Hydrological Summary

for the United Kingdom

February 2021

General

February began with wintry, unsettled conditions which gave way to a milder period albeit still with frequent rainfall. The UK's coldest temperature (-23°C) since 1995 was recorded in Braemar (Aberdeenshire) on the 11th. Rainfall totals were again above average for much of the UK (for the third consecutive month), particularly so in central and southern Scotland, northern England, south Wales and eastern Northern Ireland. River flows for February were generally above normal across the majority of England and Wales, notably or exceptionally so in south Wales and eastern England, with new February maxima established along the eastern coast. For the winter (December-February) notable records were also set in northern and eastern England. Soil moisture deficits remained negligible across the country (as expected for the time of year), and groundwater levels remained above normal or notably high in most index boreholes, with exceptionally high levels across much of northern England. Reservoir levels continued to increase in most impoundments and stocks were above average at the national scale. In the short-term, with saturated catchments the flood risk remains high, however with below average rainfall forecast for the spring and receding river flows evident in early March, the risk is likely to subside over the coming months.

Rainfall

The first half of February featured easterly air flows which brought cold winds and unsettled, wintry weather (52mm was recorded at Logan Botanic Garden, Dumfries and Galloway, on the 4th). Snow showers in the east led to large accumulations (e.g. 38cm was recorded at Aboyne (Aberdeenshire) on the 10th), causing widespread impacts, including travel disruption and closures to COVID-19 vaccination centres and schools (500 were closed in eastern areas on the 7th and 8th). On the 9th there an avalanche warning was issued for the Pentland Hills (south-west of Edinburgh). From mid-month, milder air spread eastwards bringing more settled weather until heavy rain returned to western areas on the 19th/20th causing road and rail closures. Persistent rain (e.g. 126mm was recorded at Honister Pass (Cumbria) on the 23rd) also caused problems in northern Britain with flooding, fallen trees and disruption to travel. Month-end brought a return to more settled anticyclonic conditions. For February, the UK as a whole received 118% of average rainfall, with areas of eastern England and Scotland registering more than 170%. Below average rainfall was limited to parts of south-east England and northern Scotland. For the winter (December-February), the UK as a whole received 123% of average rainfall, with large swathes of the east coast, East Anglia and the Cotswolds registering over 170% of average. For the Anglian and Northumbria regions, winter 2020/2021 was the second wettest since 1910.

River flows

At the start of February river flows were near average before increasing in response to unsettled weather from the 3rd. During the first ten days of the month, many new daily flow maxima were set in England, Wales and Northern Ireland, including every day on the Yorkshire Derwent between the 4th and 9th (records since 1974), and a new February peak flow record was set on the Coquet on the 5th (in a series from 1967). Flows peaked during the first half of the month, although as the unsettled weather returned, between the 19th-21st, new daily flow maxima were set on many rivers across England and Wales. This was also reflected in the outflows for Wales with new daily maxima established on the 19th/20th. The second highest peak flow (of any month) was set on the Teifi on the 20th (in a series from 1959) and widespread flooding of roads, rail and some properties was reported from the Tywi, Cynon and Usk. Flows receded during the last days of February, ending the month as they started – near average. Mean February river flows were notably or exceptionally high across the majority of the UK, particularly in south Wales and eastern England. New record February mean flows were established on the Coquet (surpassing the previous record from February 2020), Lud and Yorkshire Derwent (all in records of at least 45 years), while the Stringside registered its highest monthly mean flow of any month (in a series from 1965). Average flows over the winter (December-February) were the highest on record for many rivers in northern England and East Anglia, with many receiving over twice the average (e.g. Mersey, Witham, Wensum, Waveney). Winter outflows for England were the second highest on record after winter 2013/2014 (in a series from 1960).

Groundwater

Recharge continued in most index boreholes during February, although levels fell in some boreholes including those in Wales and Northern Ireland. In the Chalk, levels rose overall at most sites with exceptionally high levels in the northern Chalk. Record February levels were set at Aylesby and Washpit Farm and localised flooding impacts associated with high groundwater levels were experienced in some places, including North Yorkshire. Elsewhere in the Chalk, levels were mostly above normal or notably high, with only Killyglen and Dial Farm in the normal range. Levels receded in around half the Chalk boreholes by month-end, particularly so in the southern Chalk where lower rainfall was recorded, potentially marking the end of the recharge season in this area. In the Jurassic limestones, New Red Lion recorded a new February maxima, while levels fell at Ampney Crucis and became notably high. Levels also rose in the Magnesian Limestone at Aycliffe, becoming exceptionally high, but fell into the normal range at Brick House Farm. Levels fell in the Carboniferous Limestone at Alstonfield and Pant Y Lladron, with the latter ending the month in the normal range (a stark contrast to January's exceptionally high level). In the Upper Greensand at Lime Kiln Way levels rose and remained notably high. Levels rose at most Permo-Triassic sandstone sites with a monthly maximum recorded at Weir Farm, and levels at Skirwith and Nuttalls Farm were exceptionally high, whilst at Llanfair D.C. levels fell, although they were notably high for the end of February.

Note: Due to unforeseen circumstances no data are available for Scotland.

UK Centre for Ecology & Hydrology

British Geological Survey

Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

Percentages are from the 1981-2010 average.

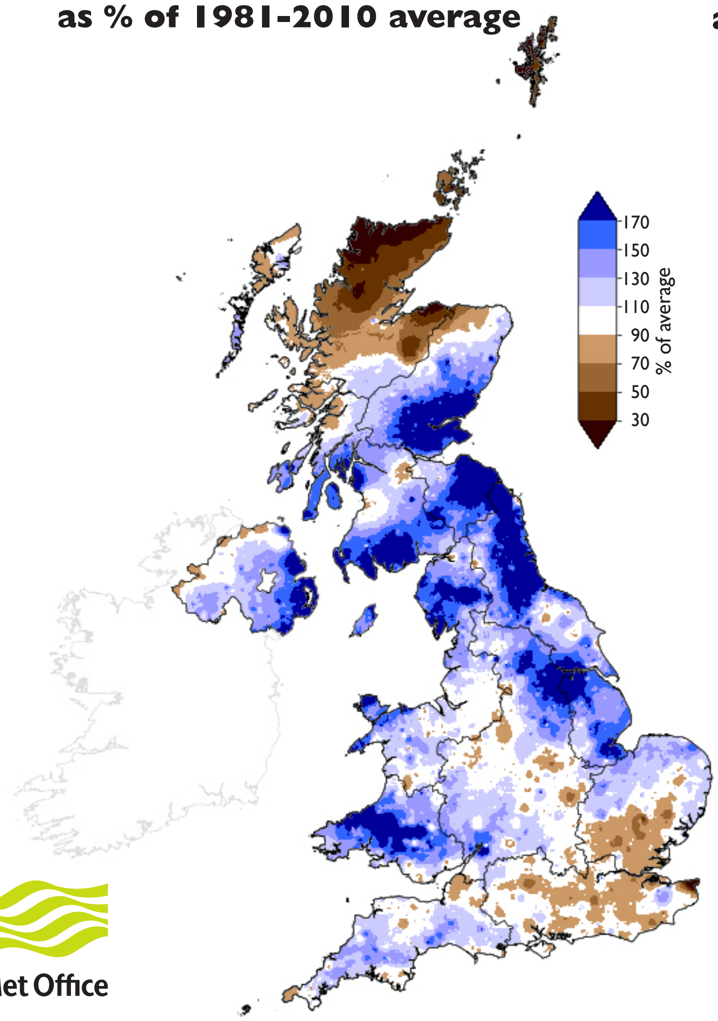
Region	Rainfall	Feb 2021	Jan21 – Feb21	RP	Dec20 – Feb21	RP	Sep20 – Feb21	RP	Mar20 – Feb21	RP
United Kingdom	mm	**102**	239		401		756		1216	
	%	**118**	116	5-10	123	8-12	114	10-15	108	5-10
England	mm	**73**	197		328		575		925	
	%	**123**	139	8-12	143	15-25	121	5-10	109	2-5
Scotland	mm	**136**	277		473		986		1589	
	%	**107**	92	2-5	102	2-5	106	5-10	105	5-10
Wales	mm	**155**	363		619		1036		1612	
	%	**144**	140	8-12	146	20-30	120	10-15	113	8-12
Northern Ireland	mm	**107**	226		355		718		1243	
	%	**129**	114	2-5	113	2-5	113	5-10	109	10-15
England & Wales	mm	**84**	220		368		638		1019	
	%	**127**	140	8-12	144	15-25	121	8-12	110	5-10
North West	mm	**127**	309		464		870		1458	
	%	**142**	145	10-20	133	10-20	121	10-20	119	20-35
Northumbria	mm	**107**	253		382		613		973	
	%	**166**	171	>100	163	>100	128	15-25	112	5-10
Severn-Trent	mm	**62**	182		306		497		832	
	%	**118**	147	8-12	152	15-25	118	5-10	106	2-5
Yorkshire	mm	**84**	230		351		579		957	
	%	**137**	162	20-35	154	20-35	126	8-12	113	5-10
Anglian	mm	**45**	138		240		417		657	
	%	**114**	149	10-20	164	30-50	129	10-15	105	2-5
Thames	mm	**46**	144		243		488		784	
	%	**94**	124	2-5	130	5-10	122	5-10	109	2-5
Southern	mm	**51**	162		291		572		816	
	%	**91**	117	2-5	129	5-10	120	5-10	102	2-5
Wessex	mm	**70**	169		304		570		918	
	%	**108**	109	2-5	120	2-5	110	2-5	104	2-5
South West	mm	**118**	283		523		860		1346	
	%	**118**	120	2-5	137	8-12	115	5-10	109	2-5
Welsh	mm	**149**	350		598		1000		1561	
	%	**146**	141	8-12	148	20-30	121	10-15	114	8-12
Highland	mm	**110**	260		485		1085		1728	
	%	**67**	68	2-5	83	2-5	95	2-5	95	2-5
North East	mm	**78**	176		357		690		1088	
	%	**103**	101	2-5	134	15-25	119	10-15	107	2-5
Tay	mm	**170**	271		464		919		1454	
	%	**153**	99	2-5	113	2-5	113	8-12	108	5-10
Forth	mm	**145**	271		424		811		1344	
	%	**150**	116	5-10	119	5-10	114	10-20	112	10-20
Tweed	mm	**135**	279		435		729		1210	
	%	**176**	152	30-50	151	>100	125	25-40	118	15-25
Solway	mm	**189**	348		526		1023		1728	
	%	**167**	127	5-10	120	5-10	115	10-20	116	40-60
Clyde	mm	**190**	370		575		1243		2024	
	%	**127**	103	2-5	103	2-5	112	10-15	111	15-25

% = percentage of 1981-2010 average *RP = Return period*

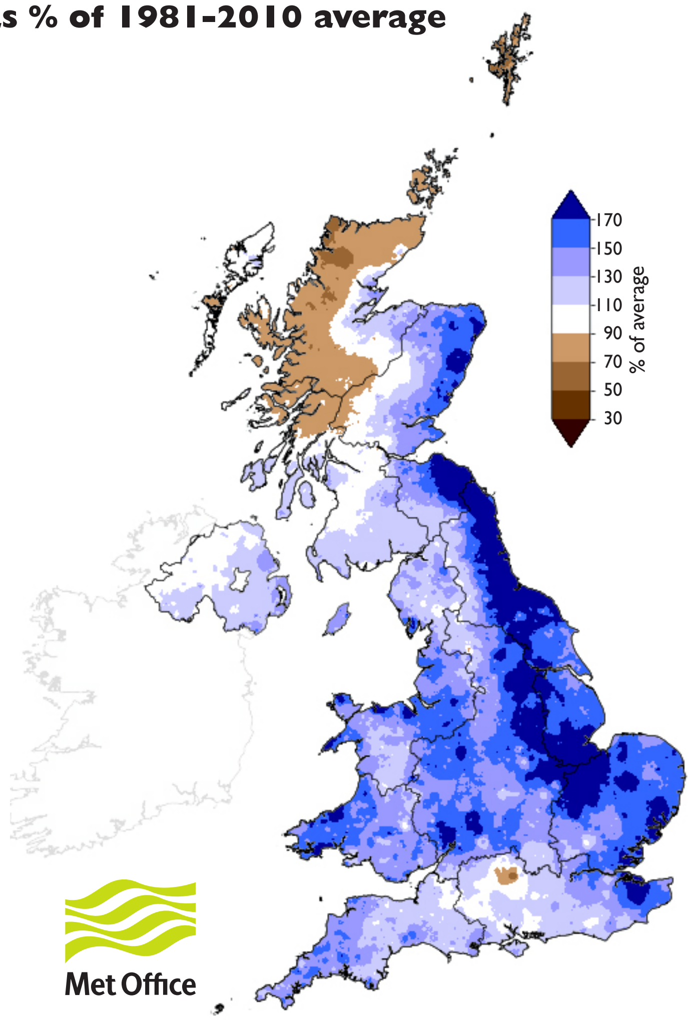
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic variability since 1910; 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 2018 are provisional.

Rainfall . . . Rainfall . . .

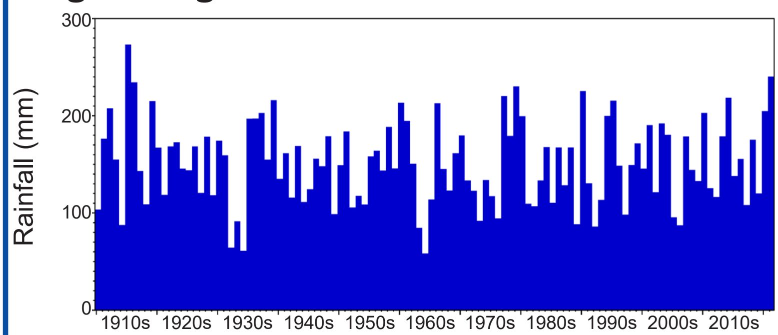
February 2021 rainfall as % of 1981-2010 average



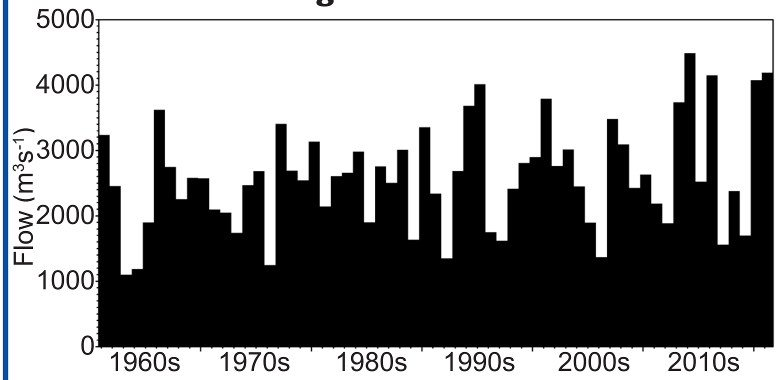
December 2020 - February 2021 rainfall as % of 1981-2010 average



December - February (winter) rainfall for Anglian region



December - February (winter) average outflows from England



Hydrological Outlook UK

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.

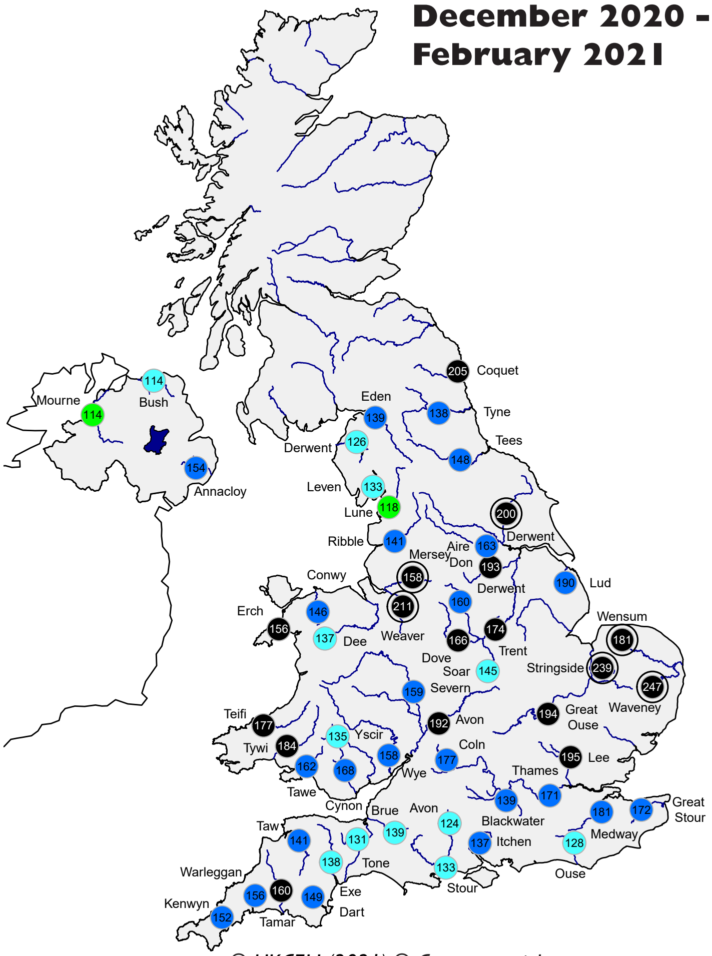
The complete version of the Hydrological Outlook UK can be found at: www.hydoutuk.net/latest-outlook/

Period: **from March 2021**
Issued: **09.03.2021**
using data to the end of February 2021

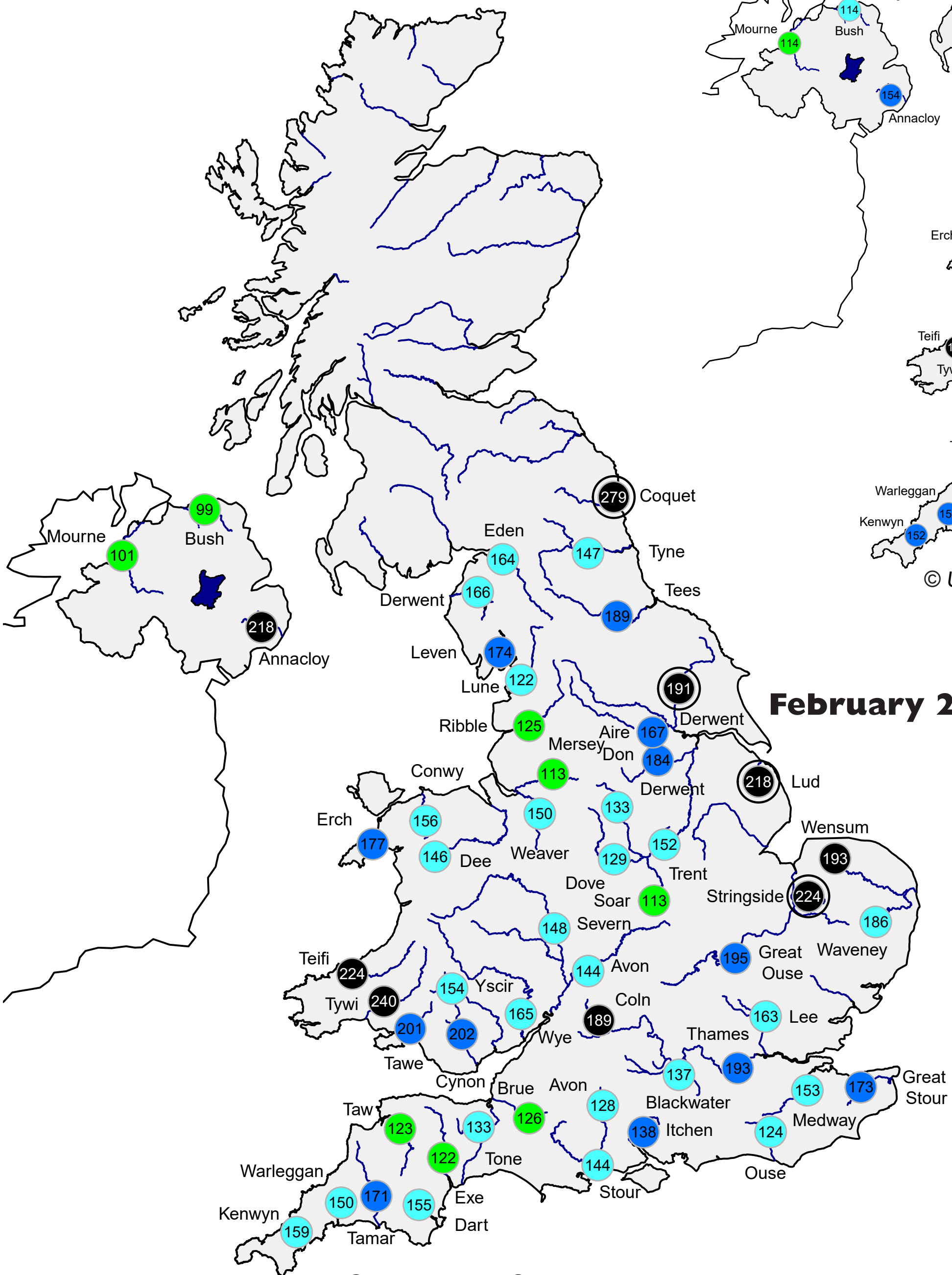
The outlook for March is for normal to above normal river flows in south-east England, with flows within the normal range the most likely scenario in northern and western areas. Groundwater levels in March are likely to be normal to exceptionally high across the UK. The three-month outlook is very similar to the one-month outlook for both river flows and groundwater levels.

River flow . . . River flow . . .

December 2020 - February 2021



February 2021



Key

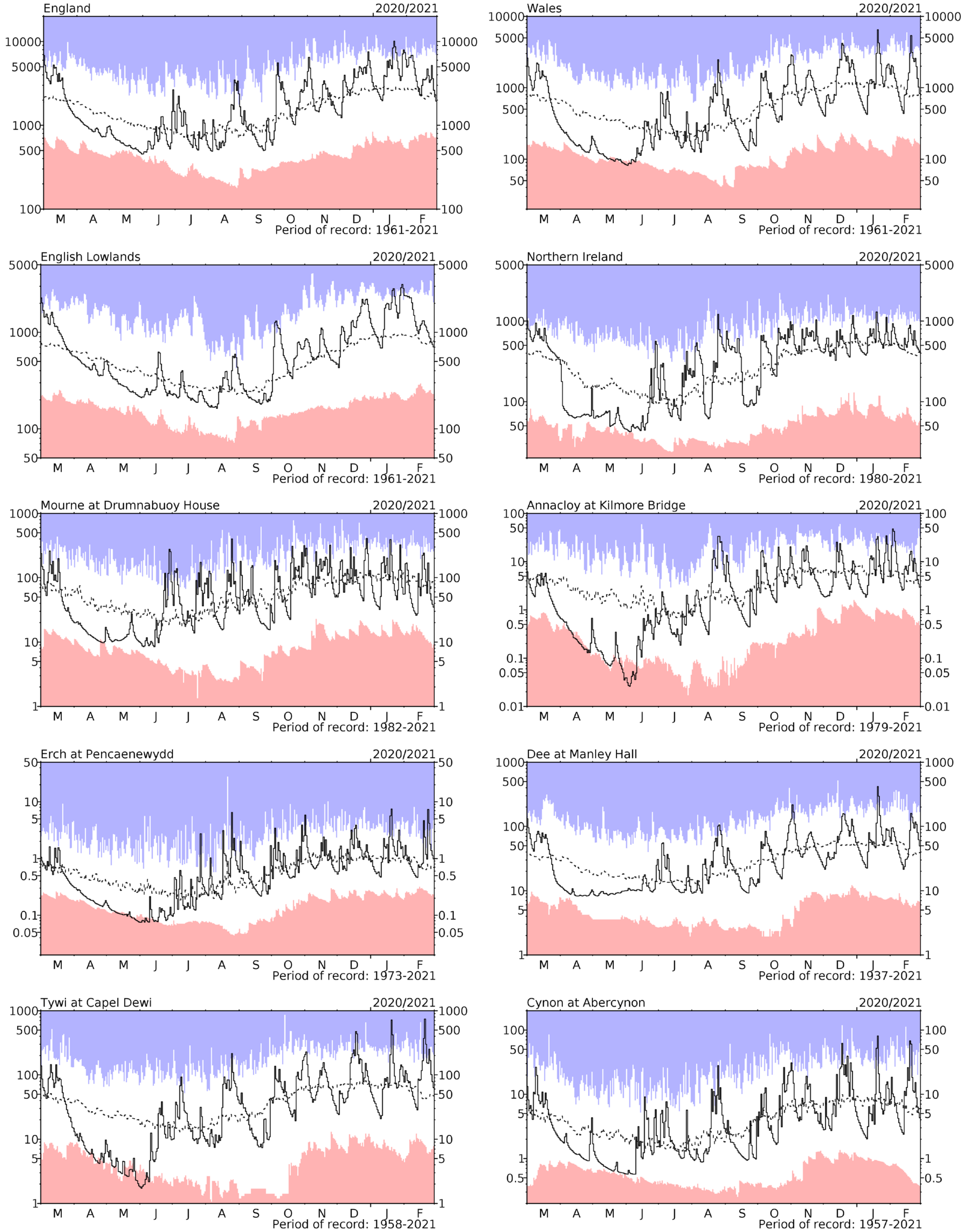
- 25 — % of long−term average (record high/low when circled)
- Exceptionally high flow
- Notably high flow
- Above normal
- Normal range
- Below normal
- Notably low flow
- Exceptionally low flow

*Based on ranking of the monthly 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. Note: the averaging period on which these percentages are based is 1981-2010. Percentages may be omitted where flows are under review.

Note: Due to unforeseen circumstances no data are available for Scotland.

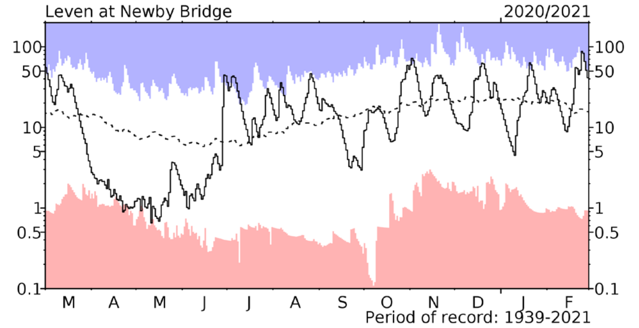


River flow hydrographs

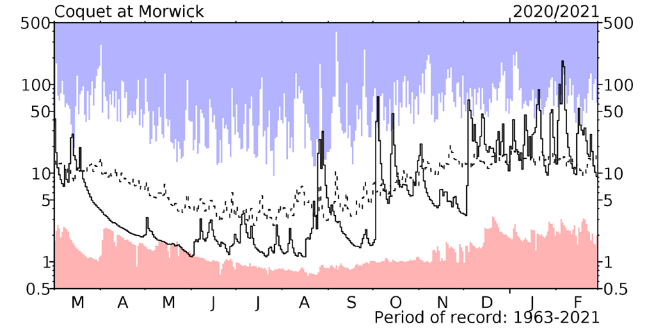
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to March 2020 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed line represents the period-of-record average daily flow.

River flow . . . River flow . . .

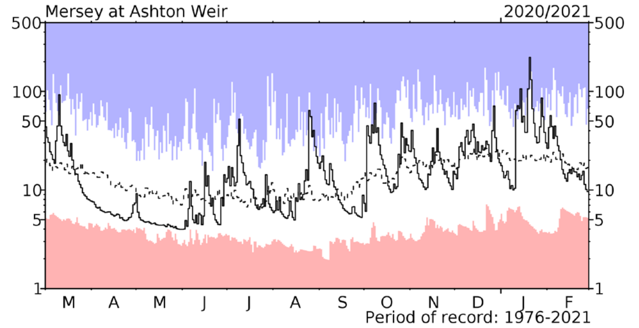
Leven at Newby Bridge



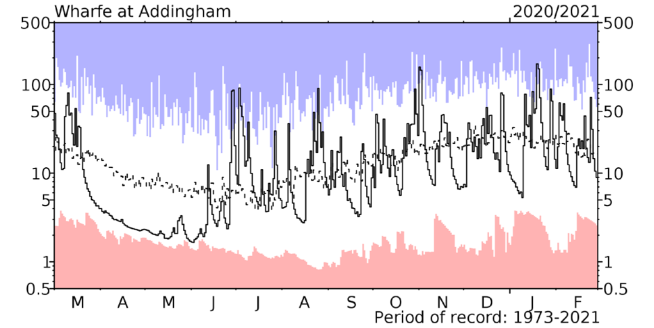
Coquet at Morwick



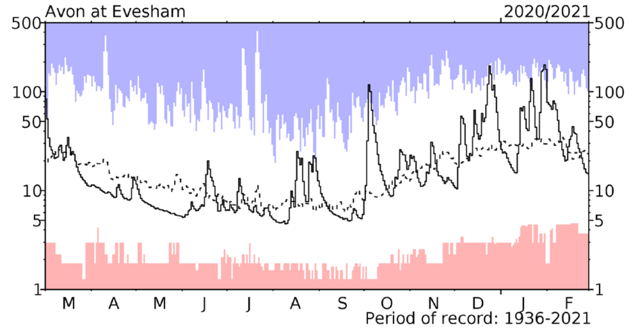
Mersey at Ashton Weir



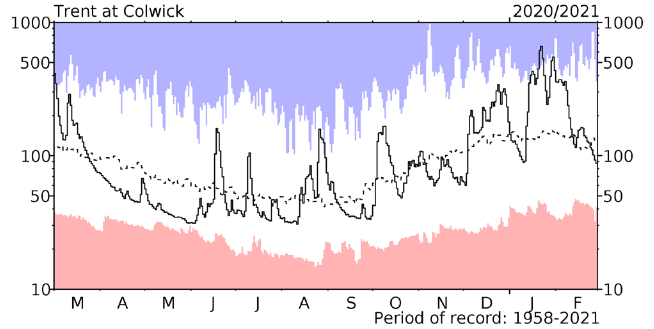
Wharfe at Addingham



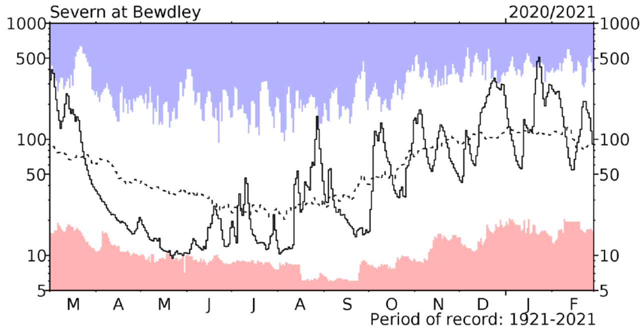
Avon at Evesham



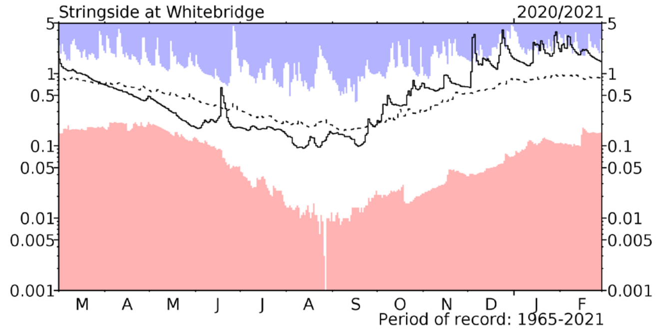
Trent at Colwick



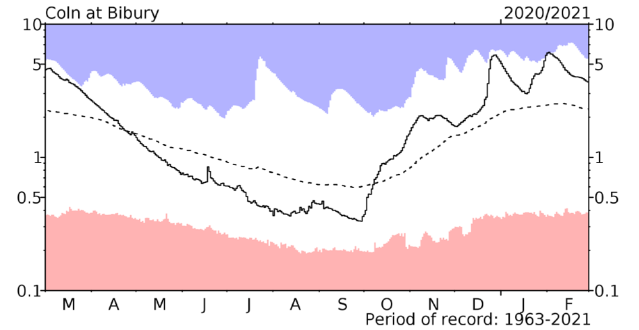
Severn at Bewdley



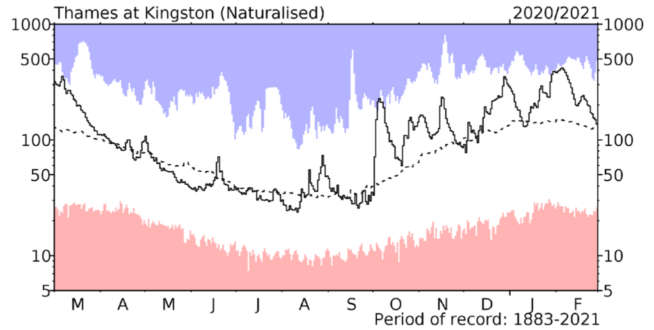
Stringside at Whitebridge



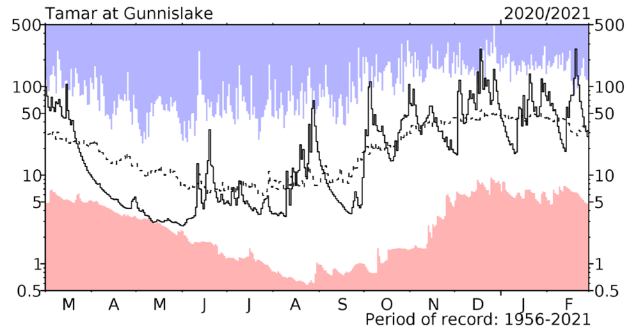
Coln at Bibury



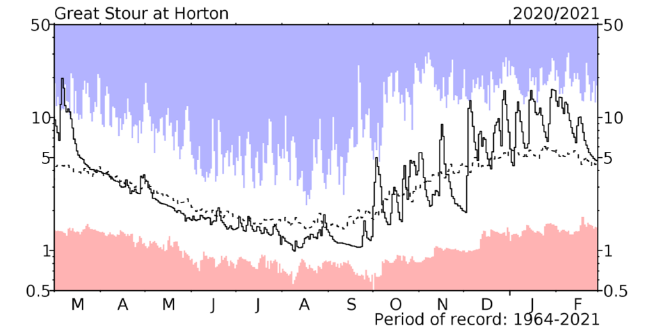
Thames at Kingston (Naturalised)



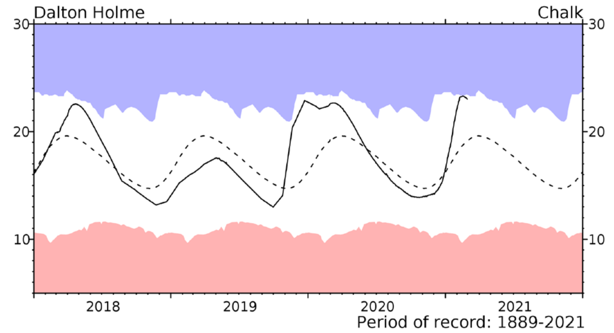
Tamar at Gunnislake

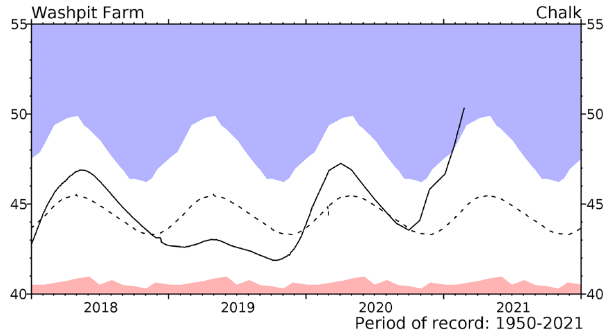


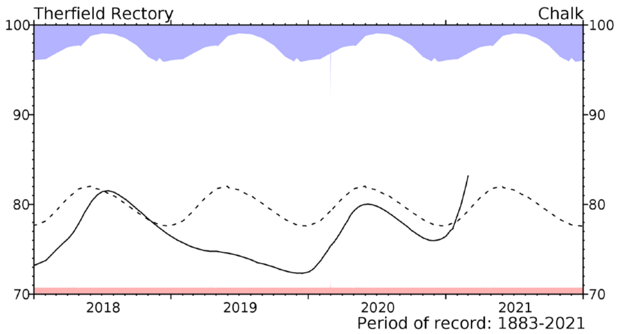
Great Stour at Horton

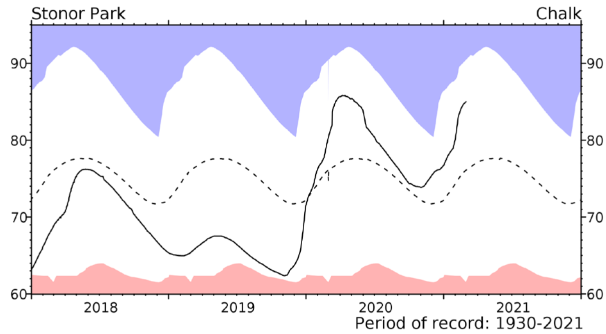


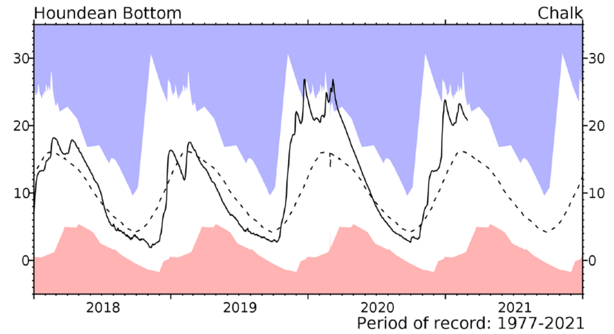
Groundwater . . . Groundwater

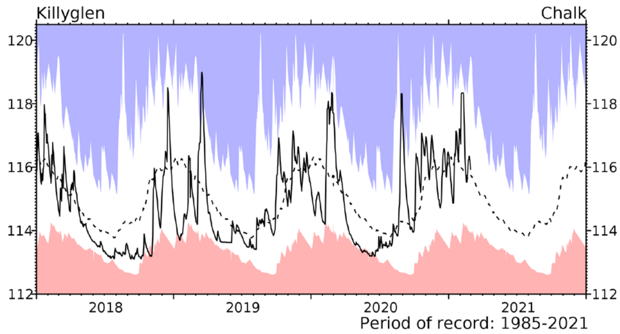


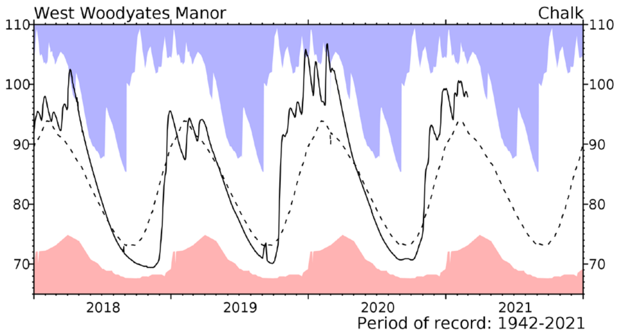


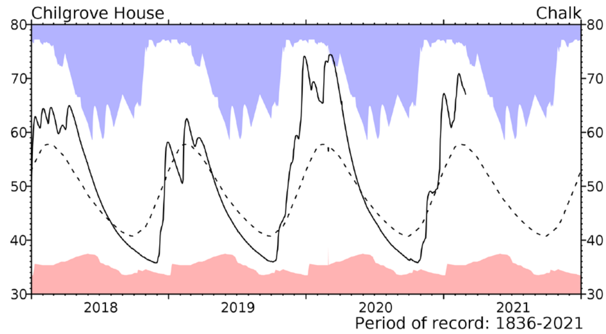


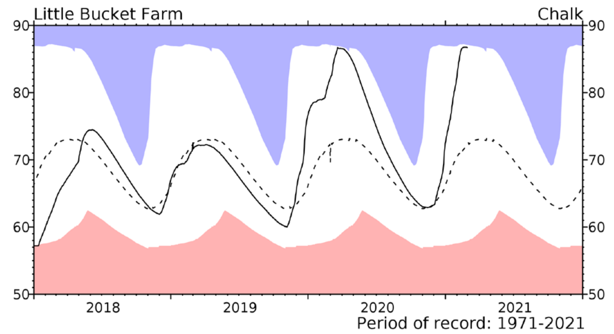


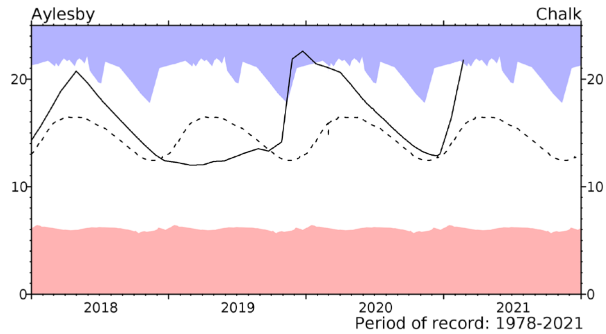




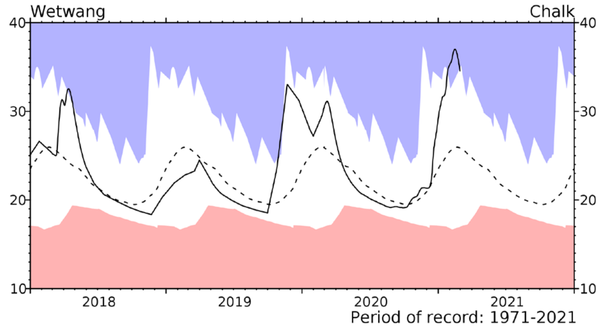


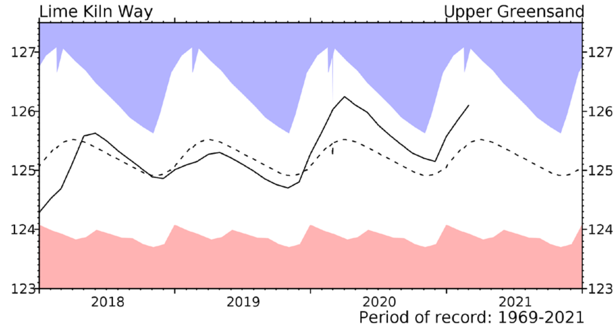


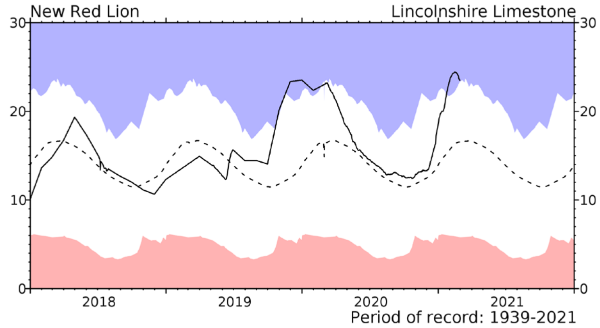


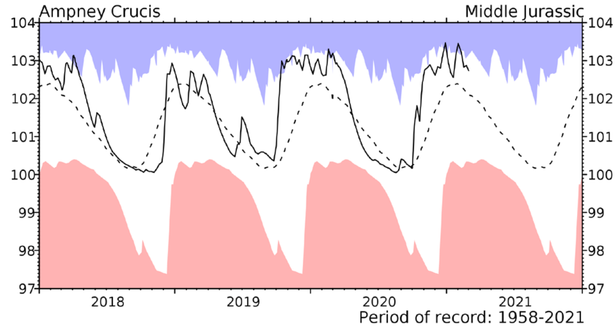


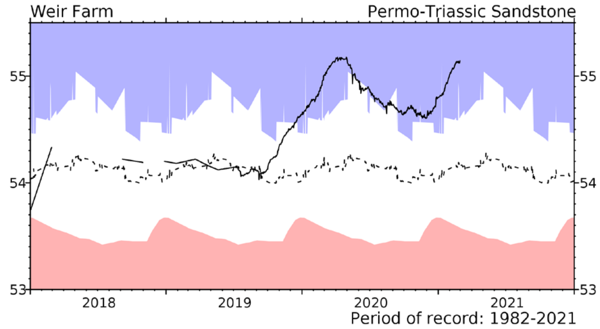
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is 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 displayed in a similar style to the river flow hydrographs. 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.

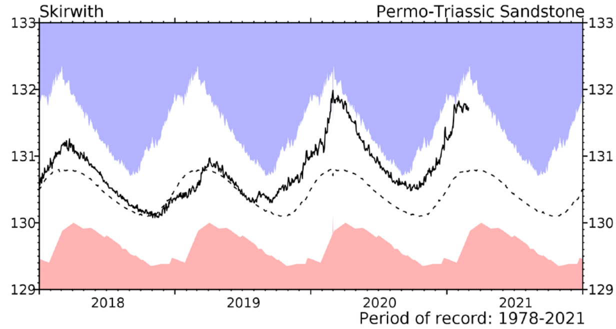

Wetwang
Chalk
Period of record: 1971-2021

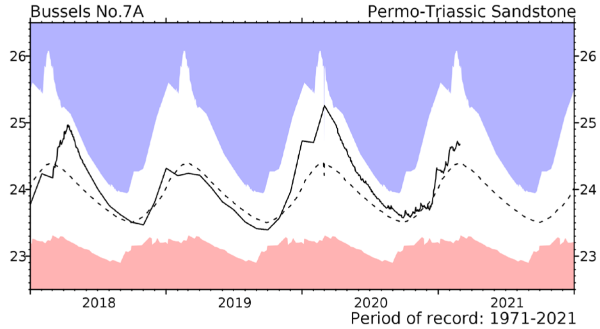

Lime Kiln Way
Upper Greensand
Period of record: 1969-2021

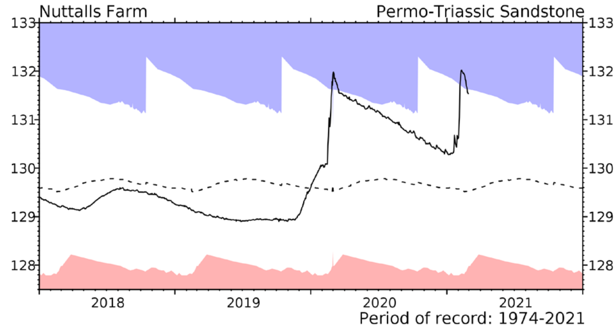

New Red Lion
Lincolnshire Limestone
Period of record: 1939-2021

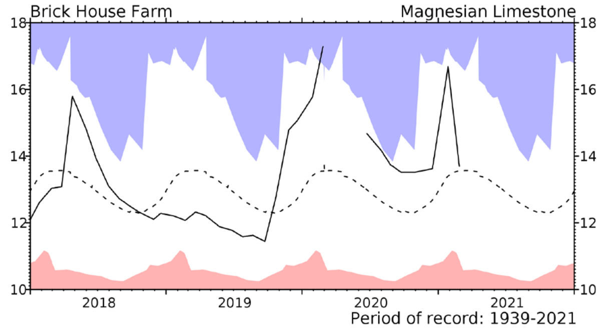

Ampney Crucis
Middle Jurassic
Period of record: 1958-2021

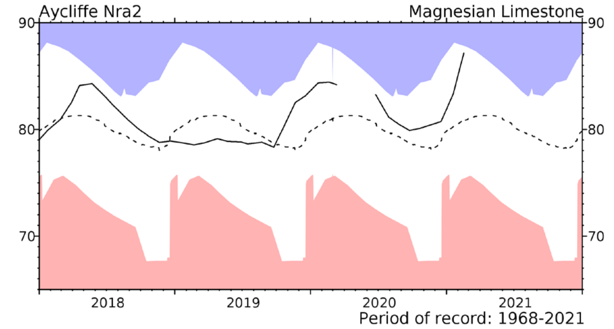

Weir Farm
Permo-Triassic Sandstone
Period of record: 1982-2021

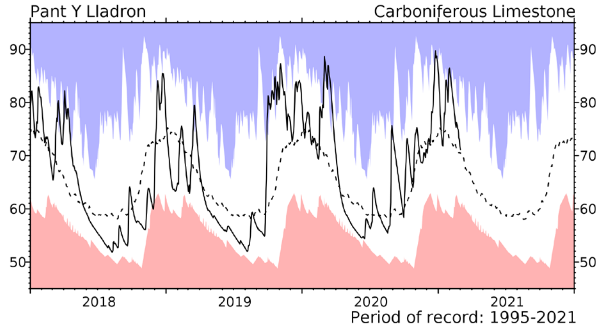

Skirwith
Permo-Triassic Sandstone
Period of record: 1978-2021

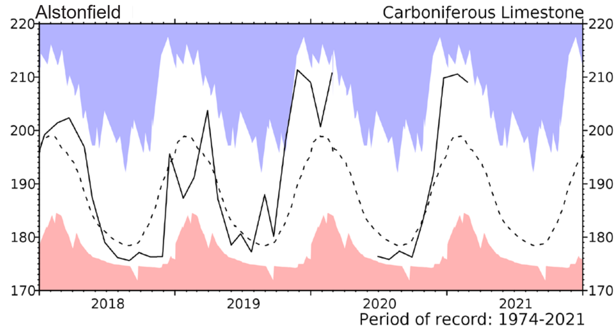

Bussels No.7A
Permo-Triassic Sandstone
Period of record: 1971-2021

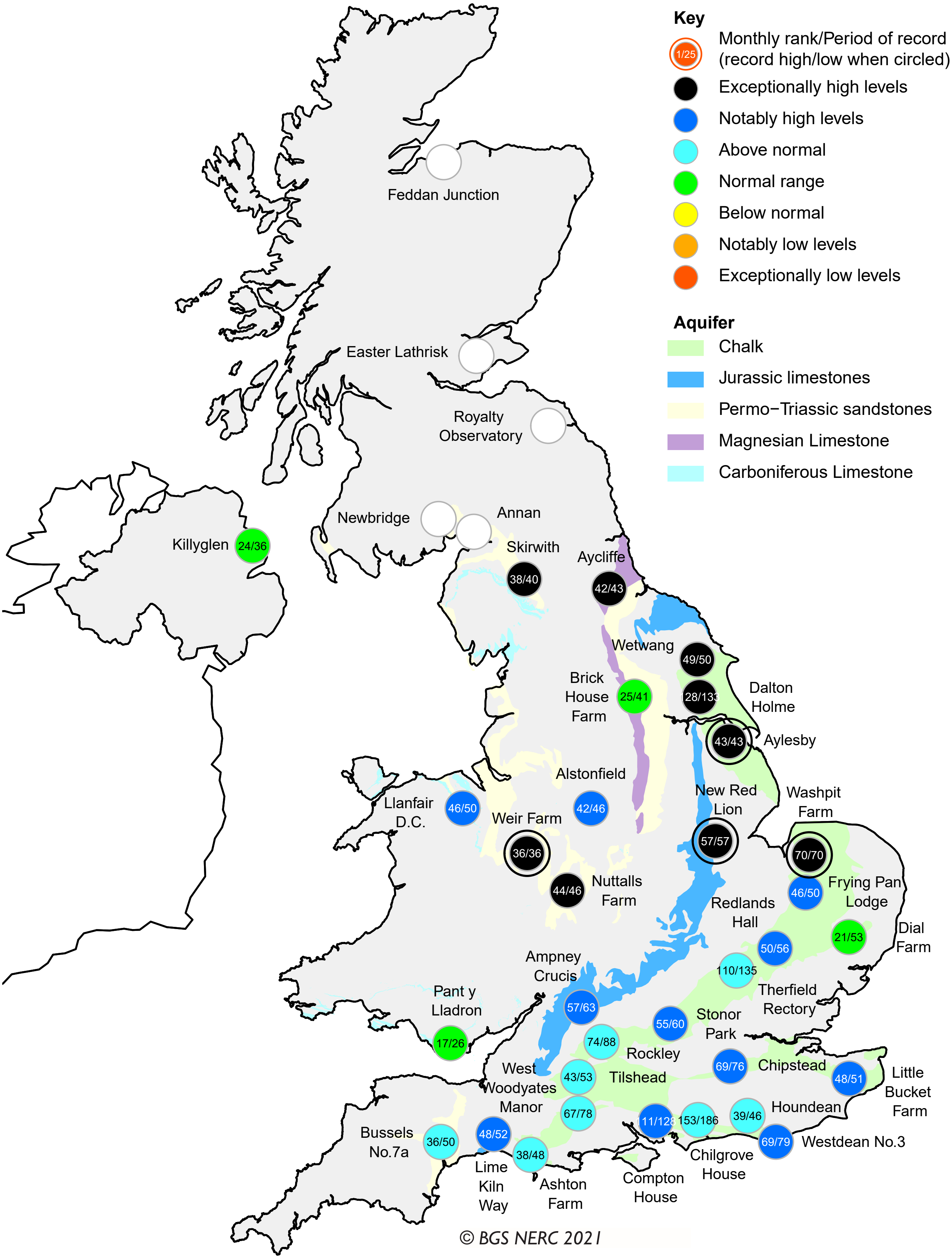

Nuttalls Farm
Permo-Triassic Sandstone
Period of record: 1974-2021


Brick House Farm
Magnesian Limestone
Period of record: 1939-2021


Aycliffe Nra2
Magnesian Limestone
Period of record: 1968-2021


Pant Y Lladron
Carboniferous Limestone
Period of record: 1995-2021


Alstonfield
Carboniferous Limestone
Period of record: 1974-2021



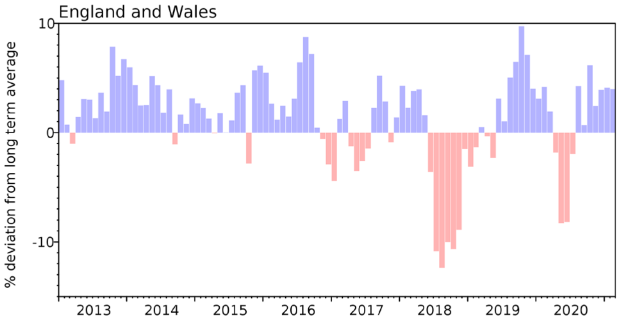
Groundwater levels - February 2021

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.

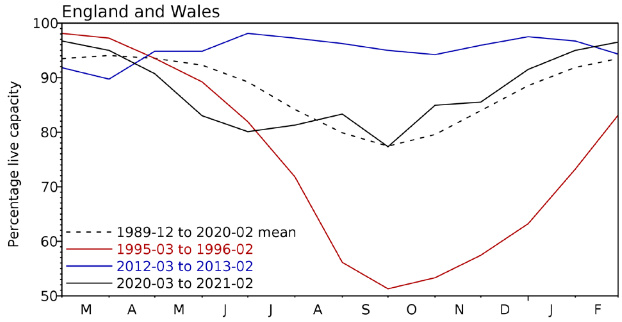
Note: Due to unforeseen circumstances no data are available for Scotland.

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

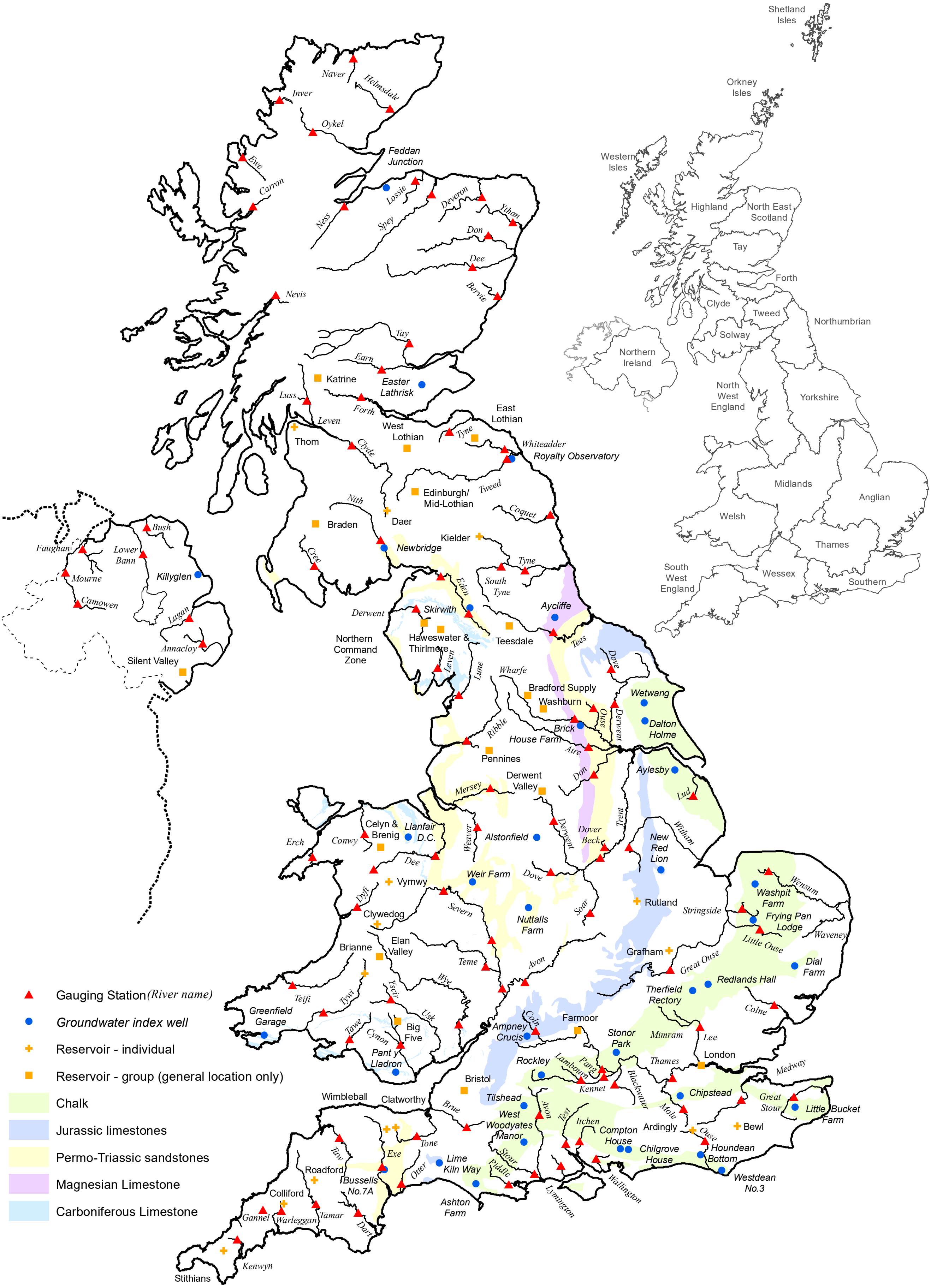
Area	Reservoir		Capacity (Ml)	2020 Dec	2021 Jan	2021 Feb	Feb Anom.	Min Feb	Year* of min	2020 Feb	Diff 21-20
North West	Haweswater & Thirlmere	•	111132	100	96	100	8	78	2017	100	0
	Pennines		126991	91	93	91	2	78	2017	95	-3
Northumbrian	Teesdale	•	87936	94	95	92	-1	72	1996	99	-7
	Kielder		(199175)	89	92	99	6	81	1993	96	3
Severn-Trent	Clywedog		49936	89	94	96	5	77	1996	100	-4
	Derwent Valley	•	46692	100	99	97	2	46	1996	100	-3
Yorkshire	Washburn	•	23373	98	96	82	-11	53	1996	97	-16
	Bradford Supply	•	40942	100	100	99	4	53	1996	100	-1
Anglian	Grafham		(55490)	87	83	82	-6	72	1997	82	0
	Rutland		(116580)	87	93	96	7	71	2012	97	-1
Thames	London	•	202828	86	94	96	3	83	1988	94	1
	Farmoor	•	13822	78	89	98	5	64	1991	97	2
Southern	Bewl		31000	74	88	90	4	40	2012	98	-8
	Ardingly		4685	87	100	100	4	46	2012	100	0
Wessex	Clatworthy		5662	100	100	100	2	82	1992	100	0
	Bristol	•	(38666)	100	99	99	7	65	1992	99	0
South West	Colliford		28540	80	87	93	7	57	1997	89	5
	Roadford		34500	90	99	100	16	35	1996	98	2
	Wimbleball		21320	100	100	100	5	72	1996	100	0
	Stithians		4967	100	100	100	6	45	1992	100	0
Welsh	Celyn & Brenig	•	131155	95	100	100	2	69	1996	97	3
	Brianne		62140	98	100	99	1	92	2004	100	-1
	Big Five	•	69762	94	99	98	2	85	1988	98	0
	Elan Valley	•	99106	100	96	100	2	88	1993	100	0
Scotland(E)	Edinburgh/Mid-Lothian	•	97223	98	99	99	3	73	1999	100	-1
	East Lothian	•	9317	100	100	100	1	91	1990	100	0
Scotland(W)	Loch Katrine	•	110326	100	99	100	5	76	2010	100	0
	Daer		22494	98	100	99	0	94	2004	100	-1
	Loch Thom		10721	92	93	100	1	90	2004	100	0
Northern Ireland	Total+	•	56800	100	100	99	8	81	2004	100	0
	Silent Valley	•	20634	99	100	99	11	57	2002	100	-1

( ) 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.

Location map…Location map



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. 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 5km 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 1910 and form the official source of UK areal rainfall statistics which have been adopted by the NHMP. The gridding technique used is described in Perry MC and Hollis DM (2005) available at https://doi.org/10.1002/joc.1161

Long-term averages are based on the period 1981-2010 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.

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

Tel: 0870 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