Hydrological Summary

for the United Kingdom

January 2018

General

January was a decidedly wintery month across the UK, interspersed with strong winds and snowfalls over higher ground. Although there were four named storms, January was only moderately wetter than average for the UK as a whole, reflecting the focus on wind for naming storms. However, it was wetter than average in Northern Ireland and substantially below average rainfall was recorded in regions of eastern Scotland. River flows were mostly in the normal range or above for January and new monthly maxima were established in Northern Ireland. Soil moisture deficits (SMDs) were eliminated in south-east England and the seasonal recovery of groundwater levels was well established with few exceptions. Levels were generally in the normal range, although below normal levels persist in parts of the Chalk. Stocks in most reservoirs increased relative to average, some substantially. Month-end stocks at Bewl increased by over 20% (but remained well below average for the time of year), and although a winter refill drought permit was granted in early January, it has not yet been implemented. Despite above average rainfall for winter so far (December-January) in the south-east of England, the delayed start to the recharge season from a below normal baseline means the likelihood of water resource pressures this summer has decreased, although in some areas above average rainfall is still required.

Rainfall

A period of high pressure brought calmer weather in the second week of January, sandwiched by unsettled periods as westerly frontal systems crossed the UK, bringing wintery, wet and windy conditions (including snow across higher ground). Although rainfall totals were not substantial for storms 'Eleanor' (2nd/3rd), 'Fionn' (16th) and 'David' (17th/18th, so named by MeteoFrance), strong gusts (e.g. 93mph on the 17th at Capel Curig, north Wales) and extensive snow falls (e.g. 38cm at Eskdalemuir on the 17th and 26cm at West Freugh on the 18th, both Dumfries and Galloway), were typical of these periods. In contrast, frontal systems on the 14th and 21st (the latter of which resulted in landslides in north Devon) and storm 'Georgina'(23rd/24th) brought larger rainfall totals: 82mm at Skye Alltdearg House (Inverness-shire) on the 14th, 41mm at Gogerddan (mid-Wales) on the 21st, and 53mm at Kielder Castle (Northumberland) on the 23rd. In northern and western areas of the UK, transport disruption and school closures due to strong winds (and the resulting damage), snowfall and icy conditions were common throughout the month. For the UK overall, January rainfall was marginally above average (112%), although there were distinct regional differences. Above average rainfall was recorded across western parts of the UK with over 170% of average in southern parts of Northern Ireland (which, as a whole, recorded 147% of average and was the ninth wettest January on record, in a series from 1910). Conversely, less than 90% of January average rainfall was registered in parts of southern and eastern England and much of north-east Scotland with parts of Aberdeenshire receiving less than half and a small area less than a third. The winter so far (December-January) has been wetter than average across Northern Ireland, much of Wales and southern and central England, with Anglian region recording 130% of average over this period. In contrast, north-eastern Britain received below average rainfall with large parts of north-east Scotland receiving less than 70% of average; deficits in the Tay and regions of southern England extend back to last winter.

River flows

Following heavy rainfall at the end of December and flow responses to storm 'Eleanor' in early January, many catchments began 2018 with average to above average flows. The second highest January peak flow was recorded on the Stringside on the 1st (in a record from 1965). Thereafter, recessions commenced and flows fell below average in many catchments but were interrupted by moderate responses to rainfall brought by storm 'Fionn' in northern and western catchments and were halted by the heavy rainfall over the 21st-24th across much of the UK. As a result, most catchments ended January with average or above average flows. The third highest January daily flow was recorded on the Brue on the 21st (in a record since 1965), with flooding occurring in parts of Devon and Cornwall. New daily flow maxima were registered on the 23rd/24th in 13 catchments in Northern Ireland and northern Britain as well as in total UK outflows (in a series from 1961) and a new January peak flow maximum was registered on the Clyde (in a record approaching 60 years). For January, monthly mean flows were, for the most part, in the normal range or above. Some catchments recorded notably high flows; the Stringside and Mersey both recorded over 150% of the January average, and the Mourne registered its highest average January flow in a series from 1982. In contrast to recent months, few catchments recorded below normal flows – these were confined to the groundwater dominated Lambourn and more responsive catchments in north-east Scotland. The winter so far (December-January) showed a similar picture as January, but looking further back to the start of the autumn (September-January) and beyond, long-term river flow deficiencies are evident across southern and eastern catchments with several below normal for this five month period. In some catchments, river flows were more than 30% below average, reflecting the dry autumn, spring and previous winter.

Groundwater

SMDs across the English Lowlands were eliminated in January and soils were wetter than average for the time of year. Groundwater levels accross the Chalk increased with substantial rises recorded at Chilgrove House, Compton House and Houndean Bottom. The majority of levels were within the normal range for the time of year. However at Killyglen, levels are now above average, and levels remained below normal in the Chilterns, and notably low at Dial Farm and Little Bucket Farm (which was no longer dry). In the more rapidly responding Jurassic limestones, levels at Ampney Crucis fell during January but were above normal, whilst at New Red Lion levels rose but remained below average. In the Magnesian limestone levels rose and were in the normal range. Levels in the Upper Greensand at Lime Kiln Way rose, but remained notably low for the fourth consecutive month. In the Permo-Triassic sandstones, levels rose (with the exception of Nuttalls Farm) and were in the normal range, apart from Newbridge where levels are now notably high. In the Carboniferous Limestone, levels fell at Greenfield Garage, but rose at Pant y Lladron and Alstonefield, where they remained in the normal range or above. At Royalty Observatory, levels in the Fell Sandstone rose 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.

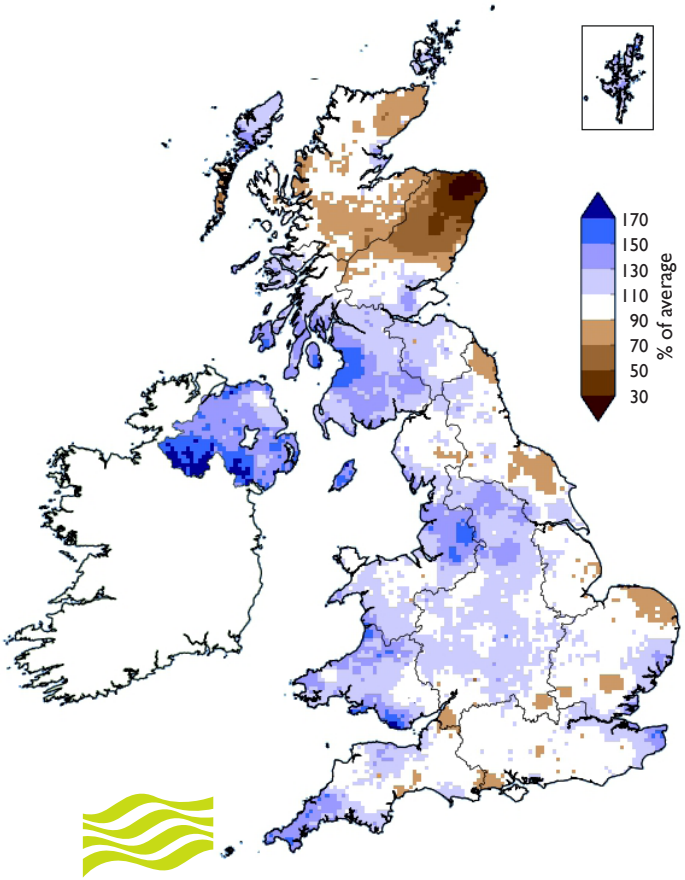
Region	Rainfall	Jan 2018	Dec17 – Jan18	RP	Oct17 – Jan18	RP	Aug17 – Jan18	RP	Feb17 – Jan18	RP
United Kingdom	mm	**134**	252		461		684		1190	
	%	**112**	106	2-5	95	2-5	103	2-5	105	5-10
England	mm	**90**	188		311		480		870	
	%	**111**	111	2-5	90	2-5	99	2-5	103	2-5
Scotland	mm	**183**	324		659		942		1603	
	%	**105**	96	2-5	99	2-5	103	2-5	106	5-10
Wales	mm	**189**	366		626		931		1584	
	%	**124**	116	2-5	98	2-5	109	2-5	111	5-10
Northern Ireland	mm	**171**	278		488		758		1263	
	%	**147**	120	5-10	105	2-5	116	10-15	111	10-20
England & Wales	mm	**104**	213		354		542		968	
	%	**114**	112	2-5	91	2-5	102	2-5	105	2-5
North West	mm	**147**	275		567		845		1442	
	%	**119**	106	2-5	108	2-5	116	5-10	117	10-20
Northumbria	mm	**86**	152		321		485		957	
	%	**104**	89	2-5	93	2-5	99	2-5	110	2-5
Severn-Trent	mm	**82**	172		272		436		784	
	%	**115**	115	2-5	89	2-5	100	2-5	100	2-5
Yorkshire	mm	**93**	149		286		472		887	
	%	**115**	89	2-5	86	2-5	100	2-5	105	2-5
Anglian	mm	**54**	139		199		326		632	
	%	**103**	130	2-5	86	2-5	96	2-5	101	2-5
Thames	mm	**71**	166		241		380		688	
	%	**104**	120	2-5	83	2-5	94	2-5	96	2-5
Southern	mm	**86**	197		274		420		755	
	%	**104**	116	2-5	77	2-5	88	2-5	94	2-5
Wessex	mm	**94**	212		332		477		853	
	%	**103**	112	2-5	86	2-5	92	2-5	96	2-5
South West	mm	**159**	322		488		727		1233	
	%	**118**	115	2-5	87	2-5	99	2-5	100	2-5
Welsh	mm	**180**	353		598		884		1511	
	%	**124**	117	2-5	97	2-5	107	2-5	110	5-10
Highland	mm	**206**	395		846		1156		1881	
	%	**95**	95	2-5	104	2-5	106	5-10	104	5-10
North East	mm	**65**	129		343		553		1012	
	%	**66**	67	10-15	82	2-5	95	2-5	100	2-5
Tay	mm	**145**	232		451		681		1253	
	%	**89**	77	2-5	77	5-10	85	2-5	93	2-5
Forth	mm	**155**	249		436		648		1222	
	%	**113**	96	2-5	86	2-5	91	2-5	102	2-5
Tweed	mm	**130**	211		382		580		1125	
	%	**123**	100	2-5	90	2-5	98	2-5	110	5-10
Solway	mm	**213**	349		667		984		1748	
	%	**133**	108	2-5	102	2-5	110	5-10	117	30-50
Clyde	mm	**262**	436		822		1173		1974	
	%	**125**	107	2-5	103	2-5	106	5-10	108	8-12

% = 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.

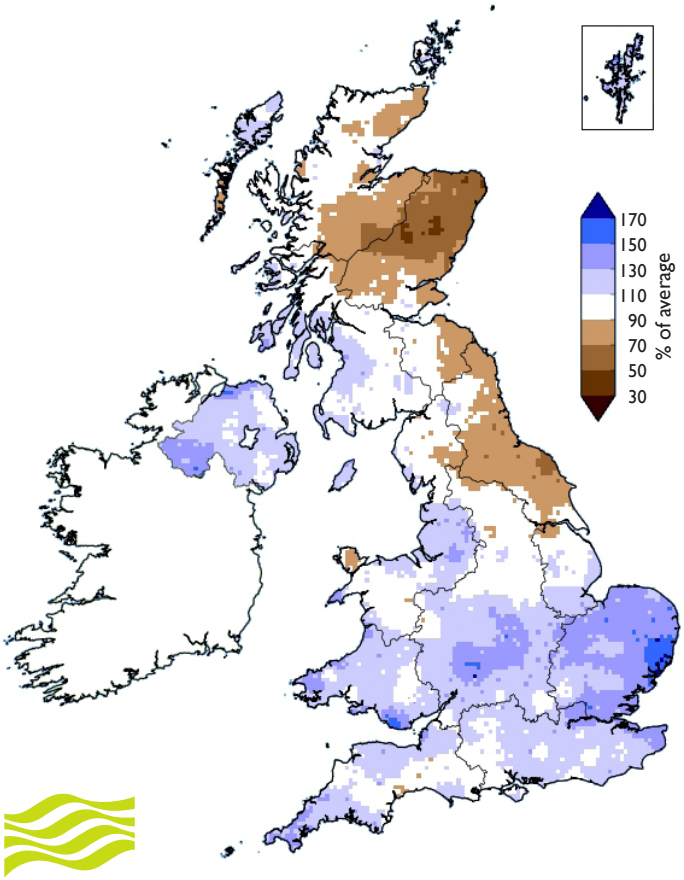
Rainfall . . . Rainfall . . .

January 2018 rainfall
as % of 1981-2010 average



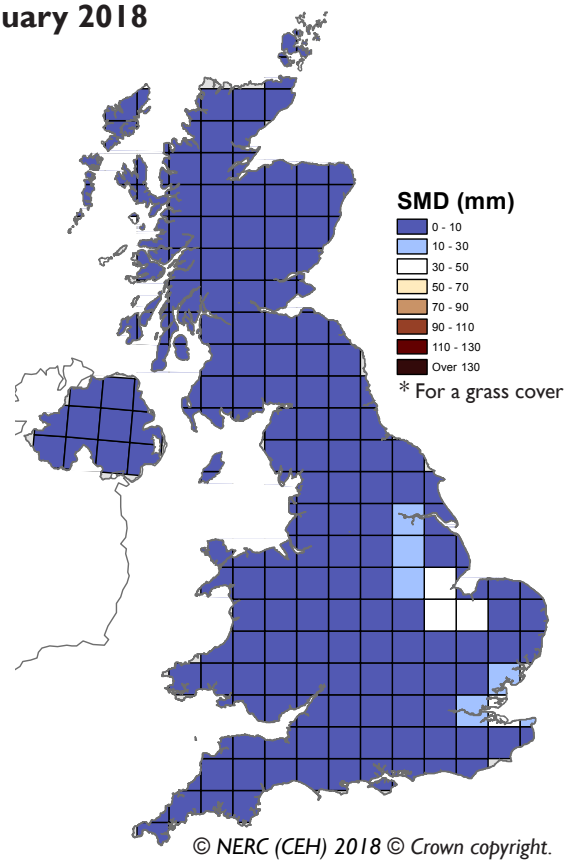
Met Office

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



Met Office

MORECS Soil Moisture Deficits*
January 2018



Hydrological Outlook UK

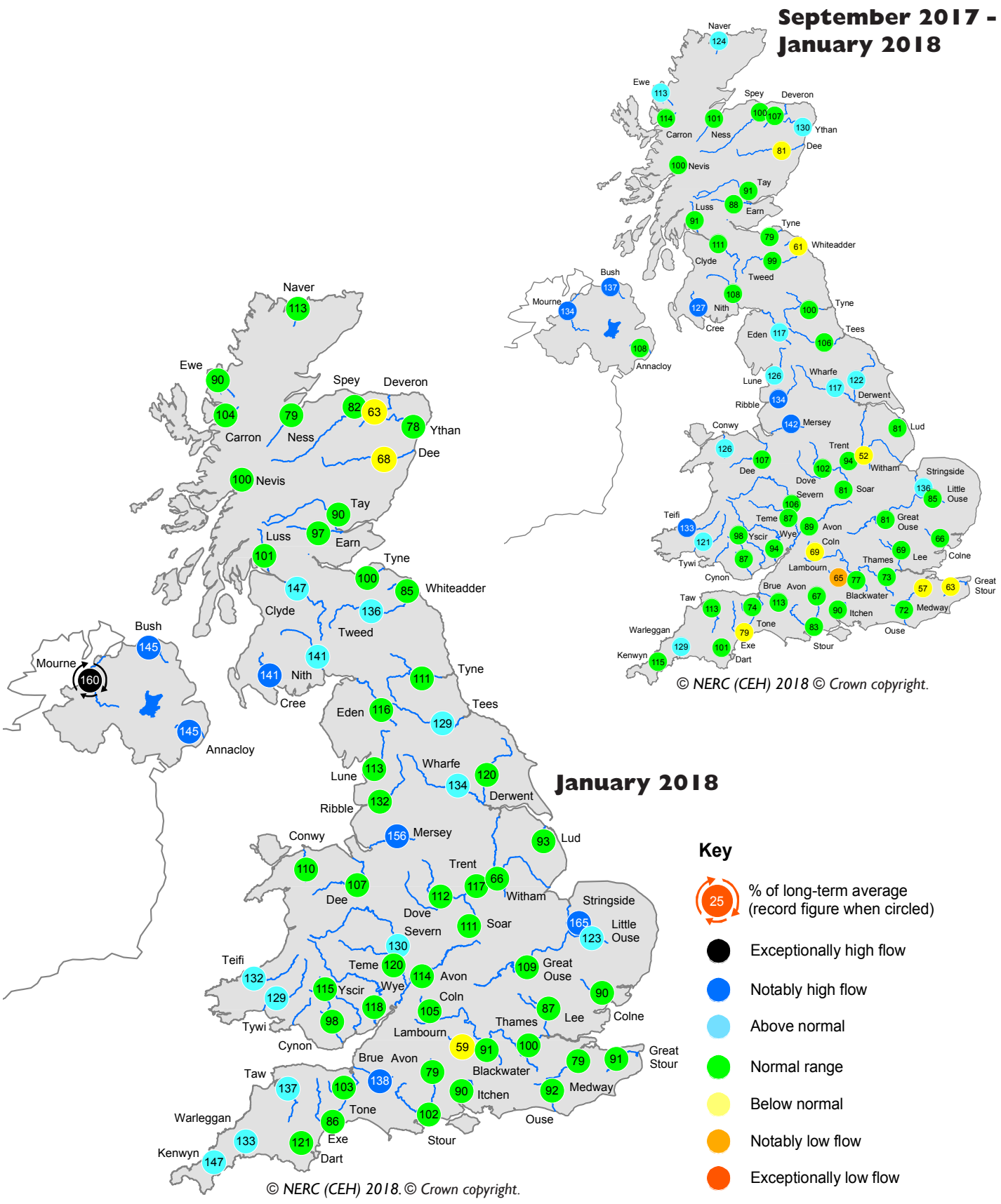
The Hydrological Outlook provides an insight into future hydrological conditions across the UK. Specifically it describes likely trajectories for river flows and groundwater levels on a monthly basis, with particular focus on the next three months.

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

Period: **from February 2018**
Issued: **08.02.2018**
using data to the end of January 2018

The outlook for February and February to April indicates that river flows and groundwater levels across the majority of the UK are likely to be within the normal range. Groundwater levels in the south-east of England are likely to be below normal for the next one to three months, and in parts of the south-east river flows are likely to be normal to below normal for this period.

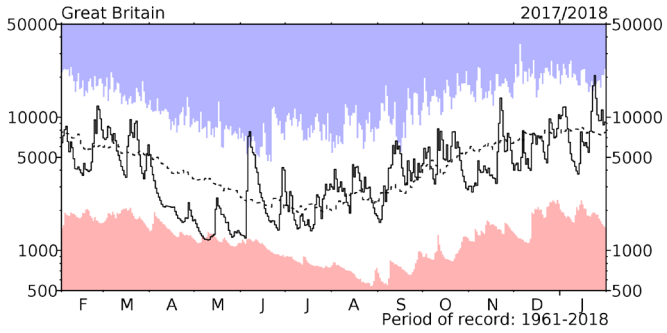
River flow . . . River flow . . .

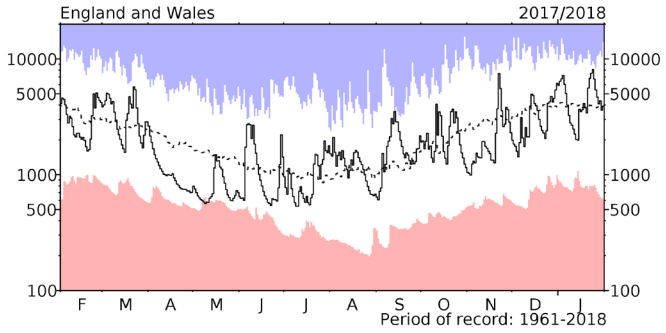


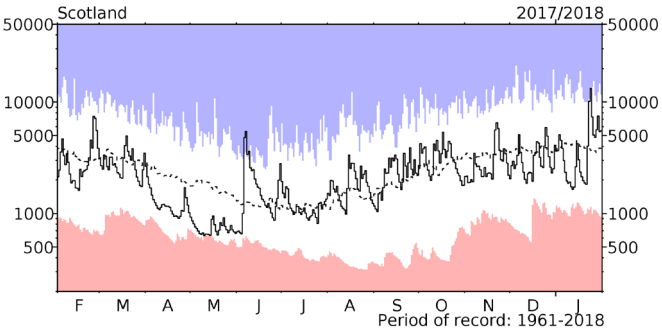
River flows

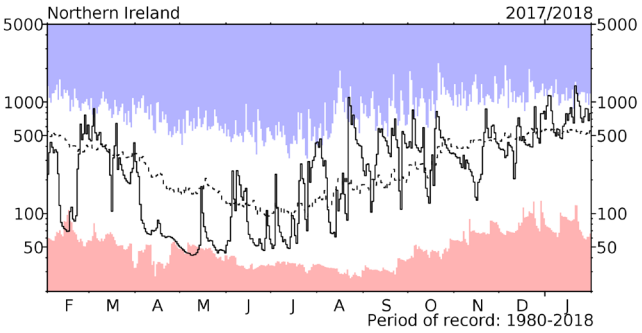
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

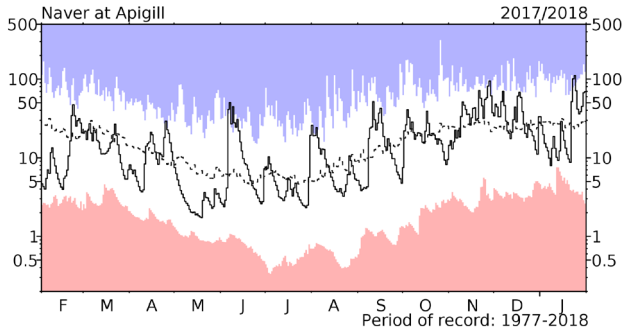
River flow . . . River flow . . .

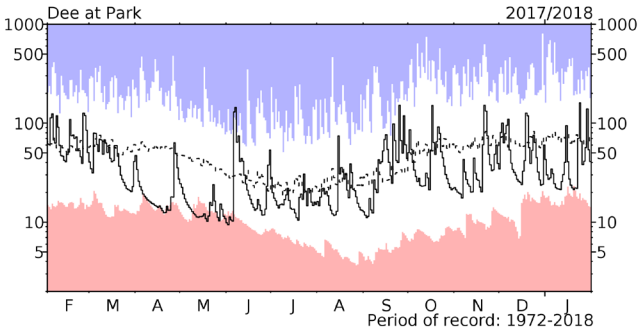


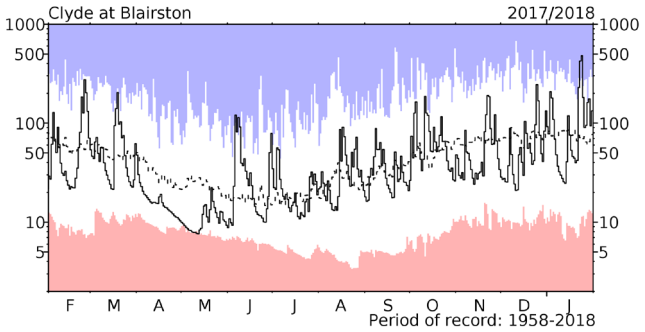


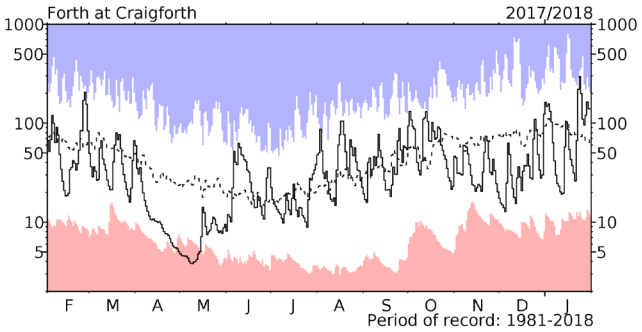


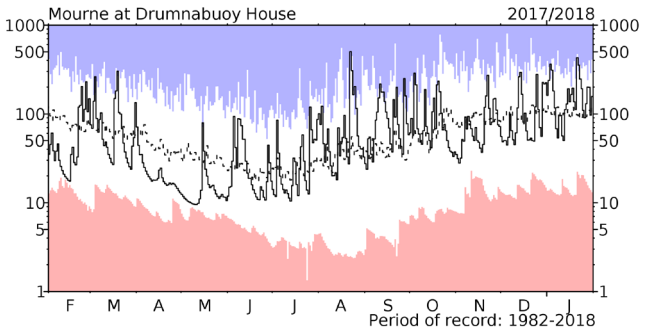


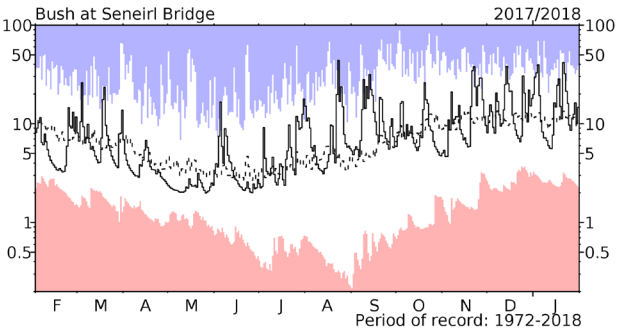








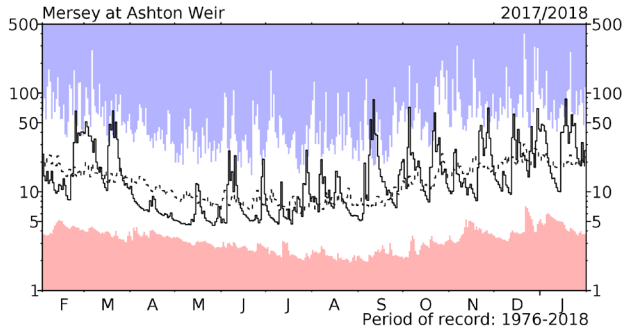


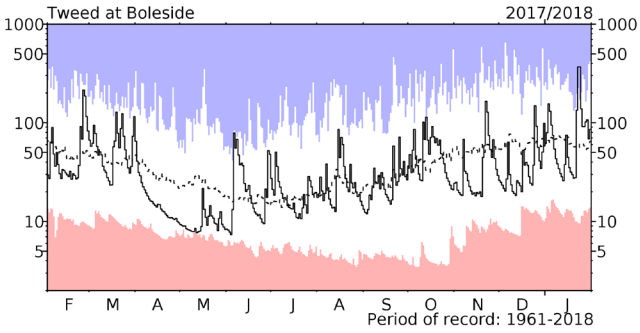


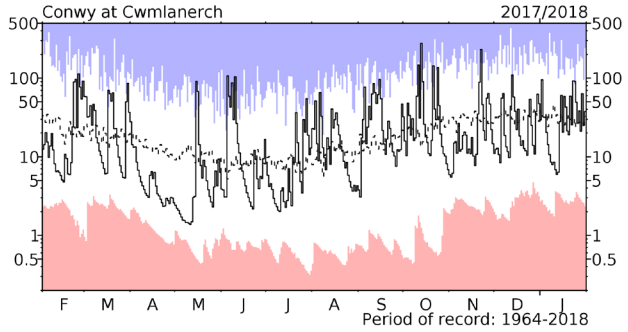
River flow hydrographs

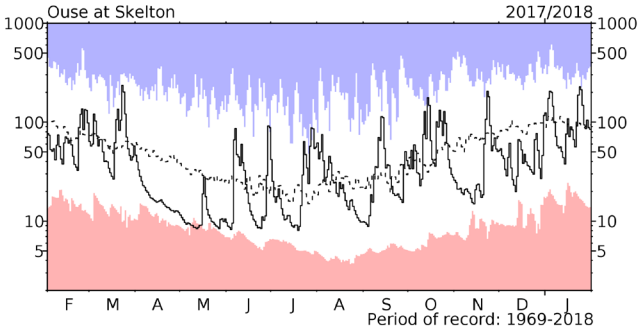
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to February 2017 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed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

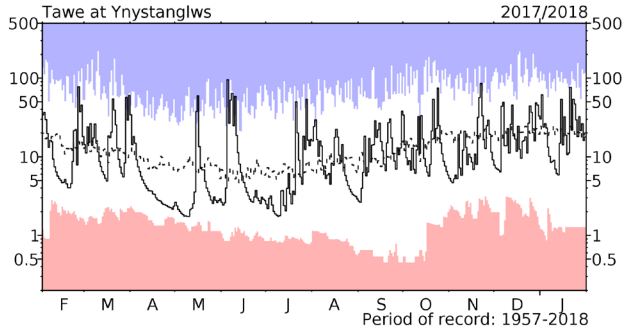
River flow . . . River flow . . .

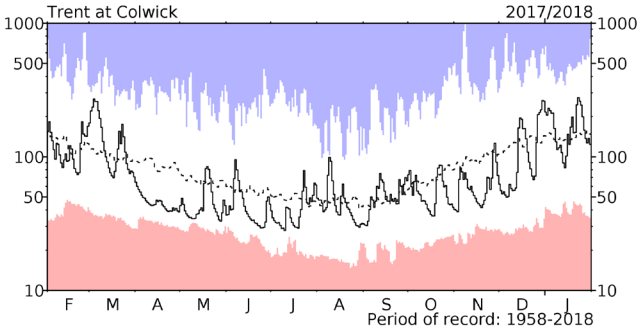


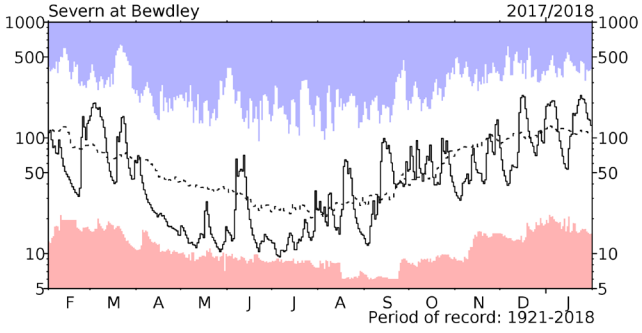


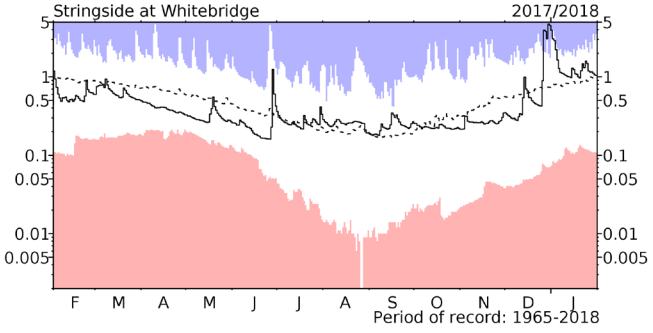


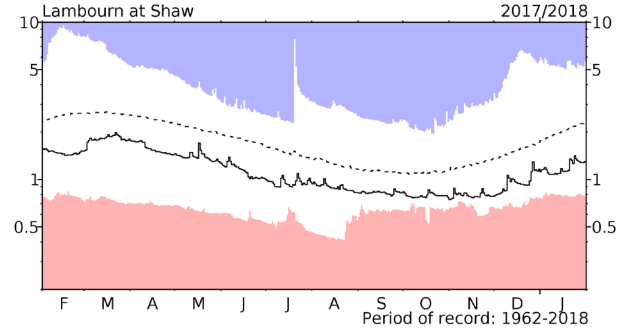


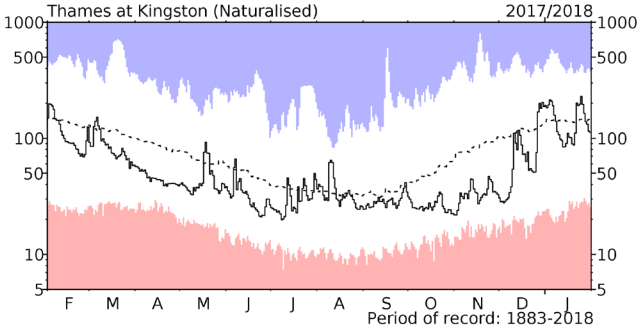


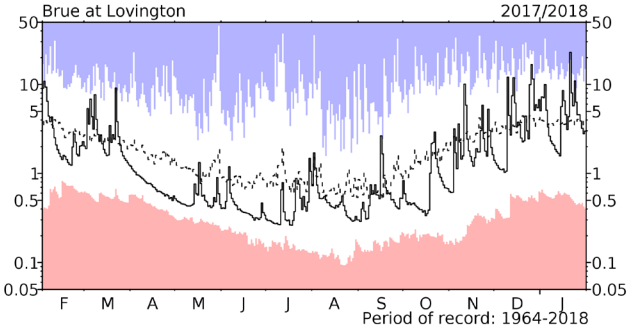


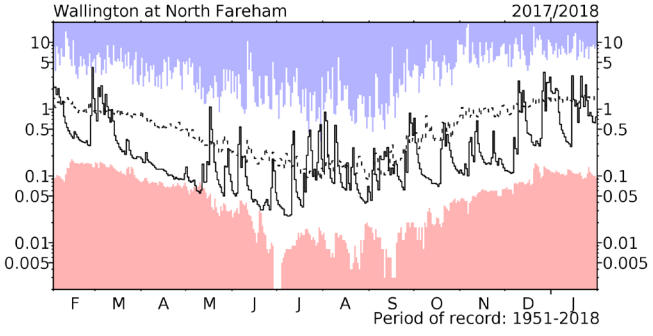




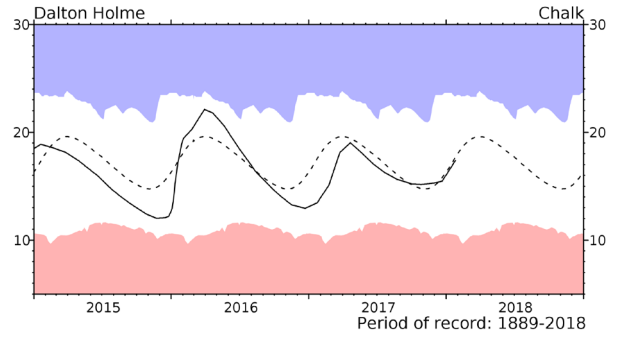


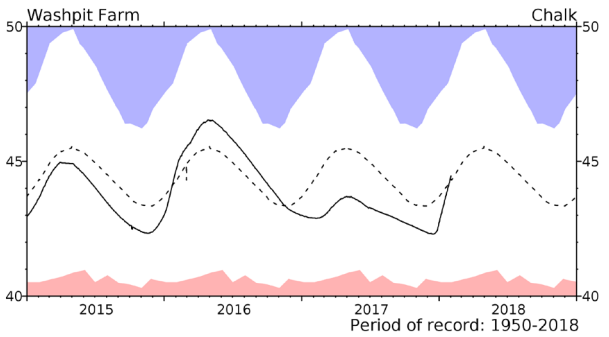


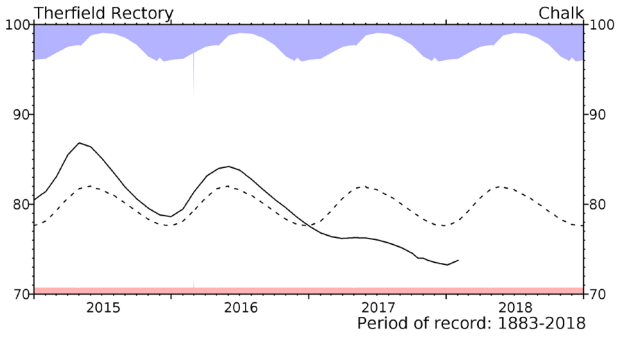


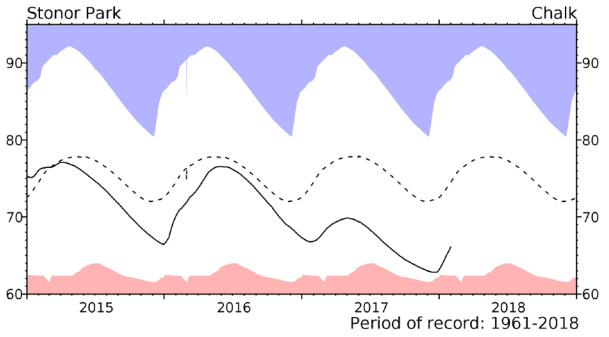


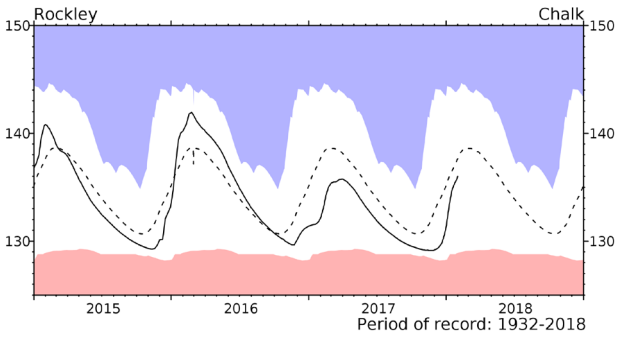
Groundwater…Groundwater

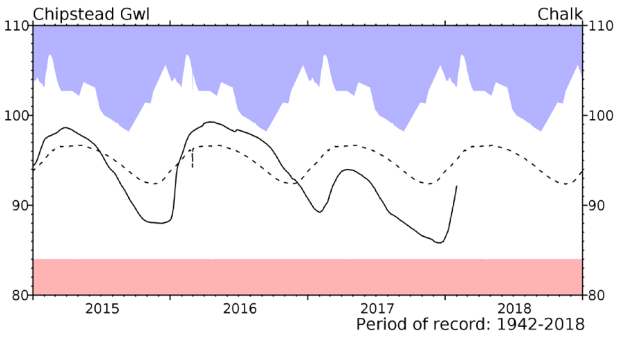


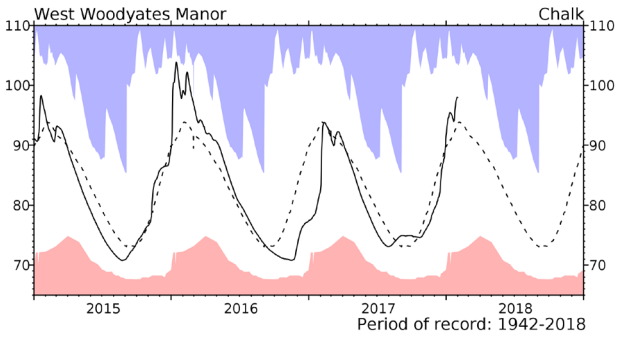


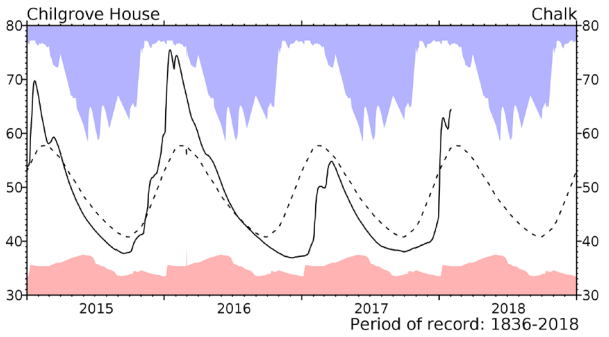


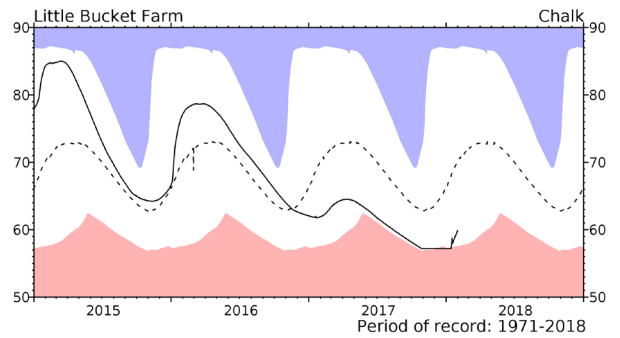


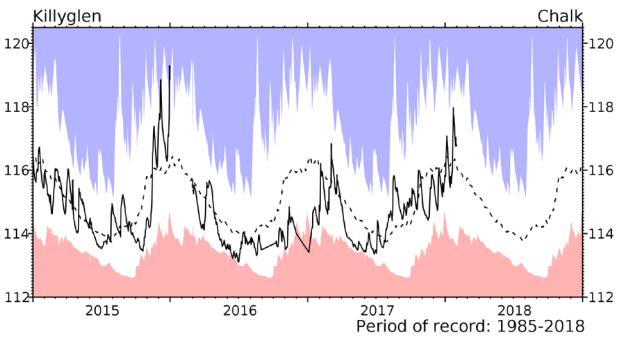






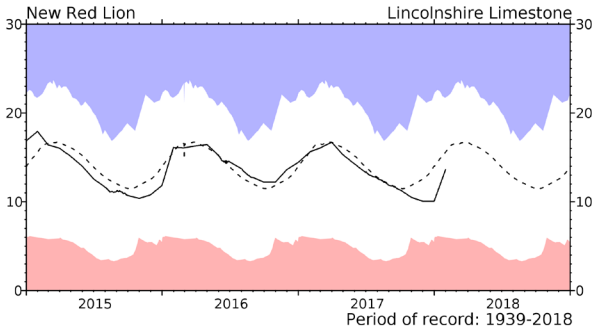


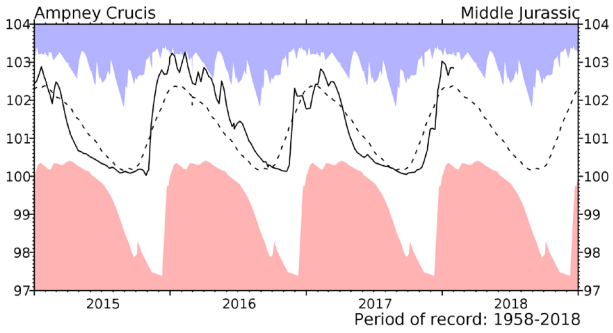


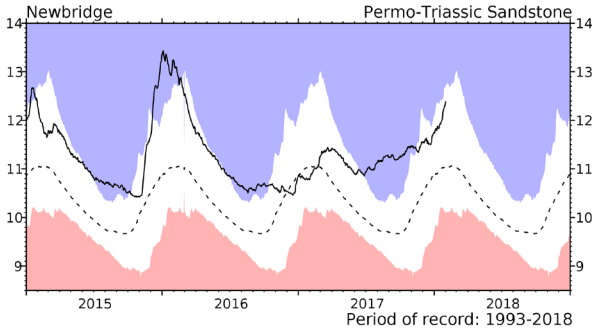


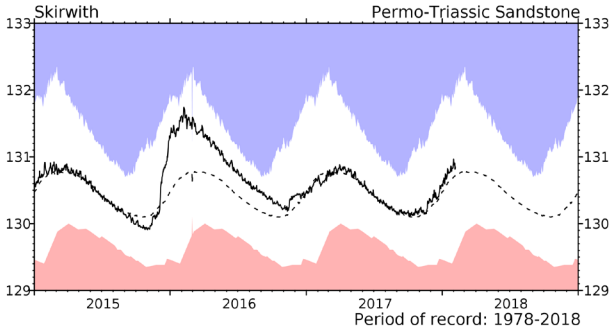
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is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

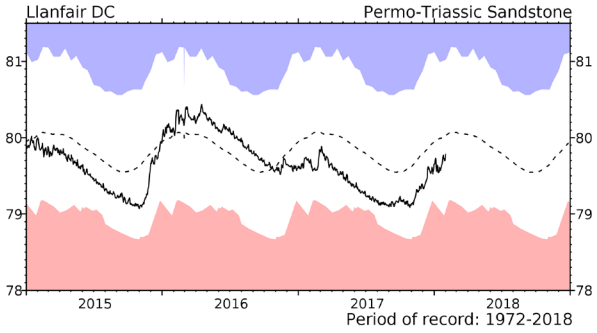
Groundwater … Groundwater

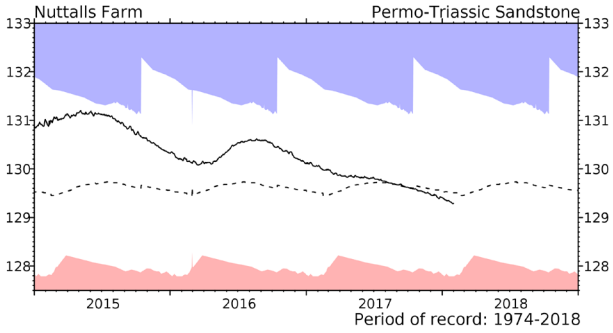


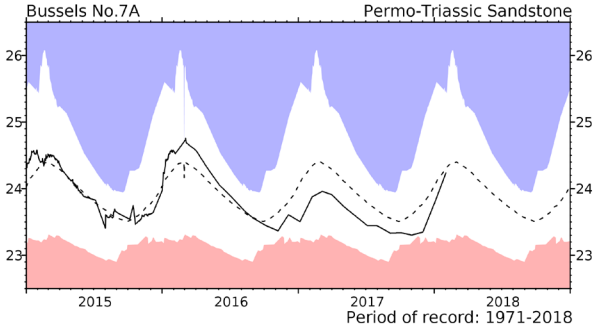


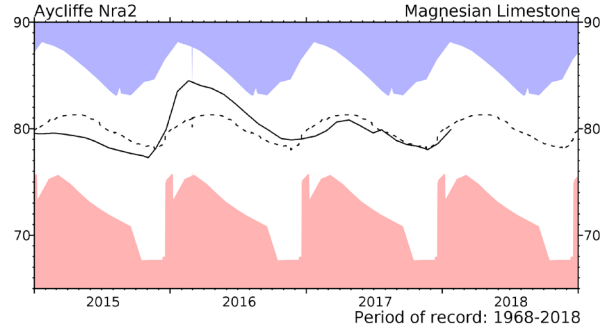


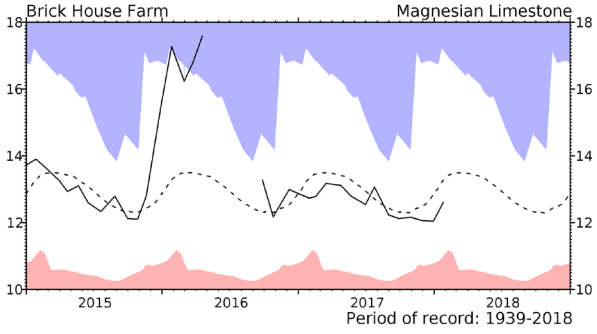


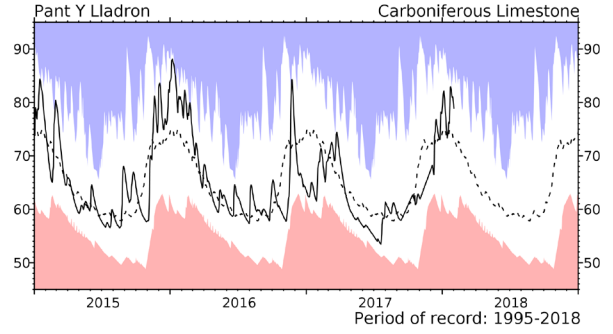


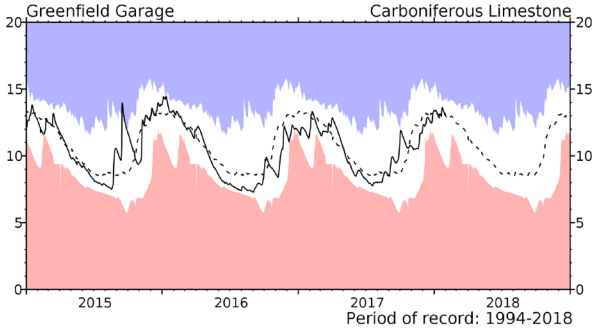


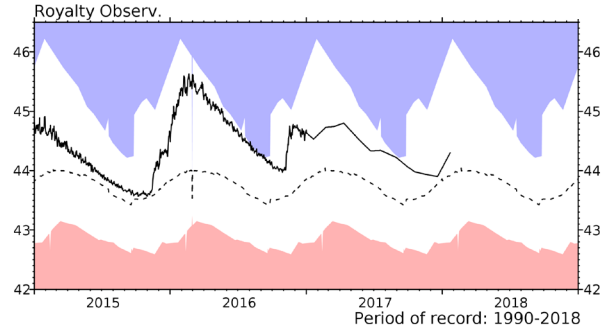


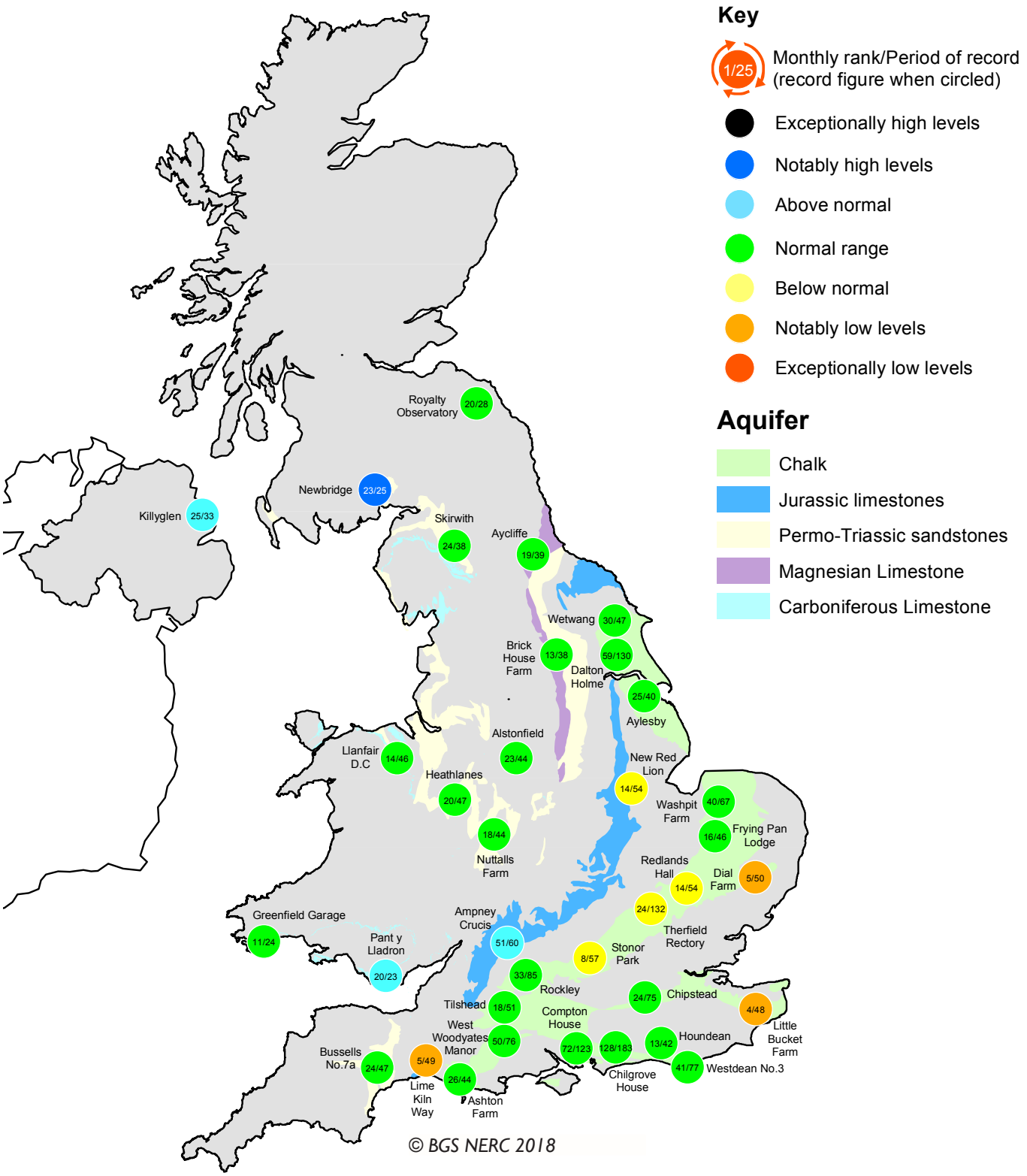










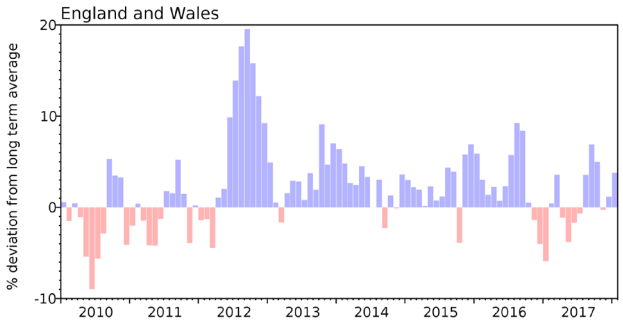


Groundwater levels - January 2018

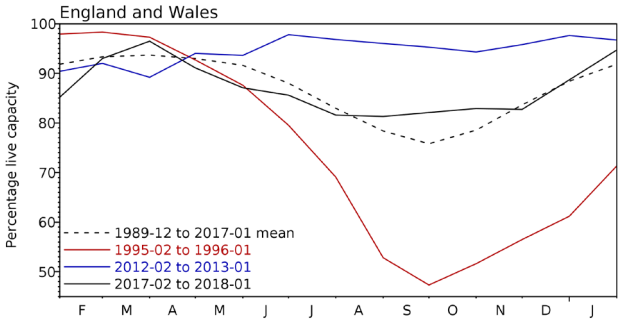
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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 Nov	2017 Dec	2018 Jan	Jan Anom.	Min Jan	Year* of min	2017 Jan	Diff 18-17
North West	N Command Zone	•	124929	82	81	87	-5	63	1996	69	19
	Vyrnwy		55146	93	99	99	6	45	1996	84	15
Northumbrian	Teesdale	•	87936	98	100	100	7	51	1996	93	7
	Kielder		(199175)	83	91	95	1	84	2017	84	10
Severn-Trent	Clywedog		49936	87	86	93	5	62	1996	91	2
	Derwent Valley	•	46692	85	100	100	5	15	1996	92	8
Yorkshire	Washburn	•	23373	86	86	94	4	34	1996	78	16
	Bradford Supply	•	40942	91	94	100	6	33	1996	78	22
Anglian	Grafham		(55490)	94	92	92	6	67	1998	87	5
	Rutland		(116580)	81	84	92	6	68	1997	87	5
Thames	London	•	202828	59	76	94	2	70	1997	92	1
	Farmoor	•	13822	94	95	95	5	72	2001	93	2
Southern	Bewl		31000	33	43	64	-17	37	2006	59	5
	Ardingly		4685	87	100	100	8	41	2012	60	40
Wessex	Clatworthy		5364	65	85	100	5	62	1989	71	29
	Bristol	•	(38666)	67	87	99	13	58	1992	73	26
South West	Colliford		28540	88	94	100	16	52	1997	70	30
	Roadford		34500	79	87	95	13	30	1996	65	30
	Wimbleball		21320	55	67	86	-4	58	2017	58	29
	Stithians		4967	80	89	100	11	38	1992	86	15
Welsh	Celyn & Brenig	•	131155	94	97	98	3	61	1996	94	4
	Brianne		62140	100	100	100	2	84	1997	94	6
	Big Five	•	69762	84	92	93	0	67	1997	86	7
	Elan Valley	•	99106	100	100	100	3	73	1996	95	5
Scotland(E)	Edinburgh/Mid-Lothian	•	96518	89	90	97	3	72	1999	85	12
	East Lothian	•	9374	97	99	100	2	68	1990	100	0
Scotland(W)	Loch Katrine	•	110326	100	99	100	7	85	2000	89	11
	Daer		22412	99	100	100	2	90	2013	93	7
	Loch Thom		10798	100	100	100	2	90	2004	91	9
Northern Ireland	Total+	•	56800	98	99	99	7	74	2017	74	25
	Silent Valley	•	20634	96	99	100	12	46	2002	59	40

( ) figures in parentheses relate to gross storage

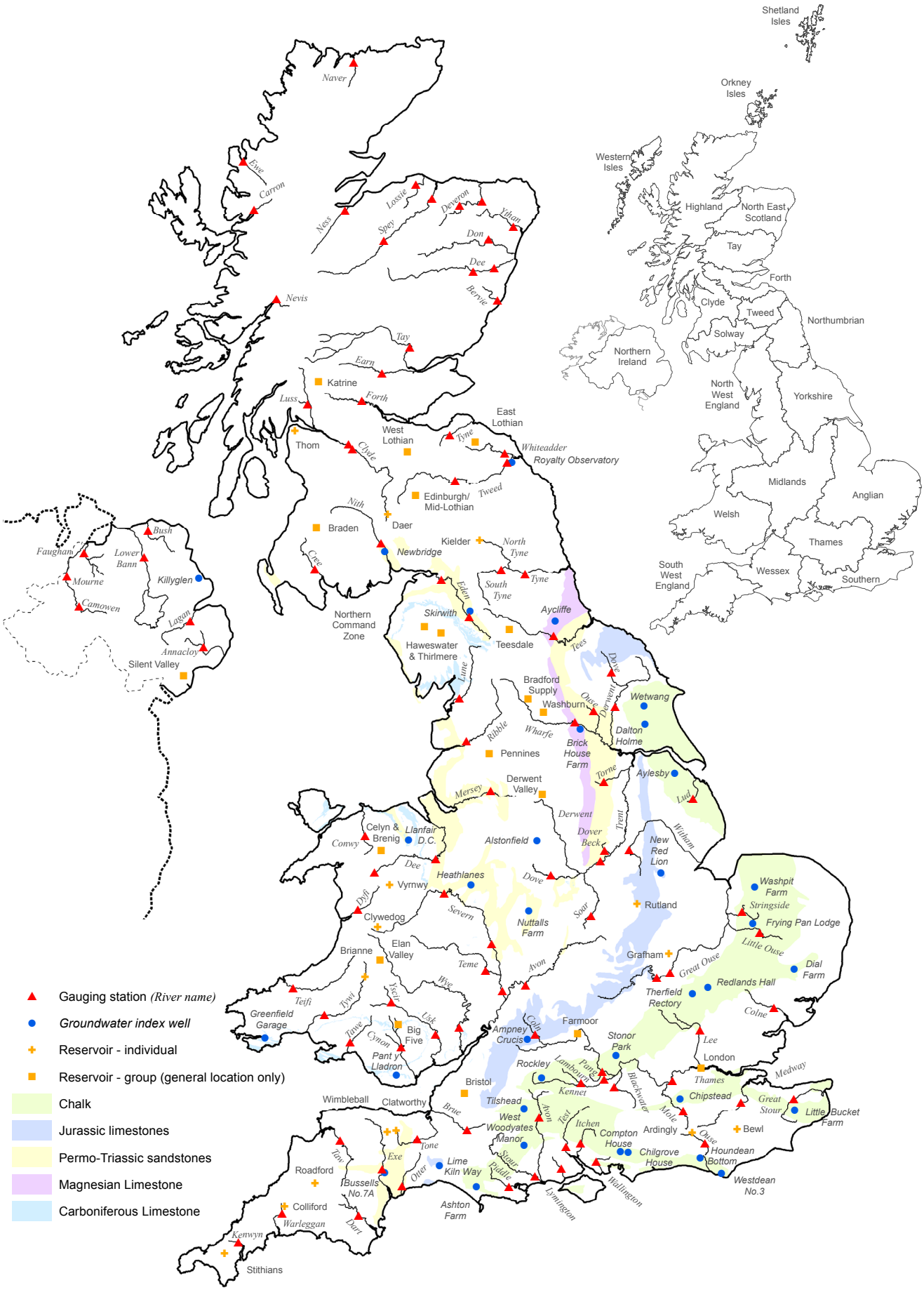
• denotes reservoir groups

*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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