Hydrological Summary
for the United Kingdom

January 2010

General

The sub-Arctic weather conditions of December continued into January with average temperature for the winter thus far being extremely low: Scotland reported its coldest Dec/Jan in a series from 1914; Northern Ireland its coldest since 1962/63. The impact of the snow and ice was widespread and severe (e.g. on transport, commerce, education and agriculture). The provisional UK precipitation total for January is around 70% of average but with a clear east to west gradient reflecting the dominant synoptic patterns. Limited rainfall and frozen headwater catchments restricted inflows to some reservoirs, particularly early in the month but reservoir stocks in index reservoirs generally remained above or within the normal range. In a few areas stocks declined (e.g. in north-west England and at Farmoor – where poor water quality curtailed abstractions). Nonetheless, overall stocks for England & Wales exceeded the average. After steep recessions early in the month, river flows generally increased briskly, snowmelt being a contributory factor in many catchments and flood warnings were widespread in mid-month. Frozen ground limited infiltration during an appreciable part of January but generally groundwater levels continued to rise (in some cases reflecting healthy early winter recharge), exceeding the monthly average in the majority of index wells and boreholes.

Rainfall

With the Jet Stream much further south than usual, synoptic patterns were conducive to northerly and north-easterly wind directions through much of January. Correspondingly, temperatures were exceptionally low and the UK registered its coldest January since 1987; there was a modest respite in mid-month when the passage of Atlantic frontal systems produced significant rainfall (e.g. 35mm at Spadeadam, Cumbria on the 16th). A few daily totals in January exceeded 50mm but in many cases they probably included melting snow from earlier falls. As in December, much of the January precipitation fell as snow (in a few localities in southern England accumulations reached 20-30cm by the end of the first week, whilst depths exceeded 50cm in parts of the Cairngorms). The high proportion of snow implies that the initial national and regional 'rainfall' totals should be treated with caution; they are likely to be underestimates. The spatial distribution of the January precipitation reflected the predominance of northerly and easterly airflows. A few western areas (e.g. parts of Northern Ireland and western Scotland) registered less than half the January average rainfall whilst some catchments exposed to the prevailing winds (e.g in north-east Scotland and the North York Moors) reported well above average precipitation; much of central southern England was also relatively wet. In the three-month (Nov-Jan) timeframe, parts of western Scotland have been notably dry but all other regions have registered above average rainfall – parts of southern England being particularly wet.

River flows

Most UK rivers reported a wide range of flows during January. Early in the month, frozen headwaters contributed to notably low flows in Scotland; in the 2nd week, the Earn recorded its lowest January flow (provisionally) in a series from 1948. Many northern headwaters were frozen and ice flows on rivers were common (note: such conditions increase the uncertainties associated with river flow measurement). Towards the end of the 2nd week frontal rainfall, augmented in many areas by snowmelt, triggered rapid recoveries in runoff rates – spate conditions (and Flood Watches) were widespread in mid-month. Near-bankfull flows and moderate floodplain inundations were common and some notable flows were reported. On the 16th the Tyne (Lothians) registered its 2nd highest January flow in a 45-yr record. Later in the month, the slower-responding Yorkshire Derwent reported its 2nd highest January peak since 1982. This high runoff interlude ensured that monthly runoff totals were generally close to, or above, average throughout much of eastern, central and southern England. In north-east Scotland the Deveron catchment reported its highest January runoff in a 50-yr series. By contrast, runoff in much of western Scotland was only 30-40% of the January mean; the Carron and Nevis both recorded their 2nd lowest January runoff in records of around 30 years. Across the UK, runoff accumulations in the 3- and 12-month timespans are generally within, or above, the normal range but relatively low in a few, mostly Anglian, index catchments.

Groundwater

Over almost the entire country soil moisture deficits were close to zero throughout January and precipitation across most major aquifer outcrop areas was in the 70-130% range (but lower in the west). Whilst, as in December, frozen ground limited infiltration for much of the month, accumulated recharge totals since October are generally very healthy particularly in north-eastern and southern England. This is reflected in the notably steep rise of groundwater levels at Chilgrove (and other boreholes in the South Downs) where late-January levels were exceptionally high – standing around 40 metres above the 2009 minimum level (registered in the autumn). Elsewhere in the Chalk, levels are mostly a little above the mid-winter average but somewhat below in parts of East Anglia (see the hydrographs for Dial Farm and Washpit Farm) where the seasonal recovery didn't begin until very late in 2009. Most index wells in the Permo-Triassic sandstones and the limestone aquifers are also near to, or a little above, average for the time of year; a particularly brisk recovery was recorded in the Magnesian Limestone (of the North York Moors) at Swan House. With soils still close to saturation, the groundwater resources outlook remains generally healthy but further late-winter replenishment would be particularly useful in some superficial deposits (e.g. in western Scotland) where they can be significant in a local water supply context.

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

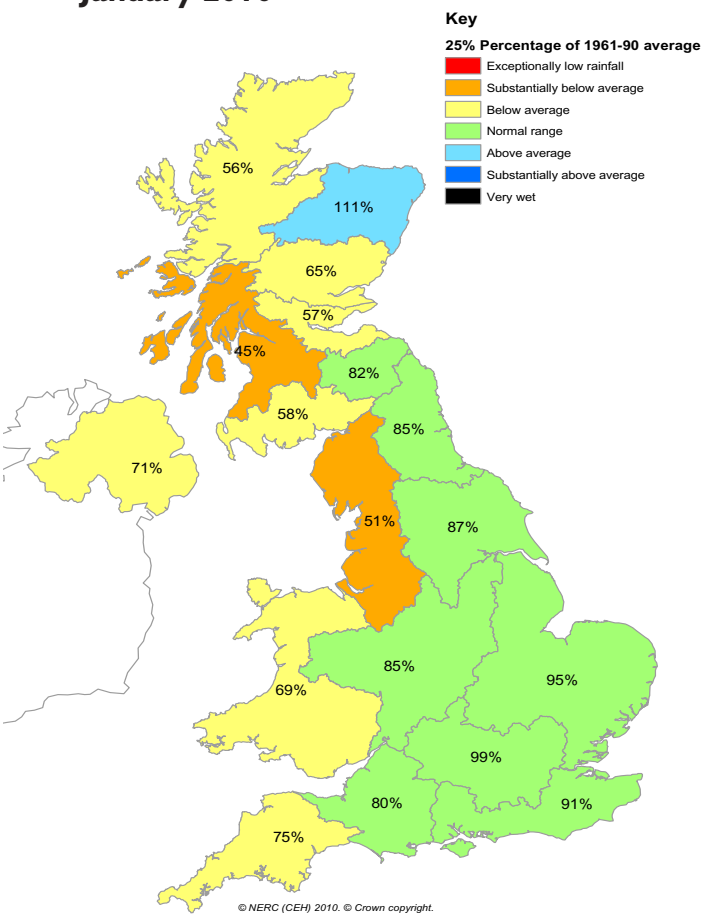
Area	Rainfall	Jan 2010	Nov 09 - Jan 10		Aug 09 - Jan 10		Feb 09 - Jan 10		Dec 08 - Jan 10	
England & Wales	**mm**	**71**	**368**		**543**		**942**		**1100**	
	%	**78**	**133**	**5-15**	**105**	**2-5**	**104**	**2-5**	**101**	**2-5**
North West	mm	**61**	471		762		1258		1494	
	%	**51**	127	5-10	105	2-5	103	2-5	102	2-5
Northumbrian	mm	**71**	367		561		977		1120	
	%	**85**	145	20-35	115	2-5	113	5-10	108	2-5
Severn Trent	mm	**60**	271		402		774		896	
	%	**85**	122	2-5	95	2-5	101	2-5	98	2-5
Yorkshire	mm	**69**	340		506		878		1015	
	%	**87**	139	10-20	109	2-5	105	2-5	102	2-5
Anglian	mm	**49**	216		319		596		673	
	%	**95**	131	5-10	99	2-5	99	2-5	95	2-5
Thames	mm	**65**	308		426		727		837	
	%	**99**	152	10-20	110	2-5	104	2-5	100	<2
Southern	mm	**74**	403		528		822		962	
	%	**91**	161	20-30	115	2-5	105	2-5	101	2-5
Wessex	mm	**72**	375		541		920		1077	
	%	**80**	139	5-10	110	2-5	108	2-5	104	2-5
South West	mm	**105**	473		695		1269		1518	
	%	**75**	116	2-5	98	2-5	106	2-5	103	2-5
Welsh	mm	**100**	569		837		1395		1648	
	%	**69**	128	5-10	104	2-5	104	2-5	100	<2
Scotland	**mm**	**95**	**445**		**939**		**1600**		**1903**	
	%	**61**	**95**	**2-5**	**106**	**2-5**	**109**	**5-10**	**107**	**2-5**
Highland	mm	**101**	441		1023		1829		2175	
	%	**56**	77	2-5	96	2-5	105	2-5	103	2-5
North East	mm	**114**	354		716		1238		1411	
	%	**111**	116	5-10	121	10-20	120	40-60	115	5-15
Tay	mm	**95**	442		870		1447		1728	
	%	**65**	108	2-5	114	5-10	112	5-10	110	2-5
Forth	mm	**68**	370		727		1210		1428	
	%	**57**	106	2-5	107	2-5	106	2-5	104	2-5
Tweed	mm	**83**	406		692		1133		1323	
	%	**82**	138	10-20	120	5-15	113	5-10	110	2-5
Solway	mm	**88**	537		1041		1667		2017	
	%	**58**	120	5-10	120	10-20	116	10-20	116	5-15
Clyde	mm	**85**	522		1136		1884		2258	
	%	**45**	93	2-5	105	2-5	108	5-10	106	2-5
Northern Ireland	**mm**	**82**	**372**		**683**		**1190**		**1404**	
	%	**71**	**112**	**2-5**	**106**	**2-5**	**108**	**2-5**	**106**	**2-5**

% = percentage of 1961-90 average *RP = Return period*

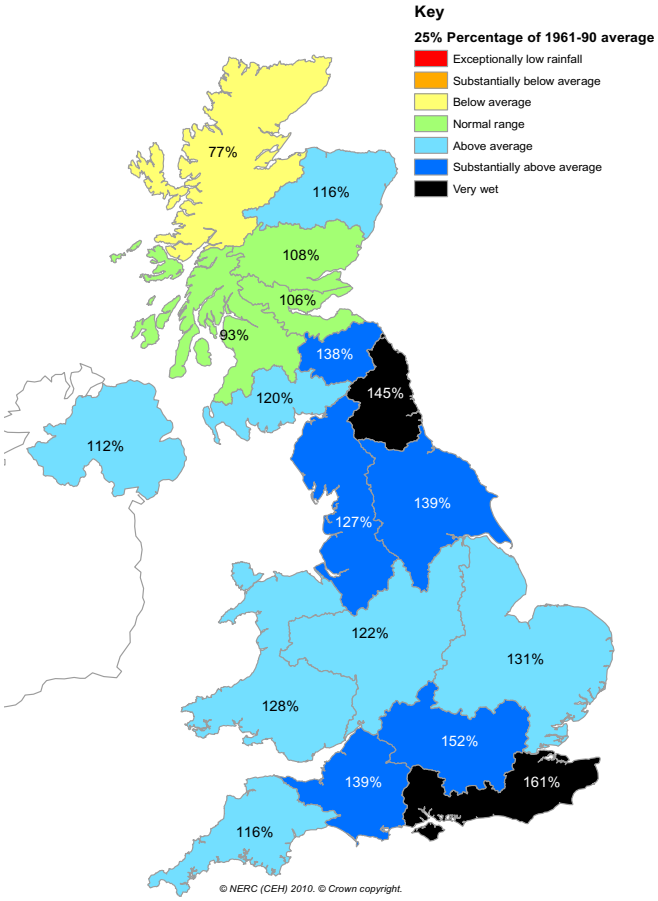
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and derived following 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 August 2009 are provisional.

Rainfall . . . Rainfall . . .

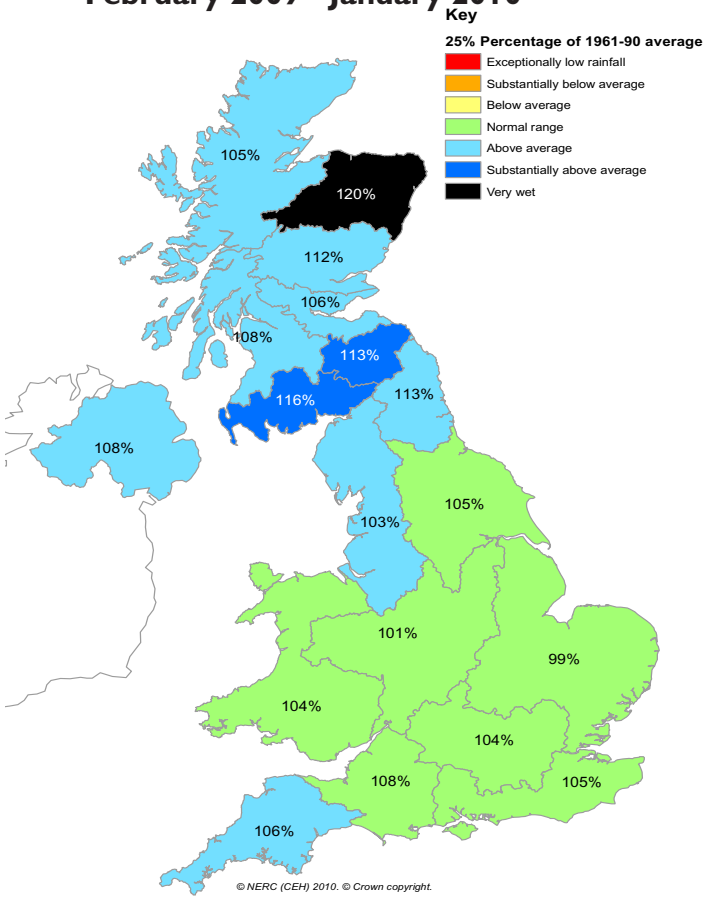
January 2010



November 2009 - January 2010



February 2009 - January 2010



Met Office Winter 2009/10 forecast

Forecast for Winter 2009/10:
Issued 30 December 2009

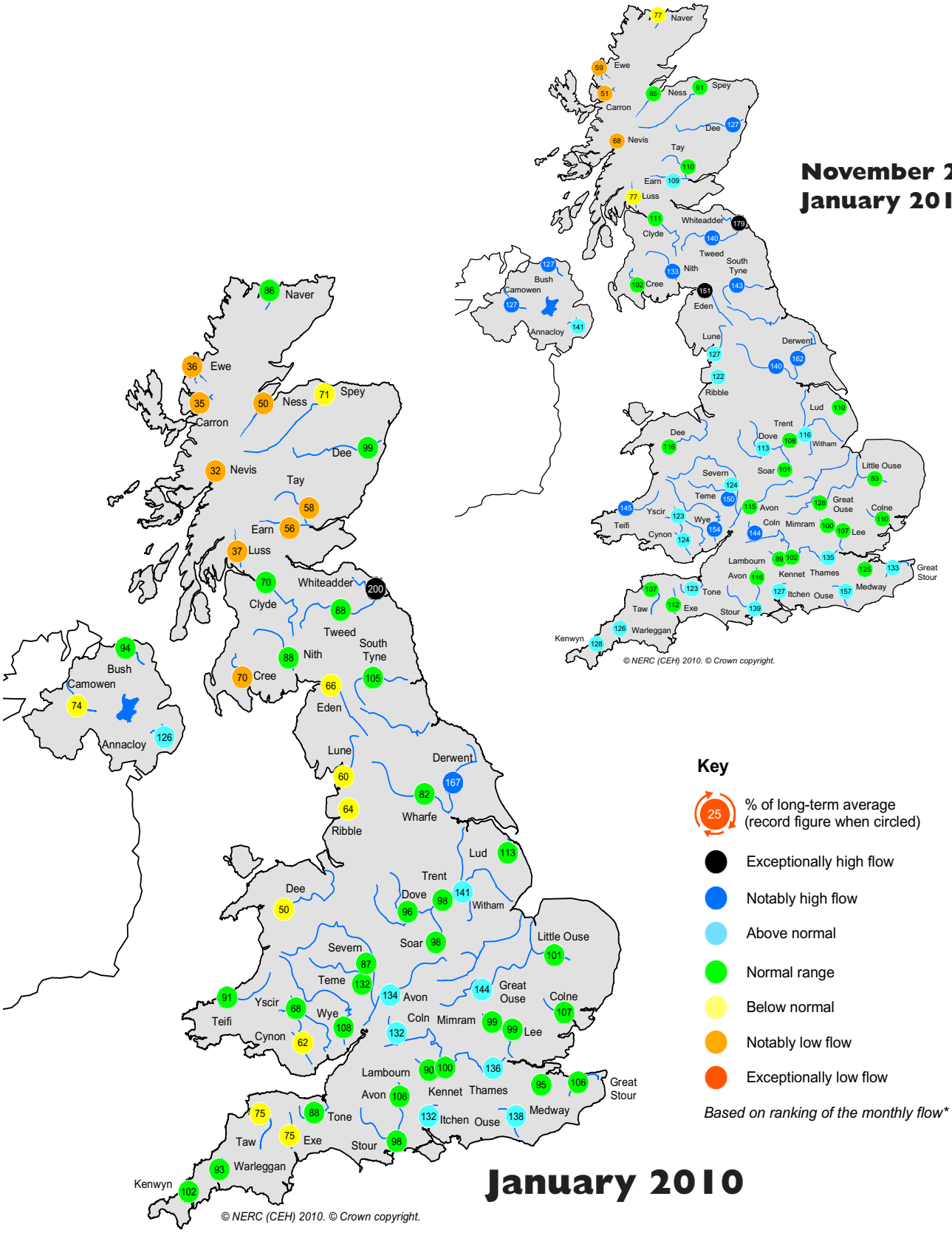
Temperature
For the rest of winter, over northern Europe including the UK, the chance of colder conditions is now 45%; there is a 30% chance of average and a 25% chance of milder conditions.

Rainfall
For the rest of winter, for northern Europe including the UK, there are near-equal chances for each of the three categories. There is a 30% chance of a drier winter, a 35% chance of an average winter and a 35% chance of a wetter winter.

Updates and reviews of the forecast
A monthly appraisal of the winter will start in early February 2010.

For further details please visit:
http://www.metoffice.gov.uk/weather/seasonal/2009/winter/

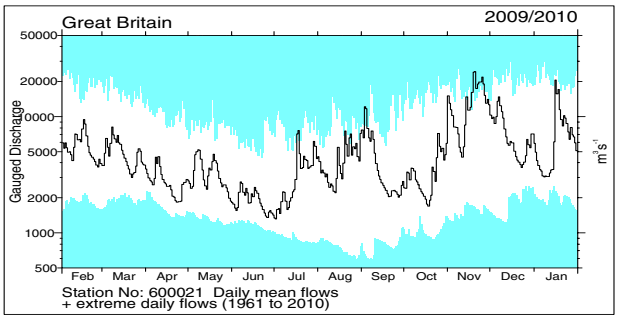
River flow . . . River flow . . .

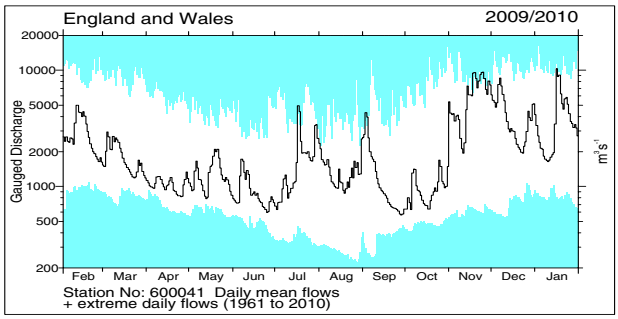


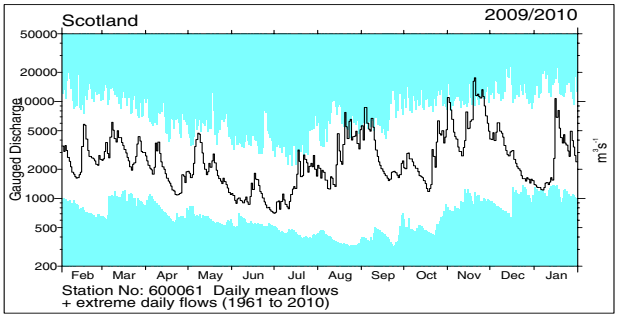
River flows

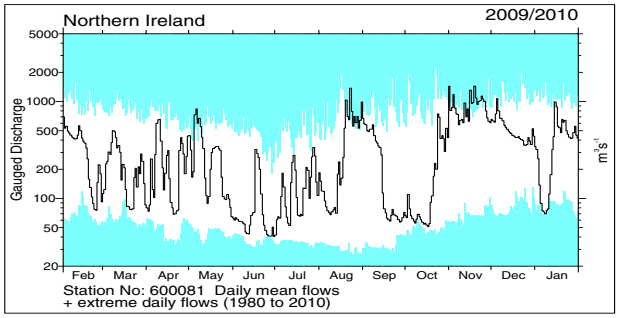
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

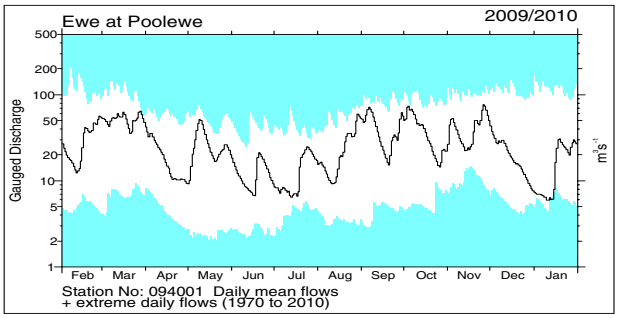
River flow . . . River flow . . .

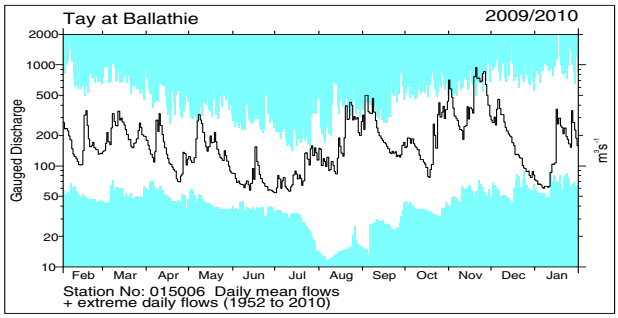


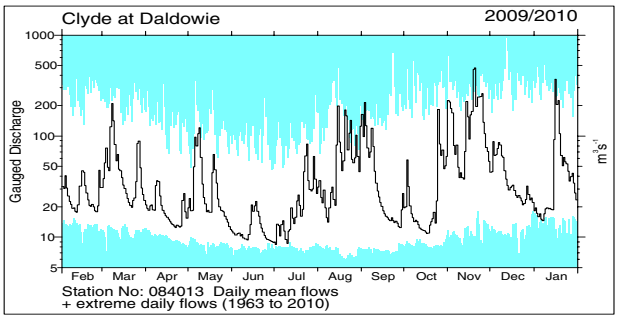


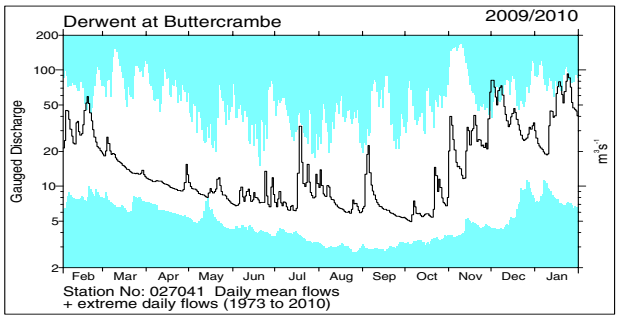


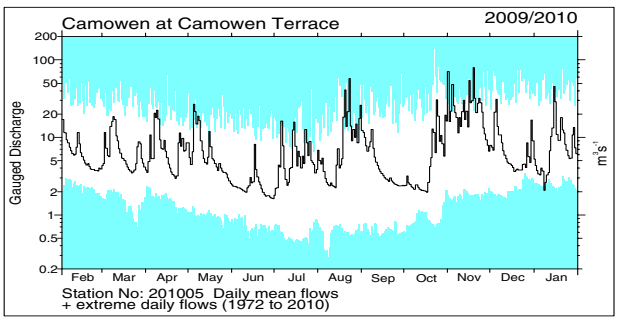


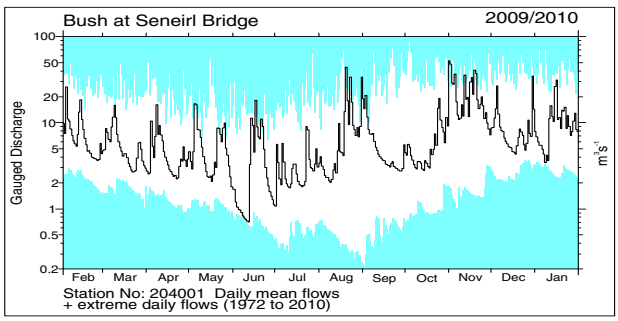








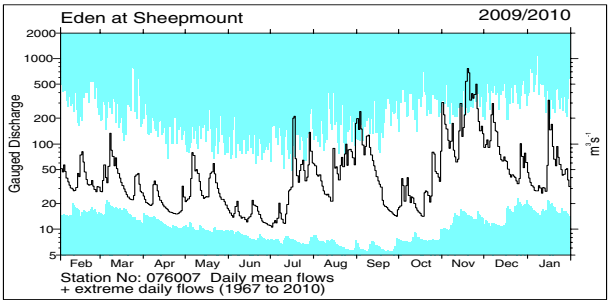


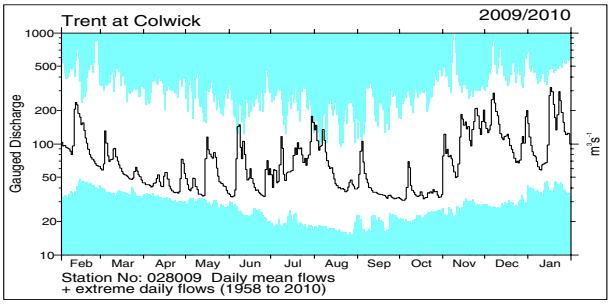


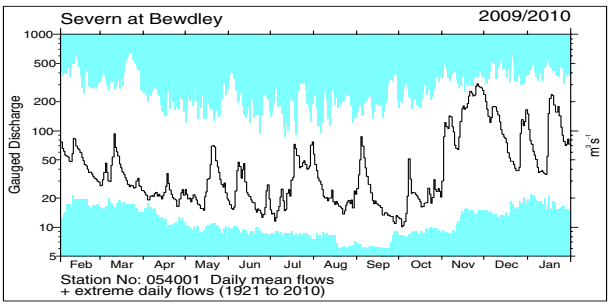
River flow hydrographs

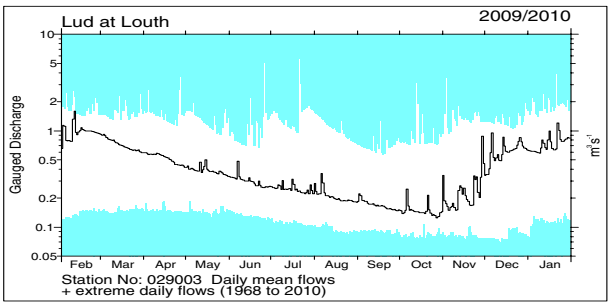
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to February 2009 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

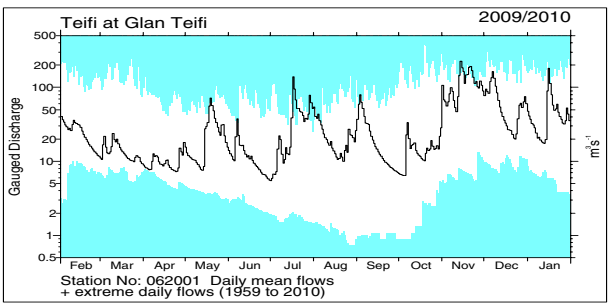
River flow . . . River flow . . .

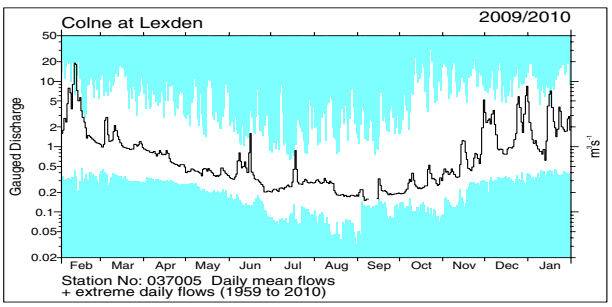


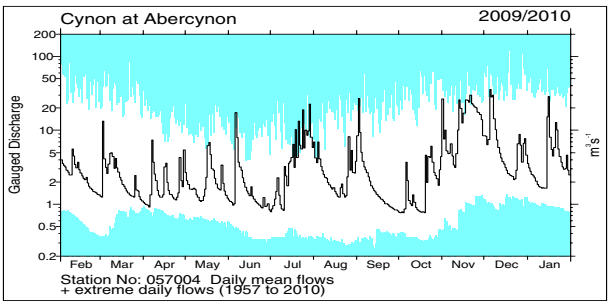


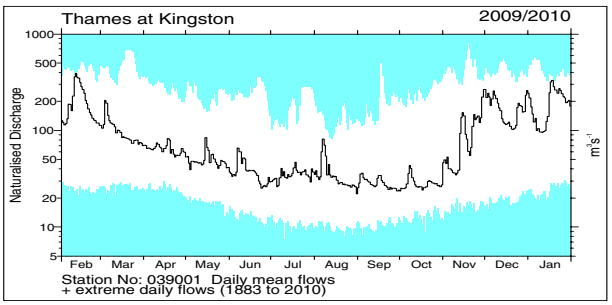


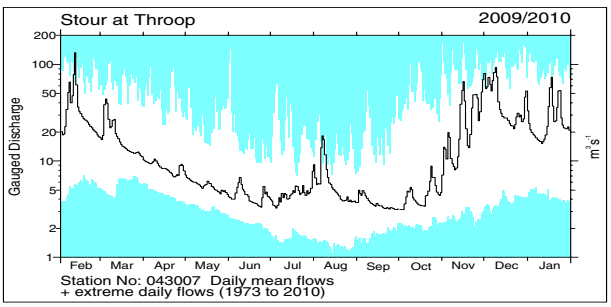


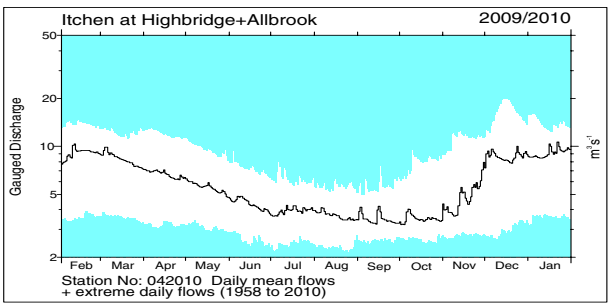












Notable runoff accumulations (a) November - January 2010, (b) February 2009 - January 2010

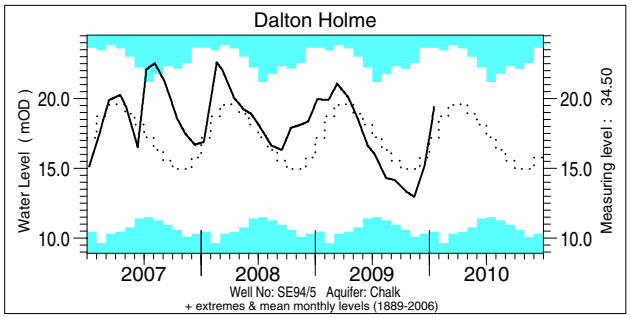
	River	%lta	Rank
a)	Tyne (Spilmersford)	173	44/45
	Tweed (Norham)	152	50/50
	Whiteadder	179	40/41
	Tyne (Bywell)	155	54/54
	S Tyne	143	46/48
	Derwent	162	46/49
	Dover Beck	184	33/35
	Mole	178	33/35

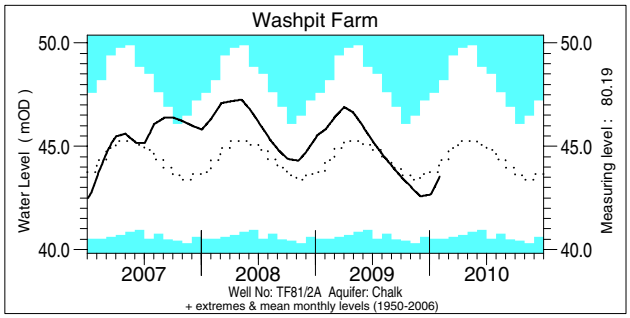
	River	%lta	Rank
a)	Lymington	171	47/50
	Wye	154	71/74
	Teifi	145	49/51
	Eden	151	42/43
	Nevis	68	3/28
	Carron	51	2/31
	Ewe	59	4/40
	Bush	127	34/36

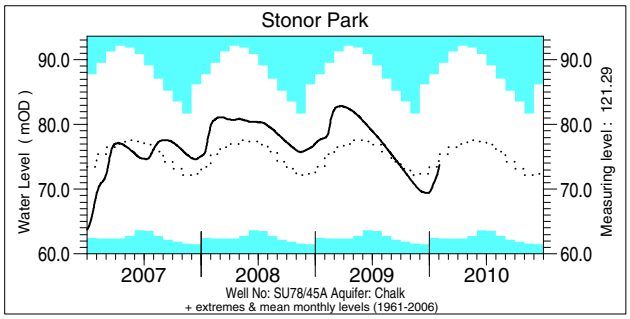
	River	%lta	Rank
b)	Nith	127	50/52
	Camowen	123	33/36
	Mourne	117	25/27
	Annacloy	118	27/30

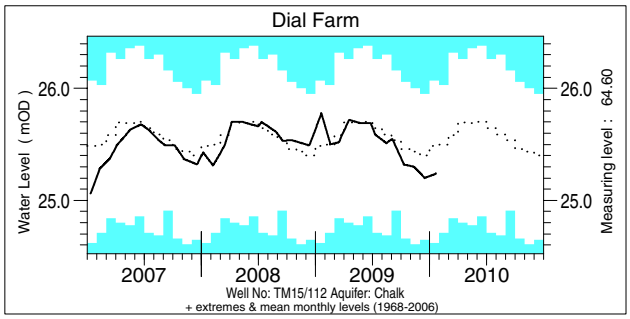
lta = long term average
Rank 1 = lowest on record

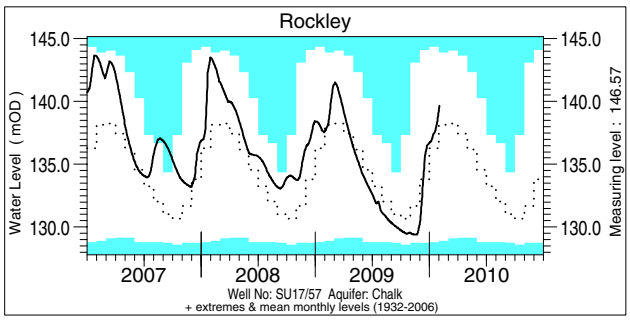
Groundwater . . . Groundwater

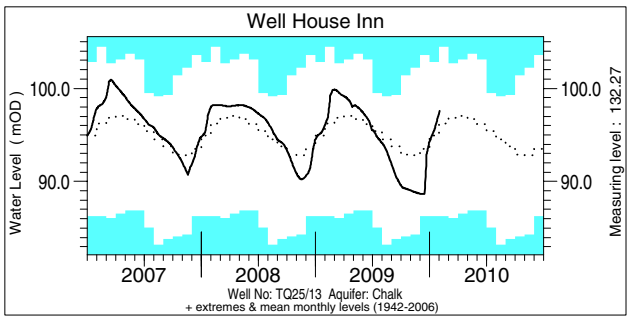


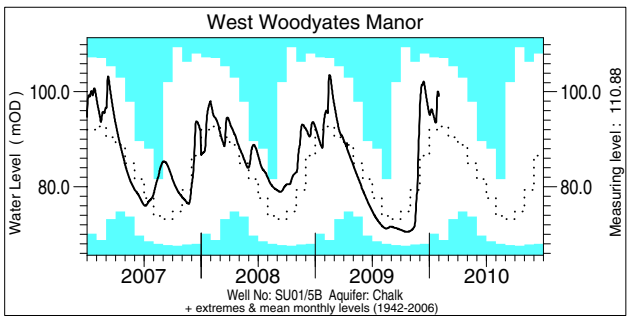


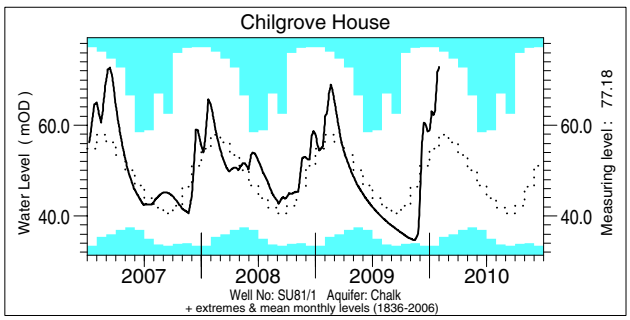


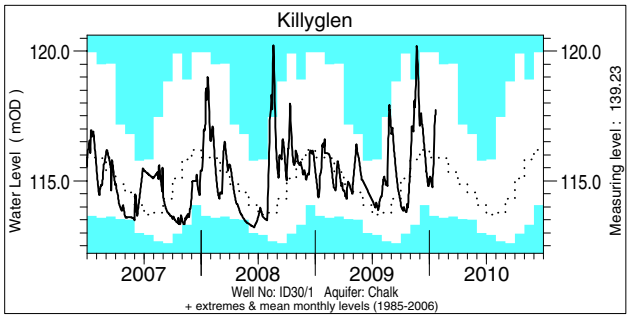


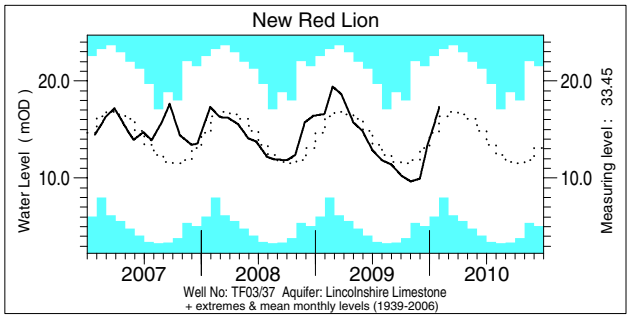






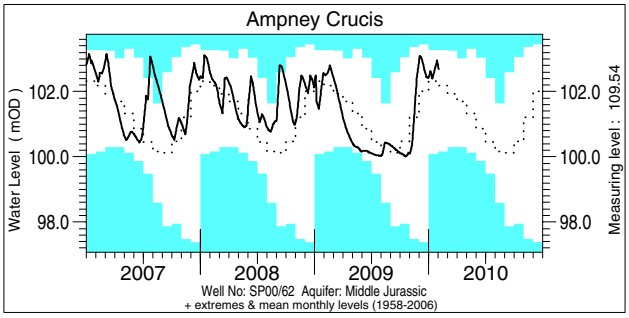


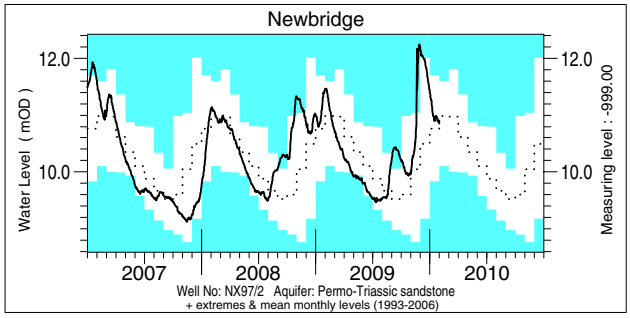


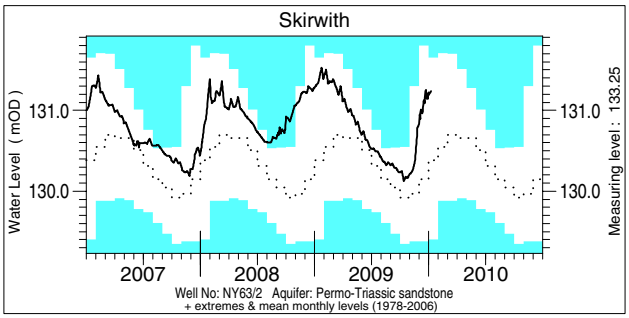


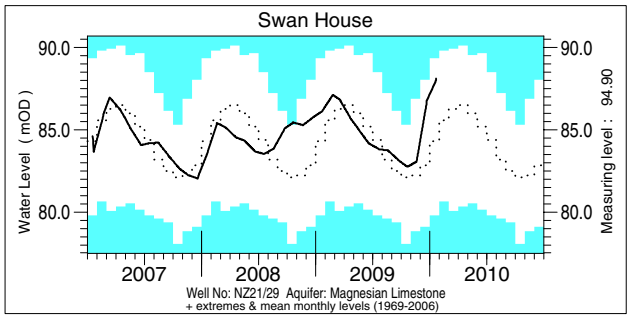
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

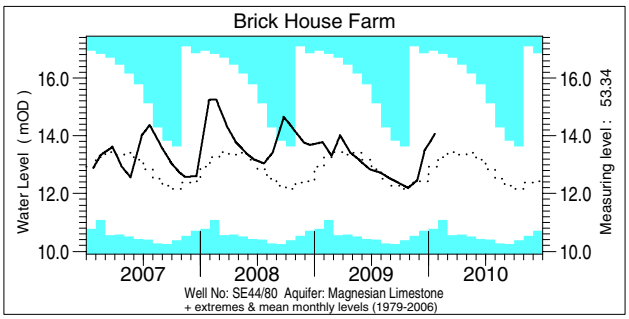
Groundwater . . . Groundwater

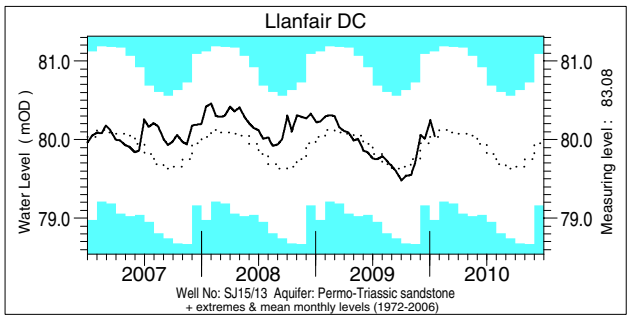


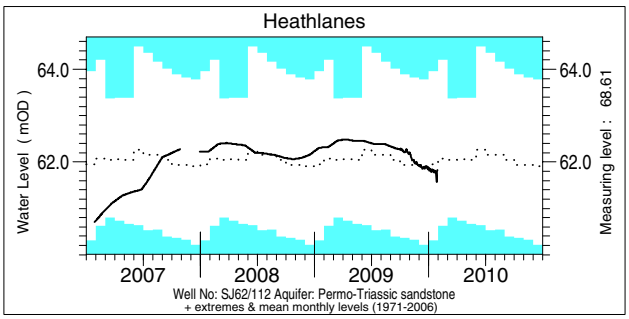


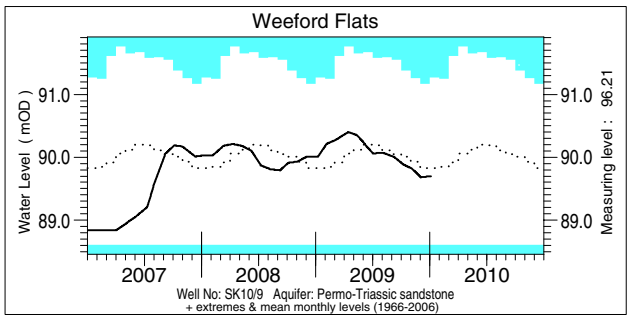


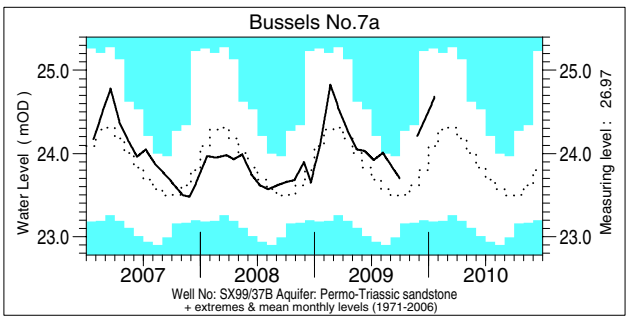


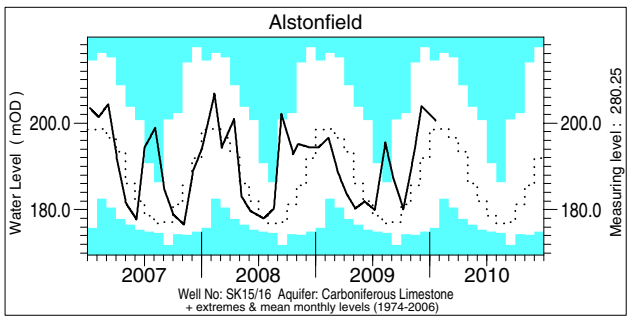












Groundwater levels January / February 2010

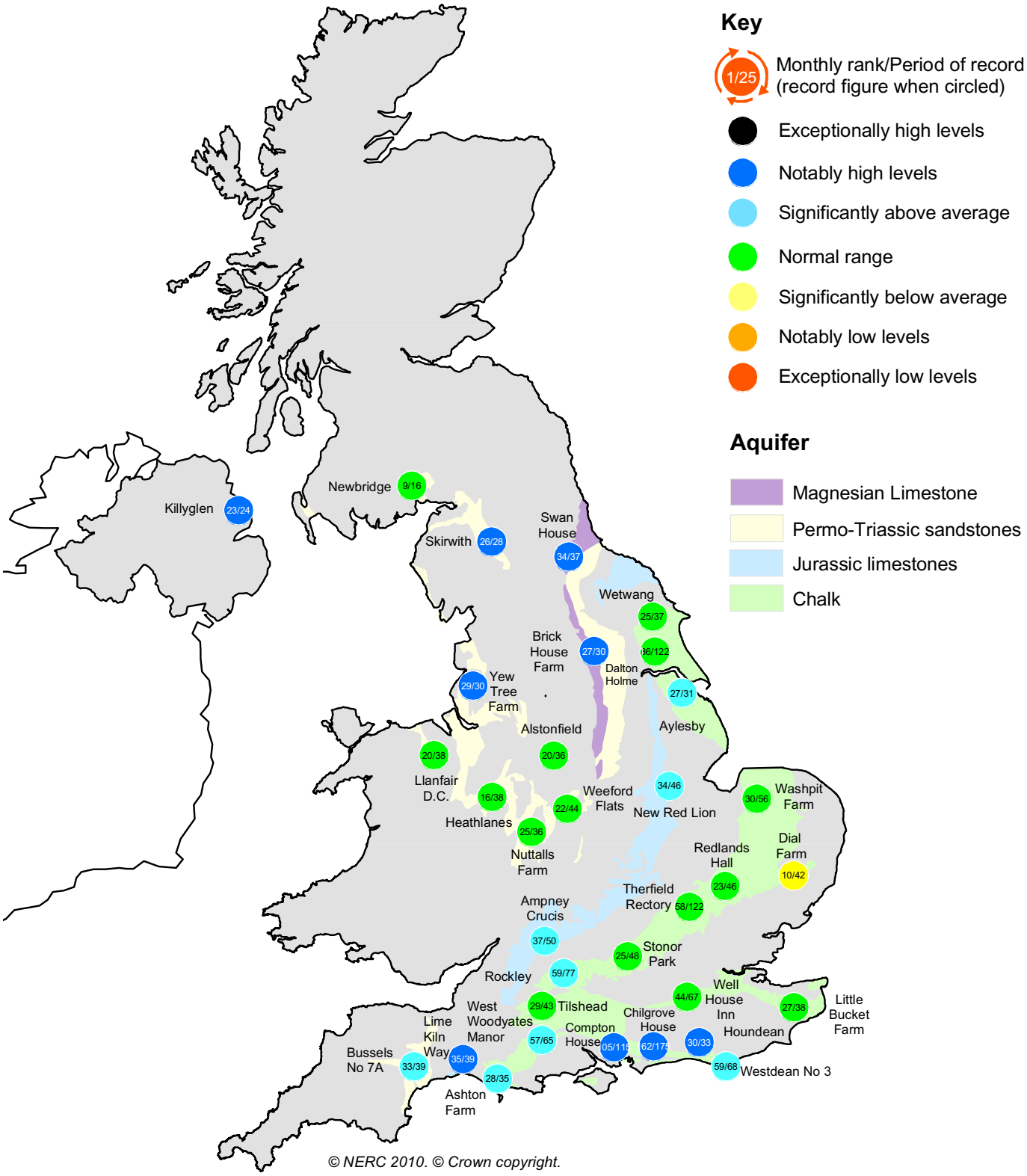
Borehole	Level	Date	Jan. av.
Dalton Holme	19.42	15/01	17.16
Washpit Farm	43.53	01/02	43.82
Stonor Park	73.78	01/02	73.43
Dial Farm	25.24	21/01	25.48
Rockley	139.69	01/02	136.40
Well House Inn	97.56	01/02	94.94
West Woodyates	99.16	31/01	91.66

Borehole	Level	Date	Jan. av.
Chilgrove House	72.83	31/01	56.18
Killyglen (NI)	117.72	21/01	116.19
New Red Lion	17.31	31/01	14.89
Ampney Crucis	102.68	01/02	102.33
Newbridge	10.85	31/01	10.79
Skirwith	131.24	07/01	130.51
Swan House	88.09	21/01	84.31

Borehole	Level	Date	Jan. av.
Brick House Farm	14.07	20/01	12.94
Llanfair DC	80.04	15/01	79.98
Heathlanes	61.83	28/01	61.92
Weeford Flats	89.70	04/01	89.64
Bussels No.7a	24.68	19/01	24.12
Alstonfield	200.52	19/01	198.40

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



Groundwater levels - January 2010

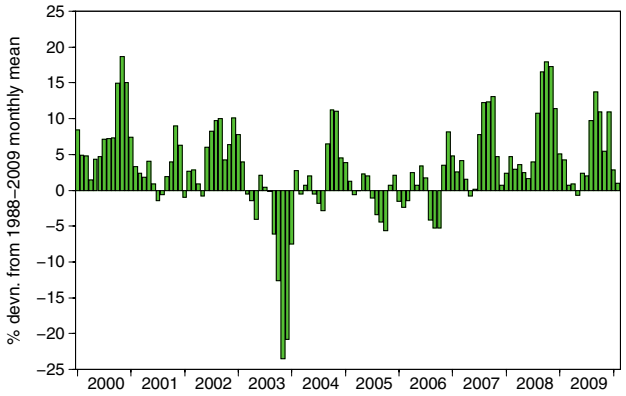
The rankings are based on a comparison between the average level in the featured month (but often only single readings are available) and the average level in each corresponding month on record. They need to be interpreted with caution especially when groundwater levels are changing rapidly or when comparing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

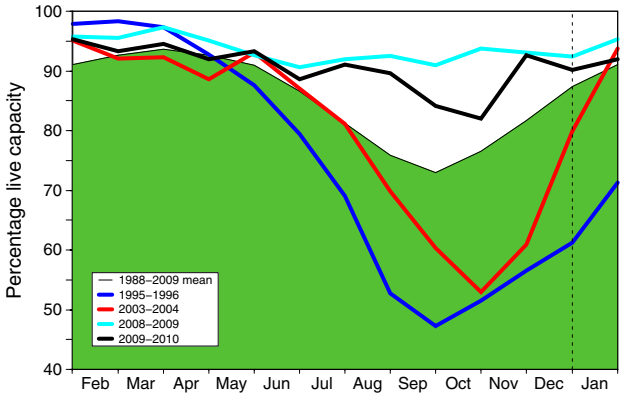
ii. Yew Tree Farm levels are now received quarterly.

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)	2009 Dec	2010 Jan	Feb	Feb Anom.	Min Feb	Year* of min	2009 Feb	Diff 10-09
North West	N Command Zone	•	124929	99	90	**86**	-7	63	1996	99	-13
	Vyrnwy		55146	99	90	**96**	4	45	1996	100	-4
Northumbrian	Teesdale	•	87936	98	87	**89**	-2	51	1996	89	0
	Kielder		(199175)	(97)	(87)	**(95)**	1	(85)	1989	(94)	1
Severn Trent	Clywedog		44922	98	79	**83**	-4	62	1996	86	-3
	Derwent Valley	•	39525	100	92	**100**	6	15	1996	100	0
Yorkshire	Washburn	•	22035	93	96	**96**	7	34	1996	97	-1
	Bradford supply	•	41407	100	98	**100**	7	33	1996	100	0
Anglian	Grafham		(55490)	(84)	(85)	**(85)**	-2	(67)	1998	(93)	-8
	Rutland		(116580)	(70)	(75)	**(82)**	-4	(68)	1997	(91)	-9
Thames	London	•	196628	94	96	**92**	2	70	1997	96	-4
	Farmoor	•	13822	81	86	**73**	-18	72	2001	78	-5
Southern	Bewl		28170	54	86	**97**	16	37	2006	80	17
	Ardingly		4685	72	97	**100**	7	65	2006	100	0
Wessex	Clatworthy		5364	100	100	**100**	5	62	1989	100	0
	Bristol WW	•	(38666)	(80)	(100)	**(95)**	9	(58)	1992	(98)	-3
South West	Colliford		28540	100	94	**100**	18	52	1997	100	0
	Roadford		34500	98	99	**94**	12	30	1996	99	-5
	Wimbleball		21320	100	100	**100**	10	59	1997	100	0
	Stithians		4967	91	100	**100**	13	38	1992	100	0
Welsh	Celyn and Brenig	•	131155	95	92	**96**	1	61	1996	97	-1
	Brianne		62140	100	96	**98**	0	84	1997	98	0
	Big Five	•	69762	91	89	**88**	-5	67	1997	94	-6
	Elan Valley	•	99106	100	100	**100**	3	73	1996	100	0
Scotland(E)	Edinburgh/Mid Lothian	•	97639	100	99	**100**	6	72	1999	100	0
	East Lothian	•	10206	99	100	**100**	2	68	1990	99	1
Scotland(W)	Loch Katrine	•	111363	100	89	**86**	-8	85	2000	100	-14
	Daer		22412	98	99	**99**	0	91	1997	99	0
	Loch Thom	•	11840	96	96	**95**	-3	90	2004	96	-1
Northern Ireland	Total+	•	56920	99	96	**98**	8	75	2002	99	-1
	Silent Valley	•	20634	99	92	**96**	10	46	2002	100	-4

() 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.
The London total has been revised to 196628 Ml as of November 2009.

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 (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.
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

NATURAL ENVIRONMENT RESEARCH COUNCIL

For further details please contact:

The Met Office
FitzRoy Road
Exeter
Devon
EX1 3PB

Tel.: 0870 900 0100 Fax: 0870 900 5050
E-mail: enquiries@metoffice.com

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

Enquiries

Enquiries should be addressed to:

Hydrological Summaries for the UK
Centre for Ecology & Hydrology
Maclean Building
Crowmarsh Gifford
Wallingford
Oxfordshire
OX10 8BB

Tel.: 01491 838800
Fax: 01491 692424
E-mail: nrfa@ceh.ac.uk

Selected text and maps are available on the WWW at
http://www.ceh.ac.uk/data/nrfa/index.html
Navigate via Water Watch

02/10