Hydrological Summary

for the United Kingdom

November 2014

General

November was a damp and dull month, the dullest November since 2004 for the UK. Temperatures were mild for the time of year, particularly during the first half of the month, contributing to mean January-November temperatures that rank 2014 as the warmest on record for the Central England Temperature series back to 1659. Although November rainfall for the UK overall was near average, there were notable regional variations. Northern Ireland and southern and eastern areas of Great Britain were much wetter than average, whilst northern and western areas of Great Britain received below average rainfall. Coinciding with the distribution of rainfall anomalies, river flows in Northern Ireland, eastern Scotland and responsive catchments of Lowland England were above average, whilst below average flows characterised north-western areas of Scotland, Wales and England. November rainfall eradicated any remaining soil moisture deficits across the majority of the country, leading to the widespread commencement of groundwater recharge. Groundwater levels in all aquifers were average or above for the time of year. Reservoir stocks were generally near average with the exception of those drawn down for management purposes. Rainfall over the next three months will be influential in determining the water resources outlook for 2015, but the current situation in relation to groundwater levels and reservoir stocks remains healthy.

Rainfall

The dominant synoptic pattern in November was low pressure in the eastern Atlantic, which caused a prevailing south-easterly airflow. This pushed a succession of fronts across the UK which delivered showery conditions throughout the month, particularly for southern and eastern areas. Rainfall was generally showery and persistent in November, with a monthly total of 248mm recorded at Whitchurch (Pembrokeshire). However, there were relatively few examples of large amounts of rainfall from individual storm events. The largest daily rainfall total recorded in November was 123mm on the Isle of Skye on the 6th. For November overall, despite this daily total on Skye, Highlands region registered only 55% of monthly average rainfall, with some areas recording less than 30%, contributing to the driest November since 1993 for northern Scotland. Less than 70% of monthly average rainfall was also registered in areas of north Wales and Lancashire. Conversely, substantially above average rainfall was recorded in November for southern, central and eastern England, Northern Ireland, and eastern Scotland. Wessex, Thames and Southern England each received more than 160% of monthly average rainfall, with some localised areas registering more than double the average rainfall. It was the fourth wettest November on record for Northern Ireland, in a series from 1910. For the autumn (September-November), rainfall was generally near or below average, with some areas of above average rainfall in Northern Ireland, north-east Scotland and southern England. Wales, north-west England and western Scotland were notably dry, receiving less than 85% of the long-term average. New maximum rainfall totals for January-November were registered for south-east England, in a series from 1910.

River flows

Persistent rainfall onto saturated ground led to an elevated flood risk in November, triggering intermittent flood alerts and warnings in many regions of the UK. Despite this, there were few examples of extreme flows registered in November. For some rivers in Northern Ireland and Scotland, some of the highest flows on record for November were registered over the 6th/7th (Mourne, Faughan, Annacloy and Earn) and the 14th/15th (Lagan and Scottish Dee). The Mourne registered its second highest November peak flow on record on the 6th and the peak flow on the Scottish Dee on the 14th was amongst the largest on record for November in a series back to 1929. The Ravensbourne overflowed in south-east London, flooding Lewisham on the 23rd, one of few reported instances of flooding in the month. Conversely, new daily minima were registered for the Carron in north-west Scotland, for the second consecutive month. Outflows from the UK increased over the first half of the month before decreasing over the last fortnight. Outflows for Scotland were high at the beginning of November before declining steeply towards month-end, and outflows from Northern Ireland at the start of the month were amongst the highest on record for any month. Monthly average flows for November predominantly followed the pattern of rainfall anomalies. Above average flows occurred in Northern Ireland, eastern Scotland and responsive catchments across Lowland England. Around twice the monthly average flow was recorded for the Great Stour, Medway, Colne, Blackwater and Scottish Dee, and the Annacloy registered its second highest November mean flow on record. Monthly flows were below average in north-west Scotland, north-west England, and notably so in parts of north Wales. The pattern of average flows for the autumn (September-November) closely resembled that of November. Above average flows were registered in south-east England, north-east Scotland and for the Annacloy, whilst below average flows characterised parts of western Scotland, northern England and north Wales.

Groundwater

Levels in the Chalk rose significantly in the fast responding southern Chalk, by over 10m at Chilgrove House, Compton House, Houndean Bottom and nearly 20m at West Woodyates Manor. Levels at Redlands Hall (East Anglia), Little Bucket Farm (North Downs), and Westdean No.3 and Houndean Bottom (South Downs) were notably high for the time of year. However, levels continued to fall in Norfolk, the Chilterns and at Well House Inn. In both the Jurassic and Magnesian limestones, levels were generally above average and rising, the exception being Swan House where they declined into the normal range. Levels were also generally above average throughout the Permo-Triassic sandstones, despite still being in recession across most sites (including Nuttalls Farm, where levels remained exceptionally high). Levels at Bussells No.7A (Devon) and Newbridge (south-west Scotland) rose to register as notably high. Levels at Lime Kiln Way in the Upper Greensand of south-west England remained exceptionally high. In the Carboniferous Limestone, levels rose overall by several metres during November. Levels declined towards month-end in south Wales, although they remained in the normal range there and in the Peak District.

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 1971-2000 average.

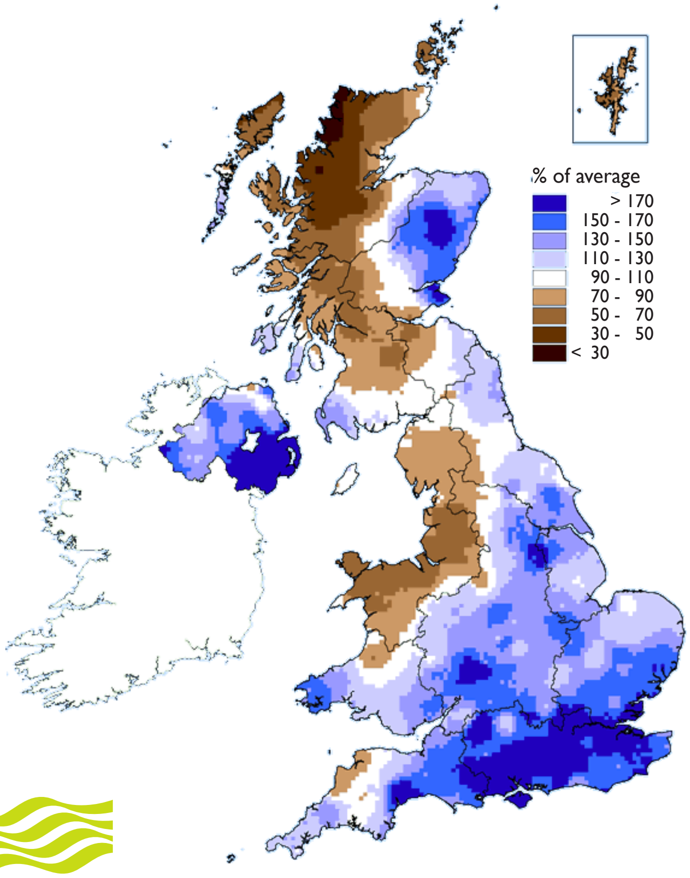
Area	Rainfall	Nov 2014	Sep14 – Nov14	RP	Jun14 – Nov14	RP	Mar14 – Nov14	RP	Dec13 – Nov14	RP
United	mm	**123**	304		562		810		1354	
Kingdom	%	**107**	94	2-5	104	2-5	106	2-5	125	80-120
England	mm	**107**	227		436		633		1035	
	%	**131**	97	2-5	105	2-5	108	2-5	127	20-30
Scotland	mm	**131**	416		759		1083		1826	
	%	**82**	92	2-5	107	2-5	109	2-5	127	70-100
Wales	mm	**157**	343		600		889		1615	
	%	**103**	82	2-5	89	2-5	94	2-5	118	5-10
Northern	mm	**174**	317		575		796		1285	
Ireland	%	**158**	99	2-5	104	2-5	101	2-5	116	10-20
England &	mm	**114**	243		458		669		1115	
Wales	%	**124**	93	2-5	102	2-5	105	2-5	125	15-25
North West	mm	**101**	295		559		810		1340	
	%	**81**	83	2-5	92	2-5	97	2-5	114	5-10
Northumbrian	mm	**94**	211		423		633		988	
	%	**113**	92	2-5	101	2-5	105	2-5	119	5-10
Severn-Trent	mm	**93**	189		389		582		919	
	%	**132**	90	2-5	102	2-5	106	2-5	122	8-12
Yorkshire	mm	**95**	200		412		620		942	
	%	**121**	89	2-5	102	2-5	106	2-5	116	2-5
Anglian	mm	**80**	175		370		519		737	
	%	**141**	104	2-5	116	2-5	114	2-5	122	8-12
Thames	mm	**113**	222		405		579		1000	
	%	**171**	111	2-5	114	2-5	113	2-5	143	>100
Southern	mm	**147**	279		461		640		1178	
	%	**176**	115	2-5	116	2-5	115	2-5	151	>100
Wessex	mm	**141**	269		464		687		1233	
	%	**163**	107	2-5	110	2-5	114	2-5	143	>100
South West	mm	**158**	317		566		836		1528	
	%	**119**	89	2-5	98	2-5	103	2-5	127	25-40
Welsh	mm	**154**	334		589		870		1572	
	%	**105**	83	2-5	90	2-5	95	2-5	119	8-12
Highland	mm	**111**	460		870		1258		2064	
	%	**55**	85	2-5	104	2-5	108	2-5	121	15-25
North East	mm	**148**	365		708		872		1316	
	%	**148**	126	5-10	144	20-30	126	5-10	139	>100
Tay	mm	**150**	402		731		1005		1807	
	%	**114**	106	2-5	121	2-5	116	2-5	143	>>100
Forth	mm	**95**	294		558		833		1404	
	%	**83**	87	2-5	100	2-5	105	2-5	124	20-30
Tweed	mm	**98**	279		538		777		1316	
	%	**105**	104	2-5	114	2-5	114	2-5	138	50-80
Solway	mm	**160**	444		732		1070		1899	
	%	**107**	104	2-5	105	2-5	109	2-5	135	>100
Clyde	mm	**157**	453		779		1193		2127	
	%	**84**	84	2-5	90	2-5	100	2-5	123	25-40

% = percentage of 1971-2000 average *RP = Return period*

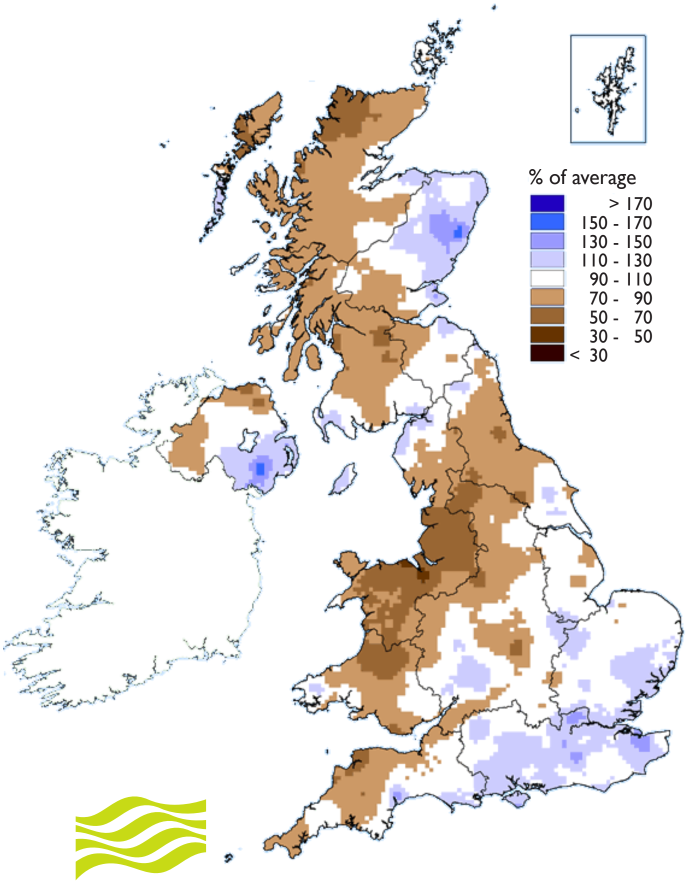
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic 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 from July 2014 (inclusive) are provisional.

Rainfall . . . Rainfall . . .

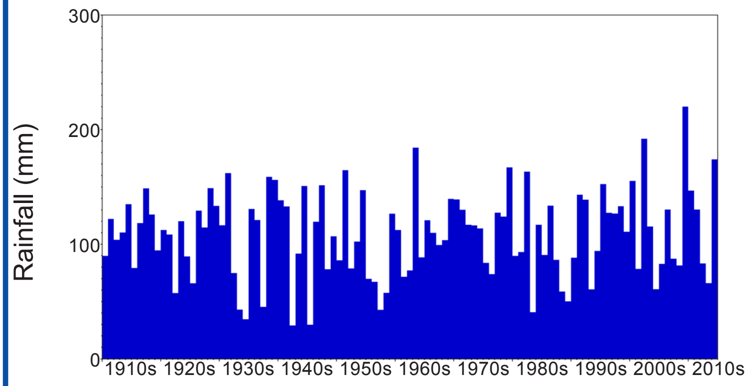
November 2014 rainfall as % of 1971-2000 average



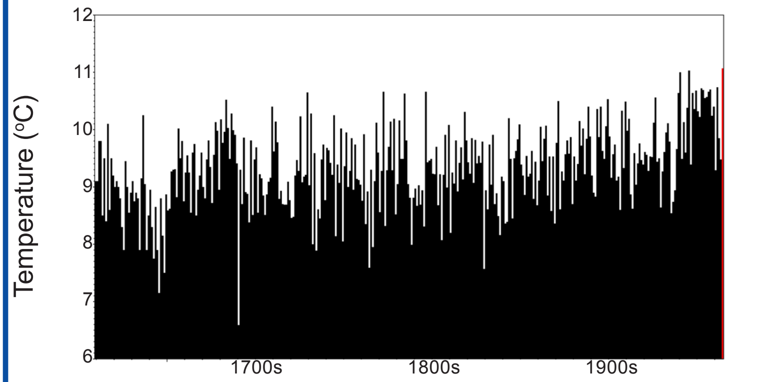
September 2014 - November 2014 rainfall as % of 1971-2000 average



November rainfall for Northern Ireland



Jan-Nov mean temperature for Central England



Met Office 3-month outlook Updated: November 2014

Latest predictions for UK-mean precipitation favour near-to or above-average rainfall for the December-January-February period.

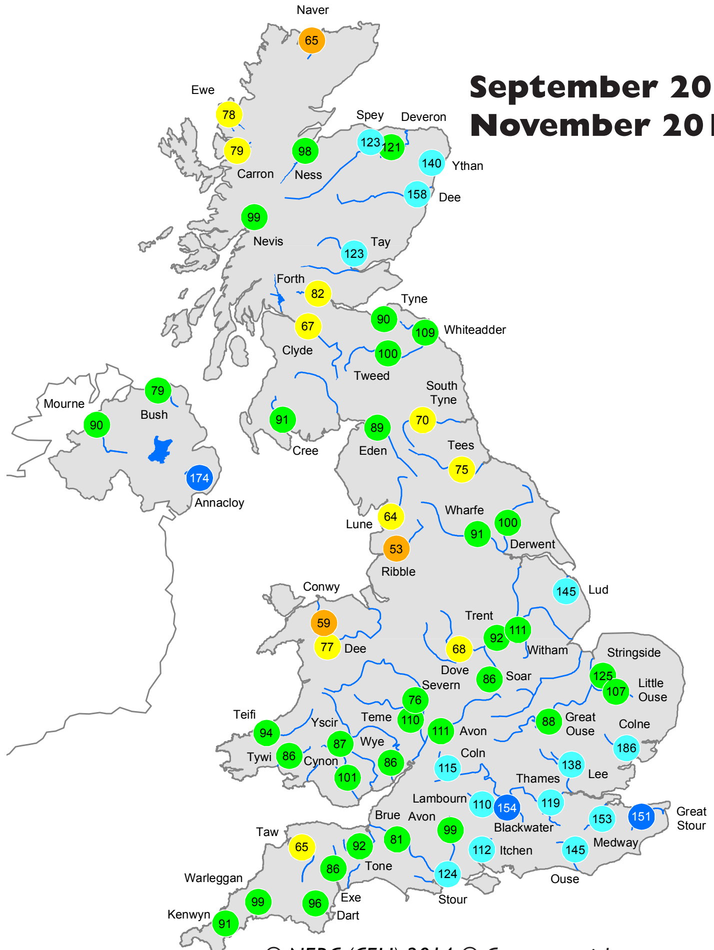
The probability that UK precipitation for December-January-February will fall into the driest of our five categories is between 10% and 15% and the probability that it will fall into the wettest category is around 25% (the 1981-2010 probability for each of these categories is 20%).

The complete version of the 3-month outlook may be found at:
http://www.metoffice.gov.uk/publicsector/contingency-planners
This outlook is updated towards the end of each calendar month.

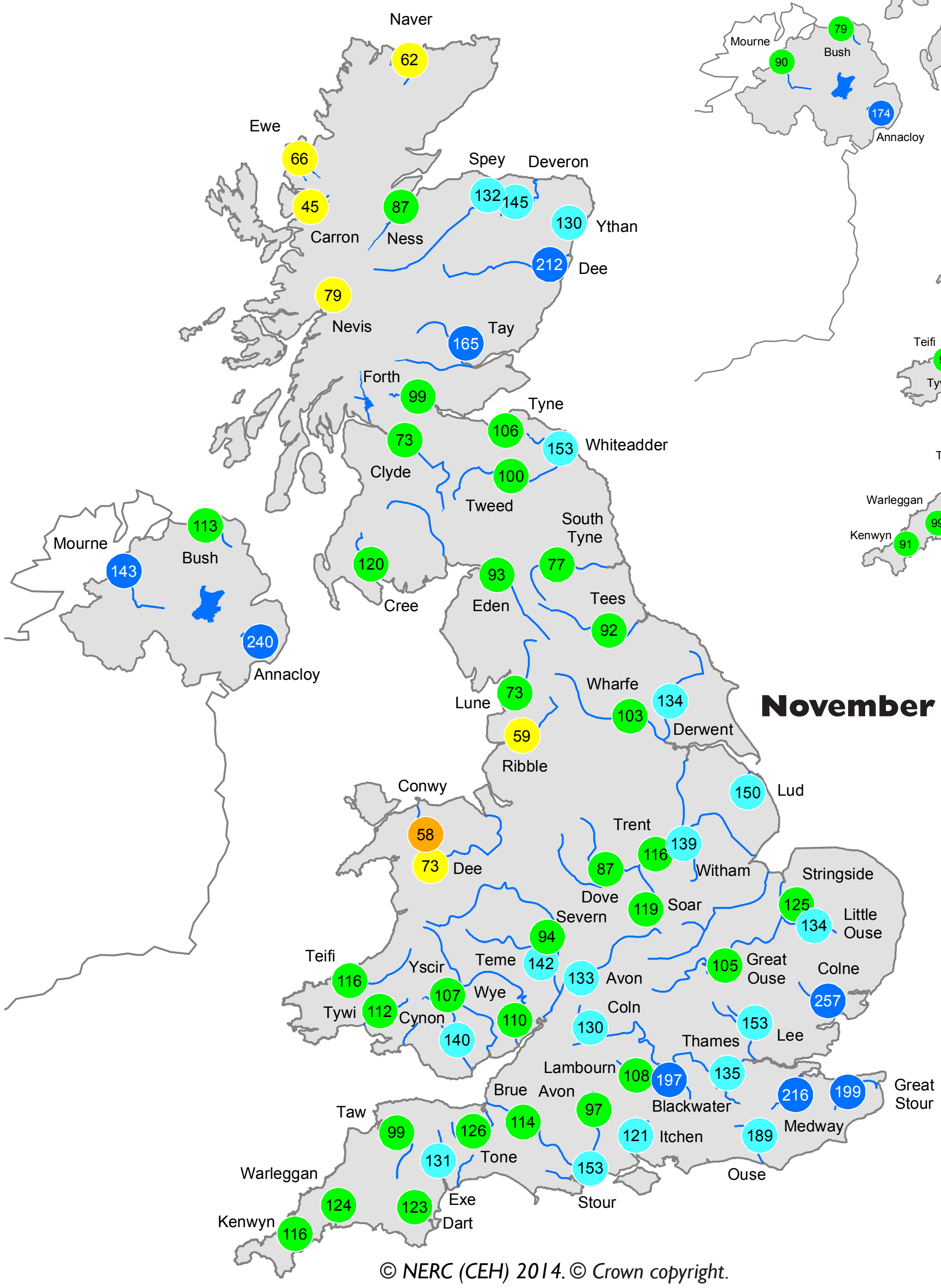
The latest shorter-range forecasts, covering the upcoming 30 days, can be accessed via:
http://www.metoffice.gov.uk/weather/uk/uk_forecast_weather.html
These forecasts are updated very frequently.

River flow . . . River flow . . .

September 2014 - November 2014



November 2014



Key

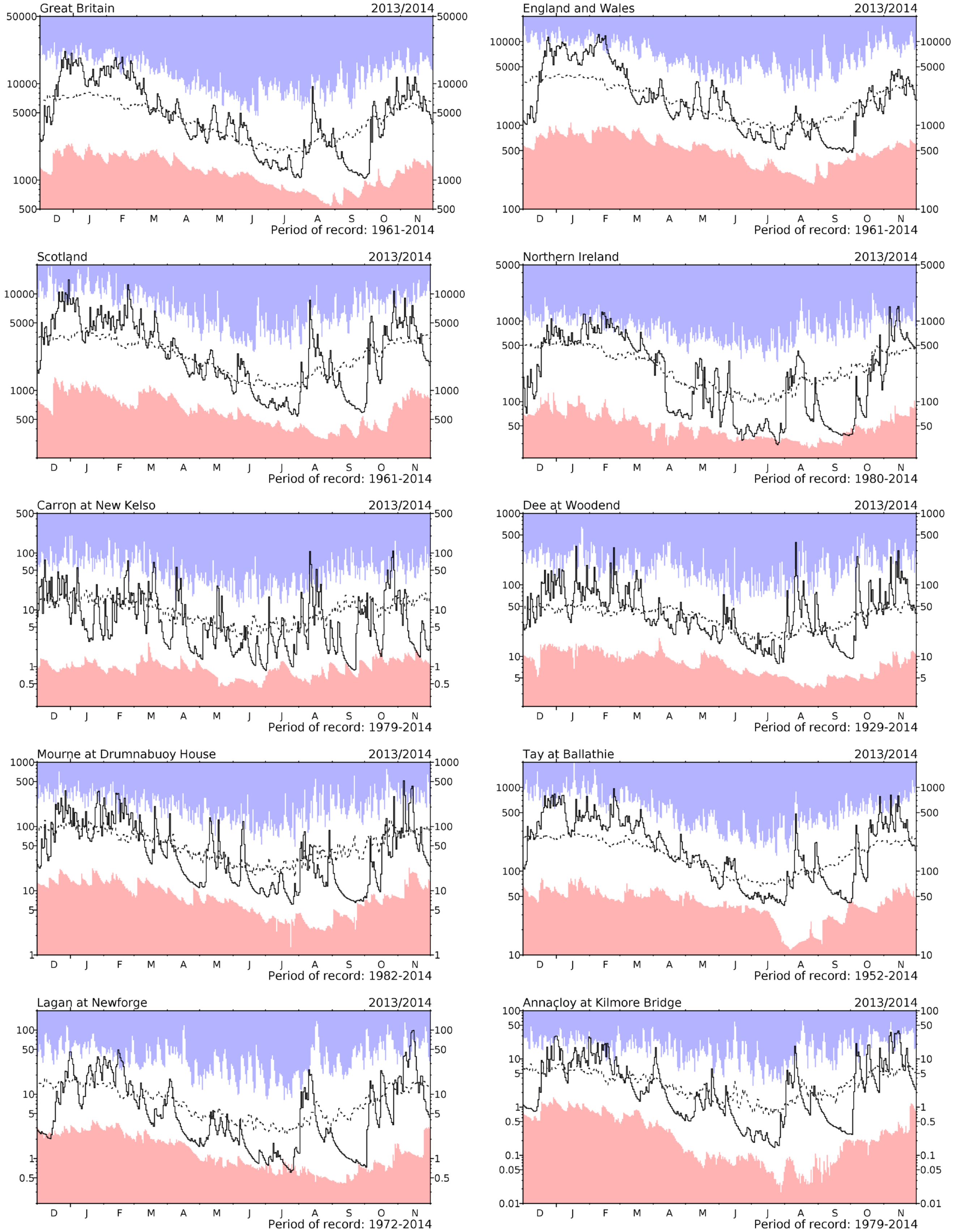
- 25 — % of long-term average (record figure when circled)
- Exceptionally high flow
- Notably high flow
- Above normal
- Normal range
- Below normal
- Notably low flow
- Exceptionally low flow

*Based on ranking of the monthly flow**

River flows

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

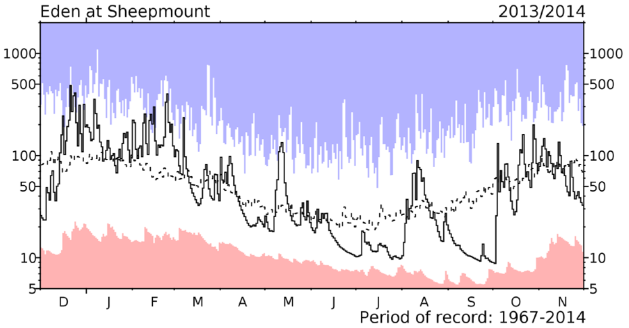
River flow . . . River flow . . .

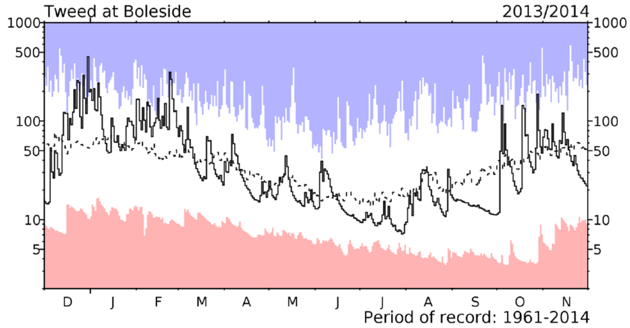


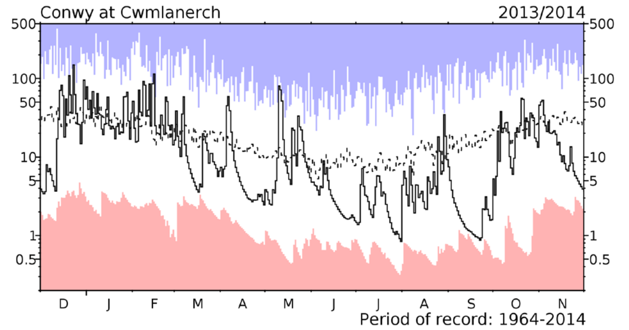
River flow hydrographs

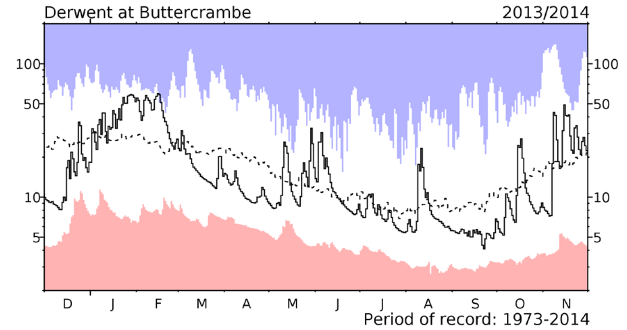
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to December 2013 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. Mean daily flows are shown as the dashed line.

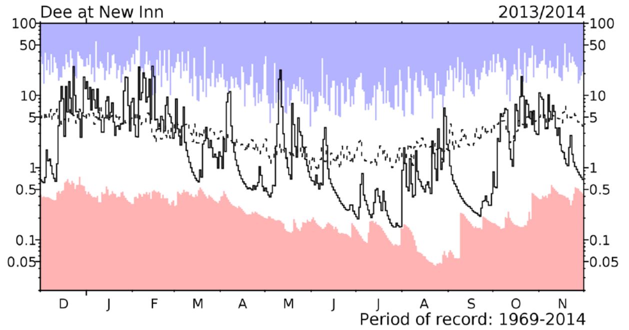
River flow . . . River flow . . .

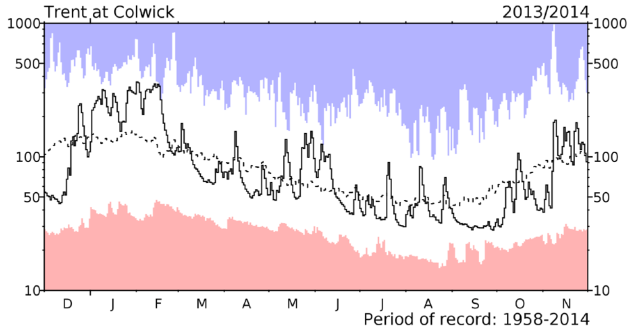


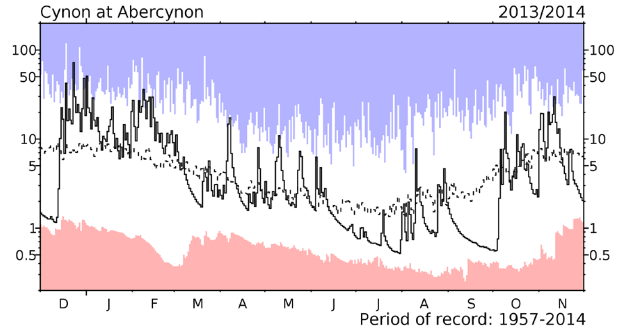


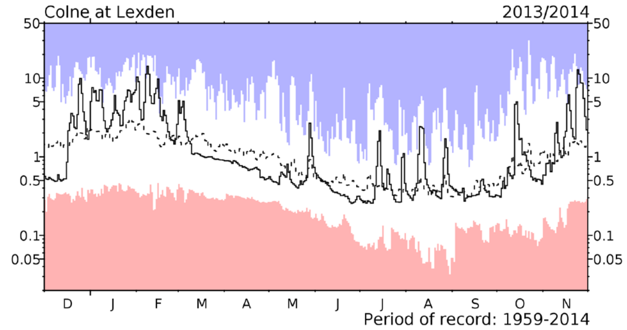


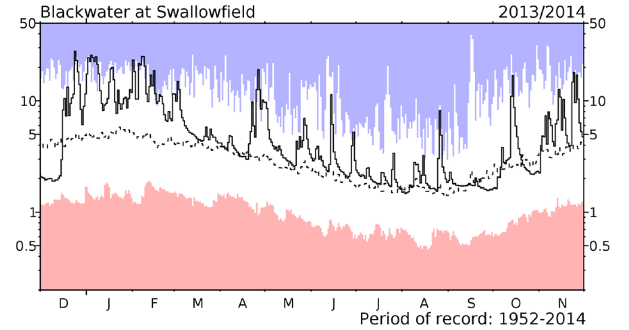


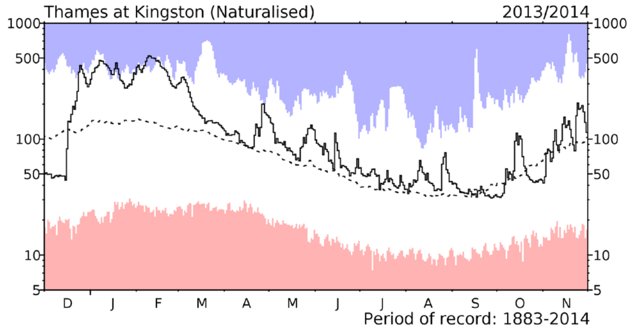


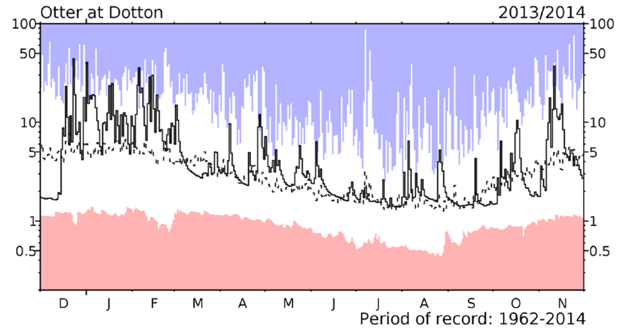


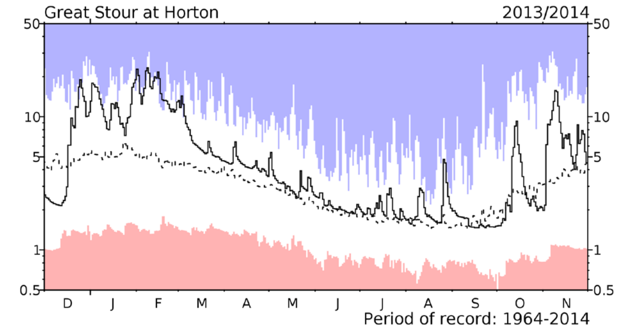




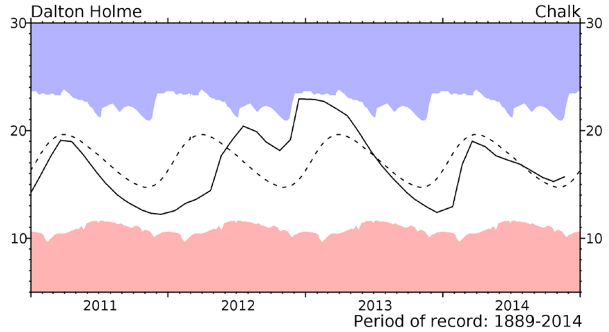


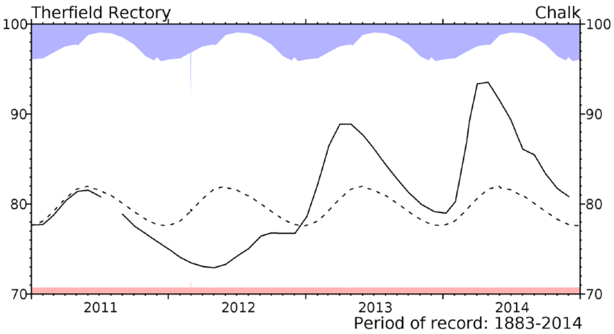


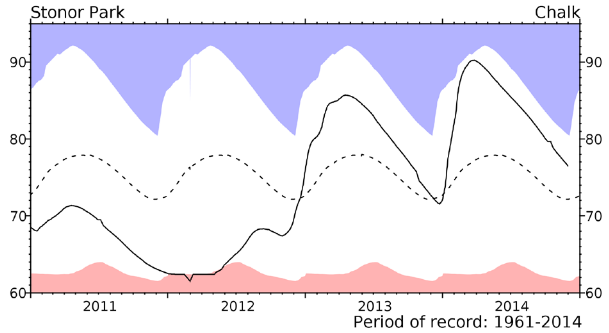


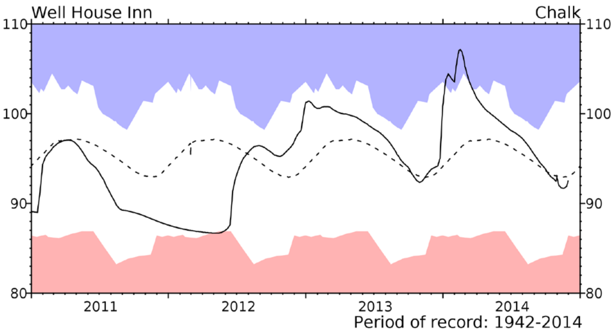


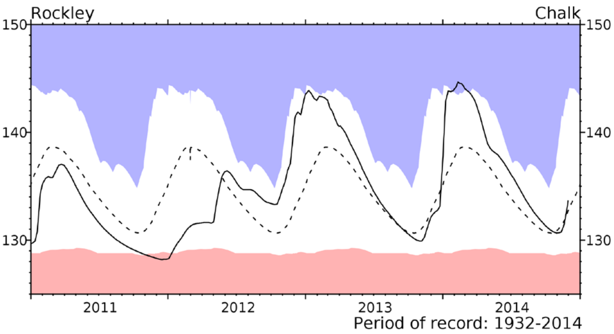
Groundwater . . . Groundwater

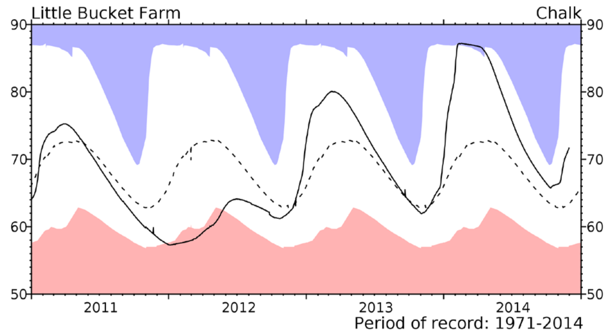


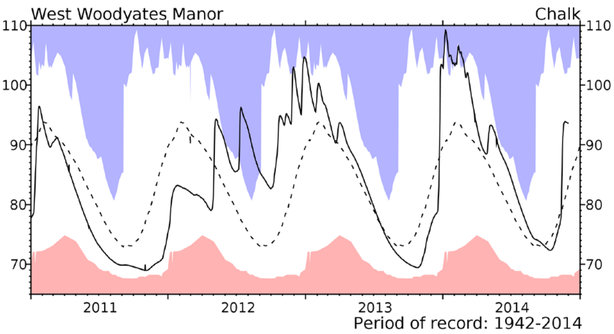


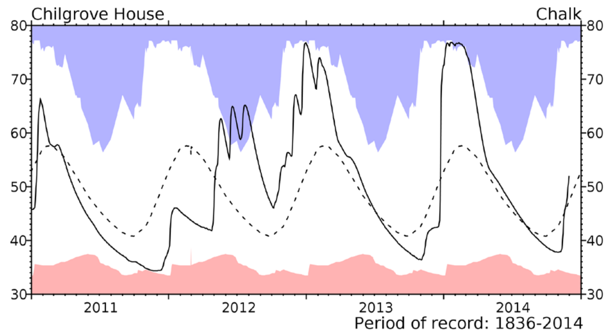


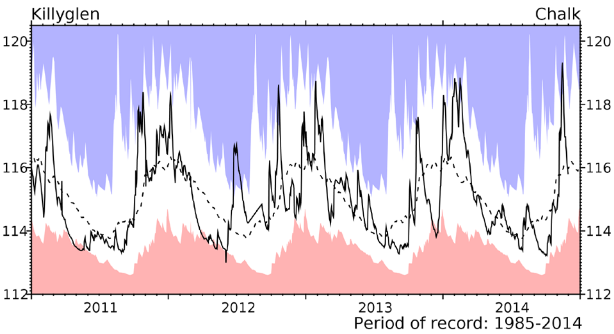


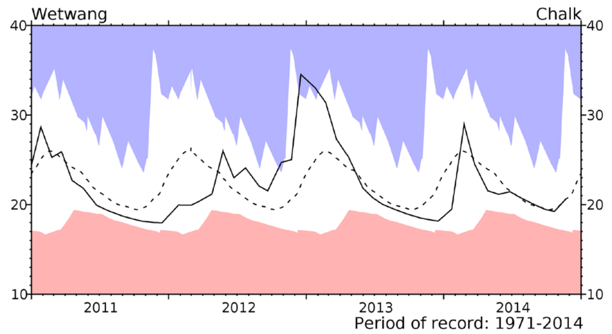






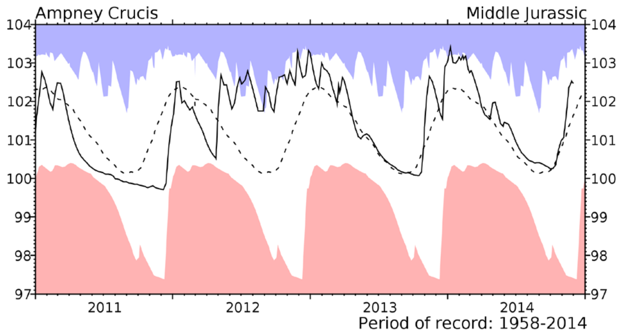


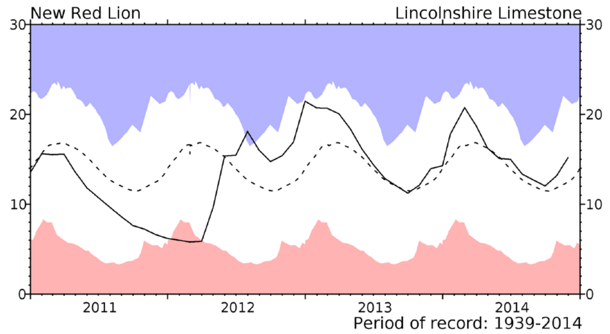


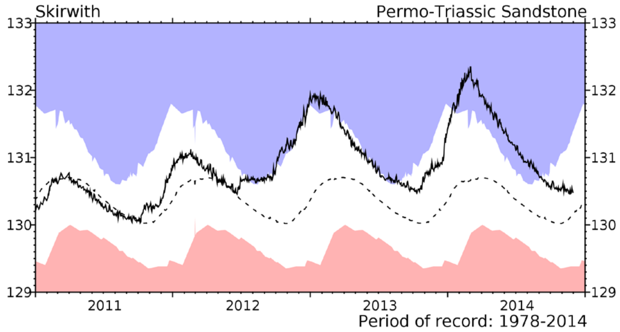


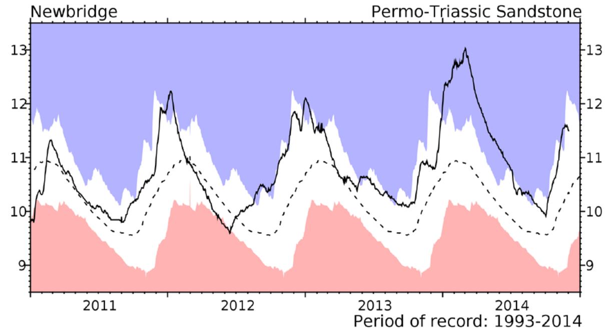
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined 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. The latest recorded levels are listed overleaf.

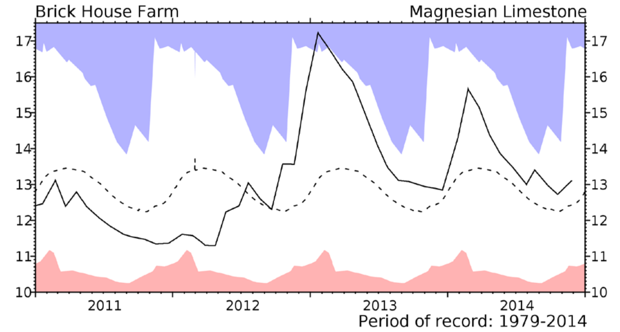
Groundwater... Groundwater

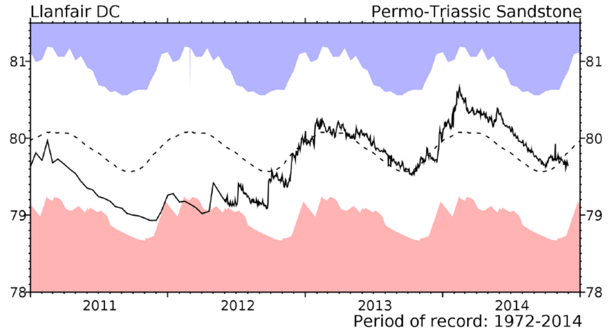


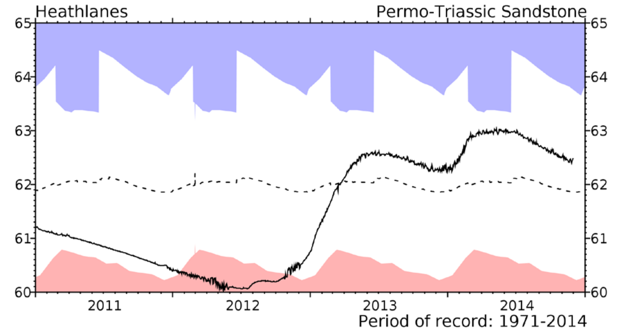


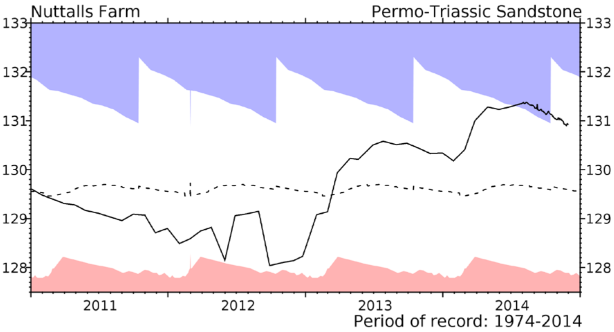


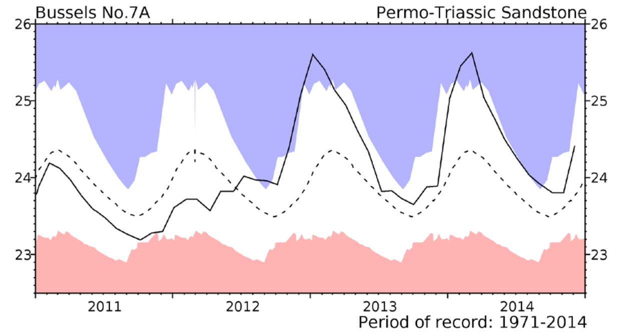


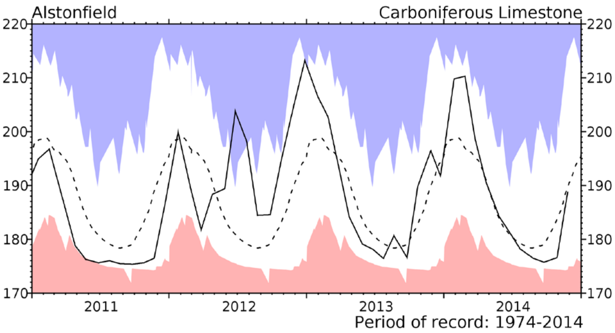










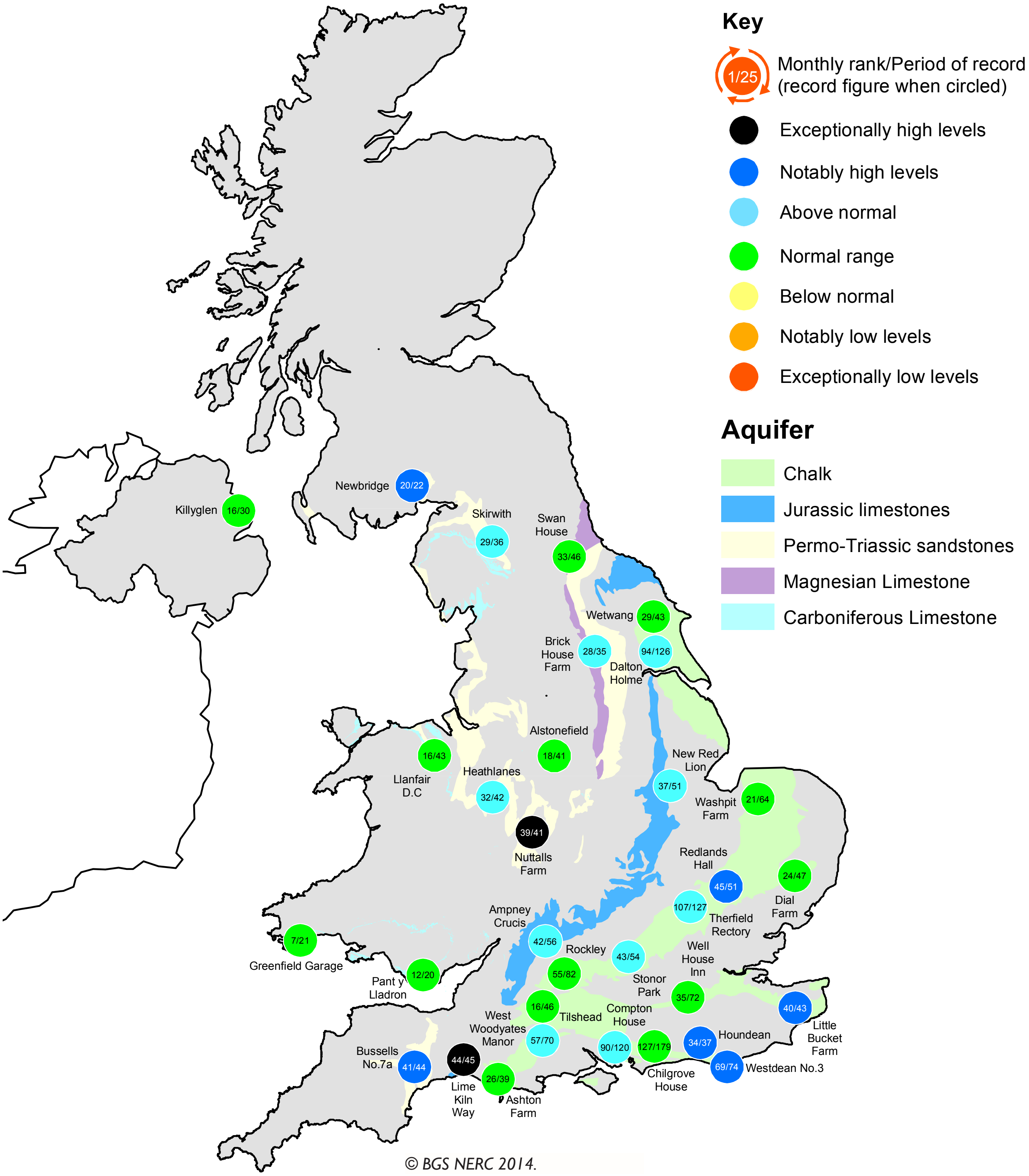


Groundwater levels November / December 2014

Borehole	Level	Date	Nov av.	Borehole	Level	Date	Nov av.	Borehole	Level	Date	Nov av.
Dalton Holme	15.69	20/11	14.79	Chilgrove House	52.18	30/11	46.39	Brick House Farm	13.10	26/11	12.36
Therfield Rectory	80.82	01/12	78.23	Killyglen (NI)	115.80	30/11	115.91	Llanfair DC	79.65	30/11	79.67
Stonor Park	76.51	30/11	72.03	Wetwang	20.54	20/11	20.26	Heathlanes	62.47	30/11	61.82
Tilshead	80.09	30/11	82.55	Ampney Crucis	102.48	30/11	101.23	Nuttalls Farm	130.93	30/11	129.57
Rockley	133.62	30/11	131.64	New Red Lion	15.18	30/11	12.29	Bussels No.7a	24.41	04/12	23.66
Well House Inn	92.50	30/11	92.88	Skirwith	130.47	30/11	130.14	Alstonefield	188.72	26/11	187.50
West Woodyates	93.63	30/11	80.60	Newbridge	11.50	01/12	10.24				

Levels in metres above Ordnance Datum

Groundwater...Groundwater

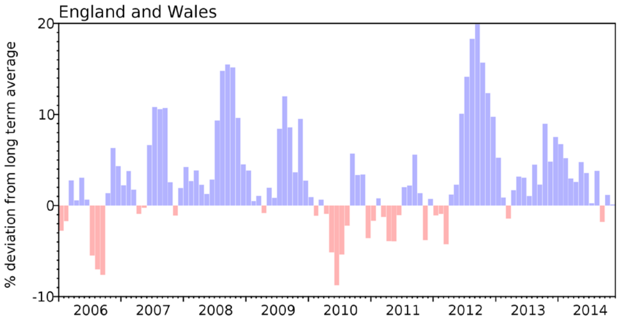


Groundwater levels - November 2014

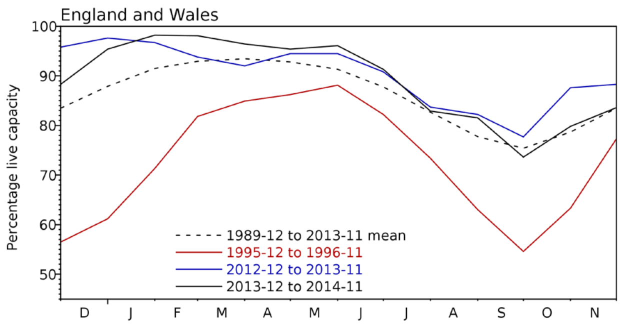
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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)	2014 Sep	2014 Oct	2014 Nov	Nov Anom.	Min Nov	Year* of min	2013 Nov	Diff 14-13
North West	N Command Zone	•	124929	49	68	74	-4	44	1993	81	-7
	Vyrnwy		55146	60	71	74	-8	33	1995	83	-9
Northumbrian	Teesdale	•	87936	74	89	88	6	39	1995	97	-9
	Kielder		(199175)	83	89	95	9	55	2007	89	6
Severn-Trent	Clywedog		44922	79	84	86	5	43	1995	87	-1
	Derwent Valley	•	39525	54	56	66	-12	9	1995	89	-23
Yorkshire	Washburn	•	22035	54	52	67	-9	16	1995	92	-25
	Bradford Supply	•	41407	61	66	84	1	20	1995	79	5
Anglian	Grafham		(55490)	79	75	66	-17	47	1997	89	-23
	Rutland		(116580)	87	84	82	2	57	1995	86	-5
Thames	London	•	202828	87	88	88	6	52	1990	94	-6
	Farmoor	•	13822	88	78	69	-20	52	1990	92	-23
Southern	Bewl		28170	70	67	71	7	34	1990	80	-10
	Ardingly**		4685	67	76	100	26	14	2011	84	17
Wessex	Clatworthy		5364	61	62	84	5	16	2003	100	-16
	Bristol	•	(38666)	77	66	74	6	27	1990	69	5
South West	Colliford		28540	71	71	76	3	42	1995	75	1
	Roadford		34500	74	74	78	4	19	1995	81	-3
	Wimbleball		21320	66	63	75	1	34	1995	66	9
	Stithians		4967	54	44	52	-15	29	2001	81	-29
Welsh	Celyn & Brenig	•	131155	65	74	81	-8	50	1995	89	-8
	Brianne		62140	84	100	93	-2	72	1995	91	2
	Big Five	•	69762	68	80	86	2	49	1990	92	-6
	Elan Valley	•	99106	73	90	99	6	47	1995	100	-1
Scotland(E)	Edinburgh/Mid-Lothian	•	97639	66	71	79	-7	45	2003	81	-2
	East Lothian	•	10206	92	98	99	11	38	2003	73	26
Scotland(W)	Loch Katrine	•	111363	55	89	90	0	65	2007	87	3
	Daer		22412	72	92	99	2	73	2003	100	-1
	Loch Thom	•	11840	73	76	100	6	72	2003	100	0
Northern Ireland	Total+	•	56800	73	84	93	8	59	2003	87	6
	Silent Valley	•	20634	72	82	97	17	43	2001	85	12

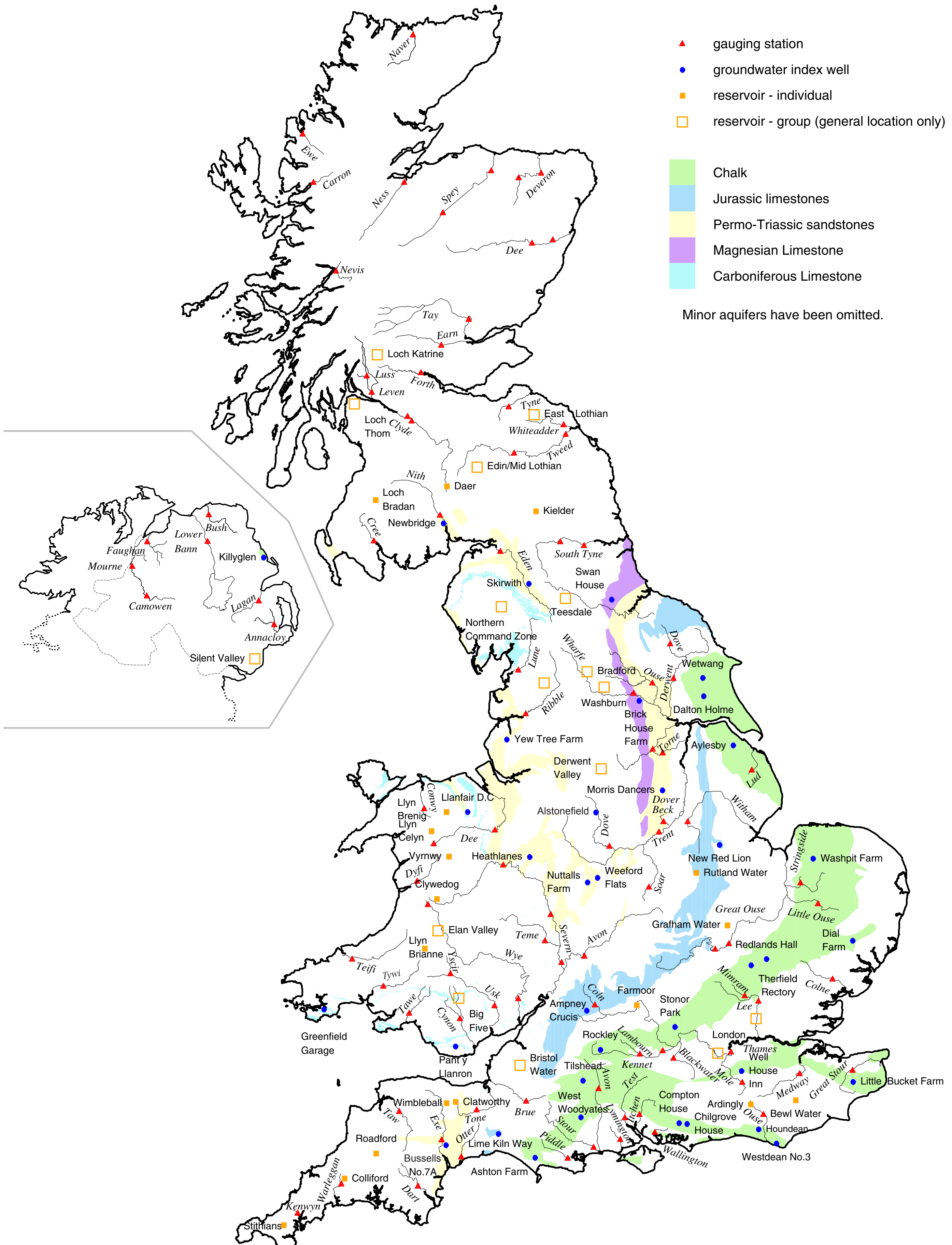
( ) figures in parentheses relate to gross storage • denotes reservoir groups *last occurrence

** the monthly record of Ardingly reservoir stocks is under review.

+ excludes Lough Neagh

Details of the individual reservoirs in each o 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



National Hydrological Monitoring Programme

The National Hydrological Monitoring Programme (NHMP) was instigated in 1988 and is undertaken jointly by the Centre for Ecology & Hydrology (CEH) and the British Geological Survey (BGS) – both are component bodies of the Natural Environment Research Council (NERC). The National River Flow Archive (maintained by CEH) and the National Groundwater Level Archive (maintained by BGS) provide the historical perspective within which to examine contemporary hydrological conditions.

Data Sources

River flow and groundwater level data are provided by the Environment Agency (EA), Natural Resources Wales - Cyfoeth Naturiol Cymru, 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).

Reservoir level information is provided by the Water Service Companies, the EA, Scottish Water and Northern Ireland Water.

Most rainfall data are provided by the Met Office (address opposite).

To allow better spatial differentiation the monthly rainfall data for Britain are presented for the regional divisions of the precursor organisations of the EA and SEPA.

The monthly, and n-month, rainfall figures have been produced by the Met Office, National Climate Information Centre (NCIC) and are based on gridded data from raingauges. They include a significant number of monthly raingauge totals provided by the EA and SEPA. The Met Office NCIC monthly rainfall series extends back to 1910 and forms 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/Monthly_gridded_datasets_UK.pdf

The regional figures for the current month are based on limited raingauge networks so these (and the return periods associated with them) should be regarded as a guide only.

The Met Office NCIC monthly rainfall series are Crown Copyright and may not be passed on to, or published by, any unauthorised person or organisation.

From time to time the Hydrological Summary may also refer to evaporation and soil moisture figures. These are obtained from MORECS, the Met Office services involving the routine calculation of evaporation and soil moisture throughout the UK.

For further details please contact:

The Met Office
FitzRoy Road
Exeter
Devon
EX1 3PB

Tel.: 0870 900 0100
Email: enquiries@metoffice.gov.uk

The National Hydrological Monitoring Programme depends on the active cooperation of many data suppliers. This cooperation is gratefully acknowledged.

Enquiries

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A full catalogue of past Hydrological Summaries can be accessed and downloaded at:
http://www.ceh.ac.uk/data/nrfa/nhmp/nhmp.html

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