Hydrological Summary

for the United Kingdom

January 2019

General

January was occasionally unsettled but was predominantly dry, exceptionally so in some areas. While there were mild spells, and the mean UK temperature for January was near-average, the month had a distinctly wintry character. The impact of the 'sudden stratospheric warming' that occurred in late December began to be felt, with northwesterly airflows bringing very cold weather and some disruptive snowfall. With frontal systems making little impression except in the north of Scotland, river flows generally declined steeply and January mean flows were depressed across the country, exceptionally so in some catchments. With recharge slowed or arrested across most aquifers, below normal and notably low groundwater levels were also widespread. At the national scale, reservoir stocks were moderately below average (4% below for England and Wales) but were appreciably below average in some northern impoundments (e.g. Kielder, Derwent Valley) and at Grafham and Ardingly in the English Lowlands. While the wetter December yielded some modest replenishment in the south, rainfall has been below average for much of the period from late spring 2018. The window for groundwater recharge and reservoir replenishment has narrowed further – late winter/early spring rainfall will be influential for the water resources outlook for summer 2019. February started with some very wet weather, and the latest outlooks marginally favour wetter-than-average conditions for the next three months, but with significant uncertainties.

Rainfall

January began dry and settled, a continuation of the anticyclonic conditions which prevailed in the last week of 2018. Frontal systems in the second week brought more mild and changeable conditions, especially to the west. Strong winds caused disruption on the 7th/8th in Scotland, alongside coastal flood alerts and some locally heavy rainfall (73mm was received at Achnagart, western Scotland, on the 12th). Generally rainfall totals were modest with little appreciable rainfall was received across large areas of south-east England through the first half of the month. Thereafter, February was generally colder, under persistent northwesterly flows, and often unsettled with sporadic, sometimes wintry, showers. There was a cold spell between the 17th and 23rd, with snowfall in upland areas (e.g. 16cm on the 23rd at Malham Tarn, North Yorkshire). Further widespread snow brought some transport disruption in the final days. The January rainfall total was 53% of average for the UK as a whole, and much of the country received less than half the typical rainfall. It was the eighth driest January on record for England but parts of north-east Britain were exceptionally dry: for the Northumbria and Tweed regions it was the second driest January on record (27% and 21% of average respectively, all in records from 1910). The dry January extended medium-term rainfall deficiencies in north-east Britain where some areas received less than 70% of average for October-January (the driest such period since 1975/1976 for Northumbria) and longer-term deficiencies in central and eastern England: the June-January rainfall total was the fifth lowest on record (from 1910) for Anglian region and the lowest since 1996/1997 more widely (e.g. for Severn-Trent, Thames and Yorkshire).

River flows

Flows in the majority of catchments began 2019 in recession and, aside from some catchments in northwest Britain which saw modest responses to the unsettled spell in the second week, river flows continued to recede through the first half of the month. There were widespread incursions into low flow envelopes in responsive western catchments and some new January minimum daily flows (for the Earn, Lagan and Annacloy). The latter half of the month saw generally muted flow responses (although there were localised flood alerts in northern Scotland around the 26th). Flows were rarely above the seasonal average and recessions continued in some of the driest areas (north-east coastal catchments) and in slowly responding catchments in the English Lowlands. January mean flows were below average across the whole of the UK except the far north of Scotland, and for a significant majority of catchments flows were notably or exceptionally low. A number of eastern catchments had flows less than 25% of average, with new record minimum mean flows in some catchments including the Earn, in a record from 1948, and the English Tyne, in a record from 1956. New minima were also established on the Soar (1972) and the Annacloy (1980). The January average outflows reflect the depressed runoff at the national scale; outflows for England & Wales and the English Lowlands series were the fourth lowest on record (after notable drought years, in a series from 1961). River flow accumulations since the start of autumn were generally below average or notably low and the November-January flows for the Helmsdale and Naver were the lowest in records commencing before 1978. Significant runoff deficiencies can be traced back to the early summer in many central and eastern catchments with flows less than half the average on the Bedford Ouse, Coquet, Tweed, Scottish Tyne and Deveron.

Groundwater

By the end of January, soil moisture deficits (SMDs) were negligible or eliminated across most of the country, but modest SMDs remained in parts of eastern England (although this is not atypical and the SMDs were near-average). For the majority of Chalk boreholes, groundwater levels fell during January, including several that had previously recorded some recharge. Levels at half the sites were below normal to notably low for January, although levels were in the normal range across the South Downs and locally elsewhere in the south and east. In the fast responding Chalk of Northern Ireland, levels at Killyglen fell in the first half of the month and later increased, but ended the month exceptionally low for the time of year. In the more responsive Jurassic limestones, levels were below normal, but rose at New Red Lion but fell at Ampney Crucis. Levels fell slightly in the Magnesian limestones, and remained in the normal range at Aycliffe but below normal at Brick House Farm. Groundwater levels in the Upper Greensand at Lime Kiln Way rose slowly and remained in the normal range. In the Permo-Triassic sandstones, levels generally fell overall but increases were recorded at Skirwith and Llanfair DC and levels were generally in the normal range. Levels fell overall to below normal or notably low in the Carboniferous Limestone, although some recovery occurred in south Wales towards the end of the month. At Royalty Observatory, levels stabilised in the Fell Sandstone and remained in the normal range.

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

Percentages are from the 1981-2010 average.

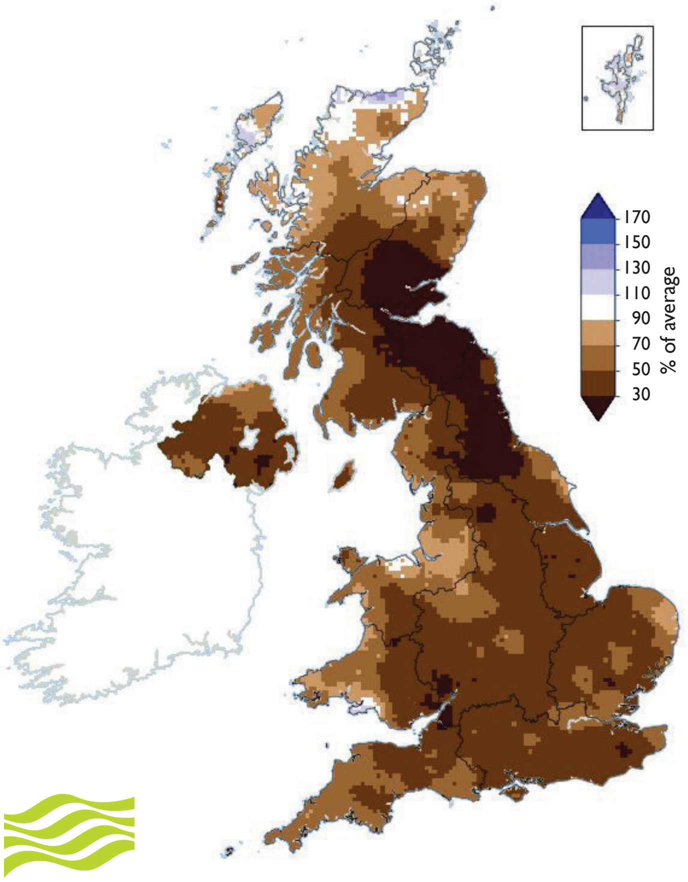
Region	Rainfall	Jan 2019	Oct18 – Jan19	RP	Aug18 – Jan19	RP	Jun18 – Jan19	RP	Feb18 – Jan19	RP
United	mm	**64**	410		600		690		994	
Kingdom	%	**53**	85	2-5	90	2-5	85	5-10	88	5-10
England	mm	**37**	294		422		473		747	
	%	**46**	85	2-5	87	2-5	78	10-15	88	5-10
Scotland	mm	**102**	558		839		992		1314	
	%	**59**	84	2-5	92	2-5	91	2-5	87	2-5
Wales	mm	**89**	596		842		924		1340	
	%	**58**	93	2-5	98	2-5	90	2-5	94	2-5
Northern	mm	**52**	377		536		666		965	
Ireland	%	**45**	81	5-10	82	5-10	82	10-15	85	8-12
England &	mm	**45**	336		480		535		829	
Wales	%	**49**	87	2-5	90	2-5	80	8-12	90	2-5
North West	mm	**68**	429		665		762		1037	
	%	**55**	81	2-5	91	2-5	85	5-10	84	5-10
Northumbria	mm	**22**	247		406		491		758	
	%	**27**	72	10-15	83	5-10	79	10-20	87	5-10
Severn-Trent	mm	**33**	242		364		407		690	
	%	**46**	79	5-10	84	5-10	73	15-25	88	5-10
Yorkshire	mm	**31**	268		387		457		735	
	%	**39**	81	5-10	82	5-10	76	10-20	87	5-10
Anglian	mm	**24**	194		281		315		540	
	%	**45**	84	2-5	83	2-5	70	15-25	86	5-10
Thames	mm	**31**	250		347		372		630	
	%	**45**	86	2-5	86	2-5	73	10-20	88	2-5
Southern	mm	**33**	319		436		472		758	
	%	**40**	89	2-5	92	2-5	81	5-10	95	2-5
Wessex	mm	**42**	351		467		501		801	
	%	**47**	91	2-5	90	2-5	79	5-10	90	2-5
South West	mm	**73**	545		706		761		1143	
	%	**54**	97	2-5	97	2-5	86	2-5	93	2-5
Welsh	mm	**85**	571		807		887		1293	
	%	**58**	93	2-5	98	2-5	90	2-5	94	2-5
Highland	mm	**165**	669		1031		1190		1514	
	%	**76**	82	2-5	94	2-5	92	2-5	84	2-5
North East	mm	**63**	369		516		621		863	
	%	**64**	88	2-5	88	2-5	85	5-10	85	5-10
Tay	mm	**45**	475		692		836		1146	
	%	**27**	81	2-5	87	2-5	87	2-5	85	5-10
Forth	mm	**33**	361		554		689		975	
	%	**24**	71	8-12	78	5-10	79	5-10	81	5-10
Tweed	mm	**23**	306		498		624		927	
	%	**21**	72	8-12	84	2-5	84	2-5	90	2-5
Solway	mm	**68**	594		869		1020		1377	
	%	**43**	91	2-5	97	2-5	94	2-5	92	2-5
Clyde	mm	**104**	676		1010		1220		1611	
	%	**50**	84	2-5	91	2-5	92	2-5	88	2-5

% = 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.

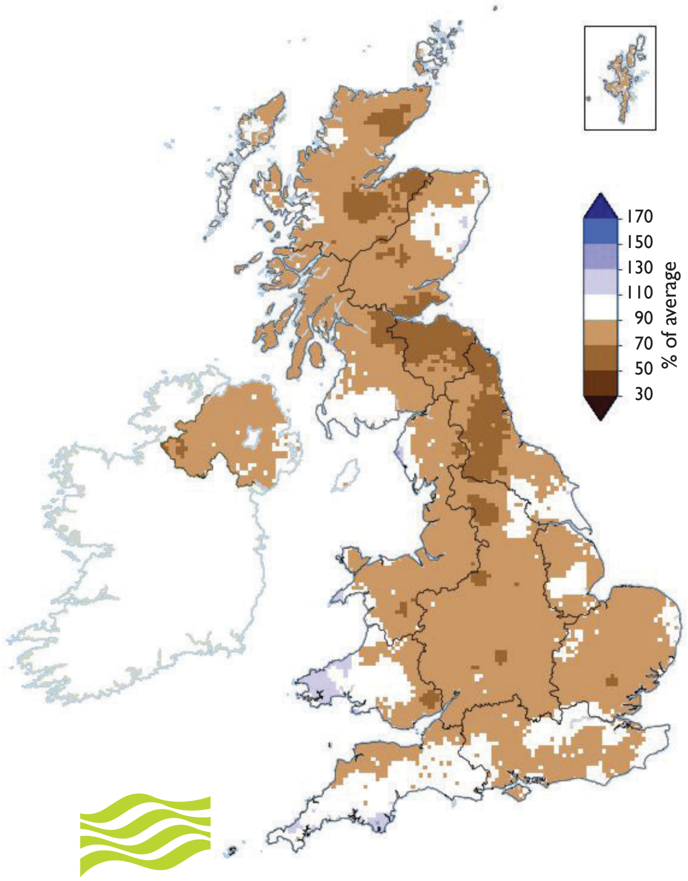
Rainfall . . . Rainfall . . .

January 2019 rainfall as % of 1981-2010 average



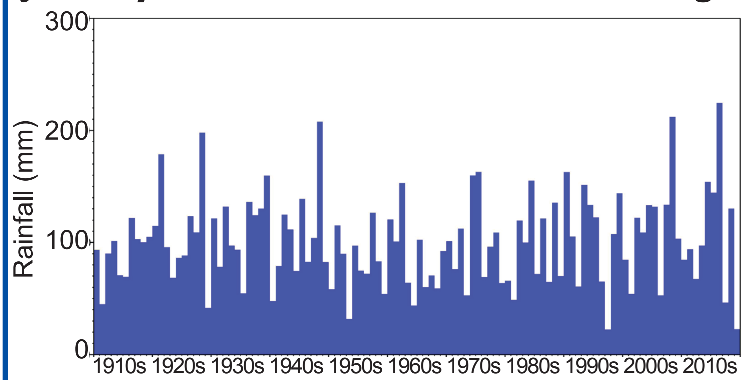
Met Office

October 2018 - January 2019 rainfall as % of 1981-2010 average

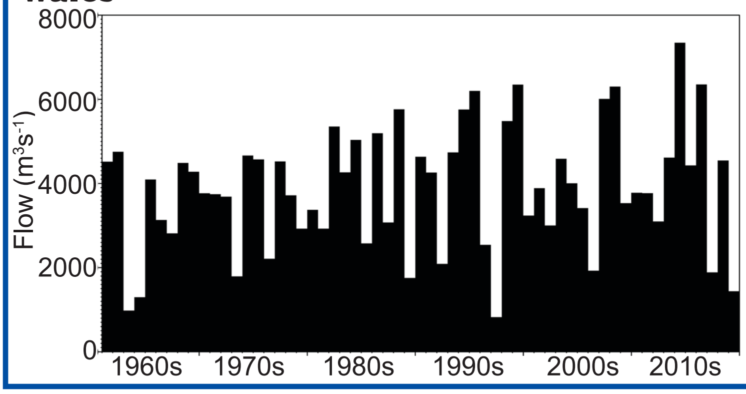


Met Office

January rainfall totals for the Tweed region



January average outflows for England & Wales



Hydrological Outlook UK

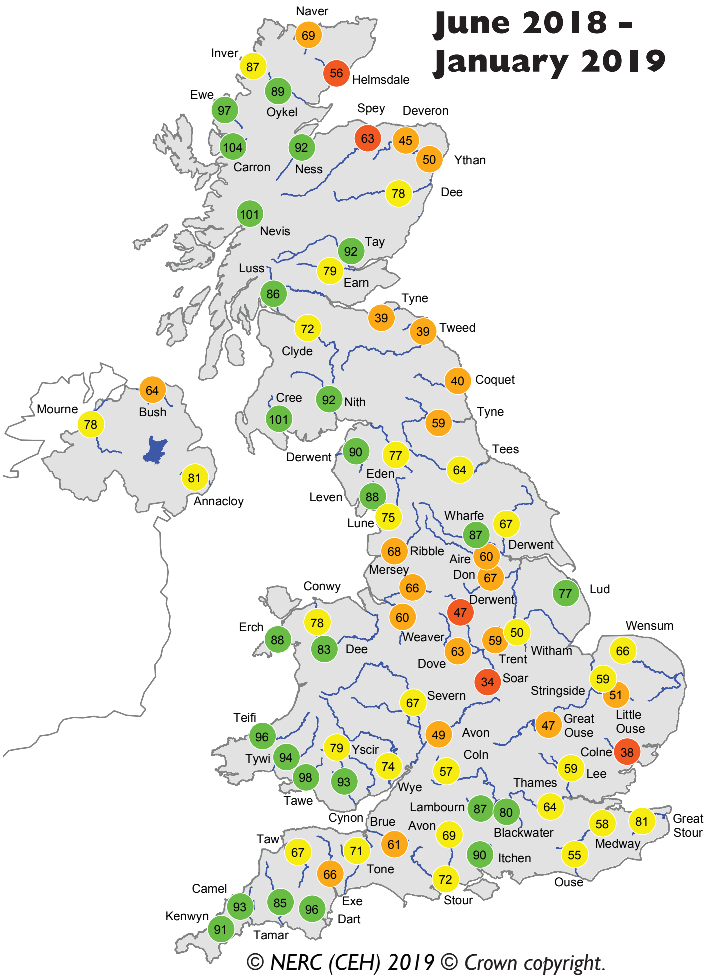
The Hydrological Outlook provides an insight into future hydrological conditions across the UK. Specifically it describes likely trajectories for river flows and groundwater levels on a monthly basis, with particular focus on the next three months.

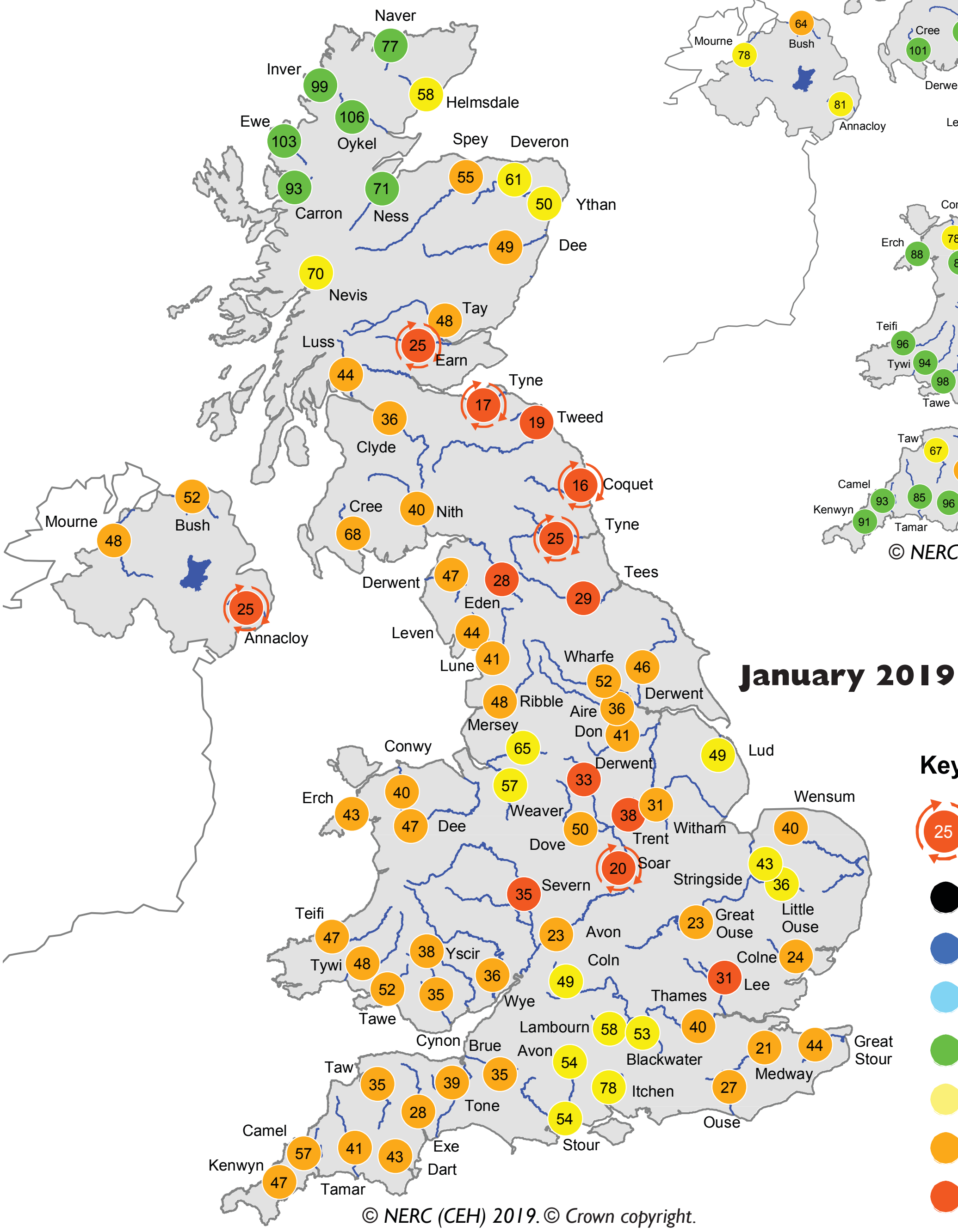
The complete version of the Hydrological Outlook UK can be found at: www.hydoutuk.net/latest-outlook/

Period: **from February 2019**
Issued: **11.02.2019**
using data to the end of January 2019

The hydrological outlook for parts of central, southern and eastern England is for below normal river flows and groundwater levels over the next one to three months. River flows elsewhere across the UK are subject to some uncertainty due to the atypical meteorological patterns that are currently dominating the UK's precipitation, but are most likely to be within the normal range for February. Groundwater levels across the majority of the UK are likely to be normal to below normal for February-March-April.

River flow . . . River flow . . .





Key

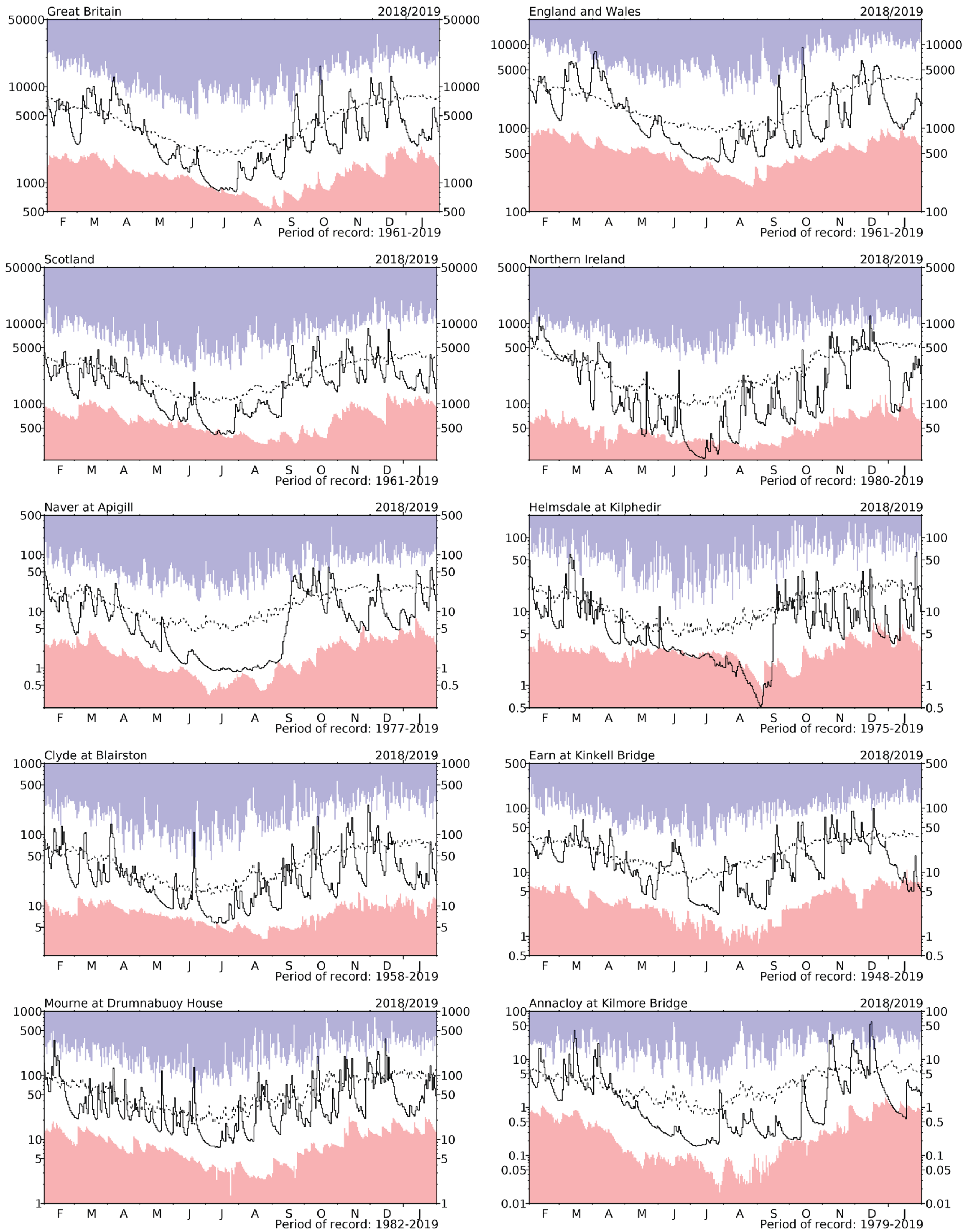
- % of long-term average (record figure when circled)
- Exceptionally high flow
- Notably high flow
- Above normal
- Normal range
- Below normal
- Notably low flow
- Exceptionally low flow

*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 . . .

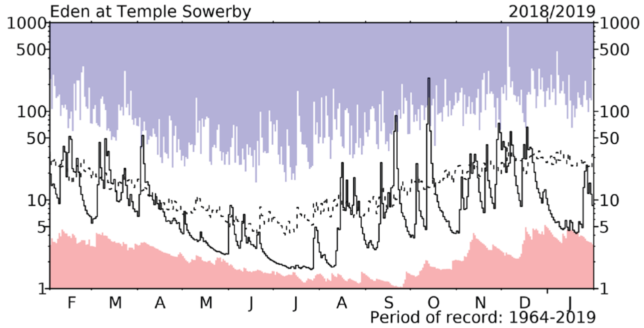


River flow hydrographs

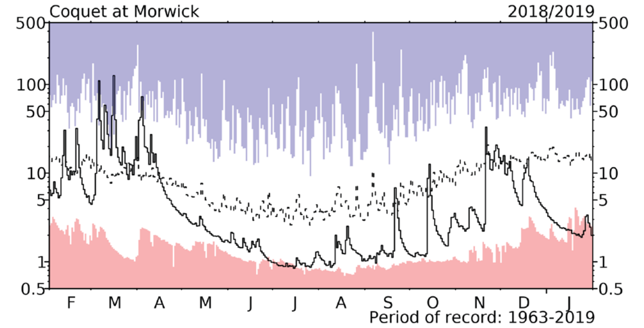
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to February 2018 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed line represents the period-of-record average daily flow.

River flow . . . River flow . . .

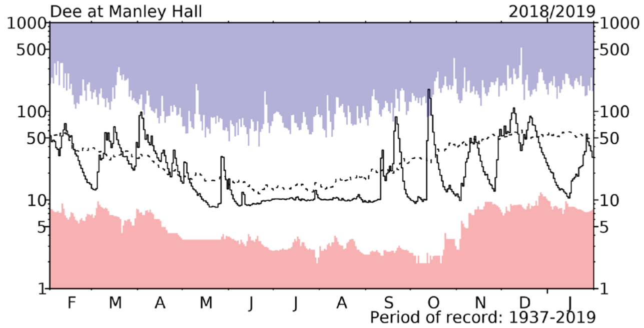
Eden at Temple Sowerby 2018/2019



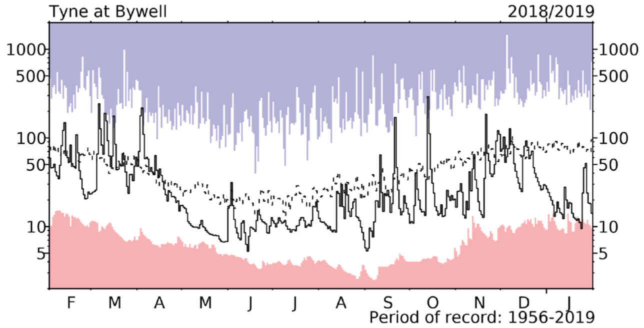
Coquet at Morwick 2018/2019



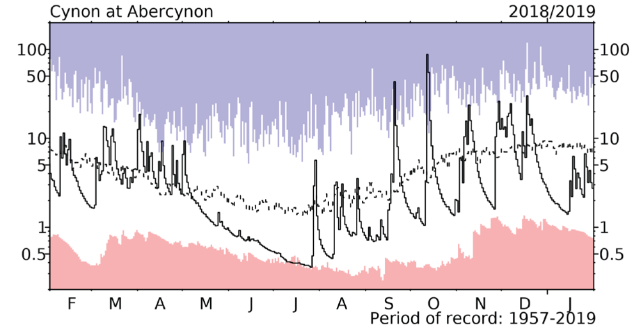
Dee at Manley Hall 2018/2019



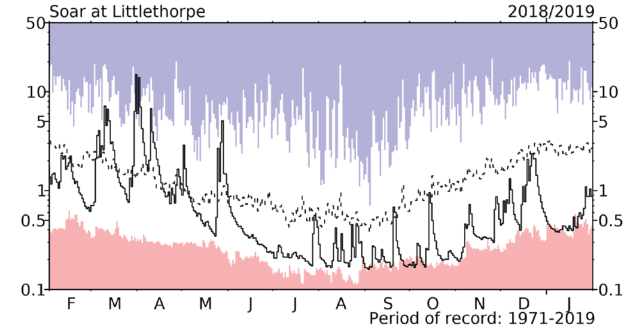
Tyne at Bywell 2018/2019



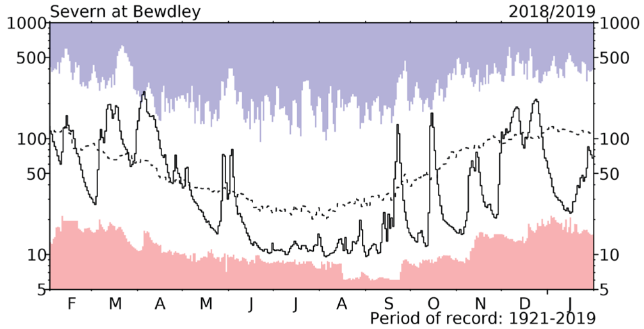
Cynon at Abercynon 2018/2019



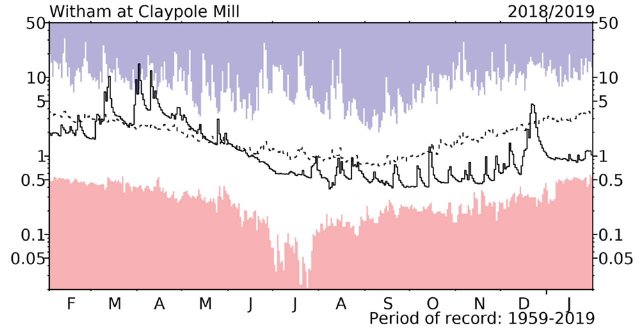
Soar at Littlethorpe 2018/2019



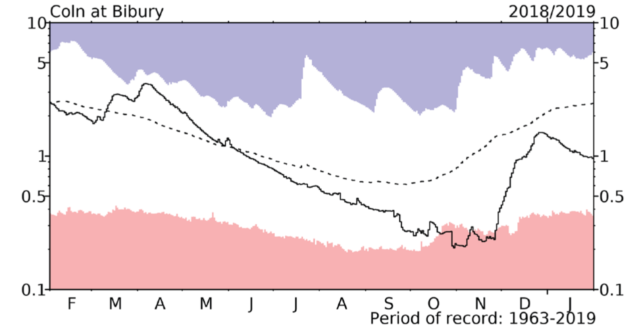
Severn at Bewdley 2018/2019



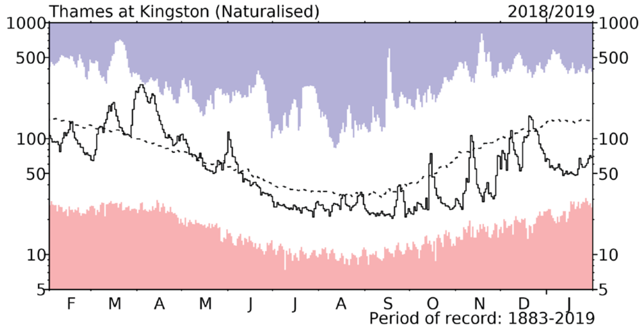
Witham at Claypole Mill 2018/2019



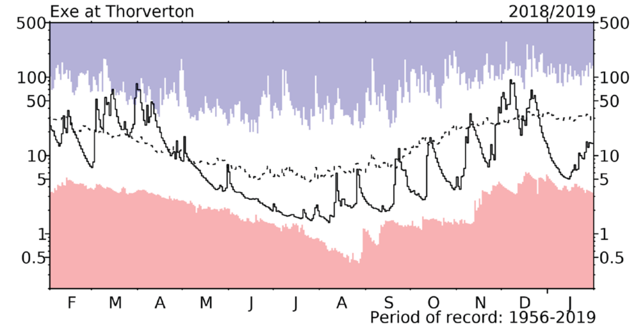
Coln at Bibury 2018/2019



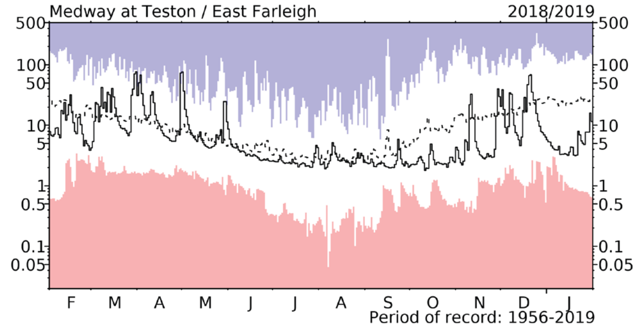
Thames at Kingston (Naturalised) 2018/2019



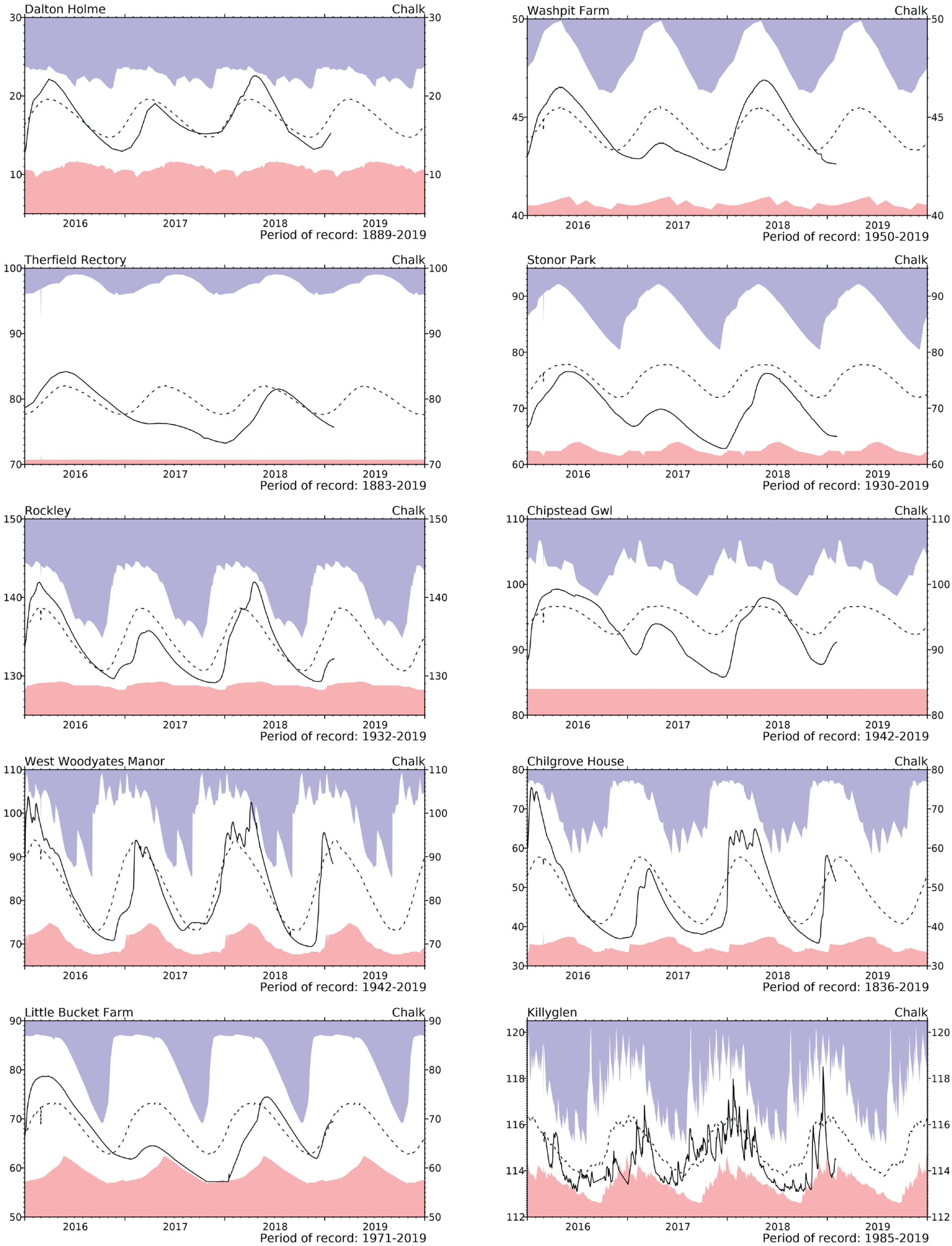
Exe at Thorverton 2018/2019



Medway at Teston / East Farleigh 2018/2019

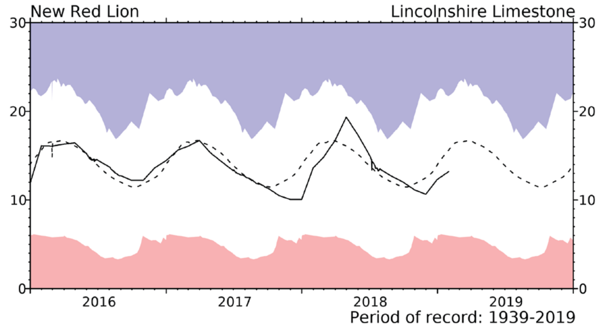


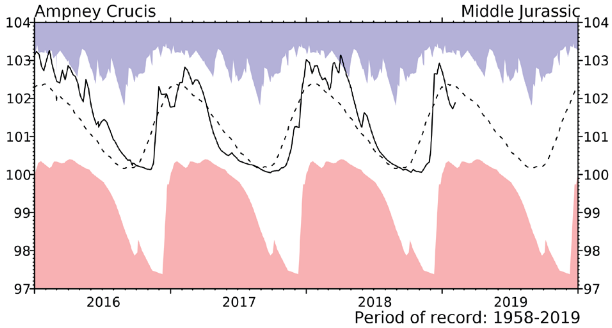
Groundwater . . . Groundwater

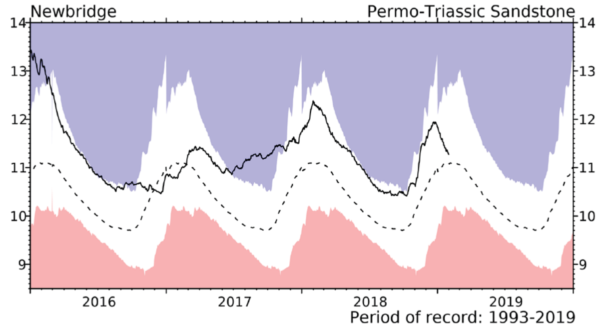


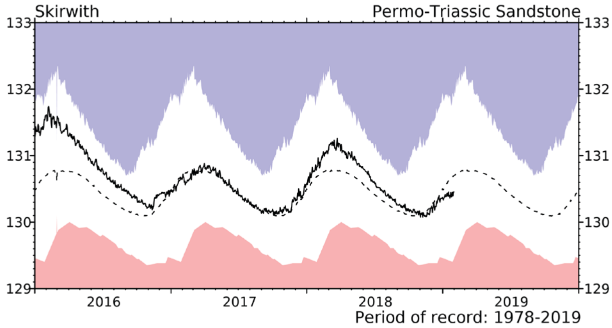
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is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

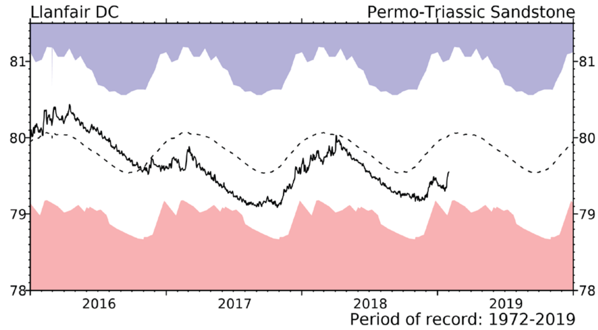
Groundwater... Groundwater

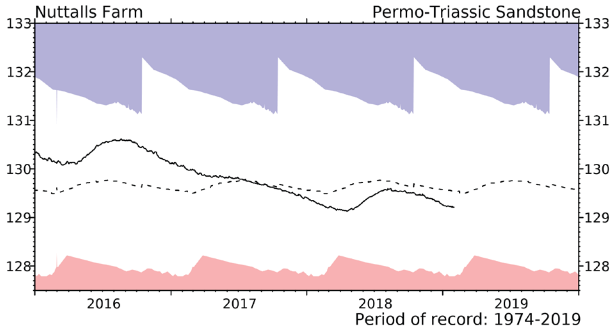


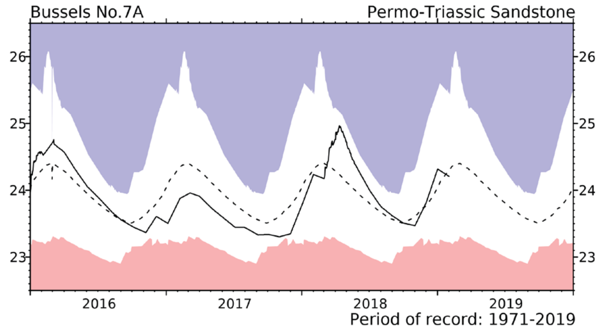


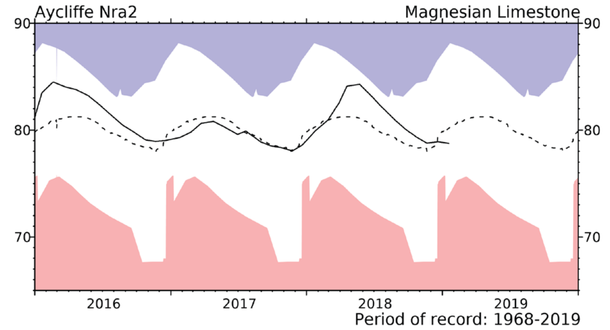


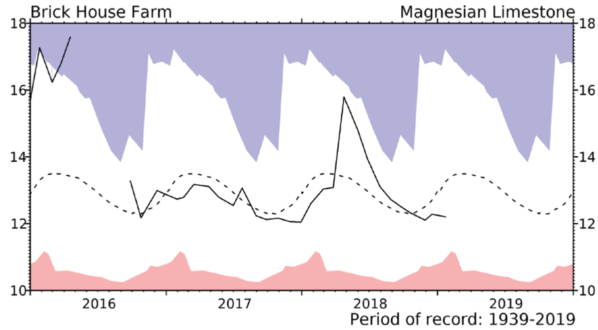


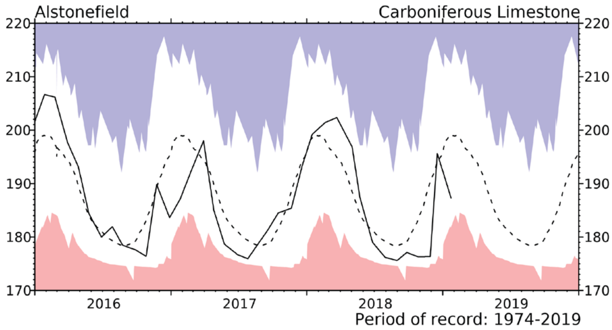


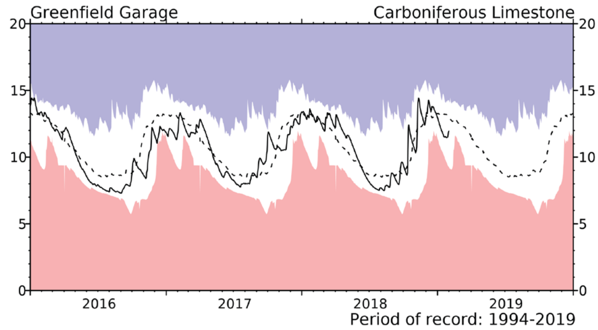


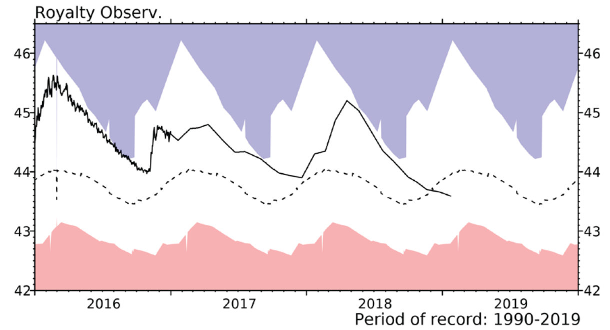




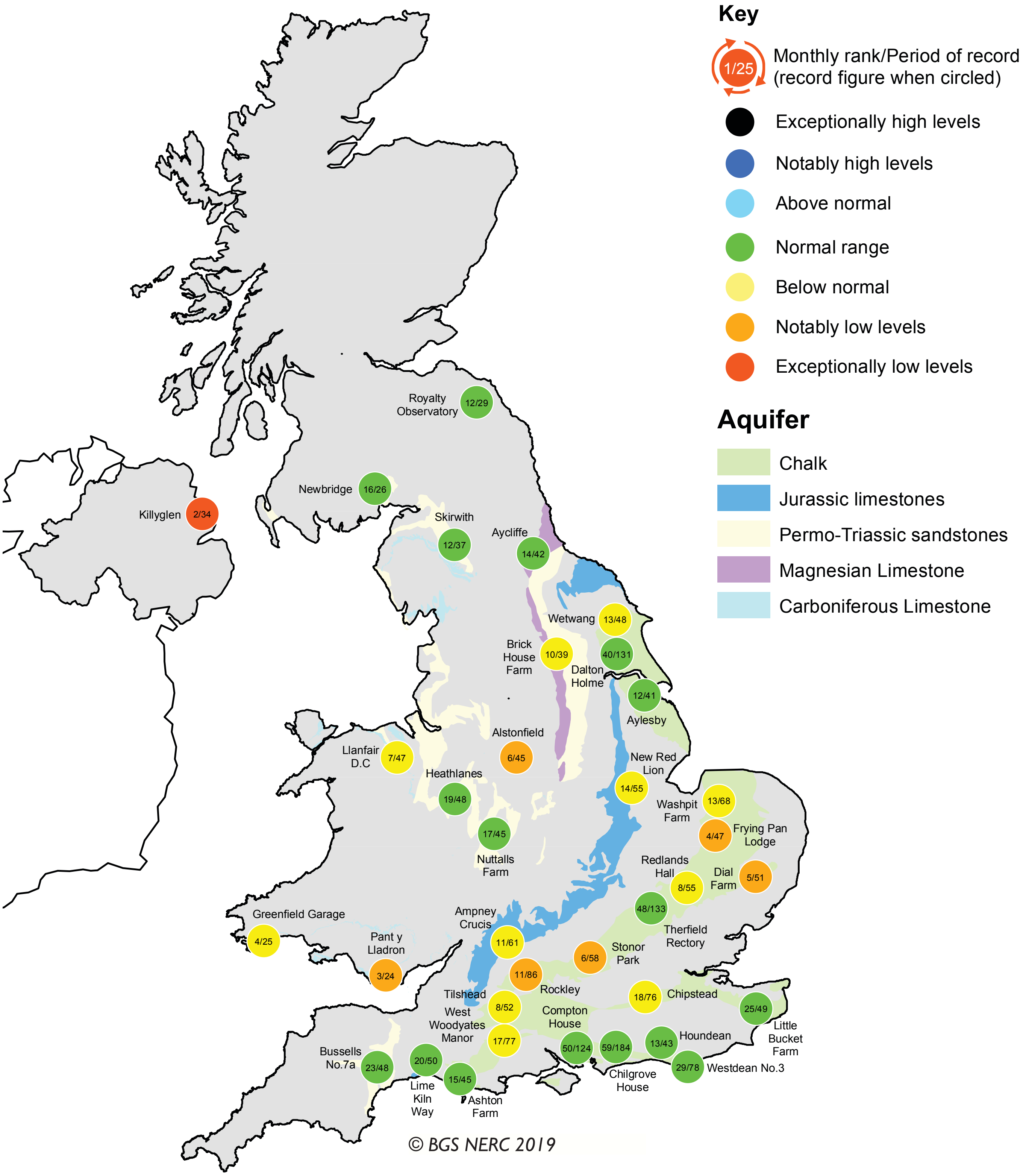








Groundwater...Groundwater

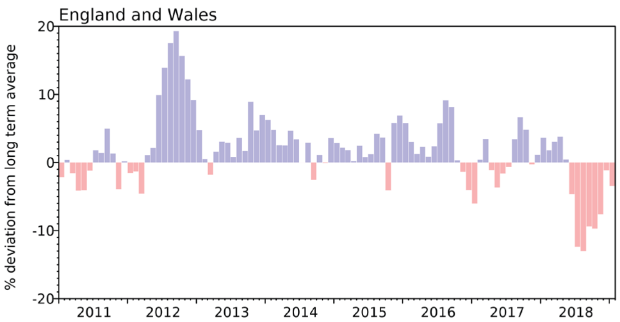


Groundwater levels - January 2019

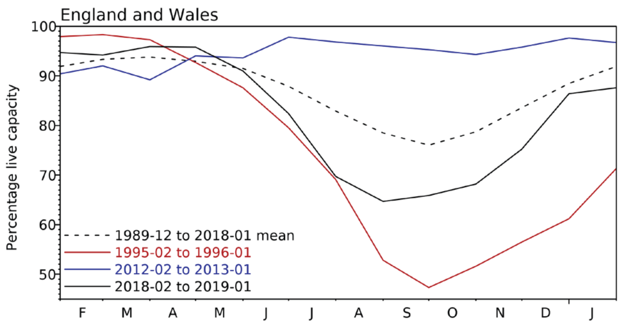
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated.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

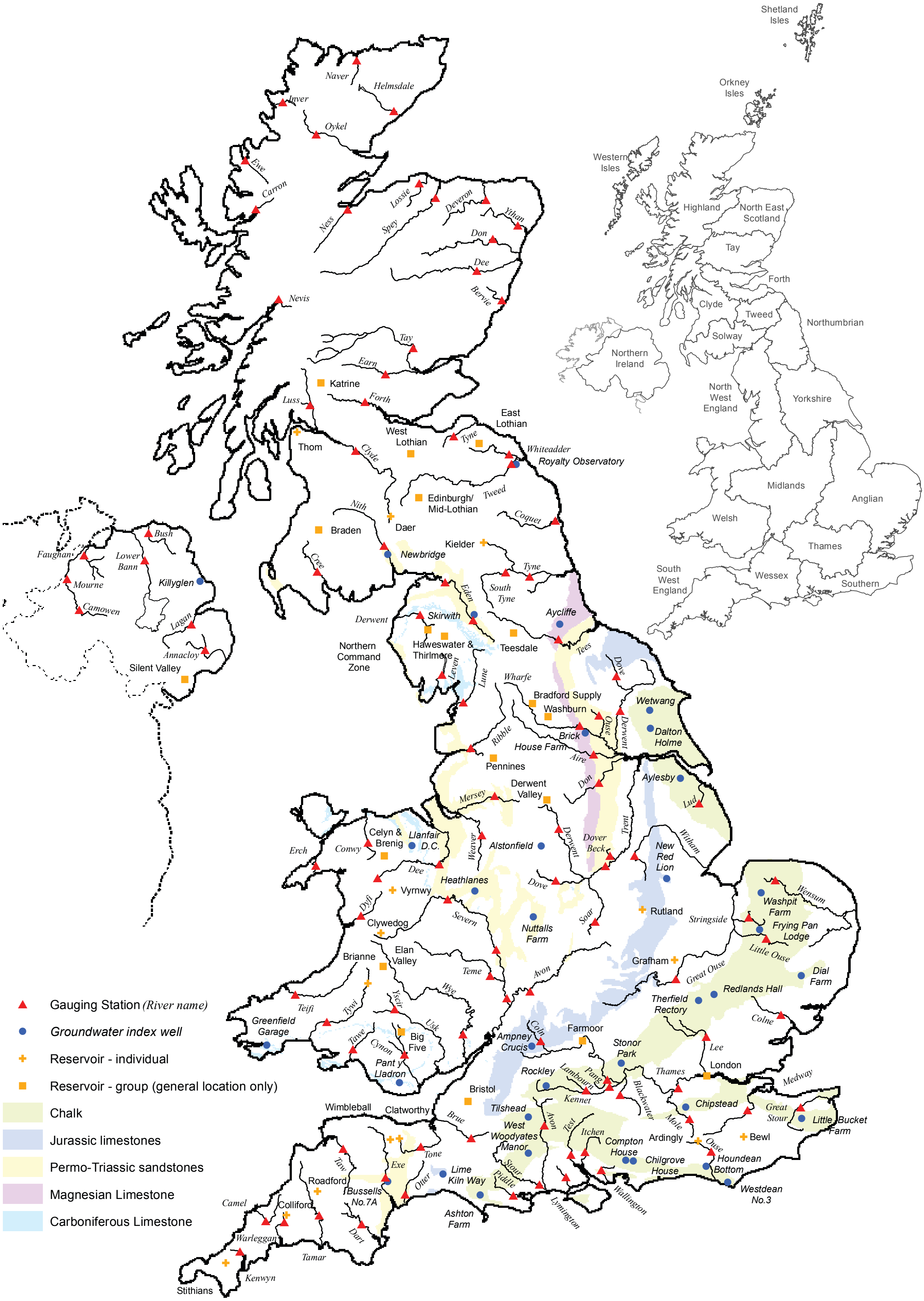
Area	Reservoir		Capacity (Ml)	2018 Nov	2018 Dec	2019 Jan	Jan Anom.	Min Jan	Year* of min	2018 Jan	Diff 19-18
North West	N Command Zone	•	124929	84	90	84	-8	63	1996	87	-3
	Vyrnwy		55146	81	88	89	-4	45	1996	99	-10
Northumbrian	Teesdale	•	87936	86	99	98	5	51	1996	100	-2
	Kielder		(199175)	82	84	82	-12	82	2019	95	-13
Severn-Trent	Clywedog		49936	87	87	94	5	62	1996	93	1
	Derwent Valley	•	46692	40	74	78	-17	15	1996	100	-22
Yorkshire	Washburn	•	23373	60	96	87	-3	34	1996	94	-7
	Bradford Supply	•	40942	54	76	74	-20	33	1996	100	-26
Anglian	Grafham		(55490)	60	66	72	-14	67	1998	92	-20
	Rutland		(116580)	77	82	82	-4	68	1997	92	-10
Thames	London	•	202828	61	87	94	2	70	1997	94	0
	Farmoor	•	13822	94	88	97	6	72	2001	95	2
Southern	Bewl		31000	72	89	95	14	37	2006	64	31
	Ardingly		4685	42	70	75	-17	41	2012	100	-25
Wessex	Clatworthy		5364	52	100	95	0	62	1989	100	-5
	Bristol	•	(38666)	61	82	80	-7	58	1992	99	-19
South West	Colliford		28540	62	74	78	-6	52	1997	100	-22
	Roadford		34500	54	67	68	-14	30	1996	95	-27
	Wimbleball		21320	50	77	83	-7	58	2017	86	-3
	Stithians		4967	55	90	100	11	38	1992	100	0
Welsh	Celyn & Brenig	•	131155	78	87	89	-7	61	1996	98	-10
	Brianne		62140	100	100	99	1	84	1997	100	-1
	Big Five	•	69762	84	90	94	1	67	1997	93	1
	Elan Valley	•	99106	94	100	99	2	73	1996	100	-1
Scotland(E)	Edinburgh/Mid-Lothian	•	96518	92	92	90	-4	72	1999	97	-7
	East Lothian	•	9374	76	95	98	0	68	1990	100	-2
Scotland(W)	Loch Katrine	•	110326	99	96	95	2	85	2000	100	-5
	Daer		22494	99	98	96	-3	90	2013	100	-5
	Loch Thom		10798	99	100	99	2	90	2004	100	-1
Northern Ireland	Total+	•	56800	86	95	93	2	74	2017	99	-6
	Silent Valley	•	20634	85	99	95	6	46	2002	100	-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.

Location map . . . Location map



NHMP

The National Hydrological Monitoring Programme (NHMP) was started in 1988 and is undertaken jointly by the Centre for Ecology & Hydrology (CEH) 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 CEH) and National Groundwater Level Archive (NGLA; maintained by BGS), including rainfall, river flows, borehole levels, and reservoir stocks.

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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

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