Hydrological Summary

for the United Kingdom

January 2011

General

January was a month of contrasting synoptic patterns but, overall, near-average temperatures. Rainfall was generally below average across much of the UK (Northern Ireland was particularly dry) but a sequence of Atlantic frontal systems produced substantial runoff and aquifer recharge around mid-month. This was particularly beneficial in water resources terms. Reservoir stocks increased by around 30% at Clatworthy and stocks were within 5% of the early February average in the great majority of index reservoirs; overall stocks for England & Wales were only marginally below average. However stocks remain appreciably below the seasonal average in a few impoundments mostly in the south west. River flows were relatively depressed entering 2011 but recoveries were brisk during the 2nd week and flood alerts were common around mid-month before recessions became re-established. Belated, but relatively steep groundwater level recoveries were registered over the latter half of January across the southern Chalk and levels in most index wells are now within the normal late-winter range. Although considerable medium- and longer-term rainfall and runoff deficiencies extend over wide areas, water resources remain healthy across most of the UK. However, below average rainfall over the next 2-3 months would result in seasonally depleted resources in some areas (e.g. in Wessex).

Rainfall

Weather patterns in November and December were notable for the high frequency of northerly and north-easterly airflows. Maritime influences were much more evident in January which was much milder than the early winter but, at the national scale, it was another month with below average rainfall. Most of the January rainfall resulted from a sequence of active Atlantic frontal systems which were particularly intense around mid-month. Gales were common and some notable rainfall totals were recorded: on the 15th Shap, Cumbria and Capel Curig, Gwynedd registered 24-hr totals of 112 and 114mm respectively, the latter contributing to a 256mm total for the week. January rainfall totals displayed large spatial variations across the UK. Most of southern Britain registered above average rainfall, approaching 200% in a few coastal localities in Kent; similar anomalies were reported for a restricted area in the northern Pennines. By contrast, large parts of the Midlands, north-east England and eastern Scotland recorded only 50-80% of average. For the UK the Dec/Jan rainfall total ranks among the lowest four in the last 48 years. More notably the 2-month total for Northern Ireland is the 4th lowest in a series from 1910. Significant medium and longer term rainfall deficiencies characterise a number of regions. For the Wessex, Severn Trent and Welsh regions rainfall deficiencies in the 10 or 11-month timeframes would be expected, on average, once every 10 years.

River flows

In most catchments, January river flows spanned an unusually wide range. Runoff rates were depressed early in the month but spate conditions were widespread in the week beginning the 12th. Flood alerts were common and affected many rivers basins across Britain. In Wales, the Conwy registered it highest January flow in a 46-year series and floodplain inundations (mostly moderate) were frequent. Overall outflows from Britain for mid-January approached the highest on record but thereafter steep recessions became established. The net result was that January mean flows at index gauging stations were mostly within the normal range. However, seasonally low runoff totals characterised many catchments in central and southern England and, particularly, in Northern Ireland where the Lagan and Camowen both registered their 2nd lowest January runoff on record. Of greater water resources significance are the multi-season runoff deficiencies across a significant proportion of the country. Runoff in most western, northern and southern catchments since last September is appreciably below average. In the 12-month timeframe, runoff accumulations are 25% or more below average in a significant proportion of the rivers draining from the Scottish Highlands, in Wales and south west England where the Tone reported its lowest Feb-Jan runoff since 1975/76. Over the same period, gauged flows on the Severn at Bewdley were the 2nd lowest in the last 75 years and in western Scotland, the Luss and Carron, both eclipsed previous Feb-Jan minima.

Groundwater

The rainfall distribution in January favoured the southern Chalk in particular, but most other aquifer outcrop areas received less than 80% of average rainfall. Nonetheless, residual soil moisture deficits were effectively eliminated in January in all but parts of East Anglia. Correspondingly, the very wet interlude in mid-month triggered a belated seasonal recovery (from depressed late-2010 levels) in some outcrop areas (see the Tilshead hydrograph for example). Steep groundwater level recoveries were recorded across much of the southern Chalk – West Woodyates and Chilgrove were among those index wells and boreholes recording rises of more than 10m. January groundwater levels were, with a few exceptions, within the normal range throughout the Chalk. Levels were also well within the normal range in index wells monitoring the limestone aquifers. In the more westerly and northern outcrops of the Permo-Triassic sandstones, however, most wells were considerably below average, albeit well above drought minima. The recovery in groundwater levels, in southern England particularly, has been marked by the onset of flows in many winterbournes (e.g. the Till in Wiltshire) but flows in most groundwater-fed streams remain below average.

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

Rainfall accumulations and return period estimates

Percentages are from the 1971-2000 average.

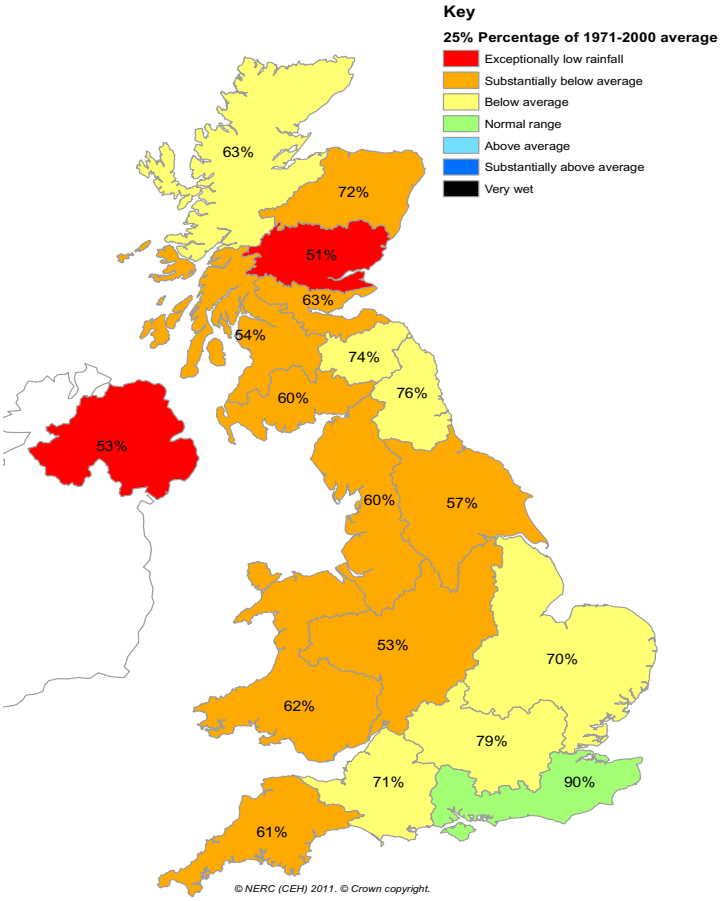
Area	Rainfall	Jan 2011	Dec10 - Jan11	RP	Oct10 - Jan11	RP	Mar10 - Jan11	RP	Feb10 - Jan11	RP
England & Wales	**mm**	**87**	**125**		**299**		**721**		**793**	
	%	**95**	**65**	**5-10**	**80**	**5-10**	**87**	**5-10**	**89**	**5-10**
North West	mm	**115**	151		389		967		1024	
	%	**94**	60	5-15	77	5-10	89	5-10	87	5-10
Northumbrian	mm	**74**	127		361		800		876	
	%	**90**	76	2-5	110	2-5	104	2-5	105	2-5
Severn Trent	mm	**52**	82		209		573		623	
	%	**70**	53	10-20	71	10-20	81	10-20	82	10-20
Yorkshire	mm	**57**	98		285		661		731	
	%	**70**	57	10-20	88	2-5	87	5-10	90	5-10
Anglian	mm	**53**	77		180		503		579	
	%	**99**	70	5-10	80	2-5	89	2-5	96	2-5
Thames	mm	**82**	112		232		546		626	
	%	**120**	79	2-5	83	2-5	84	5-10	89	2-5
Southern	mm	**106**	154		319		647		758	
	%	**129**	90	2-5	93	2-5	89	2-5	97	2-5
Wessex	mm	**101**	139		292		642		720	
	%	**109**	71	2-5	79	5-10	80	10-20	83	5-10
South West	mm	**131**	177		413		920		1015	
	%	**93**	61	5-10	75	5-10	83	5-10	84	5-10
Welsh	mm	**139**	189		433		1064		1124	
	%	**95**	62	5-15	73	10-20	87	5-15	85	10-20
Scotland	**mm**	**133**	**198**		**501**		**1201**		**1283**	
	%	**80**	**61**	**10-20**	**78**	**5-10**	**91**	**2-5**	**89**	**2-5**
Highland	mm	**169**	251		552		1349		1432	
	%	**84**	63	5-10	71	5-10	86	2-5	83	5-10
North East	mm	**63**	136		364		970		1069	
	%	**65**	72	5-10	94	2-5	110	2-5	113	2-5
Tay	mm	**107**	151		501		1125		1202	
	%	**68**	51	15-25	89	2-5	97	2-5	95	2-5
Forth	mm	**101**	158		410		989		1081	
	%	**80**	63	5-10	85	2-5	95	2-5	95	2-5
Tweed	mm	**92**	152		369		880		958	
	%	**92**	74	5-10	94	2-5	100	<2	100	<2
Solway	mm	**142**	189		532		1221		1277	
	%	**91**	60	10-20	86	2-5	94	2-5	91	2-5
Clyde	mm	**159**	215		591		1385		1468	
	%	**79**	54	10-20	76	5-10	87	5-10	85	5-10
Northern Ireland	**mm**	**62**	**127**		**344**		**961**		**1023**	
	%	**52**	**53**	**40-60**	**74**	**10-20**	**94**	**2-5**	**92**	**2-5**

% = 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 1913; 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. All monthly rainfall totals since August 2010 are provisional.

Rainfall . . . Rainfall . . .

December 2010 - January 2011



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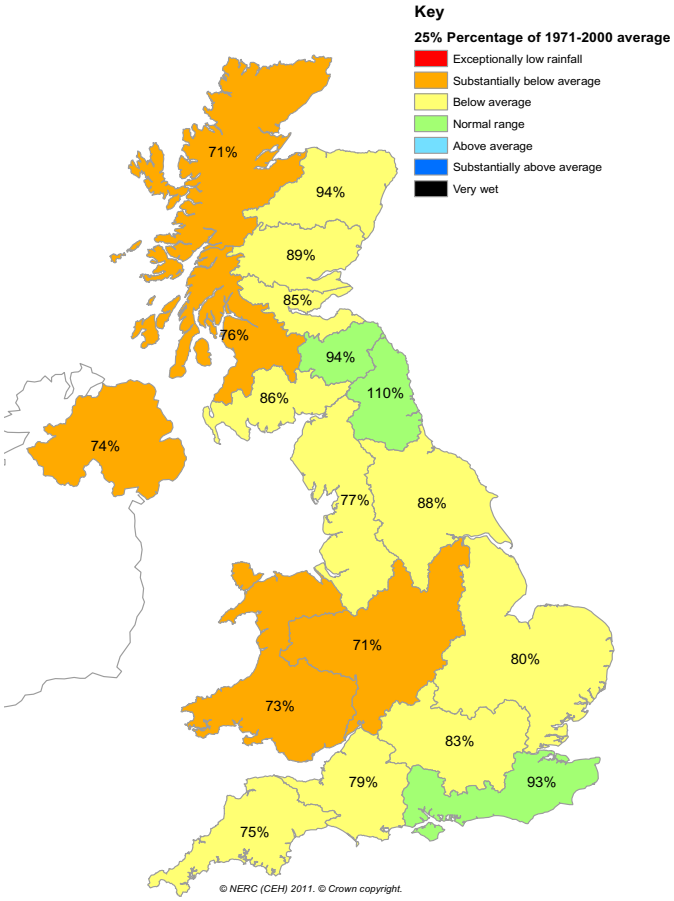
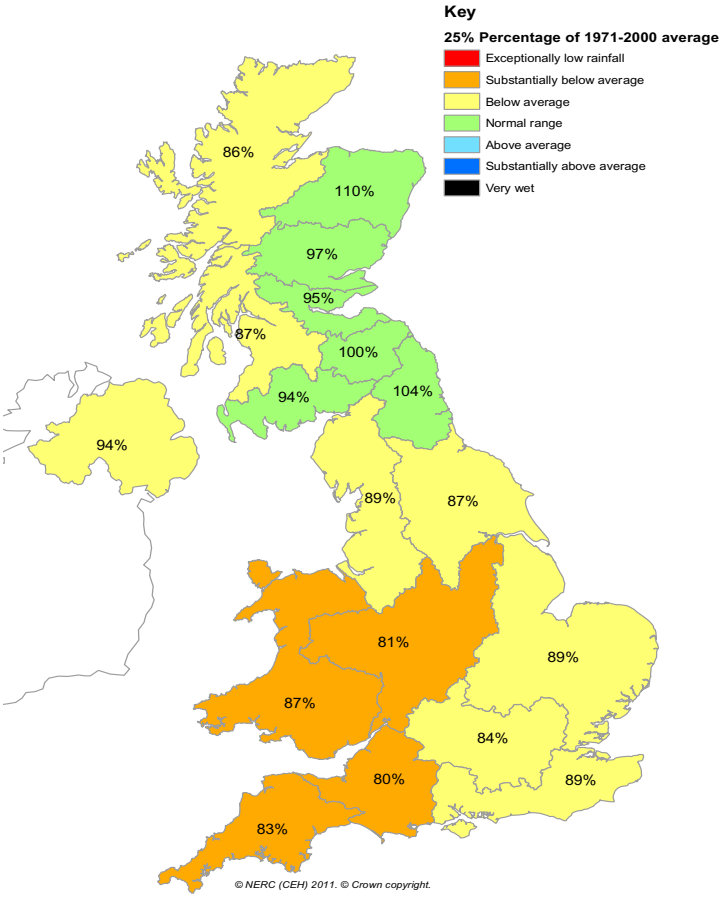


March 2010 - January 2011



Met Office Weather forecast

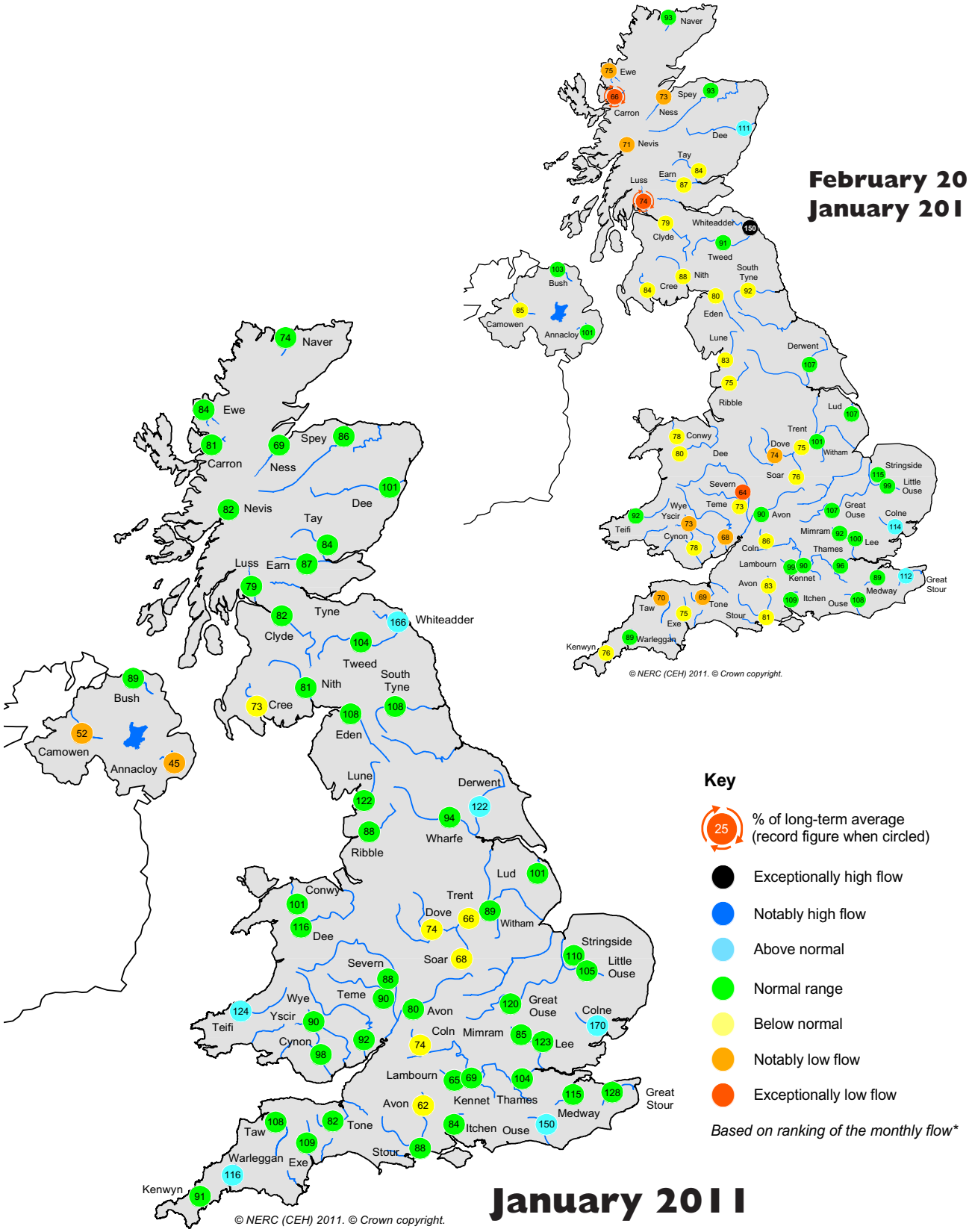
Updated: 12:13 on Friday 11 February 2011

UK Outlook for Wednesday 16 Feb to Friday 25 Feb 2011: Unsettled and at times windy conditions are expected during the second half of the coming week and into the following weekend. There will be rain at times, occasionally heavy, especially in the north, and this is likely to turn to snow at times over higher ground from the Midlands northwards, and perhaps over lower ground too over parts of Scotland. Some significant snow is possible over Scottish mountains. Some drier interludes are expected, especially later in the south. Rather cold, with a risk of overnight frost in the sheltered west, though southern areas may be milder at times. During the following week, remaining unsettled and at times windy, though with some drier, brighter intervals. It should become gradually milder, especially in the southwest.

UK Outlook for Saturday 26 Feb to Saturday 12 Mar 2011: A generally unsettled, cloudy, but fairly mild start is expected. Rain is likely in all areas, this mainly in the west where some may be heavy over hills, but drier interludes are expected in the east and southeast. Thereafter, a trend to more settled conditions seems likely with rainfall amounts falling below normal, and sunshine amounts increasing. However, with clearer skies, there is an increasing risk of overnight frost.

For further details please visit:
http://www.metoffice.gov.uk/weather/uk/uk_forecast_alltext.html

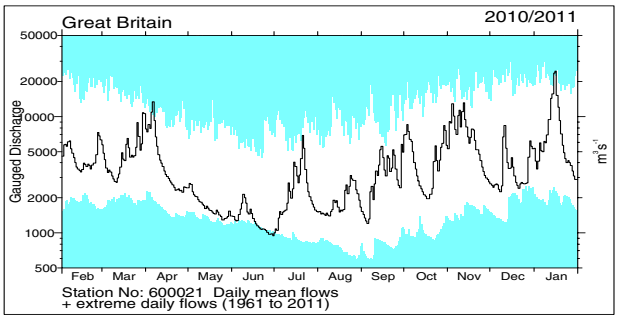
River flow . . . River flow . . .

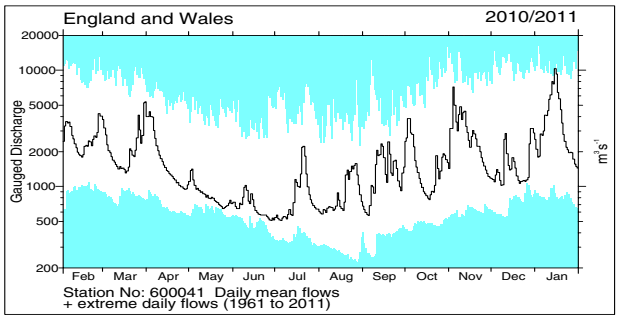


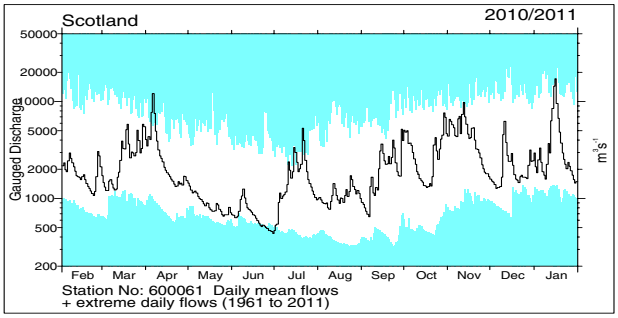
River flows

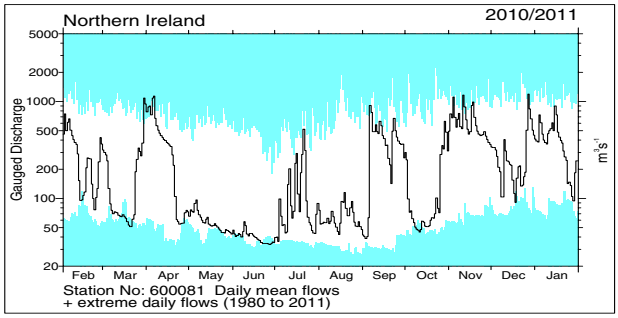
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

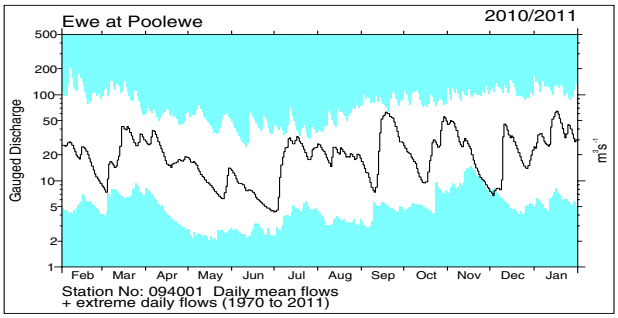
River flow . . . River flow . . .

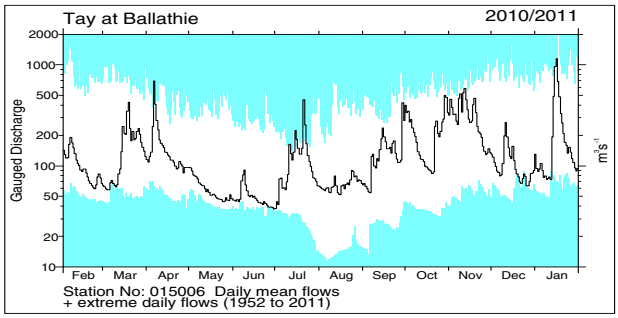


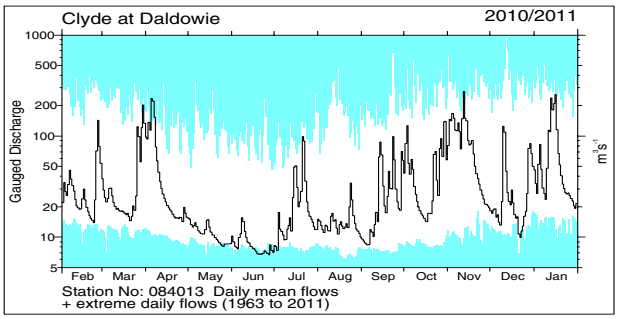


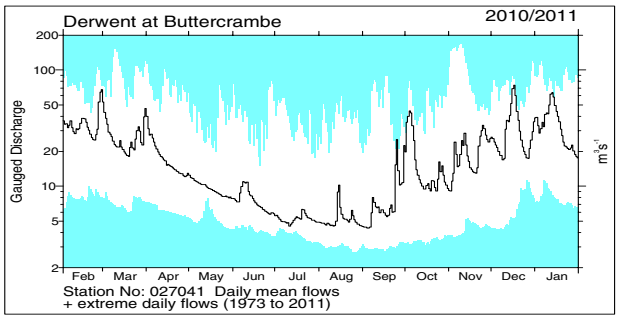


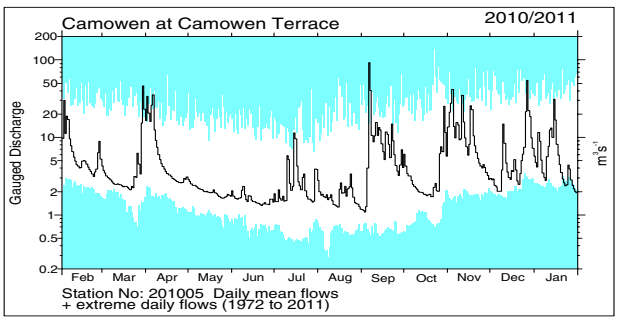


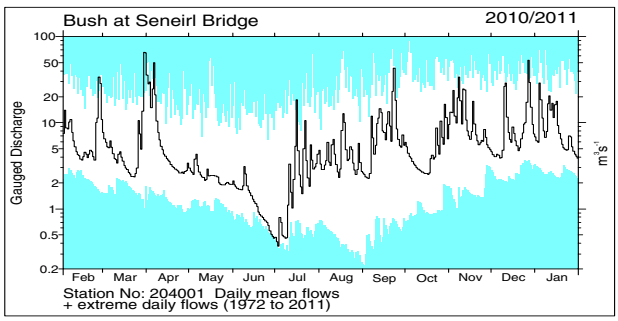








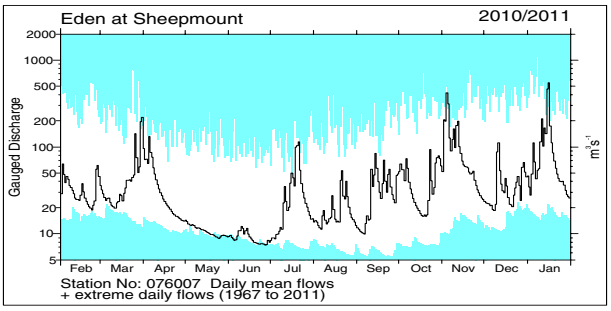


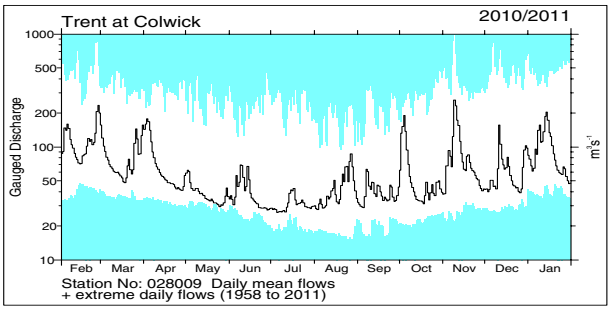


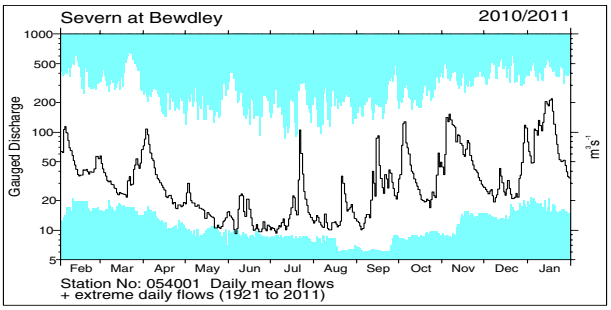
River flow hydrographs

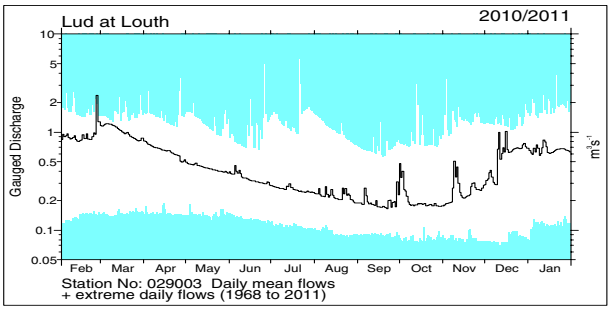
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to February 2010 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

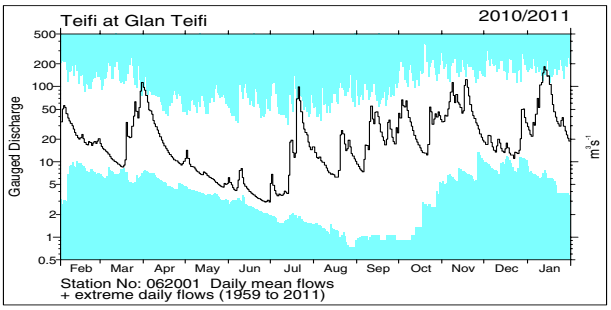
River flow . . . River flow . . .

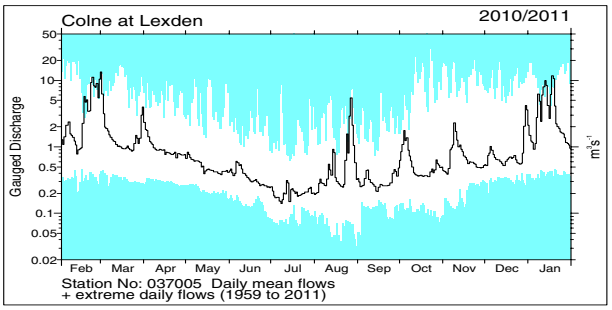


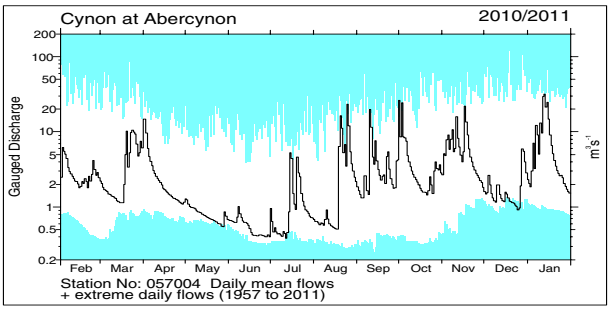


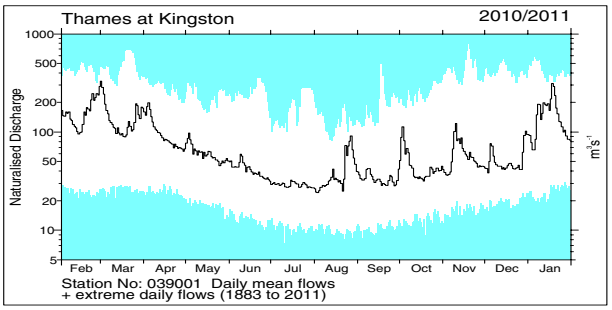


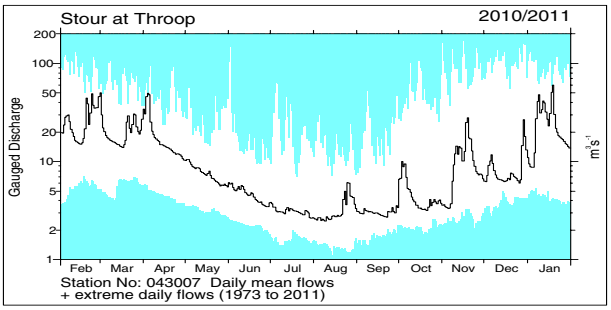


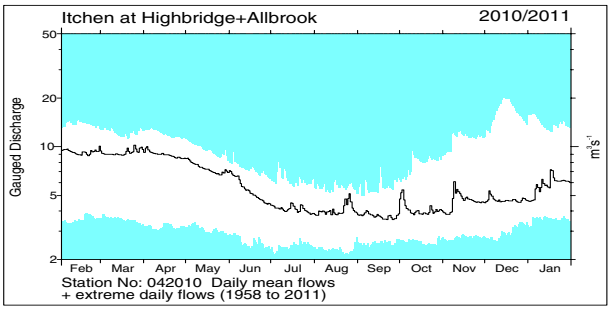












Notable runoff accumulations (a) October 2010 - January 2011 (b) February 2010 - January 2011

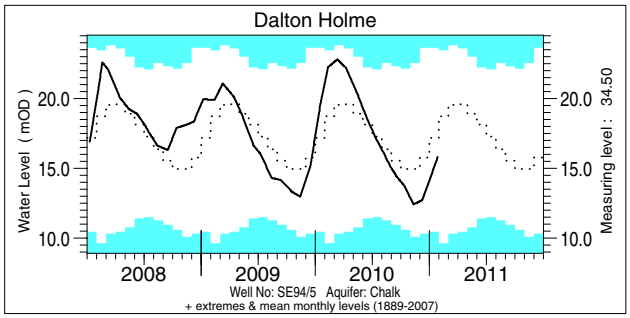
	River	%lta	Rank
a)	Soar	57	5/40
	Avon (Amesbury)	55	6/46
	Brue	63	4/45
	Ribble	76	7/51
	Camowen	74	3/38

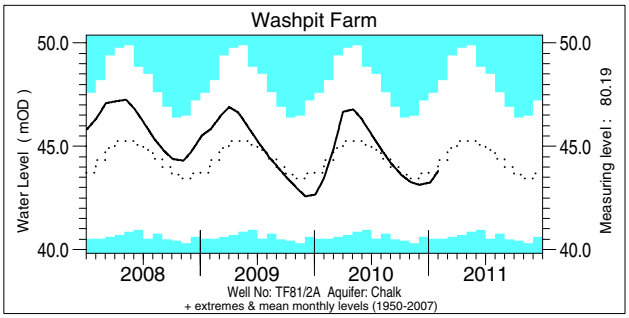
	River	%lta	Rank
b)	Ness	73	4/38
	Forth	73	3/29
	Tyne (Spilmersford)	150	44/45
	Whiteadder	150	40/41
	Taw	70	5/52
	Tone	69	5/50
	Severn	64	3/89

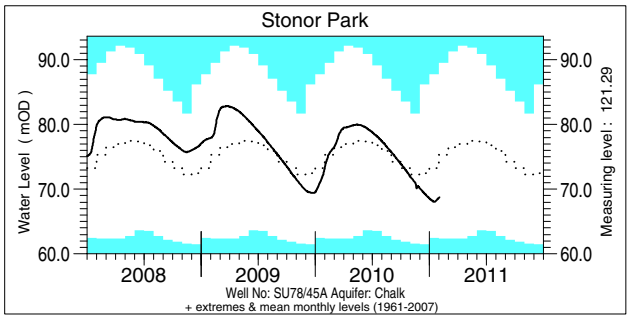
	River	%lta	Rank
b)	Yscir	73	5/38
	Dee (Manley Hall)	77	7/73
	Luss Water	74	1/32
	Nevis	71	2/28
	Carron	66	1/32
	Ewe	75	4/40
	Faughan	81	5/34

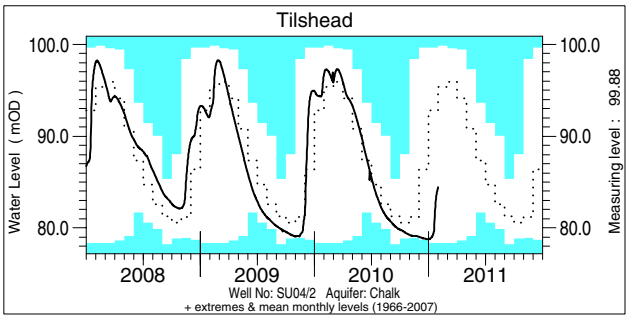
lta = long term average
Rank 1 = lowest on record

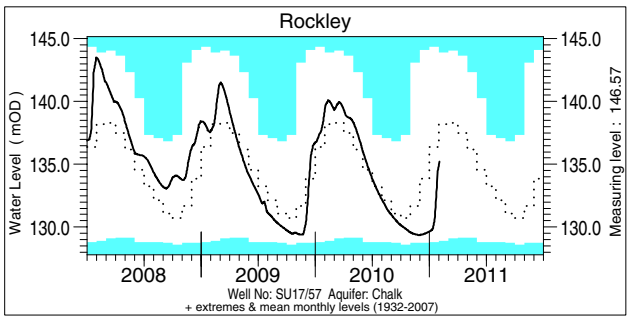
Groundwater . . . Groundwater

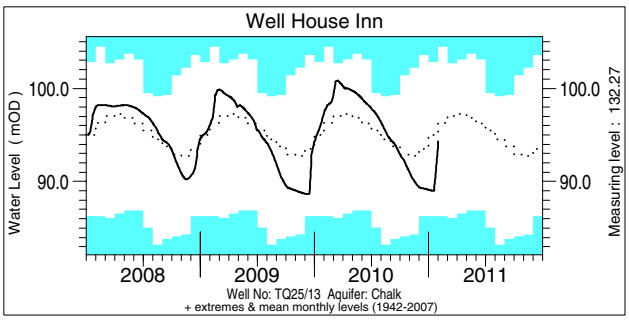


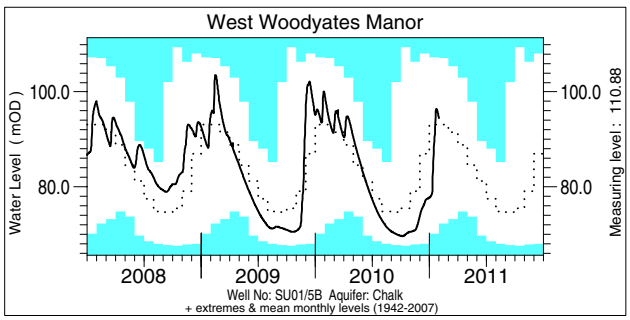


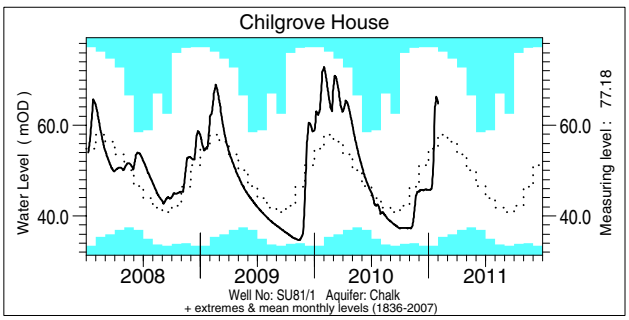


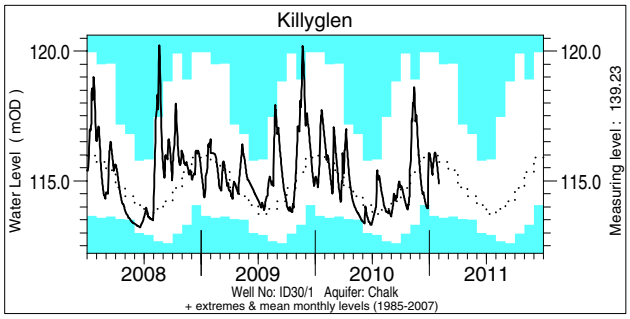


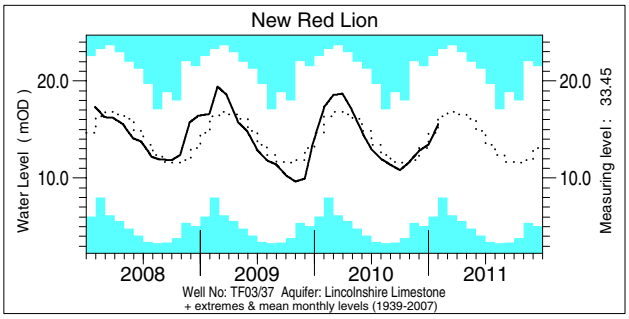






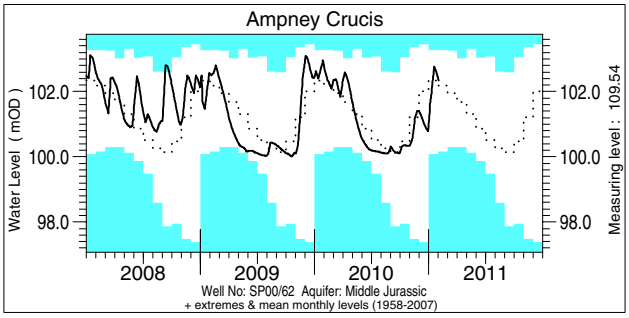


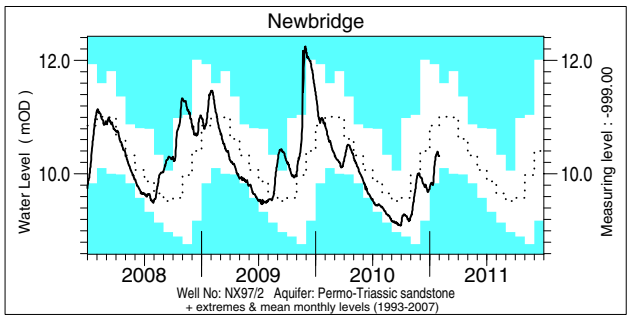


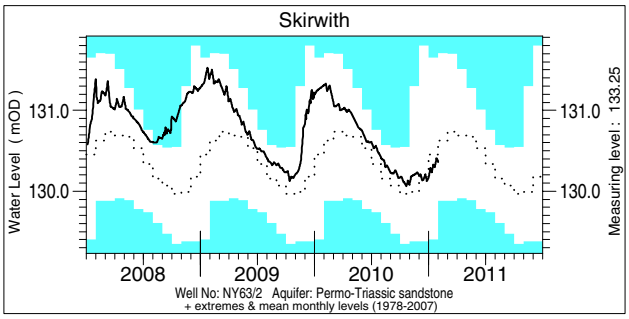


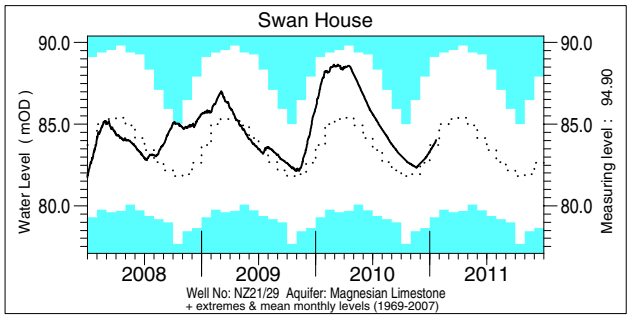
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

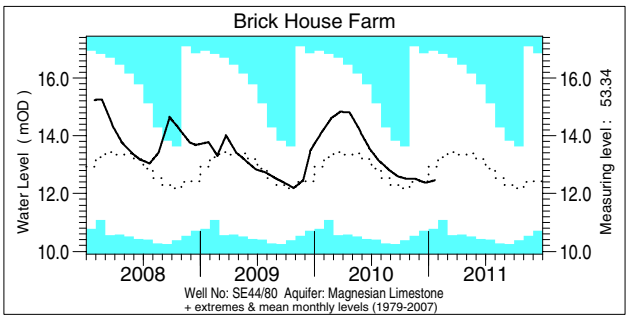
Groundwater . . . Groundwater

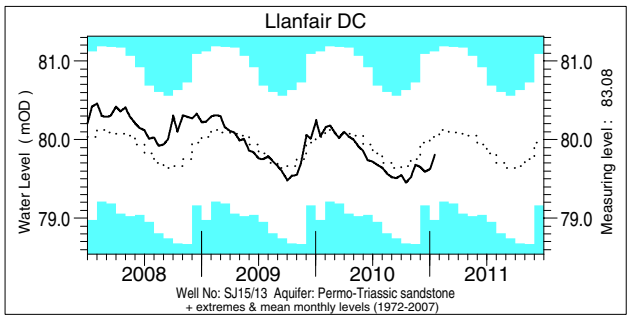


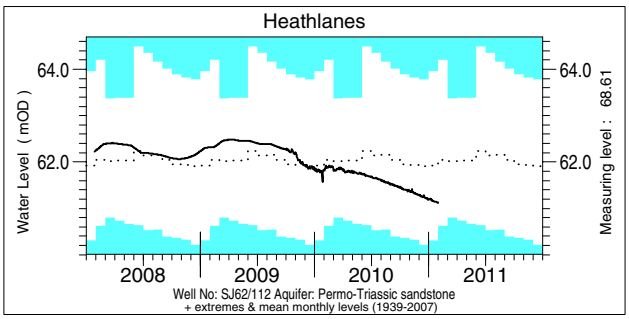


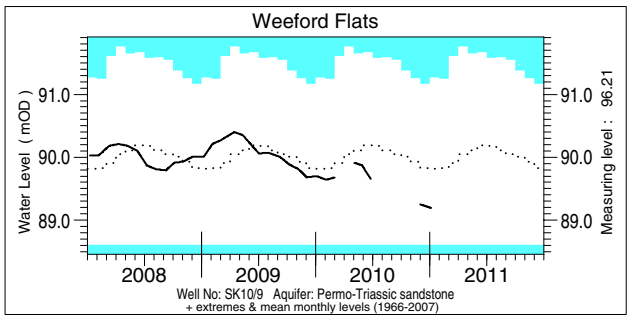


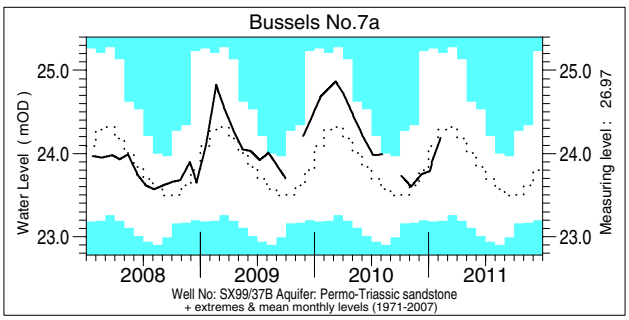


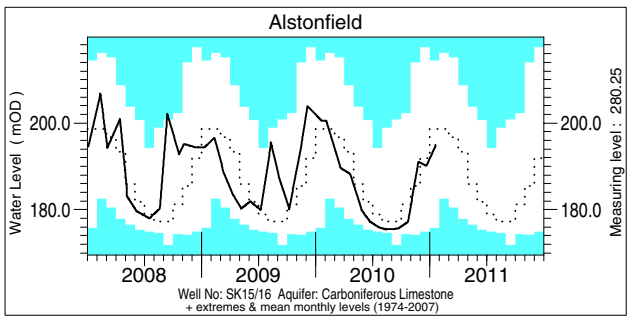










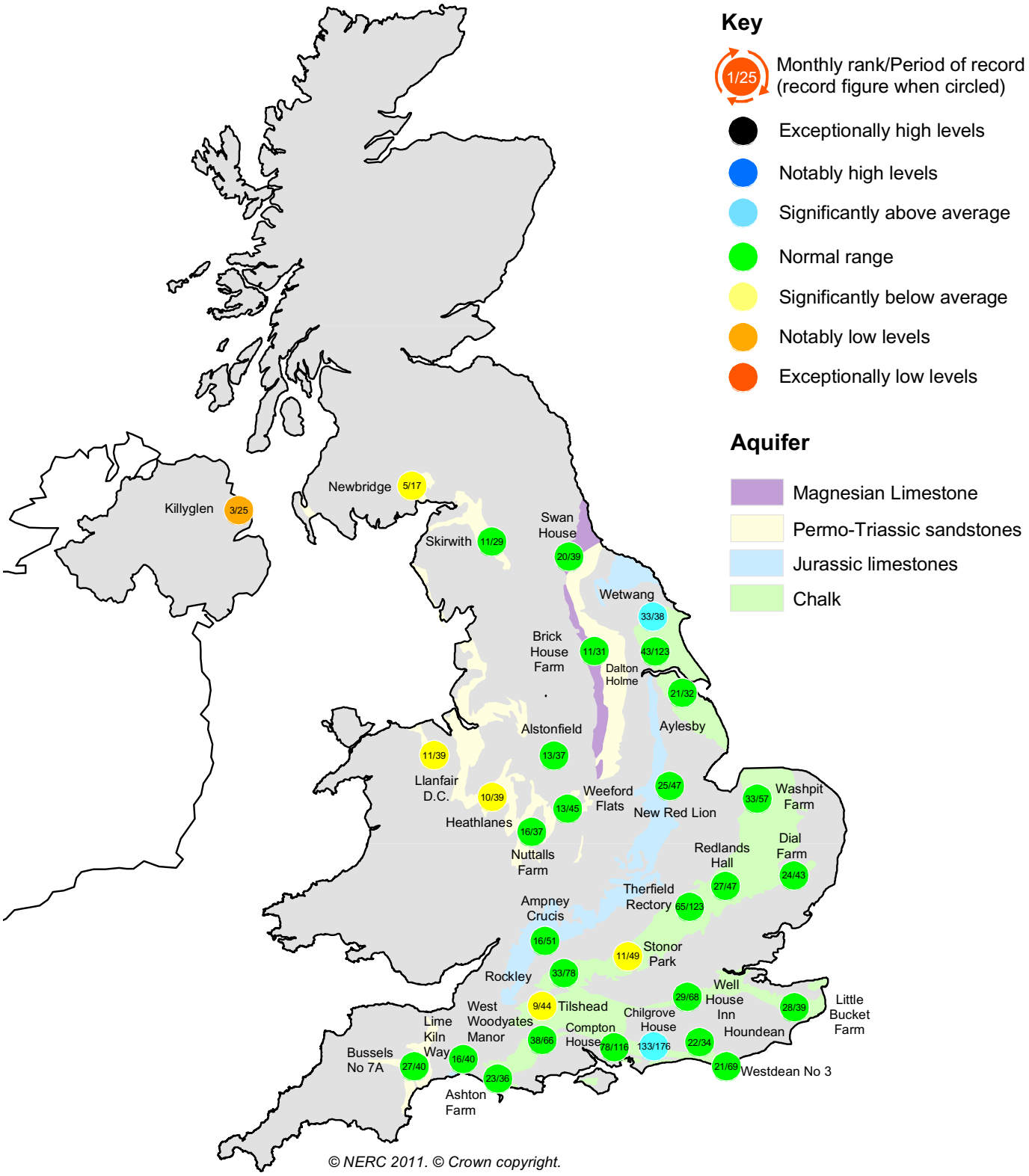


Groundwater levels January / February 2011

Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.
Dalton Holme	15.80	26/01	17.18	Chilgrove House	64.82	31/01	56.24	Brick House Farm	12.46	20/01	12.98
Washpit Farm	43.81	31/01	43.80	Killyglen (NI)	114.90	31/01	116.18	Llanfair DC	79.81	15/01	79.99
Stonor Park	68.71	01/02	73.39	New Red Lion	15.60	31/01	14.94	Heathlanes	61.12	31/01	61.92
Tilshead	84.44	31/01	91.51	Ampney Crucis	102.33	01/02	102.34	Weeford Flats	89.19	04/01	89.64
Rockley	135.22	01/02	136.42	Newbridge	10.31	31/01	10.80	Bussels No.7a	24.19	07/02	24.13
Well House Inn	94.33	31/01	94.95	Skirwith	130.36	31/01	130.54	Alstonfield	194.91	18/01	198.46
West Woodyates	94.42	31/01	91.73	Swan House	84.05	21/01	84.01				

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



Groundwater levels - January 2011

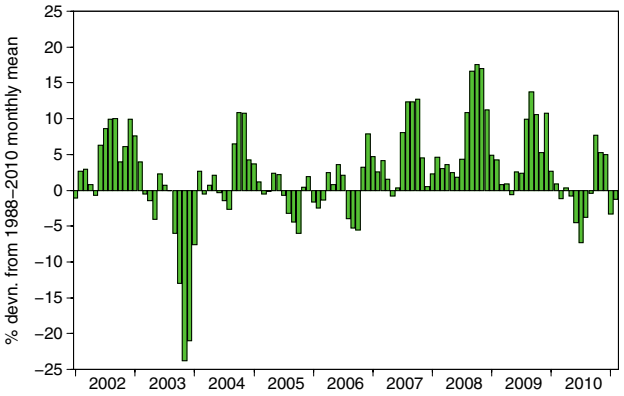
The rankings are based on a comparison between the average level in the featured month (but often only single readings are available) and the average level in each corresponding month on record. They need to be interpreted with caution especially when groundwater levels are changing rapidly or when comparing wells with very different periods of record. Rankings may be omitted where they are considered misleading.

Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.

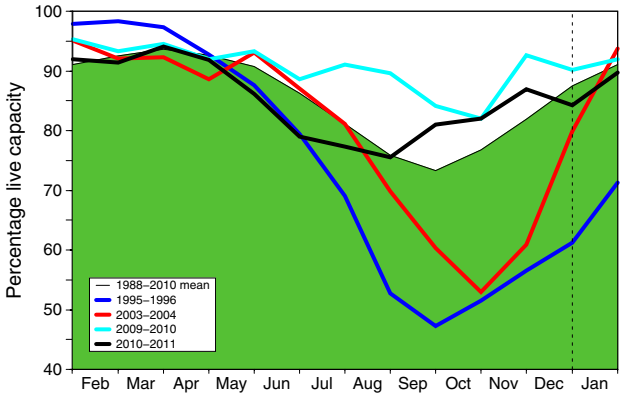
ii. Yew Tree Farm levels are now received quarterly.

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



These plots are based on the England and Wales figures listed below.

Percentage live capacity of selected reservoirs at start of month

Area	Reservoir		Capacity (Ml)	2010 Dec	2011 Jan	Feb	Feb Anom.	Min Feb	Year* of min	2010 Feb	Diff 11-10
North West	N Command Zone	•	124929	83	66	**84**	-8	63	1996	86	-2
	Vyrnwy		55146	96	82	**95**	3	45	1996	96	-1
Northumbrian	Teesdale	•	87936	90	90	**93**	2	51	1996	89	4
	Kielder		(199175)	(88)	(89)	**(92)**	-2	(85)	1989	(95)	-3
Severn Trent	Clywedog		44922	86	86	**91**	4	62	1996	83	8
	Derwent Valley	•	39525	85	84	**92**	-2	15	1996	100	-8
Yorkshire	Washburn	•	22035	89	84	**93**	3	34	1996	96	-3
	Bradford supply	•	41407	92	84	**92**	-1	33	1996	100	-8
Anglian	Grafham		(55490)	(95)	(89)	**(81)**	-5	(67)	1998	(85)	-4
	Rutland		(116580)	(75)	(76)	**(80)**	-6	(68)	1997	(82)	-2
Thames	London	•	202828	89	89	**91**	1	70	1997	92	-1
	Farmoor	•	13822	87	91	**77**	-13	72	2001	73	4
Southern	Bewl		28170	51	65	**88**	6	37	2006	97	-9
	Ardingly		4685	75	85	**100**	6	65	2006	100	0
Wessex	Clatworthy		5364	60	56	**86**	-10	62	1989	100	-14
	Bristol WW	•	(38666)	(54)	(51)	**(73)**	-13	(58)	1992	(95)	-22
South West	Colliford		28540	79	79	**84**	1	52	1997	100	-16
	Roadford		34500	72	69	**78**	-4	30	1996	94	-16
	Wimbleball		21320	62	61	**78**	-13	59	1997	100	-22
	Stithians		4967	64	77	**100**	12	38	1992	100	0
Welsh	Celyn and Brenig	•	131155	97	94	**97**	2	61	1996	96	1
	Brianne		62140	92	95	**93**	-5	84	1997	98	-5
	Big Five	•	69762	100	89	**95**	2	67	1997	88	7
	Elan Valley	•	99106	99	99	**99**	2	73	1996	100	-1
Scotland(E)	Edinburgh/Mid Lothian	•	97639	90	88	**92**	-2	72	1999	100	-8
	East Lothian	•	10206	100	100	**100**	2	68	1990	100	0
Scotland(W)	Loch Katrine	•	111363	90	78	**87**	-6	85	2000	86	1
	Daer		22412	99	91	**97**	-2	91	1997	99	-2
	Loch Thom	•	11840	96	96	**95**	-3	90	2004	95	0
Northern Ireland	Total+	•	56920	92	92	**94**	4	75	2002	98	-4
	Silent Valley	•	20634	93	92	**91**	5	46	2002	96	-5

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

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 1988-2009 period except for West of Scotland and Northern Ireland where data commence in the mid-1990's. In some gravity-fed reservoirs (e.g. Clywedog) stocks are kept below capacity during the winter to provide scope for flood attenuation purposes.

Location map . . . Location map

National Hydrological Monitoring Programme

The National Hydrological Monitoring Programme (NHMP)[#] is undertaken jointly by the Centre for Ecology & Hydrology (CEH) and the British Geological Survey (BGS). Financial support for the production of the monthly Hydrological Summaries is provided by the Department for Environment, Food and Rural Affairs (Defra), the Environment Agency (EA), the Scottish Environment Protection Agency (SEPA), the Rivers Agency (RA) in Northern Ireland, and the Office of Water Services (OFWAT).

Data Sources

River flow and groundwater level data are provided by the Environment Agency, the Environment Agency Wales, the Scottish Environment Protection Agency and, for Northern Ireland, the Rivers Agency and the Northern Ireland Environment Agency. In all cases the data are subject to revision following validation (flood and drought 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.

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.

Rainfall

Most rainfall data are provided by the Met Office (see opposite). To allow better spatial differentiation the rainfall data for Britain are presented for the regional divisions of the precursor organisations of the EA and SEPA. Following the discontinuation of the Met Office's CARP system in July 1998, the areal rainfall figures have been derived using several procedures, including initial estimates based on MORECS[*]. Recent figures have been produced by the Met Office, National Climate Information Centre (NCIC), using a technique similar to CARP. A significant number of additional monthly raingauge totals are provided by the EA and SEPA to help derive the contemporary regional rainfalls. Revised monthly national and regional rainfall totals for the post-1960 period were made available by the Met Office in 2004; these have been adopted by the NHMP. As with all regional figures based on limited raingauge networks the monthly tables and accumulations (and the return periods associated with them) should be regarded as a guide only.
The monthly rainfall figures are provided by the Met Office (National Climate Information Centre) and are Crown Copyright and may not be passed on to, or published by, any unauthorised person or organisation.

[*]MORECS is the generic name for the Met Office services involving the routine calculation of evaporation and soil moisture throughout Great Britain.

[#] Instigated in 1988

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

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Selected text and maps are available on the WWW at http://www.ceh.ac.uk/data/nrfa/nhmp/nhmp.html
Navigate via Hydrological Summary for the UK.

02/11