Hydrological Summary
for the United Kingdom

February 2011

General

February was notably mild with most areas registering above average rainfall – primarily the result of active Atlantic frontal systems which brought gales to many western areas. Most rivers were in spate during the first 10 days of the month; flood alerts and, generally moderate, floodplain inundations were common. However, the winter (Dec-Feb) precipitation total for the UK was considerably below average (for the third successive year) with notable deficiencies in some western and northern areas. Fortunately, the above average February rainfall and near-saturated soil conditions made for plentiful replenishment to reservoirs, and most aquifers, across the majority of the country. Although some modest drawdowns were required to moderate flood risk, reservoir stocks generally increased appreciably. Overall stocks for England &Wales rose to a little above the early-March average and stocks in the majority of upland index reservoirs were within 5% of capacity. In southern Britain, mostly in the South West, a few reservoirs remain below average but well above late-winter minima. After a belated seasonal recovery, groundwater levels are within the normal range across most outcrop areas but still considerably below the early spring average in parts of the southern Chalk and in some wells in the Midlands. In those areas with significant long term rainfall deficiencies weather patterns in the early spring will be particularly influential in determining the water resources outlook.

Rainfall

Low pressure dominated synoptic patterns during most of February with vigorous Atlantic depressions bringing rain and high winds to much of northern Britain and Northern Ireland; depressions were considerably less frequent across southern England. Sustained frontal rainfall (often with orographic enhancement) resulted in some notable 24-hour rainfall totals (Capel Curig in Snowdonia reported 121.6mm on the 5/6th). Correspondingly, February rainfall totals were generally well above average north of a line from Cardigan Bay to the Wash. Parts of northern Britain and north Wales registered more than twice the February average; this was true of Northern Ireland also. By contrast, rainfall totals were considerably below average in a few, mostly rain-shadow, areas (e.g. the Wye basin). Despite the wet February, most regional rainfall totals for the winter were appreciably below average, notably so in the Western and Northern Isles where deficiencies exceeded 30%. On the mainland, similar winter deficiencies characterise south-west England, where local variability in rainfall totals is considerable. The relatively dry winter has contributed to substantial rainfall deficiencies over longer timespans across much of southern Britain. Provisionally, the Wessex Region registered its 3rd lowest March-February rainfall since 1975/76; much of the Severn-Trent Region was also particularly dry in this timeframe.

River Flows

As in January, February river flows spanned a wide range in most index catchments. Late-January flows were generally depressed but successive frontal systems generated a steep runoff recovery and flood alerts were both common and widespread from the 2nd to the 7th. On the 5th, the Conwy and upper Dee registered their highest February flows in records of 47- and 41-years respectively. Transport disruption and local flooding (e.g. in Betws-y-coed) affected much of north Wales. Two days later in Northern Ireland, the Mourne and Faughan both eclipsed previous maximum February flows. Many rivers remained in spate over much of the first half of the month with further flood alerts during the final week. Reflecting the rainfall pattern, February runoff totals were well above average in a broad zone from the Cairngorms to north Wales (and encompassing Northern Ireland). In southern Scotland, the Tyne eclipsed its previous maximum February mean flow. By contrast, many rivers in central southern and south-west England reported below average runoff; the Taw and Tone (Somerset) both recording only a little above 50% of the February average. The regional contrasts are accentuated when winter runoff totals are considered and, over a 12-month timespan, runoff deficiencies in northern Scotland and, particularly, south-west England are considerable. For the River Tone, the Mar-Feb runoff total is the 3rd lowest in a 50-yr record.

Groundwater

February rainfall totals across the outcrop areas of the major aquifers were mostly in the 80-120% range but, with soil moisture deficits close to zero, recharge was very healthy – as is often the case in late winter. Belated groundwater level recoveries were initiated in some of the slowest- responding index wells (e.g. Therfield) and most wells reported significant rises over the month (these are not fully captured by those wells reporting early February levels). Late-winter groundwater levels were mostly in the normal range but significantly above average in some northern outcrops e.g. in the Permo-Triassic sandstones (Newbridge) and the Chalk of Northern Ireland (Killyglen). In many of the southern Chalk outcrops, the 2010/11 groundwater level recoveries have been generated from a low base and, in Wessex particularly, levels remain below average; see for example the Tilshead hydrograph. Levels are also below average in some Permo-Triassic index wells in the Midlands (e.g. in the very slow-responding Heathlanes borehole where the 2010 recession has yet to be arrested). The wet soil conditions do however provide scope for considerable further recharge during the spring.

Centre for Ecology & Hydrology
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Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

Percentages are from the 1971-2000 average.

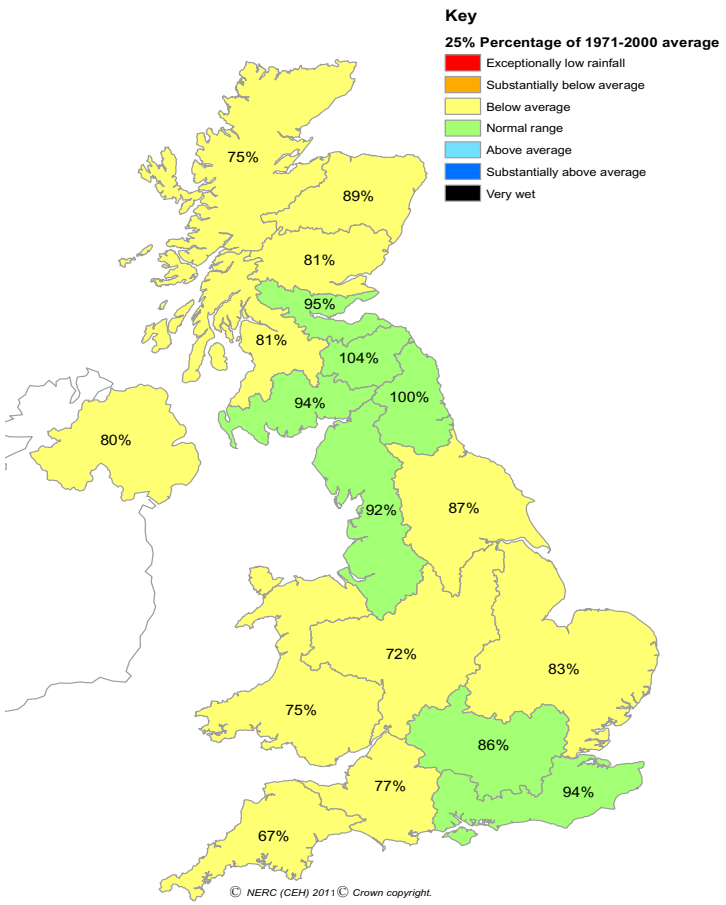
Area	Rainfall	Feb 2011	Dec10 - Feb11	RP	Sep10 - Feb11	RP	Jun10 - Feb11	RP	Mar10 - Feb11	RP
England & Wales	**mm**	**84**	**209**		**471**		**682**		**806**	
	%	**128**	**81**	**2-5**	**91**	**2-5**	**96**	**2-5**	**90**	**5-10**
North West	mm	**162**	313		707		986		1129	
	%	**189**	92	2-5	102	2-5	105	2-5	96	2-5
Northumbrian	mm	**100**	227		547		751		894	
	%	**170**	100	<2	120	5-10	117	2-5	108	2-5
Severn Trent	mm	**70**	151		344		536		642	
	%	**129**	72	5-10	82	5-10	91	2-5	85	>=10
Yorkshire	mm	**101**	199		481		651		757	
	%	**175**	87	2-5	106	2-5	103	2-5	93	2-5
Anglian	mm	**45**	121		286		471		548	
	%	**121**	83	2-5	91	2-5	101	2-5	91	2-5
Thames	mm	**50**	162		329		492		595	
	%	**106**	86	2-5	85	2-5	91	2-5	85	5-10
Southern	mm	**58**	211		427		590		704	
	%	**108**	94	2-5	91	2-5	95	2-5	90	2-5
Wessex	mm	**63**	201		418		588		708	
	%	**93**	77	2-5	82	2-5	86	5-10	82	>=10
South West	mm	**89**	265		609		846		1015	
	%	**84**	67	5-10	81	2-5	87	2-5	84	5-10
Welsh	mm	**118**	307		697		997		1188	
	%	**113**	75	5-10	86	5-10	94	2-5	90	5-10
Scotland	**mm**	**166**	**363**		**820**		**1128**		**1368**	
	%	**140**	**82**	**2-5**	**92**	**2-5**	**98**	**2-5**	**95**	**2-5**
Highland	mm	**160**	411		884		1233		1514	
	%	**108**	75	2-5	81	2-5	89	2-5	88	2-5
North East	mm	**92**	228		591		866		1063	
	%	**138**	89	2-5	109	2-5	116	2-5	112	2-5
Tay	mm	**176**	327		820		1109		1302	
	%	**165**	81	2-5	105	2-5	110	2-5	103	2-5
Forth	mm	**167**	325		703		960		1156	
	%	**184**	95	2-5	104	2-5	107	2-5	102	2-5
Tweed	mm	**135**	287		611		826		1016	
	%	**191**	104	2-5	112	2-5	110	2-5	106	2-5
Solway	mm	**217**	406		899		1190		1445	
	%	**192**	94	2-5	105	2-5	105	2-5	103	2-5
Clyde	mm	**223**	438		993		1342		1601	
	%	**156**	81	2-5	92	2-5	96	2-5	92	2-5
Northern Ireland	**mm**	**132**	**258**		**638**		**884**		**1092**	
	%	**153**	**80**	**5-10**	**99**	**2-5**	**101**	**2-5**	**98**	**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 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. All monthly rainfall totals since September 2010 are provisional.

Rainfall . . . Rainfall . . .

December 2010 - February 2011



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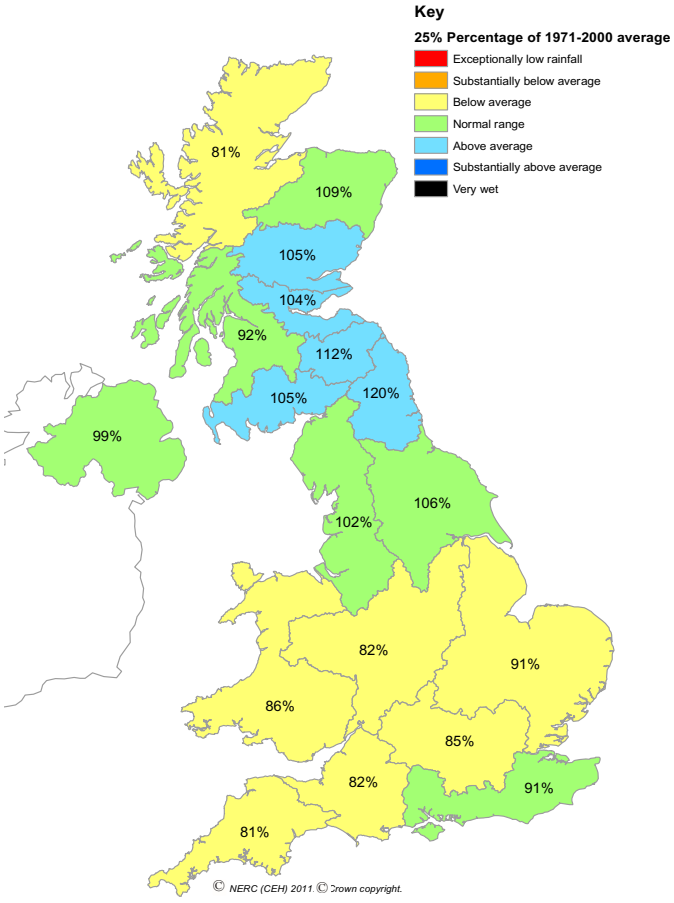
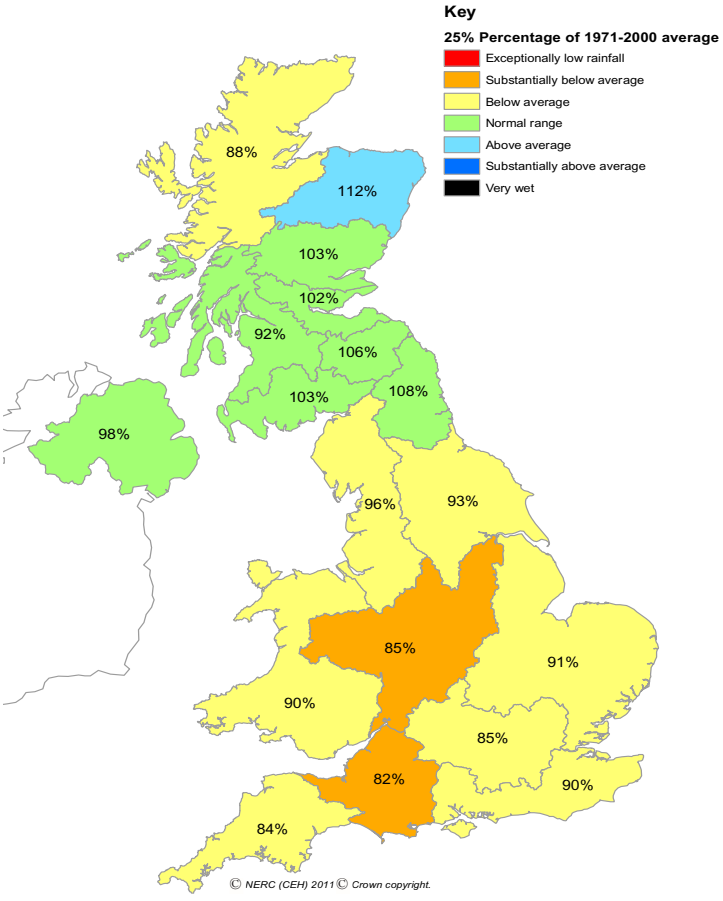


March 2010 - February 2011



Met Office Weather forecast

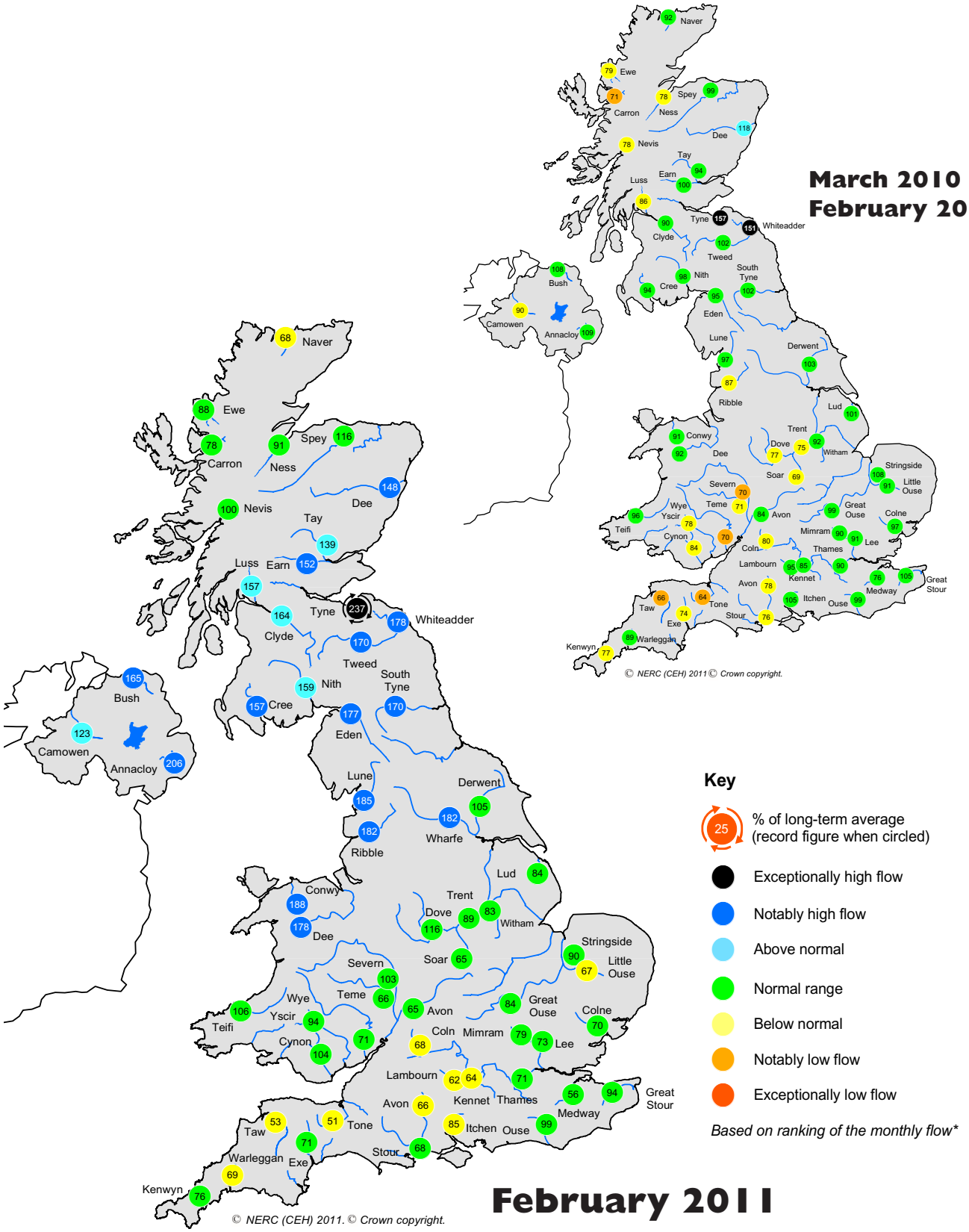
Updated: 12:05 on Thursday 10 March 2011

UK Outlook for Tues 15 March to Thurs 24 March 2011:
Southern parts of the UK are expected to start rather cloudy, with outbreaks of rain or drizzle at times, but with some occasional drier and brighter interludes too. Northern parts will initially be fairly settled, with some sunny periods and overnight frost and fog patches, but it will soon turn more unsettled, with rain or showers, occasionally falling as snow over the hills. It will become windy with a risk of gales in the northwest. Into the following week, many southern parts will stay fairly settled, with the best of the drier and brighter weather. However, it will remain more unsettled further north, with a series of weak fronts pushing in from the west, occasionally giving outbreaks of rain or snow over the hills.

UK Outlook for Thurs 24 March to Thurs 7 April 2011:
Continuing generally settled in southern parts, with much of England and Wales seeing well below average rainfall amounts through the period, but with Scotland and Northern Ireland likely to be nearer the seasonal norm. Whilst most of the country should see near average temperatures, eastern England will perhaps be a little colder than normal overnight, with more overnight frosts than elsewhere. Cloudier and more unsettled conditions for Scotland and Northern Ireland should keep temperatures here a little above normal for early spring. Sunshine amounts for the period should be around average across the country.
For further details please visit:

http://www.metoffice.gov.uk/weather/uk/uk_forecast_alltext.html

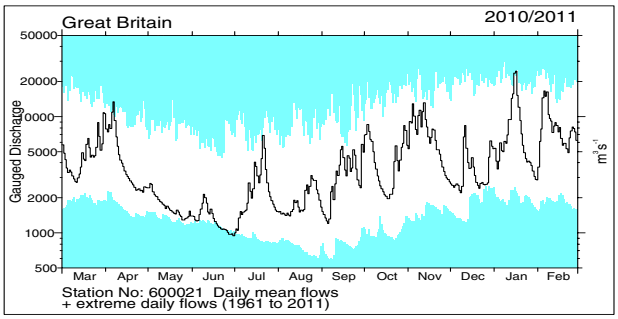
River flow . . . River flow . . .

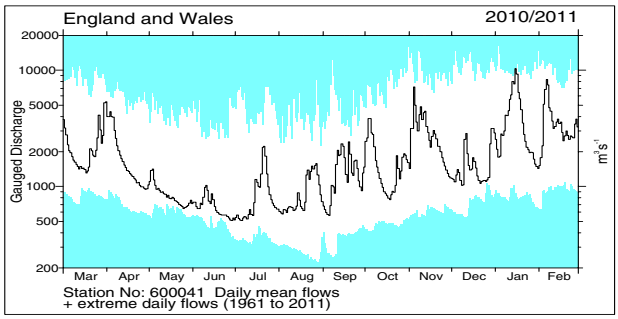


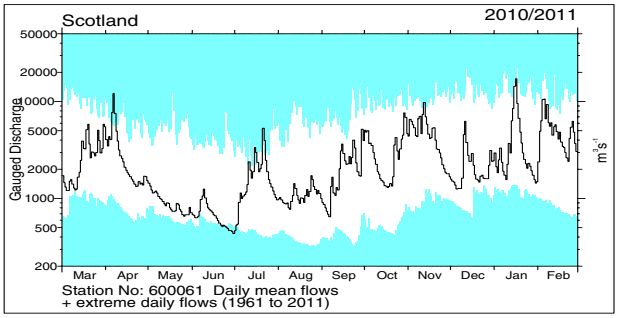
River flows

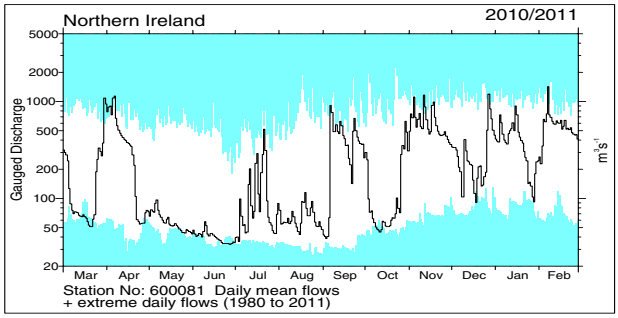
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

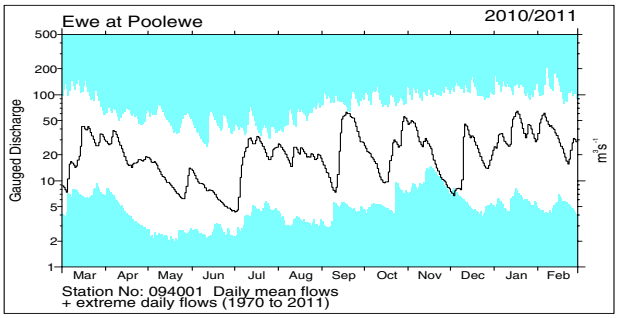
River flow . . . River flow . . .

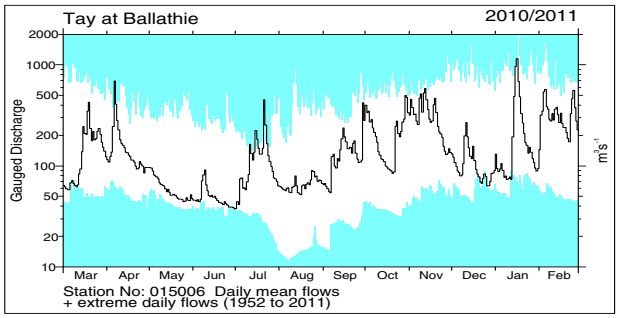


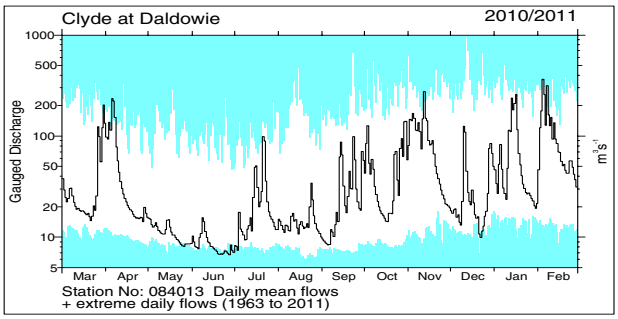


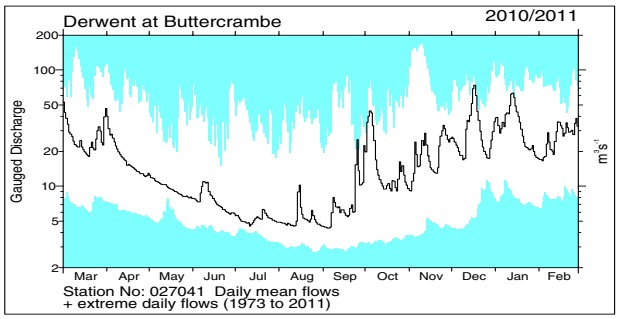


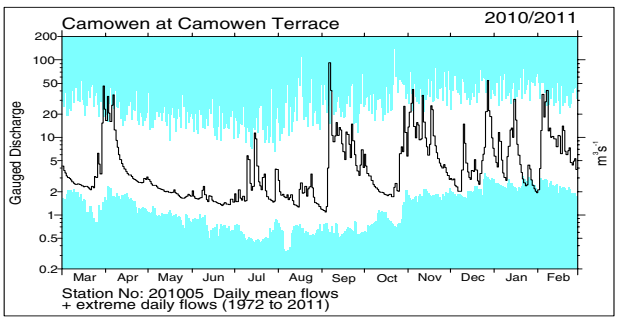


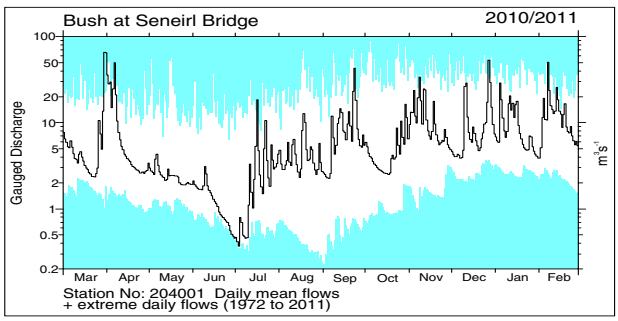








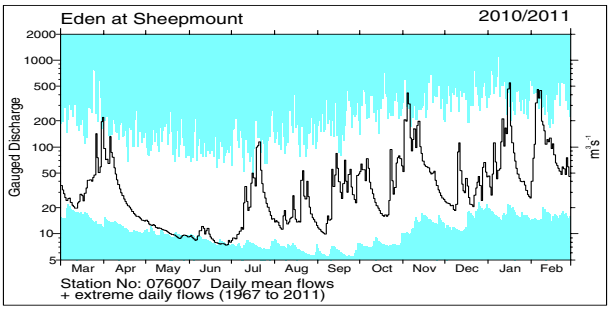


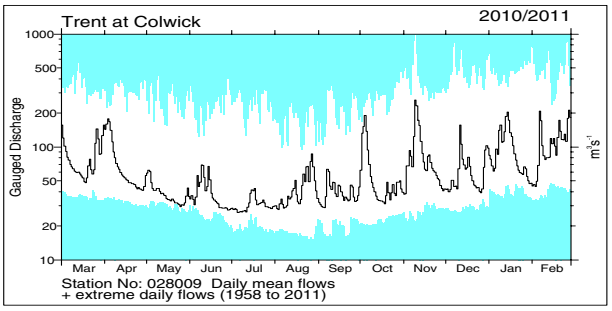


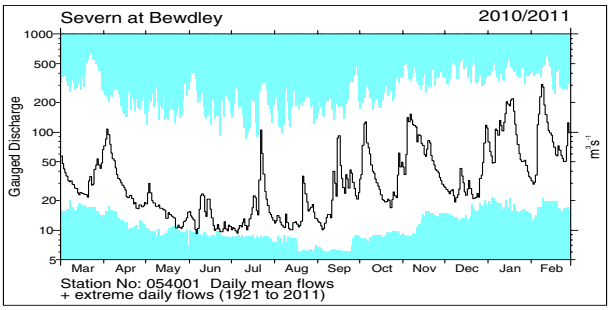
River flow hydrographs

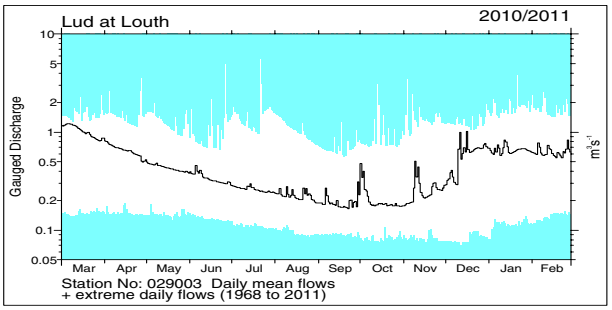
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to March 2010 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

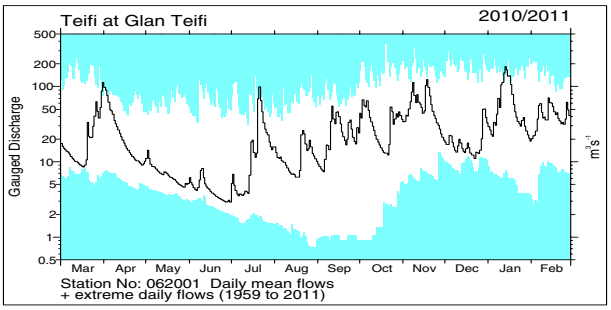
River flow . . . River flow . . .

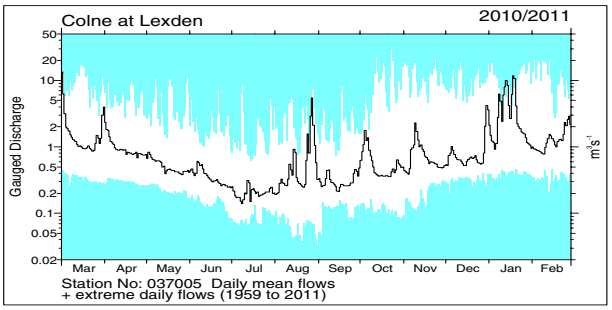


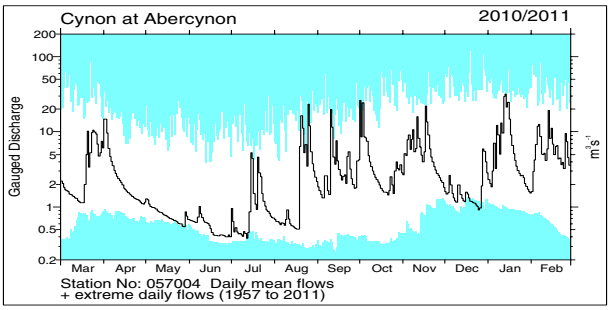


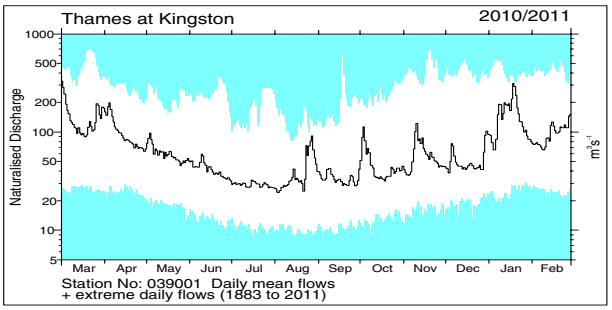


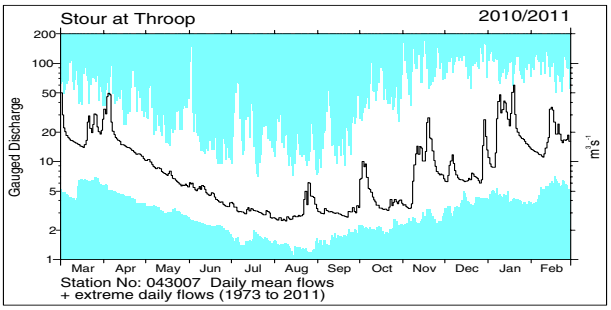


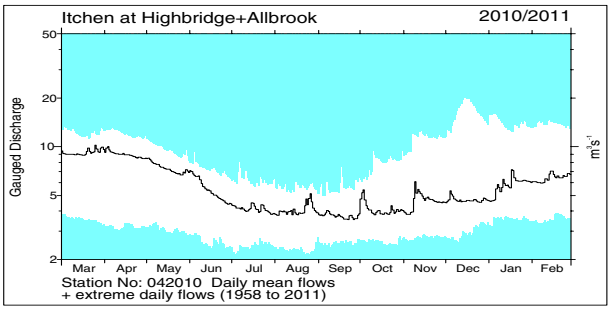












Notable runoff accumulations (a) Dec 2010 - Feb 2011 (b) Sep 2010 - Feb 2011 (c) Mar 2010 - Feb 2011

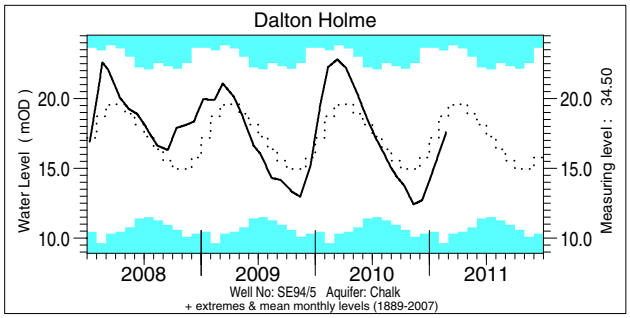
	River	%lta	Rank
a)	Tyne (Spilmersford)	184	46/46
	Tweed (Norham)	131	45/51
	Whiteadder	173	41/42
	Tyne (Bywell)	131	48/55
	Coln	62	7/48
	Camowen	78	8/38
	Lagan	75	6/38

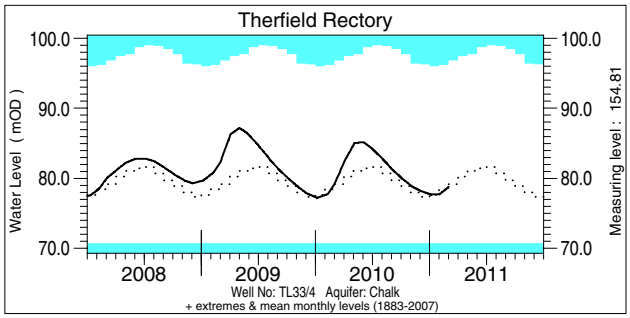
	River	%lta	Rank
b)	Ness	77	5/38
	Soar	60	6/40
	Avon (Amesbury)	59	7/46
	Tone	58	2/50
	Nevis	78	4/28
	Annacloy	116	25/31

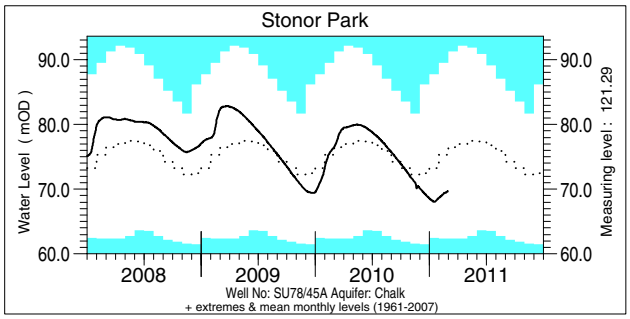
	River	%lta	Rank
c)	Dee (Woodend)	122	78/81
	Taw	66	4/52
	Brue	64	4/45
	Severn	70	7/89
	Wye	70	5/74
	Carron	71	3/32
	Faughan	87	7/34

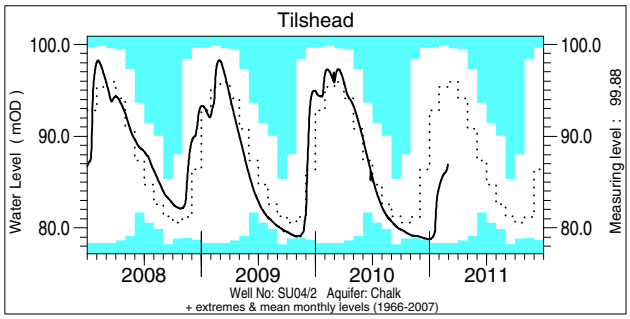
lta = long term average
Rank 1 = lowest on record

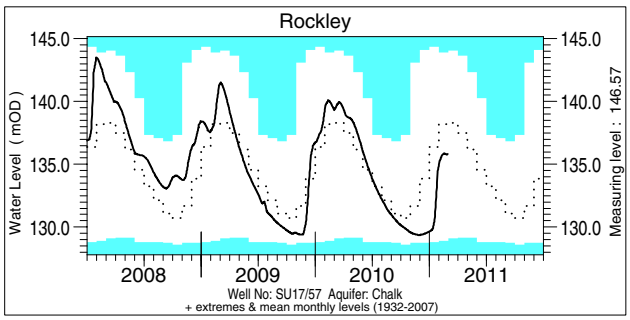
Groundwater . . . Groundwater

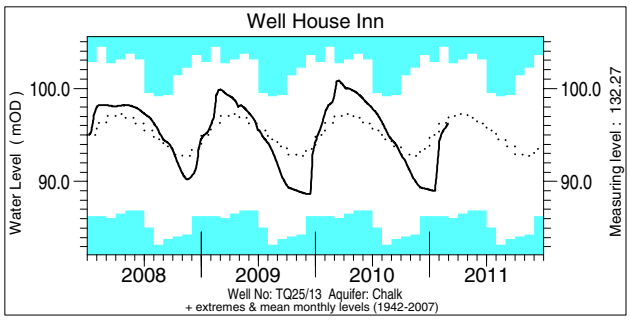


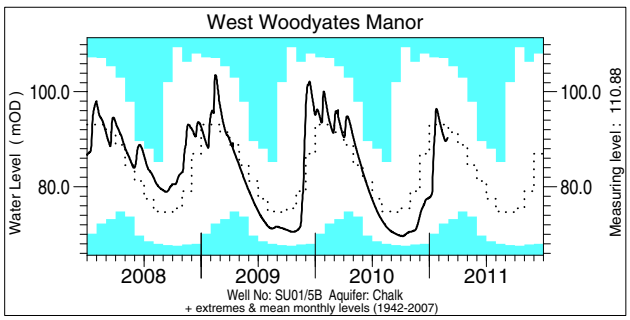


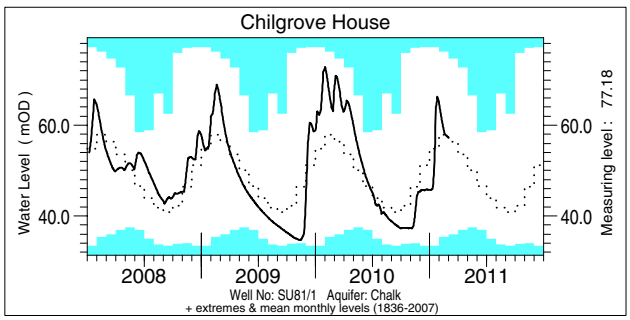


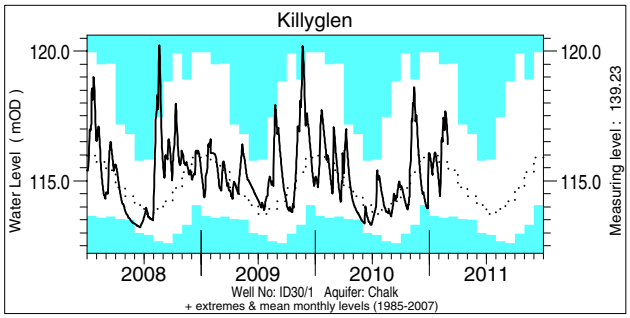


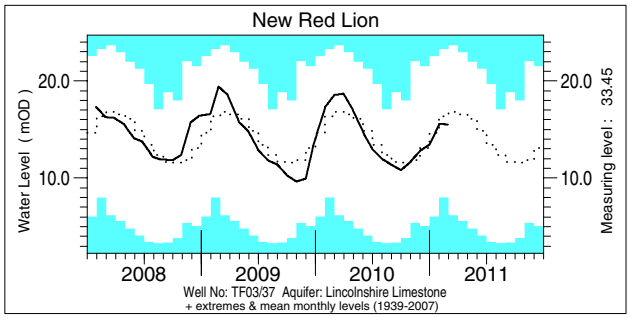






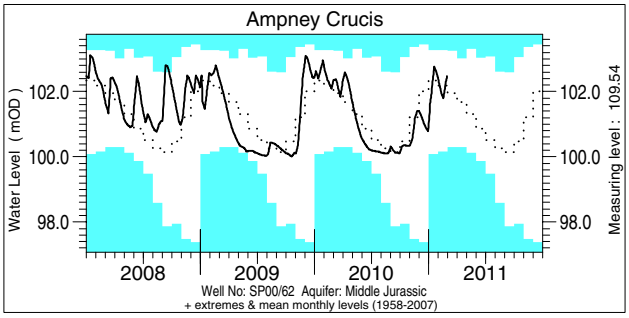


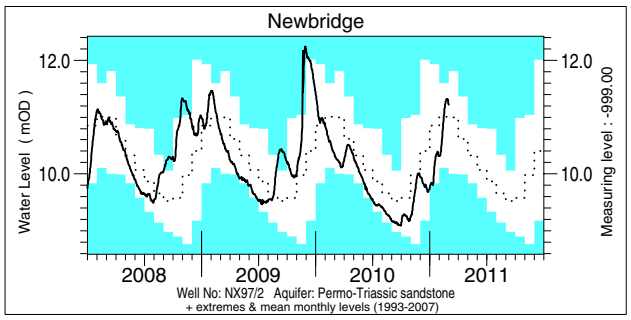


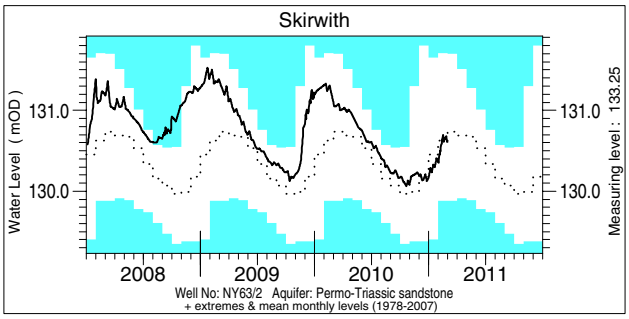


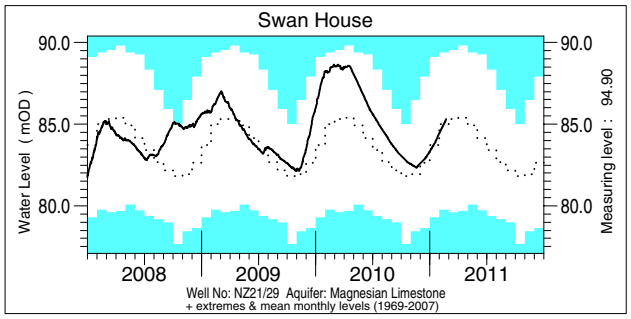
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

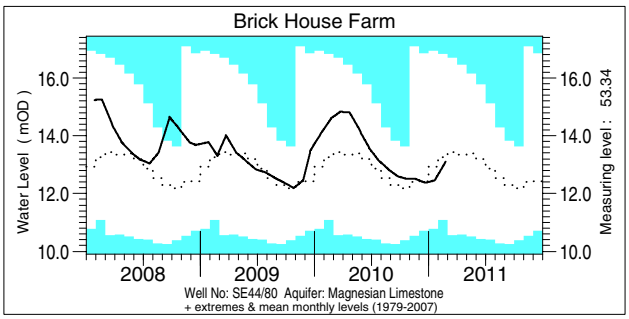
Groundwater . . . Groundwater

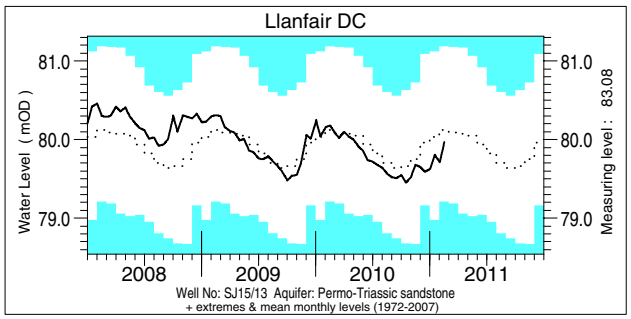


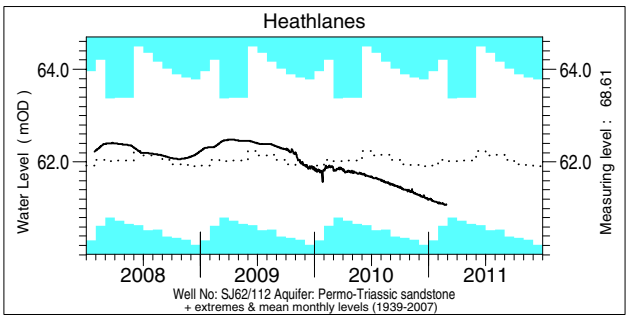


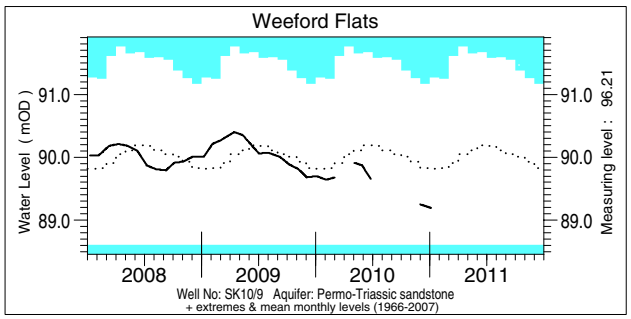


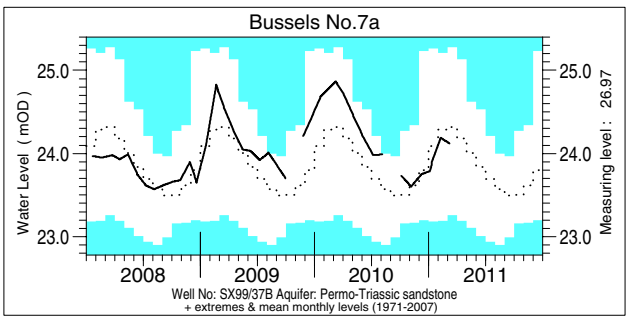


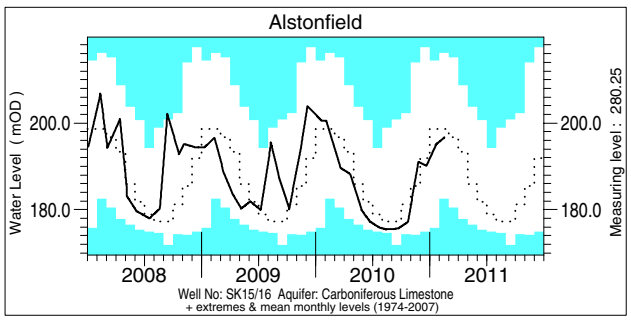










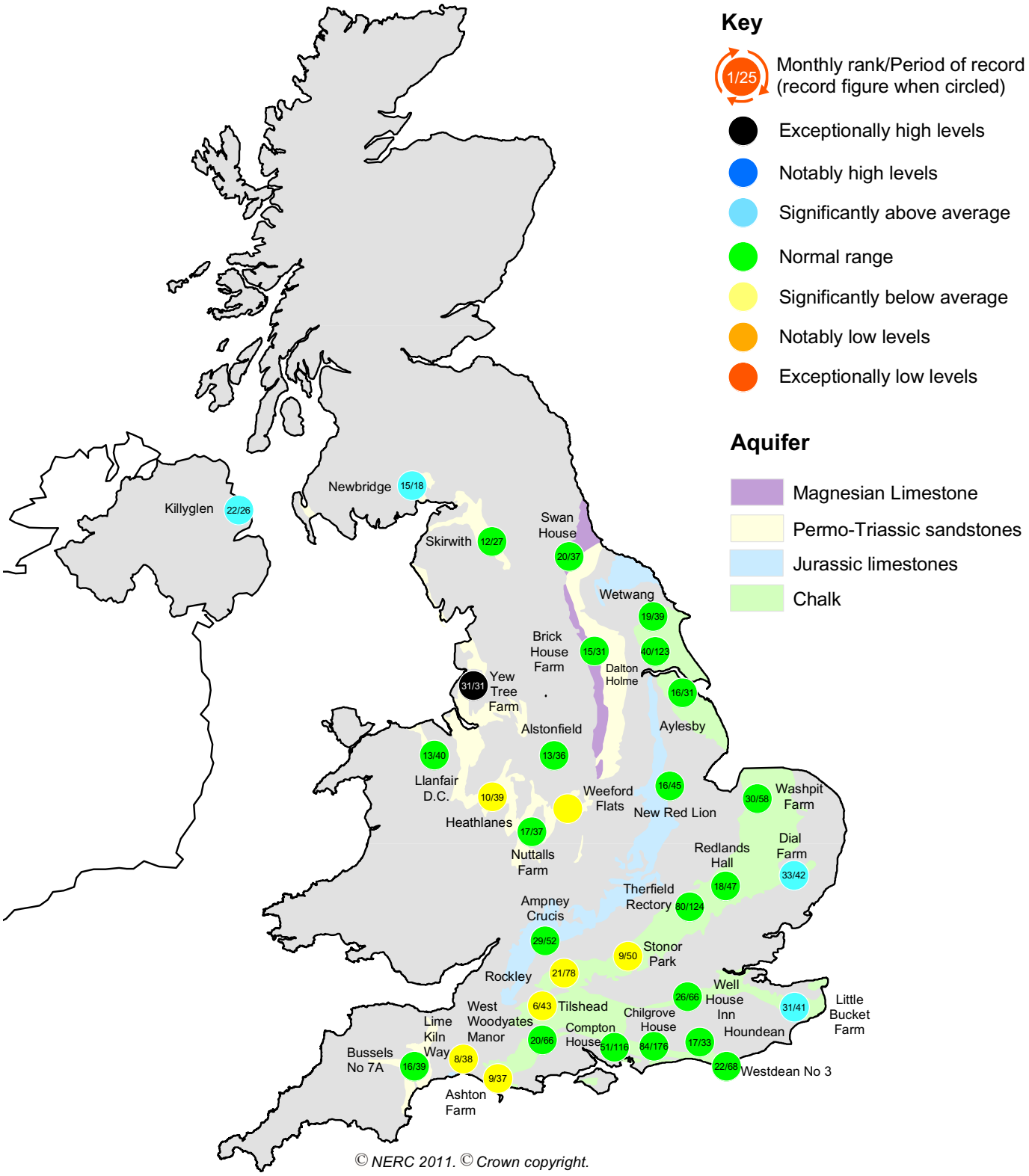


Groundwater levels February / March 2011

Borehole	Level	Date	Feb. av.	Borehole	Level	Date	Feb. av.	Borehole	Level	Date	Feb. av.
Dalton Holme	17.57	22/02	18.73	Chilgrove House	57.38	01/03	57.67	Brick House Farm	13.11	23/02	13.30
Therfield Rectory	78.79	02/03	78.24	Killyglen (NI)	116.42	28/02	115.61	Llanfair DC	79.97	15/02	80.07
Stonor Park	69.74	28/02	75.60	New Red Lion	15.50	28/02	16.52	Heathlanes	61.09	26/02	62.00
Tilshead	86.96	28/02	94.36	Ampney Crucis	102.48	28/02	102.22	Weeford Flats	89.19	04/01	89.67
Rockley	135.81	28/02	138.38	Newbridge	11.22	01/03	10.93	Bussels No.7a	24.12	07/03	24.31
Well House Inn	96.25	28/02	96.34	Skirwith	130.61	01/03	130.70	Alstonfield	196.73	16/02	198.88
West Woodyates	90.37	28/02	93.28	Swan House	85.32	21/02	84.99				

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



Groundwater levels - February 2011

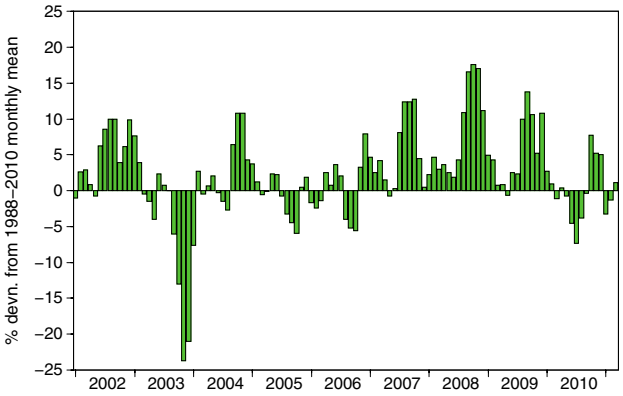
The rankings are based on a comparison between the average level in the featured month (but often only single readings are available) and the average level in each corresponding month on record. They need to be interpreted with caution especially when groundwater levels are changing rapidly or when comparing 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.

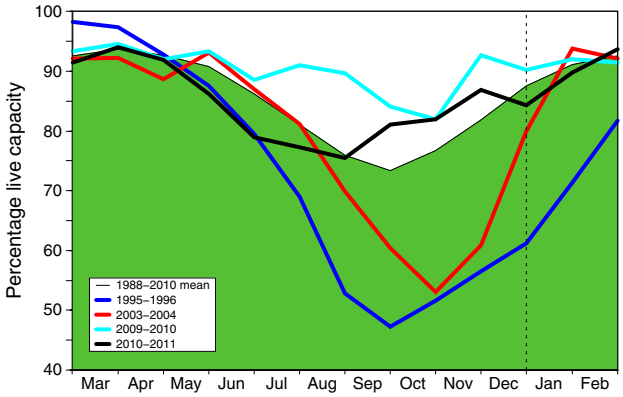
ii. Yew Tree Farm levels are now received quarterly.

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)	2011 Jan	Feb	Mar	Mar Anom.	Min Mar	Year* of min	2010 Mar	Diff 11-10
North West	N Command Zone	•	124929	66	84	**97**	5	78	1996	80	17
	Vyrnwy		55146	82	95	**100**	6	59	1996	93	7
Northumbrian	Teesdale	•	87936	90	93	**93**	2	72	1996	82	11
	Kielder		(199175)	(89)	(92)	**(91)**	-2	(81)	1993	(90)	1
Severn Trent	Clywedog		44922	86	91	**94**	4	77	1996	87	7
	Derwent Valley	•	39525	84	92	**100**	5	46	1996	100	0
Yorkshire	Washburn	•	22035	84	93	**98**	5	53	1996	98	0
	Bradford supply	•	41407	84	92	**100**	5	53	1996	99	1
Anglian	Grafham		(55490)	(89)	(81)	**(84)**	-4	(72)	1997	(90)	-6
	Rutland		(116580)	(76)	(80)	**(87)**	-2	(71)	1992	(91)	-4
Thames	London	•	202828	89	91	**92**	0	83	1988	90	2
	Farmoor	•	13822	91	77#	**76#**	-17	64	1991	79	-3
Southern	Bewl		28170	65	88	**99**	13	50	2006	100	-1
	Ardingly		4685	85	100	**100**	3	77	2006	100	0
Wessex	Clatworthy		5364	56	86	**97**	-1	82	1992	95	2
	Bristol WW	•	(38666)	(51)	(73)	**(82)**	-10	(65)	1992	(100)	-18
South West	Colliford		28540	79	84	**87**	2	57	1997	99	-13
	Roadford		34500	69	78	**79**	-6	35	1996	94	-16
	Wimbleball		21320	61	78	**93**	-2	72	1996	100	-11
	Stithians		4967	77	100	**100**	8	45	1992	99	1
Welsh	Celyn and Brenig	•	131155	94	97	**100**	3	69	1996	99	1
	Brianne		62140	95	93	**98**	0	92	2004	96	2
	Big Five	•	69762	89	95	**100**	5	85	1988	92	8
	Elan Valley	•	99106	99	99	**100**	2	88	1993	97	3
Scotland(E)	Edinburgh/Mid Lothian	•	97639	88	92	**97**	2	73	1999	98	-1
	East Lothian	•	10206	100	100	**100**	1	91	1990	100	0
Scotland(W)	Loch Katrine	•	111363	78	87	**93**	-1	76	2010	76	17
	Daer		22412	91	97	**99**	0	94	2004	95	4
	Loch Thom	•	11840	96	95	**95**	-3	90	2004	95	0
Northern Ireland	Total+	•	56920	92	94	**96**	7	81	2004	94	2
	Silent Valley	•	20634	92	91	**99**	14	57	2002	91	8

() 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 1988-2010 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.

#Pumping from the Thames to Farmoor was reduced in Jan-Feb 2011 due to water quality issues.

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.

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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.

03/11