Hydrological Summary
for the United Kingdom

June 2020

General

June was characterised by unsettled, and at times thundery, conditions. Rainfall for the UK as a whole was around one and a half times the June average, with only southern and eastern parts of England and Scotland recording below average rainfall. With the majority of flows starting the month substantially below average, June monthly mean flows were generally in the normal range, although were below normal and above normal across England and the north-west of the UK, respectively. Soils generally remained drier than normal for the time of year and were the second driest in series from 1961 in the Anglian, Thames and Southern regions, behind 1976. Groundwater levels were mainly within the normal range for June, with notably high levels in some boreholes in central and northern England. Reservoir stocks for England and Wales were around three-quarters of average, and at Ardingly the month-end stocks were the lowest on record for June (from 1988). In contrast, stocks increased in northern and western reservoirs, notably so at Daer where stocks rose by a fifth relative to average. Continued wet weather at the start of July has improved the soil moisture and water resources situation, but the risks of localised water resources pressure and agricultural stress for the coming months remain, particularly if there is a return to predominantly high pressure conditions.

Rainfall

Low pressure and frontal systems dominated June, but were interspersed with high pressure and thunderstorms throughout the month. High pressure established in May continued into the first few days of June, but was swiftly followed by unsettled, wet weather (e.g. 50mm at Coignafearn, Invernesshire, on the 5th). A ridge of high pressure on the 8th/9th preceded heavy rain on the 10th (68mm at The Mumbles, West Glamorgan) and resulted in localised flooding in Swansea. From mid-month, conditions were humid and thunderstorms brought heavy rainfall across the country (e.g. 49mm at Castlederg, County Tyrone, on the 15th and 50mm at St Athan, Vale of Glamorgan, on the 18th) resulting in localised flooding (e.g. over 100 properties were flooded in Pentre, Rhonda Valley, on the 17th) and lightning damage in numerous places across the UK over this period. A dry spell across the UK between the 23rd and 26th was followed by a thundery breakdown and persistent rain in northern parts (213mm at Honister Pass, Cumbria, on the 28th) with a landslip disrupting rail travel in Scotland. The UK received 149% of average June rainfall with several regions recording similar anomalies, whilst the South West region recorded more than twice the average (the fifth wettest June in a series from 1910). Below average rainfall was mainly confined to parts of eastern Scotland and south-east England – Southern was the only region to register below average rainfall in June (84%). Since the start of spring (March-June) the UK received around 80% of average, with less than three-quarters of average in many regions – rainfall was around half the average for Anglian region, making it the driest March-June since 2011. Only the Highlands region registered near average rainfall over this period. Looking at a longer timeframe of 2020 so far, there is a split between above average rainfall in the west (due to the exceptionally wet February) and below average rainfall in the east (with less than 70% of average in parts of Aberdeenshire).

River flows

The recessions established in May continued into June in most catchments, with new daily flow minima established in the west of the UK and across northern England. Flow responses were triggered in the first week in north-east England and Scotland, and mid-month in eastern and south-west England. Almost all catchments responded to the rainfall at month-end, with new daily flow maxima established over the 28th-29th in 16 catchments in the north and west. In contrast, new daily minima were set on Ythan for the majority of June. Mean monthly flows for June were generally in the normal range, with below normal flows in eastern and central England (with several less than half the average) and on the Annacloy where flows were around a fifth of average. Exceptionally low flows were recorded on the Ythan (a new June minimum in a series from 1983) and the Erch (the second lowest in a series from 1973, behind 1976). Above normal flows were recorded in western parts of the UK, with more than 150% of the average in several catchments and almost twice the average on the Cree. Since the start of spring (March-June) flows were generally in the normal range across the UK, with notably low flows in northern and eastern Scotland. Flows were exceptionally low on the Scottish Dee (the fourth lowest in a series from 1930) and a new minimum for this period was established on the Annacloy (in a series from 1980).

Groundwater*

Soil Moisture Deficits reflected the rainfall distribution in June, with wetter soils in the west, especially in Scotland, although soils remained drier than average for the time of year. Levels receded at all but one of the Chalk boreholes, but were generally in the normal range. Levels also receded in the Jurassic limestones and were below normal at Ampney Crucis. In the Magnesian Limestones, levels were exceptionally high at Aycliffe and notably high at Brick House Farm, although they had fallen since last measured (in March and February, respectively). Levels in the Welsh Carboniferous Limestone rose overall, but fell to below normal at Alstonfield (England) since the last measurement in March. In the Upper Greensand, levels receded and were above normal at Lime Kiln Way. Levels fell at all sites in the Permo-Triassic Sandstones and were above normal to exceptionally high at the majority of sites, with a new June maximum at Weir Farm. Annan was the exception, where a new record low level for June was established (in a series from 1993). Elsewhere in Scotland, levels fell since the last measurement in February but remained above normal at Royalty Observatory (Fell Sandstone), while at Eastern Lathrisk (Devonian sandstone), levels fell and remained in the normal range.

**Note: Due to COVID-19 restrictions, data were unavailable for several sites in the Chalk.*

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.

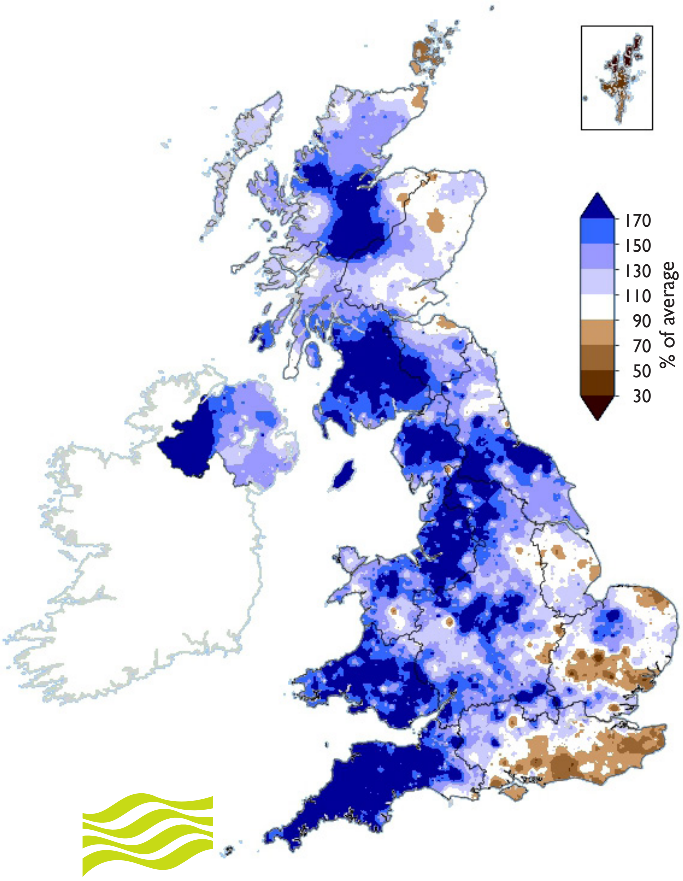
Region	Rainfall	Jun 2020	May20 – Jun20	RP	Mar20 – Jun20	RP	Jan20 – Jun20	RP	Jul 19 – Jun20	RP
United	mm	**106**	138		246		576		1319	
Kingdom	%	**149**	100	2-5	81	2-5	113	10-15	117	60-90
England	mm	**88**	98		175		401		1003	
	%	**145**	83	2-5	73	5-10	105	2-5	119	10-20
Scotland	mm	**123**	199		350		835		1771	
	%	**147**	122	2-5	91	2-5	122	20-30	117	50-80
Wales	mm	**137**	151		286		717		1648	
	%	**166**	91	2-5	78	2-5	115	5-10	116	10-20
Northern	mm	**124**	155		250		541		1235	
Ireland	%	**164**	104	2-5	78	2-5	104	2-5	109	5-10
England &	mm	**95**	105		190		444		1091	
Wales	%	**148**	84	2-5	74	5-10	107	2-5	118	10-20
North West	mm	**143**	163		271		674		1550	
	%	**179**	108	2-5	84	2-5	126	25-40	127	70-100
Northumbria	mm	**96**	118		175		388		1013	
	%	**146**	97	2-5	70	5-10	98	2-5	117	8-12
Severn-Trent	mm	**87**	94		162		377		971	
	%	**139**	78	2-5	69	5-10	105	2-5	124	20-30
Yorkshire	mm	**109**	123		178		420		1056	
	%	**159**	101	2-5	72	5-10	108	2-5	126	15-25
Anglian	mm	**58**	63		109		239		657	
	%	**107**	61	5-10	56	15-25	84	2-5	105	2-5
Thames	mm	**64**	68		152		328		801	
	%	**127**	64	5-10	72	5-10	100	2-5	112	2-5
Southern	mm	**42**	48		144		350		894	
	%	**84**	46	10-20	67	5-10	99	2-5	112	2-5
Wessex	mm	**86**	91		198		428		1043	
	%	**154**	79	2-5	82	2-5	108	2-5	118	8-12
South West	mm	**144**	157		287		637		1526	
	%	**205**	108	2-5	90	2-5	115	5-10	124	20-35
Welsh	mm	**135**	149		279		688		1591	
	%	**168**	92	2-5	79	2-5	114	5-10	117	10-20
Highland	mm	**141**	256		463		1069		2073	
	%	**156**	144	10-20	103	2-5	128	25-40	114	15-25
North East	mm	**87**	140		196		415		1085	
	%	**123**	103	2-5	70	10-20	91	2-5	107	2-5
Tay	mm	**102**	162		272		716		1559	
	%	**134**	104	2-5	78	2-5	115	5-10	116	15-25
Forth	mm	**98**	141		248		656		1455	
	%	**126**	96	2-5	78	2-5	119	10-20	121	40-60
Tweed	mm	**109**	143		231		563		1274	
	%	**154**	105	2-5	82	2-5	121	10-20	125	50-80
Solway	mm	**152**	198		318		797		1822	
	%	**179**	118	2-5	83	2-5	122	25-40	122	>100
Clyde	mm	**149**	223		414		1024		2217	
	%	**154**	121	2-5	92	2-5	126	30-50	122	80-120

% = 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.

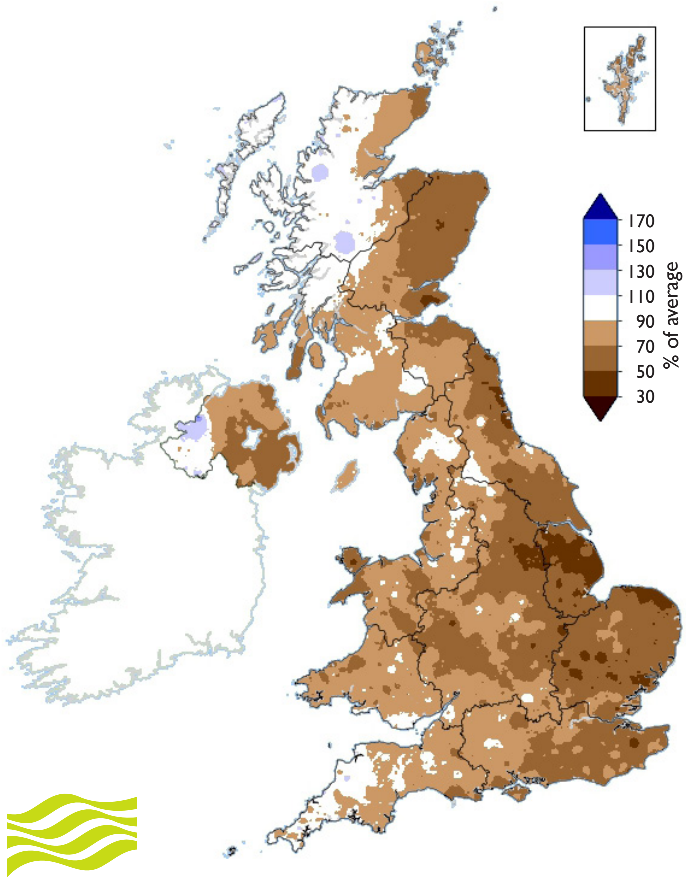
Rainfall . . . Rainfall . . .

June 2020 rainfall as % of 1981-2010 average



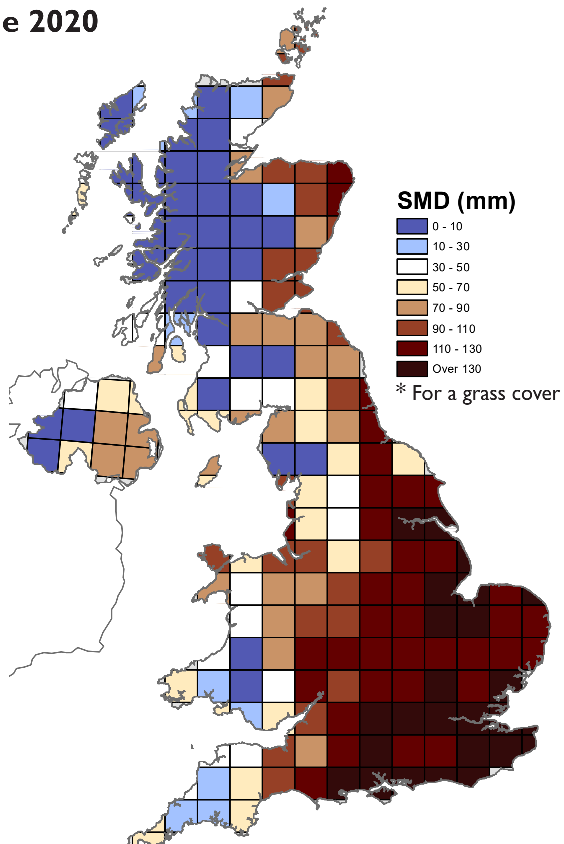
Met Office

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



Met Office

MORECS Soil Moisture Deficits* June 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.

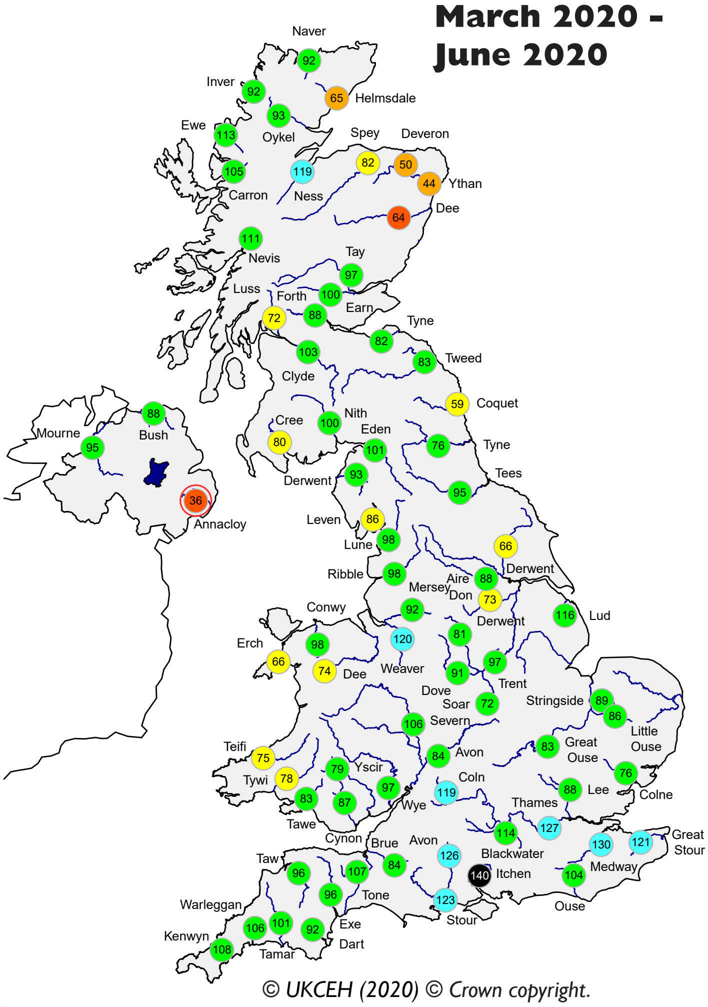
The complete version of the Hydrological Outlook UK can be found at: www.hydoutuk.net/latest-outlook/

Period: **from July 2020**
Issued: **07.07.2020**
using data to the end of June 2020

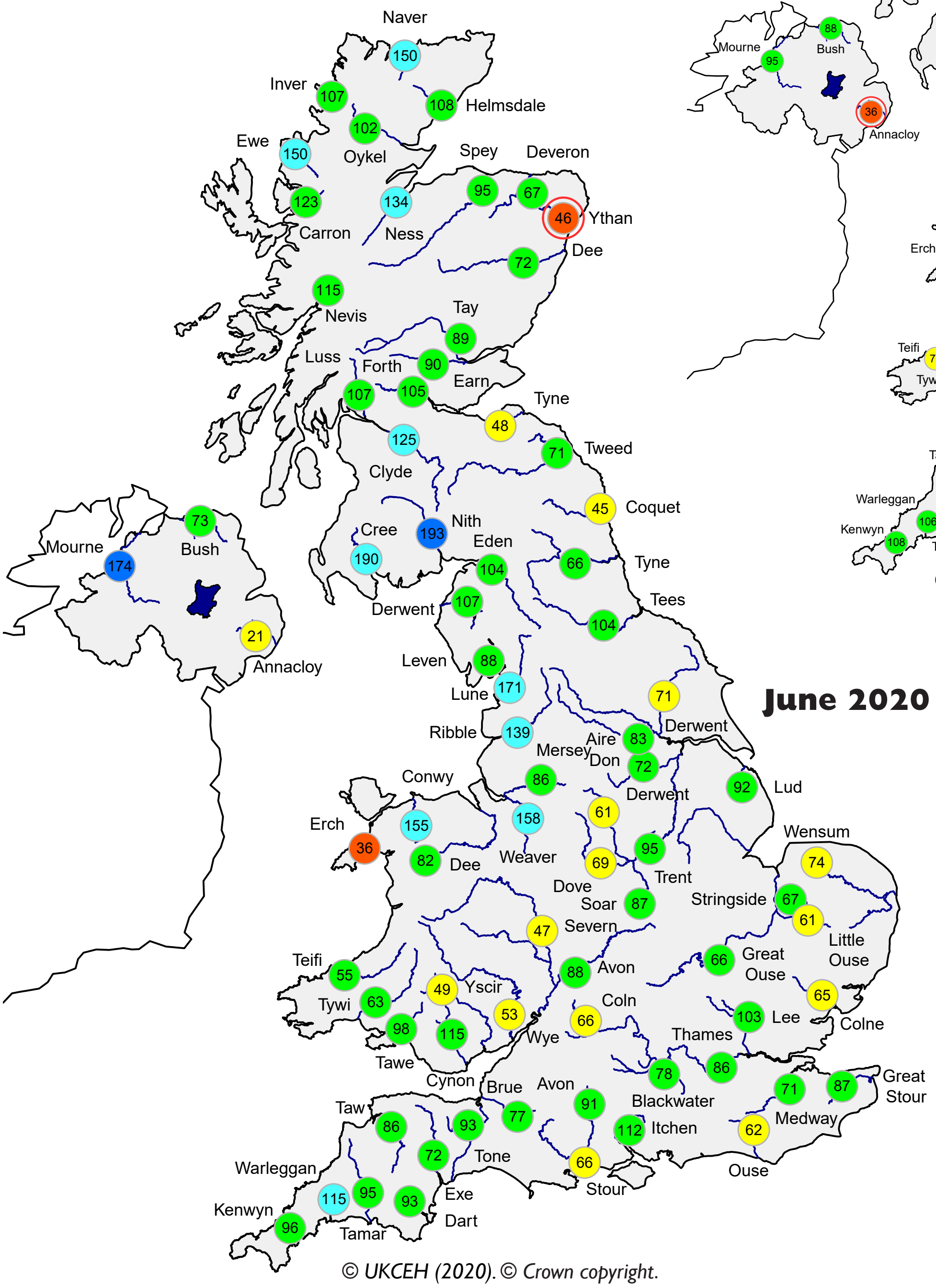
During July river flows are likely to be normal to above normal in western parts of the UK, and normal to below normal in eastern areas. Over the period to September, flows are likely to return to normal in all areas, although some below normal flows may persist in south-east England. Groundwater levels in July, and the period to September, are most likely to be in the normal range in the south-east of the UK; elsewhere the existing patterns of variability are likely to be maintained, with some aquifers having high levels, and some low.

River flow . . . River flow . . .

March 2020 - June 2020



June 2020



Key

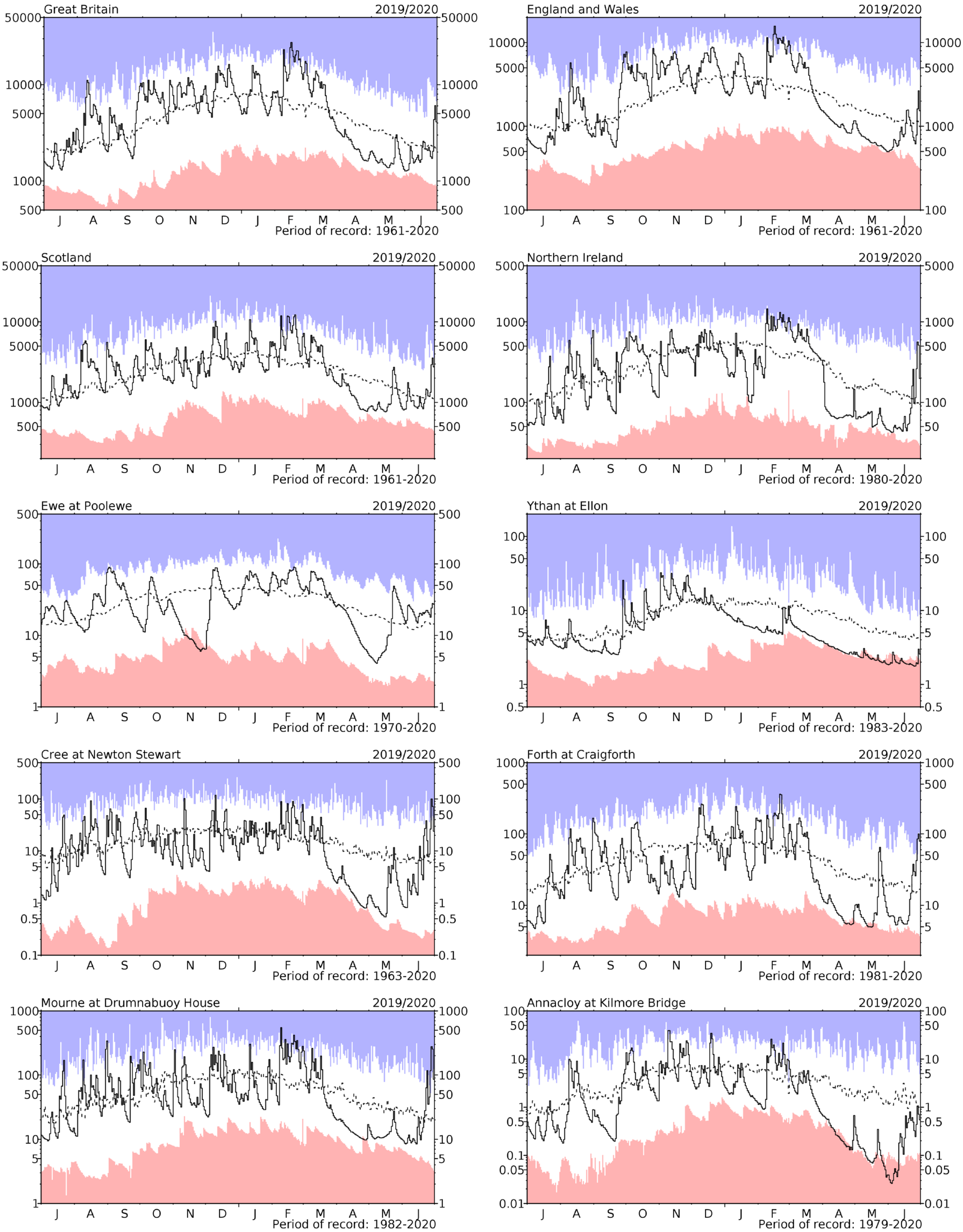
- 25 — % of long−term average (record high/low when circled)
- Exceptionally high flow
- Notably high flow
- Above normal
- Normal range
- Below normal
- Notably low flow
- Exceptionally low flow

*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.

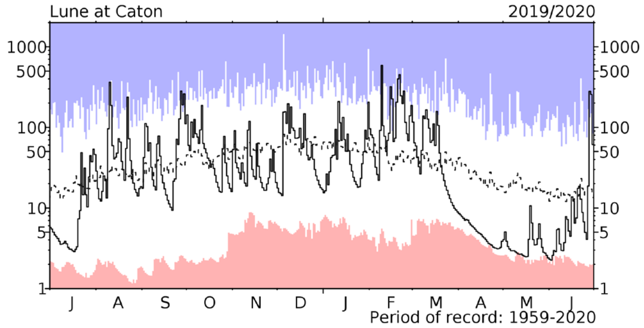
River flow . . . River flow . . .

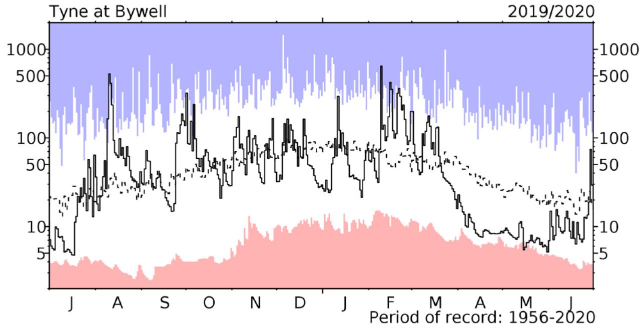


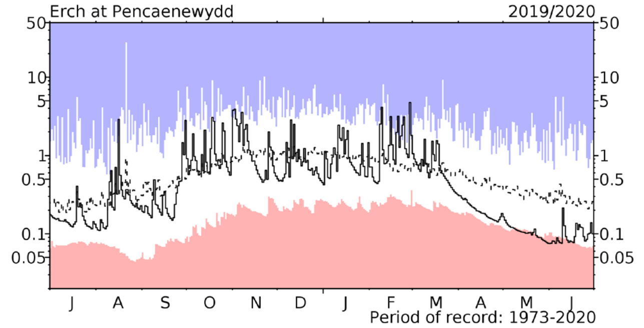
River flow hydrographs

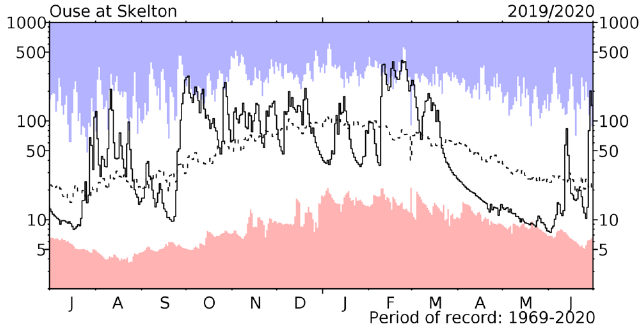
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to June 2019 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed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

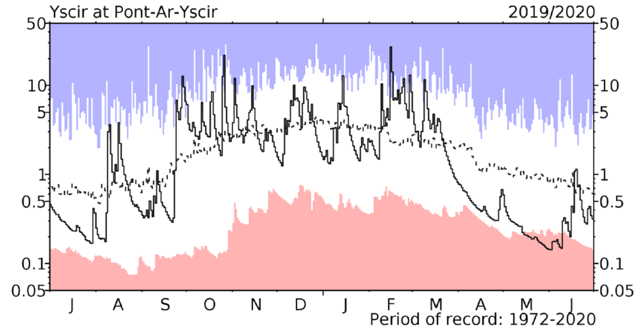
River flow . . . River flow . . .

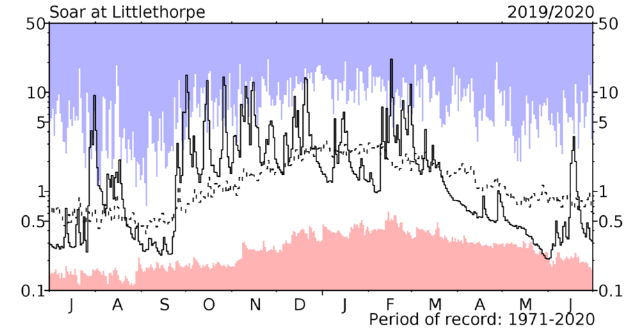


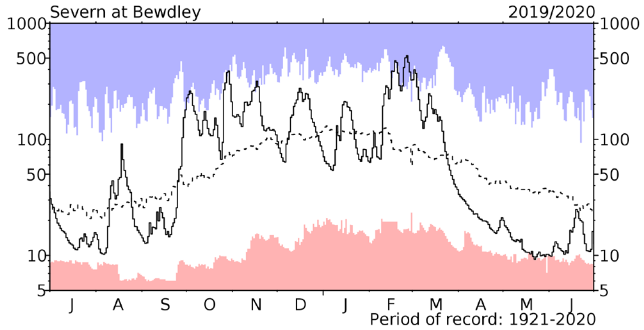


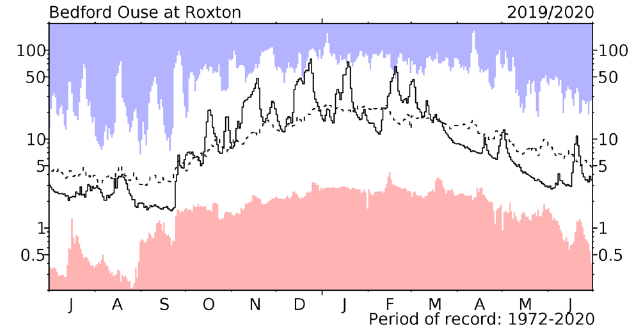


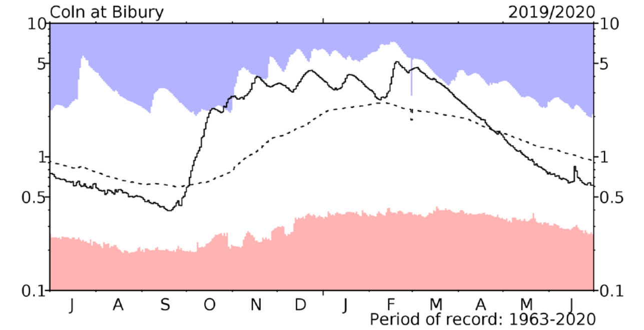


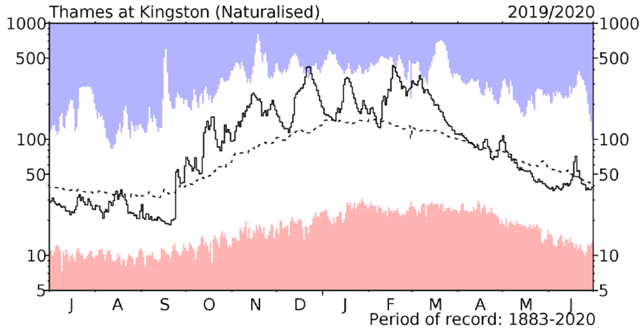


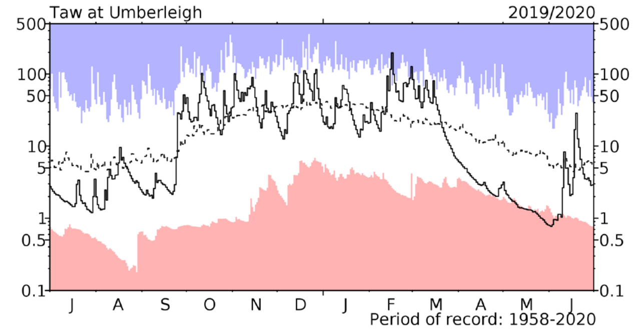


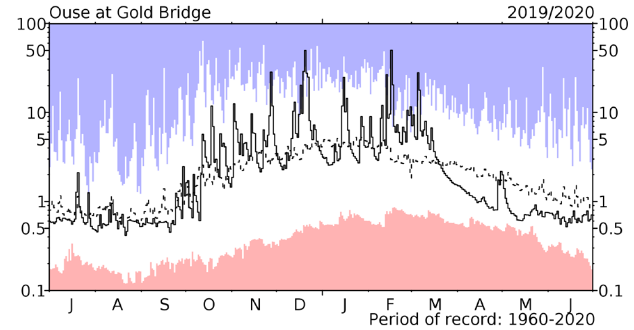




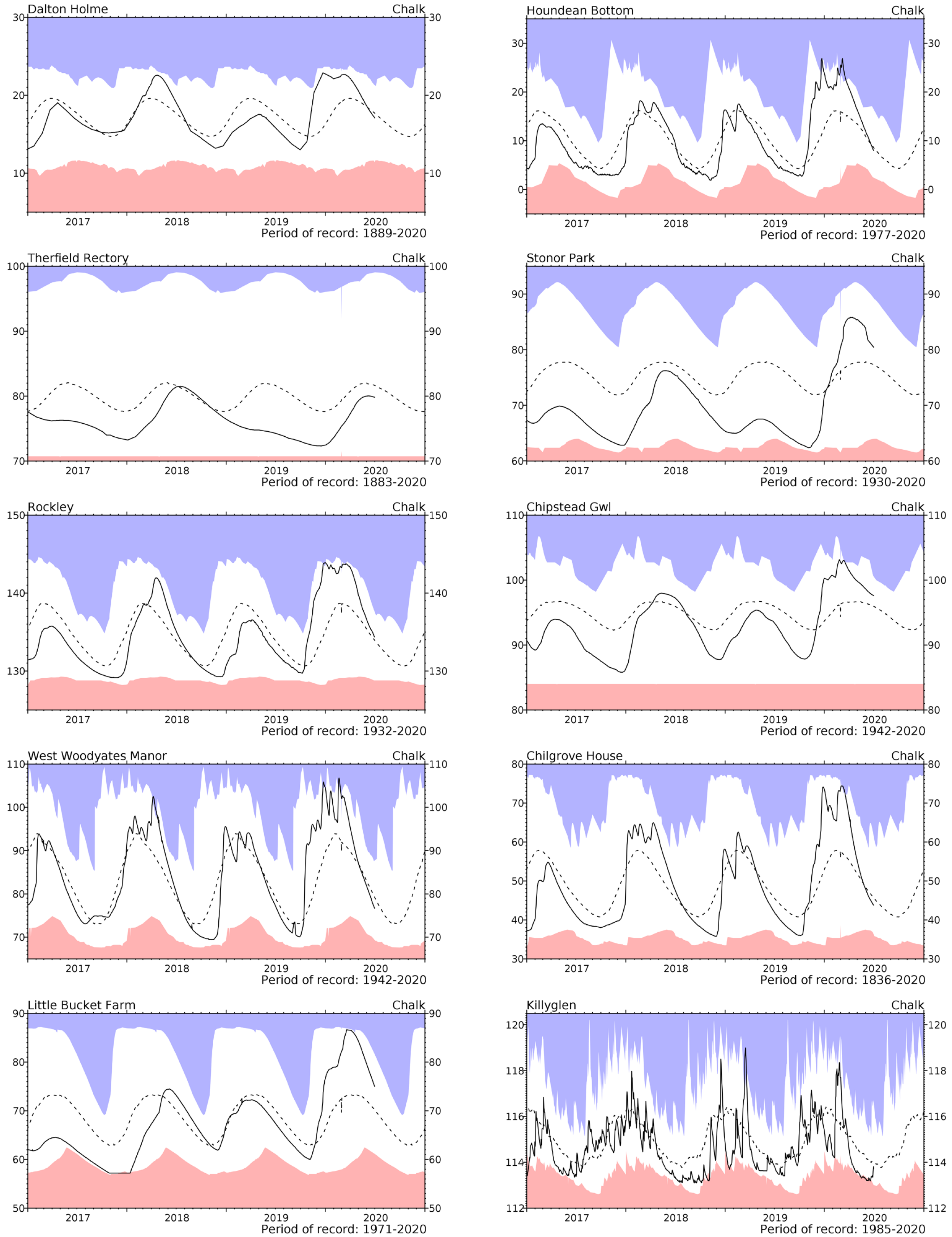






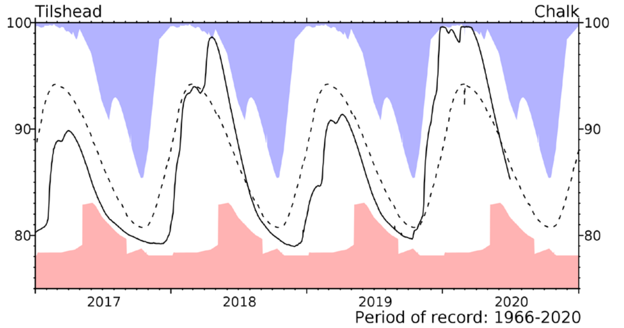


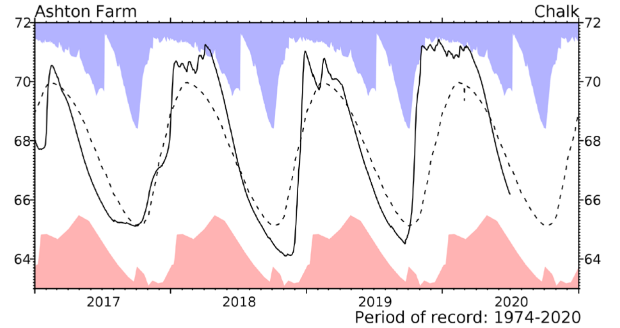
Groundwater . . . Groundwater

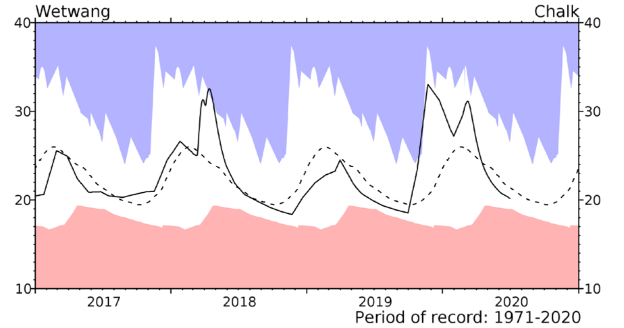


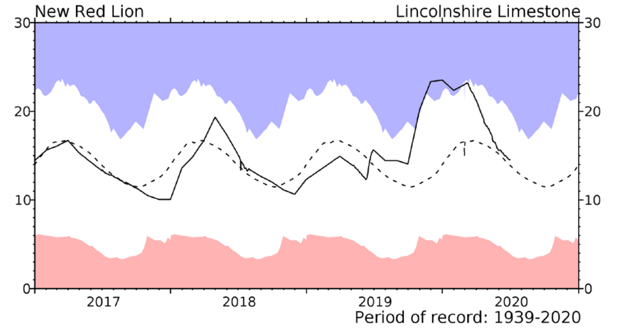
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is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

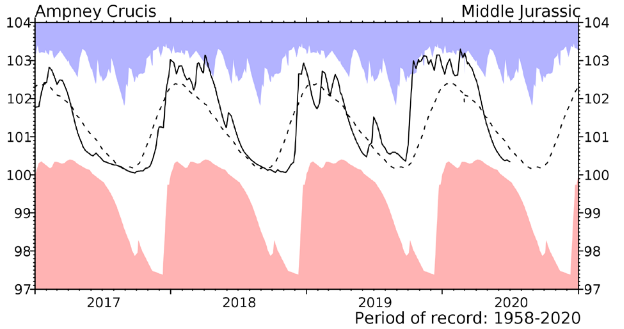
Groundwater ... Groundwater

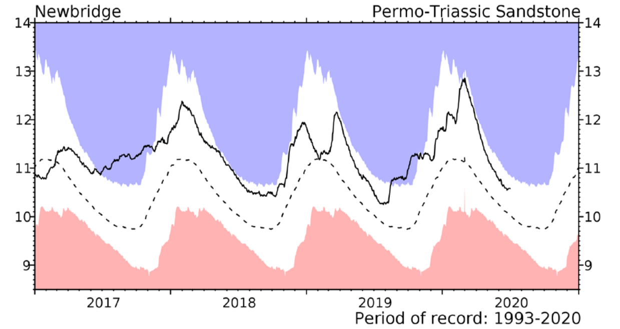


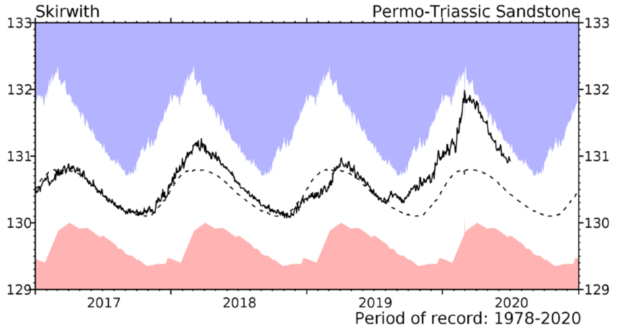


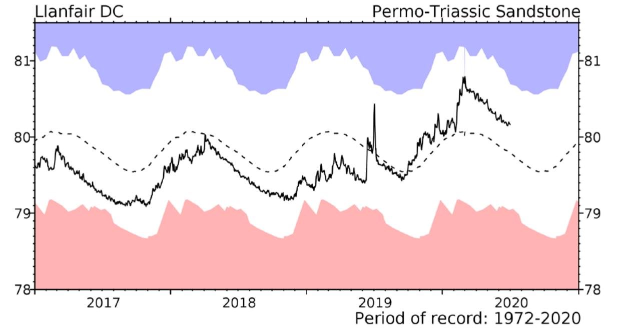


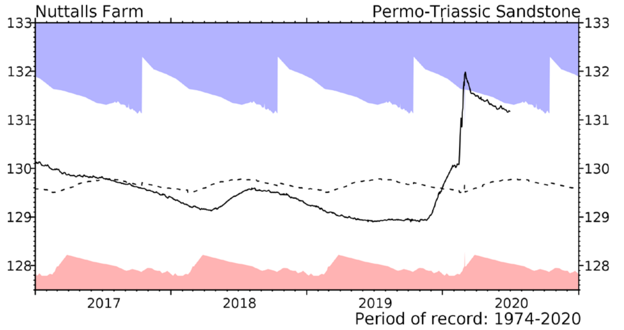


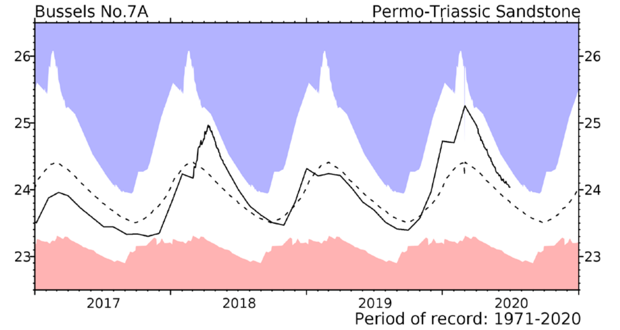


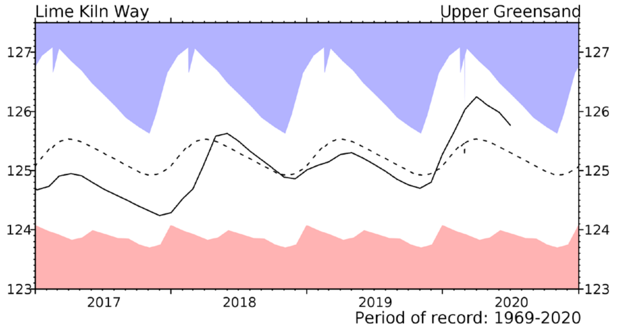


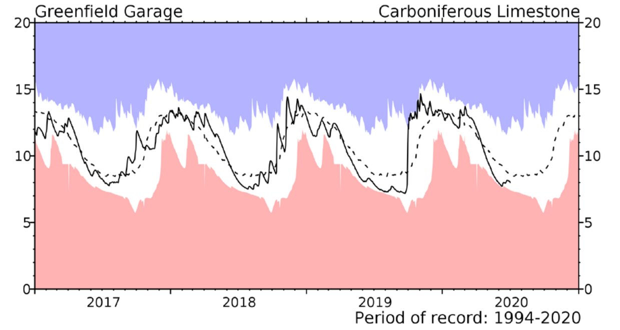




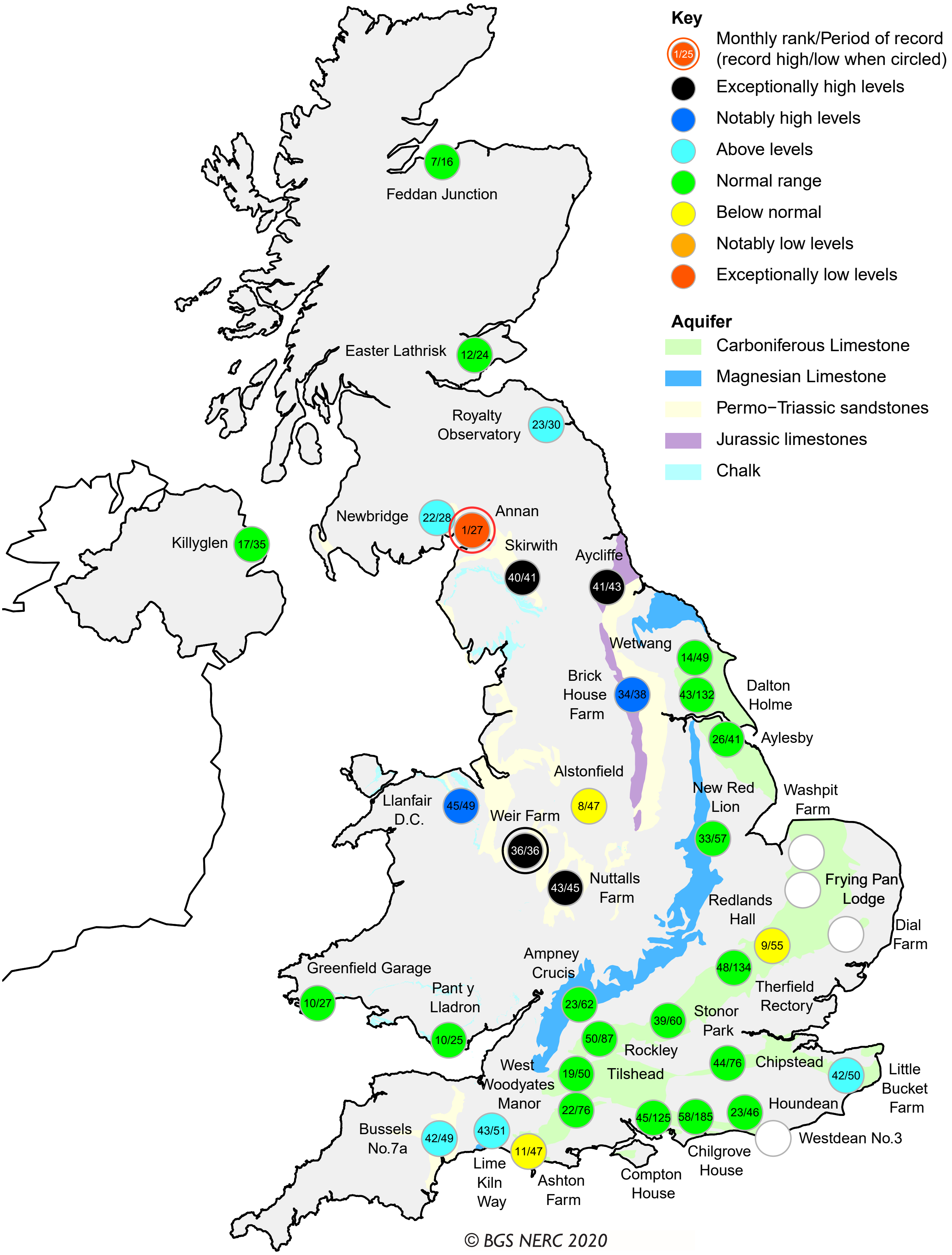








Groundwater...Groundwater

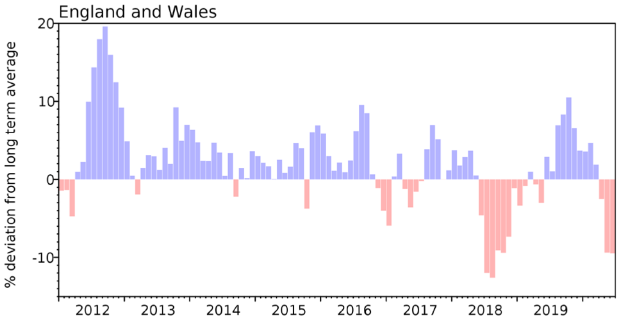


Groundwater levels - June 2020

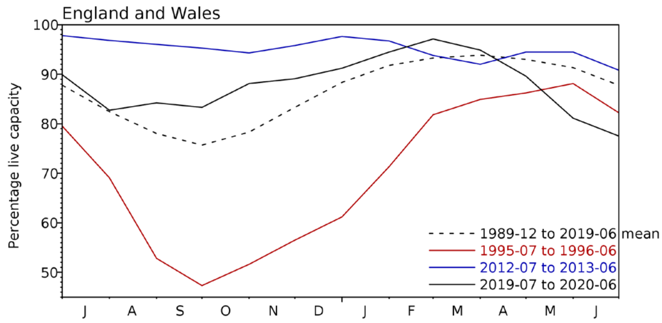
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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

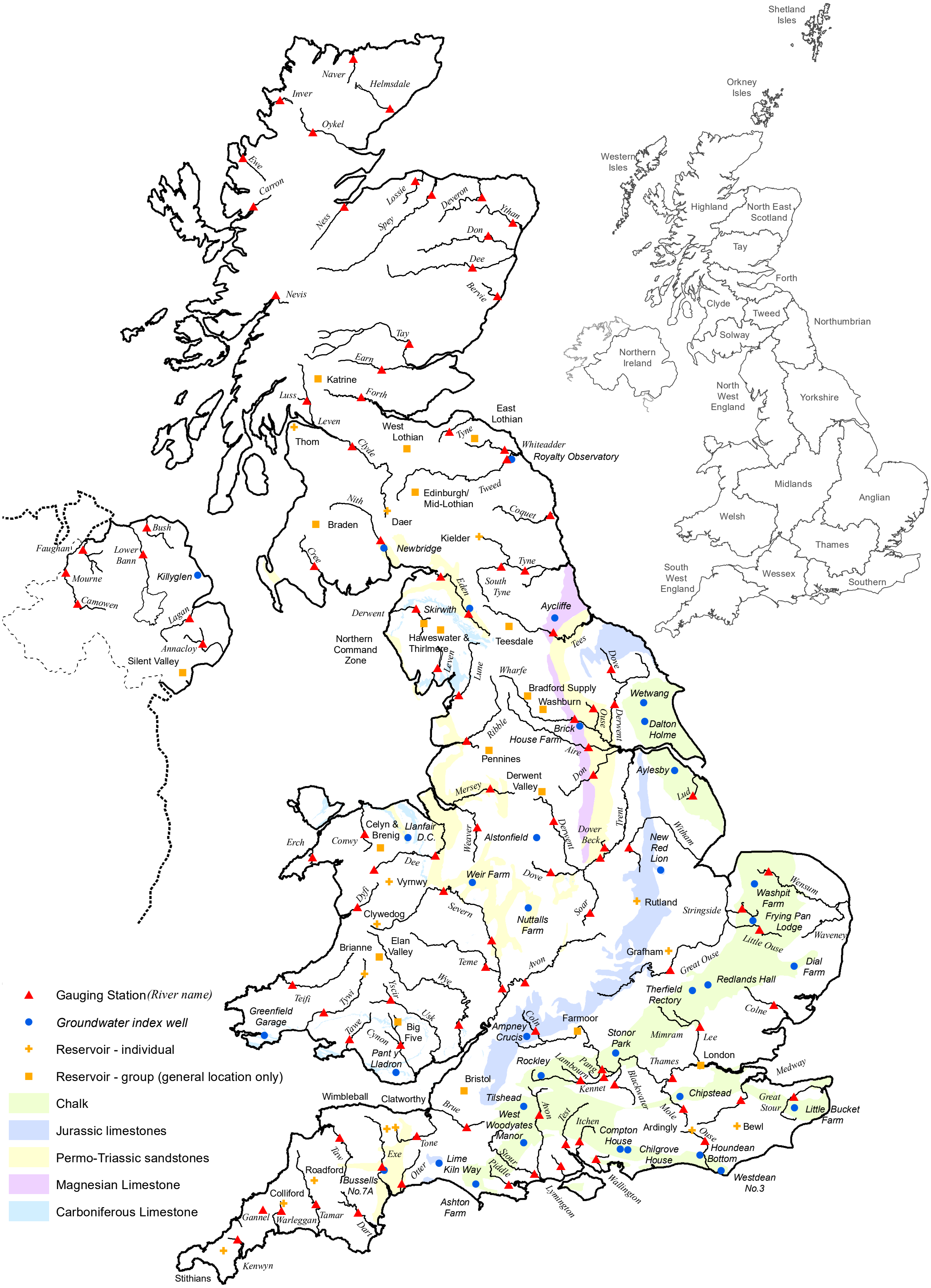
Area	Reservoir		Capacity (Ml)	2020 Apr	2020 May	2020 Jun	Jun Anom.	Min Jun	Year* of min	2019 Jun	Diff 20-19
North West	N Command Zone	•	124929	77	61	51	-21	38	1984	69	-18
	Vyrnwy		55146	90	80	73	-10	58	1984	100	-27
Northumbrian	Teesdale	•	87936	73	62	59	-22	58	1989	84	-25
	Kielder		(199175)	89	85	85	-5	71	1989	90	-4
Severn-Trent	Clywedog		49936	97	91	90	-3	32	1976	99	-10
	Derwent Valley	•	46692	82	68	66	-14	53	1996	81	-14
Yorkshire	Washburn	•	23373	84	71	67	-13	63	1995	95	-28
	Bradford Supply	•	40942	85	68	67	-12	54	1995	88	-20
Anglian	Grafham		(55490)	96	94	93	0	70	1997	93	-1
	Rutland		(116580)	97	94	94	5	75	1997	96	-2
Thames	London	•	202828	95	92	93	1	85	1990	95	-1
	Farmoor	•	13822	98	99	97	0	94	1995	98	-1
Southern	Bewl		31000	98	94	82	-1	52	1990	89	-7
	Ardingly		4685	100	96	77	-18	77	2020	94	-17
Wessex	Clatworthy		5662	90	78	70	-12	61	1995	100	-30
	Bristol	•	(38666)	95	85	78	-5	64	1990	86	-8
South West	Colliford		28540	89	80	75	-7	51	1997	75	0
	Roadford		34500	94	86	79	-2	49	1996	70	9
	Wimbleball		21320	93	81	74	-11	63	2011	95	-21
	Stithians		4967	93	84	80	0	53	1990	89	-9
Welsh	Celyn & Brenig	•	131155	93	79	70	-24	70	2020	94	-24
	Brianne		62140	91	82	81	-12	76	1995	98	-17
	Big Five	•	69762	89	74	68	-17	61	1989	87	-19
	Elan Valley	•	99106	88	76	70	-18	68	1976	97	-27
Scotland(E)	Edinburgh/Mid-Lothian	•	97223	89	82	83	-4	54	1998	85	-2
	East Lothian	•	9317	100	97	91	-4	81	1992	100	-9
Scotland(W)	Loch Katrine	•	110326	83	79	71	-10	55	2010	91	-20
	Daer		22494	80	69	84	0	62	1994	83	1
	Loch Thom		10721	76	70	73	-15	69	2000	97	-24
Northern	Total+	•	56800	88	75	73	-9	61	2008	93	-19
Ireland	Silent Valley	•	20634	85	70	66	-14	54	1995	96	-30

( ) 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.

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