Hydrological Summary

for the United Kingdom

October 2010

General

Overall, October was a relatively mild month but with a notably cold interlude – associated with the persistence of northerly and easterly airflows after the first week. The associated limited precipitation during mid-month is reflected in the October rainfall totals – most regions reported modestly below the 1971-2000 average. Nonetheless, with the benefit of declining evaporation rates, overall reservoir storage increased through October; for England & Wales as whole, storage is now around 5% above the early November average. There are however substantial regional contrasts: reservoir stocks are healthy throughout much of Wales, Scotland and north-west England but substantially below average in parts of south-west Britain. In the Wessex region, Clatworthy reservoir registered its 2nd lowest early-November level since the terminal phase of the 1995 drought. Many rivers were in spate early in the month and flood alerts were common but October runoff totals were generally well within the normal range; moderate medium term runoff deficiencies can still be recognised in some western and southern catchments. The residual impact of the 2010 rainfall deficiency is most evident in the below-average groundwater levels for October (in the southern Chalk particularly) but overall groundwater resources remain typical of the autumn. As is often the case, November rainfall totals will be particularly influential in determining the water resources outlook for 2011.

Rainfall

The below average frequency of Atlantic frontal system, a feature of 2010 thus far, continued in October but, with a westerly airflow during the first week, a considerable number of storm totals exceeding 30mm were reported (e.g. Dunkeswell, Devon on the 1st , Cardinham, Cornwall on the 3rd). The final week was also wet, particularly in Scotland, where Cluanie Inn, Highland reported 54.6mm on the 27th and Inveruglas, Strathclyde, 48.6mm on the 29th. In the interim, a preponderance of mostly light showers made for considerable local variations in October rainfall totals. Generalising broadly, eastern areas of England (where showers off the North Sea were common) reported normal or above average October rainfall totals – parts of London and Norfolk were particularly wet. By contrast, Northern Ireland reported its 2nd driest October since 2003 and a few catchments (e.g. in the western Pennines) registered only around half the average monthly rainfall. The combined September and October rainfall totals are appreciably below average in some regions (e.g. Wessex and Wales) and most regions in England & Wales have registered only two months with above average rainfall this year. Nonetheless, accumulated rainfall deficiencies for 2010, thus far, are generally moderate; the most notable being Wessex (2nd driest since 1976) and Welsh (2nd driest in last 15 years). In water resources terms some residual benefit from the record rainfall in November 2009 may still be recognised.

River flow

October river flow patterns were generally characterised by early spate conditions followed by recessions and thence recoveries late in the month in responsive rivers (particularly in northern Britain). Flood alerts were common entering October (when notably high flows were recorded on the Tawe and Neath in South Wales). Successive pulses of frontal rainfall resulted in Flood Watches in all regions of England and Wales by the 3rd when spate conditions were widespread (e.g. across the North York Moors and, again, in South Wales). Flood risk declined rapidly during the second week and, with recessions re-established, some exceptional low flows were reported in a few western catchments; in mid-month, the Faughan (Northern Ireland) registered its 2nd lowest October daily flow on record. Estimated total outflows for Britain were close to the October average and monthly runoff totals were mostly well within the normal autumn range, albeit relatively depressed in some western catchment; in Northern Ireland , the Mourne registered its 2nd lowest October mean flow since 1994. Similarly, runoff accumulations over spans of 3-12 months show few wide departures from the average but, importantly, several pockets of substantially depleted runoff remain, particularly in Wessex where the May-October runoff for the River Tone is the 2nd lowest in a 50-yr record.

Groundwater

The showery nature of much of the October rainfall (after the first week), in the English Lowlands especially, contributed to large spatial variations in soil moisture conditions across the major aquifer outcrop areas. At the end of October, soils were close to saturation in the west and north of Britain (and in Northern Ireland) but still seasonally dry in some areas (e.g. parts of the East Midlands and Wessex). The combination of relatively dry soils and below average monthly rainfall meant that infiltration was around half, or less, of the October average across much of the Chalk outcrop (e.g. in parts of Dorset and the Chilterns). Correspondingly, October groundwater levels were significantly below average in a few southern Chalk index wells (e.g. Tilshead) but across the greater part of the aquifer levels remain within the normal autumn range. Seasonal recoveries (generally sluggish) are underway in most of the limestone aquifers and in some of the more responsive Permo-Triassic sandstone outcrops (e.g. Newbridge). Elsewhere, evidence of the start of the 2010/2011 recharge season is largely restricted to inflections in the recessions (see Chilgrove for example). In areas where above average soil moisture deficits remain, the return of a vigorous Atlantic airflow in early November was particularly welcome.

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.

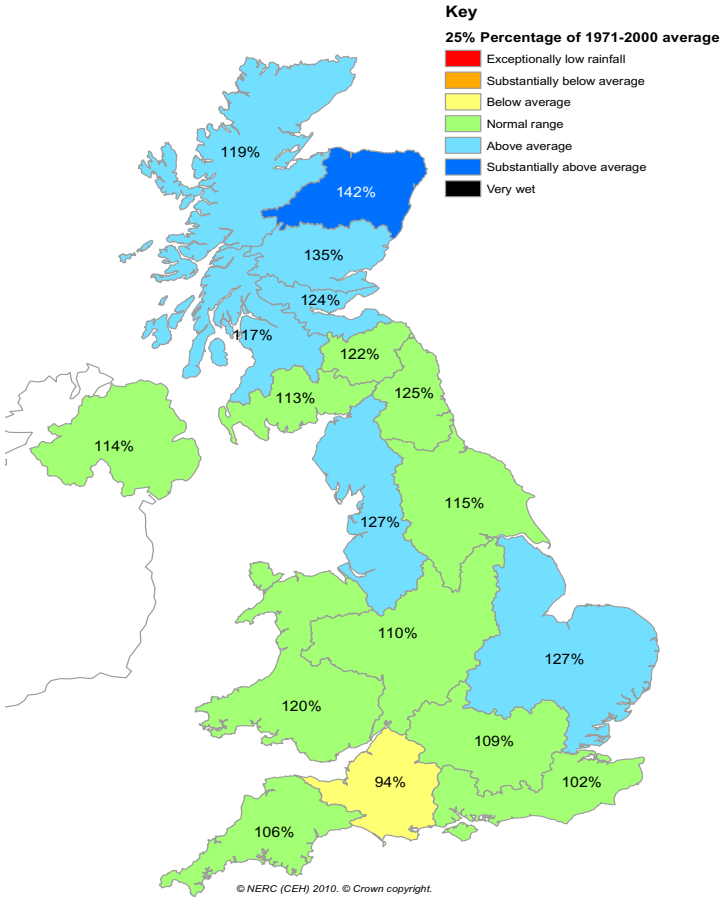
Area	Rainfall	Oct 2010	Jul10 - Oct10	RP	Mar10 - Oct10	RP	Jan10 - Oct10	RP	Nov09 - Oct10	RP
England & Wales	**mm**	**80**	**340**		**502**		**646**		**939**	
	%	**88**	**116**	**2-5**	**92**	**2-5**	**92**	**2-5**	**105**	**2-5**
North West	mm	**107**	511		690		813		1217	
	%	**85**	127	2-5	97	2-5	88	5-10	103	2-5
Northumbrian	mm	**78**	343		526		676		971	
	%	**102**	125	2-5	101	2-5	102	2-5	117	5-10
Severn Trent	mm	**64**	275		426		538		743	
	%	**91**	110	2-5	89	5-10	88	5-10	98	2-5
Yorkshire	mm	**78**	305		454		595		856	
	%	**101**	115	2-5	90	2-5	92	2-5	105	2-5
Anglian	mm	**54**	265		377		505		675	
	%	**95**	127	2-5	94	2-5	103	2-5	112	2-5
Thames	mm	**68**	253		380		524		764	
	%	**96**	109	2-5	85	2-5	93	2-5	109	2-5
Southern	mm	**85**	262		415		602		933	
	%	**96**	102	2-5	87	2-5	99	2-5	119	5-10
Wessex	mm	**65**	261		411		558		849	
	%	**74**	94	2-5	79	5-15	82	5-10	98	2-5
South West	mm	**92**	391		592		793		1170	
	%	**72**	106	2-5	87	2-5	86	5-10	97	2-5
Welsh	mm	**115**	508		741		899		1351	
	%	**81**	120	2-5	96	2-5	88	5-10	102	2-5
Scotland	**mm**	**149**	**572**		**852**		**1027**		**1392**	
	%	**97**	**121**	**2-5**	**102**	**2-5**	**92**	**2-5**	**97**	**2-5**
Highland	mm	**171**	648		972		1146		1495	
	%	**94**	119	2-5	101	2-5	87	2-5	87	2-5
North East	mm	**95**	462		700		910		1189	
	%	**93**	142	5-10	118	2-5	120	5-10	125	10-20
Tay	mm	**150**	545		782		962		1322	
	%	**112**	135	5-10	107	2-5	97	2-5	104	2-5
Forth	mm	**115**	467		701		860		1179	
	%	**98**	124	2-5	104	2-5	96	2-5	104	2-5
Tweed	mm	**80**	384		599		762		1098	
	%	**84**	122	2-5	102	2-5	101	2-5	115	2-5
Solway	mm	**148**	534		828		972		1439	
	%	**95**	113	2-5	100	<2	89	2-5	102	2-5
Clyde	mm	**189**	687		985		1157		1608	
	%	**100**	117	2-5	98	2-5	86	2-5	93	2-5
Northern Ireland	**mm**	**67**	**426**		**679**		**829**		**1126**	
	%	**58**	**114**	**2-5**	**100**	**<2**	**94**	**2-5**	**101**	**2-5**

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

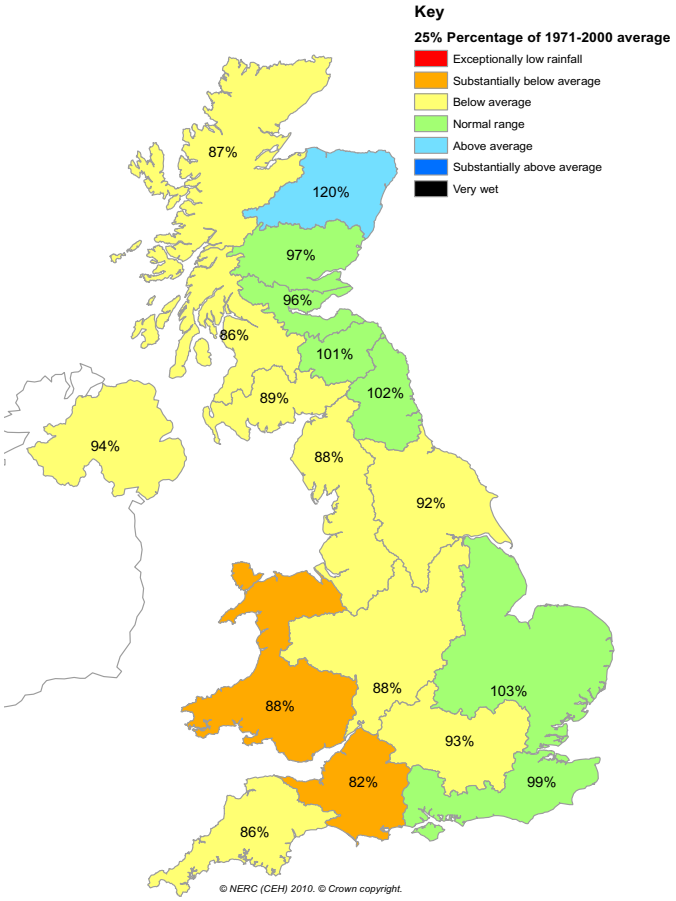
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic 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 June 2010 are provisional.

Rainfall . . . Rainfall . . .

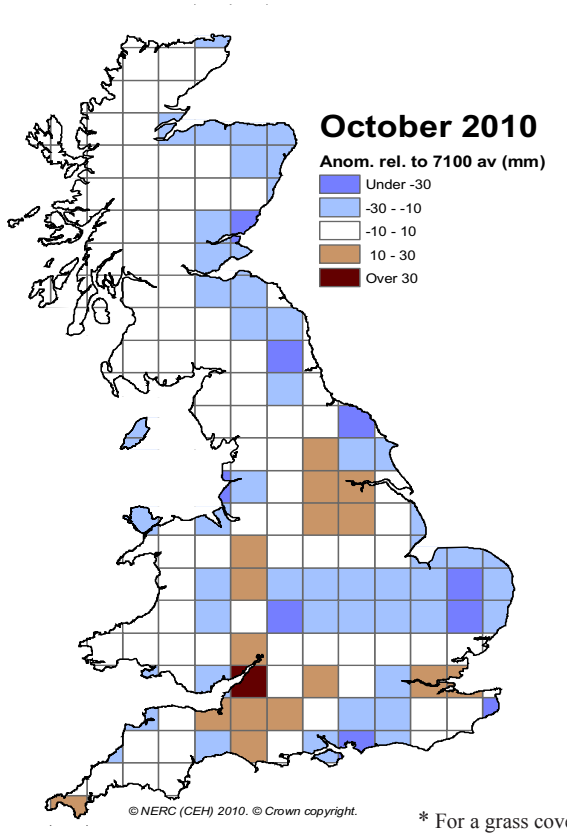
July - October 2010



January - October 2010



MORECS Soil Moisture Deficits *



* For a grass cover

Met Office
Weather forecast

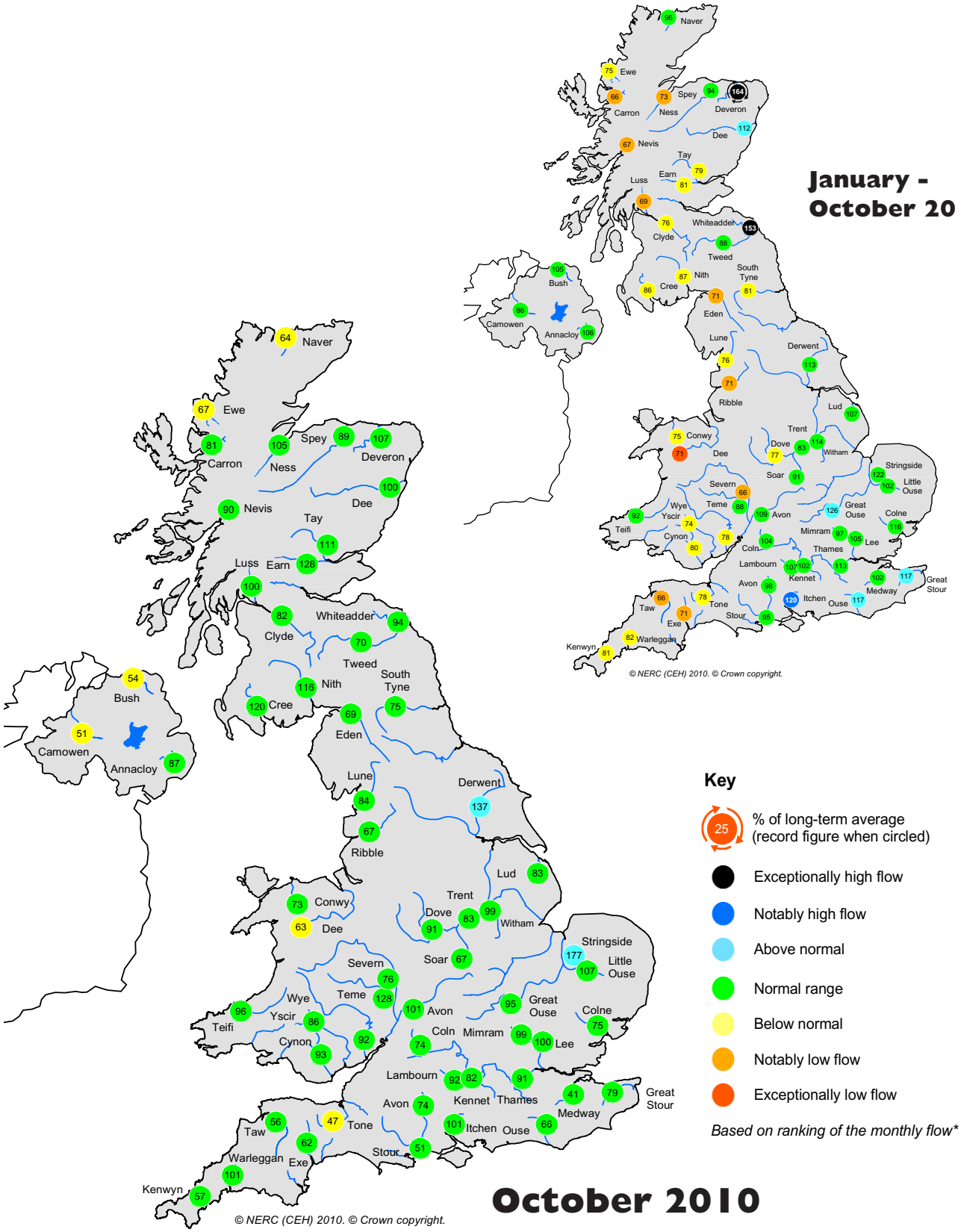
Updated: 11:54 on Weds 10 November

UK Outlook for Mon 15 Nov to Weds 24 Nov 2010:
It is likely to stay unsettled and windy with showers or longer spells of rain for most of the UK. The rain most persistent and heavy across northwestern parts at first, then elsewhere during the course of the first week. Occasional snow is likely over the higher ground of Scotland and perhaps Northern England. Drier and brighter interludes can also be expected, these most likely in the south and east. Later in the period there is a chance of drier and more settled weather in the south of the UK, but elsewhere it is likely to remain unsettled and cold with showers, still wintry in the north. Temperatures generally near or below average across the UK, with a risk of overnight frost on most nights under any clear skies.

UK Outlook for Thurs 25 Nov 2010 to Thurs 9 Dec 2010:
There is a trend for slightly more settled, but colder weather to become established across much of the UK. Precipitation should be mostly below average, especially in the west, with the driest and brightest weather expected here. Northeasterly winds could bring wintry showers into eastern areas at times. Temperatures are likely to be below average across much of the country, with an increased risk of overnight frosts.

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

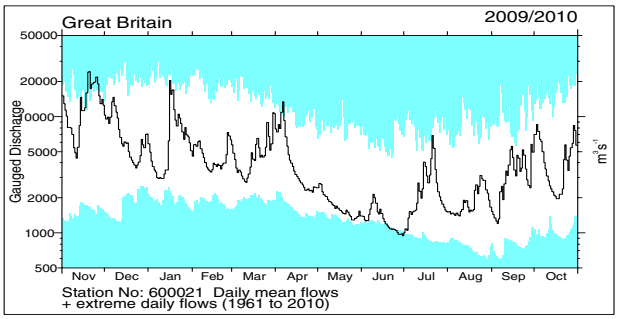
River flow . . . River flow . . .

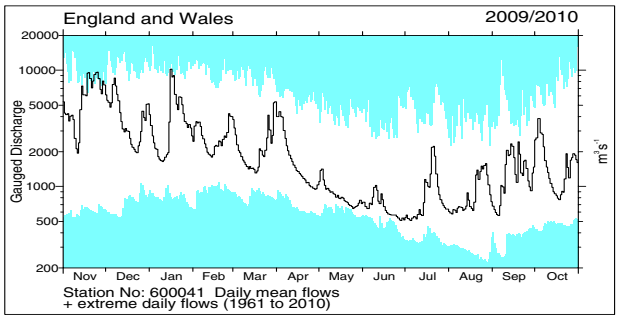


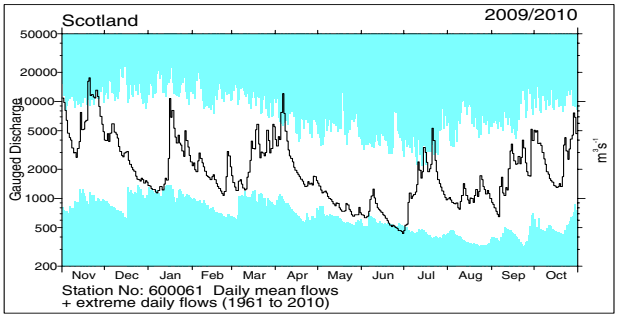
River flows

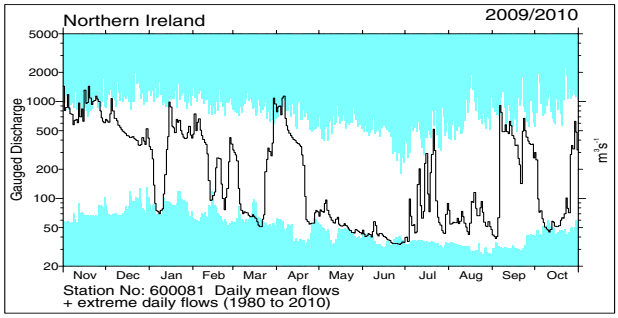
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

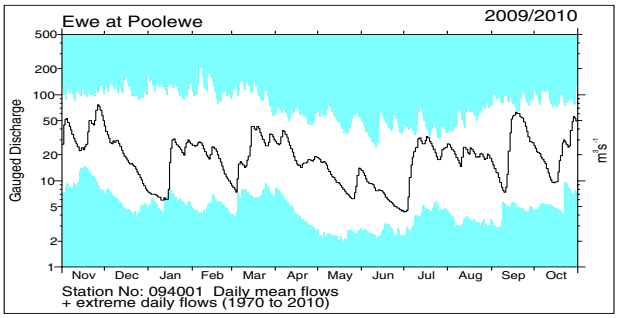
River flow . . . River flow . . .

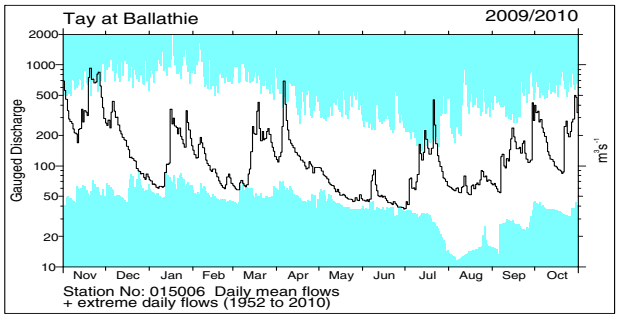


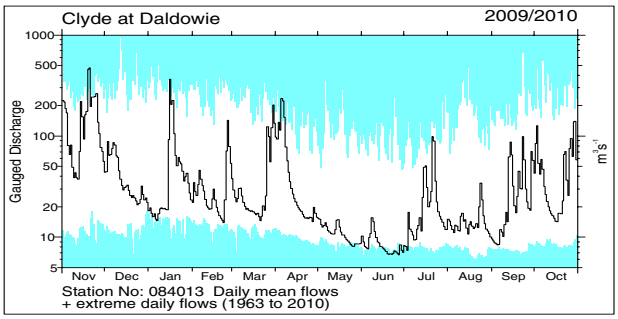


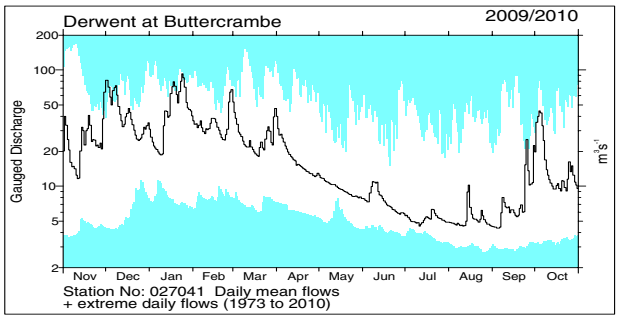


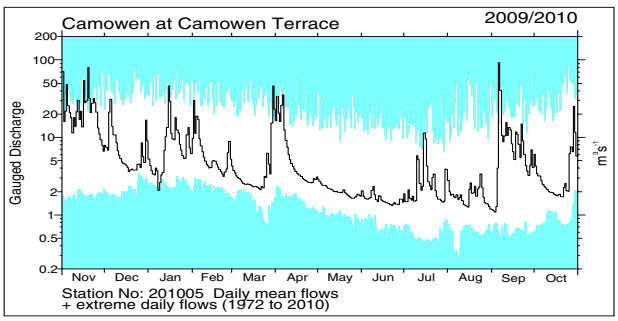


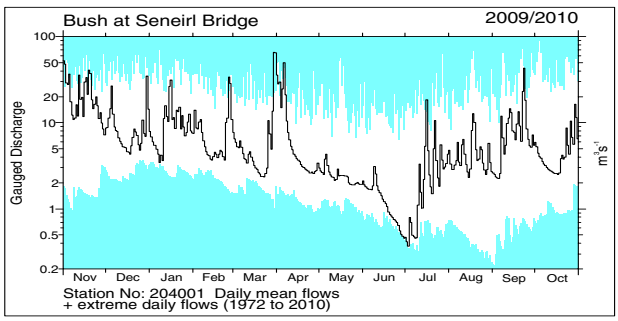








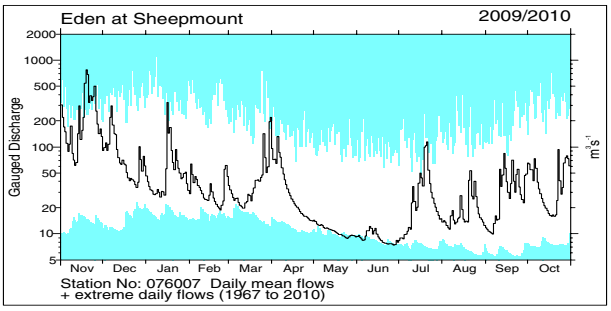


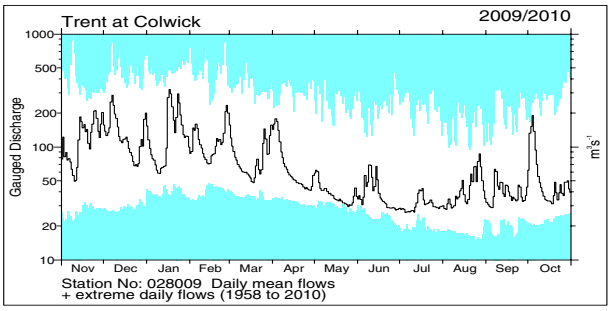


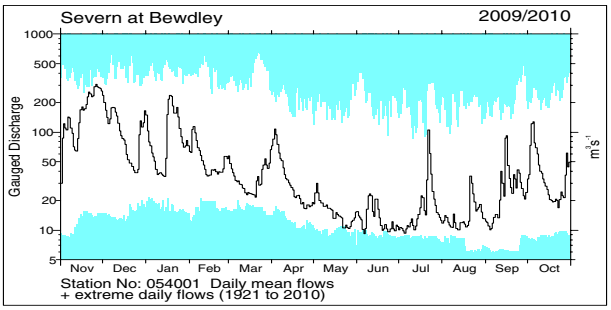
River flow hydrographs

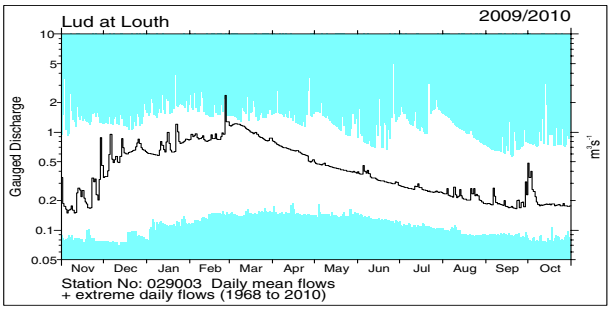
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to November 2009 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

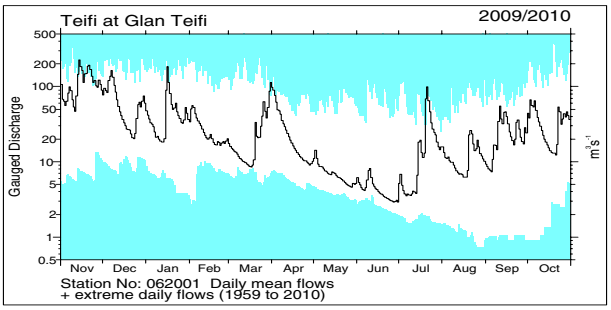
River flow . . . River flow . . .

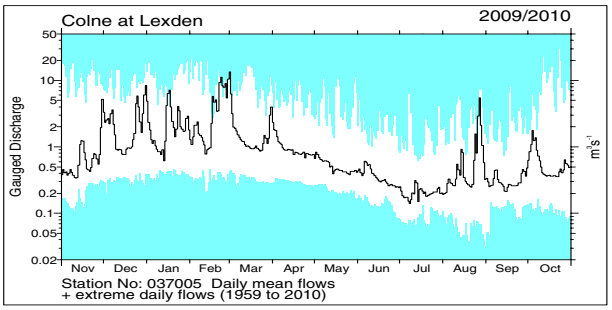


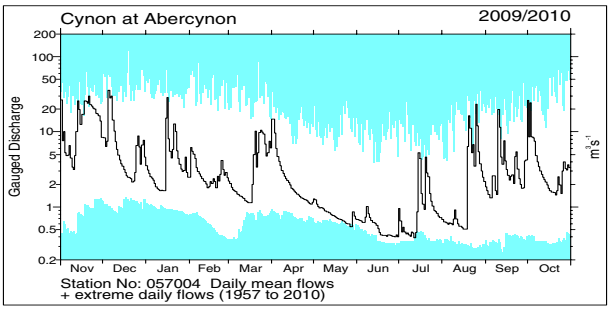


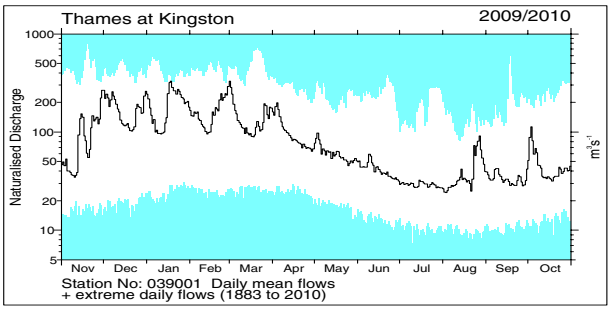


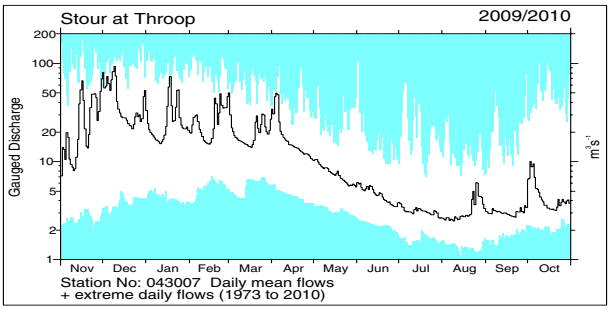


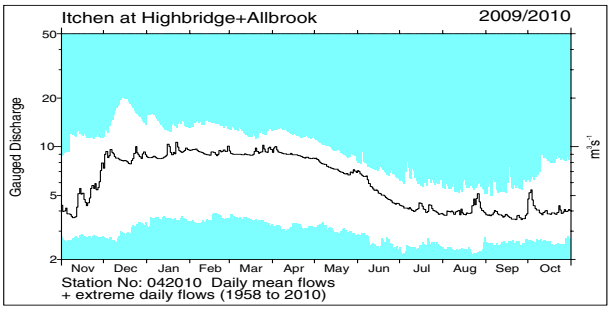










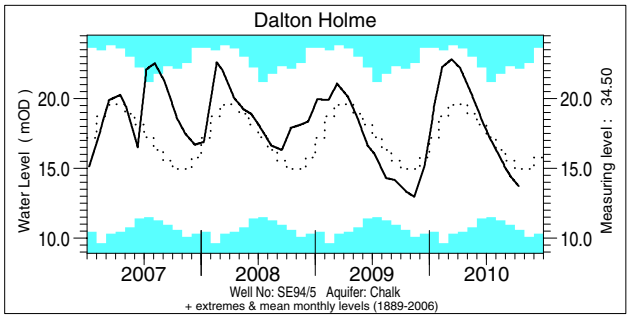


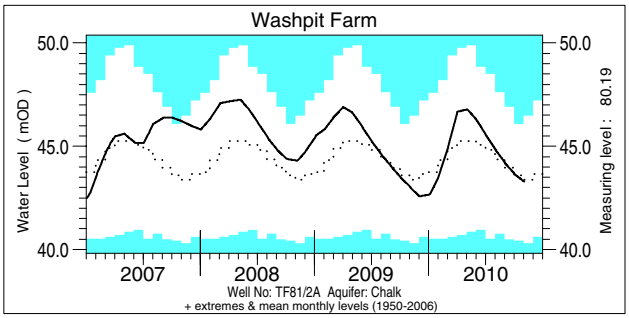
Notable runoff accumulations (a) January - October 2010 (b) November 2009 - October 2010

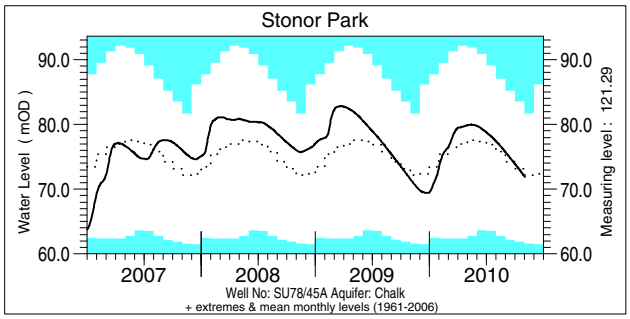
	River	%lta	Rank	River	%lta	Rank		River	%lta	Rank
a)	Ness	73	3/38	Dee (New Inn)	71	2/41	b)	Tyne (Spilmersford)	154	43/44
	Deveron	164	50/50	Ribble	71	4/50		Whiteadder	156	41/41
	Forth	66	2/29	Eden	71	4/43		Dover Beck	144	30/33
	Itchen	120	47/52	Nevis	67	3/28		Blackwater	135	57/58
	Exe	71	4/54	Carron	66	2/32		Mole	141	32/34
	Taw	66	4/52	Mourne	79	4/28		Luss	77	2/30
	Severn	66	7/89	Faughan	73	4/34		Ewe	74	5/40
	Yscir	74	6/38							

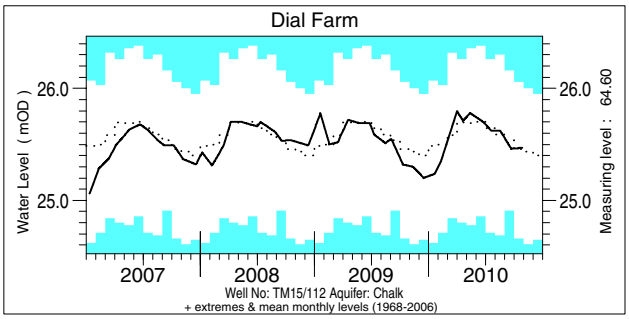
lta = long term average
Rank 1 = lowest on record

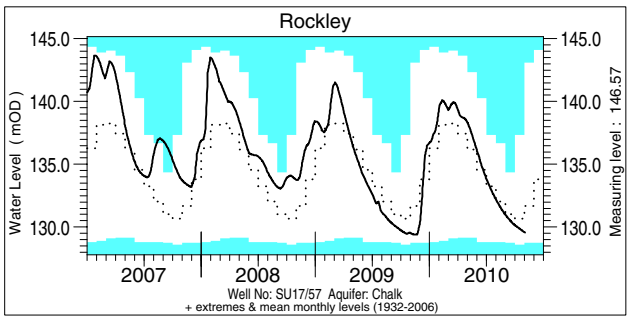
Groundwater . . . Groundwater

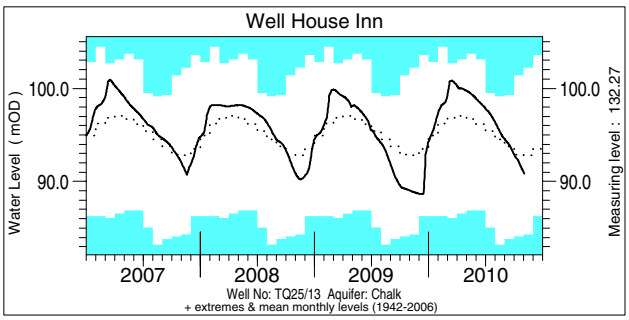


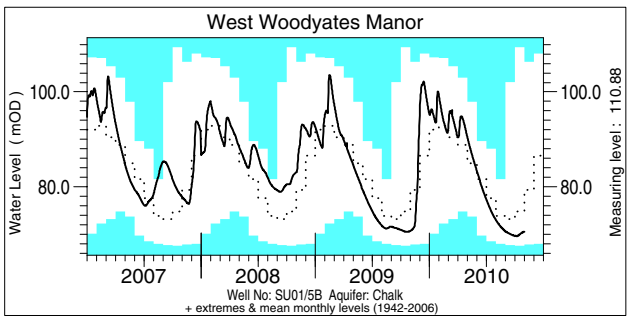


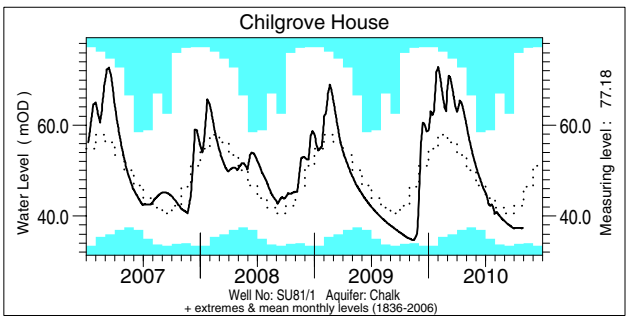


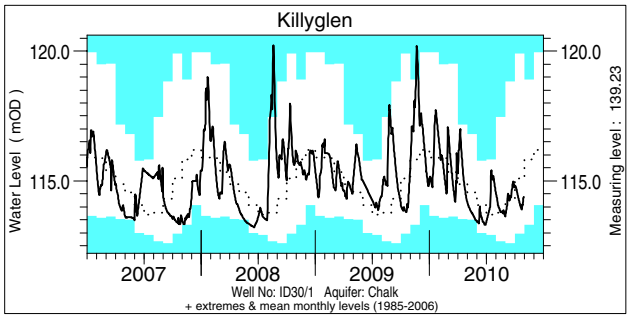


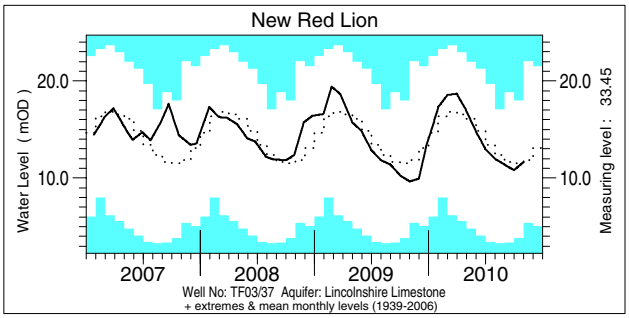






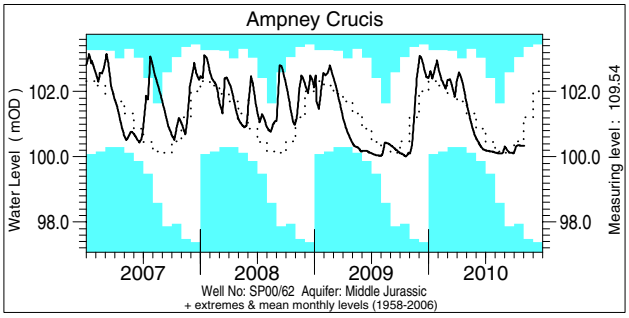


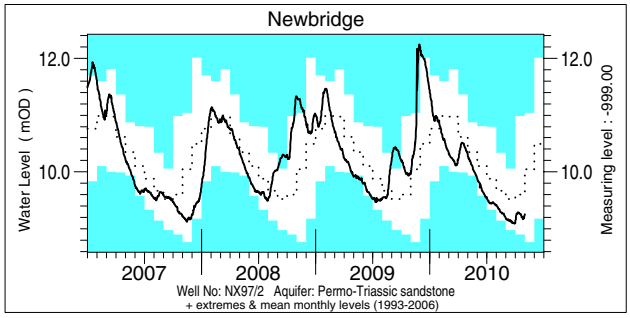


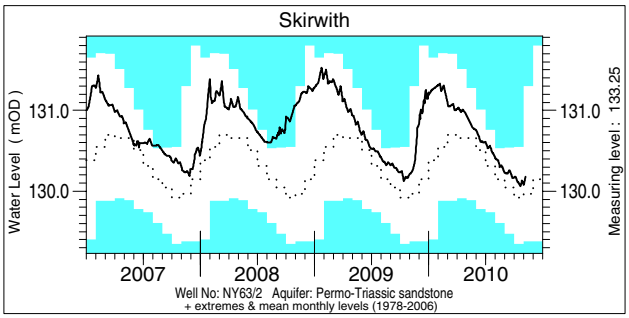


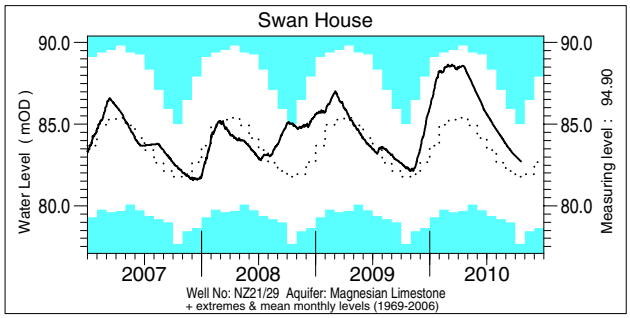
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

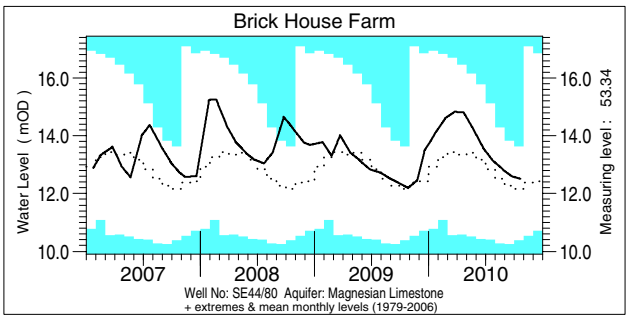
Groundwater . . . Groundwater

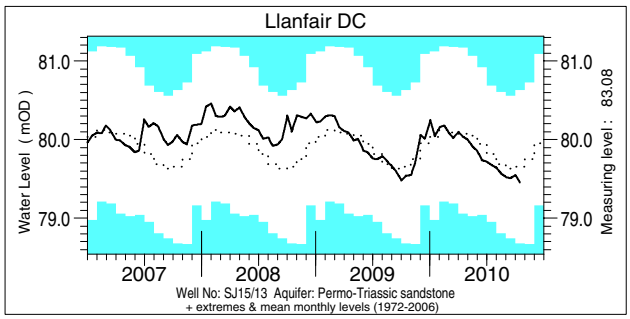


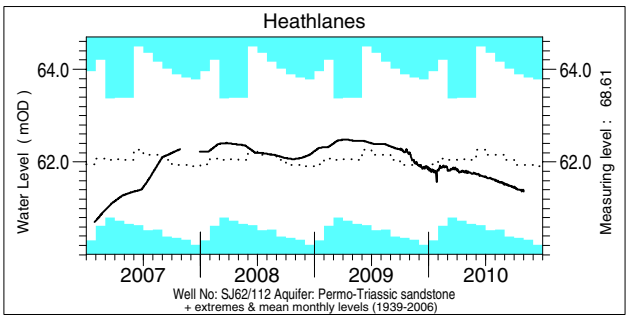


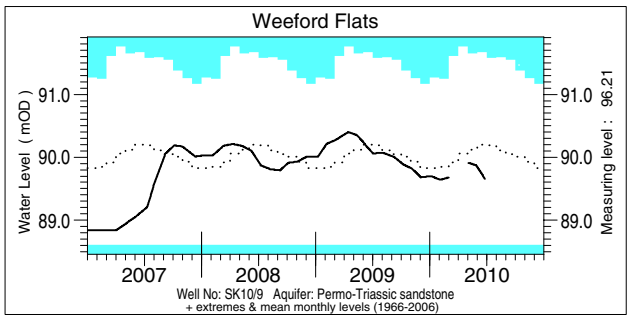


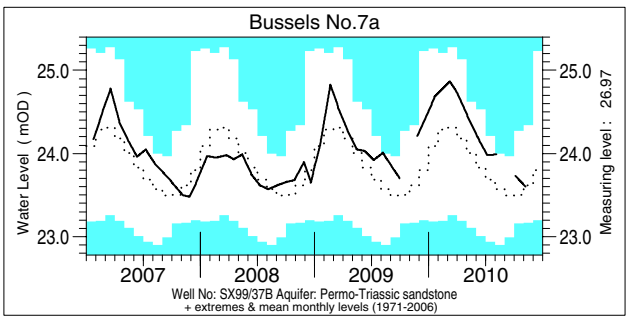


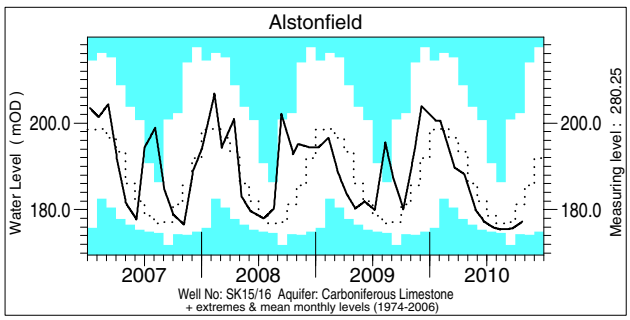








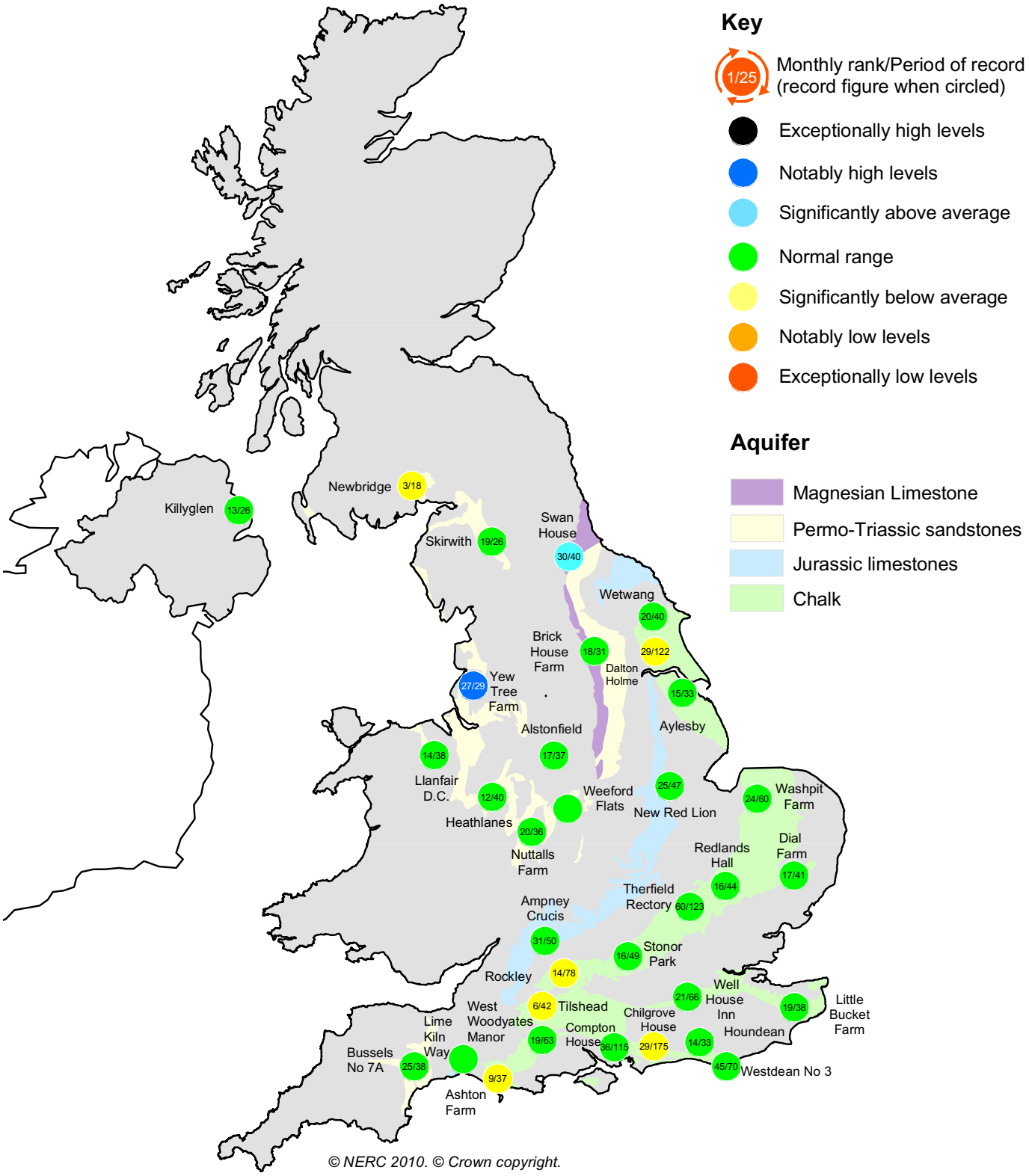




Groundwater levels October / November 2010

Borehole	Level	Date	Oct. av.	Borehole	Level	Date	Oct. av.	Borehole	Level	Date	Oct. av.
Dalton Holme	13.72	12/10	14.91	Chilgrove House	37.31	29/10	42.31	Brick House Farm	12.51	20/10	12.26
Washpit Farm	43.28	01/11	43.58	Killyglen (NI)	114.38	29/10	114.79	Llanfair DC	79.45	15/10	79.58
Stonor Park	71.88	01/11	73.16	New Red Lion	11.69	31/10	11.58	Heathlanes	61.37	31/10	61.94
Dial Farm	25.47	27/10	25.47	Ampney Crucis	100.33	01/11	100.44	Weeford Flats	89.36	27/09	89.73
Rockley	129.57	01/11	130.72	Newbridge	9.25	31/10	9.70	Bussels No.7a	23.60	05/11	23.51
Well House Inn	90.87	01/11	93.10	Skirwith	130.18	05/11	130.01	Alstonfield	177.21	22/10	181.43
West Woodyates	70.56	31/10	74.96	Swan House	82.70	18/10	81.87	*Levels in metres above Ordnance Datum*			

Groundwater . . .Groundwater



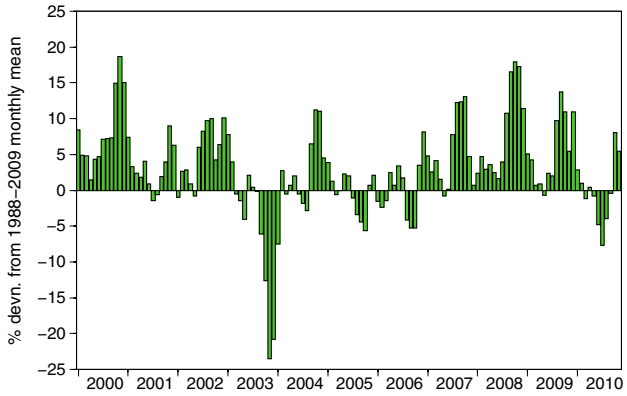
Groundwater levels - October 2010

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.

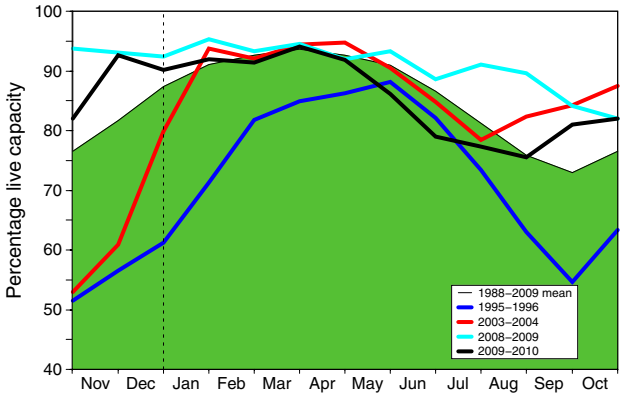
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.

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 Sep	Oct	Nov	Nov Anom.	Min Nov	Year* of min	2009 Nov	Diff 10-09
North West	N Command Zone	•	124929	61	69	**70**	4	33	2003	90	-20
	Vyrnwy		55146	68	81	**79**	5	25	1995	72	7
Northumbrian	Teesdale	•	87936	62	80	**86**	13	33	1995	92	-6
	Kielder		(199175)	(88)	(89)	**(89)**	3	63	1989	88	1
Severn Trent	Clywedog		44922	83	90	**85**	10	38	1995	79	6
	Derwent Valley	•	39525	57	63	**70**	-1	15	1995	67	3
Yorkshire	Washburn	•	22035	71	81	**75**	7	15	1995	77	-2
	Bradford supply	•	41407	58	72	**70**	-1	16	1995	74	-4
Anglian	Grafham		(55490)	(87)	(92)	**(95)**	13	44	1997	81	14
	Rutland		(116580)	(75)	(75)	**(75)**	-2	59	1995	69	6
Thames	London	•	202828	87	87	**89**	13	46	1996	80	9
	Farmoor	•	13822	98	97	**99**	11	43	2003	85	14
Southern	Bewl		28170	64	55	**48**	-13	33	1990	45	3
	Ardingly		4685	76	71	**68**	2	15	2003	55	13
Wessex	Clatworthy		5364	49	39	**36**	-27	14	2003	72	-36
	Bristol WW	•	(38666)	(62)	(54)	**(50)**	-12	24	1990	57	-7
South West	Colliford		28540	74	74	**75**	6	38	2006	95	-20
	Roadford		34500	68	68	**67**	-4	18	1995	86	-19
	Wimbleball		21320	57	52	**51**	-17	26	1995	81	-30
	Stithians		4967	56	52	**51**	-5	18	1990	75	-24
Welsh	Celyn and Brenig	•	131155	83	91	**94**	11	48	1989	85	9
	Brianne		62140	86	95	**97**	7	57	1995	95	2
	Big Five	•	69762	75	91	**92**	19	38	2003	89	3
	Elan Valley	•	99106	67	81	**84**	-1	37	1995	93	-9
Scotland(E)	Edinburgh/Mid Lothian	•	97639	78	77	**79**	-1	48	2003	92	-13
	East Lothian	•	10206	74	69	**98**	16	38	2003	97	1
Scotland(W)	Loch Katrine	•	111363	55	63	**93**	8	40	2003	93	0
	Daer		22412	84	88	**99**	9	42	2003	93	6
	Loch Thom	•	11840	79	79	**95**	7	66	2007	95	0
Northern Ireland	Total+	•	56920	76	91	**87**	7	39	1995	96	-9
	Silent Valley	•	20634	81	93	**89**	17	34	1995	95	-6

() 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/index.html
Navigate via Water Watch

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