Hydrological Summary

for the United Kingdom

February 2018

General

February was a notably dry and exceptionally cold month, with snow and ice causing periodic and at times widespread disruption. Large parts of south-west and eastern England registered monthly mean temperatures more than 1.5°C below average, and the minimum daily temperature of -11.7°C was registered at South Farnborough (Hampshire) on the final day of the month. Under clear skies that accompanied the cold temperatures, it was provisionally the second sunniest February for the UK in a series from 1929. As February progressed, an increasing proportion of the precipitation fell as snow, and disruption of transport networks, schools and hospitals, and power supplies intensified dramatically towards month-end and into early March. Rainfall for the UK was around three quarters of average in February, and two thirds of average across swathes of eastern Scotland and central, southern and south-western England. Despite the dry weather, river flows were generally in the normal range across most of the country. The seasonal recovery of groundwater levels continued at most sites, albeit at a slower rate due to the drier weather of February, and levels were generally in the normal range. With reservoir stocks healthy (above average in almost all major reservoirs) and most river flows and groundwater levels within the normal range, the outlook for water resources has improved relative to the situation at the start of winter. Nevertheless, groundwater levels were low in parts of the Chalk aquifer, and rainfall during the remainder of the recharge season will be influential on the extent of streamflow network contraction and localised water resource stress in these areas in the summer.

Rainfall

The first half of February was unsettled, though the absence of westerly airflows limited rainfall totals and kept temperatures low. Blizzards and icy conditions between the 8th and 12th caused disruption in south-west England, where pluvial flooding, landslides and fallen trees impacted transport networks. The second half of February was drier and briefly milder before persistent anticyclonic conditions drew in a strong easterly flow of extremely cold air from Siberia over the final week. Precipitation was dominated by snowfall towards month-end (e.g. 5-10cm across a swathe of south-east England on the 27th; 21cm at Copley (Durham) on the 28th). A red warning for snow (only the second ever) for the central belt of Scotland was issued on the 28th, and snow caused widespread disruption across Scotland and northern, southern and eastern England. Road networks were severely impacted and there were delays and cancellations across numerous train operators and airports (e.g. Glasgow airport was closed). More than 4,000 schools in Britain were closed, hospitals cancelled appointments, and power cuts in Aberdeen affected 27,000 homes. For February overall, large areas of Scotland, Wales and southern England registered less than 70% of average rainfall. Localised parts of the Scottish Highlands, Welsh borders and the south-west of England received less than half the average rainfall, and it was the driest February since 1991 for the Shetland Islands. The only exceptions to the dry weather were Norfolk and parts of Northern Ireland and the Scottish borders. For the winter (December-February), UK rainfall was 97% of average; whilst most of Scotland and northern England received below average rainfall (North East Scotland registered two thirds of average, the driest winter since 1991/92), Northern Ireland and East Anglia were wetter than average.

River flows

Following rainfall in late January, high flows characterised many responsive catchments entering February, and river flows generally receded over the first week. Unsettled weather mid-month was sufficient to interrupt these recessions, but there were few notably high flows. Thereafter, recessions continued over the final week of the month, very steeply in responsive catchments including in the north and east where the majority of precipitation fell as snow. Recessions towards month-end were widespread, reflected in national outflows which declined steeply. In many responsive catchments, river flows approached daily minima towards month-end, though the melting of snow accumulated through the last few days of February will contribute to flows in March. Rivers flows in February were mostly in the normal range, although below normal flows were recorded on tributaries of the Thames and Trent and in north-east Scotland. Flows on the Scottish Dee were notably low. Only the Bush experienced above normal flows in February, registering as notably high with 150% of average flow. For winter overall (December-February), flows were mostly near average, though above normal in Northern Ireland (notably high on the Bush) and south-west Wales, and below normal in north-east Scotland and some groundwater-influenced catchments of southern England. Around two thirds of the average flow was recorded on the Whiteadder, Witham, Lambourn and Medway, and flows were notably low on the Scottish Dee.

Groundwater

With the exception of an area around the Wash, soils remained saturated in February for the vast majority of the country. Groundwater levels throughout the Chalk generally rose but stabilised at Westdean No.3 and decreased at Wetwang, Chilgrove House, Ashton Farm, West Woodyates Manor and Killyglen. The majority of levels remained within the normal range, but were still below average in the Chilterns, parts of East Anglia and east Kent, and were notably low at Dial Farm and Stonor Park. In the more rapidly responding Jurassic limestones, levels at Ampney Crucis fell into the normal range in February, whilst at New Red Lion they rose but remained below normal. In the Magnesian limestone levels rose and remained in the normal range for the time of year. Levels in the Upper Greensand at Lime Kiln Way rose and were below normal after four months of notably low levels. In the Permo-Triassic sandstones, groundwater levels were generally in the normal range but Llanfair DC was below normal and Skirwith and Newbridge above; the latter was notably high for February despite the overall decrease in levels. Levels in the Carboniferous Limestone fell at Greenfield Garage and Pant y Lladron and rose at Alstonefield, though were mostly within the normal range. Levels in the Fell Sandstone at Royalty Observatory stabilised and remained in the normal range.

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.

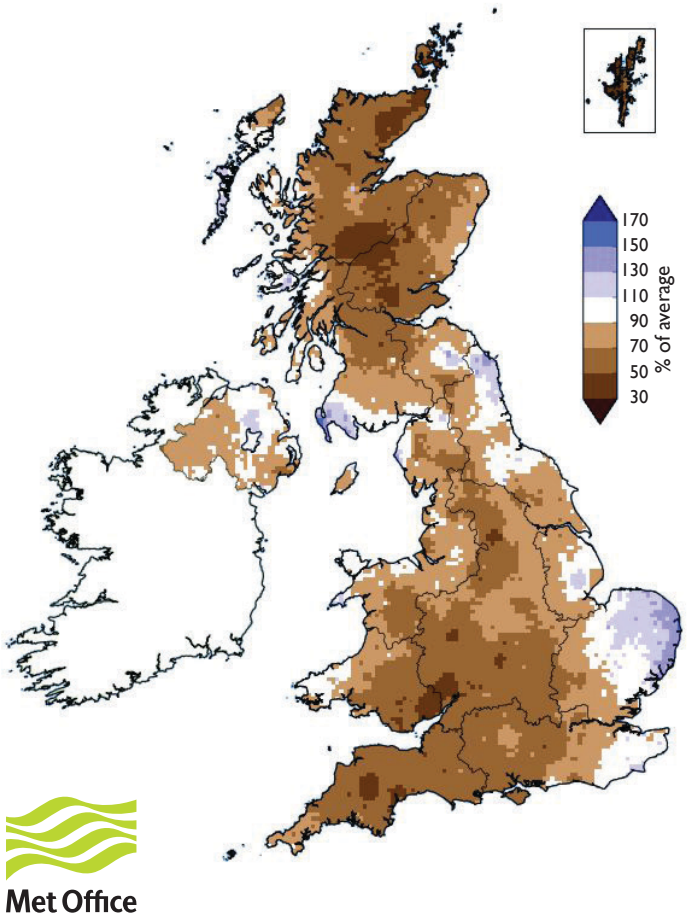
Region	Rainfall	Feb 2018	Dec17 – Feb18	RP	Sep17 – Feb18	RP	Jun17 – Feb18	RP	Mar17 – Feb18	RP
United Kingdom	mm	**64**	317		644		969		1161	
	%	**74**	97	2-5	97	2-5	108	5-10	103	2-5
England	mm	**45**	233		450		706		853	
	%	**75**	102	2-5	95	2-5	106	2-5	101	2-5
Scotland	mm	**91**	415		888		1307		1552	
	%	**71**	89	2-5	96	2-5	107	5-10	102	2-5
Wales	mm	**80**	446		888		1274		1538	
	%	**74**	105	2-5	103	2-5	112	5-10	108	2-5
Northern Ireland	mm	**74**	352		707		1064		1262	
	%	**89**	112	2-5	111	5-10	119	25-40	111	10-20
England & Wales	mm	**50**	262		511		784		947	
	%	**75**	103	2-5	97	2-5	107	2-5	102	2-5
North West	mm	**70**	346		803		1193		1413	
	%	**79**	99	2-5	112	5-10	121	10-20	115	10-20
Northumbria	mm	**59**	211		481		781		931	
	%	**91**	90	2-5	101	2-5	113	5-10	107	2-5
Severn-Trent	mm	**35**	207		400		616		761	
	%	**67**	103	2-5	95	2-5	101	2-5	97	2-5
Yorkshire	mm	**45**	195		433		726		866	
	%	**74**	85	2-5	94	2-5	109	2-5	103	2-5
Anglian	mm	**38**	176		302		507		626	
	%	**96**	121	2-5	94	2-5	104	2-5	100	2-5
Thames	mm	**32**	199		343		556		676	
	%	**66**	106	2-5	86	2-5	99	2-5	94	2-5
Southern	mm	**46**	243		390		624		745	
	%	**82**	107	2-5	82	2-5	98	2-5	93	2-5
Wessex	mm	**40**	251		454		687		835	
	%	**61**	99	2-5	87	2-5	98	2-5	94	2-5
South West	mm	**60**	383		693		1001		1211	
	%	**60**	100	2-5	92	2-5	102	2-5	98	2-5
Welsh	mm	**76**	428		843		1214		1468	
	%	**74**	106	2-5	102	2-5	111	2-5	107	2-5
Highland	mm	**109**	504		1099		1535		1843	
	%	**66**	87	2-5	97	2-5	106	5-10	102	2-5
North East	mm	**49**	177		506		820		978	
	%	**64**	66	10-20	87	2-5	102	2-5	97	2-5
Tay	mm	**62**	293		627		996		1176	
	%	**56**	72	5-10	77	5-10	93	2-5	88	2-5
Forth	mm	**57**	307		588		991		1154	
	%	**59**	86	2-5	83	2-5	103	2-5	96	2-5
Tweed	mm	**65**	276		543		900		1077	
	%	**84**	96	2-5	93	2-5	110	5-10	105	2-5
Solway	mm	**104**	453		941		1437		1691	
	%	**92**	104	2-5	106	5-10	120	25-40	114	20-35
Clyde	mm	**118**	554		1114		1627		1904	
	%	**79**	99	2-5	100	2-5	111	8-12	105	5-10

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

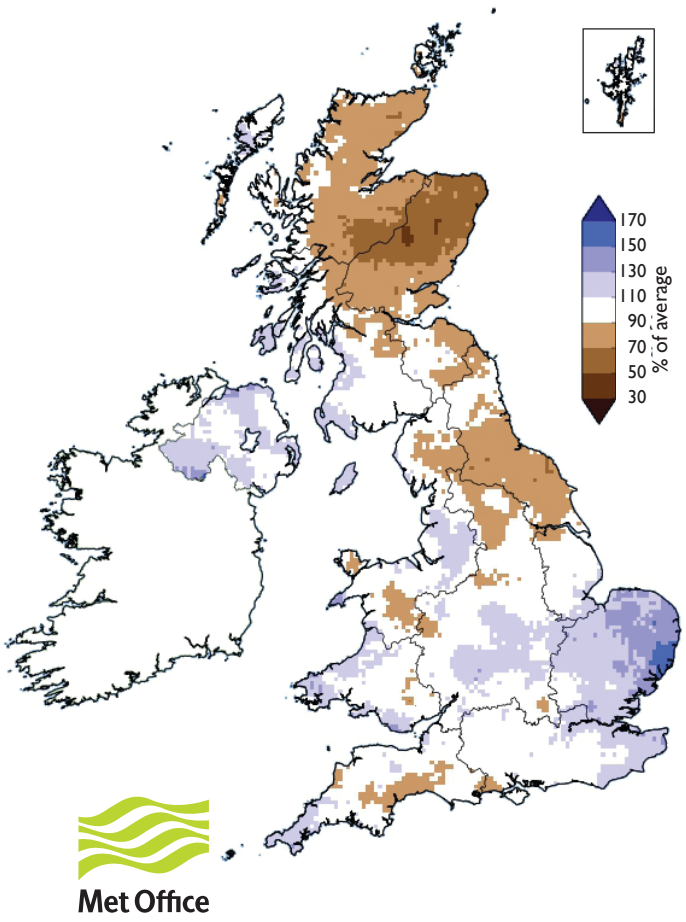
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic 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 2017 are provisional.

Rainfall . . . Rainfall . . .

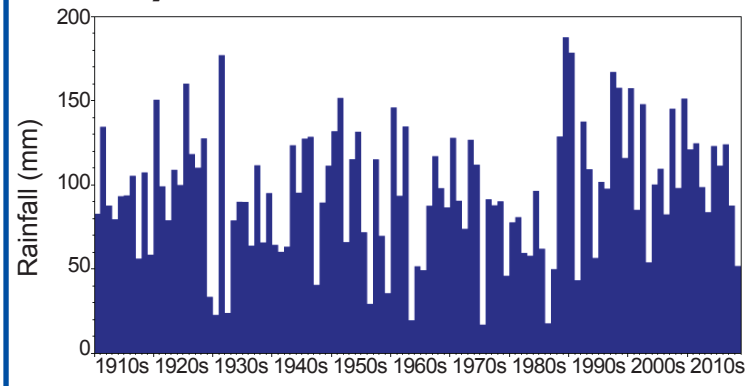
February 2018 rainfall as % of 1981-2010 average



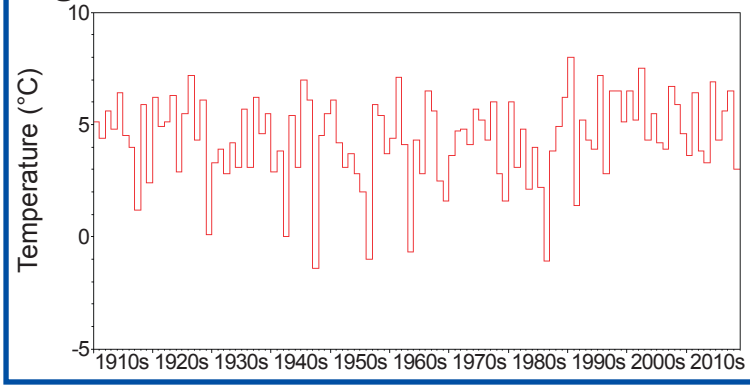
December 2017 - February 2018 rainfall as % of 1981-2010 average



February rainfall totals for Shetland Islands



February average temperatures for Southern Region



Hydrological Outlook UK

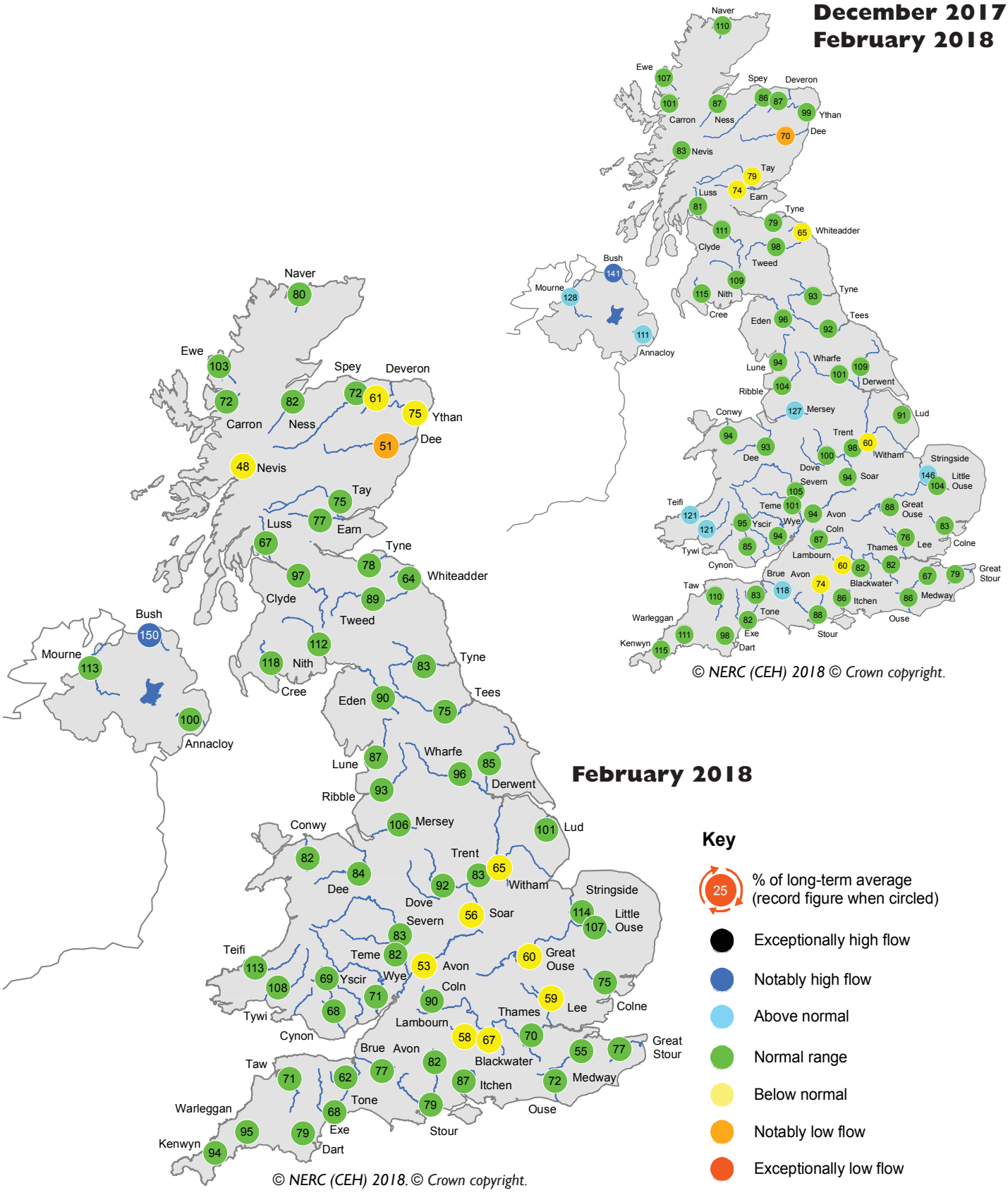
The Hydrological Outlook provides an insight into future hydrological conditions across the UK. Specifically it describes likely trajectories for river flows and groundwater levels on a monthly basis, with particular focus on the next three months.

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

Period: **from March 2018**
Issued: **09.03.2018**
using data to the end of February 2018

The outlook for March and for the spring as a whole indicates that river flows and groundwater levels across the majority of the UK are likely to be within the normal range. Below normal flows and groundwater levels are more likely in some parts of south-east England over this period. Current outlooks suggest this is relatively localised, but spring rainfall will be influential in determining the extent of below normal flows and groundwater levels going into the summer.

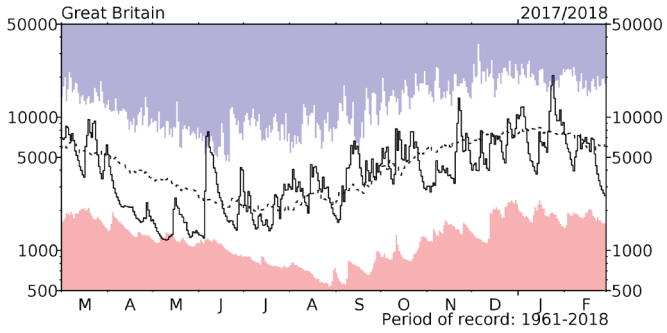
River flow . . . River flow . . .

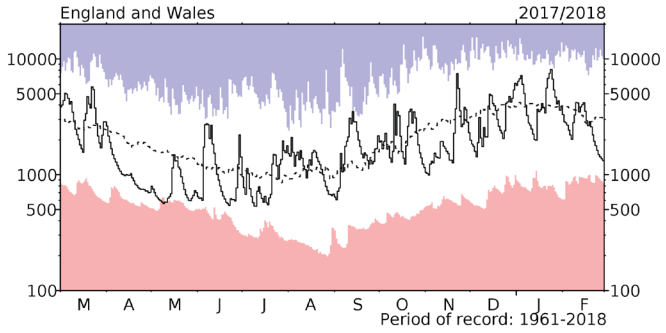


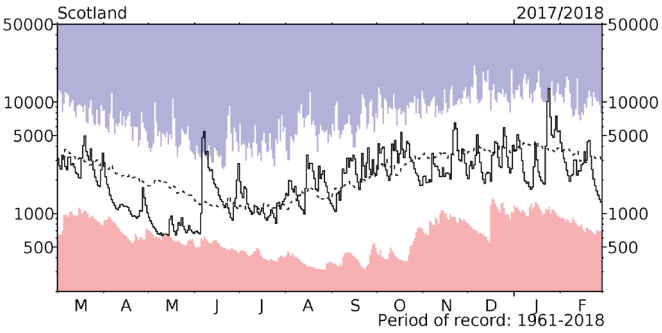
River flows

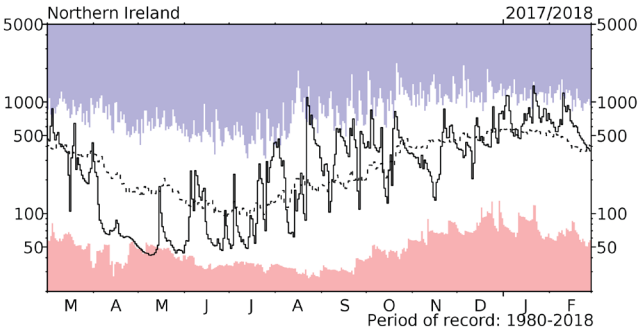
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

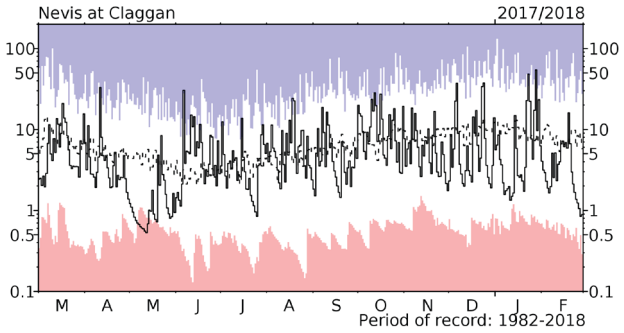
River flow . . . River flow . . .

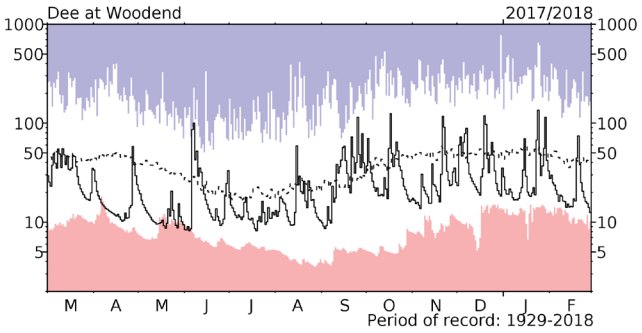


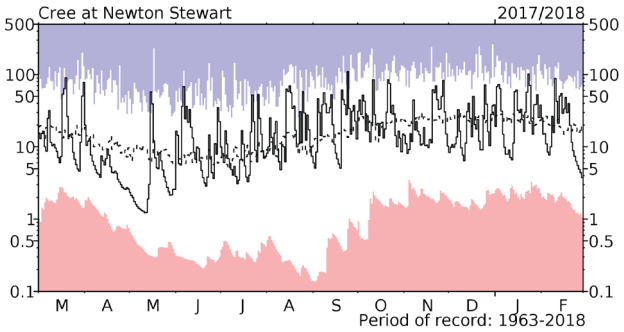


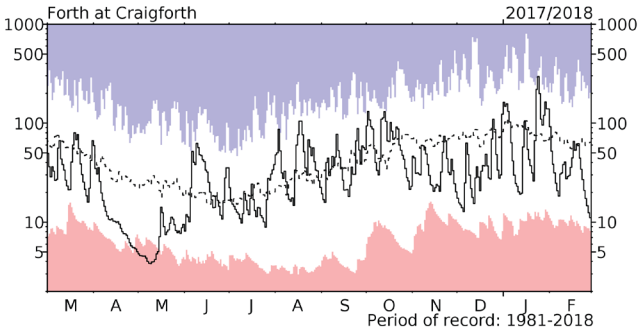


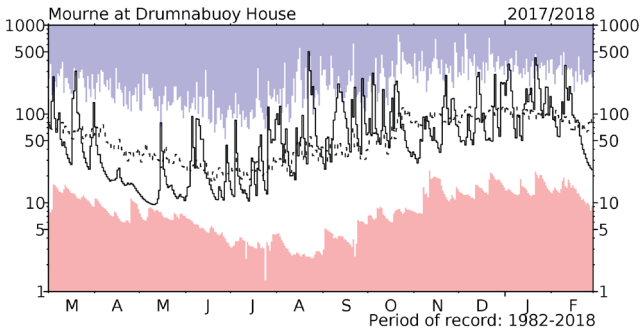


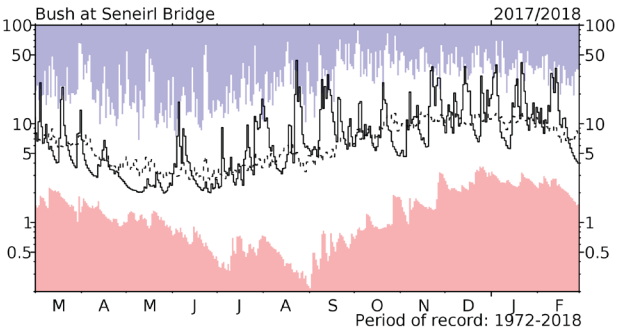








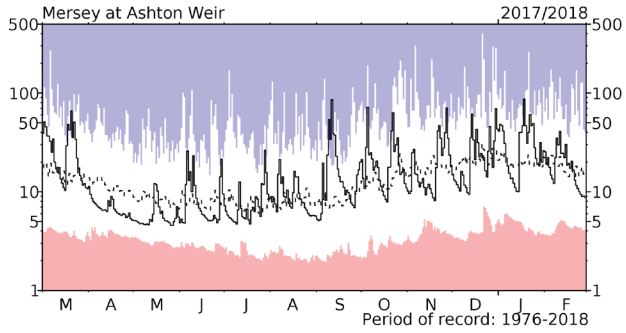


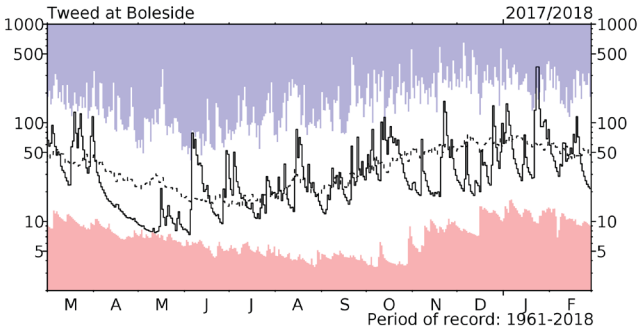


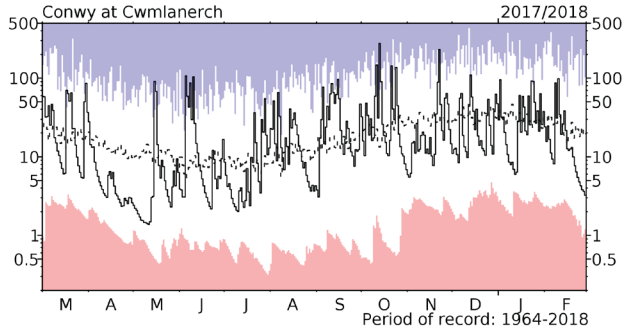
River flow hydrographs

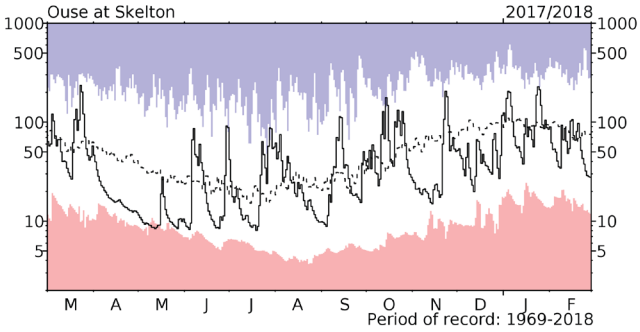
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to March 2017 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed line represents the period-of-record average daily flow.

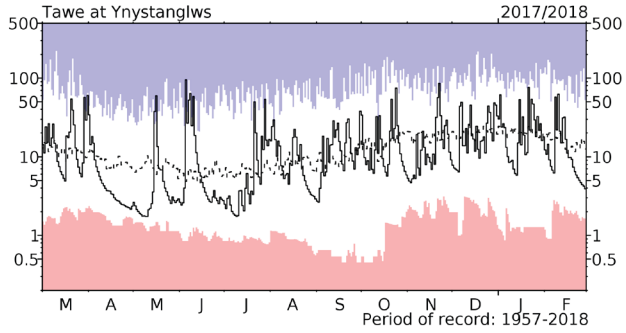
River flow . . . River flow . . .

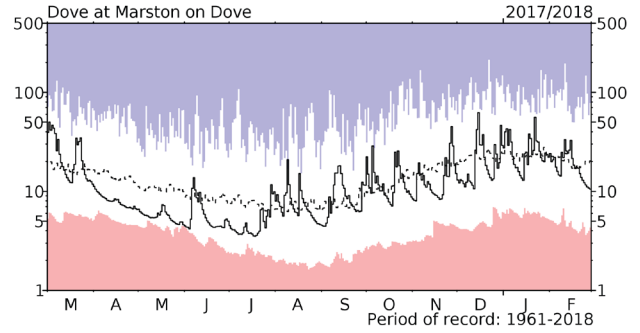


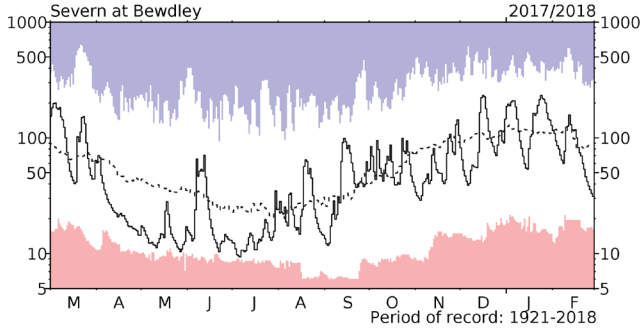


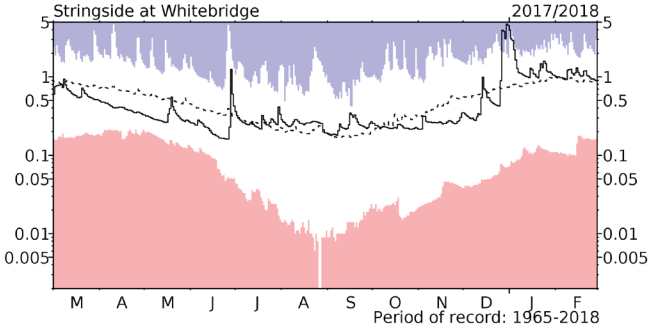


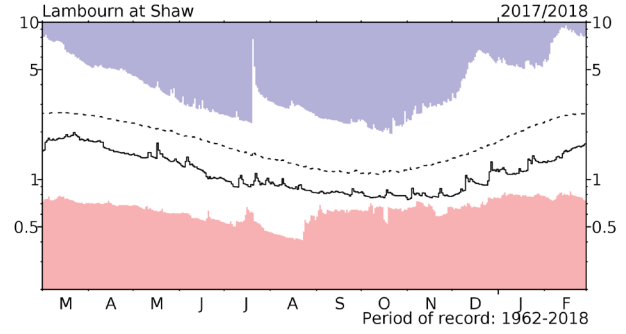


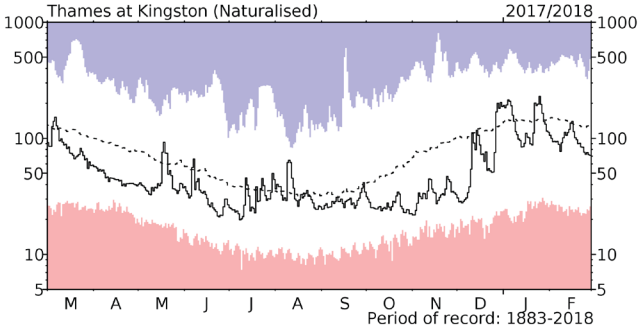


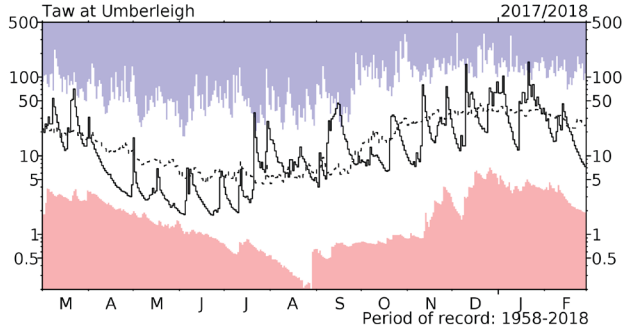


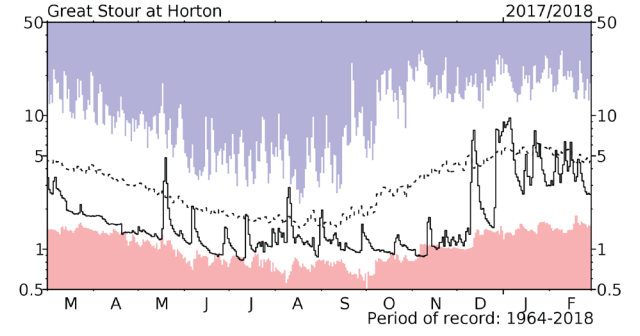




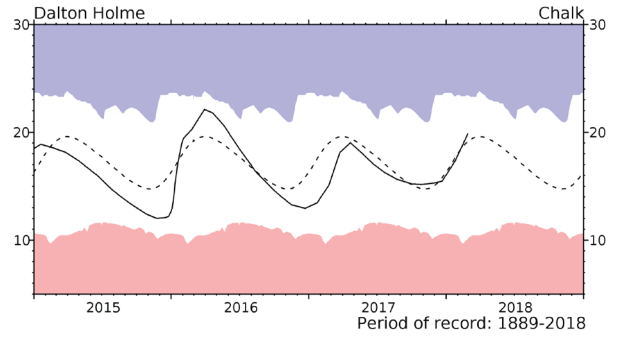


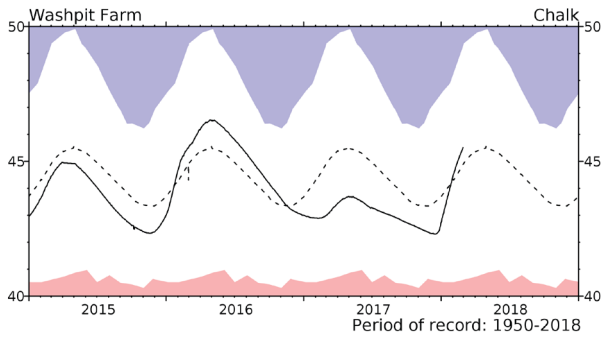


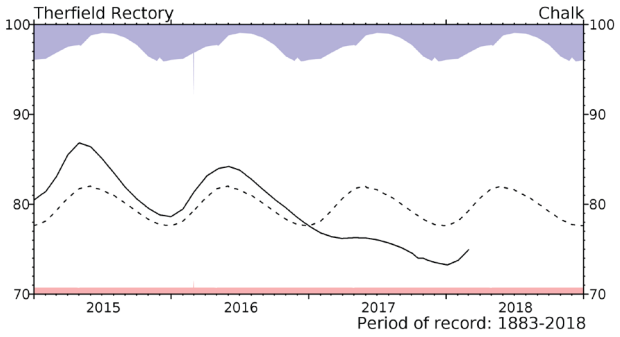


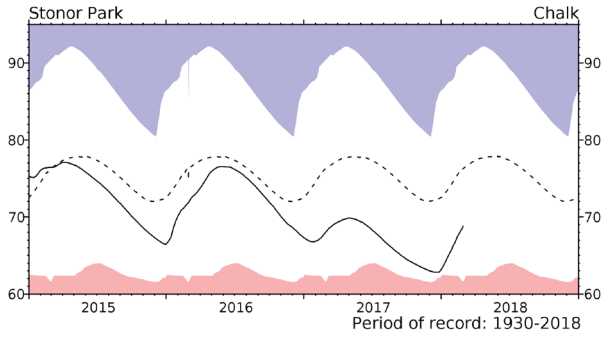


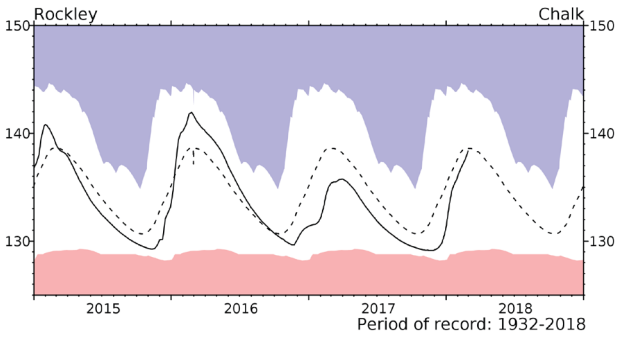
Groundwater…Groundwater

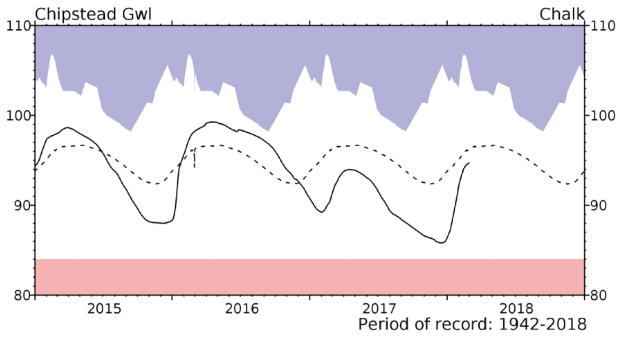


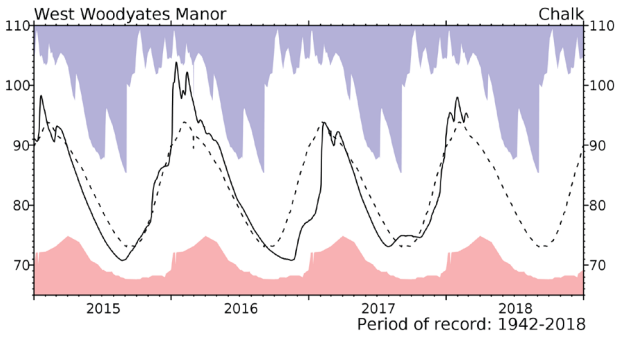


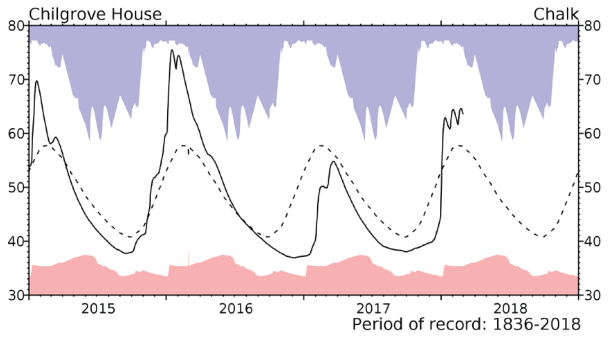


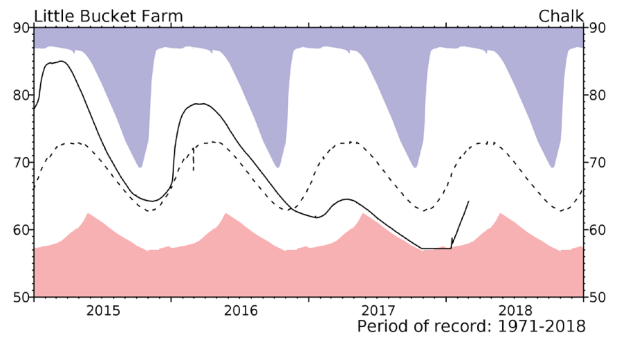


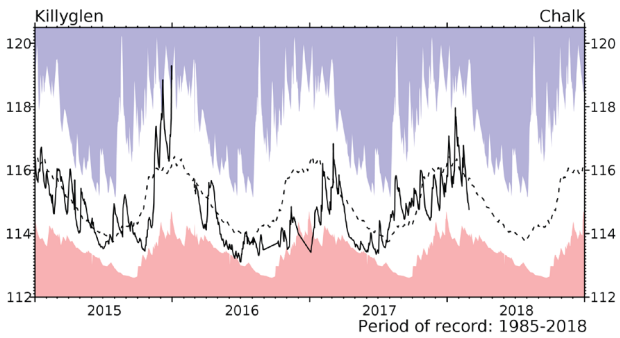






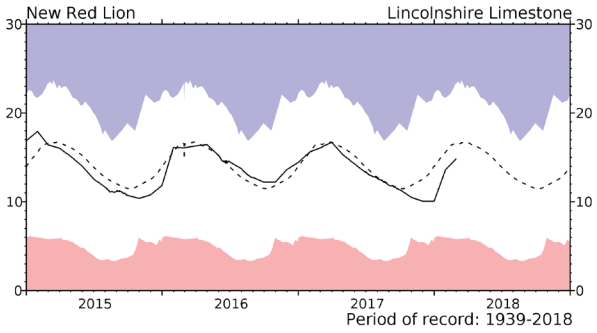


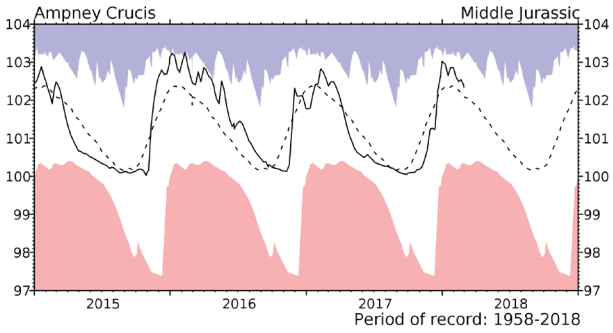


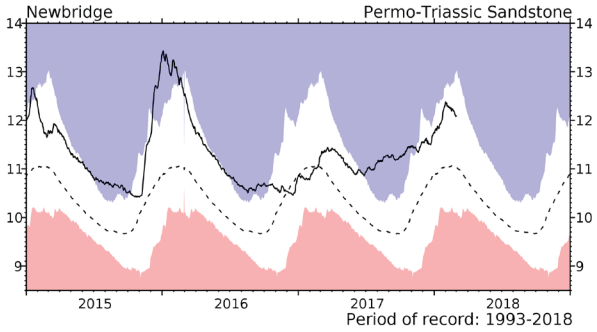


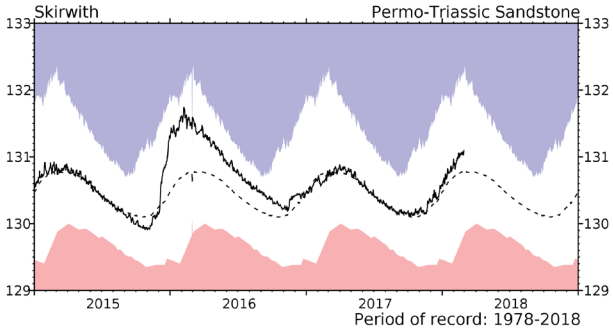
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is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

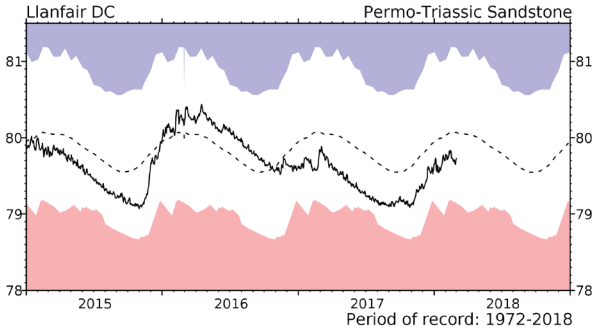
Groundwater … Groundwater

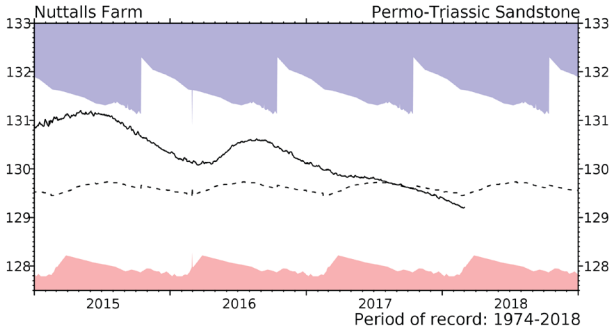


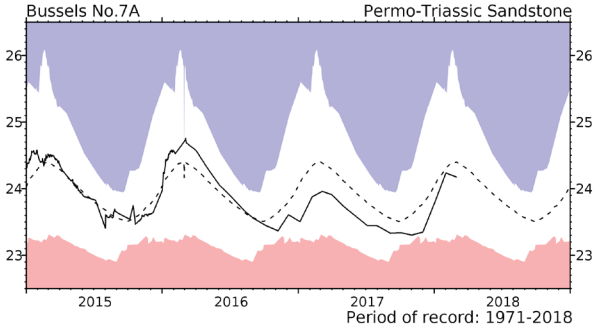


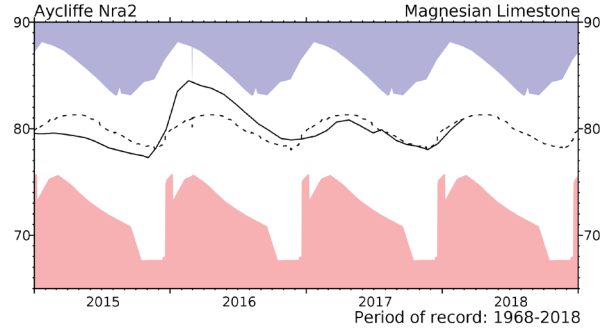


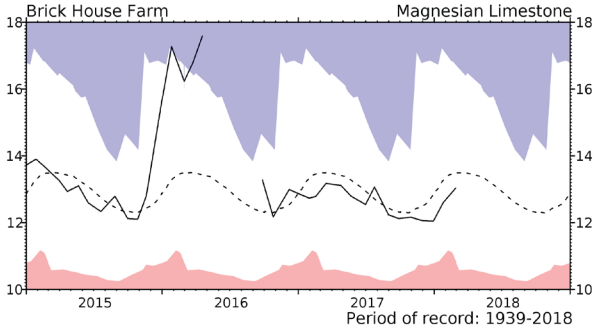


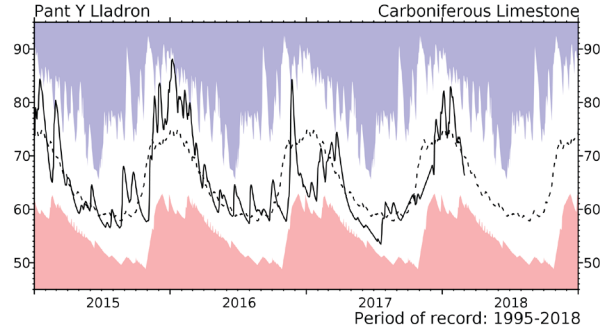


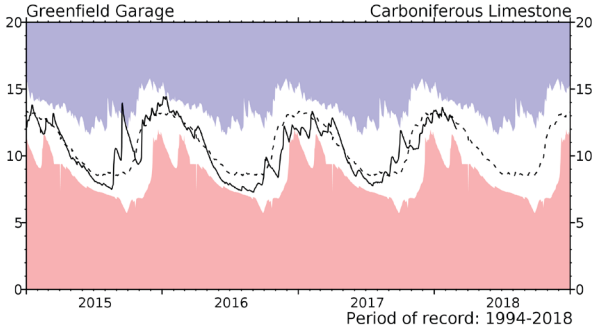


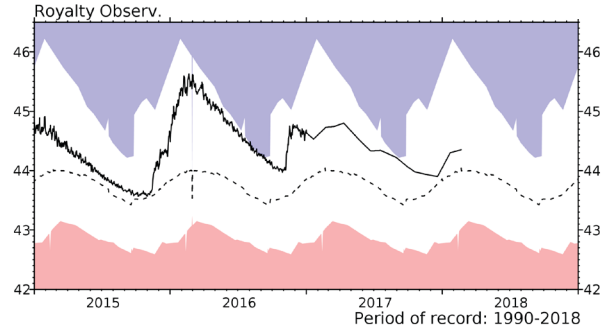


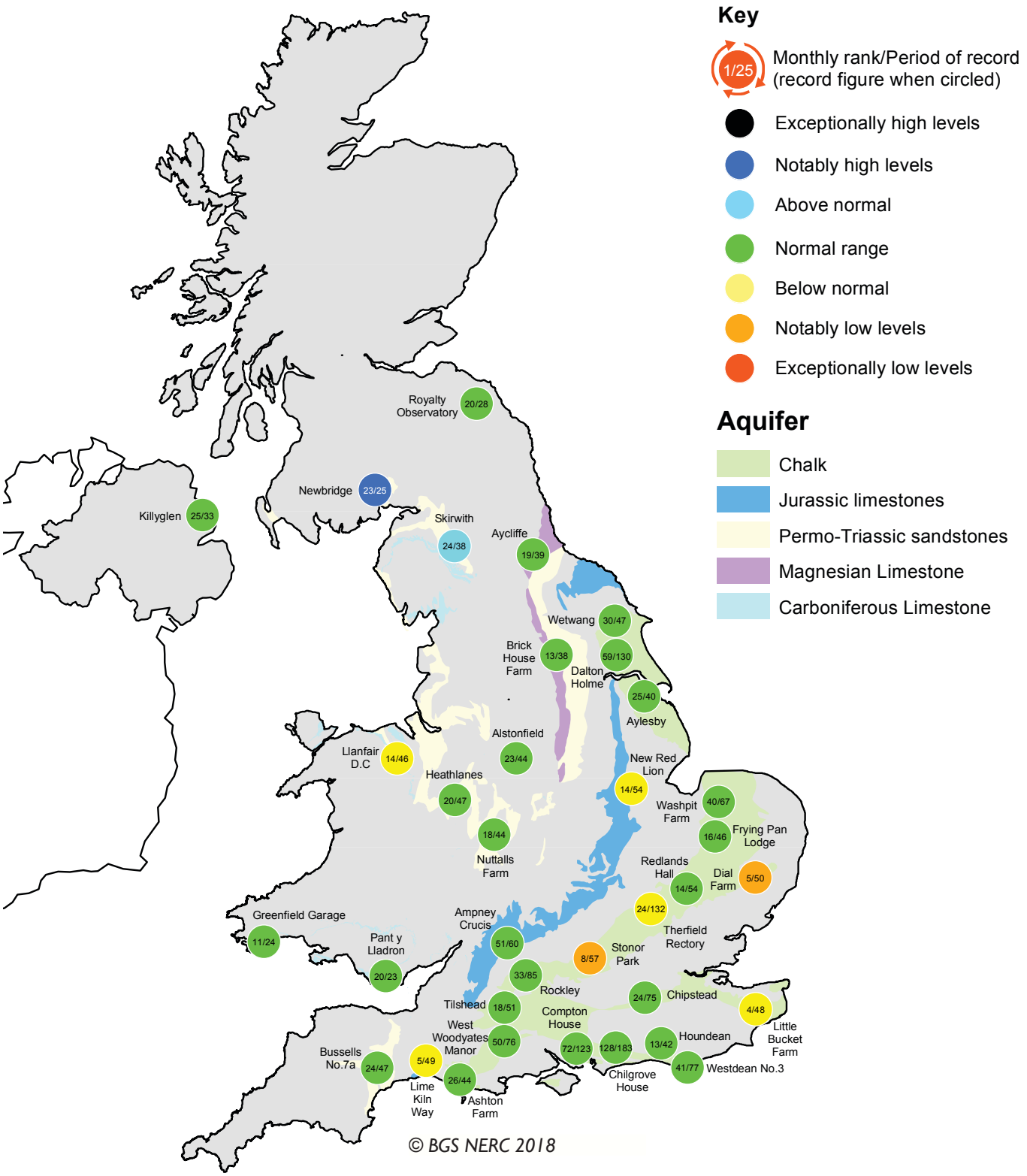










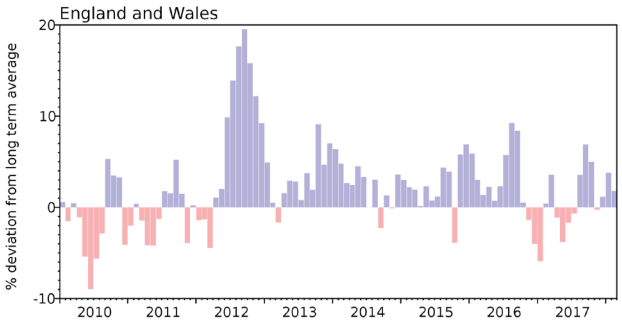


Groundwater levels - February 2018

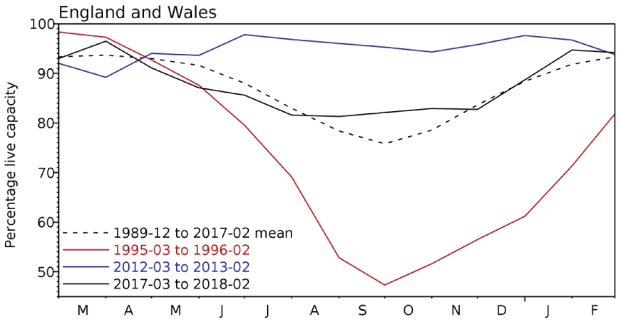
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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)	2017 Jan	2018 Jan	2018 Feb	Feb Anom.	Min Feb	Year* of min	2017 Feb	Diff 18-17
North West	N Command Zone	•	124929	81	87	86	-6	78	1996	80	6
	Vyrnwy		55146	99	99	96	1	59	1996	98	-2
Northumbrian	Teesdale	•	87936	100	100	97	5	72	1996	100	-3
	Kielder		(199175)	91	95	90	-3	81	1993	95	-5
Severn-Trent	Clywedog		49936	86	93	94	3	77	1996	100	-6
	Derwent Valley	•	46692	100	100	91	-5	46	1996	100	-9
Yorkshire	Washburn	•	23373	86	94	96	3	53	1996	95	1
	Bradford Supply	•	40942	94	100	99	4	53	1996	86	12
Anglian	Grafham		(55490)	92	92	96	8	72	1997	95	1
	Rutland		(116580)	84	92	93	4	71	2012	95	-2
Thames	London	•	202828	76	94	95	2	83	1988	94	1
	Farmoor	•	13822	95	95	97	5	64	1991	98	-1
Southern	Bewl		31000	43	64	88	3	40	2012	71	17
	Ardingly		4685	100	100	100	4	46	2012	94	6
Wessex	Clatworthy		5364	85	100	100	2	82	1992	90	10
	Bristol	•	(38666)	87	99	98	6	65	1992	84	14
South West	Colliford		28540	94	100	99	13	57	1997	77	22
	Roadford		34500	87	95	90	6	35	1996	69	21
	Wimbleball		21320	67	86	94	-1	72	1996	76	18
	Stithians		4967	89	100	100	7	45	1992	95	5
Welsh	Celyn & Brenig	•	131155	97	98	99	1	69	1996	100	-1
	Brianne		62140	100	100	98	0	92	2004	100	-2
	Big Five	•	69762	92	93	94	-2	85	1988	92	2
	Elan Valley	•	99106	100	100	98	0	88	1993	100	-2
Scotland(E)	Edinburgh/Mid-Lothian	•	96518	90	97	97	2	73	1999	90	7
	East Lothian	•	9374	99	100	100	1	91	1990	100	0
Scotland(W)	Loch Katrine	•	110326	99	100	98	4	76	2010	98	0
	Daer		22412	100	100	99	0	94	2004	100	-1
	Loch Thom		10798	100	100	100	2	90	2004	100	0
Northern Ireland	Total+	•	56800	99	99	98	7	81	2004	84	15
	Silent Valley	•	20634	99	100	98	11	57	2002	71	27

( ) figures in parentheses relate to gross storage

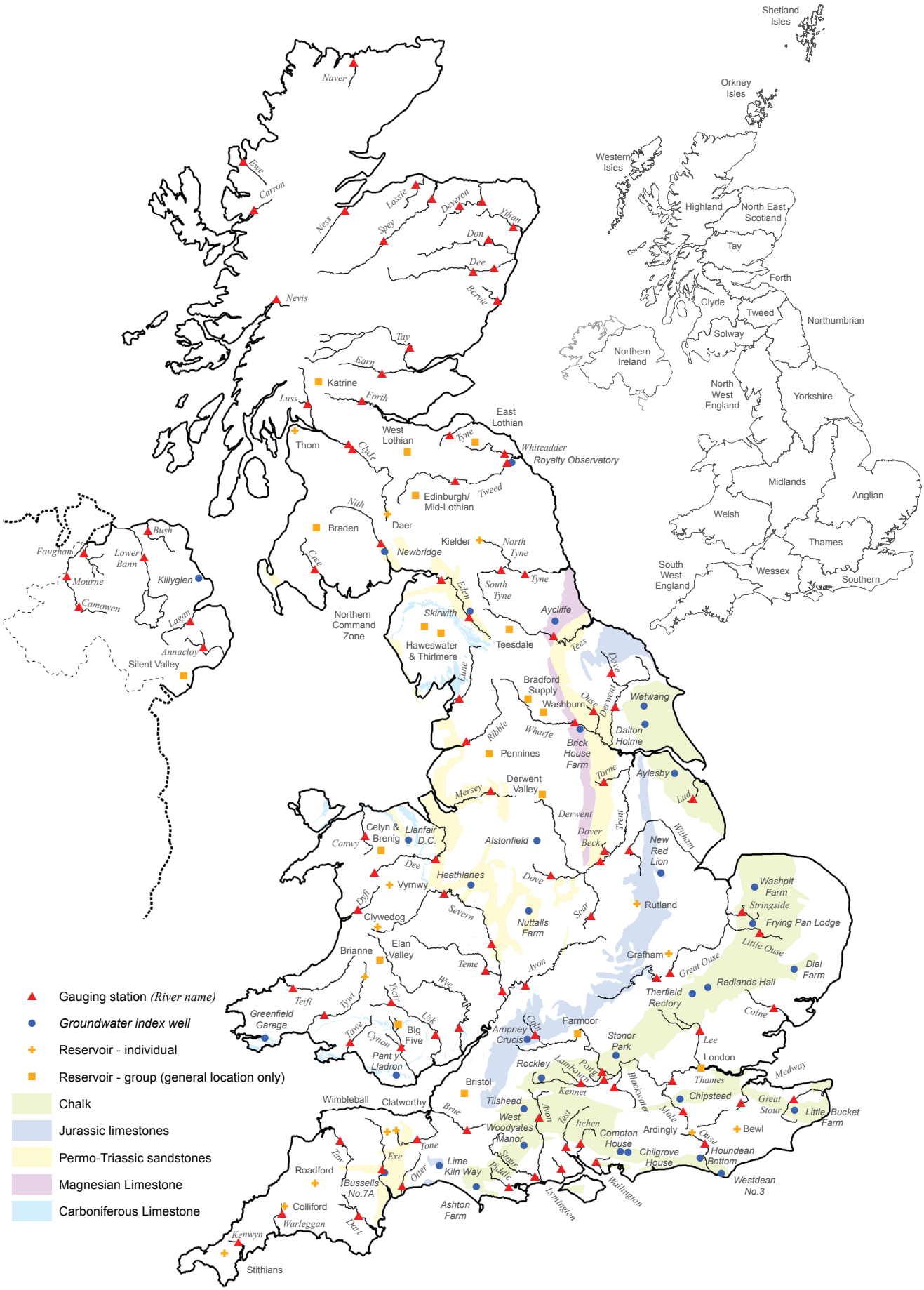
• denotes reservoir groups

*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 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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