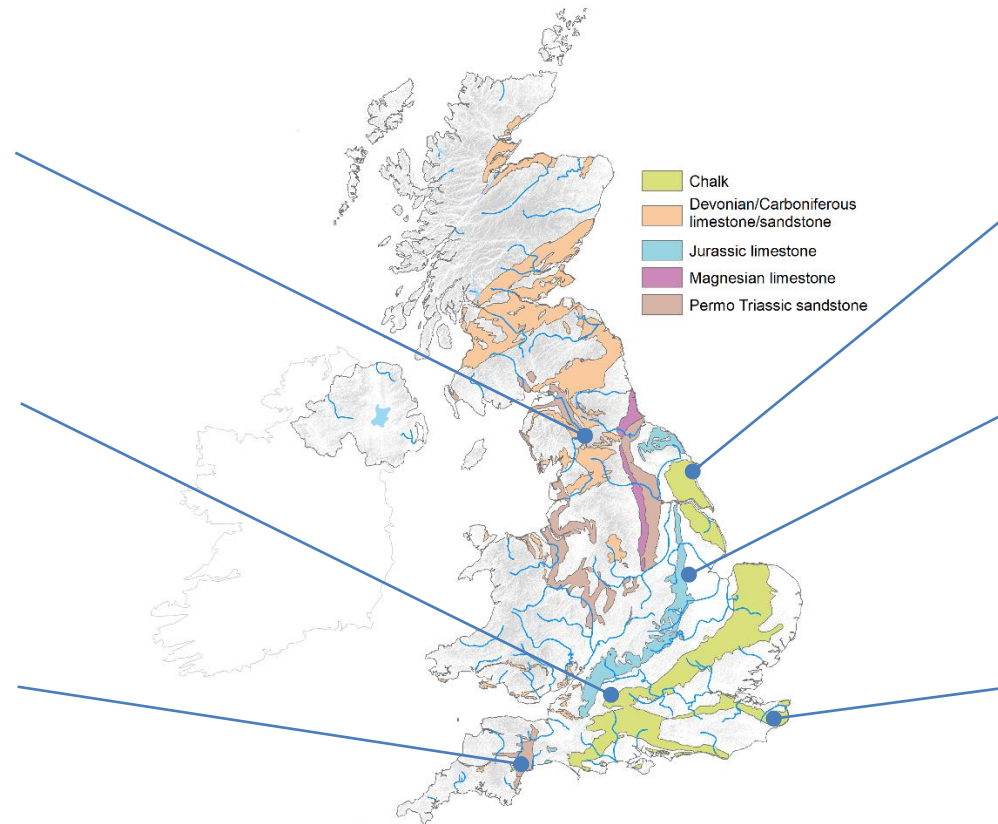
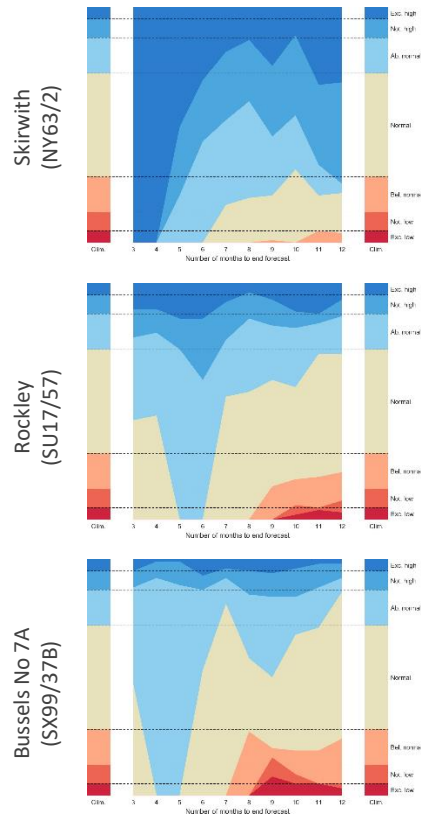
The Hydrological Outlook UK provides an outlook for the water situation for the UK over the next three months and beyond. For guidance on how to interpret the outlook, a wider range of information, and a full description of underpinning methods, please visit the website: www.hyoutuk.net

Outlook based on modelled groundwater from historical climate

Period: April 2024 – March 2025

Issued on 05.04.2024 using data to the end of March.

Groundwater levels at Skirwith in the Permo-Triassic Sandstones are forecast to be exceptionally high over the next 4 months, before returning towards notably high and above normal conditions throughout the following 8 months. In the Chalk at Rockley and the Permo-Triassic Sandstones at Bussels No 7A, above normal conditions are likely to continue for the next 5 - 6 months before transitioning towards more normal conditions for the remaining 6 - 7 months. At New Red Lion and Little Bucket Farm, above normal conditions are likely to persist for the next 5 and 7 months respectively, before giving way to more normal conditions. At Dalton Holme normal conditions are expected to persist for the next 12 months.



This outlook is based on monthly ensembles of historical sequences of observed climate (rainfall and potential evapotranspiration) that form input to hydrological models. The outputs are probabilistic simulations of the average groundwater level over the forecast horizon (3 to 12 months ahead), at each location.

that fall within each the seven categories: exceptionally low, notably low, below normal, normal, above normal, notably high and exceptionally high. The monthly variations can be compared to the long-term average distribution of levels, which are shown as columns on the left and right of each graph.

the atmosphere and ocean. It is hence possible that some of the historical sequences used might be inconsistent with current large-scale atmospheric conditions and would therefore be unlikely to occur in the next few months.

The graphs show variation over time of the number of simulated groundwater levels in each monthly ensemble,

This outlook is based entirely on historical sequences and therefore does not contain any knowledge of the state of