Hydrological Summary
for the United Kingdom

February 2015

General
Considered at the national scale, weather conditions in February (although exceptionally sunny) were typical of the late winter but the spatial and temporal variations in rainfall amounts were substantial – reflecting the preferred paths taken by the rain-bearing frontal systems. Generally river flows continued their late January recessions during early February with frozen catchments contributing to relatively depressed flow rates. A recovery thereafter saw widespread moderate spate conditions but an absence of extreme flow rates, and the number of fluvial flood alerts was modest for the time of year. Runoff from Great Britain was appreciably below the February mean but, for the winter as a whole, the average was exceeded by around 10%. This is generally reflected in reservoir stocks which were usefully boosted by healthy replenishment over the latter half of February. Having remained close to or above (often notably so) the monthly average since spring 2012, overall reservoir stocks for England & Wales were moderately above average entering March; the great majority of impoundments were within 10% of capacity (a not unusual circumstance entering the spring). With soils at, or close to, saturation over the latter half of the month, some aquifer recharge occurred and groundwater levels in most index boreholes are well within the normal range, with a majority above the late-winter average. With soils remaining wet and an unsettled start to March, the water resources outlook remains healthy.

Rainfall
A very cold northerly airflow which characterised late January continued into February attended by significant snowfall early in the month. A snow depth of 21cm was recorded at Aviemore (Highlands) on the 1st and a dusting of snow was also reported on the Chilterns. Subsequently, high pressure dominated synoptic patterns for 10-12 days across much of the country; many areas reporting meagre precipitation in this timespan. Thereafter, much more cyclonic conditions prevailed and rain, snow, sleet and hail contributed to monthly totals which were within 20% of the 1971-2000 February average across the greater part of the UK. Generalising broadly, above average rainfall was reported for much of north-western Britain (in the Western Isles a 24-hr total of 90.8mm was recorded at Tiree on the 10th/11th) and for parts of South East England. By contrast, monthly rainfall totals fell well below average in a broad band from north Wales to eastern Scotland with a few areas falling below 50% (e.g. in the rain shadow of the Pennines; in Northumberland, Chillingham Castle reported a monthly total of 11mm). A broadly similar rainfall distribution could be recognised for the winter (December-February) as a whole. Whilst the UK rainfall total was around 10% above average, zones of distinctive deficiency can be recognised in much of eastern Britain, the South West, and the south-eastern part of Northern Ireland. Generally, longer term regional rainfall accumulations are appreciably above average in Scotland and within the normal range for England & Wales.

River flows
In most parts of the country the first fortnight of February saw sustained river flow recessions but, generally, runoff rates remained well above seasonal minima. The change in synoptic patterns then triggered a smart recovery, enhanced on occasions by snow melt from northern and western hills. On the 13th, locally intense downpours caused flash flooding in many localities across southern England and, subsequently, moderate spate conditions were common with scattered flood alerts on the 19th-21st from northern Scotland (e.g. on the Dulnain) to the Midlands (e.g. the Soar and Swift) and southern England (e.g. the Sussex Ouse); tidal blocking was an exacerbating factor in the lower reaches of a number of rivers, and standing water was very evident across low-lying agriculture land. The counterbalancing effect of the modest and healthy runoff episodes in February meant that an exceptionally high proportion of index catchments registered monthly runoff totals well within the normal range; the Kenwyn (Cornwall) and Tyne (Lothian Region) were significant exceptions. For the winter as a whole, most catchment runoff totals were also well within the normal range. There were a minority of catchments, including the Yorkshire Derwent which registered its second lowest winter runoff since 1995/96, for which the modest winter runoff is reflected in the below average reservoir stocks. For England & Wales as a whole, winter runoff was within 5% of the long term average whilst Scotland recorded outflows >30% above the long term average adding to the preponderance of high runoff winters since the 1980s.

Groundwater
Soil moisture deficits were close to zero across the UK during the latter half of February and, in many areas, close to saturation throughout much of the winter. Aquifer recharge was intermittent and spatially variable but the near-average winter rainfall, and in the less responsive aquifers the residual benefit of the outstanding recharge through the winter of 2013/14, ensured that February groundwater levels were within the normal late-winter range across the majority of aquifer outcrop areas. Levels in the Chalk are now receding across the southern, western and northern outcrops but remain notably high in a few index boreholes (e.g. Little Bucket Farm in Kent – which benefited from a wet winter). In the Jurassic and Magnesian limestones, levels, whilst generally falling in February remain in the average range. In the Permo-Triassic sandstones, levels were relatively stable, rising at some sites and falling at others with Llanfair DC dropping into the below normal range. By contrast, levels remain exceptionally high at the slow-responding Nuttalls Farm (Midlands) and also at Newbridge (south-west Scotland), despite falling overall at the latter due to levels being above previous monthly maxima for much of the last year. Levels at Lime Kiln Way in the Upper Greensand of south-west England fell to within the normal late-winter range. However, levels generally rose and remain well above average in the Lower Greensand of the South East. In the flashy Carboniferous Limestone, levels fell overall at Alstonefield (Derbyshire) and Greenfield Garage (south-west Wales) but both remain within the normal range; whilst at Pant y Lladron (south-east Wales) the substantial late-February rainfall triggered a further rise in levels.

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.

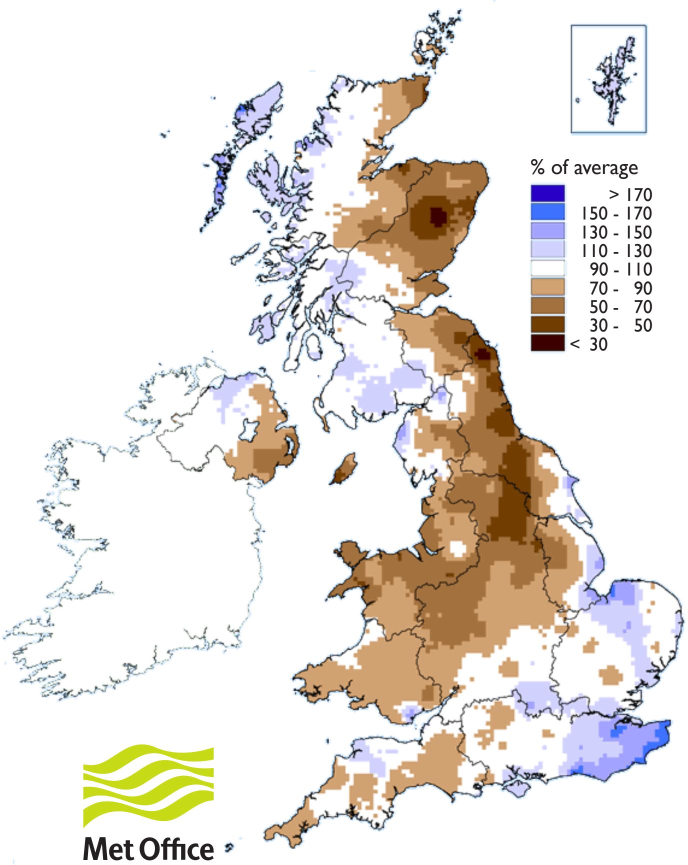
Area	Rainfall	Feb 2015	Dec14 – Feb15	RP	Sep14 – Feb15	RP	Mar14 – Feb15	RP	Dec13 – Feb15	RP
United	mm	**79**	362		666		1172		1716	
Kingdom	%	**94**	114	2-5	104	2-5	109	2-5	123	>100
England	mm	**53**	216		443		847		1248	
	%	**89**	95	2-5	97	2-5	105	2-5	120	10-20
Scotland	mm	**121**	590		1007		1675		2418	
	%	**102**	134	15-25	114	8-12	116	15-25	129	>>100
Wales	mm	**88**	430		773		1321		2047	
	%	**80**	102	2-5	93	2-5	97	2-5	115	5-10
Northern	mm	**81**	344		661		1146		1635	
Ireland	%	**94**	108	2-5	104	2-5	104	2-5	115	30-50
England &	mm	**57**	246		489		912		1358	
Wales	%	**87**	97	2-5	96	2-5	103	2-5	119	10-20
North West	mm	**73**	383		678		1192		1722	
	%	**85**	114	2-5	99	2-5	102	2-5	115	5-10
Northumbrian	mm	**40**	201		413		823		1178	
	%	**68**	89	2-5	92	2-5	101	2-5	113	2-5
Severn-Trent	mm	**41**	185		374		769		1106	
	%	**75**	90	2-5	91	2-5	103	2-5	116	5-10
Yorkshire	mm	**38**	193		393		814		1135	
	%	**66**	85	2-5	89	2-5	101	2-5	110	2-5
Anglian	mm	**38**	138		313		653		871	
	%	**103**	94	2-5	101	2-5	110	2-5	117	5-10
Thames	mm	**50**	173		395		748		1169	
	%	**106**	93	2-5	104	2-5	108	2-5	133	30-50
Southern	mm	**67**	237		516		883		1421	
	%	**125**	108	2-5	113	2-5	115	2-5	144	60-90
Wessex	mm	**63**	229		498		916		1462	
	%	**93**	89	2-5	99	2-5	107	2-5	132	30-50
South West	mm	**99**	349		666		1170		1862	
	%	**94**	89	2-5	90	2-5	98	2-5	118	10-15
Welsh	mm	**84**	405		739		1274		1976	
	%	**80**	101	2-5	93	2-5	97	2-5	116	5-10
Highland	mm	**155**	770		1230		2033		2840	
	%	**105**	142	15-25	113	5-10	118	10-20	126	40-60
North East	mm	**43**	253		618		1132		1575	
	%	**65**	100	2-5	115	2-5	120	5-10	132	50-50
Tay	mm	**92**	439		841		1436		2238	
	%	**86**	110	2-5	108	2-5	114	5-10	135	>>100
Forth	mm	**88**	428		722		1247		1818	
	%	**97**	126	8-12	107	2-5	111	5-10	125	50-80
Tweed	mm	**65**	346		625		1118		1657	
	%	**92**	127	5-10	116	2-5	118	5-10	137	>100
Solway	mm	**125**	580		1023		1635		2464	
	%	**111**	137	15-25	121	10-20	117	10-20	136	>>100
Clyde	mm	**157**	756		1209		1964		2898	
	%	**110**	141	25-40	112	5-10	113	8-12	129	>100

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

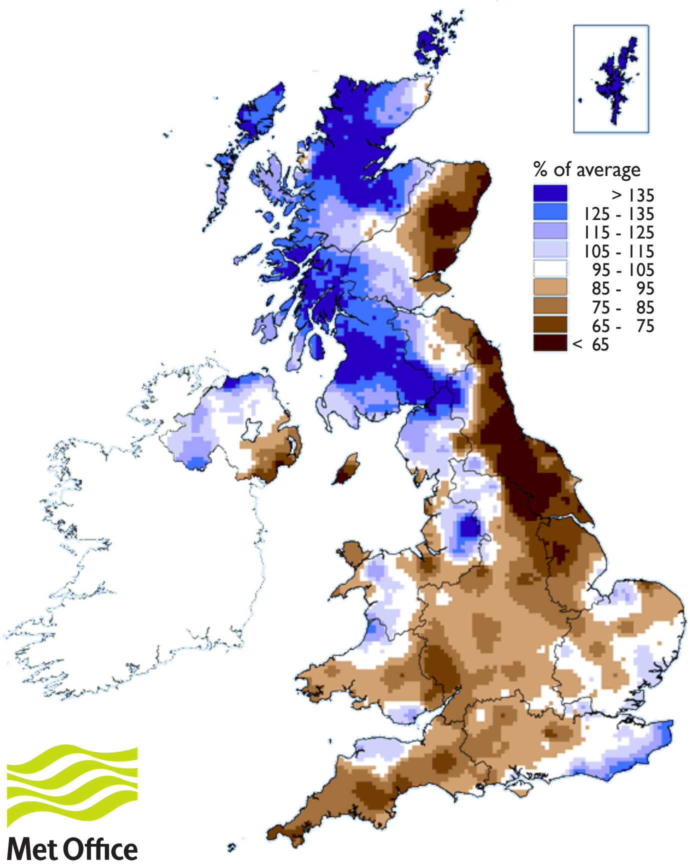
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic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

Rainfall . . . Rainfall . . .

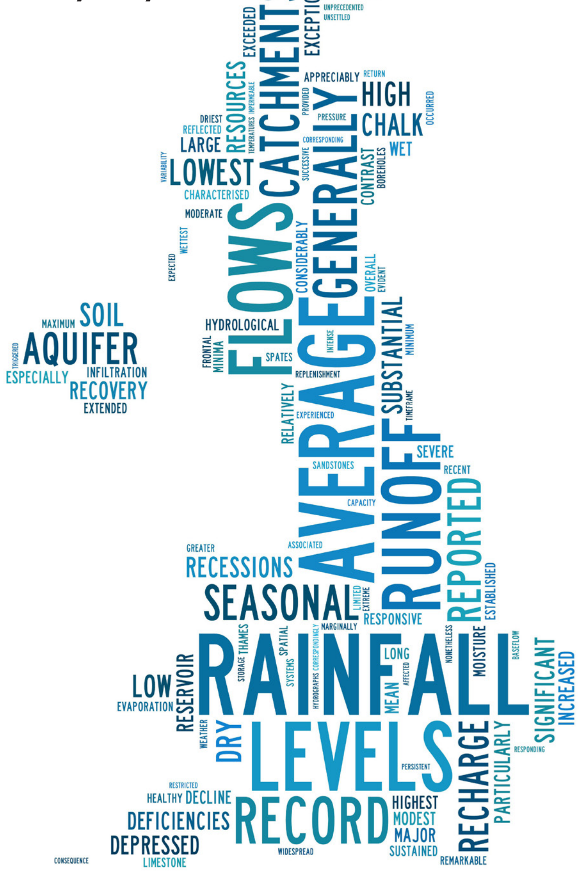
February 2015 rainfall as % of 1971-2000 average



December 2014 - February 2015 rainfall as % of 1971-2000 average



Word cloud based on Hydrological Summaries authored by Terry Marsh

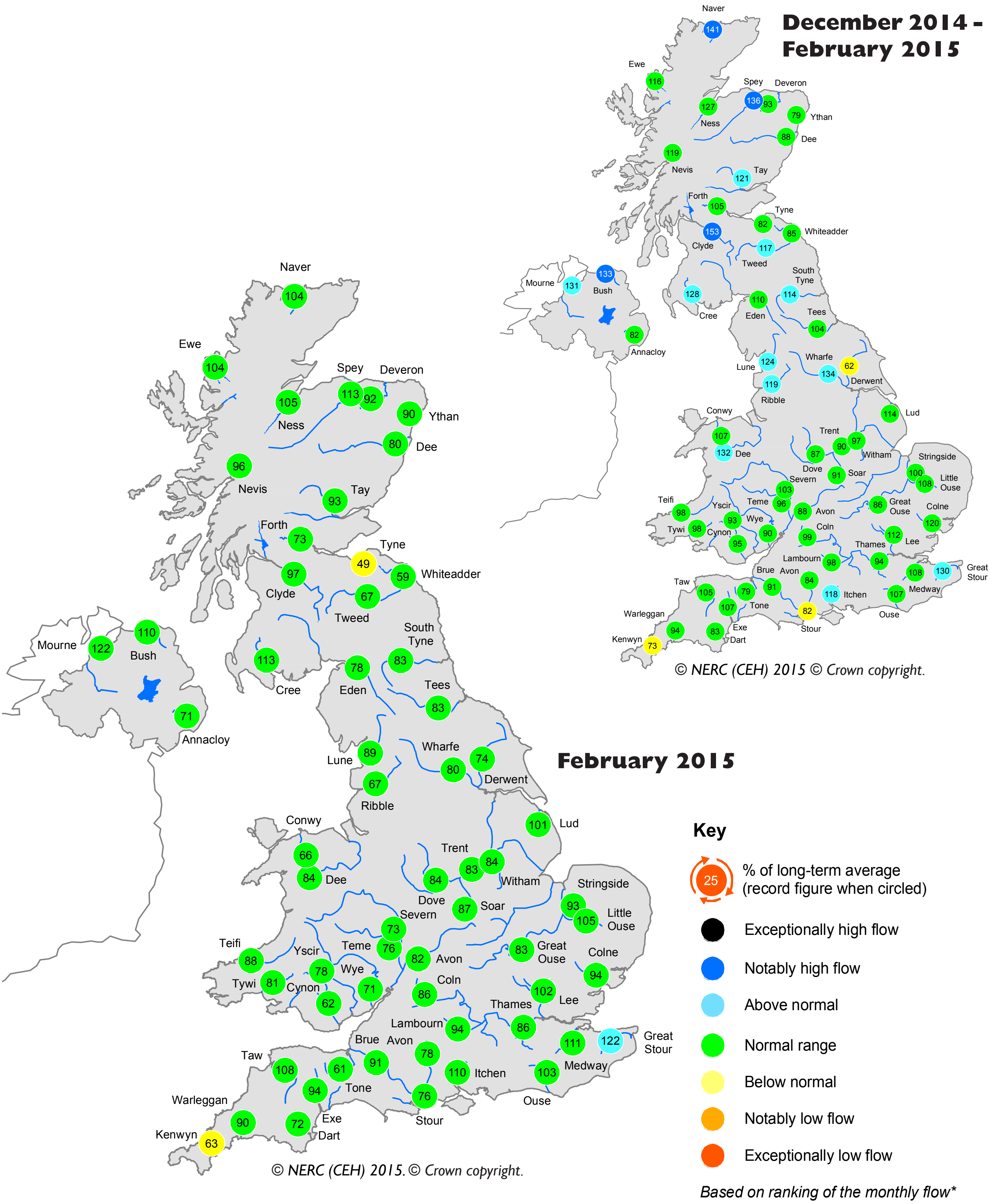


NHMP experiences most dramatic change for quarter century

This Souvenir Edition of the Hydrological Summary is brought to you by Terry Marsh. This is an 'unprecedented' event as it is the final Summary authored by Terry; the 286th in a series from 1988. This outflow of nearly 300,000 words represents a remarkable achievement.

The National Hydrological Monitoring Programme team, on behalf of the wide readership, would like to express our appreciable gratitude to Terry for his unparalleled efforts as the voice of UK hydrological reporting over the last three decades. During some hydrologically volatile and tempestuous years, it's perhaps ironic that Terry signs off with a month notable for its normality.

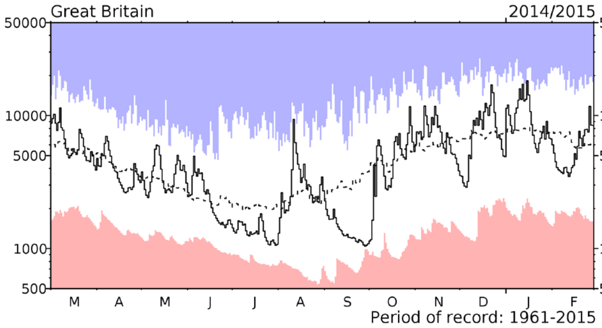
The whole team are significantly depressed at the prospect of his imminent retirement and are unsure how to manage the resultant deficit; nonetheless, we wish Terry all the best for a sustained period of happy retirement and enhanced leisure time. Terry's contribution is unlikely ever to be eclipsed.

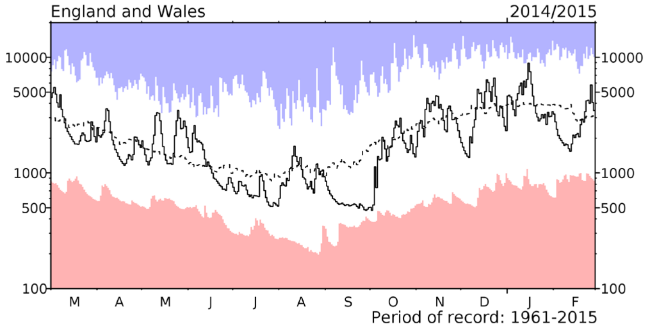


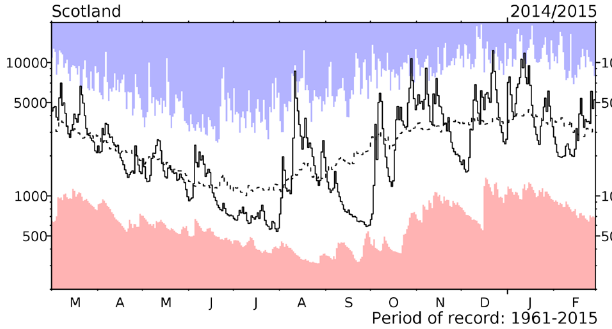
River flows

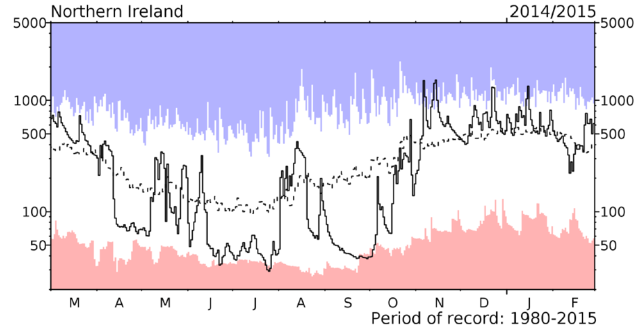
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much 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.

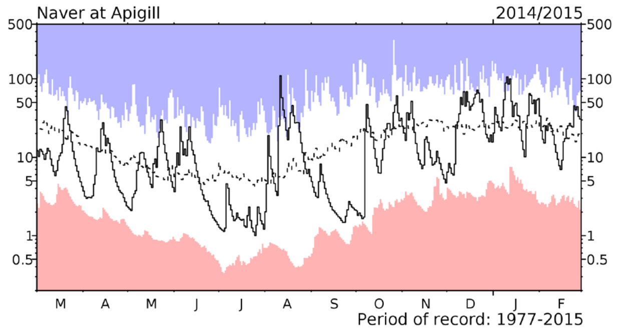
River flow . . . River flow . . .

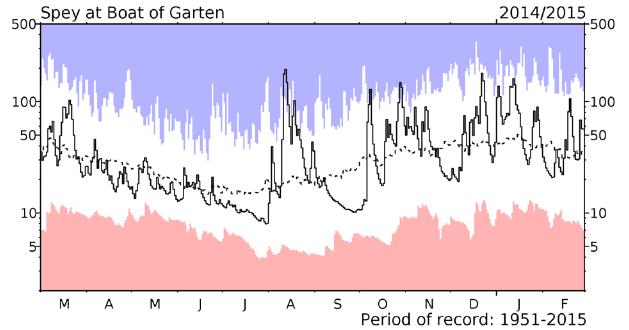


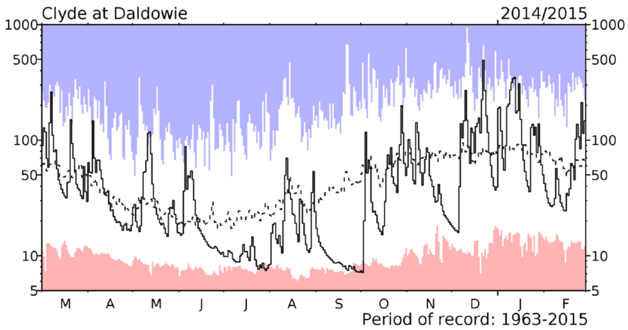


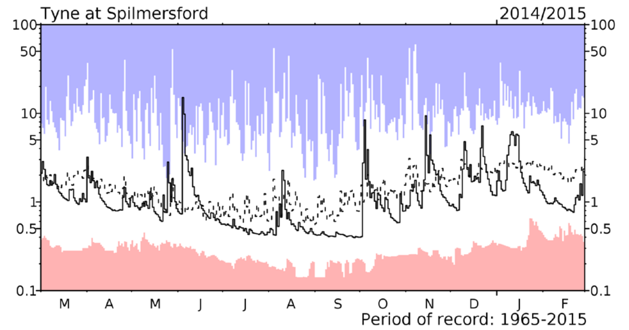


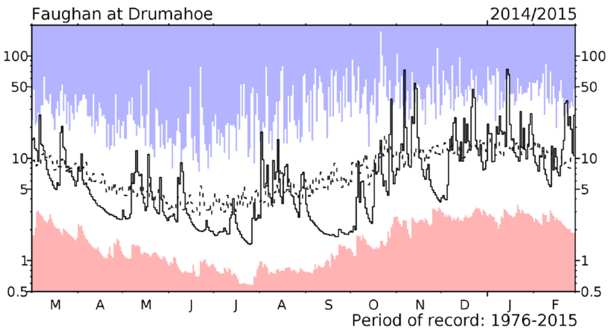


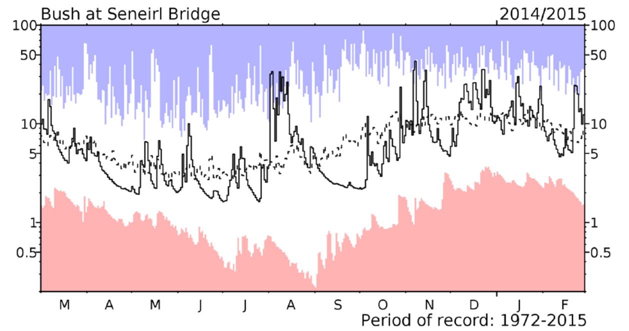








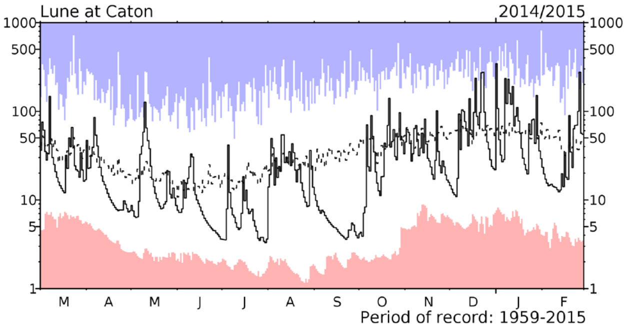


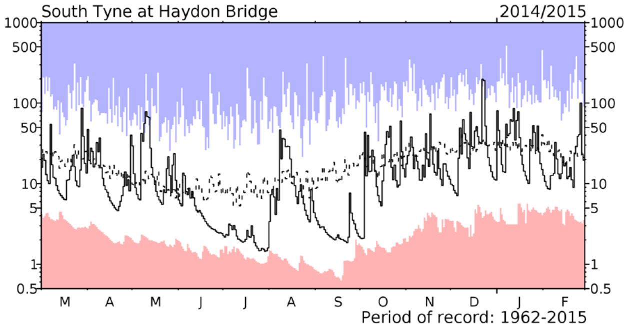


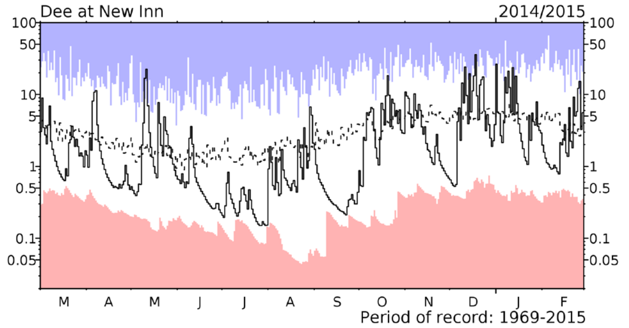
River flow hydrographs

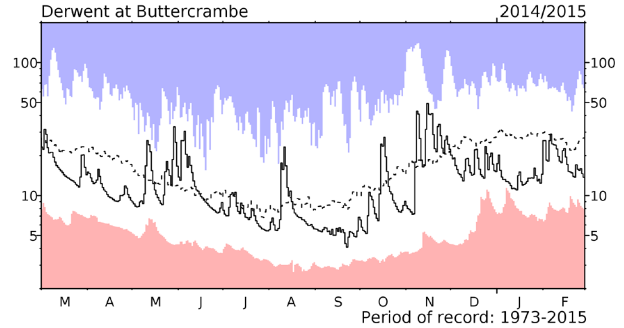
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to March 2014 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. Mean daily flows are shown as the dashed line.

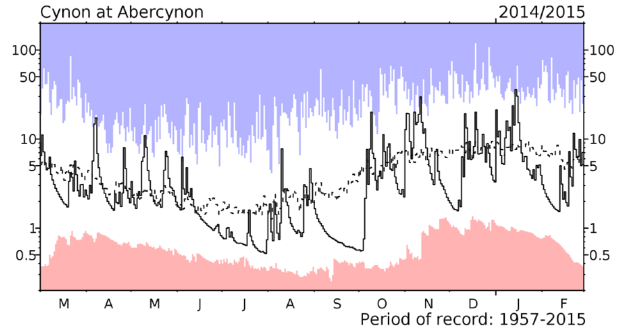
River flow . . . River flow . . .

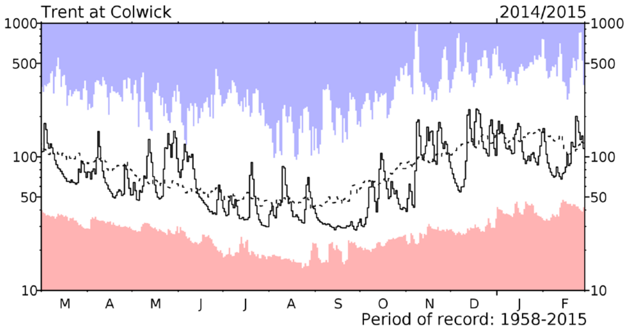


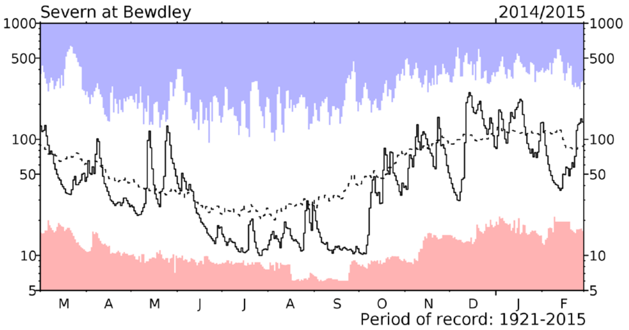


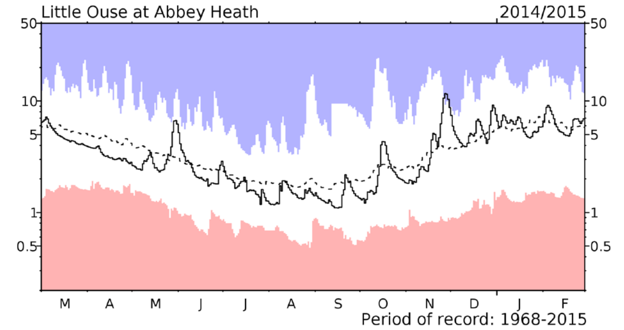


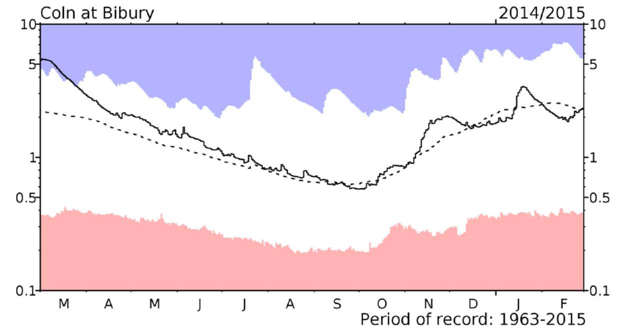


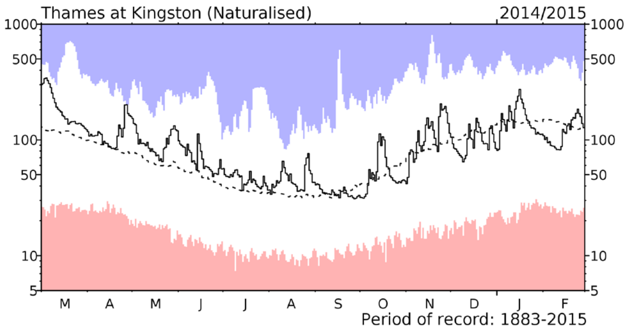


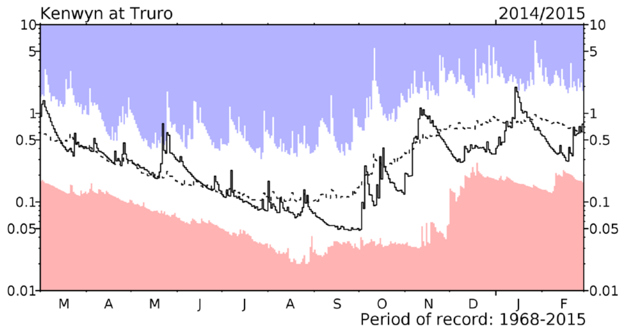


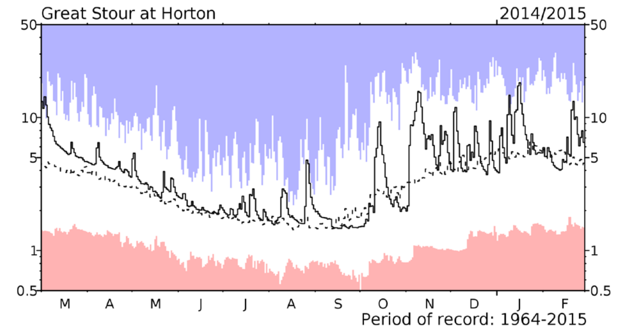




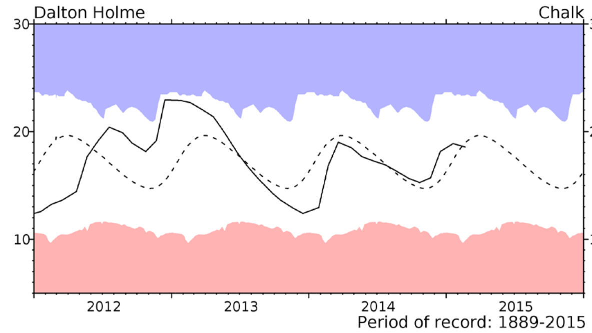


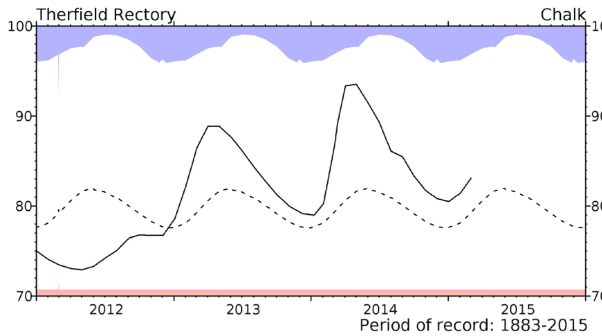


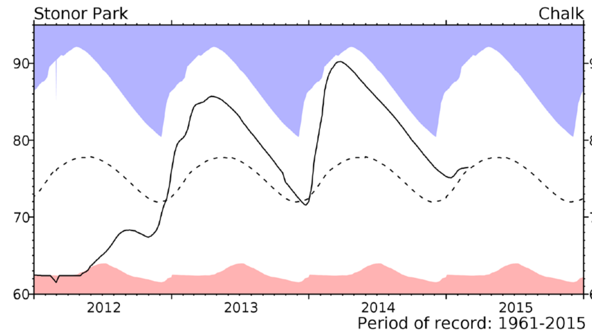


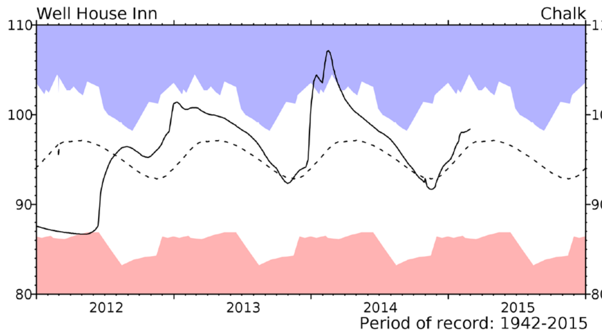


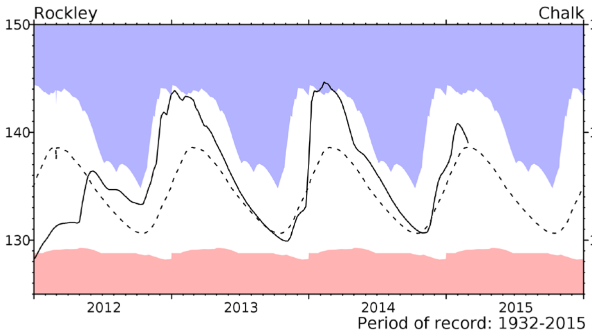
Groundwater . . . Groundwater

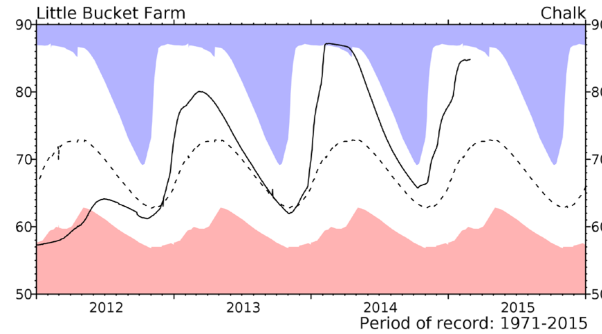


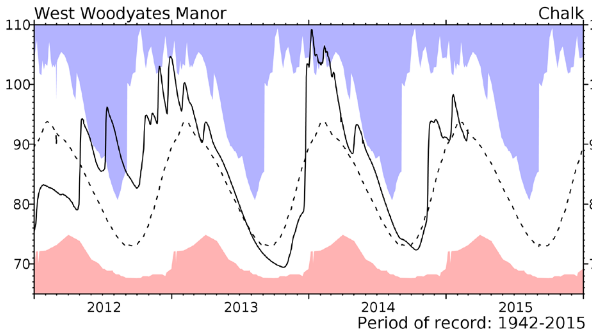


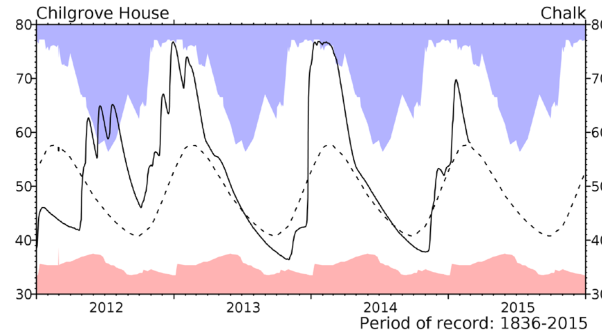


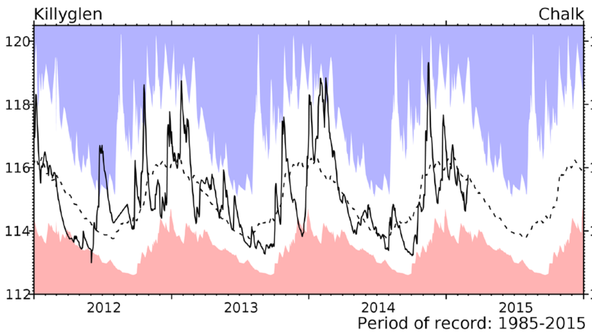


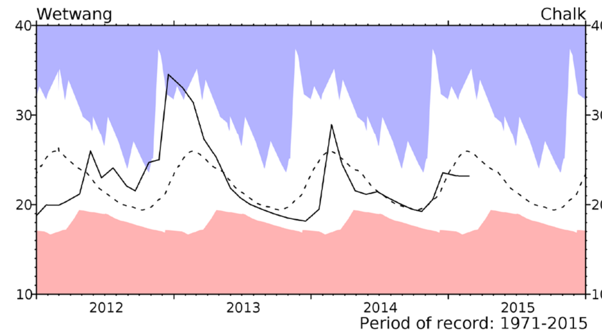






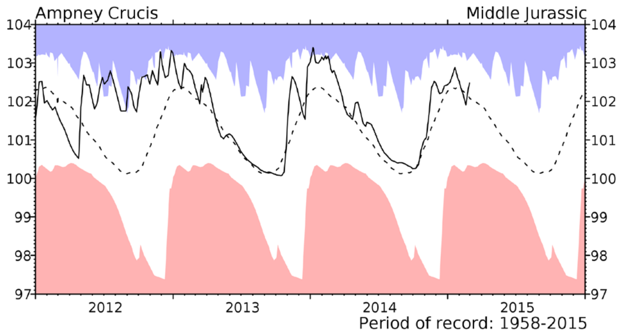


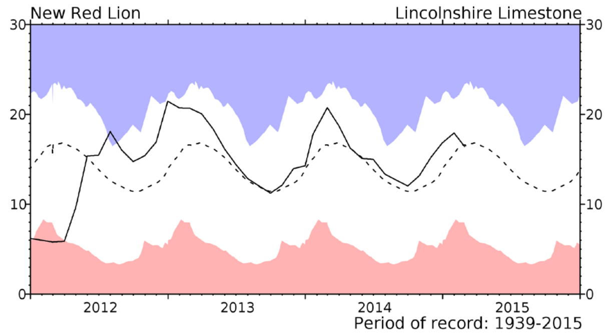


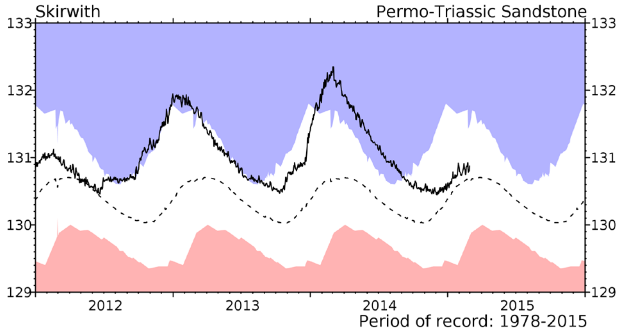


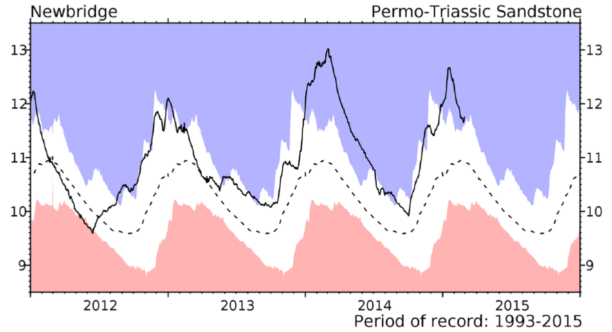
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

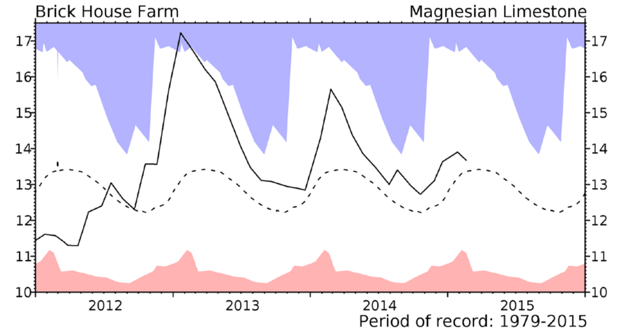
Groundwater ... Groundwater

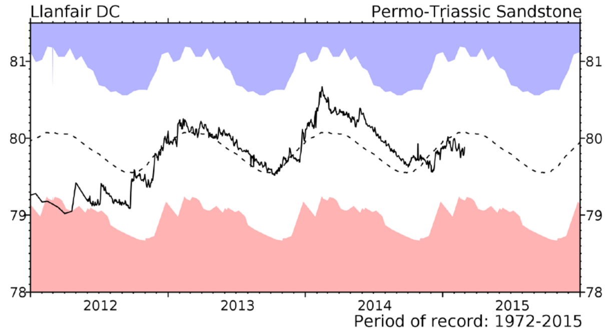


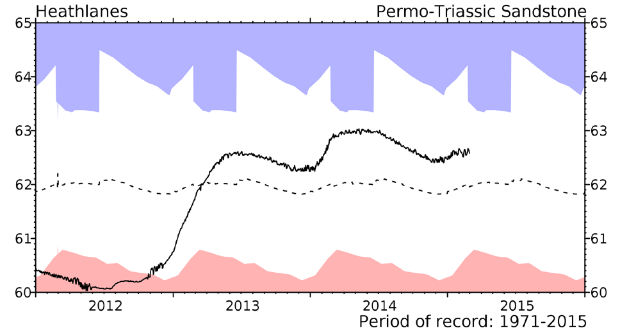


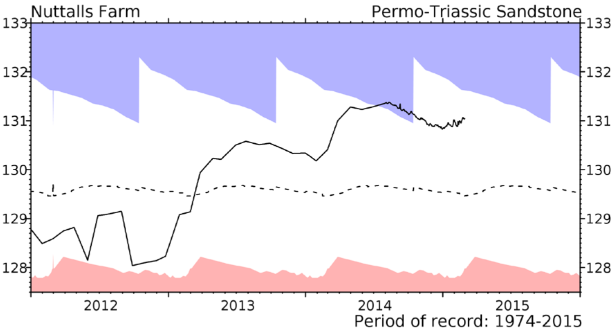


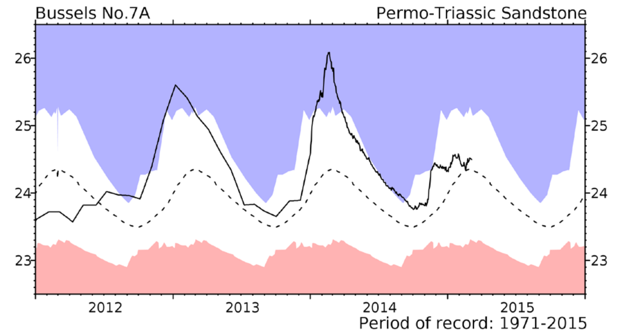


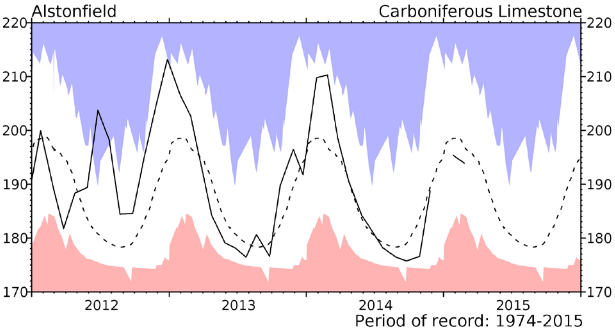












Groundwater levels February / March 2015

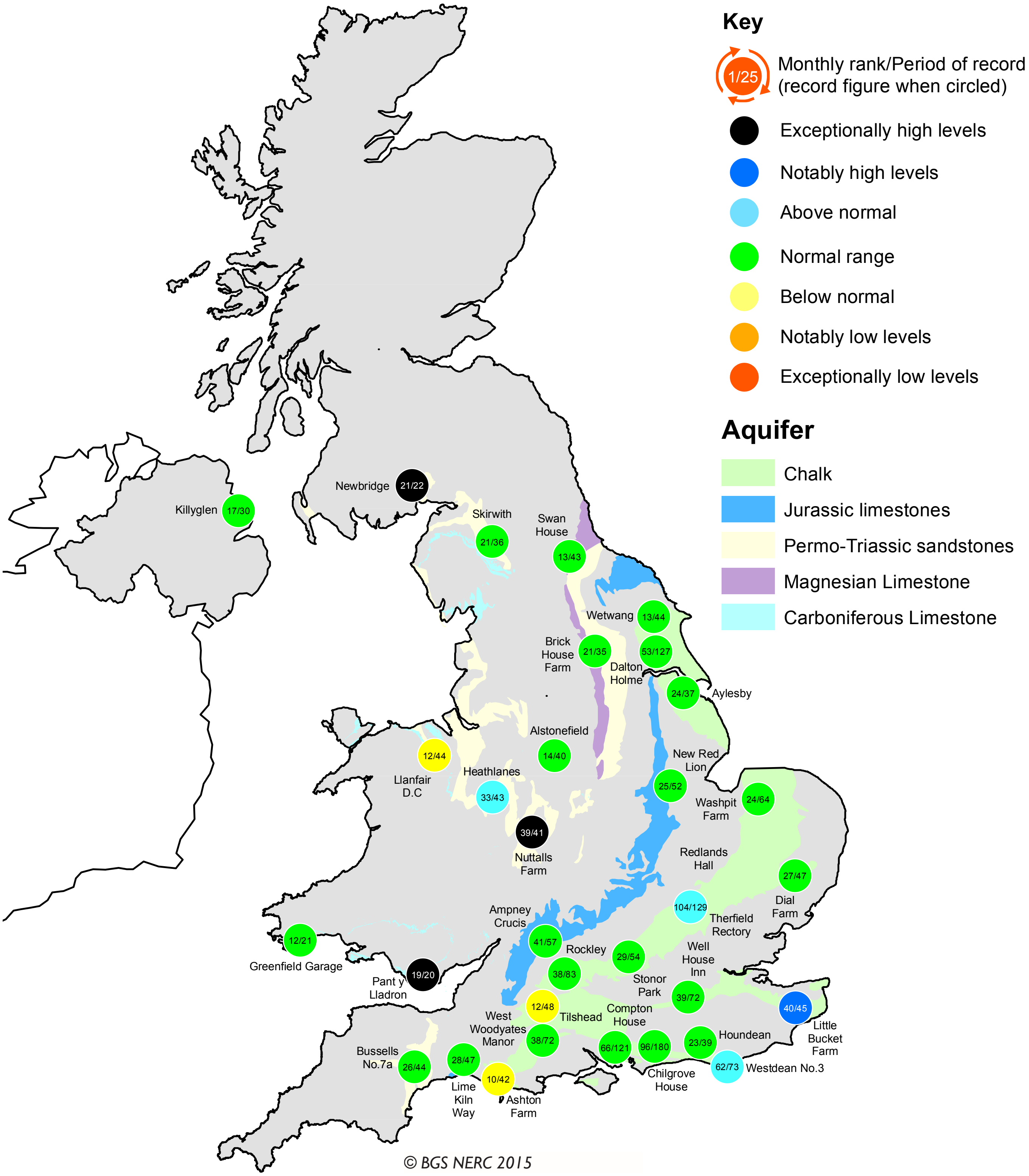
Borehole	Level	Date	Feb av.
Dalton Holme	18.56	20/02	18.69
Therfield Rectory	83.08	02/03	78.25
Stonor Park	76.45	28/02	75.59
Tilshead	92.96	28/02	94.09
Rockley	139.02	28/02	138.39
Well House Inn	98.38	28/02	96.41
West Woodyates	92.40	28/02	93.32

Borehole	Level	Date	Feb av.
Chilgrove House	58.08	28/02	57.79
Killyglen (NI)	115.76	28/02	115.77
Wetwang	23.17	25/02	25.69
Ampney Crucis	102.48	28/02	102.24
New Red Lion	16.40	28/02	16.45
Skirwith	130.93	28/02	130.79
Newbridge	11.75	28/02	11.05

Borehole	Level	Date	Feb av.
Brick House Farm	13.67	19/02	13.41
Llanfair DC	79.88	28/02	80.06
Heathlanes	62.58	28/02	61.94
Nuttalls Farm	131.04	28/02	129.50
Bussells No.7a	24.49	06/03	24.36
Alstonefield	193.88	25/02	198.97

Levels in metres above Ordnance Datum

Groundwater...Groundwater

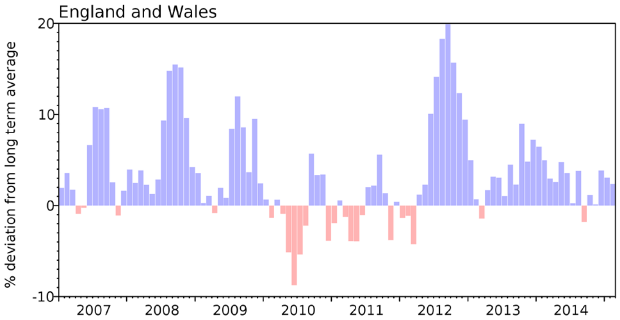


Groundwater levels - February 2015

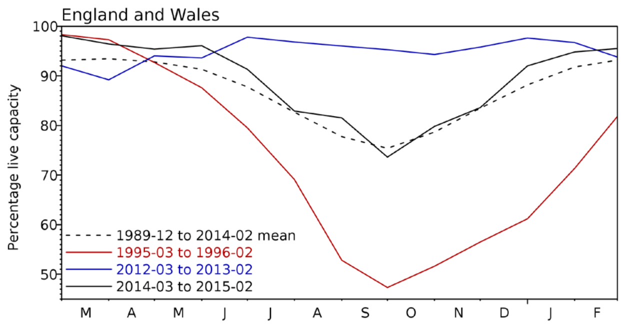
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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 Dec	2015 Jan	2015 Feb	Feb Anom.	Min Feb	Year* of min	2014 Feb	Diff 15-14
North West	N Command Zone	•	124929	93	98	94	1	78	1996	100	-6
	Vyrnwy		55146	99	94	92	-2	59	1996	100	-8
Northumbrian	Teesdale	•	87936	99	99	100	8	72	1996	100	0
	Kielder		(199175)	98	94	96	3	81	1993	99	-3
Severn-Trent	Clywedog		44922	86	93	96	5	77	1996	91	5
	Derwent Valley	•	39525	96	100	100	4	46	1996	99	0
Yorkshire	Washburn	•	22035	87	87	86	-7	53	1996	96	-10
	Bradford Supply	•	41407	96	99	100	4	53	1996	100	0
Anglian	Grafham		(55490)	70	76	83	-5	72	1997	95	-11
	Rutland		(116580)	83	95	95	7	71	2012	95	1
Thames	London	•	202828	94	96	93	0	83	1988	95	-2
	Farmoor	•	13822	89	96	93	1	64	1991	97	-4
Southern	Bewl		28170	73	85	90	4	40	2012	100	-10
	Ardingly		4685	100	100	100	4	46	2012	100	0
Wessex	Clatworthy		5364	100	100	100	2	82	1992	100	0
	Bristol	•	(38666)	84	95	99	7	65	1992	99	0
South West	Colliford		28540	79	87	91	5	57	1997	100	-9
	Roadford		34500	82	91	95	12	35	1996	99	-4
	Wimbleball		21320	83	100	100	5	72	1996	100	0
	Stithians		4967	57	75	84	-9	45	1992	100	-16
Welsh	Celyn & Brenig	•	131155	96	94	97	0	69	1996	100	-3
	Brianne		62140	98	98	100	2	92	2004	100	0
	Big Five	•	69762	93	97	98	2	85	1988	99	-1
	Elan Valley	•	99106	100	100	100	2	88	1993	100	0
Scotland(E)	Edinburgh/Mid-Lothian	•	97639	83	91	92	-4	73	1999	100	-8
	East Lothian	•	10206	100	100	99	0	91	1990	100	-1
Scotland(W)	Loch Katrine	•	111363	96	95	98	4	76	2010	97	1
	Daer		22412	99	98	100	1	94	2004	100	0
	Loch Thom	•	11840	100	100	100	2	90	2004	100	0
Northern Ireland	Total+	•	56800	92	92	93	2	81	2004	94	-1
	Silent Valley	•	20634	85	95	97	10	57	2002	100	-3

( ) 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

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

Enquiries should be addressed to:

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Email: nhmp@ceh.ac.uk

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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