Hydrological Summary

for the United Kingdom

June 2024

General

Northerly airflows kept conditions cool although relatively dry in June, with frontal showery rain interspersed by occasional ridges of high pressure that heralded a brief warm spell from 25th-27th (when temperatures exceeded 28°C in parts of the south-east). Total rainfall was below average in England, Wales and Northern Ireland, but above average in north-west Scotland, and average for Scotland as a whole. River flows were widely normal or above normal, as below-average flows in north-west Scotland recovered, and recessions were established or continued elsewhere. Groundwater levels remained above average at most sites, with new maximum June records reported at six sites. Levels receded at all locations as the seasonal recession continued. Reservoir stocks fell by 5% but remained close to average at the national scale. At some impoundments in the south-west of England the reductions drew down surpluses bringing stocks close to average (Clatworthy and Stithians), whilst small deficits (< 10%) developed at Northern Command Zone and Celyn & Brenig. With a return to wet conditions at the start of July, and an outlook for July to September of normal river flows, and normal or above normal groundwater levels, there are no immediate concerns for water resources during the summer months.

Rainfall

June began cool, with showers and rain in the north-west associated with low pressure, whilst the south remained largely dry. Away from north-west Scotland, much of the month's rain fell between the 9th and the 16th, although the highest daily total was a modest 51mm (recorded on the 13th at Mickleden, Cumbria). On the 18th, heavy showers caused some localised flooding of roads in the north of England, but thereafter conditions were more settled and often dry, despite some westerly fronts and northerly airflows. A brief warm spell from 25th-27th ended with a cold front that, in Scotland, was accompanied by rain but without notable daily totals. The total June rainfall was 71% of average for the UK. Most of the country received below average rainfall (less than half of average for the south), with north-west Scotland a notable exception. Highland region saw 134% of average June rainfall, in contrast to 35% for Thames, Southern and Wessex (although none of these ranked amongst the wettest or driest for June). The dry June went some way to offsetting the high rainfall of recent months, but accumulations over five or more months remained high ranking at the national scale (e.g. it was the wettest February - June period for England, and 12 month period from July 2023 - June 2024 for the UK, both in series from 1890).

River Flows

Whilst some rivers in north-west Scotland saw recovery from below average flows, river flows generally receded during June. Recessions at the end of May continued for the first fortnight, and flows widely tracked close to average, with moderate responses to rainfall in Northern Ireland and western Scotland. The spell of wet weather mid-month caused river flows to peak across the country from 15th-18th, and responsive catchments, predominantly in north-west Scotland saw incursions into the daily maximum flow envelope (e.g. Lossie, Spey, Deveron, Wharfe, all in records of 50 years or more). Thereafter, recessions continued, but without notably low flows. Recessions were constrained in Northern Ireland by further responses to rainfall on the 21st and 27th, the latter also affecting north-west Scotland. Flows on many groundwater-fed catchments, although receding, were above average throughout the month, and some saw repeated or sustained incursions into the daily maximum flow envelope (e.g. Dover Beck, Itchen). June river flows were widely normal or above normal, and below normal for some rivers in south Wales and south-west England (e.g. Twyi, Yscir, Taw). Monthly mean flows of 150% of average or more were recorded in northern Scotland (e.g. Naver, Oykel), and the south and east of England (e.g. Wensum, Stringside, Lee, Itchen), with the groundwater-dominated Itchen seeing a new June maximum (in a series from 1958). It was only in these areas that high flows persisted in June, in contrast to the widespread exceptionally high flows seen over longer accumulations (with numerous new records established), resulting in the highest England outflows over the 6-month period from January - June (in a series from 1961) and for the UK over the 12-month period from July 2023 - June 2024 (in a series from 1980).

Soil Moisture and Groundwater

Soil moisture deficits were present across most of the UK, with soil moisture at or close to field capacity only in north-west Scotland. Groundwater levels remained above normal to exceptionally high across the Chalk of England. The levels in a third of the index sites moved into a lower category compared to May: this was observed in the Chalk of Wessex, the Marlborough Downs and the South Downs. For example, the level at Chilgrove House was notably high in May but became above normal in June. The groundwater level fell at Killyglen in Northern Ireland and became notably low. Levels fell in both the Jurassic limestones and the Magnesian Limestone aquifers, becoming normal at Ampney Crucis and remaining notably high at New Red Lion. Further record high levels were recorded for June at both Magnesian Limestone sites (Aycliffe and Brick House Farm, with 48- and 43-year series respectively). Groundwater levels fell and remained above normal in the Carboniferous Limestone at Alstonfield, whilst in the same aquifer in South Wales, levels became notably high at Greenfield Garage and below normal at Pant y Lladron. Record high levels for June were recorded in the Permo-Triassic Sandstones at Skirwith and Weir Farm (45- and 40-year series respectively), and at Bussels No. 7a levels remained exceptionally high. Levels receded at all sites. In the Upper Greensand at Lime Kiln Way, the level fell and a record high level for June was recorded (in a 55-year series). Levels fell at Royalty Observatory and a new maximum level for June was observed (in a series of 34 years). At Easter Lathrisk (Devonian sandstones), the groundwater level fell and remained in the normal range.

National Hydrological Monitoring Programme | UK Centre for Ecology & Hydrology | BGS British Geological Survey

Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

Percentages are from the 1991-2020 average.

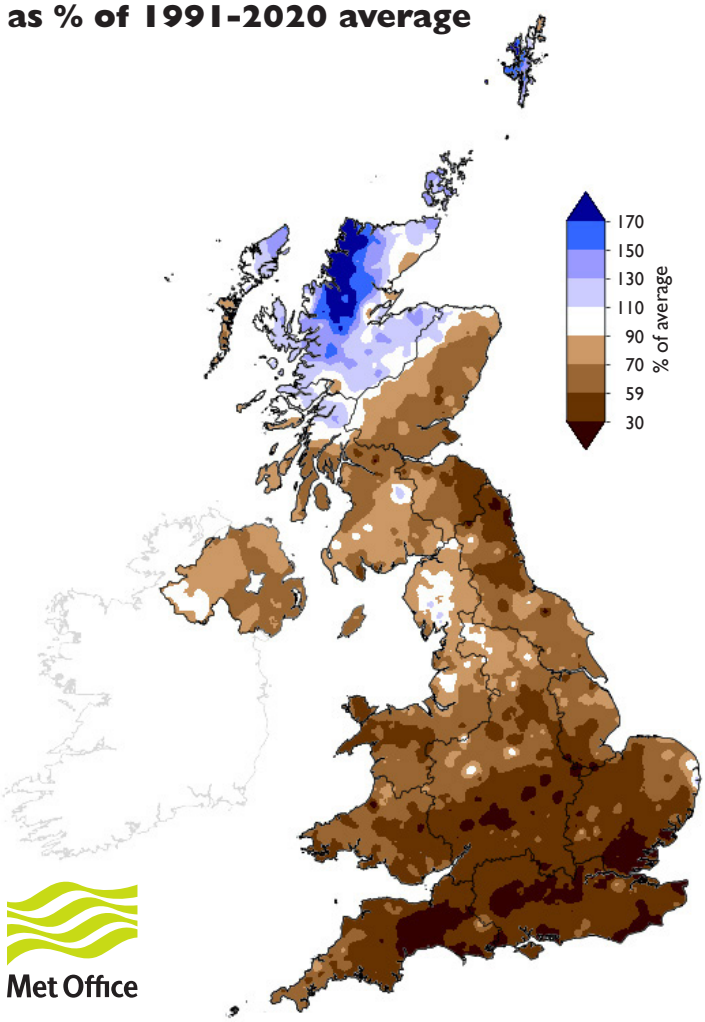
Region	Rainfall	Jun 2024	May24 – Jun24	RP	Feb24 – Jun24	RP	Jan24 – Jun24	RP	Jul23 – Jun24	RP
United Kingdom	mm	**55**	138		497		614		1442	
	%	**71**	93	2-5	124	50-80	117	20-35	125	>>100
England	mm	**34**	118		427		512		1190	
	%	**52**	97	2-5	141	>100	133	>100	138	>>100
Scotland	mm	**91**	174		585		750		1743	
	%	**98**	96	2-5	108	5-10	104	5-10	111	20-30
Wales	mm	**48**	144		643		805		1898	
	%	**52**	80	2-5	131	40-60	125	25-40	131	>100
Northern Ireland	mm	**60**	107		426		512		1422	
	%	**74**	69	5-10	104	2-5	98	2-5	123	>100
England & Wales	mm	**36**	121		457		553		1286	
	%	**52**	93	2-5	139	>100	131	>100	136	>>100
North West	mm	**70**	194		597		760		1779	
	%	**81**	120	5-10	139	>100	137	>100	140	>>100
Northumbria	mm	**39**	136		387		486		1212	
	%	**53**	105	2-5	120	10-15	120	10-20	134	>>100
Severn-Trent	mm	**34**	112		404		469		1094	
	%	**51**	89	2-5	138	50-80	129	25-40	137	>100
Yorkshire	mm	**48**	130		401		501		1223	
	%	**67**	102	2-5	128	15-25	128	20-30	141	>100
Anglian	mm	**26**	97		308		358		842	
	%	**48**	94	2-5	136	20-30	128	15-25	135	80-120
Thames	mm	**19**	94		385		453		998	
	%	**35**	88	2-5	150	60-90	138	40-60	138	>100
Southern	mm	**19**	84		416		496		1144	
	%	**35**	81	2-5	153	>100	138	70-100	140	>100
Wessex	mm	**21**	117		485		572		1306	
	%	**35**	98	2-5	156	>>100	141	>100	145	>>100
South West	mm	**34**	121		642		754		1668	
	%	**44**	82	2-5	152	>>100	134	>100	133	>100
Welsh	mm	**46**	140		629		783		1832	
	%	**51**	80	2-5	133	50-80	126	30-50	131	>100
Highland	mm	**134**	195		635		848		1934	
	%	**134**	95	2-5	98	2-5	98	2-5	104	5-10
North East	mm	**72**	141		457		565		1386	
	%	**91**	95	2-5	123	20-35	120	25-40	131	>>100
Tay	mm	**65**	154		528		679		1713	
	%	**75**	90	2-5	110	5-10	106	5-10	124	50-80
Forth	mm	**53**	181		547		677		1515	
	%	**61**	114	2-5	126	20-35	119	10-20	122	80-120
Tweed	mm	**46**	174		493		614		1376	
	%	**58**	121	5-10	130	30-50	126	30-50	127	>100
Solway	mm	**73**	187		657		808		1776	
	%	**75**	101	2-5	123	30-50	115	15-25	113	20-35
Clyde	mm	**87**	183		672		839		1963	
	%	**82**	88	2-5	105	5-10	98	2-5	104	5-10

% = percentage of 1991-2020 average *RP = Return period*

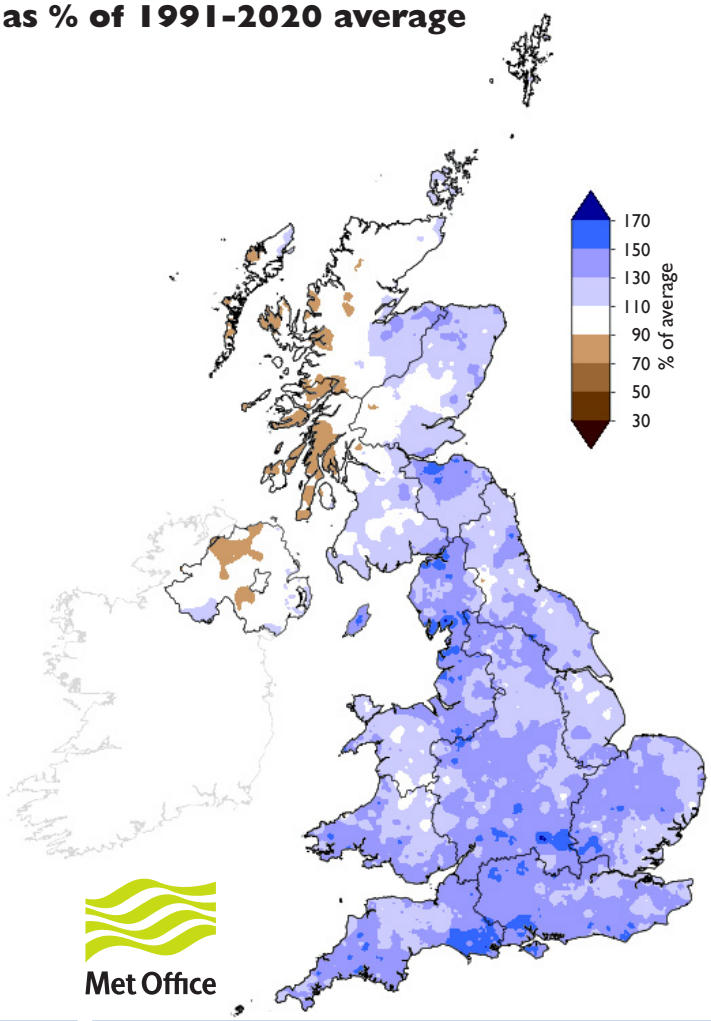
Important note: Figures in the above table may be quoted provided their source is acknowledged. Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic variability since 1890; they also assume a stable climate. The quoted RPs relate to the specific timespans only; for the same timespans, but beginning in any month the RPs would be substantially shorter. The timespans featured do not purport to represent the critical periods for any particular water resource management zone. For hydrological or water resources assessments of drought severity, river flows and/or groundwater levels normally provide a better guide than return periods based on regional rainfall totals. Note that precipitation totals in winter months may be underestimated due to snowfall undercatch. All monthly rainfall totals since January 2023 are provisional. Source: Data from HadUK-Grid dataset at 1km resolution v1.2.0.0.

Rainfall . . . Rainfall . . .

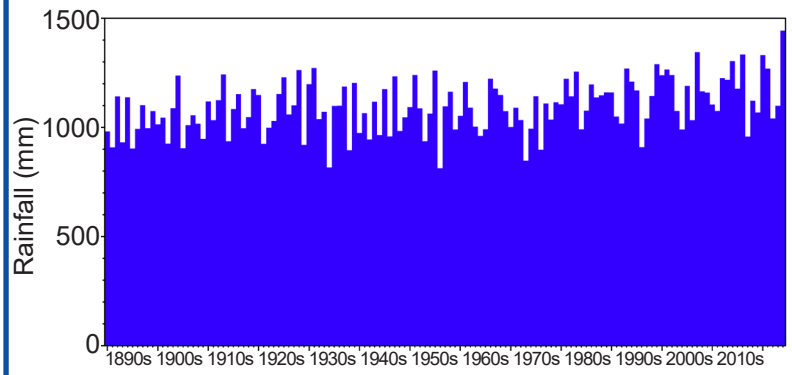
June 2024 rainfall
as % of 1991-2020 average



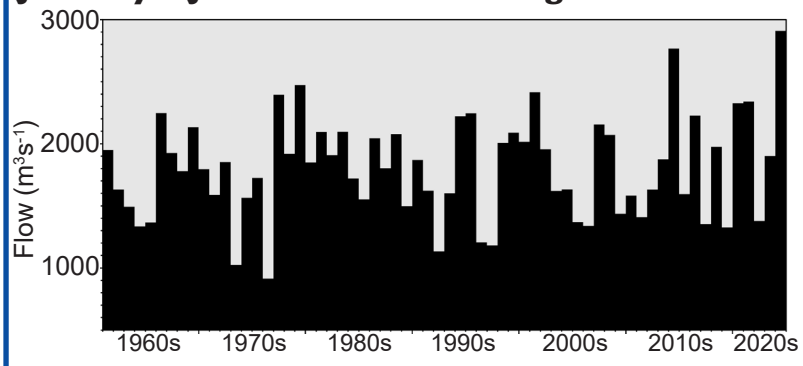
January 2024 - June 2024 rainfall
as % of 1991-2020 average



July - June rainfall for the UK



January - June outflows for England



UK Hydrological Outlook

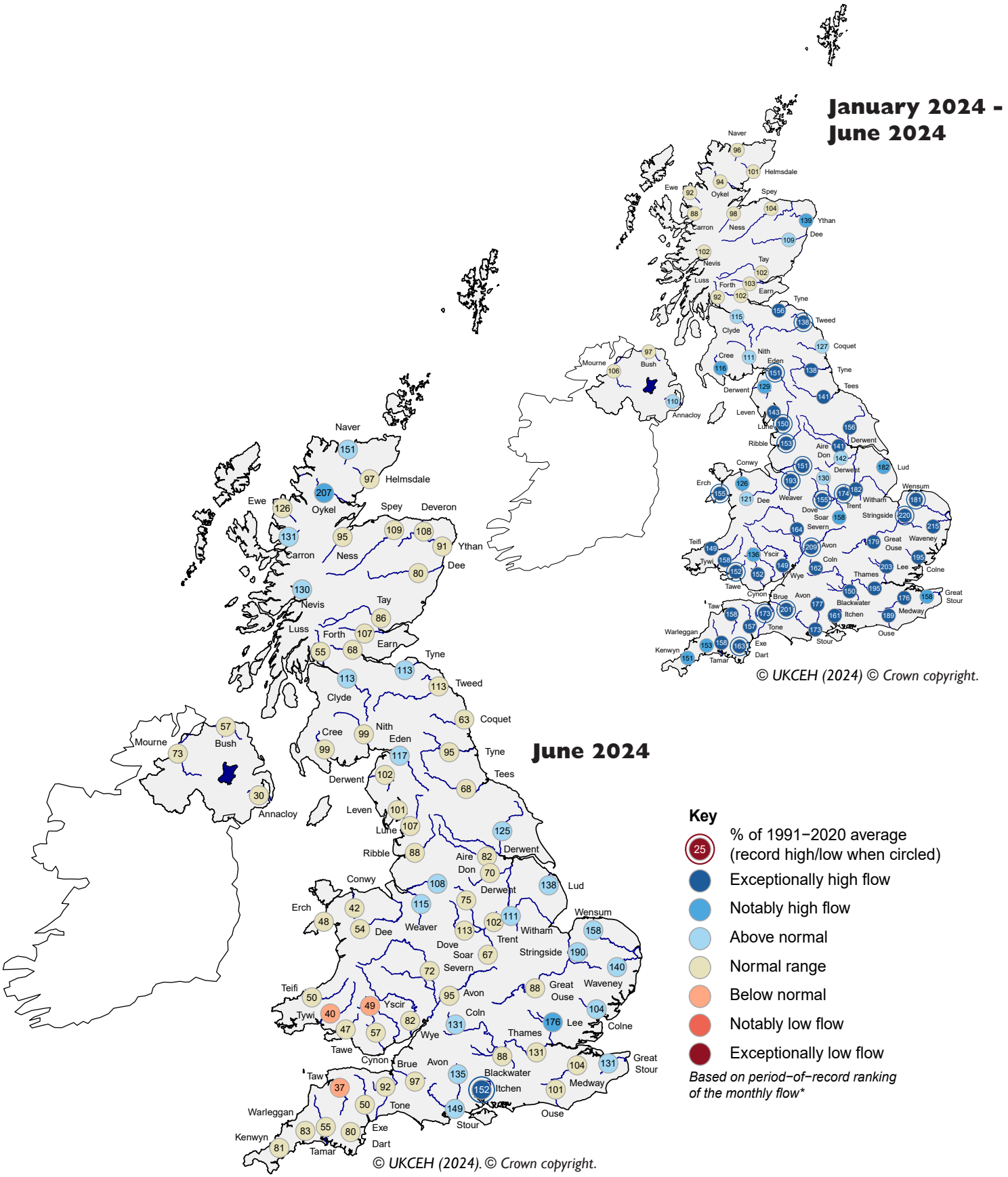
The Hydrological Outlook provides an insight into future hydrological conditions across the UK. Specifically it describes likely trajectories for river flows and groundwater levels on a monthly basis, with particular focus on the next three months.

The complete version of the Hydrological Outlook UK can be found at: www.hydoutuk.net/latest-outlook/

Period: **from July 2024**
Issued: **09.07.2024**
using data to the end of June 2024

The outlook for July suggests normal to above normal river flows in south-east England and normal flows elsewhere. For the July-September period, normal river flows are expected across the country. Groundwater levels are forecasted to be above normal in July, with normal to above normal levels anticipated for the July-September period.

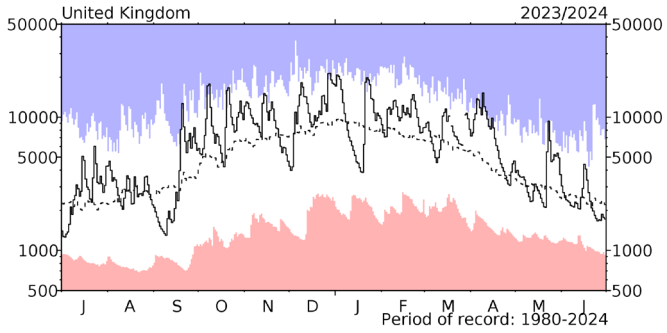
River flow . . . River flow . . .

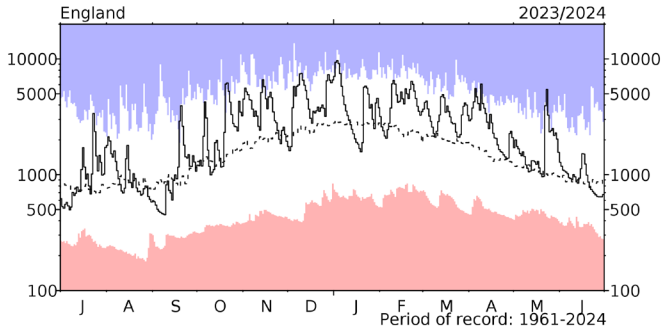


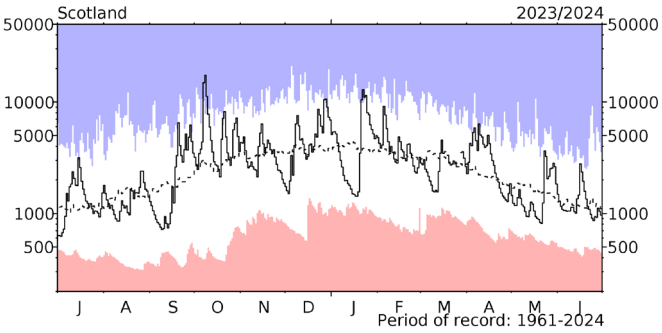
River flows

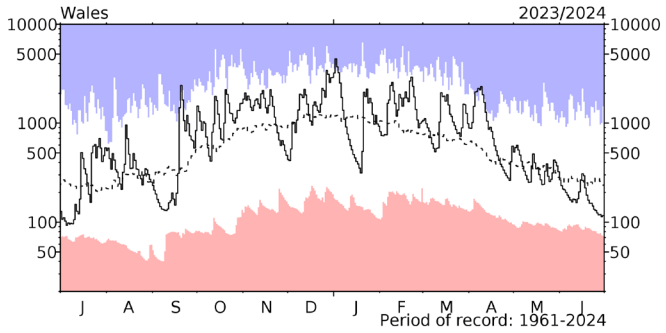
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much greater. The categories of the spots are based on the full period-of-record data whereas the percentages are based on the 1991-2020 averaging period for consistency between rainfall and river flows. Percentages may be omitted where flows are under review.

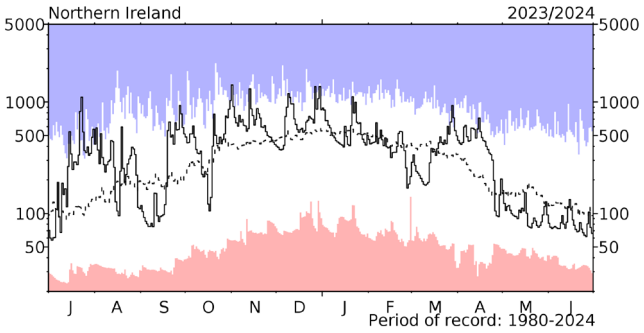
River flow . . . River flow . . .

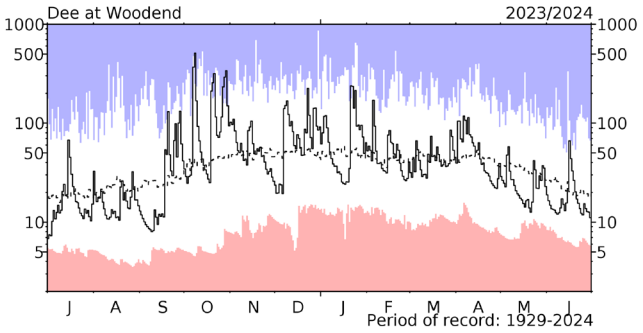


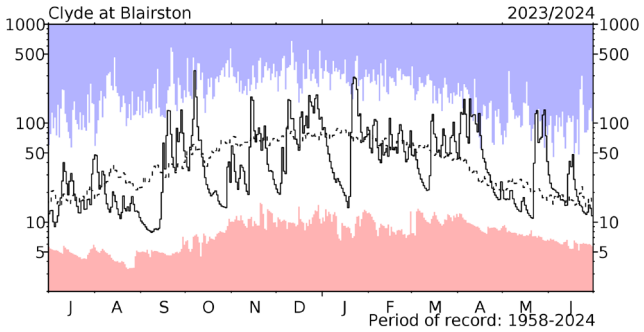


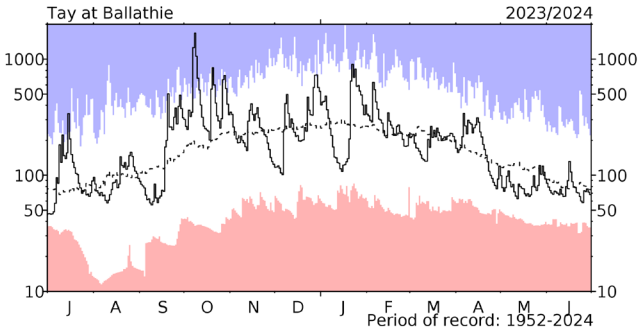


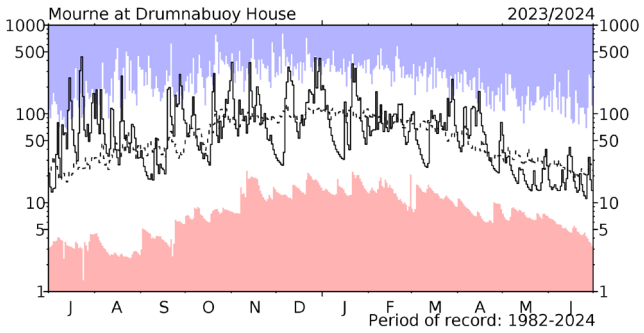


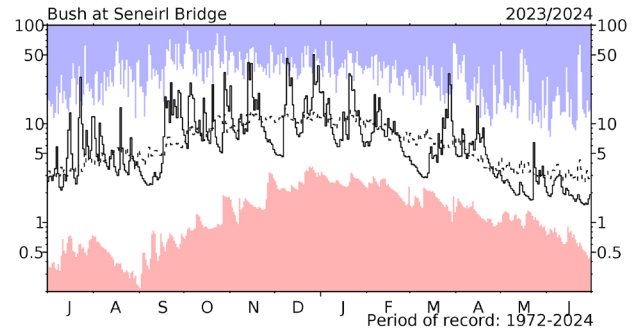








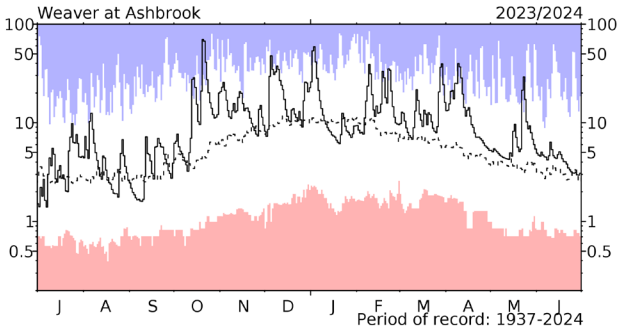


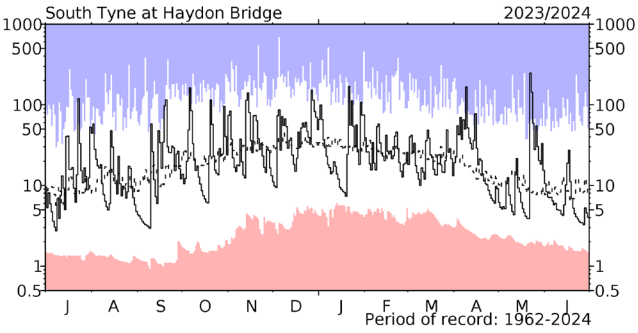


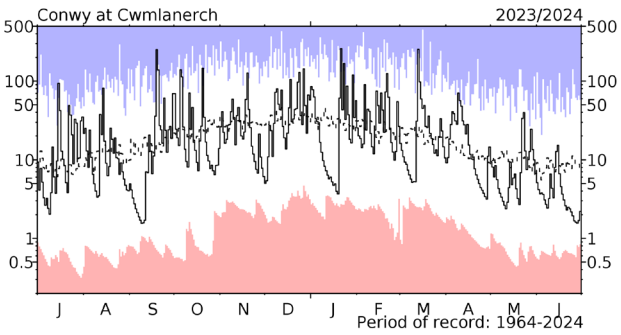
River flow hydrographs

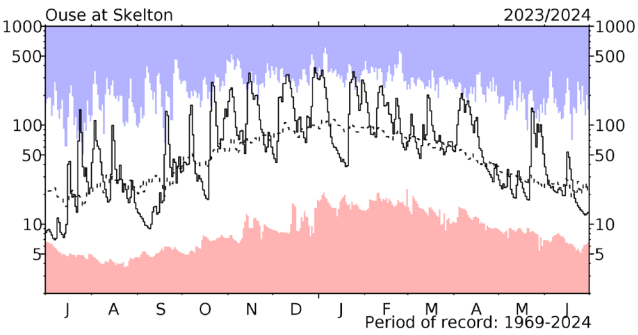
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to June 2023 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed line represents the period-of-record average daily flow.

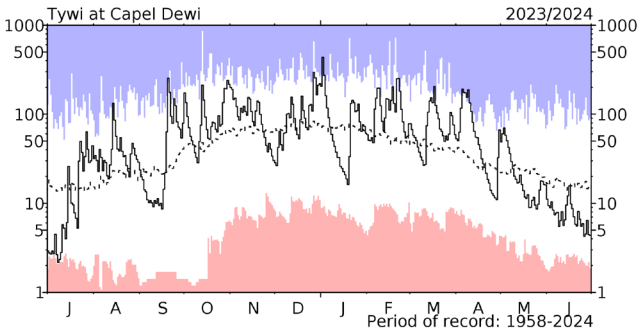
River flow . . . River flow . . .

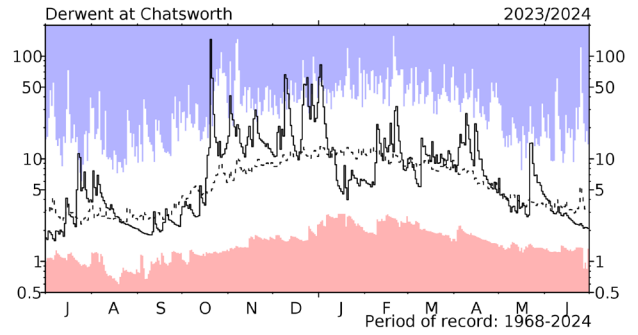


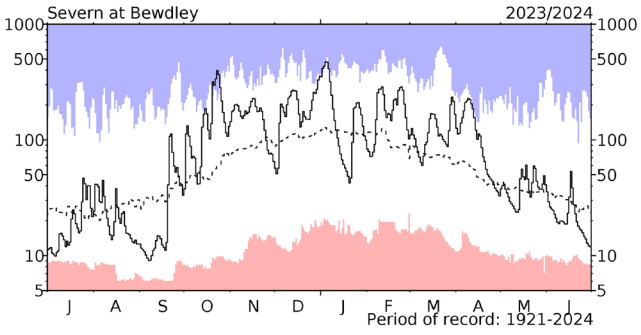


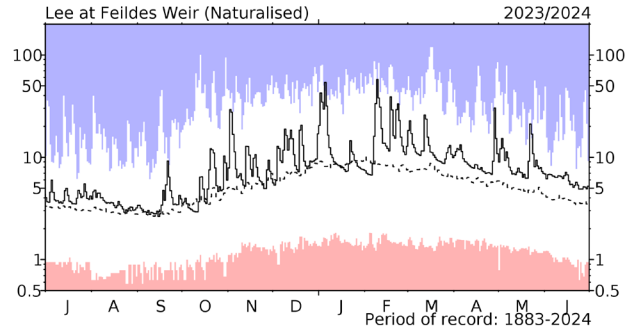


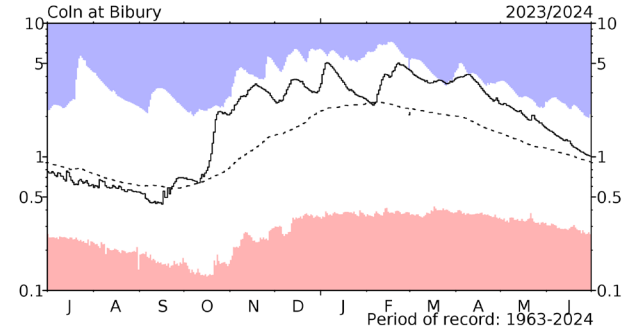


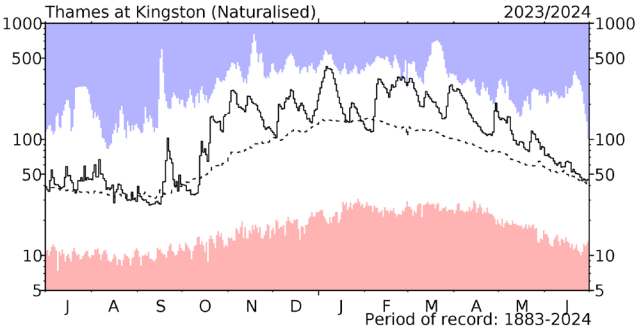


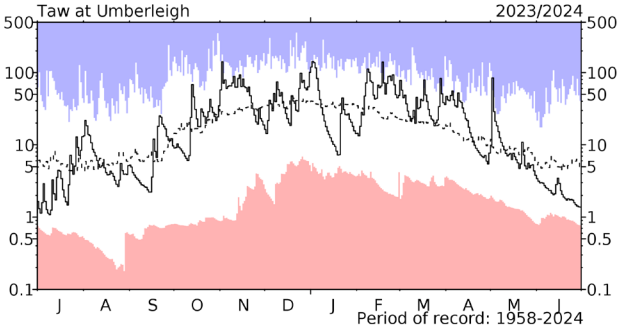


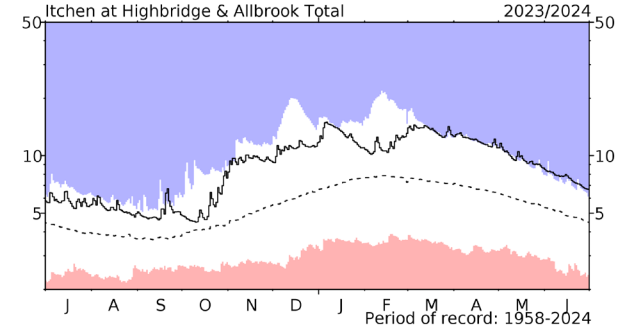




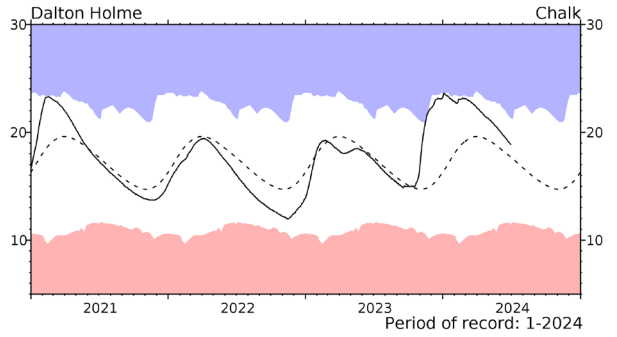


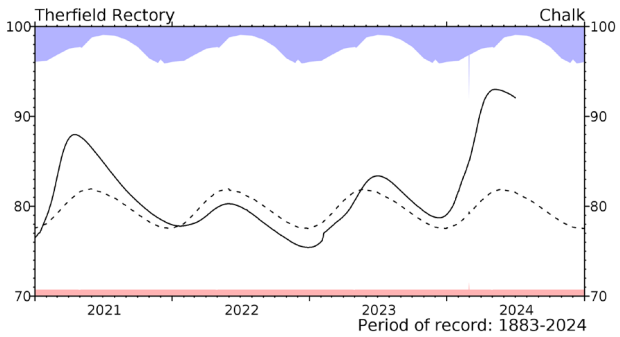


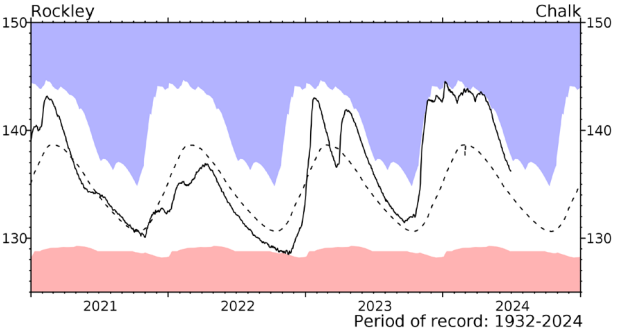


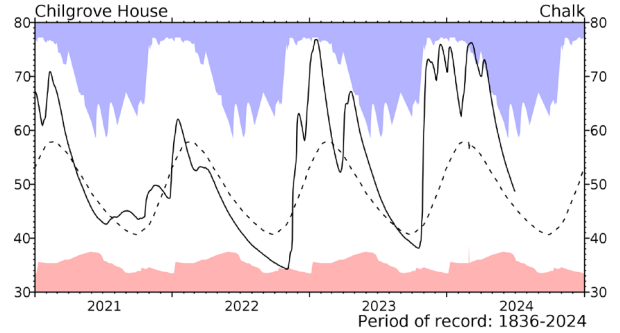


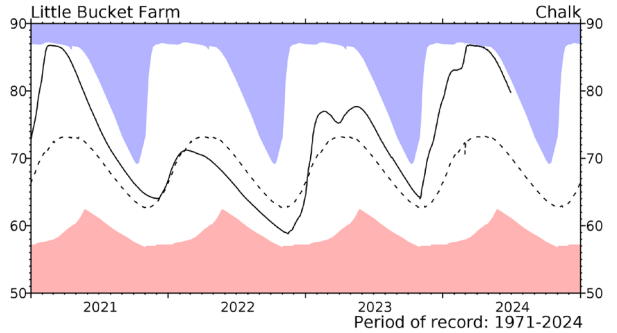
Groundwater…Groundwater

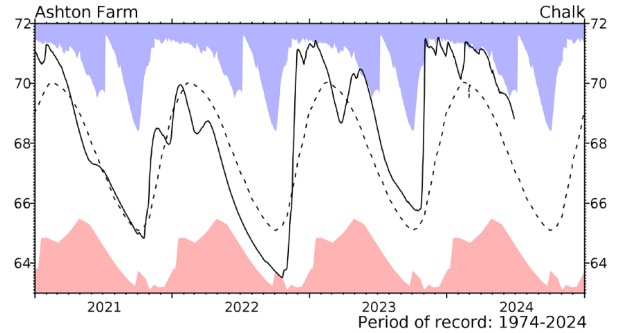


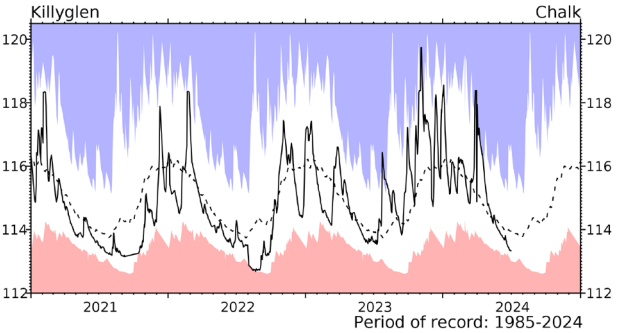


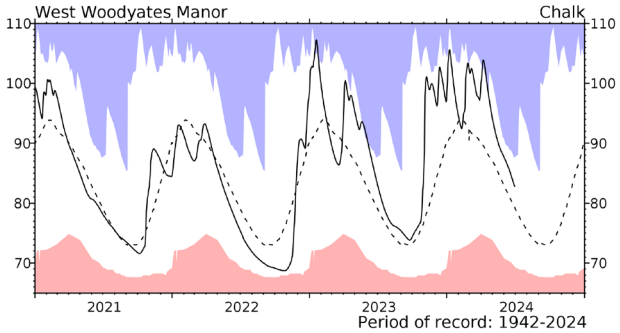


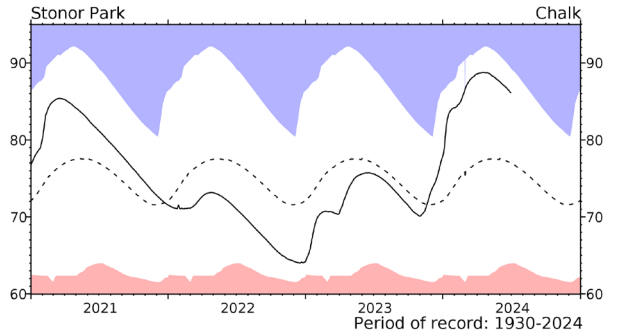


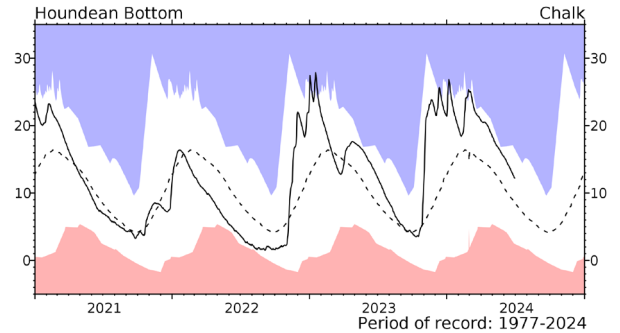






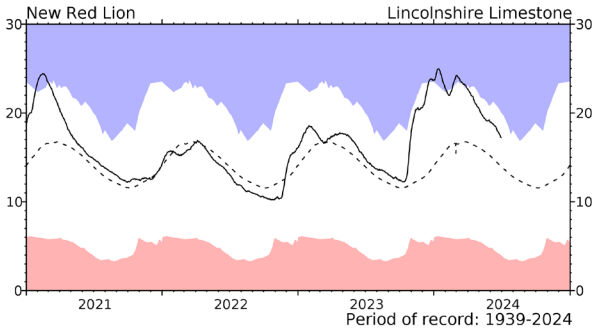


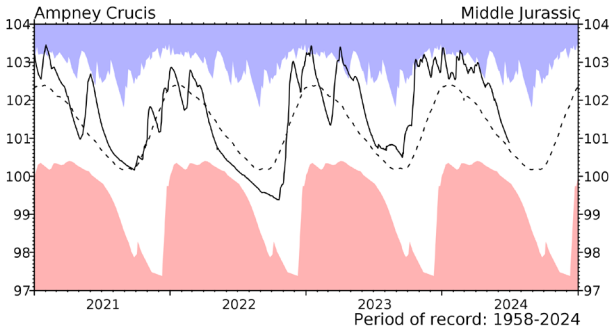


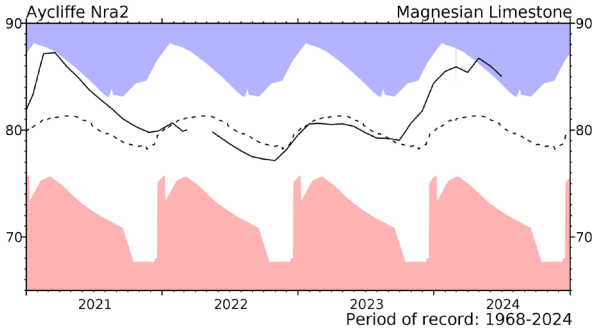


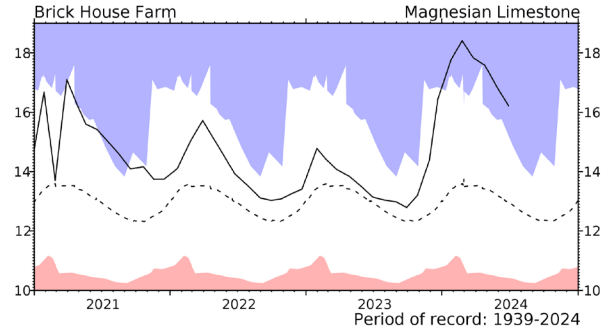
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined below overlying impermeable strata. The monthly mean and the highest and lowest levels recorded for each month are calculated with data from the start of the record to the end of 2020. Note that most groundwater levels are not measured continuously and, for some index wells, the greater frequency of contemporary measurements may, in itself, contribute to an increased range of variation.

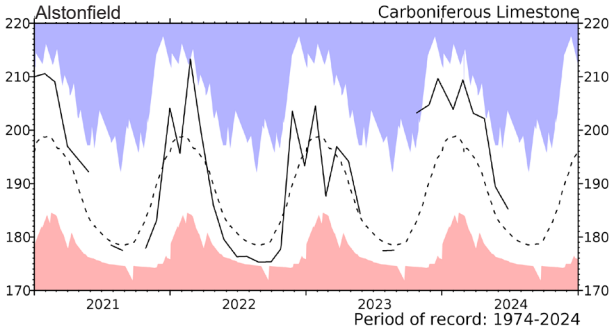
Groundwater … Groundwater

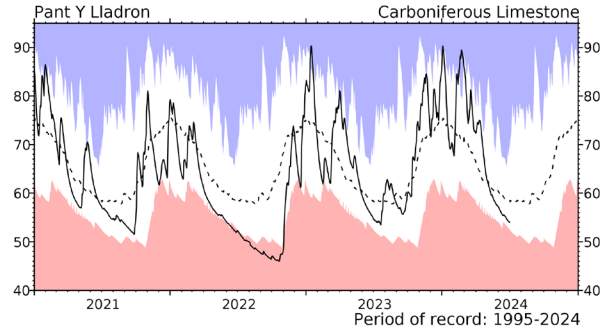


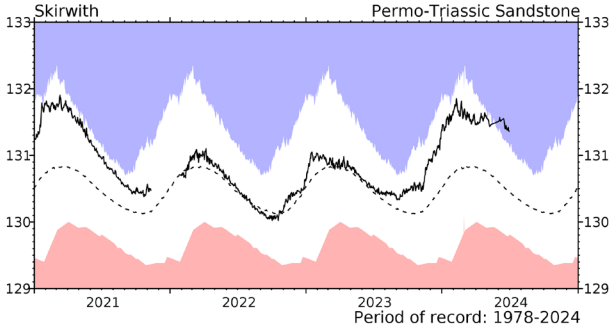


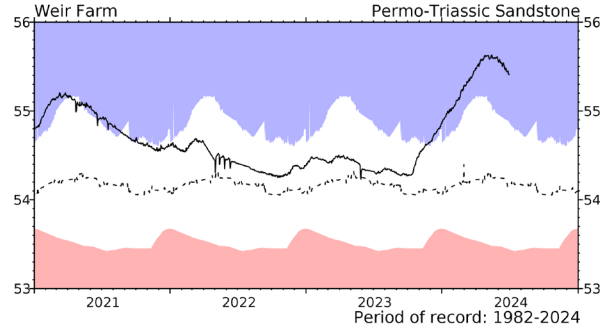


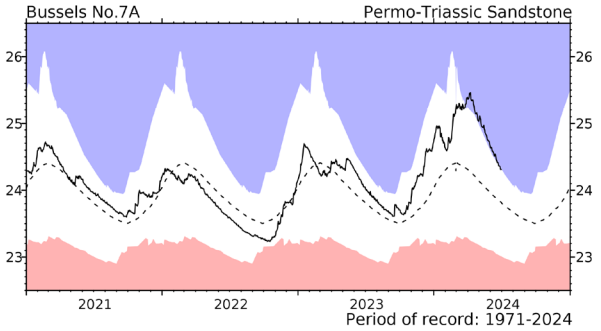


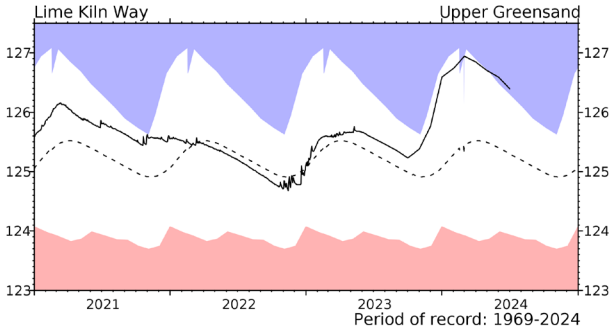


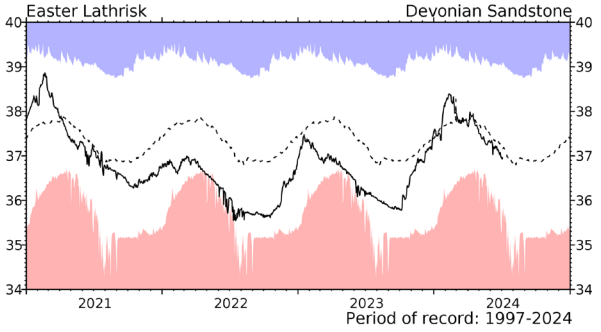


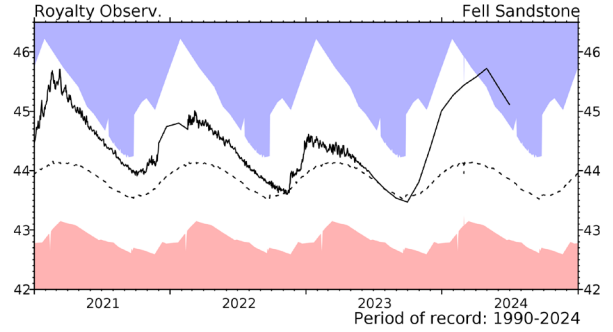


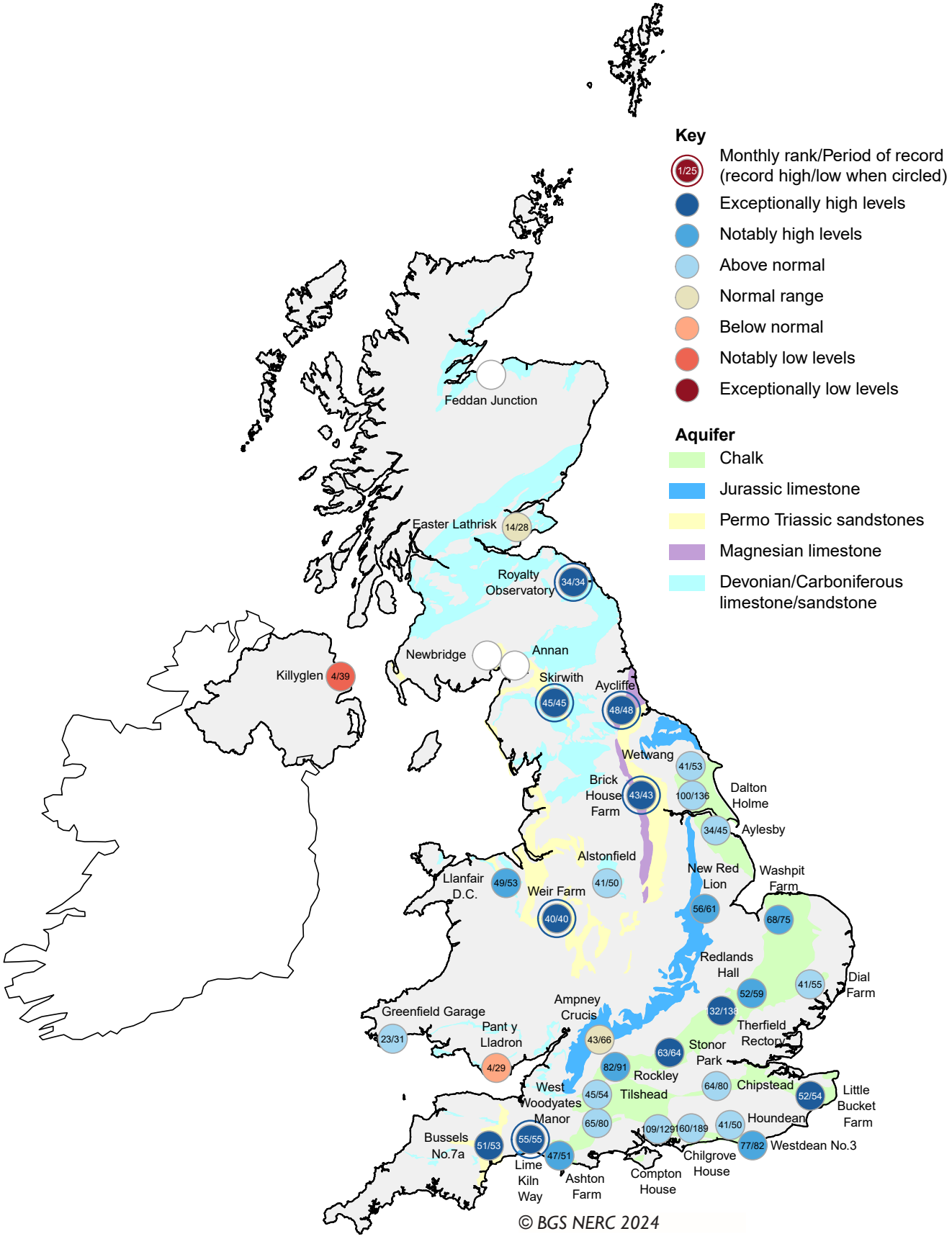










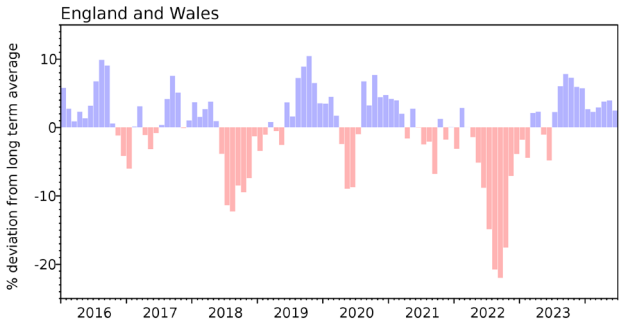


Groundwater levels - June 2024

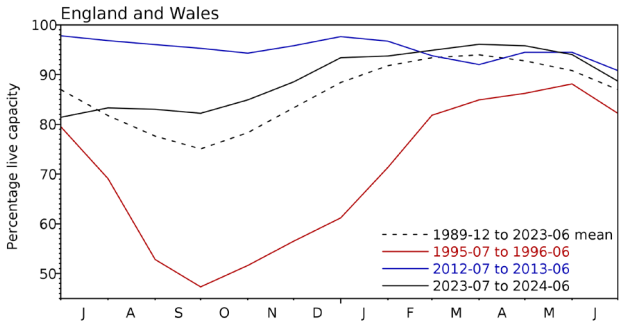
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. The rankings are designed as a qualitative indicator, and ranks at extreme levels, and when levels are changing rapidly, need to be interpreted with caution.

Reservoirs . . . Reservoirs . . .

Guide to the variation in overall reservoir stocks for England and Wales



Comparison between overall reservoir stocks for England and Wales in recent years



Percentage live capacity of selected reservoirs at end of month

Area	Reservoir		Capacity (Ml)	2024 Apr	2024 May	2024 Jun	Jun Anom.	Min Jun	Year* of min	2023 Jun	Diff 24-23
North West	N Command Zone	•	124929	94	80	63	-8	38	1984	63	0
	Vyrnwy		55146	100	92	89	6	58	1984	89	0
Northumbrian	Teesdale	•	87936	98	99	96	16	58	1989	66	29
	Kielder		(199175)	93	95	91	1	71	1989	89	2
Severn-Trent	Clywedog		49936	99	99	99	6	32	1976	85	14
	Derwent Valley	•	46692	97	94	84	5	53	1996	70	14
Yorkshire	Washburn	•	23373	97	96	90	10	63	1995	76	13
	Bradford Supply	•	40942	97	95	87	9	54	1995	66	21
Anglian	Grafham		(55490)	90	95	95	2	70	1997	94	1
	Rutland		(116580)	98	94	93	3	75	1997	91	2
Thames	London	•	202828	96	98	95	3	85	1990	95	0
	Farmoor	•	13822	96	98	98	1	92	2022	98	0
Southern	Bewl		31000	100	94	95	11	52	1990	92	3
	Ardingly		4685	100	99	93	-1	75	2022	91	2
Wessex	Clatworthy		5662	98	97	82	0	61	1995	83	-1
	Bristol	•	(38666)	95	93	85	2	64	1990	87	-2
South West	Colliford		28540	100	100	92	11	51	1997	61	31
	Roadford		34500	99	98	94	14	49	1996	62	31
	Wimbleball		21320	100	99	88	3	63	2011	84	4
	Stithians		4967	100	100	80	1	53	1990	83	-2
Welsh	Celyn & Brenig	•	131155	89	88	85	-8	70	2020	76	9
	Brianne		62140	100	100	97	5	68	2022	86	11
	Big Five	•	69762	99	93	85	1	61	1989	74	11
	Elan Valley	•	99106	99	95	87	0	65	2022	76	11
Scotland(E)	Edinburgh/Mid-Lothian	•	97223	98	97	94	8	54	1998	82	12
	East Lothian	•	9317	100	100	100	5	81	1992	91	9
Scotland(W)	Loch Katrine	•	110326	97	89	81	1	55	2010	72	9
	Daer		22494	83	85	78	-4	62	2023	62	16
	Loch Thom		10721	99	97	88	2	65	2021	70	19
Northern Ireland	Total+	•	56800	94	87	83	1	61	2008	80	2
	Silent Valley	•	20634	96	89	85	6	54	1995	80	5

( ) figures in parentheses relate to gross storage

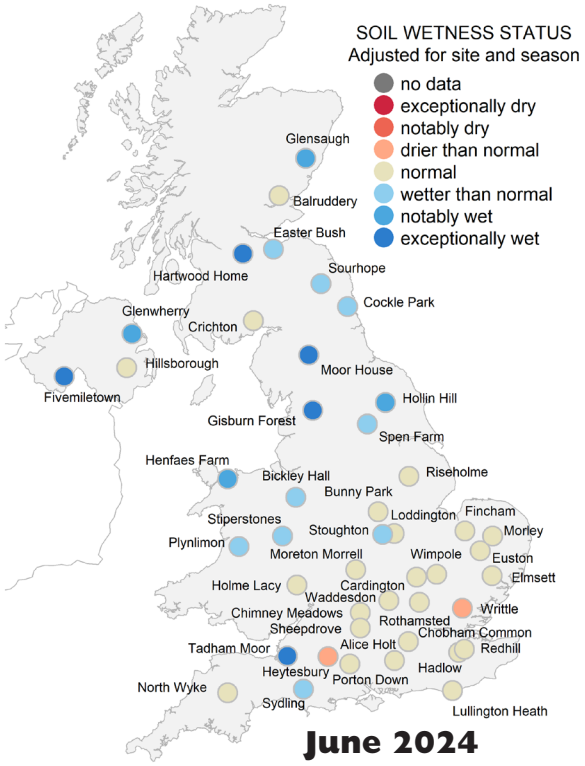
• denotes reservoir groups

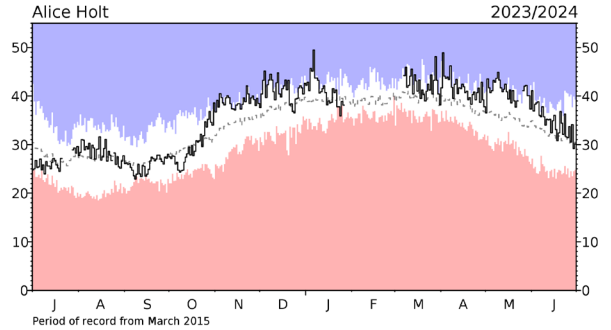
*last occurrence

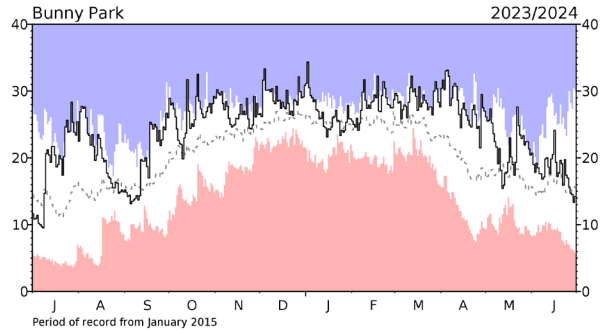
+ excludes Lough Neagh

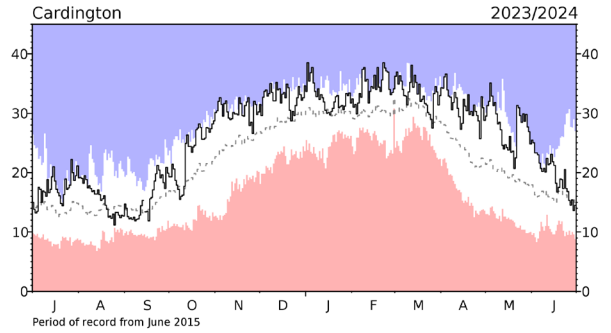
Details of the individual reservoirs in each of the groupings listed above are available on request. The percentages given in the Average and Minimum storage columns relate to the 1988-2012 period except for West of Scotland and Northern Ireland where data commence in the mid-1990s. In some gravity-fed reservoirs (e.g. Clywedog) stocks are kept below capacity during the winter to provide scope for flood attenuation purposes. Monthly figures may be artificially low due to routine maintenance or turbidity effects in feeder rivers.

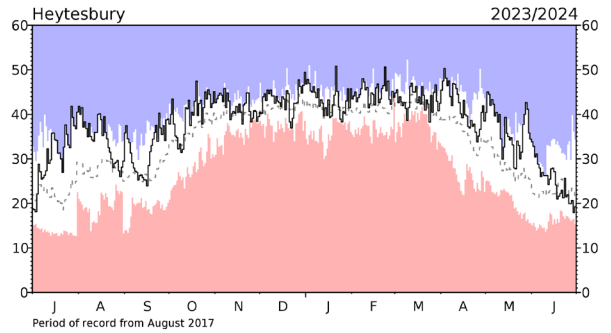
Soil Moisture . . . Soil Moisture

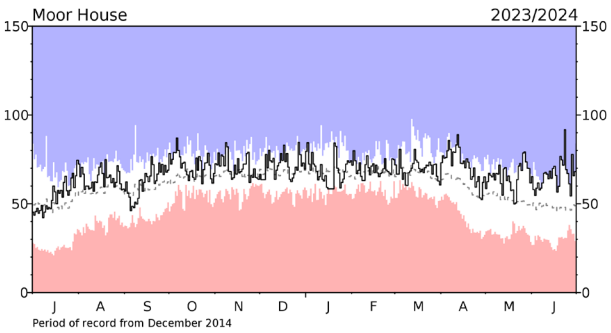












At the end of June, soil moisture has decreased at many COSMOS-UK sites after a generally dry month, though there are regional variations.

Soil moisture for many COSMOS-UK sites is lower than previous months, though still within the normal range for the time of year (e.g. Alice Holt, Bunny Park, Cardington, and Chimney Meadows). Some sites remain wetter-than-usual, limited to Northern England, North Wales, and Scotland (e.g. Henfaes, Hartwood Home, Cockle Park, and Moor House). Some sites in Southern England reached drier-than-usual conditions towards the end of the month (e.g. Heytesbury and Writtle).

Overall, soil moisture is drier than previous months after lower-than-average rainfall for much of the UK in June.

Soil moisture data

These data are from UKCEH's COSMOS-UK network. The time series graphs show volumetric water content as a percentage in black together with the maximum and minimum daily values for the period-of-record of the sites. The dashed line represents the period-of-record mean VWC. For more information visit cosmos.ceh.ac.uk.

NHMP

The National Hydrological Monitoring Programme (NHMP) was started in 1988 and is undertaken jointly by the UK Centre for Ecology & Hydrology (UKCEH) and the British Geological Survey (BGS). The NHMP aims to provide an authoritative voice on hydrological conditions throughout the UK, to place them in a historical context and, over time, identify and interpret any emerging hydrological trends. Hydrological analysis and interpretation within the Programme is based on the data holdings of the National River Flow Archive (NRFA; maintained by UKCEH) and National Groundwater Level Archive (NGLA; maintained by BGS), including rainfall, river flows, borehole levels, and reservoir stocks.

The Hydrological Summary is supported by the Natural Environment Research Council award number NE/R016429/1 as part of the UK-SCAPE programme delivering National Capability.

Data Sources

The NHMP depends on the active cooperation of many data suppliers. This cooperation is gratefully acknowledged. A location map of all sites used in the Hydrological Summary can be found on the NHMP website. River flow and groundwater level data are provided by the Environment Agency (EA), Natural Resources Wales - Cyfoeth Naturiol Cymru (NRW), the Scottish Environment Protection Agency (SEPA) and, for Northern Ireland, the Department for Infrastructure - Rivers and the Northern Ireland Environment Agency. In all cases the data are subject to revision following validation (high flow and low flow data in particular may be subject to significant revision).

Details of reservoir stocks are provided by the Water Service Companies, the EA, Scottish Water and Northern Ireland Water.

The Hydrological Summary and other NHMP outputs may also refer to and/or map soil moisture data for the UK. These data are provided by the Meteorological Office Rainfall and Evaporation Calculation System (MORECS). MORECS provides estimates of monthly soil moisture deficit in the form of averages over 40 x 40 km grid squares over Great Britain and Northern Ireland. The monthly time series of data extends back to 1961.

Rainfall data are provided by the Met Office. To allow better spatial differentiation the rainfall data for Britain are presented for the regional divisions of the precursor organisations of the EA, NRW and SEPA. The areal rainfall figures have been produced by the Met Office National Climate Information Centre (NCIC), and are based on the HadUK-Grid 1km resolution gridded data from rain gauges. The majority of the full rain gauge network across the UK is operated by the EA, NRW, SEPA and Northern Ireland Water; supplementary rain gauges are operated by the Met Office. The Met Office NCIC monthly rainfall series extend back to 1836 and form the official source of UK areal rainfall statistics which have been adopted by the NHMP. The gridding technique used is described in Hollis, 2019 available at https://doi.org/10.1002/gdj3.78

Long-term averages are based on the period 1991-2020 and are derived from the monthly areal series.

The regional figures for the current month in the hydrological summaries are based on a limited rain gauge network so these (and the associated return periods) should be regarded as a guide only.

The monthly rainfall figures are provided by the Met Office NCIC and are Crown Copyright and may not be passed on to, or published by, any unauthorised person or organisation. These are provisional totals calculated from a sub set of Met Office registered gauges and will be subject to change once data from the complete network of Met Office registered gauges has been quality assured and gridded within the annual process of updating the HadUK-Grid dataset.

For further details on rainfall or MORECS data, please contact the Met Office:

Tel: 0370 900 0100
Email: enquiries@metoffice.gov.uk

Enquiries

Enquiries should be directed to the NHMP:

Tel: 01491 692599
Email: nhmp@ceh.ac.uk

A full catalogue of past Hydrological Summaries can be accessed and downloaded at:

http://nrfa.ceh.ac.uk/monthly-hydrological-summary-uk

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