Hydrological Summary
for the United Kingdom

January 2009

General

Overall, January was a cold month, particularly in the context of the recent past, but weather patterns were generally unsettled over the latter two-thirds of the month. The UK precipitation total was modestly above average but spatial variability was large and some sheltered eastern areas were particularly dry. River flows exhibited a wide range: frozen catchments contributed to relatively depressed early winter flows, but thereafter, spates were common, with some modest flooding. Some reservoir drawdown for flood alleviation purposes was necessary in a few areas and poor river water quality limited the replenishment of Farmoor Reservoir. Nonetheless, overall stocks for England & Wales are around 5% above the early February average and most impoundments are close to capacity – this is true for index reservoirs in Scotland and Northern Ireland also. From around mid-month, aquifer recharge was generally, plentiful and groundwater levels across much the greater part of the major aquifers are within, or above, the normal late-winter range. The water resources outlook is very encouraging but with catchments close to saturation across almost all of the country the risk of flooding remains high – as is often the case in February.

Rainfall

With high pressure dominant during the first week, precipitation was largely restricted to sleet and snow flurries. Temperatures were exceptionally low (a grass minimum of -15°C was recorded at Aboyne, Grampian Region on the 6th. Burst pipes were widely reported; bowsers were deployed in the Rhondda Valley following a burst water main. A notable dry spell which extended over four weeks in some southern areas was terminated on the 10th as an active depression produced substantial precipitation totals particularly in western Scotland (Inveruglas registered a two-day total of 135.4mm). Thereafter, Atlantic influences extended eastwards and continued to dominate synoptic patterns until the last week of the month. This is reflected in the January rainfall totals: some western parts of Great Britain (and Northern Ireland) recorded more than 150% of the 1961-90 average. The extreme south-east of England was also very wet but, generally, sheltered parts of eastern Britain were relatively dry, January totals falling below 50% of average across parts of north-east Scotland. Early winter (Dec-Jan) rainfall totals are modestly below average in most regions but well within the normal range over the past four months and, generally, above average in the 12-month timeframe; notably so in parts of eastern Britain.

River Flows

In most catchments, early January saw a continuation of the steep river flow successions which began in mid-December. Frozen catchments contributed to some seasonally very depressed runoff rates in responsive rivers: the Gt Stour, Mole, Forth and Lagan were among many index rivers which approached, or eclipsed, early January minimum flows. Estimated outflows from Northern Ireland during the first 10 days of 2009 were comparable with the lowest on record (for the time of year) in a 29-yr series – and depressed across most of Britain also. The recessions were smartly reversed around the 11/12th when notable flows were reported from many northern rivers (e.g. the Eden). Spate conditions continued, with snow melt making a significant contribution in northern Britain, and climaxed around the 23rd when Flood Watches were common – particularly in southern England; where the River Arun exceeded bankfull and modest floodplain inundations were widely reported. The counterbalancing effect of the contrasting runoff conditions experienced during January resulted in monthly runoff totals well within the normal range across the greater part of the UK although, in northern Scotland, the Naver recorded its 4th lowest January flow in a 31-yr record. With a few exceptions (e.g. the Great Stour) accumulated runoff totals, over a range of durations, remain healthy – exceptionally so when the very unusual summer 2008 flows are included. The Tyne and Wharfe both established new June-January runoff maxima in records of around 50 years.

Groundwater

January rainfall totals were near-average across most major outcrop areas but relatively meagre in the Yorkshire Wolds and some other parts of the eastern Chalk outcrop. Soil moisture deficits remained close to zero throughout most of the month across almost all of the UK but spatial variations in precipitation were reflected in infiltration rates which varied both regionally and more locally. Recharge was above average in parts of the North and South Downs, for example, but relatively modest in the Cotswolds. With aquifer replenishment concentrated in the latter half of January, its effect is not captured by index wells and boreholes whose levels relate to early January. Nonetheless, the overall health of early-2009 groundwater resources is clear. Groundwater levels for almost all index sites are within, or above, the normal late-winter range with notably high levels registered for a few monitoring wells (particularly in the Permo-Triassic sandstones). In the absence of a notably dry late winter and early spring, the 2009 seasonal recessions in groundwater levels may be expected to commence from typical, or above average, levels.

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Geological Survey
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Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

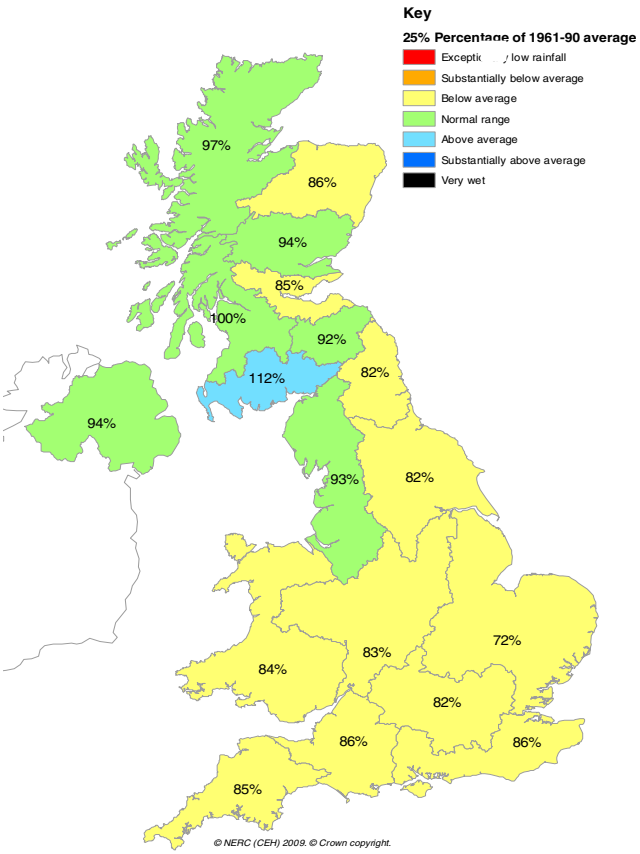
Area	Rainfall	Jan 09	Dec 08- Jan 09	RP	Oct 08- Jan 09	RP	Jun 08- Jan 09	RP	Feb 08- Jan 09	RP
England & Wales	**mm**	**93**	**156**		**357**		**753**		**1026**	
	%	**103**	**84**	**2-5**	**98**	**2-5**	**117**	**5-10**	**113**	**5-10**
North West	mm	**126**	228		546		1104		1404	
	%	**106**	93	2-5	109	2-5	123	10-20	115	5-15
Northumbrian	mm	**71**	136		307		804		1036	
	%	**85**	82	2-5	93	2-5	131	25-40	119	10-20
Severn Trent	mm	**69**	123		287		627		868	
	%	**96**	83	2-5	100	<2	117	2-5	113	5-10
Yorkshire	mm	**63**	133		278		709		947	
	%	**79**	82	2-5	87	2-5	121	5-10	113	5-10
Anglian	mm	**46**	77		216		470		677	
	%	**90**	72	5-10	100	<2	111	2-5	112	2-5
Thames	mm	**70**	113		251		540		786	
	%	**106**	82	2-5	94	2-5	110	2-5	112	2-5
Southern	mm	**101**	142		319		560		831	
	%	**124**	86	2-5	96	2-5	100	<2	106	2-5
Wessex	mm	**95**	158		327		678		976	
	%	**106**	86	2-5	93	2-5	113	2-5	114	2-5
South West	mm	**151**	239		468		951		1315	
	%	**108**	85	2-5	89	2-5	112	2-5	110	2-5
Welsh	mm	**159**	251		589		1165		1534	
	%	**111**	84	2-5	101	2-5	120	5-10	114	2-5
Scotland	**mm**	**168**	**304**		**691**		**1173**		**1623**	
	%	**108**	**98**	**2-5**	**110**	**2-5**	**110**	**5-10**	**110**	**5-15**
Highland	mm	**195**	363		900		1348		1930	
	%	**107**	97	2-5	118	5-10	106	2-5	111	5-10
North East	mm	**79**	172		389		749		1059	
	%	**77**	86	2-5	95	2-5	102	2-5	103	2-5
Tay	mm	**153**	264		526		978		1359	
	%	**105**	94	2-5	97	2-5	106	2-5	105	2-5
Forth	mm	**117**	198		434		924		1258	
	%	**98**	85	2-5	93	2-5	112	2-5	110	5-10
Tweed	mm	**103**	183		389		928		1219	
	%	**102**	92	2-5	99	2-5	129	25-40	122	20-35
Solway	mm	**201**	340		716		1319		1684	
	%	**132**	112	2-5	118	5-10	126	20-30	117	15-25
Clyde	mm	**209**	372		812		1417		1942	
	%	**111**	100	<2	107	2-5	110	5-10	111	5-10
Northern Ireland	**mm**	**131**	**213**		**438**		**962**		**1221**	
	%	**113**	**94**	**2-5**	**98**	**2-5**	**122**	**15-25**	**111**	**5-10**

% = percentage of 1961-90 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 derived following the method described in: Tabony, R. C. 1977, *The variability of long duration rainfall over Great Britain*. Met Office Scientific Paper no. 37. The estimates reflect climatic variability since 1913 and assume a stable climate. 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 2008 are provisional.

Rainfall . . . Rainfall . . .

December 2008 - January 2009



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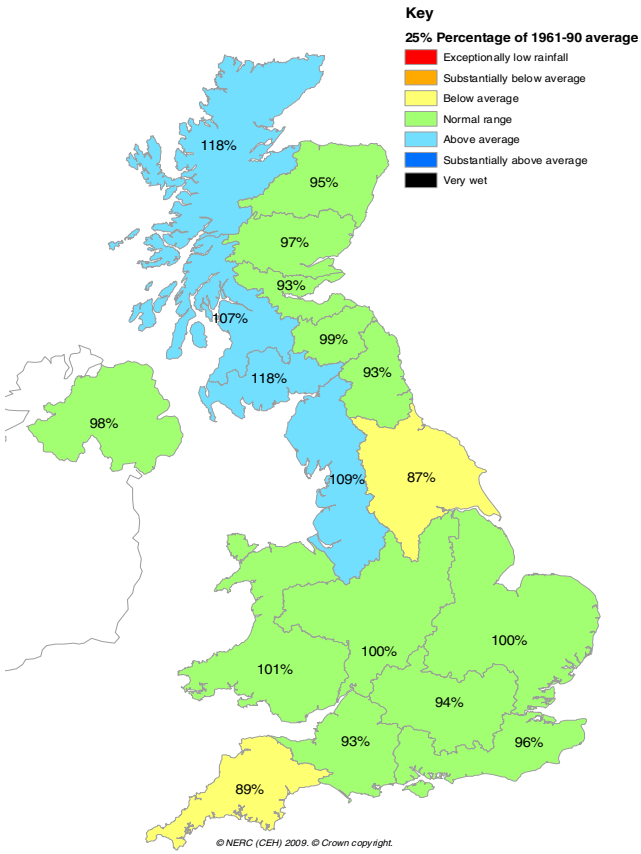
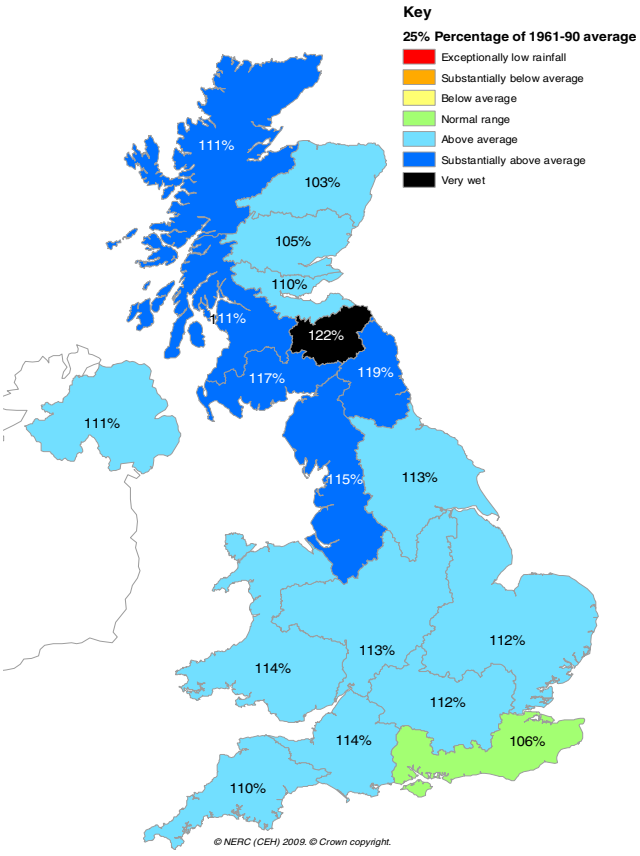


February 2008 - January 2009



Met Office Winter 2008/9 forecast

Forecast for the remainder of Winter 2008/9:
updated 22 January 2009

Temperature

Mean temperatures are likely to be average or below average for the rest of winter over the UK.

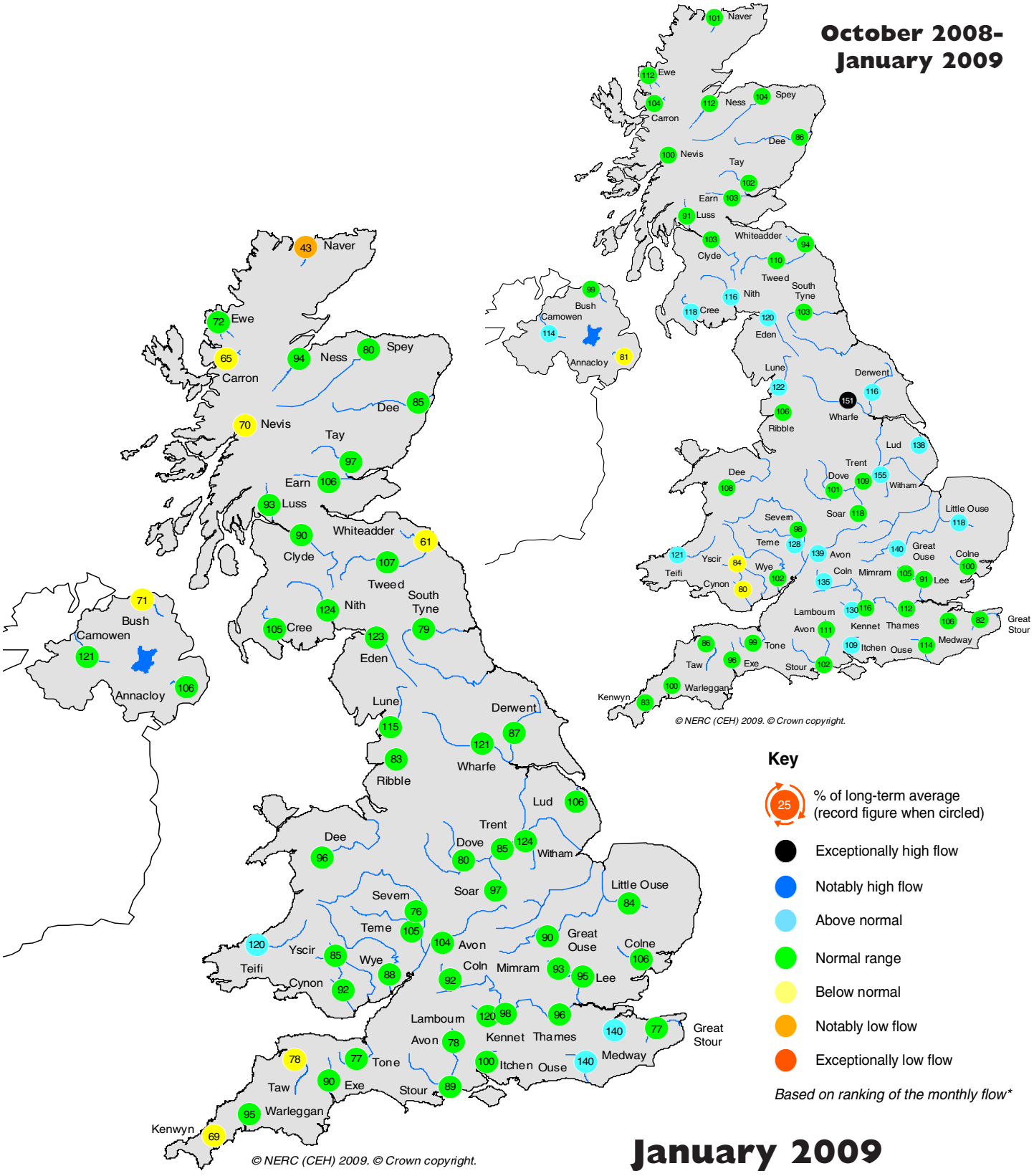
Rainfall

Over the UK, precipitation for the rest of winter is most likely to be average, or below average.

Updates and reviews of the forecast

The spring forecast will be issued at 10 a.m. on 25 February 2009.
For further details please visit:
http://www.metoffice.gov.uk/weather/seasonal/winter2008_9

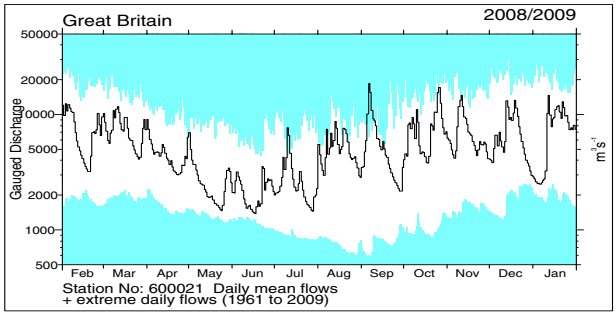
River flow . . . River flow . . .

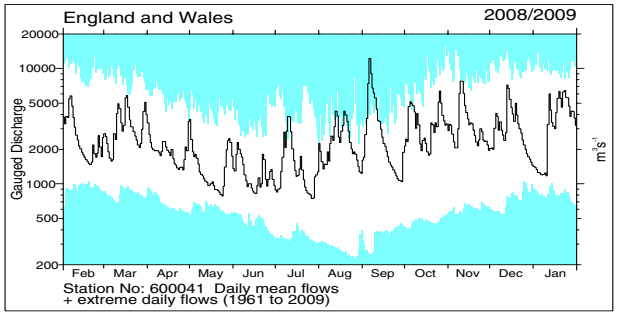


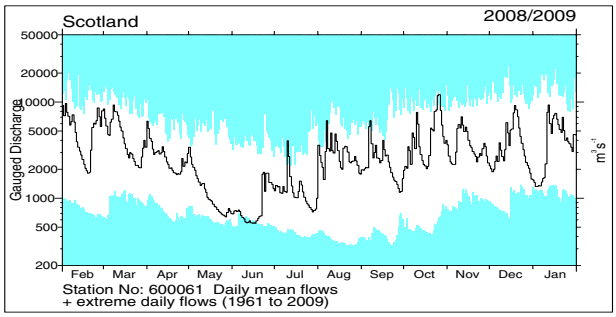
River flows

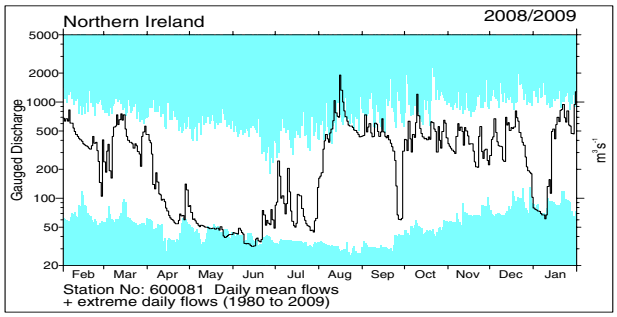
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

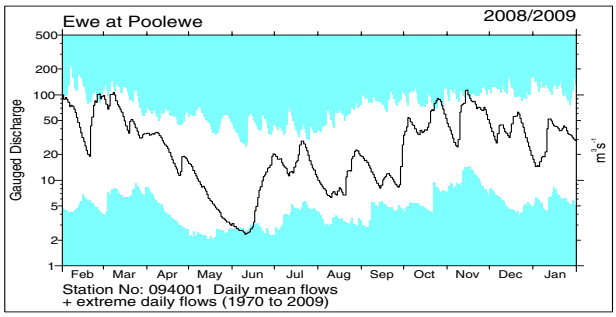
River flow . . . River flow . . .

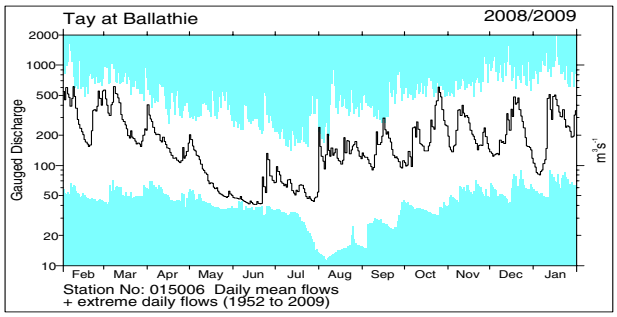


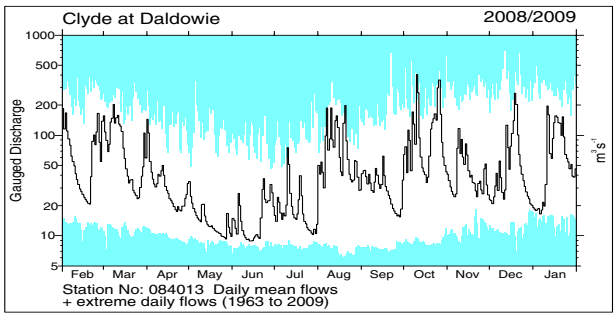


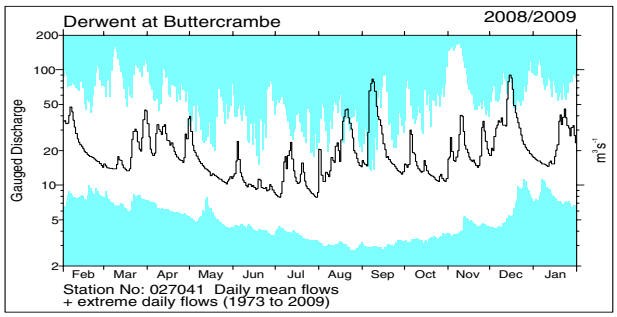


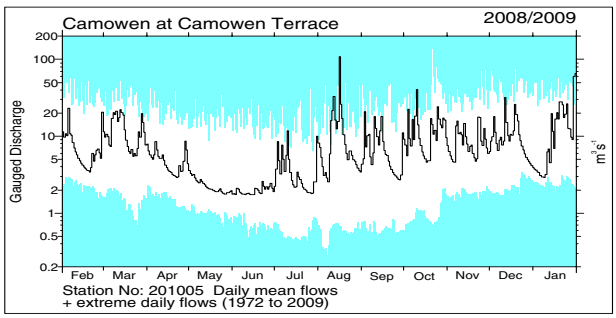


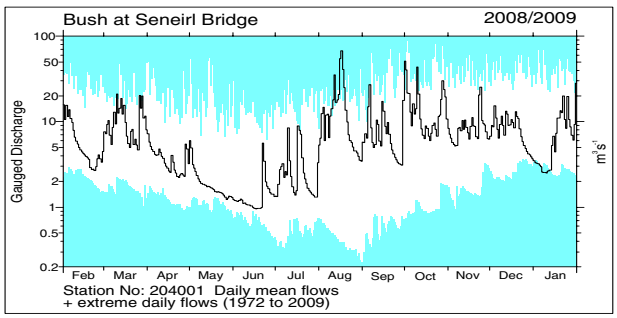








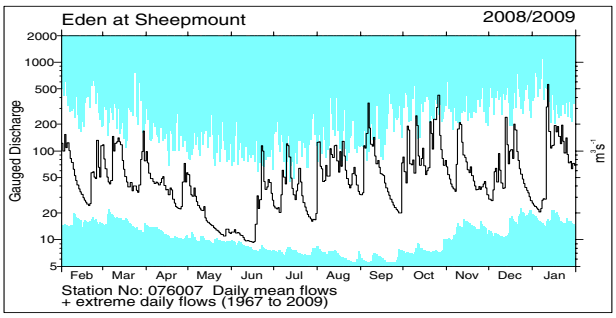


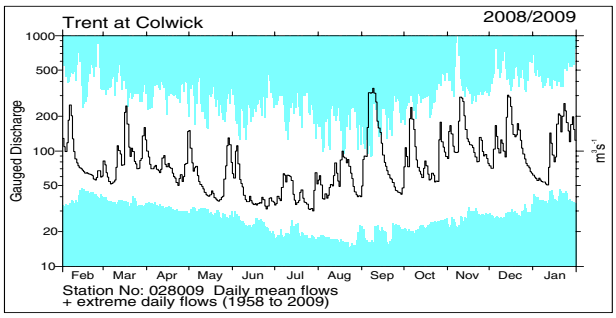


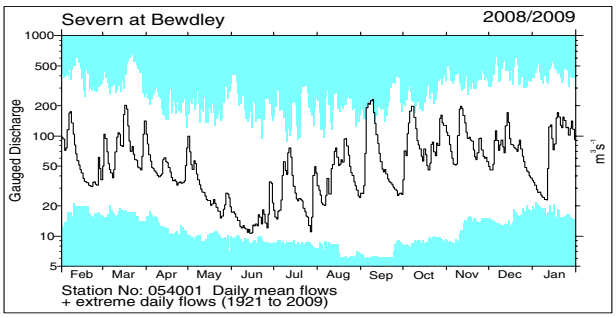
River flow hydrographs

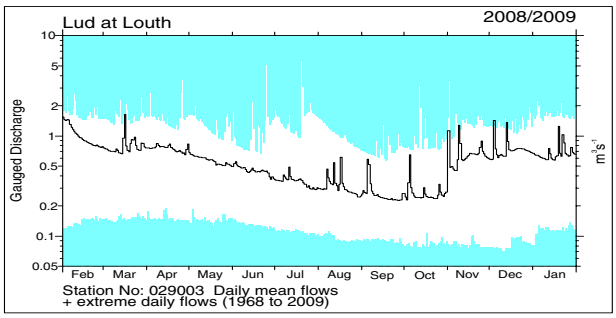
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to February 2008 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

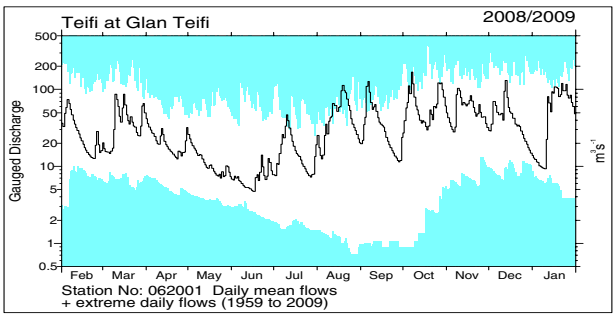
River flow . . . River flow . . .

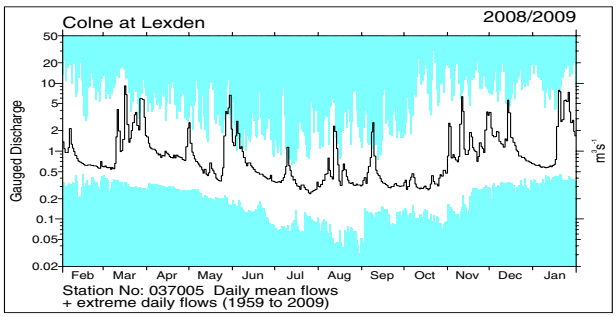


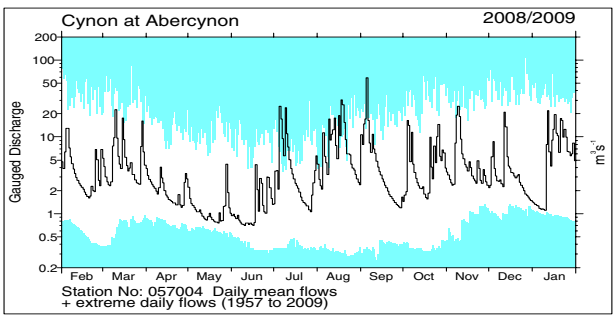


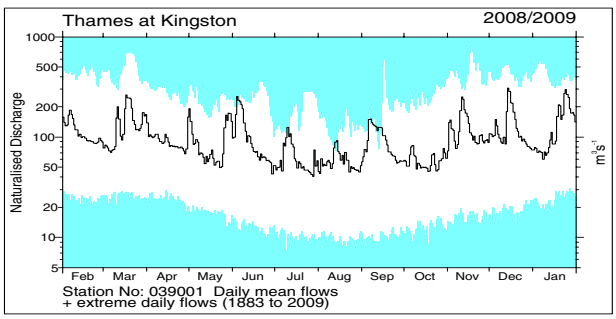


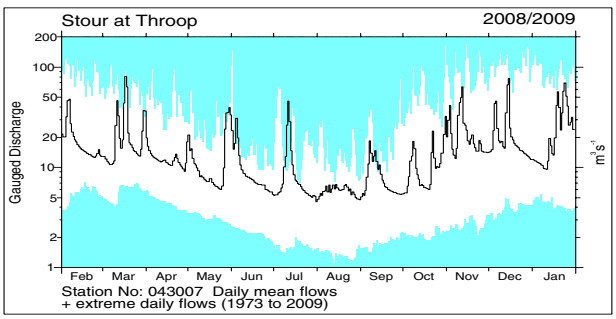


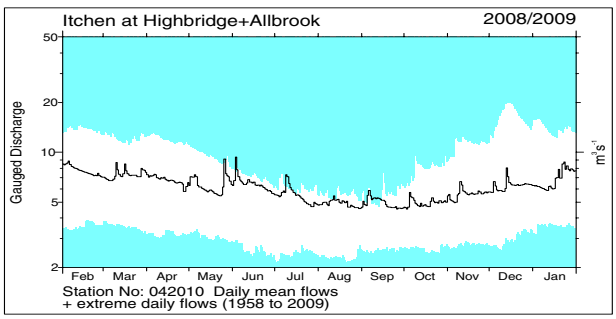












Notable runoff accumulations (a) June 2008 - January 2009, (b) February 2008 - January 2009

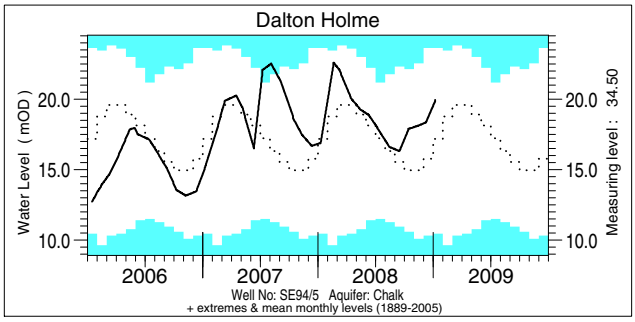
	River	%lta	Rank
a)	Tweed (Norham)	153	49/49
	Whiteadder	165	36/39
	Tyne (Bywell)	153	50/50
	Wharfe	197	53/53
	Coln	158	43/45
	Exe	142	50/53
	Otter	139	42/46
	Dart	146	48/50

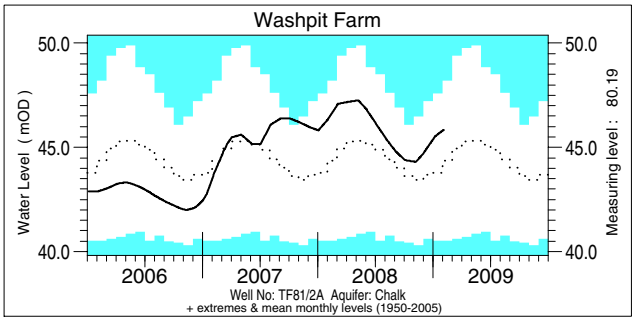
	River	%lta	Rank
a)	Warleggan	140	35/39
	Teme	158	36/39
	Teifi	143	47/48
	Lune	145	47/47
	Camowen	130	33/36
	Mourne	127	24/26
	Annacloy	139	27/29

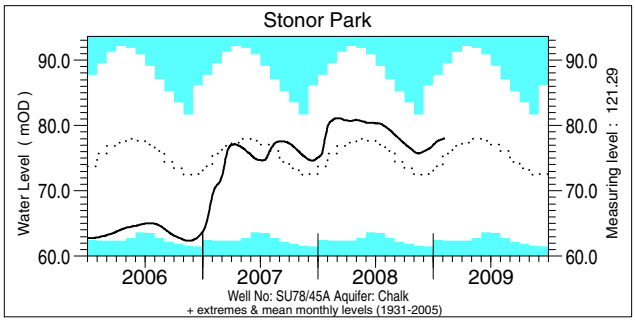
	River	%lta	Rank
b)	Tyne (Spilmersford)	140	41/43
	Kennet	126	42/47
	Lambourn	131	43/46
	Brue	133	41/43
	Eden	127	39/41
	Clyde (Blairston)	124	43/47

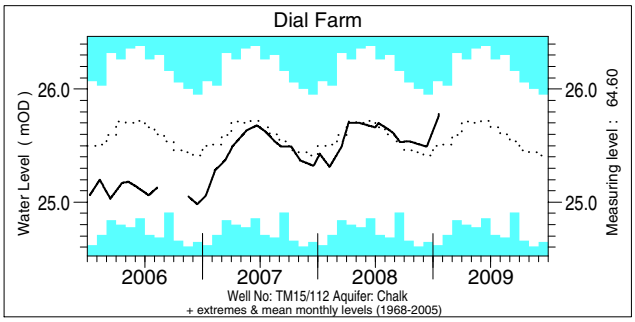
lta = long term average
Rank 1 = lowest on record

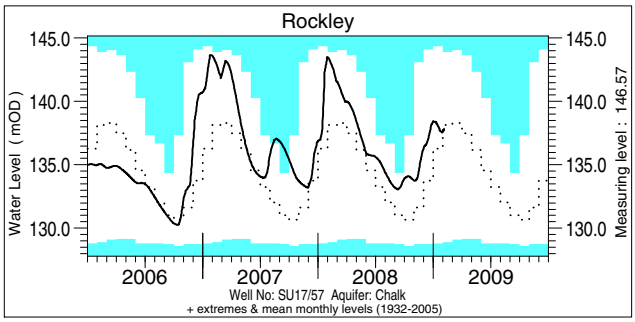
Groundwater . . . Groundwater

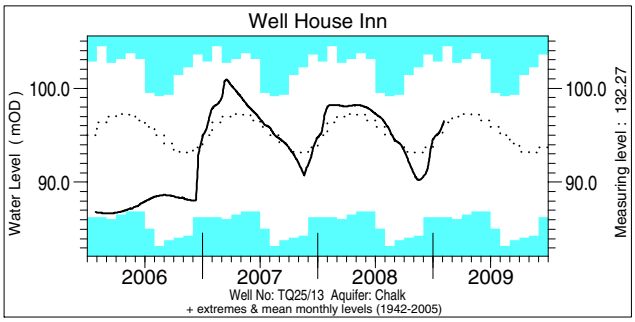


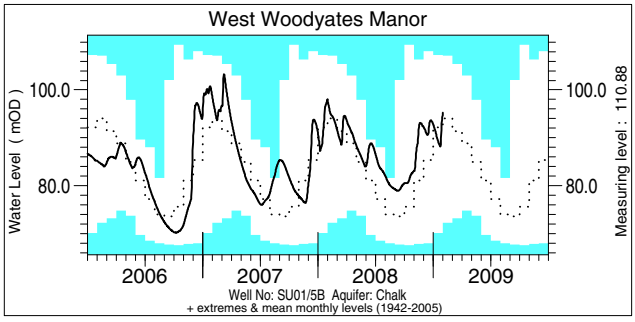


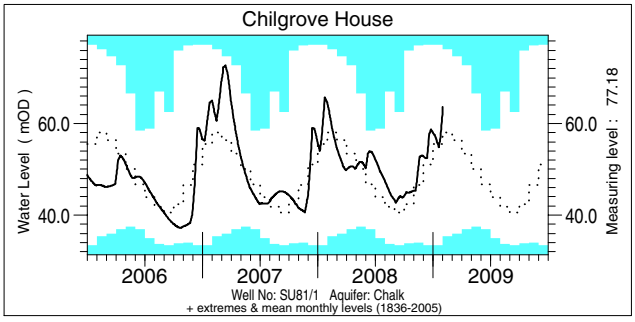


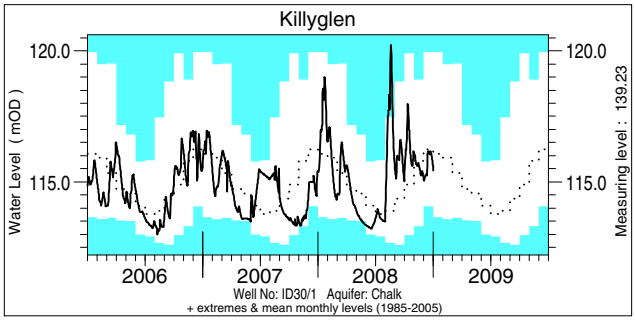


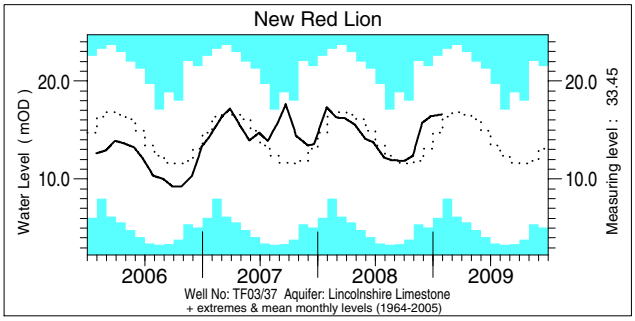






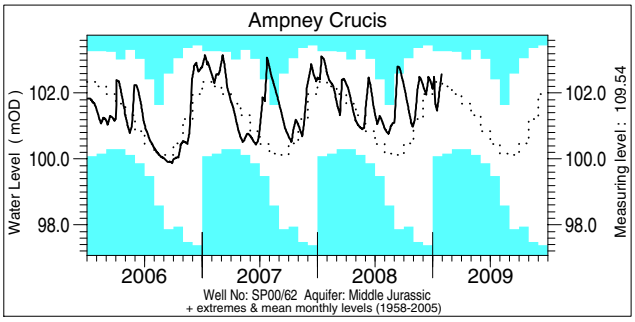


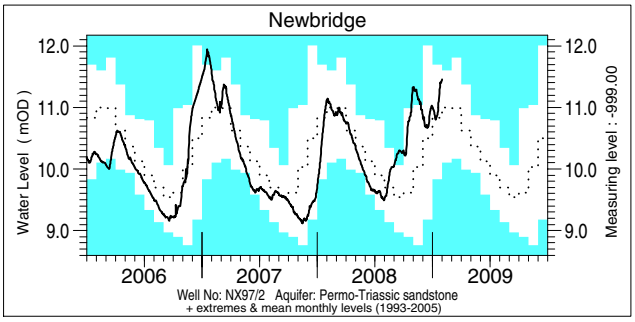


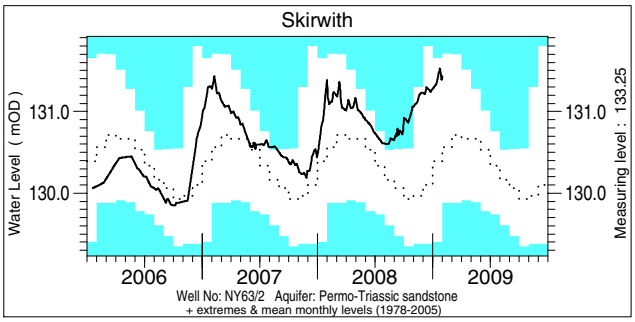


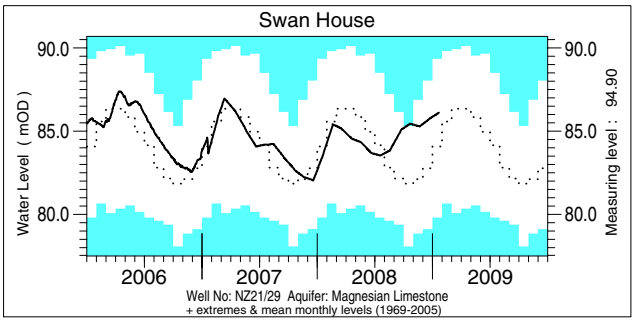
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

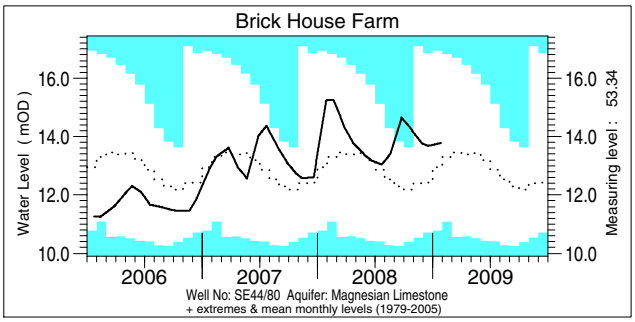
Groundwater . . . Groundwater

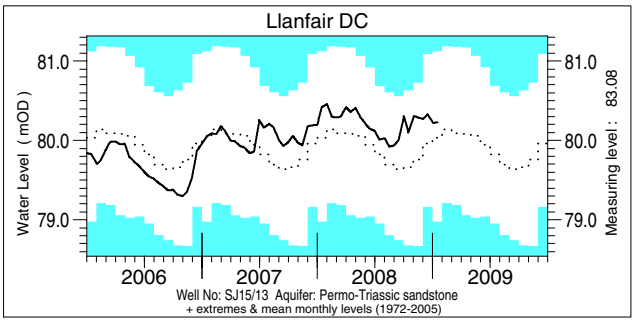


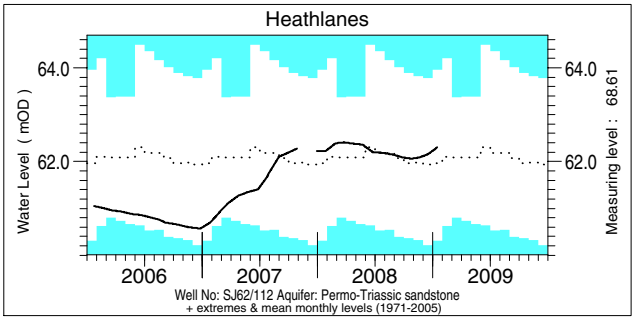


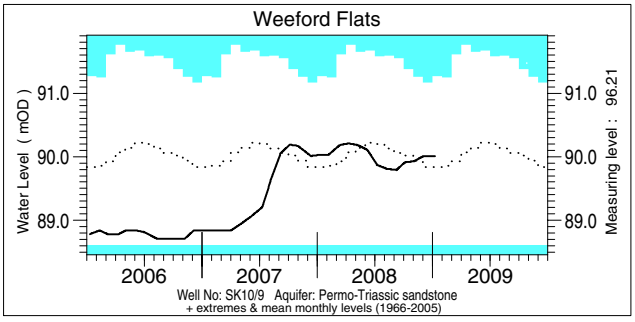


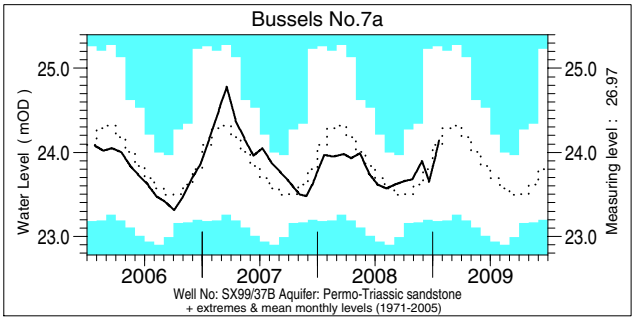


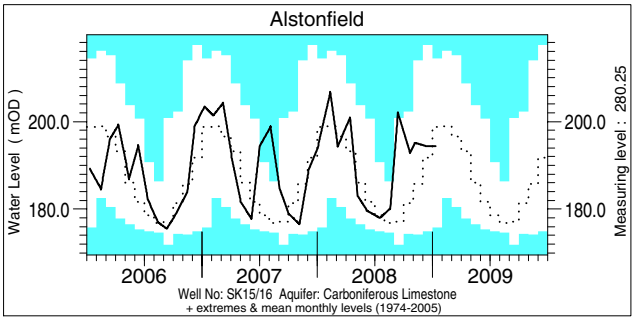










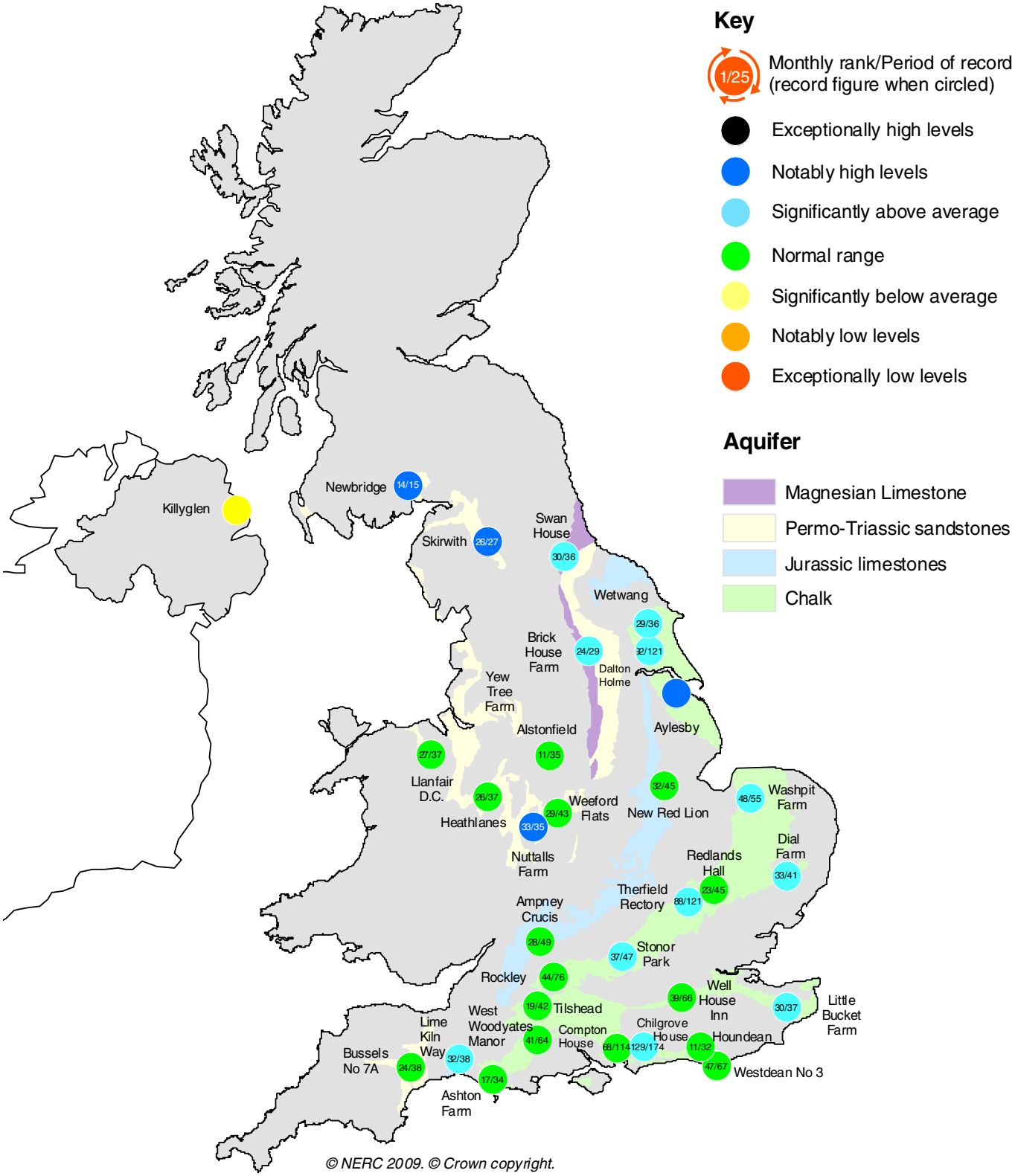


Groundwater levels January / February 2009

Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.
Dalton Holme	19.94	06/01	17.13	Chilgrove House	63.67	31/01	56.18	Brick House Farm	13.78	26/01	12.91
Washpit Farm	45.85	03/02	43.79	Killyglen (NI)	115.44	31/12	116.22	Llanfair DC	80.23	15/01	79.97
Stonor Park	78.04	04/02	73.34	New Red Lion	16.60	29/01	14.85	Heathlanes	62.31	15/01	61.91
Dial Farm	25.78	19/01	25.47	Ampney Crucis	102.58	28/01	102.34	Weeford Flats	90.01	08/01	89.63
Rockley	137.84	04/02	136.38	Newbridge	11.46	31/01	10.77	Bussels No.7a	24.14	20/01	24.12
Well House Inn	96.52	04/02	94.94	Skirwith	131.43	31/01	130.48	Alstonfield	194.34	09/01	198.52
West Woodyates	95.20	31/01	91.69	Swan House	86.12	21/01	84.26				

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



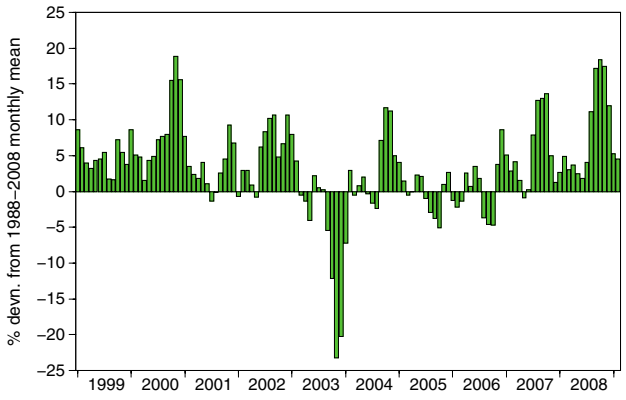
Groundwater levels - January 2009

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.

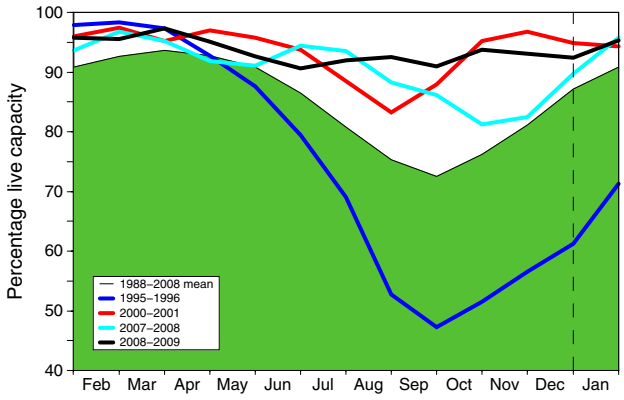
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.
ii. Adverse weather conditions have prevented access to some boreholes in early February 2009.

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)	2008 Dec	2009 Jan	Feb	Feb Anom.	Min. Feb	Year* of min.	2008 Feb	Diff 09-08
North West	N Command Zone	• 124929	95	92	99	7	63	1996	100	-1
	Vyrnwy	55146	93	90	100	8	45	1996	100	0
Northumbrian	Teesdale	• 87936	91	83	89	-3	51	1996	97	-8
	Kielder	(199175)	(88)	(90)	(94)	0	(85)	1989	(97)	-3
Severn Trent	Clywedog	44922	79	83	86	-1	62	1996	88	-2
	Derwent Valley	• 39525	95	99	100	6	15	1996	100	0
Yorkshire	Washburn	• 22035	94	94	97	8	34	1996	98	-1
	Bradford supply	• 41407	97	99	100	7	33	1996	100	0
Anglian	Grafham	(55490)	(93)	(92)	(93)	7	(67)	1998	(92)	1
	Rutland	(116580)	(88)	(90)	(91)	5	(68)	1997	(95)	-4
Thames	London	• 202828	95	96	96	6	70	1997	90	6
	Farmoor	• 13822	93	96	78	-14	72	2001	83	-5
Southern	Bewl	28170	75	80	80	-1	37	2006	89	-9
	Ardingly	4685	93	100	100	7	65	2006	100	0
Wessex	Clatworthy	5364	100	100	100	5	62	1989	100	0
	Bristol WW	• (38666)	(94)	(96)	(98)	13	(58)	1992	(99)	-1
South West	Colliford	28540	100	98	100	19	52	1997	83	17
	Roadford	34500	97	96	99	19	30	1996	92	7
	Wimbleball	21320	100	100	100	10	59	1997	100	0
	Stithians	5205	88	95	100	14	38	1992	76	24
Welsh	Celyn and Brenig	• 131155	96	94	97	2	61	1996	99	-2
	Brianne	62140	98	92	98	0	84	1997	100	-2
	Big Five	• 69762	96	92	94	1	67	1997	95	-1
	Elan Valley	• 99106	100	97	100	3	73	1996	99	1
Scotland(E)	Edinburgh/Mid Lothian	• 97639	97	97	100	7	72	1999	100	0
	East Lothian	• 10206	99	99	99	1	68	1990	100	-1
Scotland(W)	Loch Katrine	• 111363	95	98	100	7	85	2000	98	2
	Daer	22412	99	99	99	0	91	1997	100	-1
	Loch Thom	• 11840	96	96	96	-2	90	2004	96	0
Northern Ireland	Total+	• 61600	90	90	99	10	75	2002	94	5
	Silent Valley	• 20634	89	91	100	15	46	2002	99	1

() 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 1988-2008 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) was instigated in 1988 and is undertaken jointly by the Centre for Ecology and Hydrology Wallingford (formerly the Institute of Hydrology - IH) 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 Wallingford) 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 (together with revised 1961-90 averages) 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.

NATURAL ENVIRONMENT RESEARCH COUNCIL

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.

Subscription

Subscription to the Hydrological Summaries costs £48 per year. Orders should be addressed to:

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Selected text and maps are available on the WWW at http://www.nerc-wallingford.ac.uk/ih/nrfa/index.htm Navigate via Water Watch

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02/09