Hydrological Summary

for the United Kingdom

July 2020

General

July was mainly cool and cloudy, although changeable as ridges of high-pressure brought typical summer conditions at times. Most notably, a short exceptionally hot spell on the 31st led to the third highest UK temperature (for any month) of 37.8°C at Heathrow. July rainfall totals were above average for the UK, driven by wet weather in northern and western Britain whilst being below average across the south. This spatial distribution was also reflected in soil moisture deficits (SMDs) and river flows, with saturated soils and above average river flows in the north and west; whilst in the south and east, soils were drier than average and river flows normal to below normal. Groundwater levels fell and were generally in the normal range or below with the exception of central and northern England where they were mainly above normal to exceptionally high. Reservoir stocks for England & Wales returned to near-average, although impoundments in southern England and the south-west remained around 10% below average. With above-average rainfall in July and the likelihood of an enhanced north-west/south-east rainfall gradient in August, continued high temperatures and high water demand, the risk of localised water resources pressure and agricultural stress for the coming months, if somewhat lessened, does remain in the south and east.

Rainfall

Unsettled weather and frontal systems featured in between high-pressure and more typical summer weather throughout July. Low-pressure systems dominated the first ten days of the month, with showers and longer spells of rain across the UK. Frontal rainfall delivered some notable accumulations (102mm recorded at Aberllefenni, Gwynedd, on the 4th) and there were localised reports of flooding, fallen trees and travel disruption in Wales, northern England and Surrey. By the 11th, high pressure from the Azores had brought sunny and dry weather to southern areas, which, by the 18th, extended northwards. There was a return to unsettled conditions from the 23rd (40mm recorded at Dundrennan, Dumfries and Galloway), and a tornado was observed in Northampton on the 25th causing damage to some properties. Rainfall was above average at the national scale (126% of the July average for the UK). Considerably above average monthly rainfall was recorded in north-west England, north Wales, Northern Ireland and much of Scotland, with more than 170% in places; it was the fourth wettest July for Solway in a series from 1910. Conversely, rainfall was generally below average in the far north of Scotland, the Midlands, north-east and southern England, with parts of the south coast registering less than half the average. For the summer so far (June-July), a similar spatial pattern of rainfall has been evident, although above-average rainfall extends further south into the Midlands and south-west England. The Clyde region recorded its second wettest June-July in records since 1910, whilst over the five-month period (March-July) drier conditions prevailed across the UK due to the exceptionally dry spring.

River flows

Wet weather at the start of July led to some exceptional flow responses across the country, with new daily maxima recorded on the first ten days of the month on the Cumbrian Derwent and new peak flow maxima for July registered on the Lune and Cumbrian Derwent (both in records since 1968). As settled weather became established mid-month, recessions were triggered and flows at most sites across the country returned to average, although there were some isolated exceptions of below-average and above-average flows in the south-east and north-west, respectively (e.g. Little Ouse, Mersey). As low-pressure systems took hold once more towards month-end, exceptional flow responses were again apparent, particularly in northern and western Britain and many sites recorded new daily maxima (e.g. on the Clyde, Erch, and Mourne). June monthly mean flows showed a mixed picture. In the north and west, flows were generally above normal, exceptionally so in north Wales, north-west England, southern Scotland and Northern Ireland. Flows on the Lune and Conwy were over three times their respective averages, and many rivers in the north-west registered their highest mean July flows on record (e.g. the Cree, Nith, Cumbrian Leven, Cumbrian Derwent and Lune, all in records exceeding 50 years). In the south and east, flows were generally in the normal range, with some notably low flows (e.g. Yorkshire Derwent, Coln). For June-July, flows followed a similar pattern to that of July alone, although flows in the normal range were more widespread in England and Wales. Flows in the north-west were exceptionally high and on the Cree, a new maximum for this period was established (in a series from 1963).

Groundwater

SMDs reflected the rainfall distribution in July, with wetter soils in the north and west, and drier than average soils in the south and east – soils in Southern region were the joint-driest for July with the notable drought years of 1976, 1990 and 1995. Groundwater levels continued to fall in the Chalk and were normal to below normal, apart from at Little Bucket Farm where levels remained above normal. Several sites in the Wessex and South Downs Chalk fell from normal to below normal. Levels also receded in the Magnesian Limestone – at Aycliffe levels fell from exceptionally high to the normal range. In the Jurassic limestones levels fell, but remained in the normal range. In the Carboniferous Limestone the levels rose in South Wales at the start of the month, but have since receded, with an overall rise at Pant y Lladron and a fall at Greenfield Garage; both sites remained in the normal range. Levels at Alstonfield fell and remained below normal. The Upper Greensand at Lime Kiln Way recorded a slight fall in level but remained above normal. Levels generally fell in the Permo-Triassic Sandstones, although remained above normal to exceptionally high. At Annan, levels rose into the normal range in response to rainfall. In the Fell Sandstone and Devonian sandstones, levels fell slightly but remained above normal and normal, respectively.

UK Centre for Ecology & Hydrology

BGS British Geological Survey

Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

Percentages are from the 1981-2010 average.

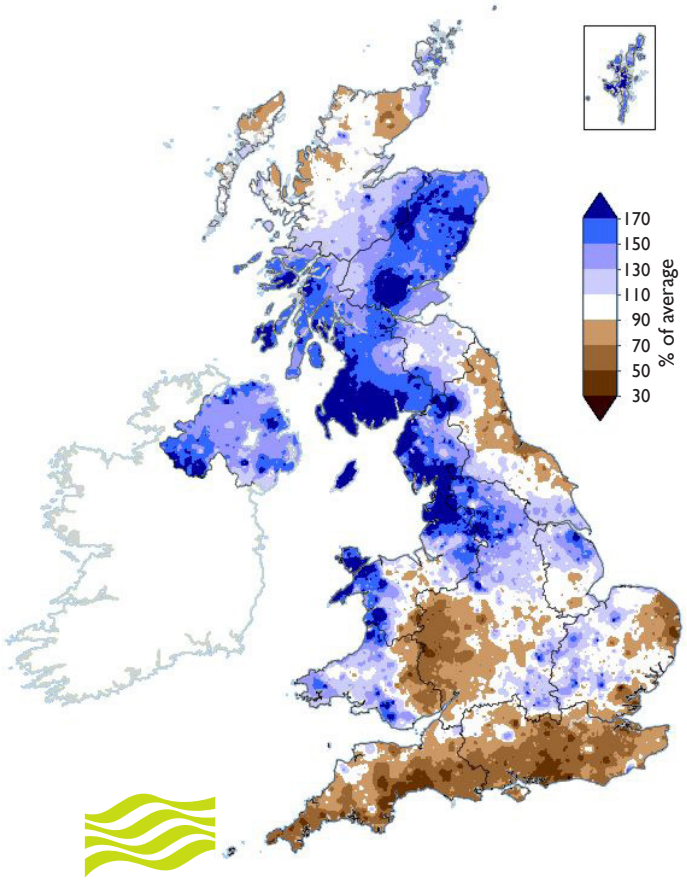
Region	Rainfall	Jul 2020	Jun20 – Jul20	RP	May20 – Jul20	RP	Feb20 – Jul20	RP	Aug19 – Jul20	RP
United Kingdom	mm	**95**	201		234		550		1326	
	%	**126**	137	8-12	109	2-5	118	15-25	118	60-90
England	mm	**65**	154		163		395		1000	
	%	**106**	125	2-5	91	2-5	110	2-5	119	10-20
Scotland	mm	**135**	258		334		761		1774	
	%	**144**	146	20-30	130	10-15	125	40-60	117	50-80
Wales	mm	**115**	252		266		690		1708	
	%	**127**	146	5-10	104	2-5	122	10-15	120	20-30
Northern Ireland	mm	**119**	243		274		591		1267	
	%	**145**	154	15-25	119	2-5	122	15-25	111	10-20
England & Wales	mm	**72**	167		177		435		1097	
	%	**110**	129	5-10	93	2-5	112	2-5	119	10-20
North West	mm	**145**	288		308		701		1557	
	%	**167**	173	30-50	130	5-10	141	>100	127	80-120
Northumbria	mm	**67**	162		185		397		985	
	%	**99**	122	2-5	98	2-5	104	2-5	113	5-10
Severn-Trent	mm	**58**	145		152		375		952	
	%	**96**	118	2-5	84	2-5	108	2-5	122	10-20
Yorkshire	mm	**80**	189		203		446		1050	
	%	**132**	147	8-12	111	2-5	121	5-10	125	15-25
Anglian	mm	**55**	113		118		246		665	
	%	**105**	106	2-5	76	2-5	86	2-5	107	2-5
Thames	mm	**48**	112		116		310		806	
	%	**93**	110	2-5	74	5-10	100	2-5	113	2-5
Southern	mm	**33**	75		81		313		884	
	%	**67**	76	2-5	53	15-25	98	2-5	111	2-5
Wessex	mm	**45**	131		136		390		1052	
	%	**77**	115	2-5	78	2-5	107	2-5	119	8-12
South West	mm	**56**	200		213		571		1531	
	%	**71**	134	5-10	95	2-5	115	5-10	125	25-40
Welsh	mm	**110**	245		259		661		1647	
	%	**126**	146	5-10	104	2-5	121	8-12	120	20-30
Highland	mm	**116**	257		372		891		2057	
	%	**115**	134	5-10	133	10-15	124	15-25	113	15-25
North East	mm	**123**	211		264		461		1106	
	%	**169**	147	5-10	126	2-5	107	2-5	109	5-10
Tay	mm	**133**	236		296		680		1577	
	%	**161**	148	10-15	124	2-5	125	15-25	118	15-25
Forth	mm	**120**	218		261		622		1458	
	%	**148**	137	8-12	114	2-5	125	25-40	121	50-80
Tweed	mm	**96**	205		239		542		1261	
	%	**124**	139	5-10	112	2-5	125	15-25	123	40-60
Solway	mm	**185**	337		383		797		1867	
	%	**189**	184	>100	144	20-30	134	>100	125	>100
Clyde	mm	**186**	335		410		962		2221	
	%	**162**	159	70-100	137	20-30	135	>100	122	>100

% = 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 2019 are provisional.

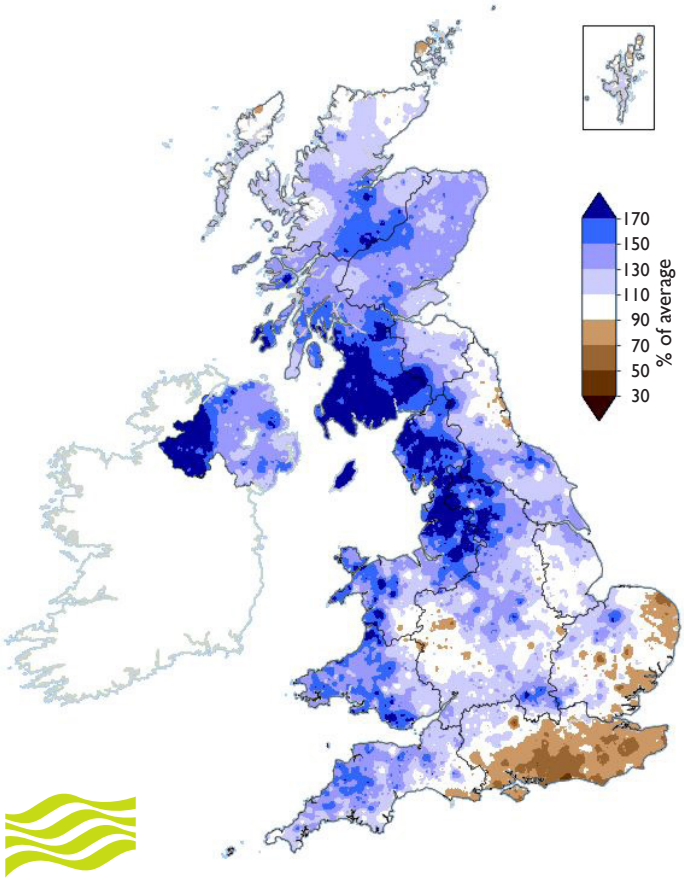
Rainfall . . . Rainfall . . .

July 2020 rainfall
as % of 1981-2010 average



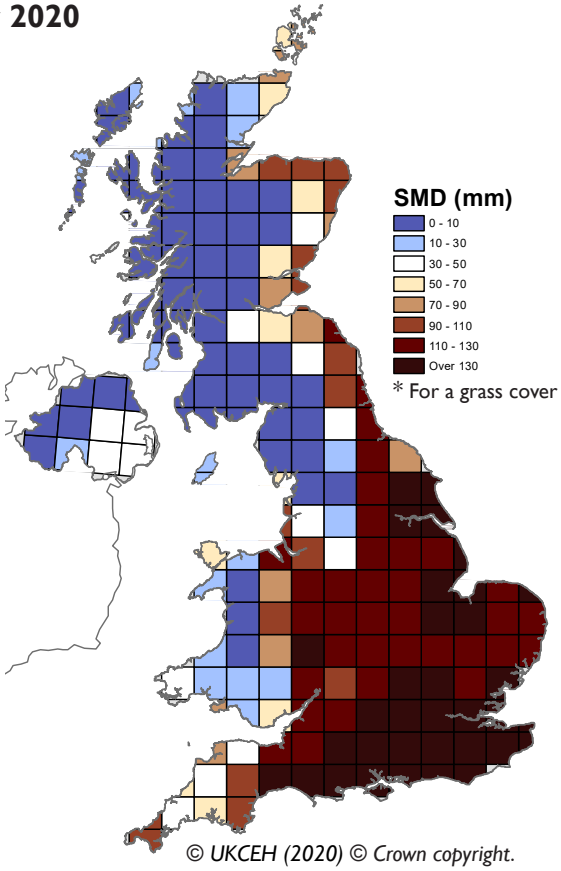
Met Office

June 2020 - July 2020 rainfall
as % of 1981-2010 average



Met Office

MORECS Soil Moisture Deficits*
July 2020



Hydrological Outlook UK

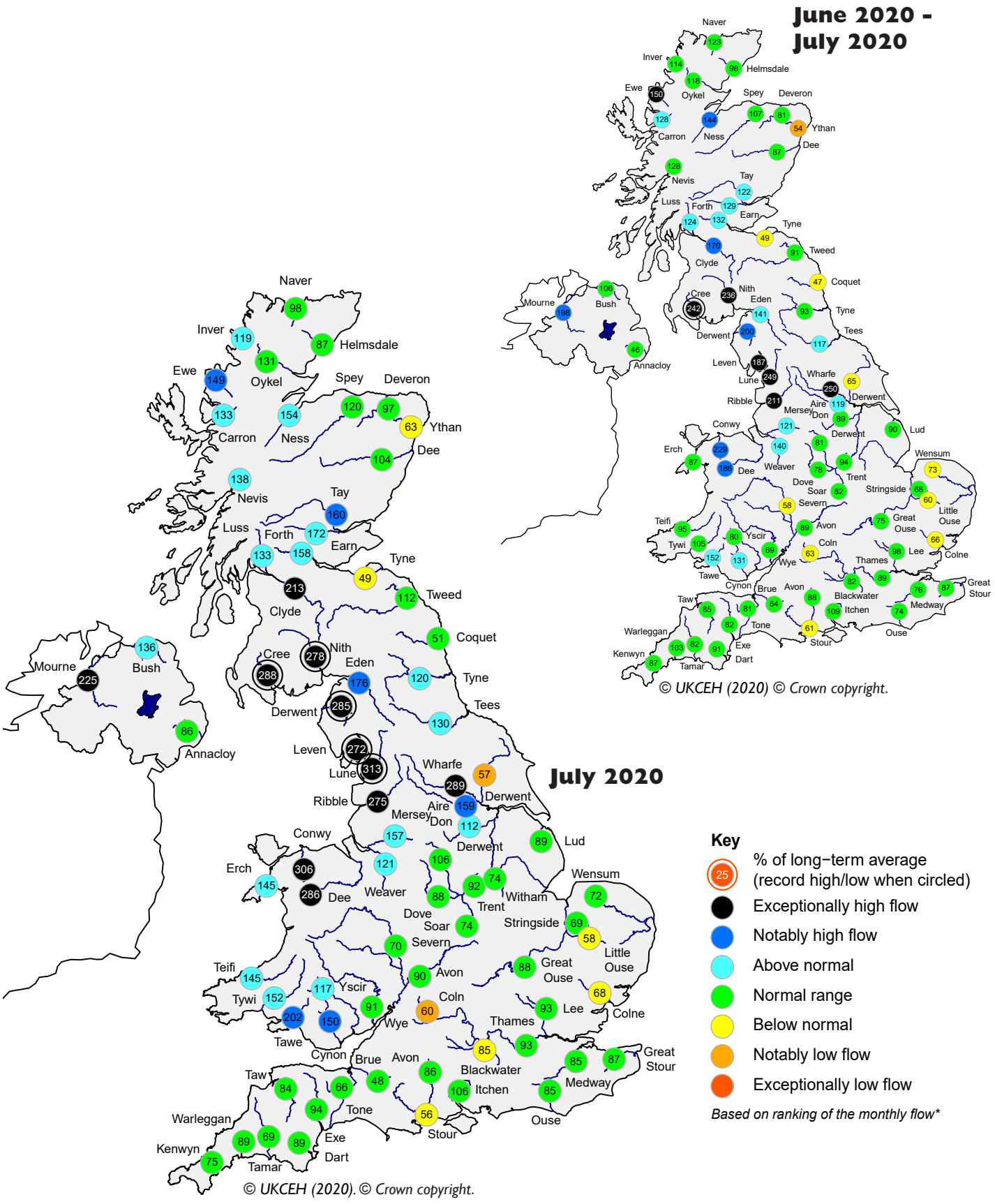
The Hydrological Outlook provides an insight into future hydrological conditions across the UK. Specifically it describes likely trajectories for river flows and groundwater levels on a monthly basis, with particular focus on the next three months.

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

Period: **from August 2020**
Issued: **11.08.2020**
using data to the end of July 2020

The outlook for August is for a continuation of the north-west to south-east UK contrast that has been seen both in rainfall and river flows in July. River flows in the north and west are likely to be normal to above normal this month, whilst groundwater levels in this region are expected to vary significantly. Both river flows and groundwater levels in the south and east are likely to be normal to below normal for the next one to three months.

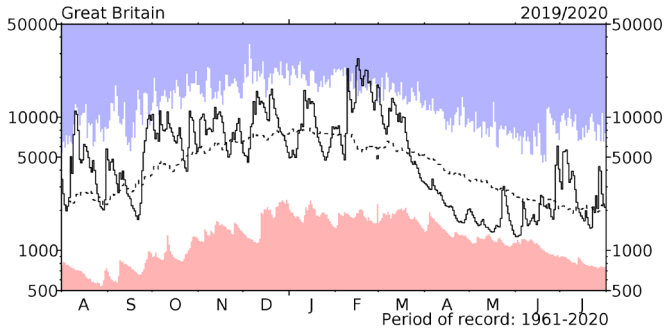
River flow . . . River flow . . .

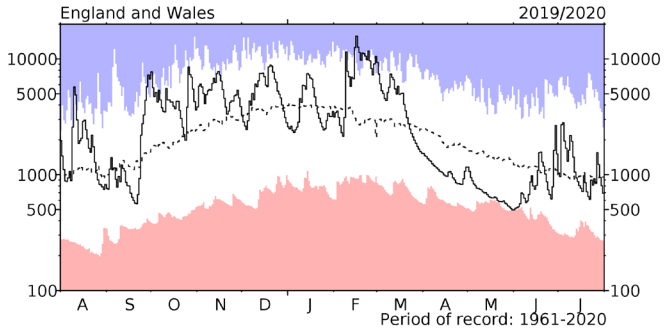


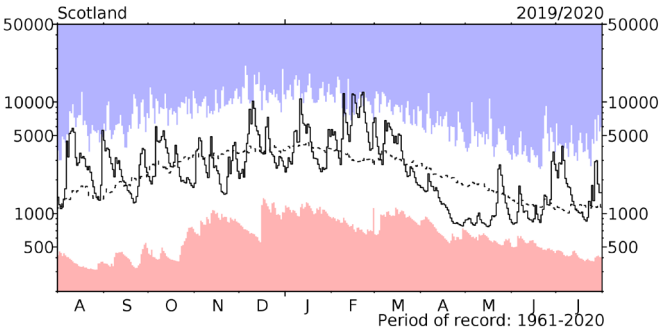
River flows

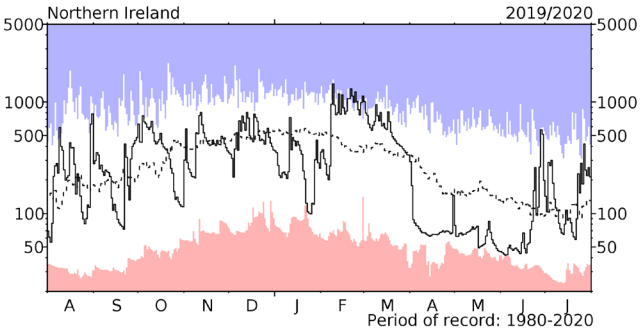
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much greater. Note: the averaging period on which these percentages are based is 1981-2010. Percentages may be omitted where flows are under review.

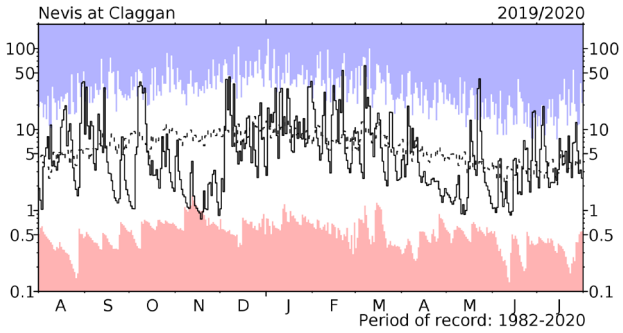
River flow . . . River flow . . .

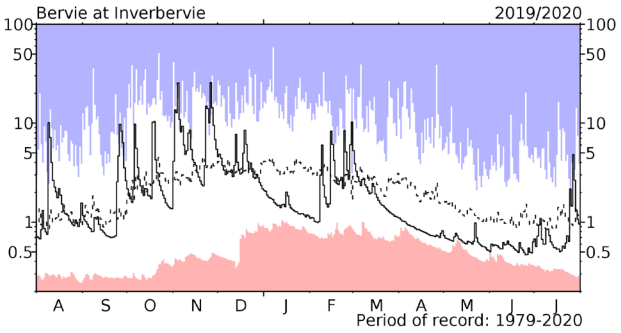


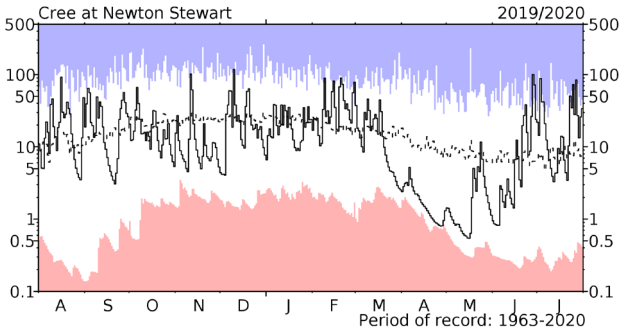


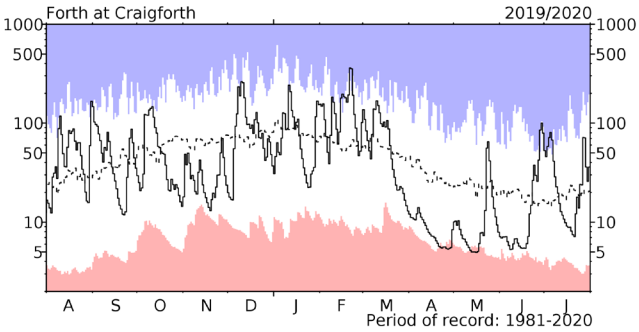


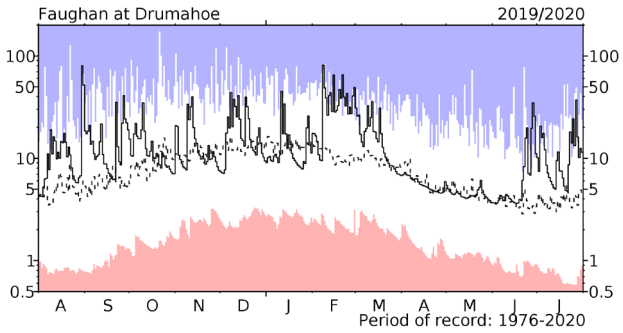


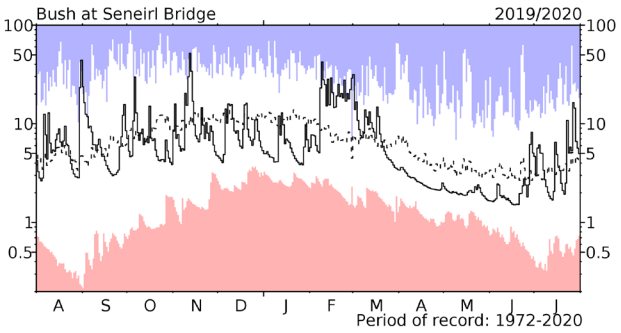








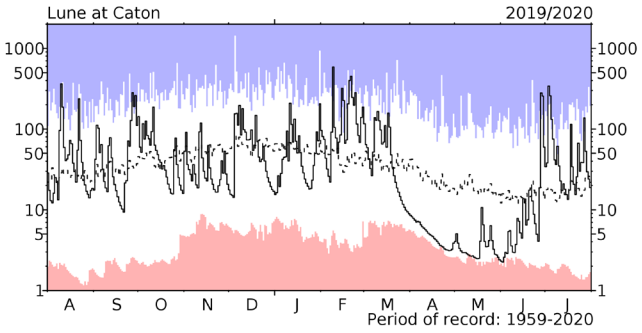


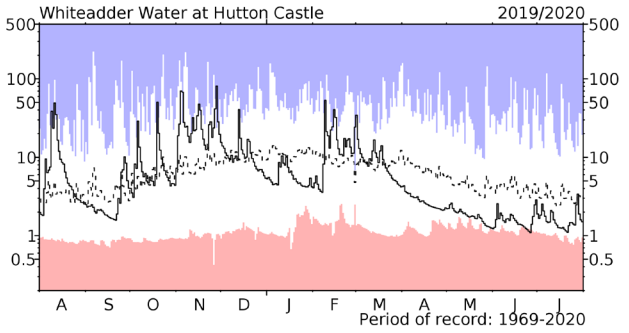


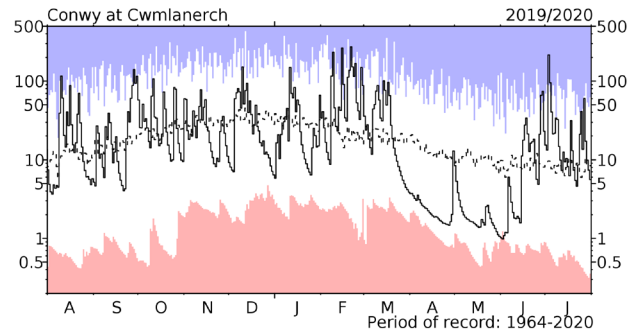
River flow hydrographs

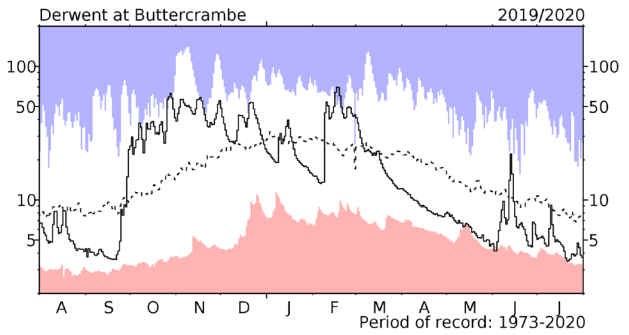
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to July 2019 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed line represents the period-of-record average daily flow.

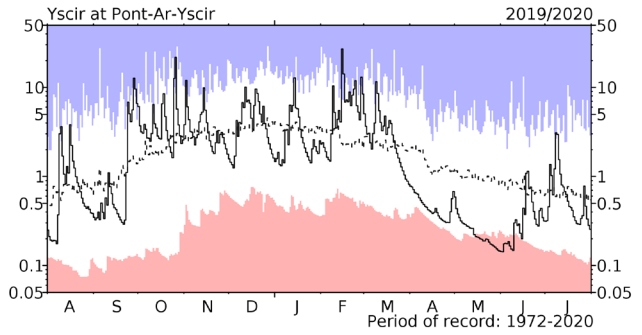
River flow . . . River flow . . .

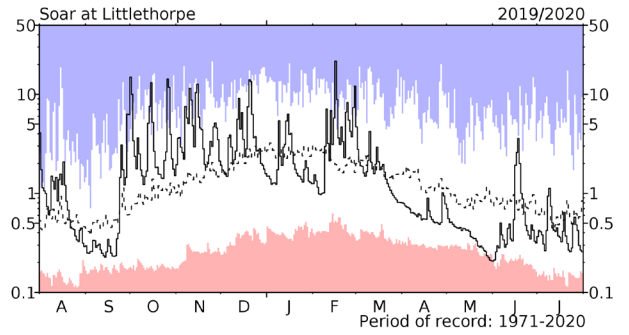


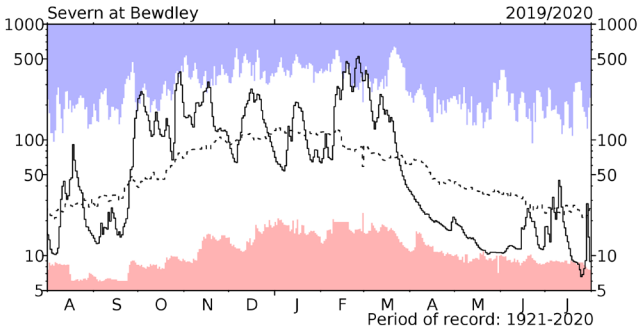


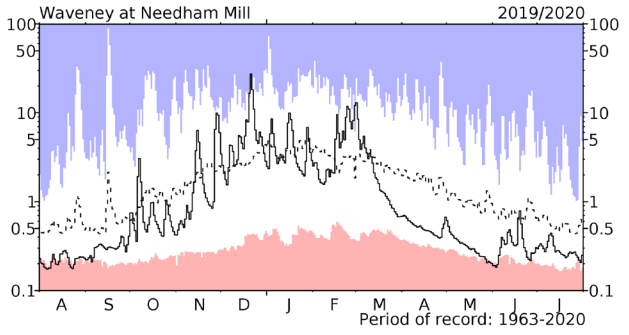


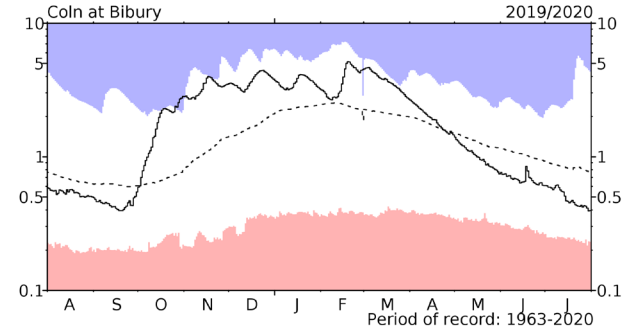


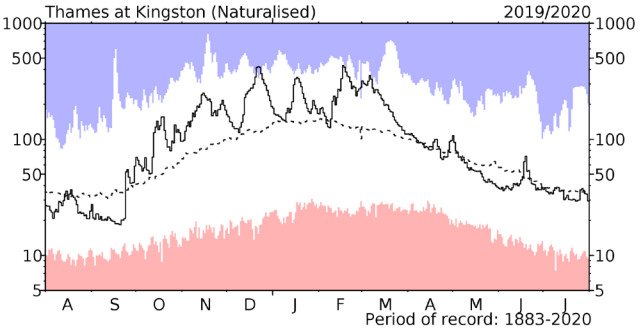


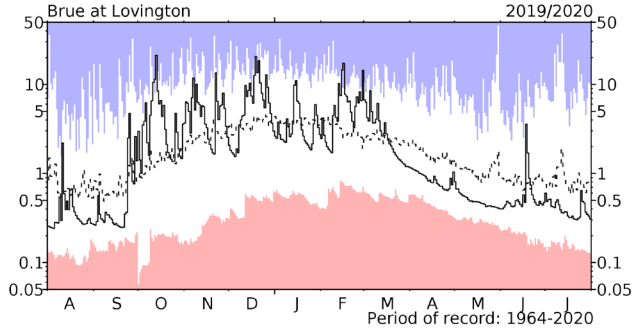


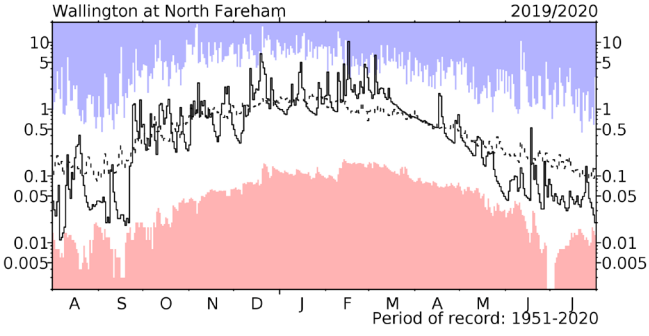




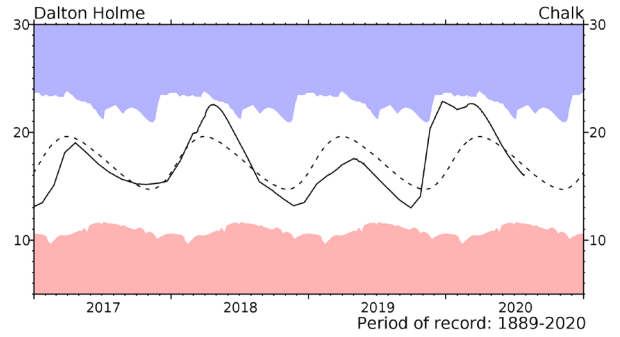


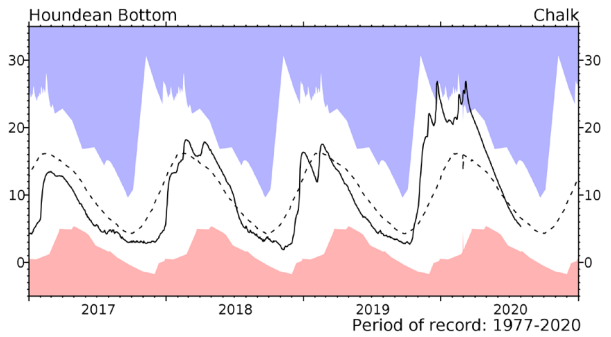


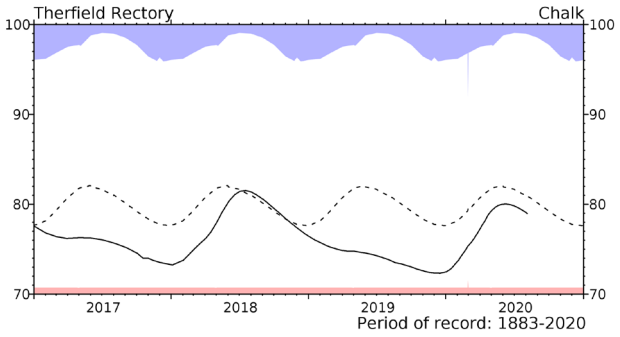


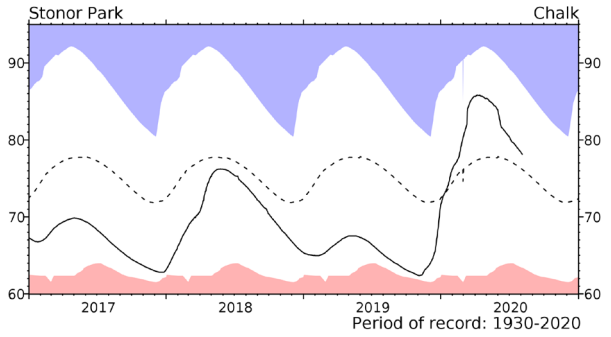


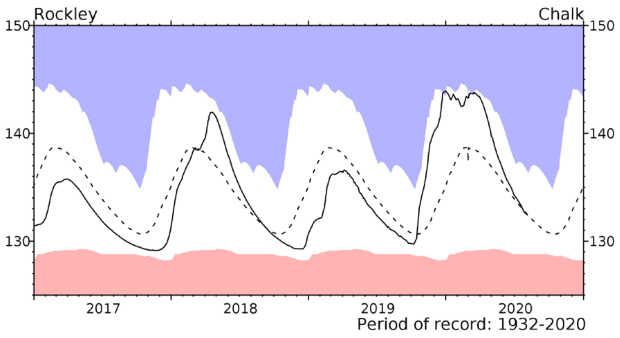
Groundwater…Groundwater

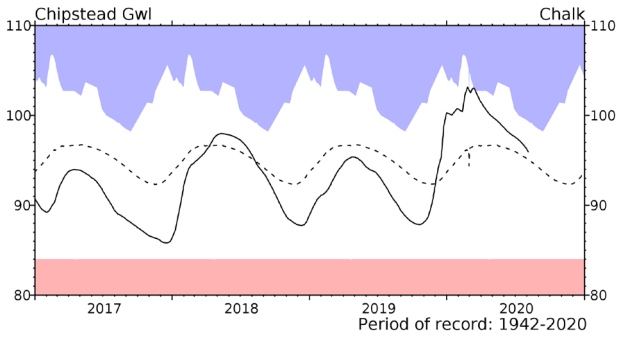


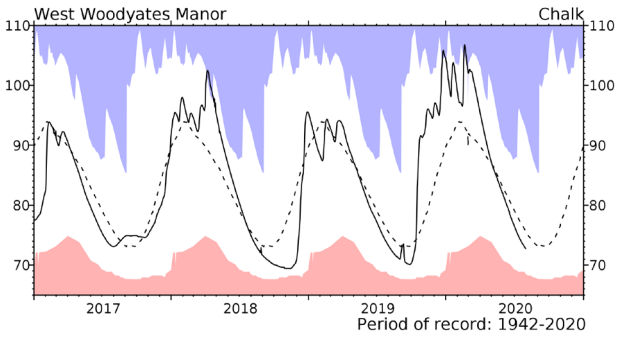


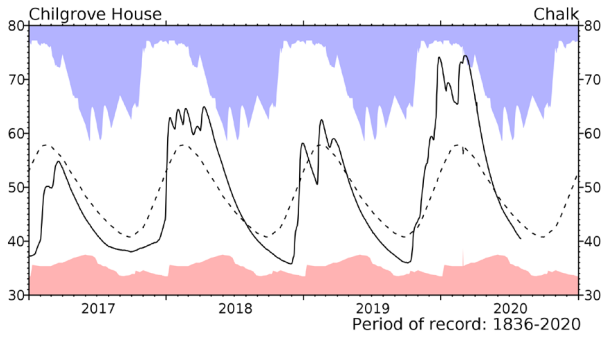


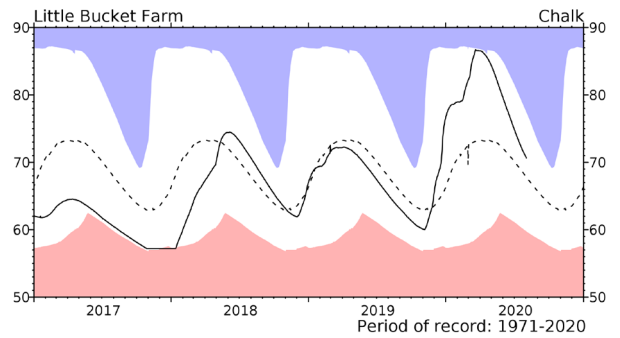


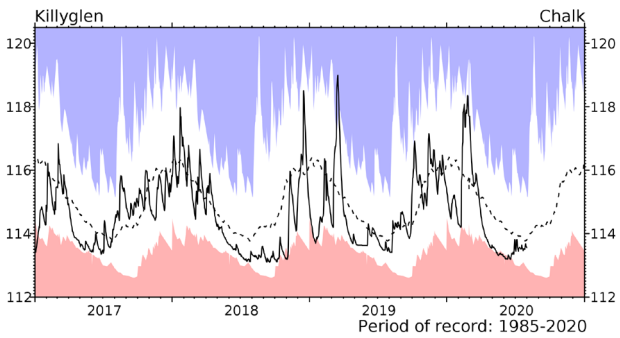






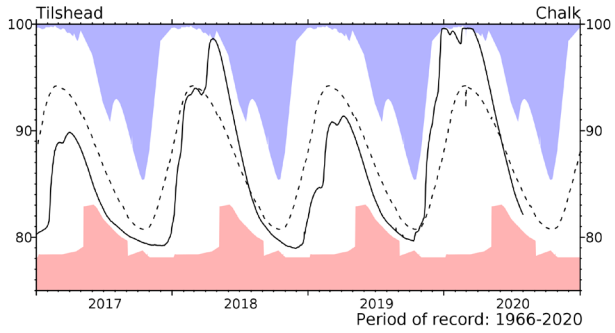


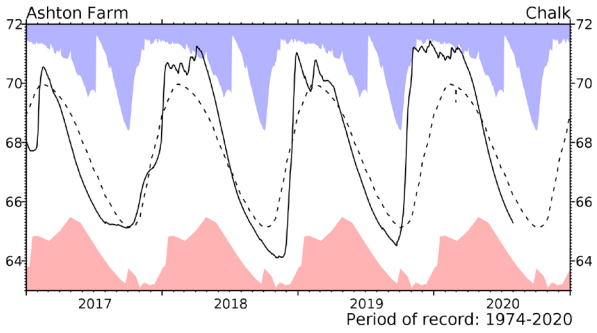


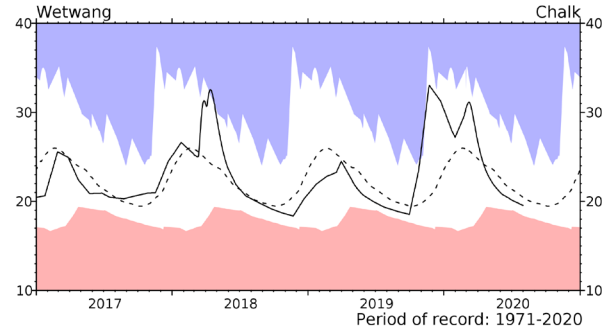


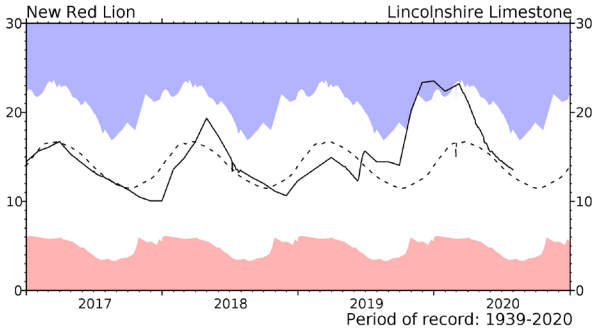
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is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

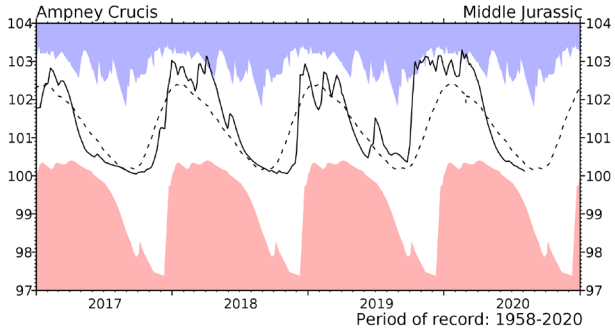
Groundwater… Groundwater

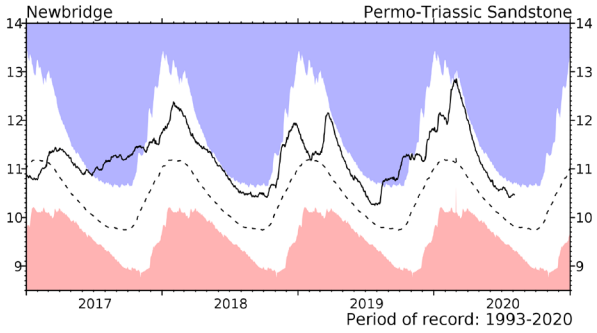


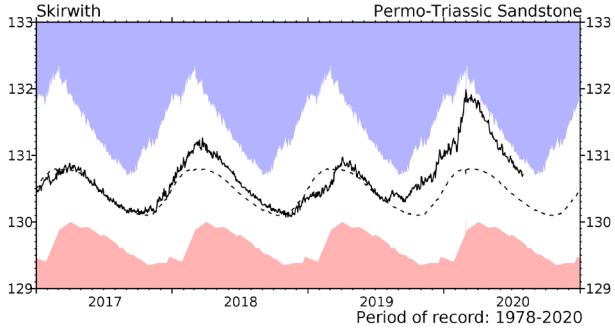


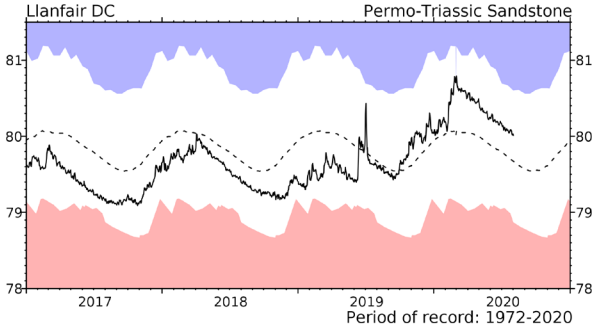


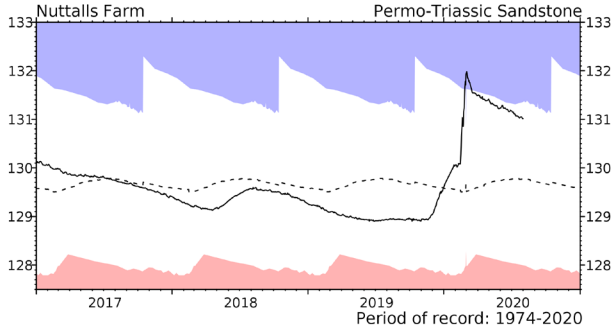


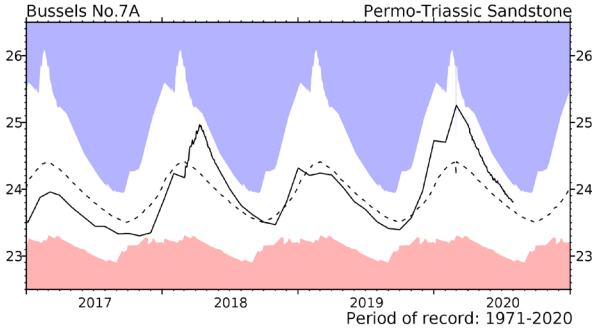


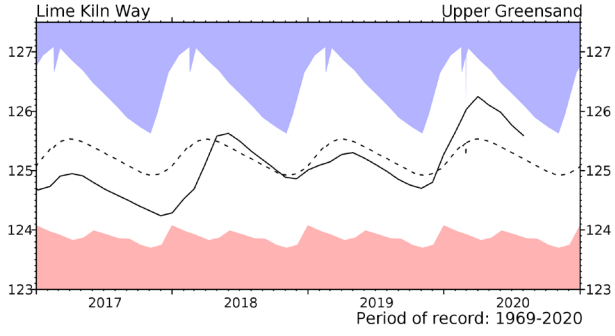


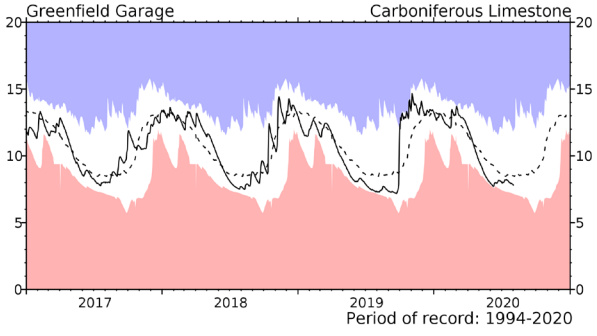


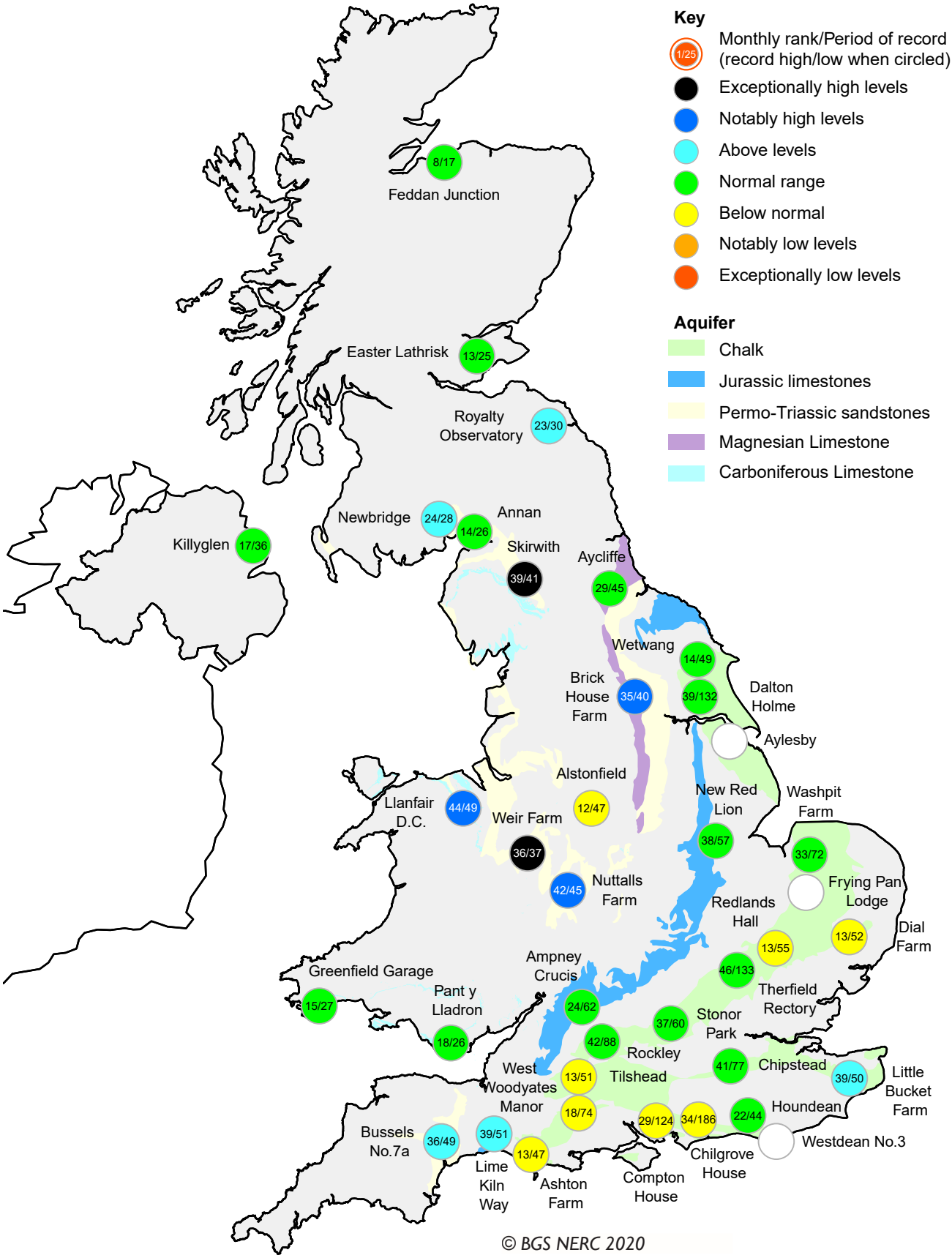










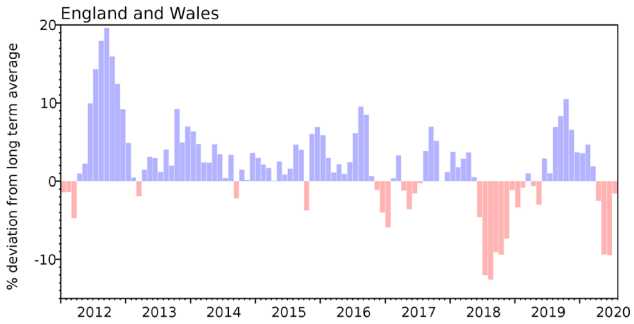


Groundwater levels - July 2020

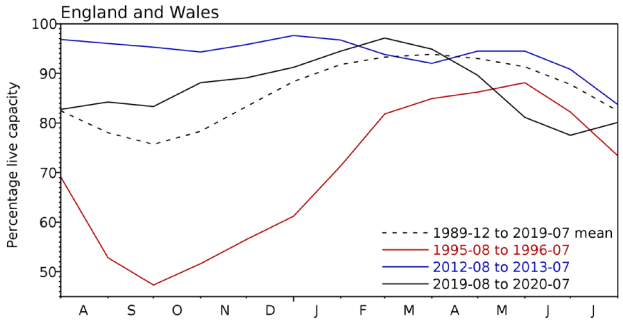
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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)	2020 May	2020 Jun	2020 Jul	Jul Anom.	Min Jul	Year* of min	2019 Jul	Diff 20-19
North West	N Command Zone	•	124929	61	51	67	4	23	1984	61	6
	Vyrnwy		55146	80	73	81	4	45	1984	91	-10
Northumbrian	Teesdale	•	87936	62	59	62	-12	45	1989	80	-18
	Kielder		(199175)	85	85	90	1	66	1989	90	1
Severn-Trent	Clywedog		49936	91	90	93	7	50	1976	96	-4
	Derwent Valley	•	46692	68	66	73	0	43	1996	66	7
Yorkshire	Washburn	•	23373	71	67	77	3	50	1995	81	-5
	Bradford Supply	•	40942	68	67	76	4	38	1995	70	5
Anglian	Grafham		(55490)	94	93	92	2	66	1997	86	6
	Rutland		(116580)	94	94	93	6	74	1995	95	-3
Thames	London	•	202828	92	93	90	3	73	1990	84	6
	Farmoor	•	13822	99	97	98	2	84	1990	99	-1
Southern	Bewl		31000	94	82	75	-1	45	1990	82	-7
	Ardingly		4685	96	77	62	-23	62	2020	79	-17
Wessex	Clatworthy		5662	78	70	62	-11	43	1992	85	-23
	Bristol	•	(38666)	85	78	71	-5	53	1990	78	-7
South West	Colliford		28540	80	75	68	-9	47	1997	65	3
	Roadford		34500	86	79	66	-11	46	1996	59	7
	Wimbleball		21320	81	74	63	-15	53	1992	85	-23
	Stithians		4967	84	80	70	0	39	1990	77	-7
Welsh	Celyn & Brenig	•	131155	79	70	79	-10	65	1989	91	-12
	Brianne		62140	82	81	91	1	67	1995	89	2
	Big Five	•	69762	74	68	69	-9	41	1989	75	-6
	Elan Valley	•	99106	76	70	70	-12	53	1976	85	-15
Scotland(E)	Edinburgh/Mid-Lothian	•	97223	82	83	84	1	51	1998	81	3
	East Lothian	•	9317	97	91	87	-3	72	1992	100	-13
Scotland(W)	Loch Katrine	•	110326	79	71	82	6	53	2000	87	-5
	Daer		22494	69	84	98	17	56	2013	81	17
	Loch Thom		10721	70	73	76	-9	59	2000	98	-22
Northern Ireland	Total+	•	56800	75	73	77	-1	54	1995	87	-10
	Silent Valley	•	20634	70	66	71	-3	42	2000	87	-16

( ) figures in parentheses relate to gross storage

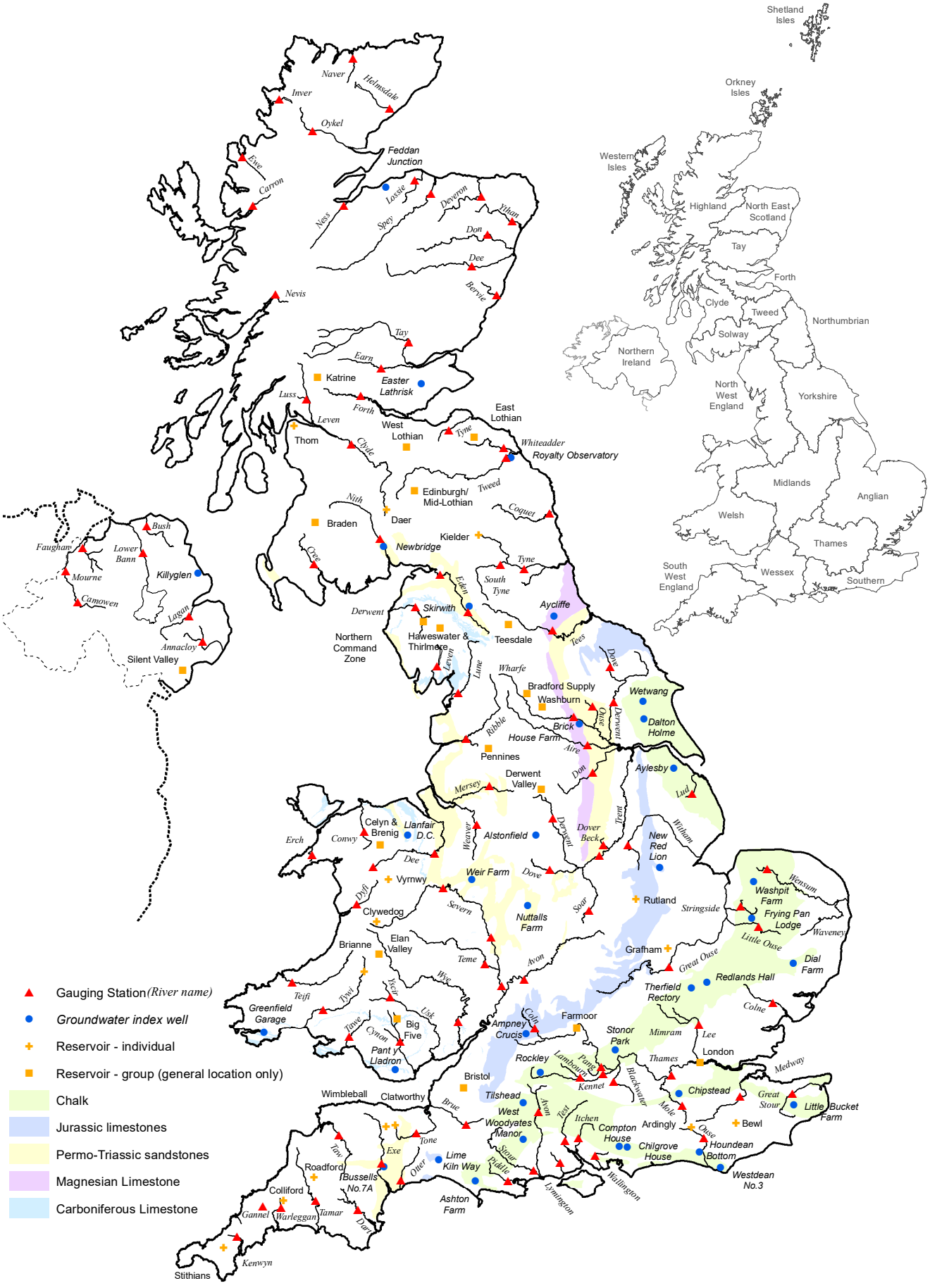
• denotes reservoir groups

*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 http://www.metoffice.gov.uk/climate/uk/about/methods

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.

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.

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

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