Hydrological Summary

for the United Kingdom

May 2015

General

May was a wet and cool month, as the majority of the UK received above average rainfall and average daily maximum temperatures provisionally ranked as the coldest May since 1996. Rainfall for the UK was 174% of the long-term average, although large parts of Northern Ireland, western Scotland and north-west England received more than double the average. Pleasant late spring weather was generally limited to short periods, predominantly in southern parts of the country, whilst northern and western areas experienced particularly stormy weather. River flows in these areas responded sharply to large amounts of rainfall, but flows were generally high rather than extreme. Average river flows in May were generally above normal in northern and western areas of the UK, and in the normal range or below in southern areas, reflecting the north-west / south-east gradient in rainfall anomalies that characterised the spring. Total outflows from the UK were high in early May, reflecting the spatial coherence of high flows, and in recession thereafter. Soil moisture deficits (SMDs) declined in many northern and western areas and end of May soils were the wettest on record (in a series from 1961) for North West Britain. Despite this, groundwater levels fell during May as normal, and the area of low or notably low levels in the southern Chalk expanded slightly. Overall reservoir stocks for England & Wales increased and were near average, and the water resource outlook is healthy at the beginning of summer.

Rainfall

Airflows in May were predominantly north-westerly, driving a sequence of low pressure systems across the UK. The start of the month was very stormy; for the UK, the long-term average rainfall for May had been exceeded by the 17th day. A large event across the 2nd/3rd triggered localised flooding in Northern Ireland, with 101mm recorded at Trassey Slievenaman (County Down). Storms brought strong winds to southern parts of England on the 5th/6th, and there was further heavy rainfall around the Scottish Borders on the 10th. Drier interludes followed in the second half of May, particularly in southern areas of the UK, whilst parts of Scotland and Northern Ireland continued to be affected by showery conditions. Scotland experienced its fourth wettest May on record (in a series from 1910) and the Orkney Islands eclipsed its previous maximum May rainfall by more than 20%. Drier exceptions to the wet conditions included the Cairngorms and localised areas of southern England. The north-west / south-east gradient in rainfall anomalies that characterised May rainfall is a pattern which was also reflected in spring (March-May). Over this period, Northern Ireland, western Scotland, north-west England and north Wales were wetter than average, with more than 120% of average rainfall recorded in all but one region of Scotland and Northern Ireland. It was the second wettest spring on record (in a series from 1910) for Scotland. Conversely, drier conditions characterised southern and eastern Britain, as all regions in southern England registered less than 75% of average rainfall.

River flows

Following a dry April, flows in many rivers across the UK were in protracted recessions entering May. However, river flows in northern and western areas increased sharply in response to the sequence of low pressure systems that traversed the country over the first fortnight. New May peak flow maxima were established for the Annacloy on the 3rd and for the Mourne on the 5th, eclipsing previous maxima by wide margins in records from the early 1980s. On the other hand, in southern Britain, above average rainfall generated little hydrological response, and flows generally remained below average through most of May and declined as normal for late spring. Above average river flows for May were restricted to north of a line from mid-Wales to the Humber estuary. A number of rivers in parts of Northern Ireland, Scotland, Wales and England registered notably or exceptionally high flows, and average flows for the Annacloy, Wharfe and Naver were more than double the long-term average. Further south, flows in almost all of the index catchments were below average (the Bedford Ouse and Brue recorded less than half of the average) and all fell within the normal range or below (notably so for the Tone and Coln). Average flows for spring reflected the north-west / south-east gradient in rainfall anomalies. Above normal flows were registered for the majority of index catchments in Northern Ireland, Scotland and northern England. However, some notably low flows were recorded in eastern Britain, and southern parts of England and Wales generally registered below normal flows.

Groundwater

Recessions in groundwater levels continued during May, despite the wet conditions over much of the UK. SMDs have become established in south-eastern areas, meaning rainfall is taken up by the soil rather than recharging aquifers. Across most Chalk aquifers, levels remained normal although they declined at a slightly faster rate than is typical. In Yorkshire, Wetwang and Dalton Holme were notably low. Compared to April, more of the Wessex and Hampshire Chalk was below normal; notably low levels were recorded at Ashton Farm and Tilshead, which recorded its sixth lowest May level in 47 years. Only two Chalk boreholes (Therfield Rectory and Little Bucket Farm) recorded above normal levels – these boreholes continued to be influenced by the wet conditions of 2013/14. Elsewhere the situation was mixed. In south-west England and south Wales, levels remained normal. Levels in the Jurassic limestone were below normal in southern areas and nearer normal further north. Swan House, in the Magnesian Limestone, was an exception, recording below normal levels due to limited recharge this winter. Several Permo-Triassic boreholes remained at exceptionally high levels, the legacy of exceptional recharge in 2013/14, whilst others were close to their seasonal norms. An exception was Llanfair D.C. in north Wales, where levels were slightly below normal. Any moderation of recessions in the Chalk from a wet May was yet to show at month-end. Low levels in Wessex and Hampshire may persist through the summer or decline further, though still well above the minima of 2011/12.

Centre for Ecology & Hydrology
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British Geological Survey
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Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

Percentages are from the 1971-2000 average.

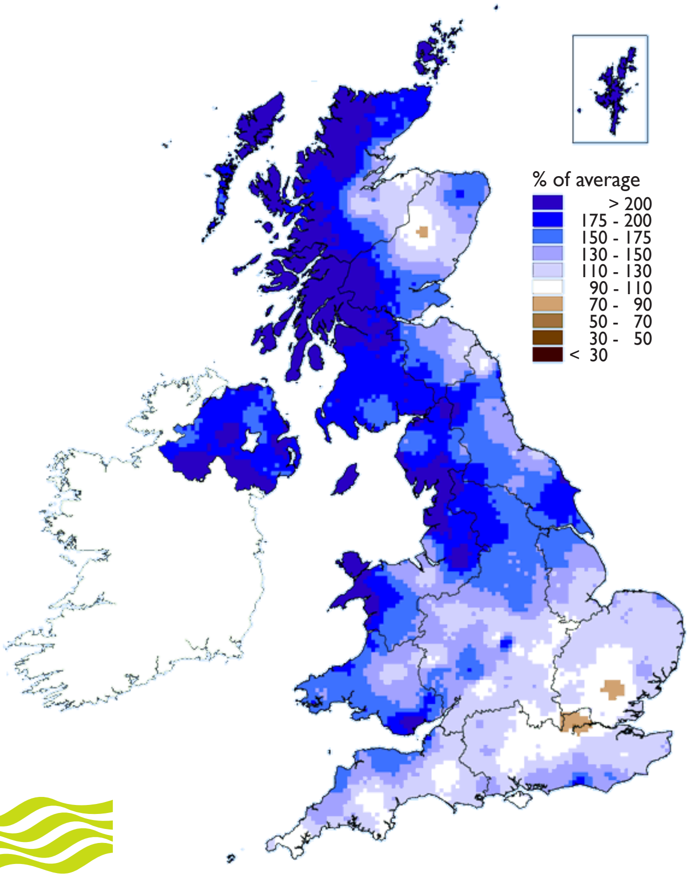
Area	Rainfall	May 2015	Mar15 – May15	RP	Dec14 – May15	RP	Sep14 – May15	RP	Jun14 – May15	RP
United	mm	**110**	252		617		922		1180	
Kingdom	%	**174**	113	5-10	114	5-10	107	2-5	109	2-5
England	mm	**79**	154		373		595		801	
	%	**144**	88	2-5	92	2-5	94	2-5	99	2-5
Scotland	mm	**150**	401		993		1420		1764	
	%	**205**	141	40-60	137	50-80	121	40-60	123	30-50
Wales	mm	**134**	269		703		1049		1307	
	%	**176**	99	2-5	102	2-5	95	2-5	96	2-5
Northern	mm	**133**	285		644		966		1231	
Ireland	%	**195**	123	5-10	117	10-15	111	10-20	111	5-10
England &	mm	**87**	170		418		658		871	
Wales	%	**150**	90	2-5	94	2-5	94	2-5	98	2-5
North West	mm	**131**	297		689		969		1232	
	%	**198**	128	5-10	121	8-12	106	2-5	106	2-5
Northumbrian	mm	**94**	197		404		603		804	
	%	**162**	106	2-5	98	2-5	95	2-5	98	2-5
Severn-Trent	mm	**78**	152		339		533		735	
	%	**145**	91	2-5	91	2-5	92	2-5	98	2-5
Yorkshire	mm	**97**	185		377		568		781	
	%	**177**	102	2-5	93	2-5	91	2-5	97	2-5
Anglian	mm	**55**	101		240		417		607	
	%	**120**	74	2-5	85	2-5	93	2-5	101	2-5
Thames	mm	**58**	109		280		491		671	
	%	**109**	69	5-10	82	2-5	91	2-5	97	2-5
Southern	mm	**63**	105		340		621		809	
	%	**127**	65	5-10	89	2-5	101	2-5	105	2-5
Wessex	mm	**72**	126		351		607		802	
	%	**128**	69	5-10	80	2-5	89	2-5	93	2-5
South West	mm	**89**	174		536		852		1086	
	%	**130**	74	5-10	85	2-5	87	2-5	91	2-5
Welsh	mm	**130**	257		664		1001		1255	
	%	**174**	98	2-5	100	2-5	94	2-5	96	2-5
Highland	mm	**168**	497		1269		1750		2167	
	%	**215**	149	40-60	145	50-80	123	20-35	126	30-50
North East	mm	**89**	220		481		824		1172	
	%	**142**	108	2-5	105	2-5	111	2-5	124	8-12
Tay	mm	**135**	333		768		1202		1524	
	%	**184**	128	8-12	116	5-10	116	8-12	121	10-15
Forth	mm	**130**	312		724		1011		1261	
	%	**196**	135	15-25	127	15-25	112	5-10	112	5-10
Tweed	mm	**107**	250		593		894		1148	
	%	**163**	121	5-10	124	10-15	120	8-12	121	5-10
Solway	mm	**148**	372		953		1394		1668	
	%	**195**	134	10-20	136	>100	124	70-100	119	10-20
Clyde	mm	**191**	508		1277		1741		2082	
	%	**242**	154	50-80	147	>100	124	50-80	120	15-25

% = 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 January 2015 (inclusive) are provisional.

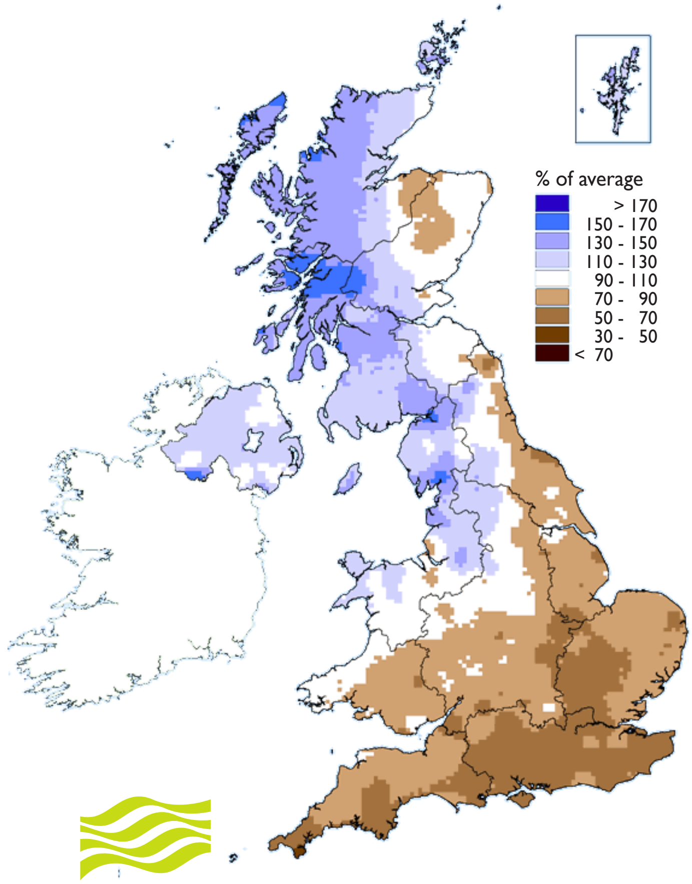
Rainfall . . . Rainfall . . .

May 2015 rainfall as % of 1971-2000 average



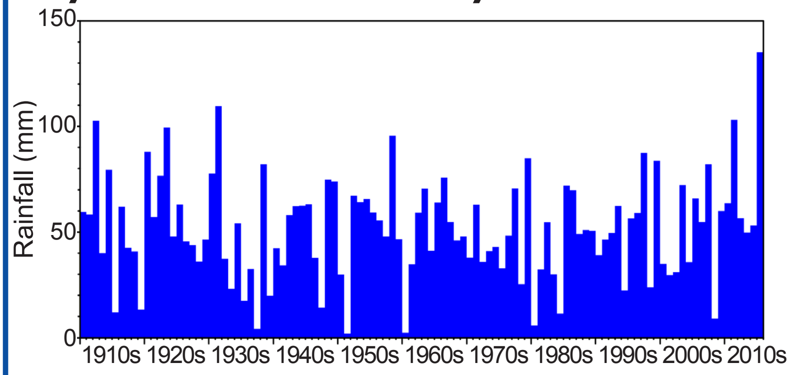
Met Office

March 2015 - May 2015 rainfall as % of 1971-2000 average

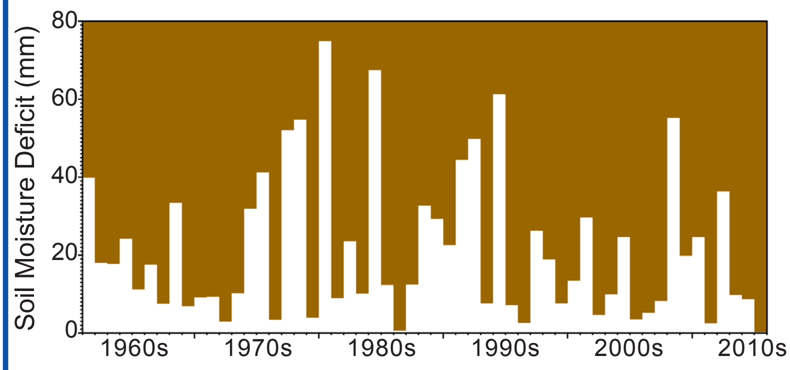


Met Office

May rainfall for the Orkney Islands



End of May SMDs for North West Britain



Met Office

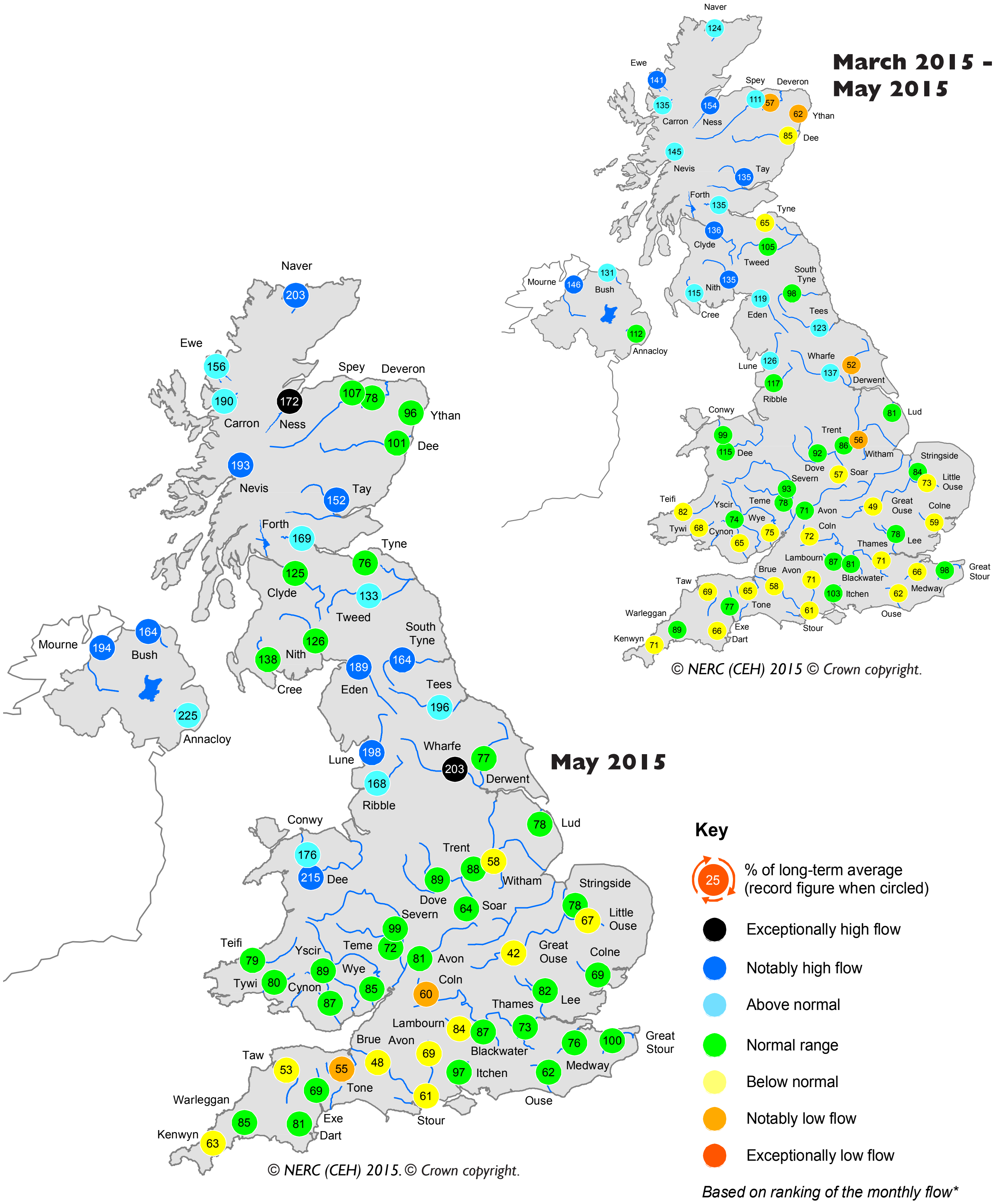
Met Office 3-month outlook Updated: May 2015

For June-July-August uncertainty is large but, on balance, below-average seasonal rainfall is more probable than above-average. The probability that UK precipitation for June-July-August will fall into the driest of our five categories is between 20% and 25% and the probability that it will fall into the wettest of our five categories is 15% (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.

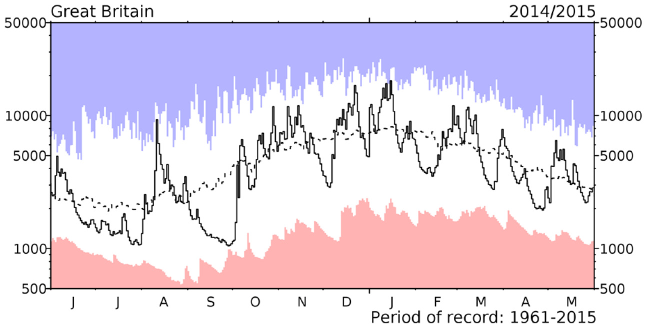
River flow . . . River flow . . .

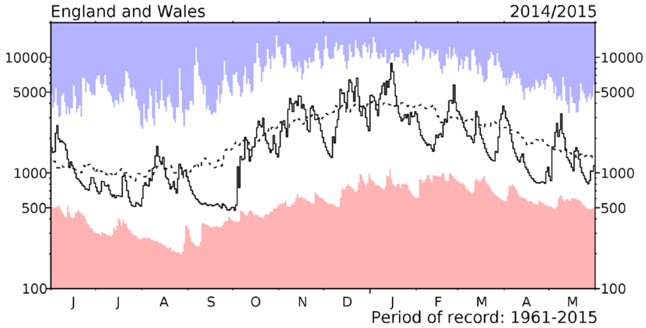


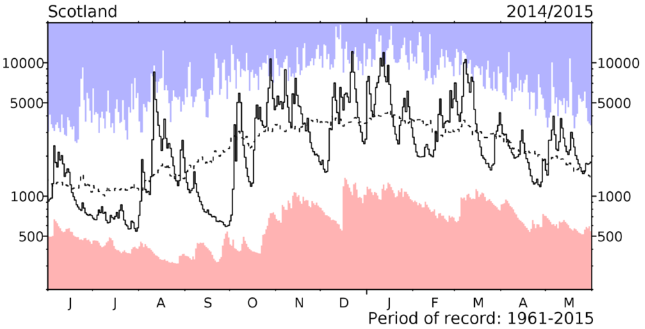
River flows

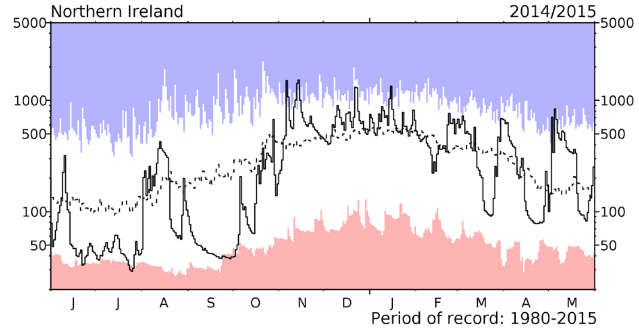
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

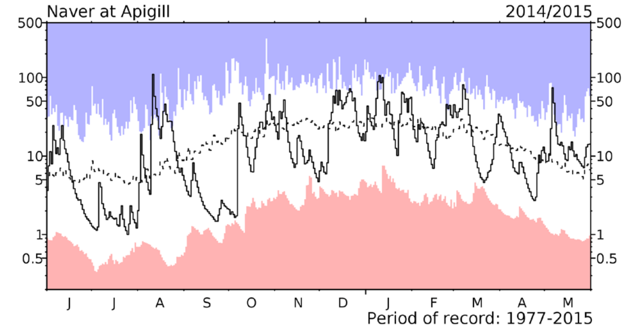
River flow . . . River flow . . .

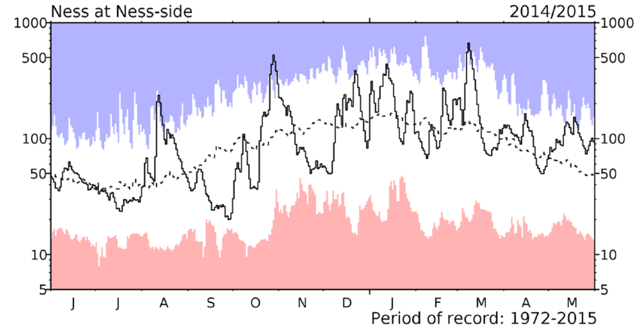


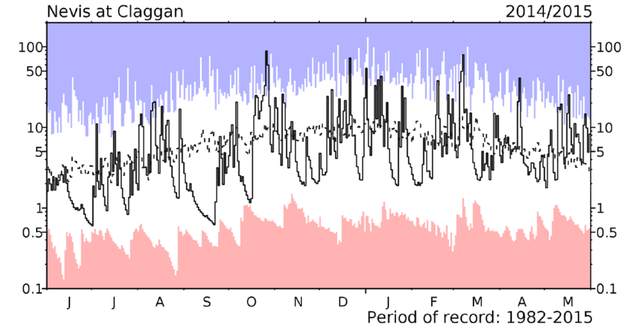


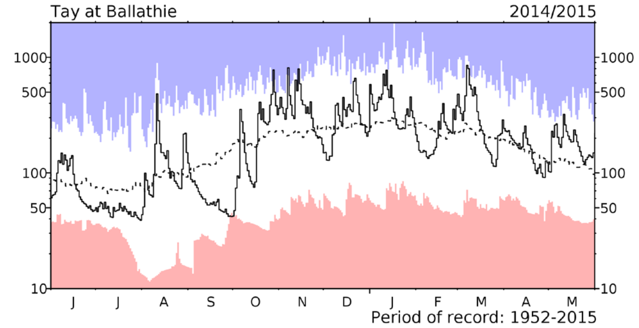


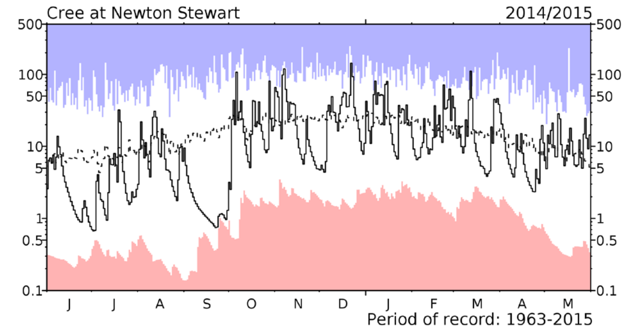


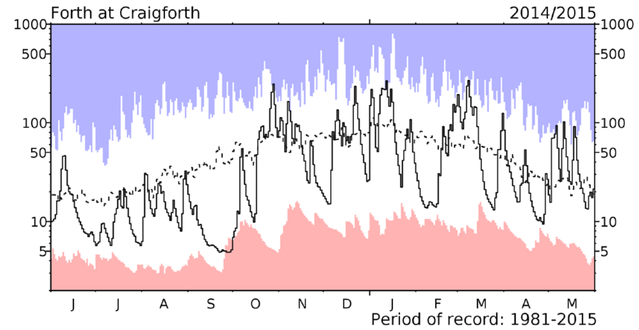






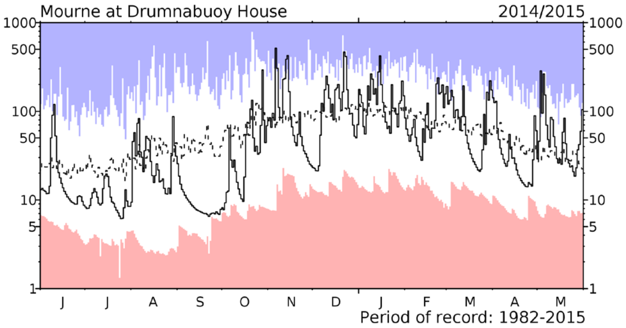


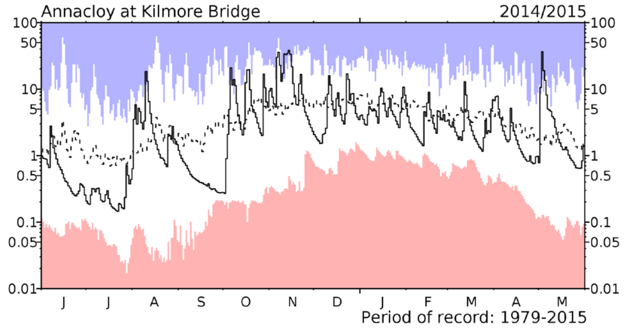


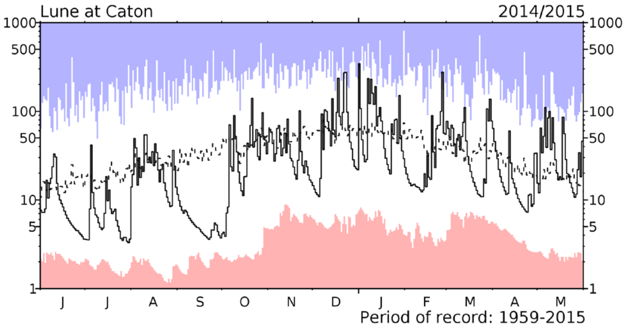


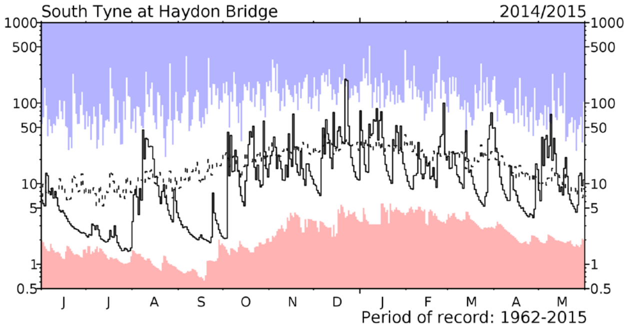
River flow hydrographs

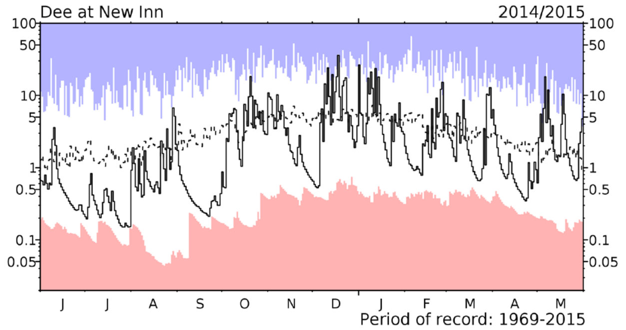
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to June 2014 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. Mean daily flows are shown as the dashed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

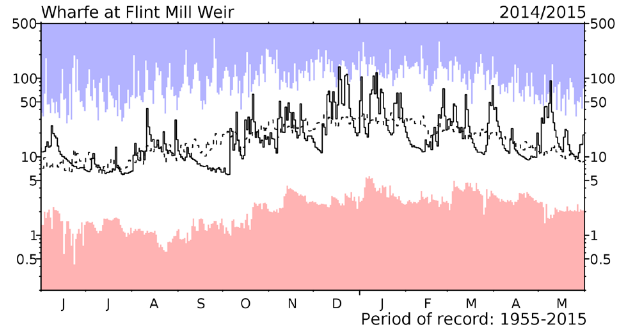

Mourne at Drumnabuoy House
2014/2015
J J A S O N D J F M A M
Period of record: 1982-2015

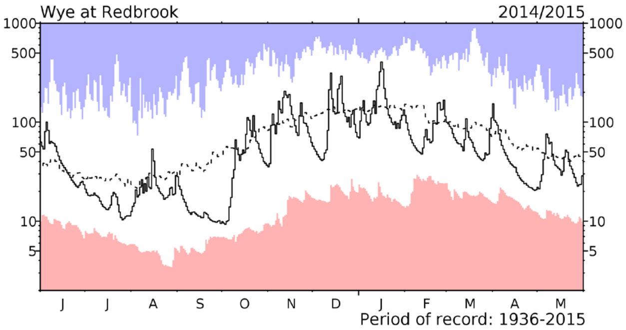

Annacloy at Kilmore Bridge
2014/2015
J J A S O N D J F M A M
Period of record: 1979-2015

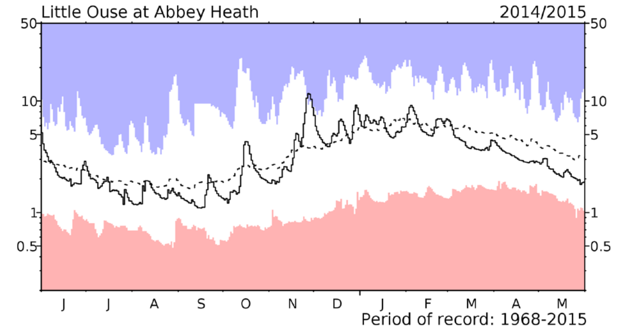

Lune at Caton
2014/2015
J J A S O N D J F M A M
Period of record: 1959-2015

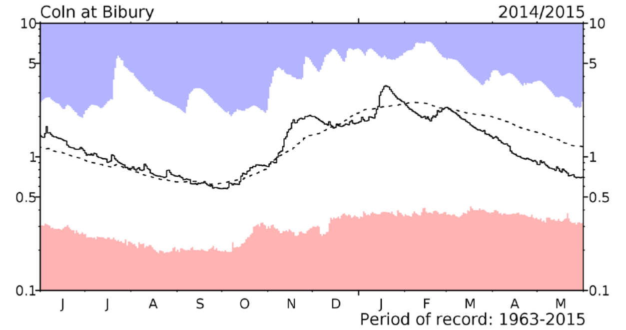

South Tyne at Haydon Bridge
2014/2015
J J A S O N D J F M A M
Period of record: 1962-2015

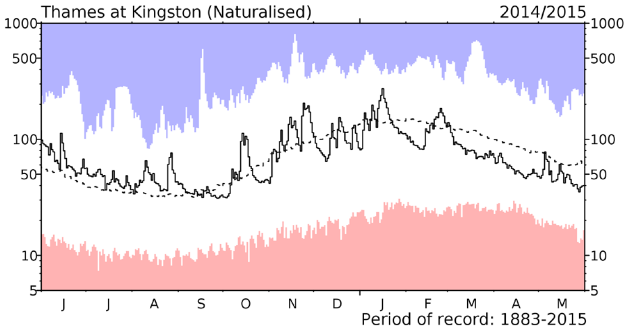

Dee at New Inn
2014/2015
J J A S O N D J F M A M
Period of record: 1969-2015

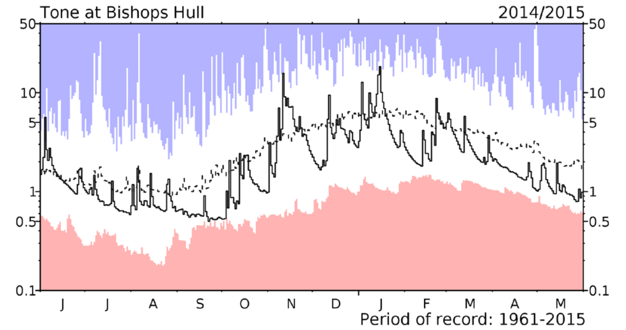

Wharfe at Flint Mill Weir
2014/2015
J J A S O N D J F M A M
Period of record: 1955-2015

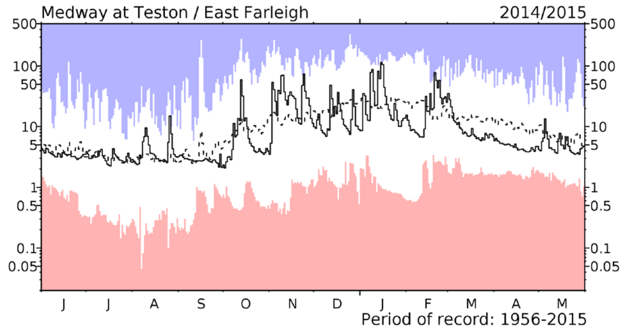

Wye at Redbrook
2014/2015
J J A S O N D J F M A M
Period of record: 1936-2015


Little Ouse at Abbey Heath
2014/2015
J J A S O N D J F M A M
Period of record: 1968-2015

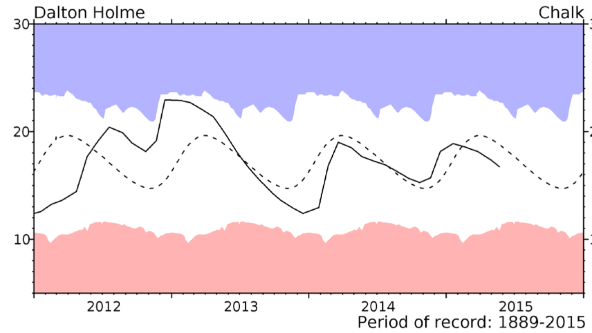

Coln at Bibury
2014/2015
J J A S O N D J F M A M
Period of record: 1963-2015

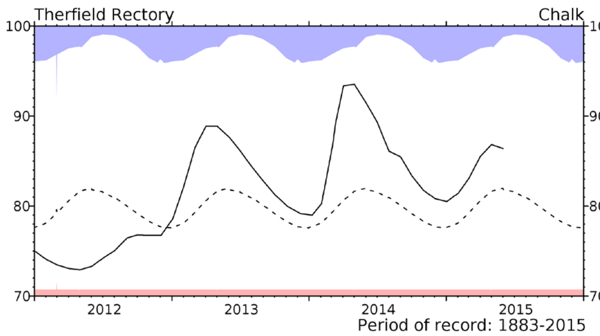

Thames at Kingston (Naturalised)
2014/2015
J J A S O N D J F M A M
Period of record: 1883-2015

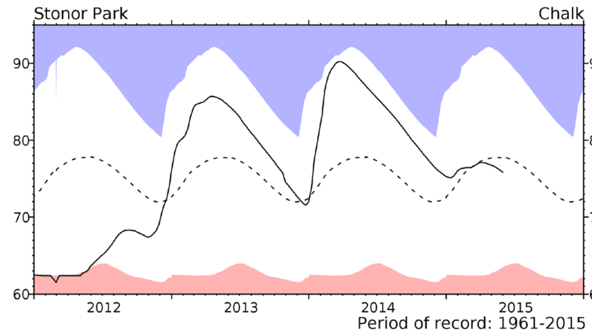

Tone at Bishops Hull
2014/2015
J J A S O N D J F M A M
Period of record: 1961-2015

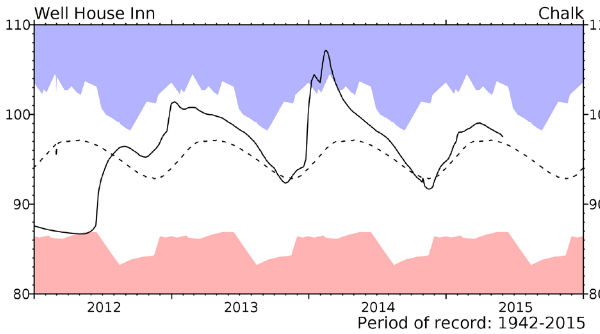

Medway at Teston / East Farleigh
2014/2015
J J A S O N D J F M A M
Period of record: 1956-2015

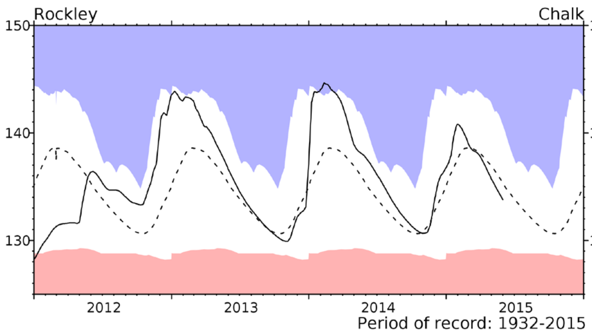
Groundwater . . . Groundwater

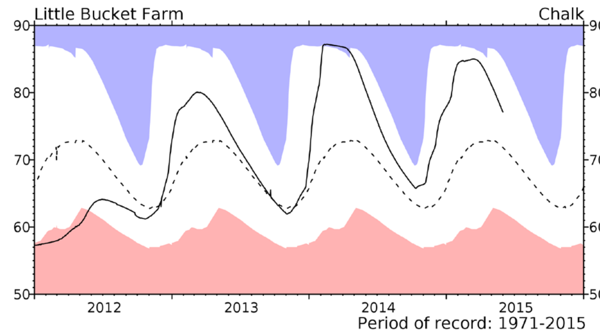


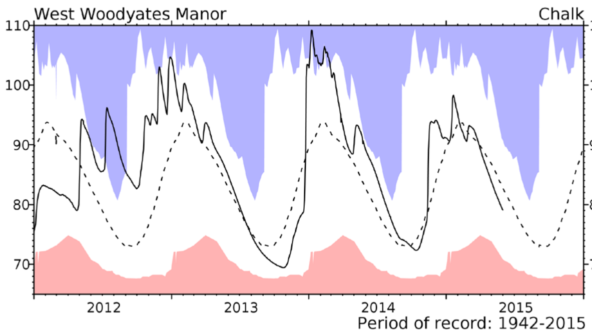


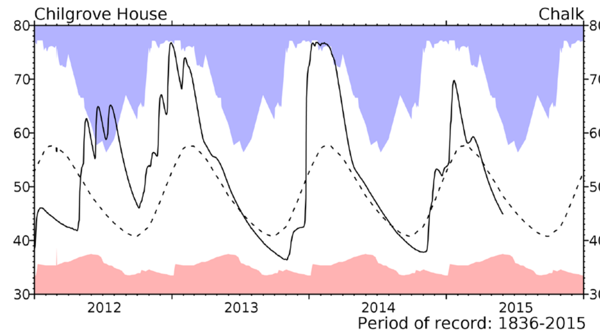


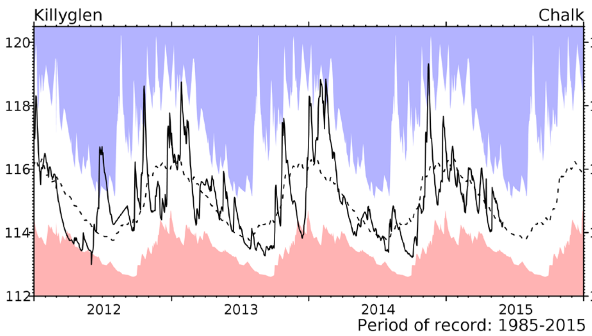


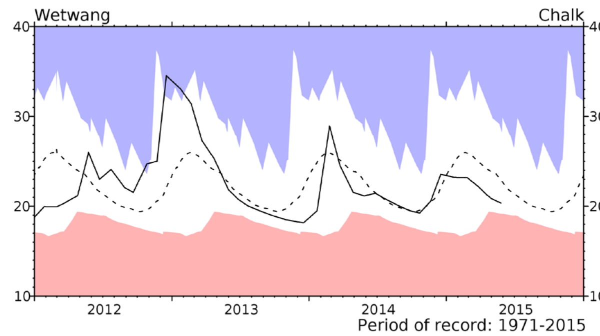






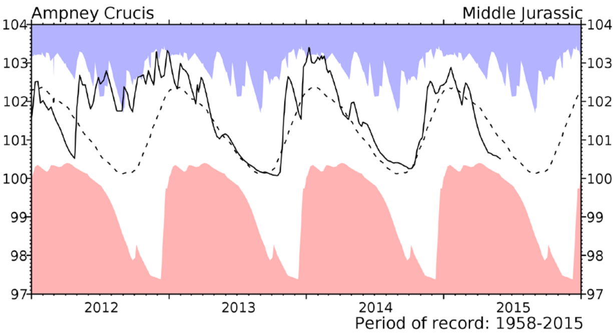


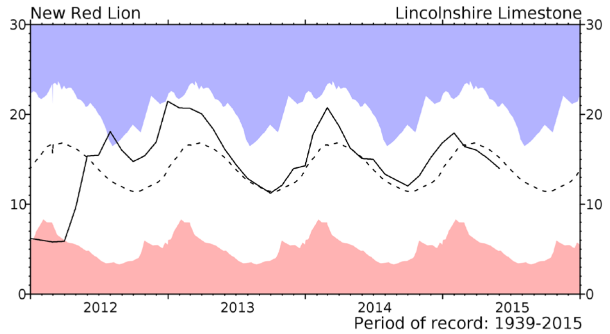


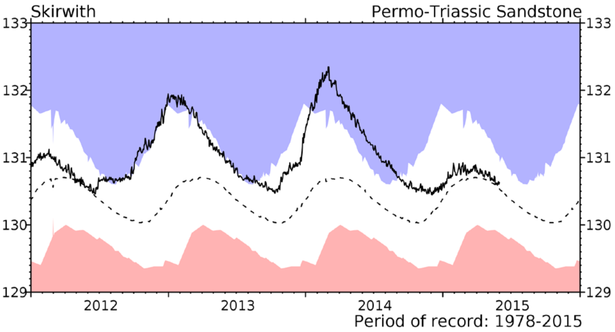


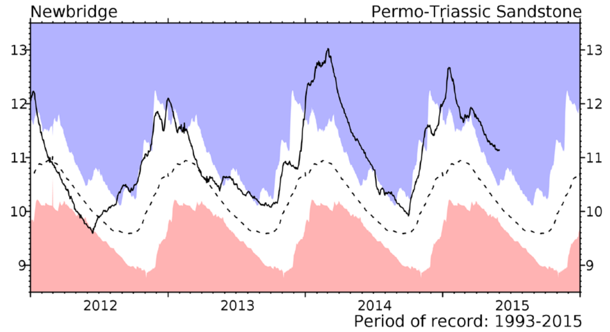
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

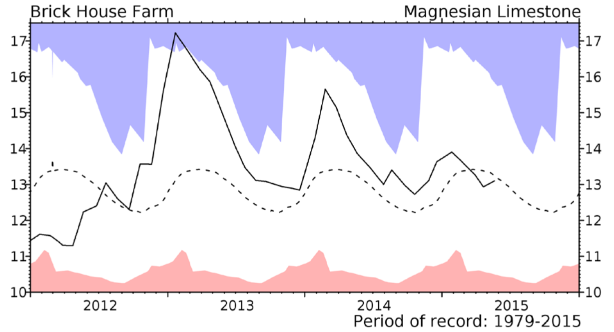
Groundwater ... Groundwater

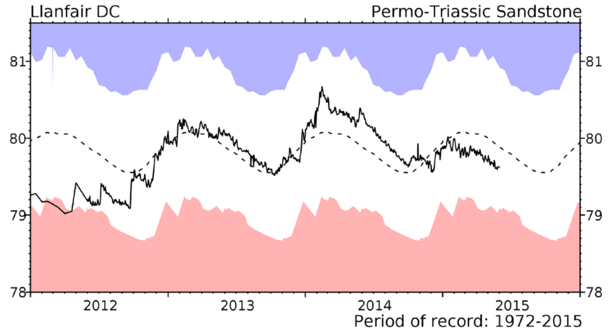


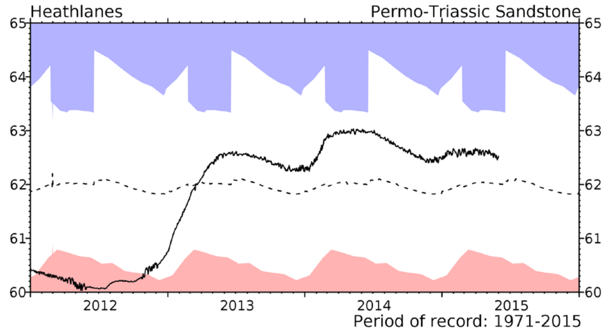


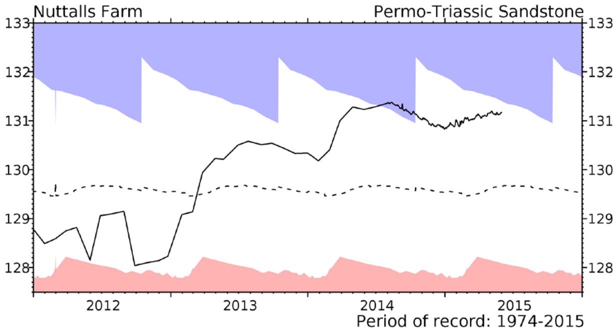


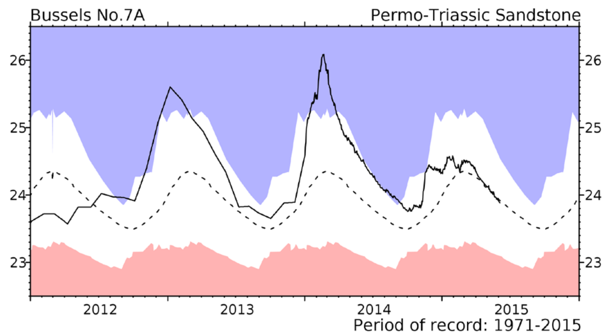


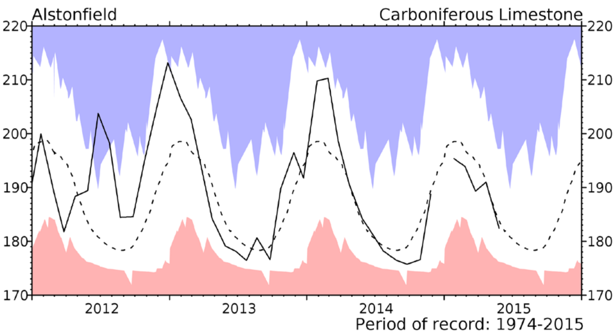










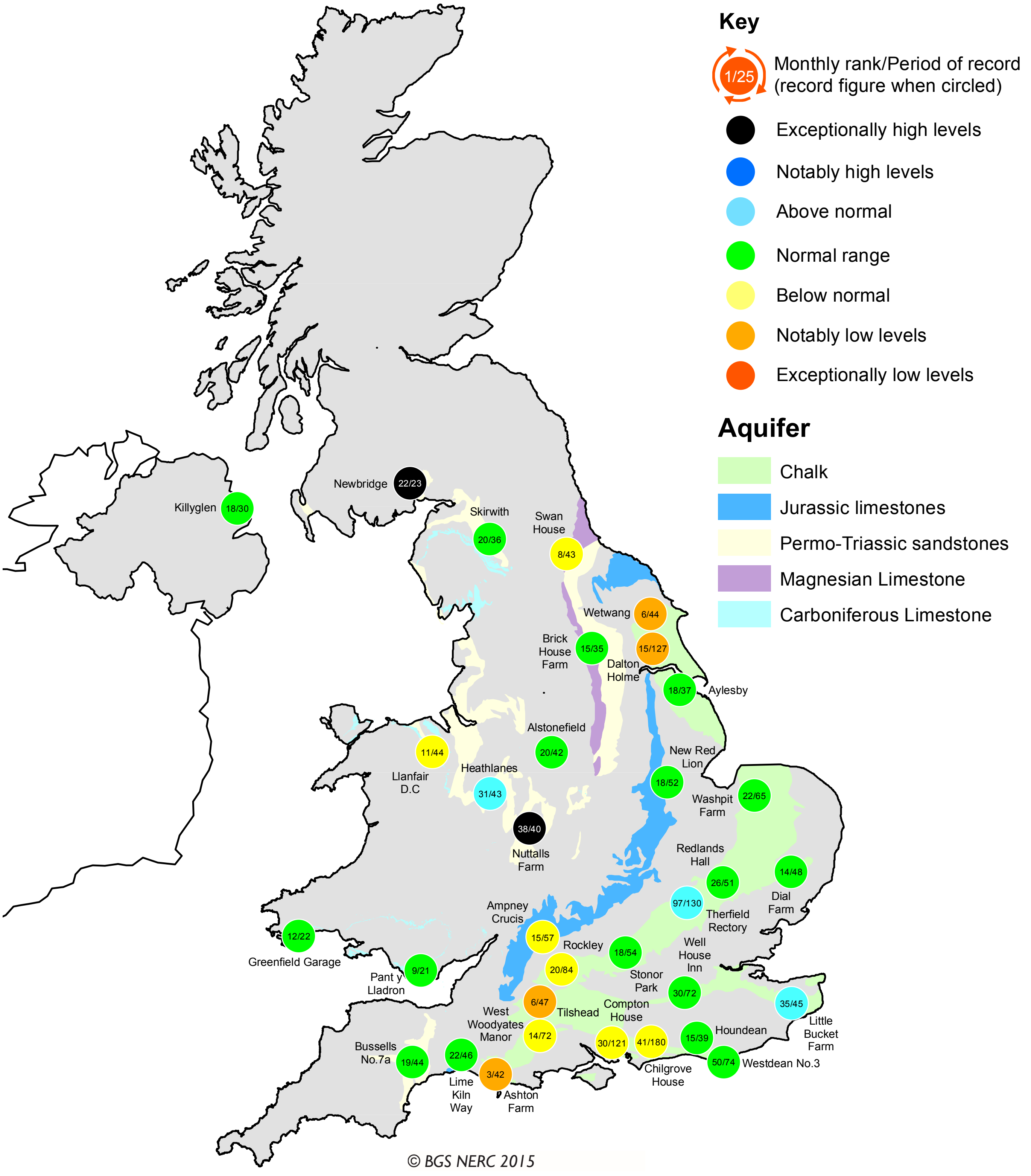


Groundwater levels May / June 2015

Borehole	Level	Date	May av.	Borehole	Level	Date	May av.	Borehole	Level	Date	May av.
Dalton Holme	16.73	22/05	18.93	Chilgrove House	44.88	31/05	49.06	Brick House Farm	13.10	21/05	13.33
Therfield Rectory	86.37	01/06	81.74	Killyglen (NI)	114.32	31/05	114.41	Llanfair DC	79.62	31/05	79.96
Stonor Park	75.84	31/05	77.96	Wetwang	20.34	26/05	23.39	Heathlanes	62.52	31/05	62.00
Tilshead	84.62	31/05	90.01	Ampney Crucis	100.51	31/05	101.25	Nuttalls Farm	131.17	31/05	129.65
Rockley	133.79	31/05	136.19	New Red Lion	13.99	31/05	15.61	Bussells No.7a	23.88	04/06	24.03
Well House Inn	97.51	31/05	96.99	Skirwith	130.60	31/05	130.66	Alstonefield	182.36	27/05	185.77
West Woodyates	79.10	31/05	84.77	Newbridge	11.14	31/05	10.30				

Levels in metres above Ordnance Datum

Groundwater...Groundwater

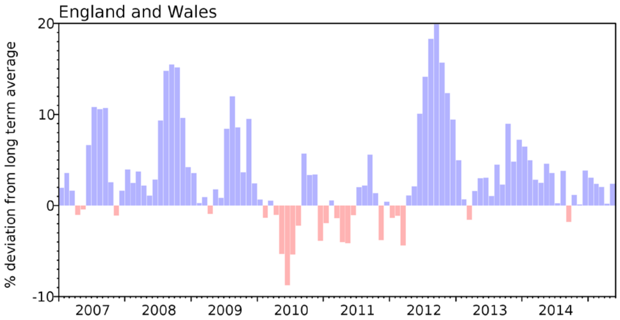


Groundwater levels - May 2015

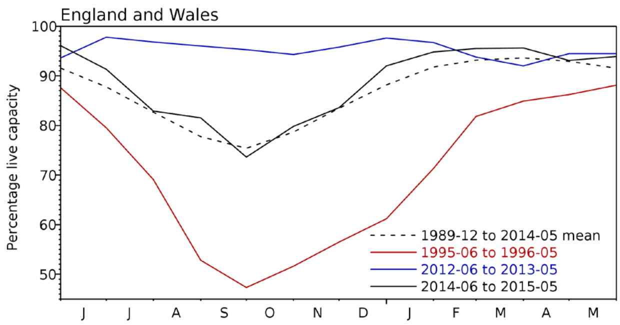
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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)	2015 Mar	2015 Apr	2015 May	May Anom.	Min May	Year* of min	2014 May	Diff 15-14
North West	N Command Zone	•	124929	96	88	90	9	50	1984	79	11
	Vyrnwy		55146	100	94	98	10	69	1984	100	-2
Northumbrian	Teesdale	•	87936	95	92	96	9	64	1991	93	4
	Kielder		(199175)	91	92	91	-1	85	1989	99	-8
Severn-Trent	Clywedog		44922	99	99	100	3	83	1989	99	1
	Derwent Valley	•	39525	101	94	96	8	56	1996	94	2
Yorkshire	Washburn	•	22035	95	82	82	-5	72	1990	86	-4
	Bradford Supply	•	41407	98	94	94	8	70	1996	98	-4
Anglian	Grafham		(55490)	92	95	96	2	72	1997	96	0
	Rutland		(116580)	96	95	93	2	75	1997	97	-3
Thames	London	•	202828	92	92	92	-2	83	1990	98	-6
	Farmoor	•	13822	99	96	95	-3	90	2002	98	-3
Southern	Bewl		28170	92	92	89	1	57	1990	99	-10
	Ardingly		4685	100	100	100	1	89	2012	100	0
Wessex	Clatworthy		5364	100	89	82	-5	67	1990	100	-18
	Bristol	•	(38666)	99	96	90	1	70	1990	99	-9
South West	Colliford		28540	93	92	88	3	52	1997	100	-12
	Roadford		34500	95	93	90	7	48	1996	95	-5
	Wimbleball		21320	100	96	92	1	74	2011	99	-7
	Stithians		4967	88	84	95	9	66	1990	95	0
Welsh	Celyn & Brenig	•	131155	99	99	100	3	82	1996	100	1
	Brianne		62140	98	96	100	4	84	2011	100	0
	Big Five	•	69762	98	91	92	2	70	1990	98	-6
	Elan Valley	•	99106	99	93	99	5	81	2011	99	0
Scotland(E)	Edinburgh/Mid-Lothian	•	97639	95	92	95	4	52	1998	96	-1
	East Lothian	•	10206	99	98	100	3	84	1990	98	2
Scotland(W)	Loch Katrine	•	111363	90	88	92	5	66	2001	94	-2
	Daer		22412	100	89	97	6	70	1994	90	7
	Loch Thom	•	11840	100	100	100	8	74	2001	100	0
Northern Ireland	Total+	•	56800	94	89	93	8	69	2008	87	5
	Silent Valley	•	20634	100	90	95	14	56	2000	91	4

( ) 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 1971-2000 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://www.ceh.ac.uk/data/nrfa/nhmp/nhmp.html

Some of the features displayed on the maps contained in this report are based on the following data with permission of the controller of HMSO.