Hydrological Summary

for the United Kingdom

General

January was a month of contrasts: the UK temperature was near-average, but it was colder and wetter than average in south-east England, and milder and drier in north-west Britain. While there were some unsettled spells, blocking anticyclonic conditions supressed frontal rainfall for the latter half of the month. There were few deep depressions (although storm surge conditions prompted evacuations on the east coast on the 13th) and notable daily rainfall totals and fluvial flood alerts were rare by the standards of recent winters. The dry January has extended long-term rainfall and runoff deficiencies. January saw modest, but welcome, replenishment in many reservoirs, but at the national scale stocks remained substantially below average (for England & Wales as a whole, stocks were the lowest for January since 1997). Stocks were 30% below average or lower in some impoundments (Wimbleball and Ardingly in southern England, and Silent Valley in Northern Ireland). Rainfall across aquifer areas in the English Lowlands triggered localised increases in groundwater levels, but levels remain well below the normal range across the Chalk. In most areas, water resources are generally resilient to a single dry winter, but the observed deficiencies increase the potential for pressures later in the year. With the window for substantial aquifer and reservoir replenishment narrowing before evapotranspiration rates begin to climb, late-winter/early-spring rainfall patterns will have a significant bearing on the long-term water resources outlook. February started wet, but the latest outlooks suggest a drier end to winter and no clear signal for the spring.

January 2017

Rainfall

The first few days of 2017 were generally settled and cold, in a northerly airflow. From the 6th, the weather became mild and unsettled, bringing frequent and sometimes heavy showers to most parts (e.g. 34mm at Hastings on the 12th; 41mm at Bournemouth on the 13th). During a cold spell from the 11th to the 14th, showers were often wintry, with snowfall across large parts of the country and significant accumulations on higher ground (18cm was reported on the 13th at Tulloch Bridge, Inverness-shire). The second half of the month was dominated by anticyclonic conditions, bringing a prolonged dry spell and some very cold weather, particularly in the south-east as high pressure drew in cold air from the continent. The final days saw a return to milder, unsettled conditions with widespread heavy rainfall. At the national scale, it was the driest January since 2006, with the UK receiving 63% of the long-term average. Moderately above average rainfall was received in south-east England, but large areas of northern Britain registered less than half the typical January total, with some substantially drier pockets – the Forth region registered 36% of average. Although punctuated by a very wet spell in November, the autumn/winter so far has been notably dry. The October-January rainfall for the UK was 65% of average, the second lowest average for these months on record (from 1910), with exceptional deficiencies in some northern and western areas – it was the driest on record for this timeframe for Northern Ireland. In southern Britain the recent anomalies are less exceptional, but more significant deficiencies are apparent from the summer: south-west England saw its second lowest July-January rainfall in a series from 1910.

River flows

After a quiescent start to the year, flows in many responsive catchments climbed in the second week, peaking mid-month with some, generally localised, flood alerts (e.g. in central and southern England on the 15th-17th), although associated peak flows were unremarkable. Thereafter, recessions became established (with new daily minima registered across Northern Ireland) before steep increases occurred in the final days. Average river flows for January were below normal across the country, although flows remained in the normal range in the far north of Scotland. Flows were notably low across other northern and western areas, with exceptionally low flows in some catchments: the Faughan, Eden and Scottish Tyne all registered their second lowest January flows (all in records of longer than 45 years) while the January flow on the Wye was 30% of average, the fourth lowest in a record from 1936. Exceptional runoff deficiencies were prevalent across western Britain over the October-January timeframe, with many index catchments registering new minima for this period. Depressed runoff is also evident in the English Lowlands, with notably low runoff totals in some catchments (e.g. the Medway and Sussex Ouse which registered less than 35% of average). Correspondingly, October-January average outflows for Great Britain and Northern Ireland were the lowest in records from 1961 and 1980, respectively. For much of the country, appreciable runoff deficiencies extend back to late summer, with exceptional deficiencies across western Britain.

Groundwater

In southern and eastern England, soil moisture deficits (SMDs) were above average entering January, but by month-end they were eliminated in the far south, while modest SMDs remained in parts of East Anglia. While the more typical January rainfall and wetter soils in the main aquifer areas of the south-east provided an opportunity for somewhat delayed recharge, generally groundwater levels remained below normal across the Chalk, except at Aylesby and Therfield Rectory where they were in the normal range. Levels continued to recede in slowly-responding sites in the Chilterns (Stonor Park), North Downs (Chipstead, Little Bucket Farm) and Norfolk (Washpit Farm). Despite some notable increases (e.g. at Chilgrove House and West Woodyates Manor), levels in the central southern Chalk were notably low (exceptionally so for Compton House; the seventh lowest January level in a 122 year record). In the more rapidly responding Jurassic and Magnesian limestones, levels were generally in the normal range, despite a small decrease in level at Brick House Farm. In the Permo-Triassic sandstones, levels were relatively stable. Most levels were in the normal range, but Llanfair DC and Bussells No.7A were below normal despite rising slightly, while at Nuttalls Farm levels fell slightly but remained above normal. Levels in the Carboniferous Limestone remained notably low in the Peak District and across south Wales, despite significant increases at Alstonefield and Pant y Lladron.

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Geological Survey
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Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

Percentages are from the 1981-2010 average.

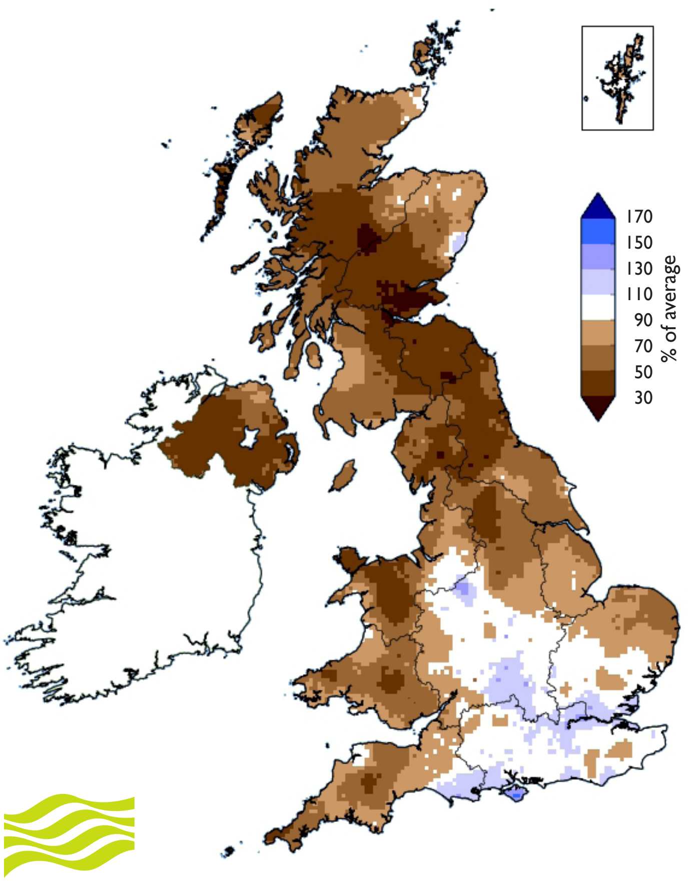
Region	Rainfall	Jan 2017	Dec16 – Jan17		Nov16 – Jan17		Oct16 – Jan17		Jul16 – Jan17	
				RP		*RP*		*RP*		*RP*
United	mm	**76**	158		266		315		583	
Kingdom	%	**63**	66	8-12	74	8-12	65	60-90	79	10-20
England	mm	**64**	100		204		243		415	
	%	**78**	59	10-15	80	2-5	70	10-20	76	10-20
Scotland	mm	**94**	252		365		431		839	
	%	**54**	75	2-5	74	5-10	65	30-50	84	2-5
Wales	mm	**94**	181		315		362		699	
	%	**61**	57	10-15	66	10-15	56	80-120	74	15-25
Northern	mm	**53**	132		213		262		538	
Ireland	%	**46**	57	30-50	62	50-80	56	>100	73	30-50
England &	mm	**68**	111		219		259		455	
Wales	%	**74**	59	10-15	77	5-10	67	15-25	76	10-20
North West	mm	**75**	153		289		330		684	
	%	**61**	59	8-12	75	5-10	63	25-40	84	5-10
Northumbria	mm	**39**	91		208		268		501	
	%	**47**	54	15-25	81	2-5	78	5-10	90	2-5
Severn-Trent	mm	**60**	94		188		216		374	
	%	**84**	63	5-10	84	2-5	71	10-15	76	10-20
Yorkshire	mm	**46**	92		197		244		436	
	%	**57**	55	10-20	79	5-10	73	8-12	82	5-10
Anglian	mm	**45**	68		139		179		300	
	%	**85**	63	5-10	84	2-5	78	5-10	76	8-12
Thames	mm	**74**	94		188		215		328	
	%	**108**	68	5-10	88	2-5	74	5-10	72	10-20
Southern	mm	**86**	104		209		241		338	
	%	**104**	61	5-10	80	2-5	67	5-10	64	25-40
Wessex	mm	**87**	115		232		274		418	
	%	**96**	61	5-10	81	2-5	71	5-10	73	10-20
South West	mm	**94**	139		282		333		540	
	%	**70**	49	10-20	67	8-12	60	40-60	67	40-60
Welsh	mm	**92**	175		308		354		675	
	%	**63**	58	8-12	68	8-12	57	70-100	74	15-25
Highland	mm	**115**	348		464		530		1015	
	%	**53**	84	2-5	76	2-5	65	10-15	85	2-5
North East	mm	**67**	143		233		320		569	
	%	**68**	75	5-10	78	5-10	76	5-10	87	5-10
Tay	mm	**64**	192		272		351		655	
	%	**40**	64	5-10	62	15-25	60	50-80	75	10-20
Forth	mm	**49**	161		236		295		577	
	%	**36**	62	5-10	63	15-25	58	>100	73	10-20
Tweed	mm	**46**	122		230		288		561	
	%	**44**	58	10-20	74	5-10	68	10-20	84	5-10
Solway	mm	**93**	201		314		363		757	
	%	**58**	62	8-12	65	10-15	56	>100	76	5-10
Clyde	mm	**120**	292		438		498		1012	
	%	**57**	72	2-5	73	5-10	62	30-50	83	2-5

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

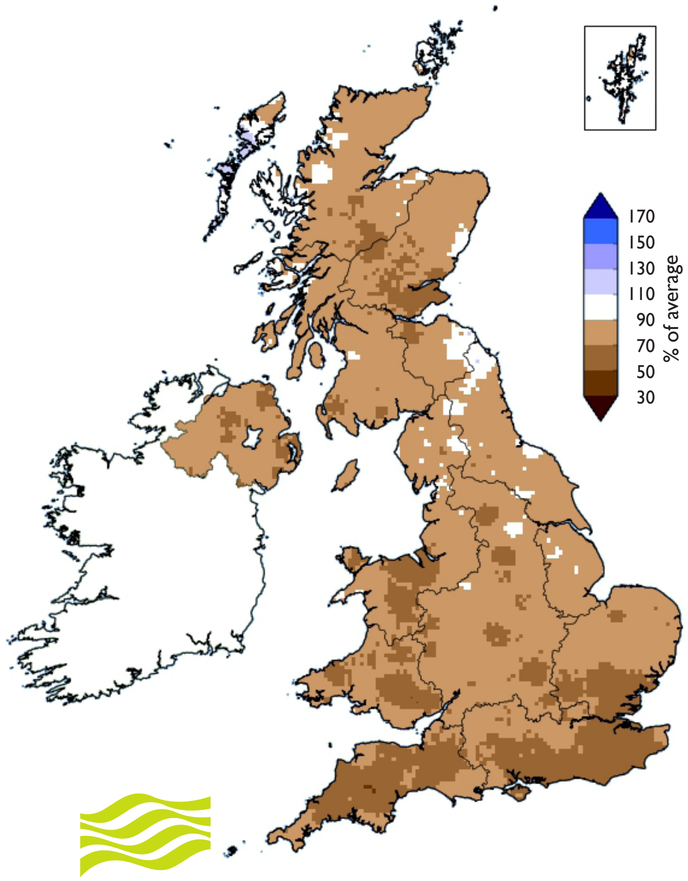
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic 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 February 2016 are provisional.

Rainfall . . . Rainfall . . .

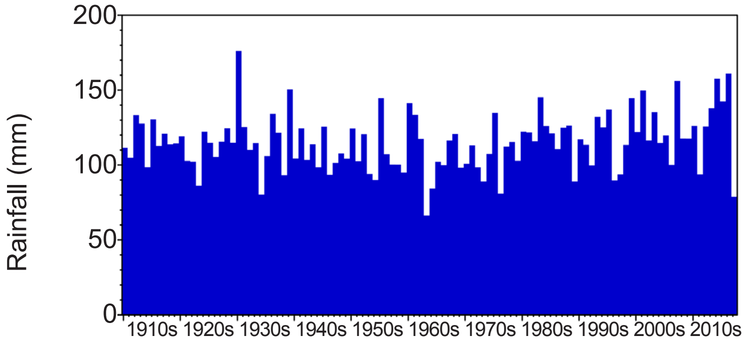
January 2017 rainfall as % of 1981-2010 average



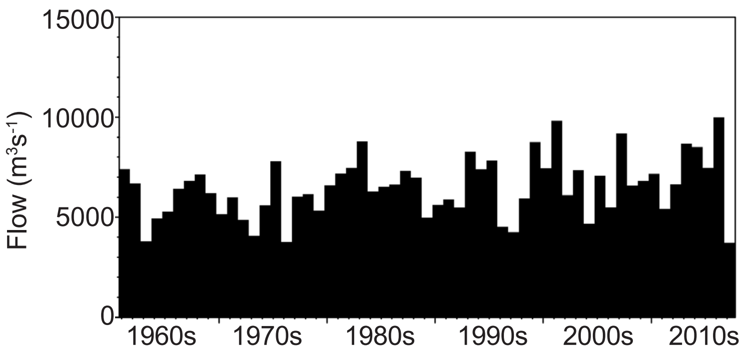
July 2016 - January 2017 rainfall as % of 1981-2010 average



October to January average UK rainfall



October to January average GB outflow



Hydrological Outlook UK

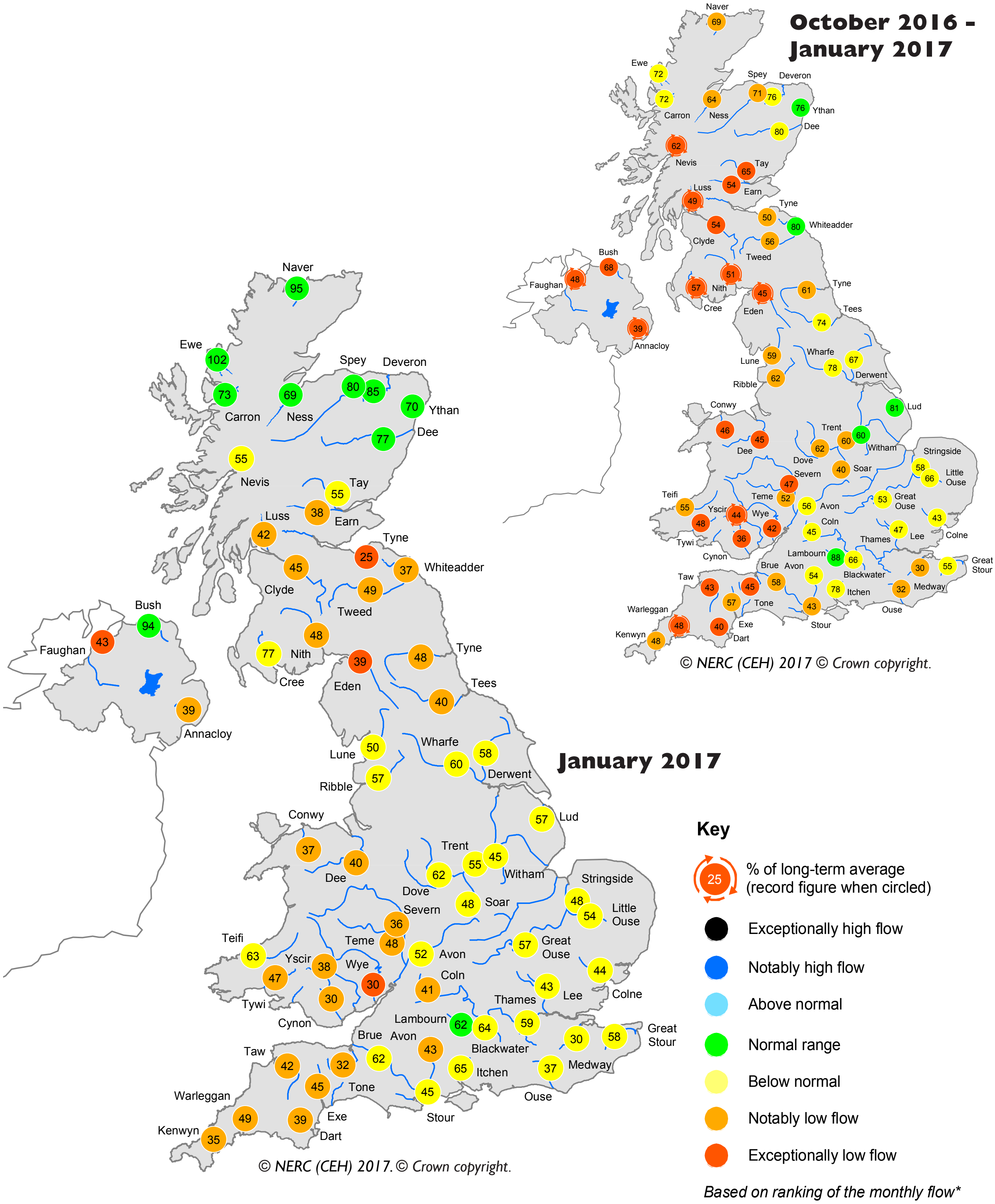
The Hydrological Outlook provides an insight into future hydrological conditions across the UK. Specifically it describes likely trajectories for river flows and groundwater levels on a monthly basis, with particular focus on the next three months.

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

Period: **from February 2017**
Issued: **10.02.2017**
using data to the end of January 2017

For both river flows and groundwater levels, the outlook is for a normal to below normal signal across south-eastern England over the next one to three months. River flows in northern and western parts of the UK are less certain, although flows within the normal range are most likely for February.

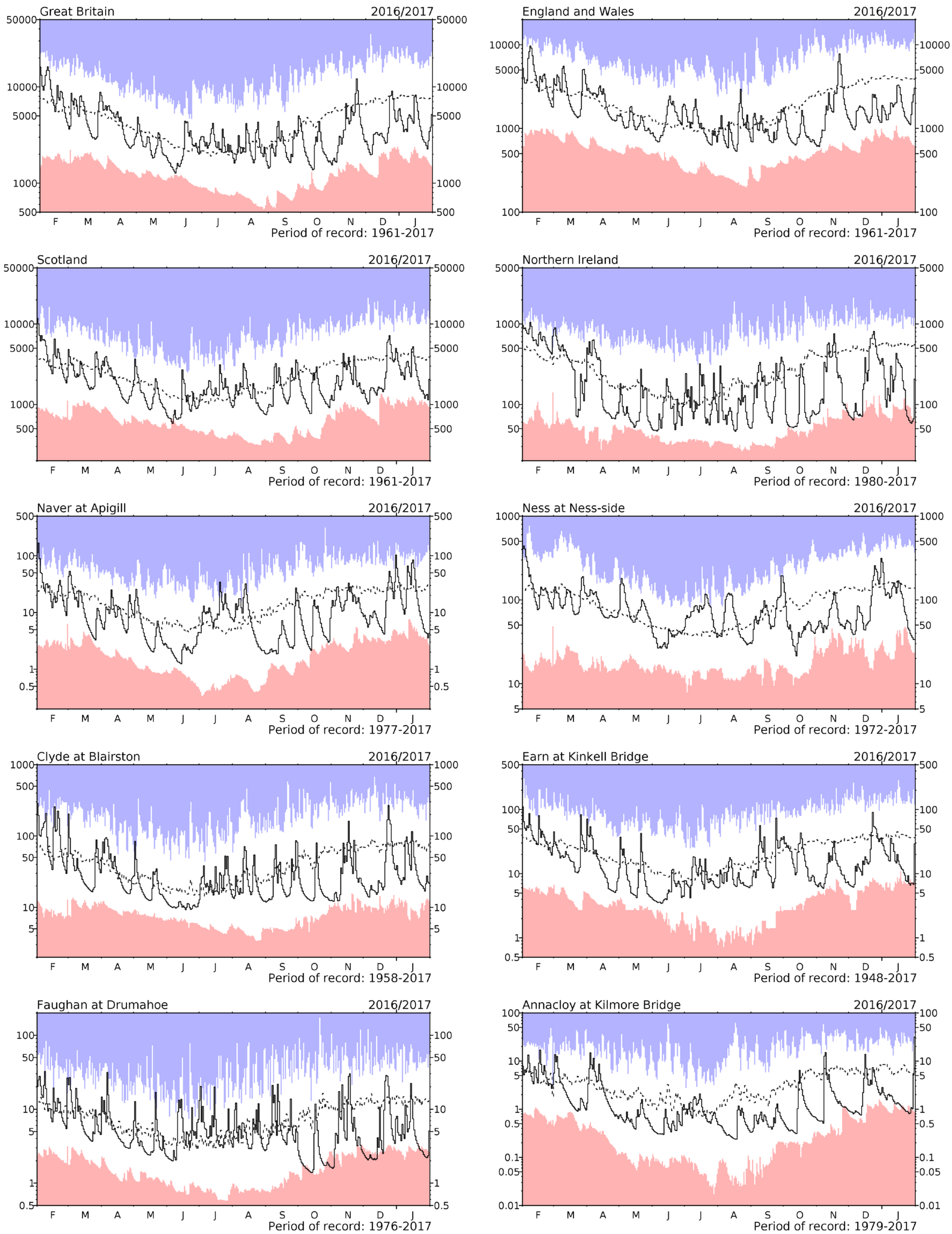
River flow . . . River flow . . .



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 ...

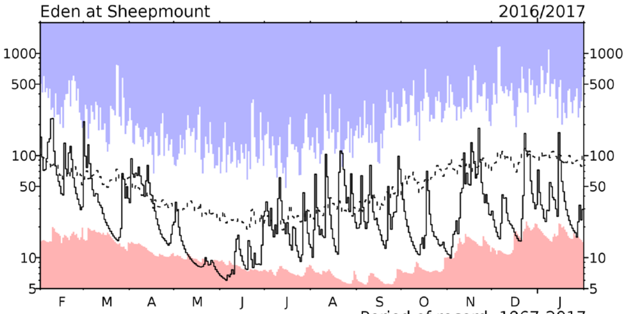


River flow hydrographs

The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to February 2016 (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.

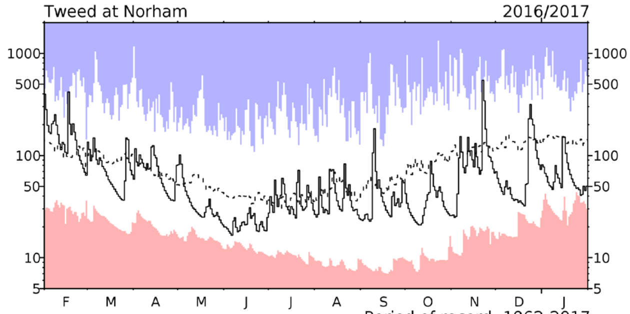
River flow . . . River flow . . .

Eden at Sheepmount 2016/2017



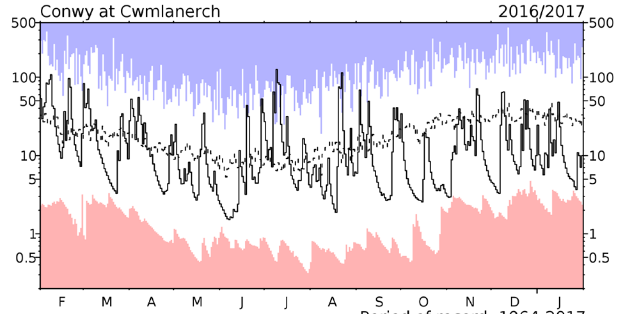
Period of record: 1967-2017

Tweed at Norham 2016/2017



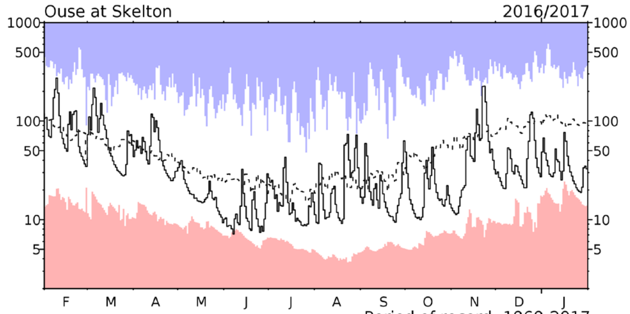
Period of record: 1962-2017

Conwy at Cwmlanerch 2016/2017



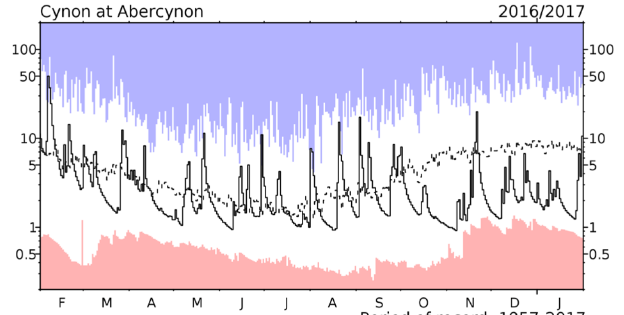
Period of record: 1964-2017

Ouse at Skelton 2016/2017



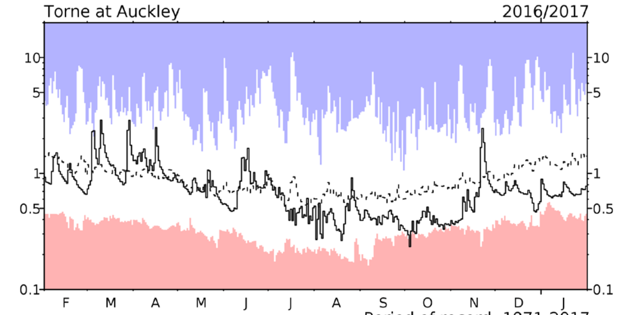
Period of record: 1969-2017

Cynon at Abercynon 2016/2017



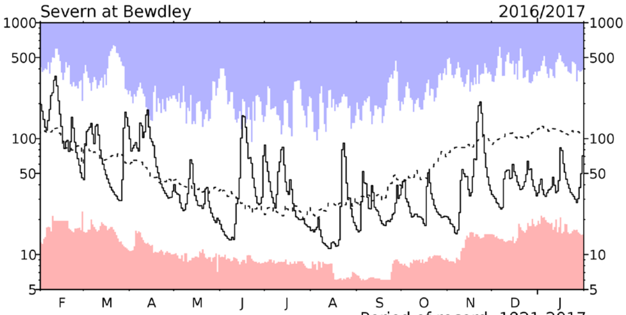
Period of record: 1957-2017

Torne at Auckley 2016/2017



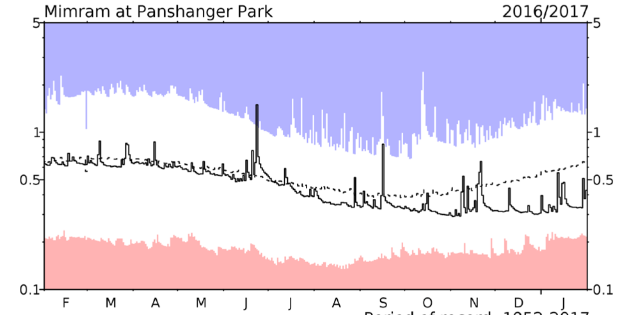
Period of record: 1971-2017

Severn at Bewdley 2016/2017



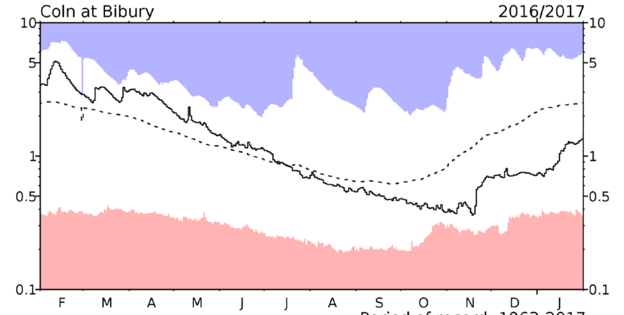
Period of record: 1921-2017

Mimram at Panshanger Park 2016/2017



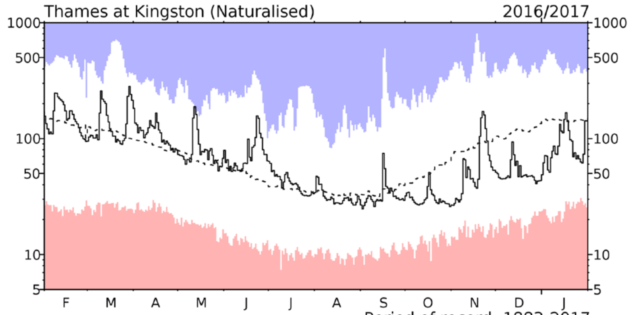
Period of record: 1952-2017

Coln at Bibury 2016/2017



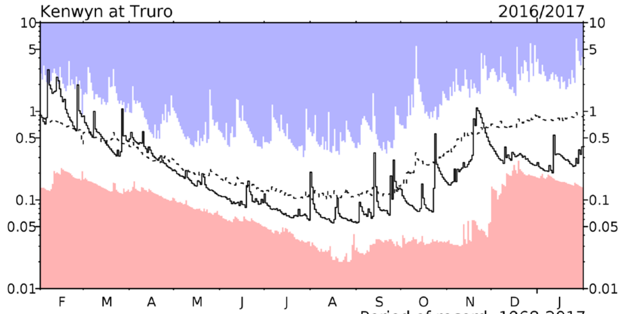
Period of record: 1963-2017

Thames at Kingston (Naturalised) 2016/2017



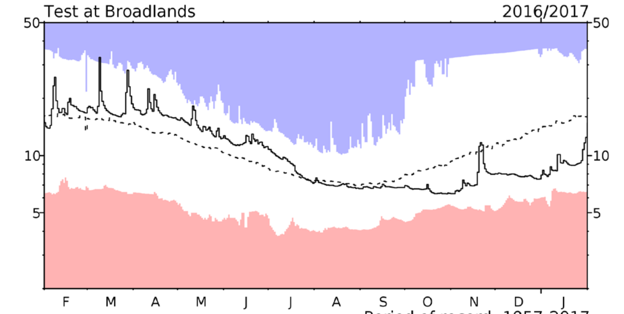
Period of record: 1883-2017

Kenwyn at Truro 2016/2017



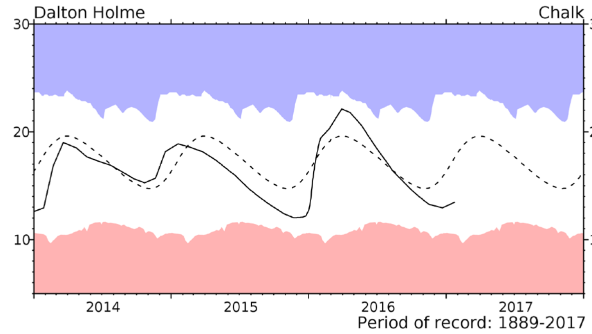
Period of record: 1968-2017

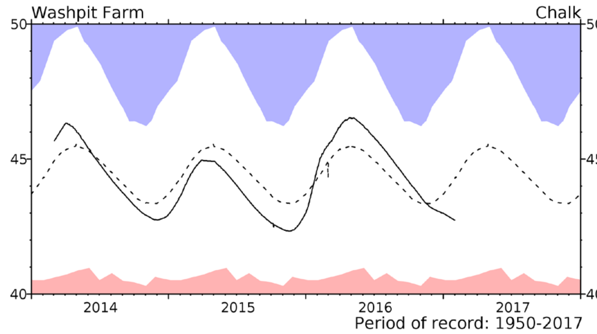
Test at Broadlands 2016/2017

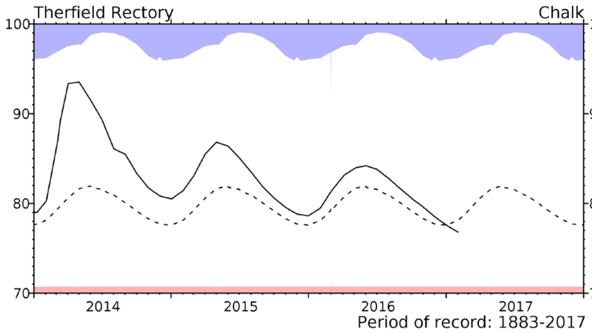


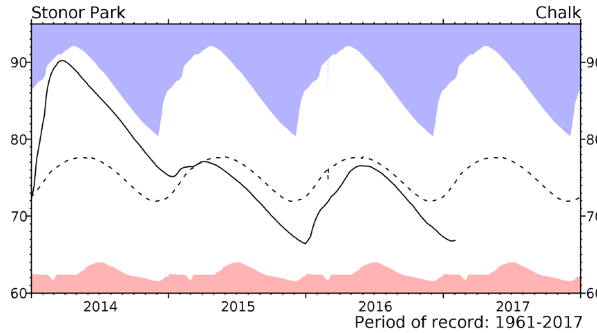
Period of record: 1957-2017

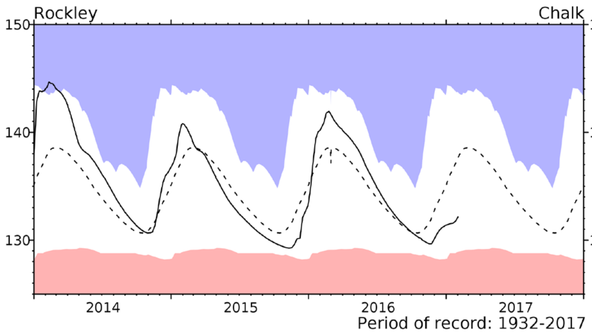
Groundwater . . . Groundwater

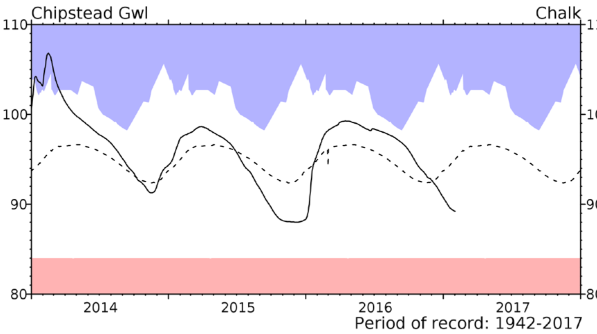


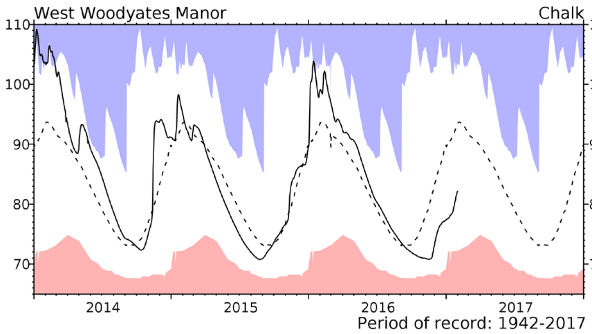


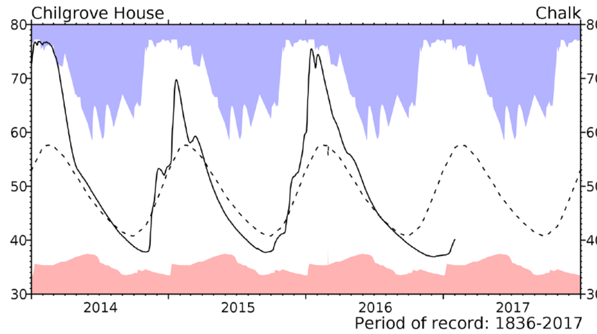


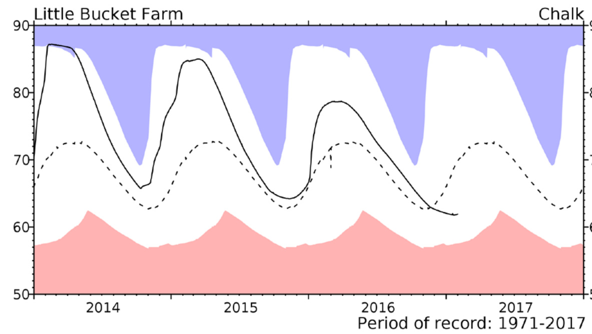


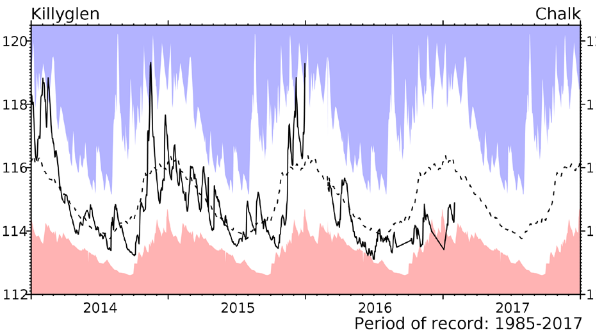




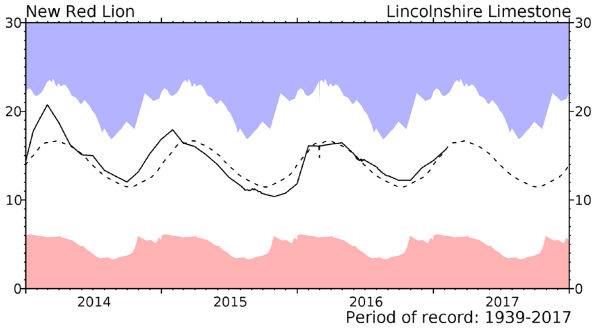


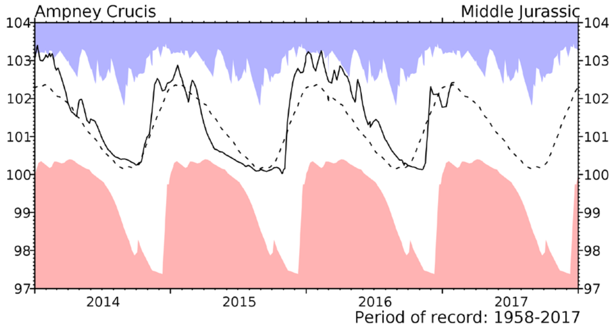


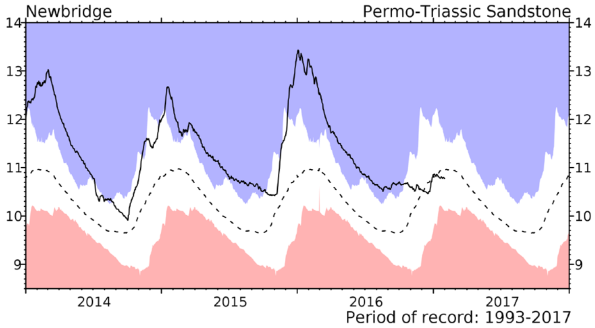


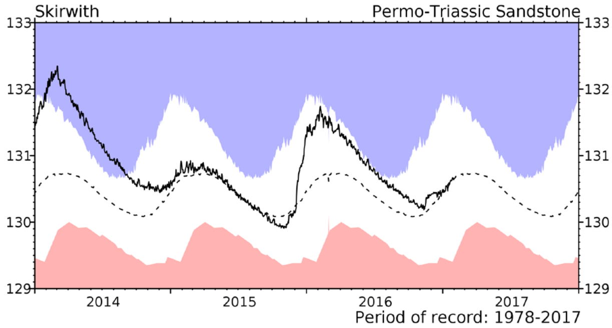


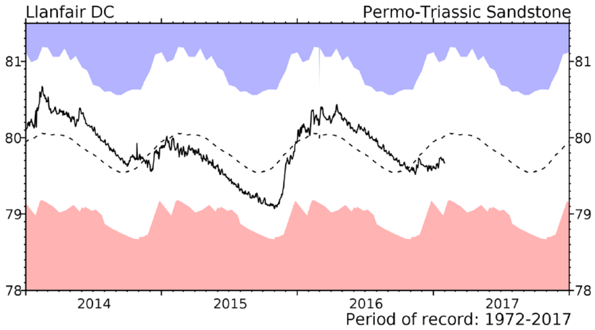
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is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

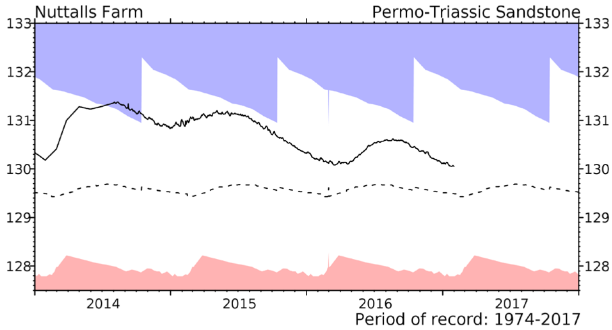

New Red Lion
Lincolnshire Limestone
2014
2015
2016
2017
Period of record: 1939-2017

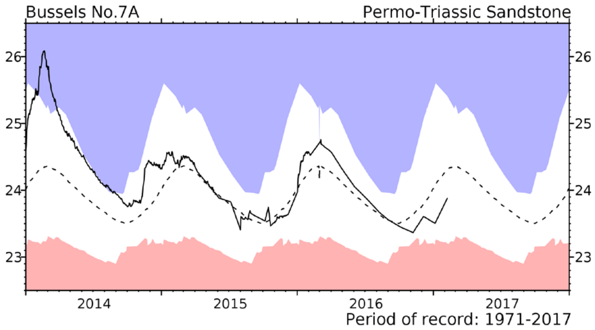

Ampney Crucis
Middle Jurassic
2014
2015
2016
2017
Period of record: 1958-2017

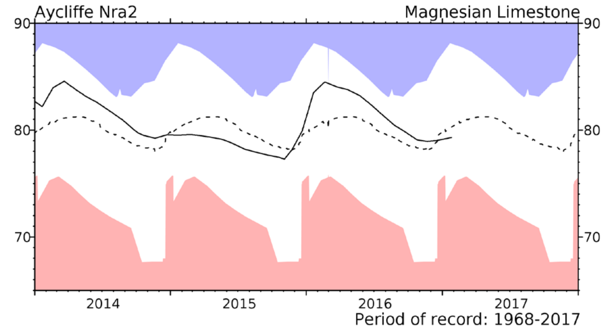

Newbridge
Permo-Triassic Sandstone
2014
2015
2016
2017
Period of record: 1993-2017

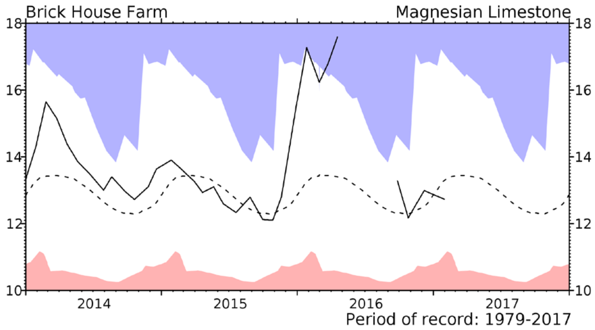

Skirwith
Permo-Triassic Sandstone
2014
2015
2016
2017
Period of record: 1978-2017

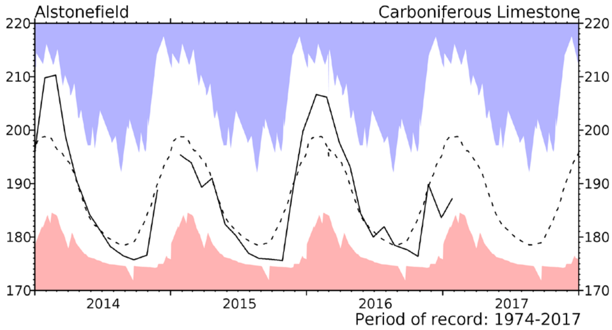

Llanfair DC
Permo-Triassic Sandstone
2014
2015
2016
2017
Period of record: 1972-2017

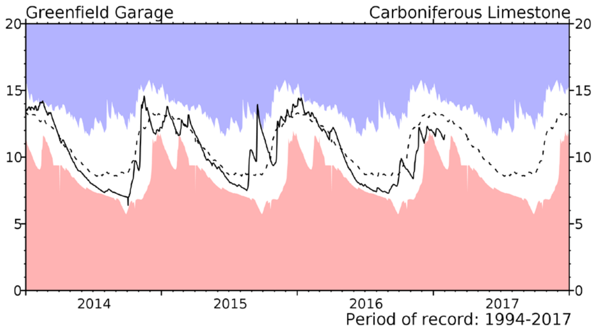

Nuttalls Farm
Permo-Triassic Sandstone
2014
2015
2016
2017
Period of record: 1974-2017

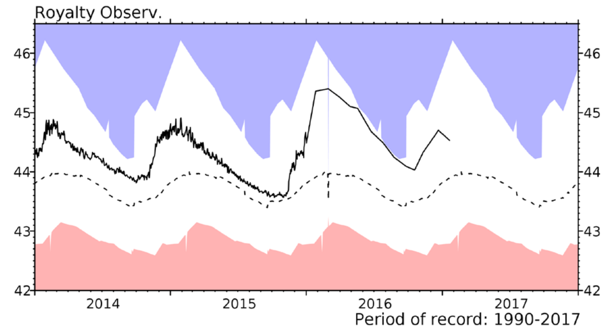

Bussels No.7A
Permo-Triassic Sandstone
2014
2015
2016
2017
Period of record: 1971-2017


Aycliffe Nra2
Magnesian Limestone
2014
2015
2016
2017
Period of record: 1968-2017

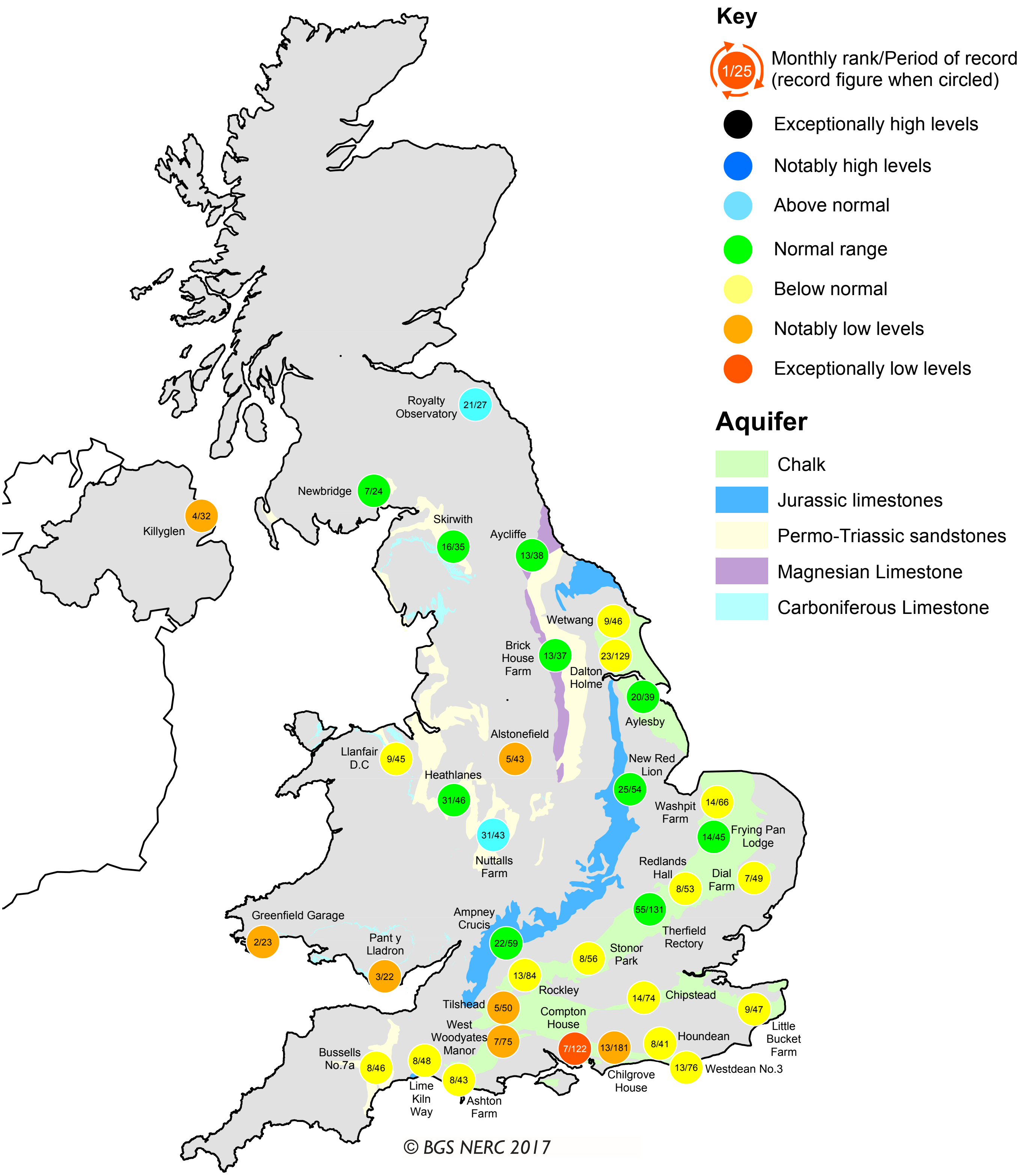

Brick House Farm
Magnesian Limestone
2014
2015
2016
2017
Period of record: 1979-2017


Alstonefield
Carboniferous Limestone
2014
2015
2016
2017
Period of record: 1974-2017


Greenfield Garage
Carboniferous Limestone
2014
2015
2016
2017
Period of record: 1994-2017


Royalty Observ.
2014
2015
2016
2017
Period of record: 1990-2017

Groundwater...Groundwater

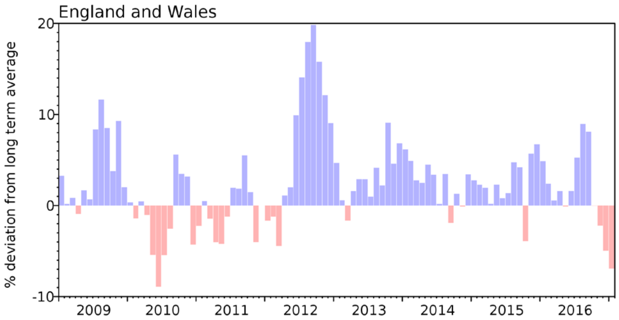


Groundwater levels - January 2017

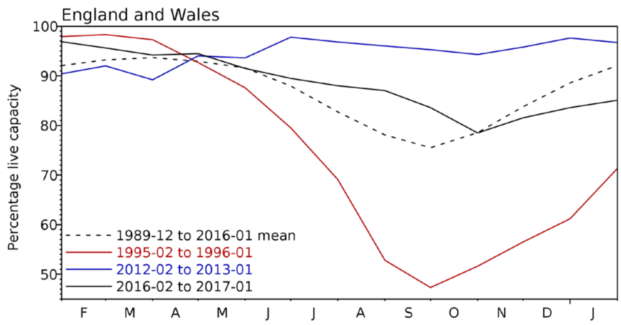
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated.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

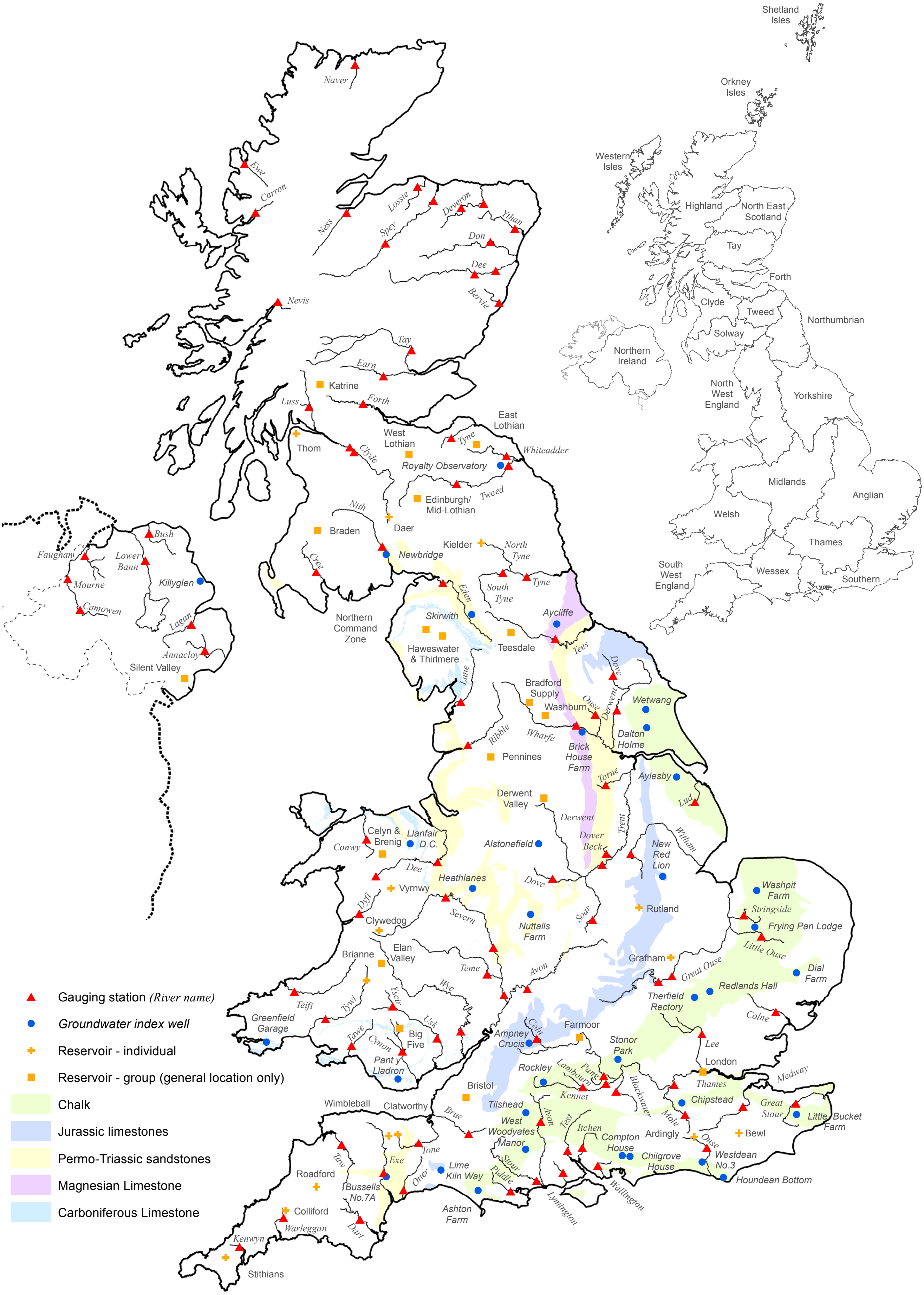
Area	Reservoir		Capacity (Ml)	2016 Nov	2016 Dec	2017 Jan	Jan Anom.	Min Jan	Year* of min	2016 Jan	Diff 17-16
North West	N Command Zone	•	124929	69	70	69	-24	63	1996	100	-31
	Vyrnwy		55146	82	85	84	-9	45	1996	99	-15
Northumbrian	Teesdale	•	87936	90	92	93	1	51	1996	100	-7
	Kielder		(199175)	82	88	84	-10	84	2017	99	-15
Severn-Trent	Clywedog		44922	89	87	91	3	62	1996	97	-5
	Derwent Valley	•	39525	94	100	92	-3	15	1996	100	-8
Yorkshire	Washburn	•	22035	74	79	78	-13	34	1996	96	-18
	Bradford Supply	•	41407	81	80	78	-17	33	1996	97	-19
Anglian	Grafham		(55490)	86	78	87	1	67	1998	91	-4
	Rutland		(116580)	85	81	87	1	68	1997	94	-7
Thames	London	•	202828	81	86	92	1	70	1997	97	-4
	Farmoor	•	13822	87	95	93	3	72	2001	79	14
Southern	Bewl		28170	58	56	59	-23	37	2006	83	-24
	Ardingly		4685	48	46	60	-33	41	2012	100	-40
Wessex	Clatworthy		5364	58	65	71	-25	62	1989	100	-29
	Bristol	•	(38666)	66	68	73	-14	58	1992	99	-26
South West	Colliford		28540	66	67	70	-14	52	1997	100	-30
	Roadford		34500	67	64	65	-18	30	1996	98	-33
	Wimbleball		21320	51	50	58	-34	58	2017	100	-42
	Stithians		4967	75	81	86	-3	38	1992	100	-15
Welsh	Celyn & Brenig	•	131155	91	94	94	-1	61	1996	100	-6
	Brianne		62140	91	97	94	-4	84	1997	100	-6
	Big Five	•	69762	80	85	86	-7	67	1997	84	2
	Elan Valley	•	99106	91	91	95	-2	73	1996	99	-4
Scotland(E)	Edinburgh/Mid-Lothian	•	96518	83	86	85	-10	72	1999	100	-15
	East Lothian	•	9374	100	100	100	2	68	1990	100	0
Scotland(W)	Loch Katrine	•	110326	88	93	89	-4	85	2000	98	-9
	Daer		22412	79	91	93	-5	90	2013	100	-7
	Loch Thom		10798	93	96	91	-7	90	2004	100	-9
Northern Ireland	Total+	•	56800	73	76	74	-18	74	2017	100	-26
	Silent Valley	•	20634	64	65	59	-30	46	2002	100	-41

( ) 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.

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 Rivers Agency 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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