Hydrological Summary
for the United Kingdom

April 2009

General

April was a warm and, despite some wetter interludes, relatively dry month in most areas of the UK. Parts of the west received above average rainfall following an unsettled final week, but notably low rainfall and runoff accumulations continued to develop in northern and western regions following the dry winter and early spring. Overall reservoir stocks increased in Northern Ireland, but declined elsewhere. Stocks for England & Wales fell below average (albeit marginally) for the first time in two years; however, stocks are significantly below the seasonal average in some of the largest northern and western reservoirs − in the Northern Command Zone group, the 2nd lowest for early May in a 22-year series (although considerably higher than in the benchmark drought year of 1984). In lowland England, the outlook generally remains favourable, with runoff accumulations in the normal range. Whilst a relatively steep seasonal recession in aquifer levels is evident, levels were in the normal range in a majority of boreholes. High rainfall during much of 2007 and 2008 is providing a continuing water resources benefit, but this year's dry spring, together with the outlook for a warm, dry summer (see page 3), implies the need for alertness to the possibility of drought conditions developing in some regions. In northern and western areas, where late-spring reservoir replenishment often moderates the seasonal decline, May rainfall could be highly influential in determining the outlook for the summer.

Rainfall

April was a very warm month, with stable sunny spells interrupted by some unsettled periods. The month started with a run of dry weather in most parts of the UK, followed by showery and thundery interludes around mid-month. In the last week, frontal systems brought very unsettled wetter weather to most areas, particularly in the west. An intense, slow-moving low pressure area brought heavy rain to west Cornwall on the 25th; over 50mm was recorded overnight on the Isles of Scilly, but radar data suggests event totals could have been substantially higher (and punctuated by periods of exceptional intensity) on the Cornish coast. Overall April rainfall totals were below average in many parts of the UK, although there was an exaggeration of the normal west-east rainfall gradient. Anglian region received less than 40% of its April average, and less than 25% in coastal areas; in contrast, South West received >120%, and >200% in west Cornwall. Northern Ireland registered its 11th wettest April since 1914. The low April rainfall continued a sequence of dry months; February - April rainfall accumulations are well below average for most regions, notably so in northern England, Wales and the Midlands. Following a broadly similar pattern, the 6-month period from November to April has been dry in most regions, with only the far north of Scotland reporting a wetter-than-average accumulation. England and Wales recorded its 3rd lowest rainfall since 1975/76 over this timeframe.

River flows

River flows continued to decrease in the majority of catchments, in response to the prolonged dry weather. Wetter interludes triggered some spates which, interspersed with dry spells, resulted in an exceptional range of flows in some responsive catchments. In the far west of Cornwall, the intense rainfall on the 25th brought flash flooding; widespread damage occurred in St. Ives, and three fatalities were reported after a car was trapped in a flash flood near Zennor. Correspondingly, the Kenwyn registered notably high April runoff. Elsewhere, April runoff was below average across most of upland England & Wales, by a substantial margin in many catchments. Below average flows were also reported from responsive catchments in south east England (e.g. the Colne), whereas runoff was in the normal range in most permeable catchments. Notably low runoff accumulations continued to develop in southern Scotland, Wales and upland areas of England. New minimum February - April runoff totals were registered in some catchments in northwest England and Wales (including the Dee at Manley Hall, in a record starting in 1929). In these areas, and in Northern Ireland, very low runoff totals have been a feature of many of the last six months. In contrast, across much of lowland England, accumulations over the winter/early spring period were generally in the normal range, in part due to groundwater support following the wet summer/autumn of 2008.

Groundwater

The lowest April rainfall broadly co-incided with major outcrop areas, and some areas of the eastern Chalk were particularly dry. Consequently, soils continued to dry out and, by month end, Soil Moisture Deficits (SMDs) exceeded the average across most of England and eastern Scotland, with substantial deficits in some eastern areas. The deficits were considerably lower (and less spatially extensive) than the SMDs recorded after the dry April in 2003, which presaged a summer drought. Seasonal recessions continued to develop in most Chalk boreholes and, with the exception of some boreholes in the south and west of the aquifer, groundwater levels in the Chalk were generally still within the normal range. Similarly, in other aquifer units, levels were largely typical for the time of year, with the occasional borehole registering below average levels (e.g. at Ampney Crucis in the Jurassic Limestone). Newbridge, in the Permo-Triassic of south west Scotland, registered a new April minimum, albeit in a short record (from 1993). In contrast, notably high levels were observed in the slowly-responding Nuttalls Farm borehole in Shropshire. Overall, the status of groundwater resources is typical of the late spring, but a warm, dry summer, with associated high SMDs, may delay the onset of the seasonal recovery in the autumn.

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Geological Survey
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Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

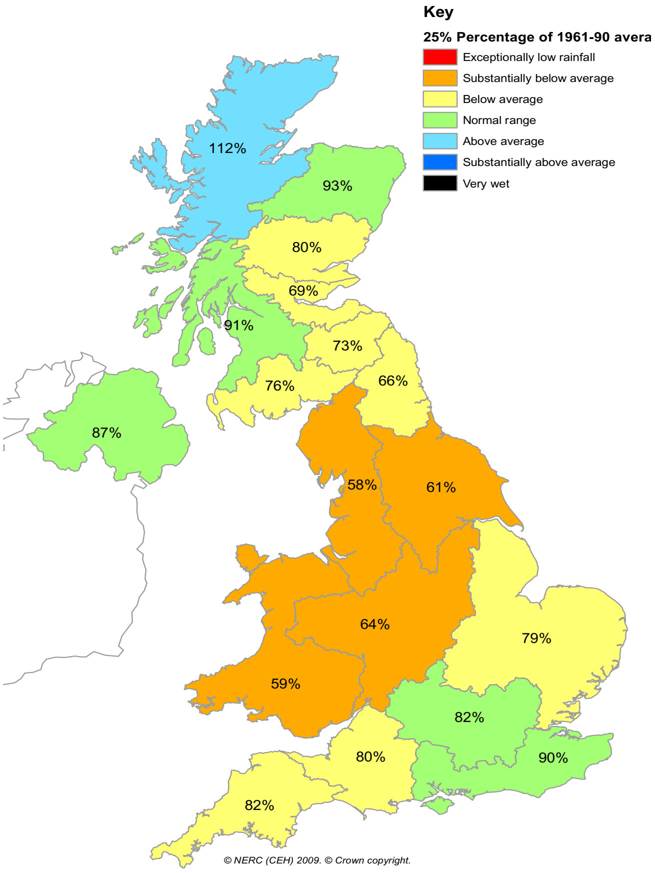
Area	Rainfall	Apr 2009	Feb 09 - Apr 09		Nov 08 - Apr 09		Aug 08 - Apr 09		May 08 - Apr 09	
England & Wales	**mm**	**45**	**137**		**381**		**716**		**949**	
	%	**74**	**69**	**5-10**	**80**	**5-10**	**100**	**<2**	**105**	**2-5**
North West	mm	**52**	143		458		983		1259	
	%	**72**	58	10-20	74	5-15	101	2-5	103	2-5
Northumbrian	mm	**38**	125		327		712		953	
	%	**66**	66	5-10	74	5-15	105	2-5	110	2-5
Severn Trent	mm	**42**	111		313		600		796	
	%	**75**	64	5-10	80	5-10	101	2-5	104	2-5
Yorkshire	mm	**37**	114		310		620		845	
	%	**63**	61	10-20	72	10-20	95	2-5	101	2-5
Anglian	mm	**18**	103		259		460		625	
	%	**39**	79	2-5	88	2-5	101	2-5	104	2-5
Thames	mm	**34**	126		323		525		743	
	%	**67**	82	2-5	91	2-5	97	2-5	106	2-5
Southern	mm	**40**	153		399		617		809	
	%	**76**	90	2-5	95	2-5	98	2-5	103	2-5
Wessex	mm	**42**	153		395		672		923	
	%	**79**	80	2-5	86	2-5	99	2-5	108	2-5
South West	mm	**84**	223		556		963		1300	
	%	**120**	82	2-5	82	2-5	99	2-5	109	2-5
Welsh	mm	**74**	173		549		1097		1398	
	%	**89**	59	10-20	75	10-20	100	<2	104	2-5
Scotland	**mm**	**81**	**305**		**756**		**1255**		**1496**	
	%	**100**	**97**	**2-5**	**97**	**2-5**	**104**	**2-5**	**102**	**2-5**
Highland	mm	**87**	426		1028		1564		1791	
	%	**93**	112	2-5	108	2-5	109	5-10	103	2-5
North East	mm	**42**	205		462		783		977	
	%	**61**	93	2-5	88	2-5	97	2-5	95	2-5
Tay	mm	**69**	224		578		999		1216	
	%	**102**	80	2-5	84	2-5	96	2-5	94	2-5
Forth	mm	**49**	166		428		900		1126	
	%	**80**	69	5-10	72	10-20	98	2-5	98	2-5
Tweed	mm	**40**	155		398		850		1113	
	%	**66**	73	5-10	78	5-10	108	2-5	111	5-10
Solway	mm	**88**	228		663		1281		1563	
	%	**111**	76	2-5	89	2-5	109	5-10	109	5-10
Clyde	mm	**121**	333		852		1463		1759	
	%	**136**	91	2-5	92	2-5	101	2-5	100	<2
Northern Ireland	**mm**	**109**	**207**		**500**		**966**		**1182**	
	%	**164**	**87**	**2-5**	**88**	**5-10**	**110**	**5-10**	**108**	**2-5**

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

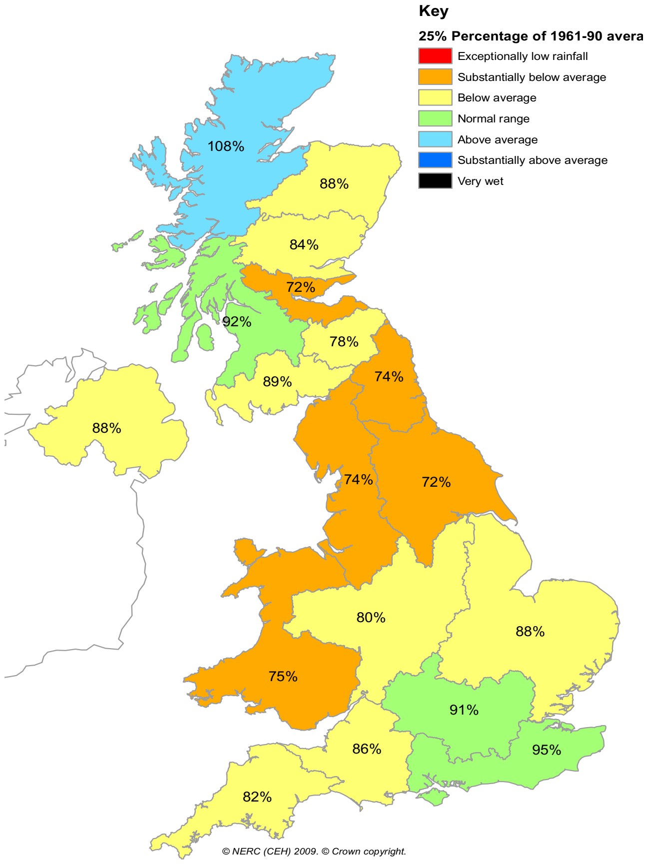
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and derived following 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 September 2008 are provisional.

Rainfall . . . Rainfall . . .

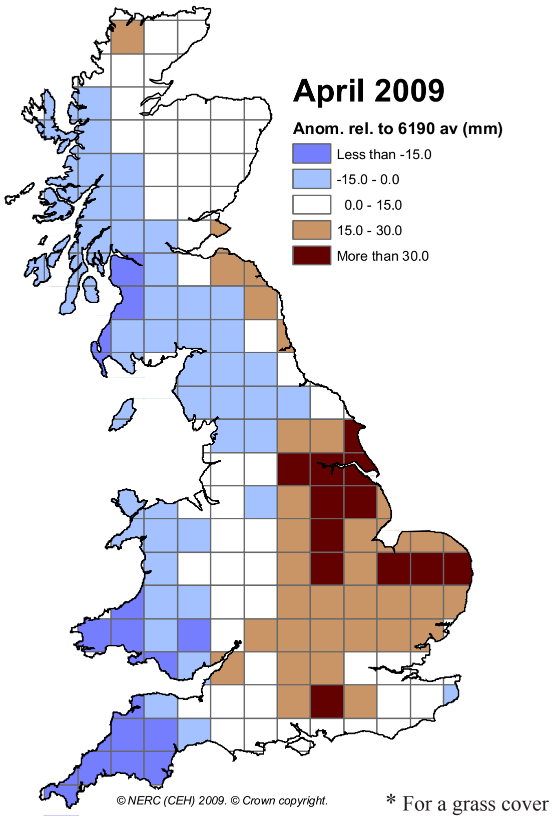
February - April 2009



November 2008 - April 2009



MORECS Soil Moisture Deficits *



* For a grass cover

Met Office Spring / Summer 2009 forecast

Forecast for the Spring 2009:
issued 23 April 2009

Temperature
UK temperatures for the rest of spring are likely to be either near or above average.

Rainfall
UK precipitation is likely to be average or below average.

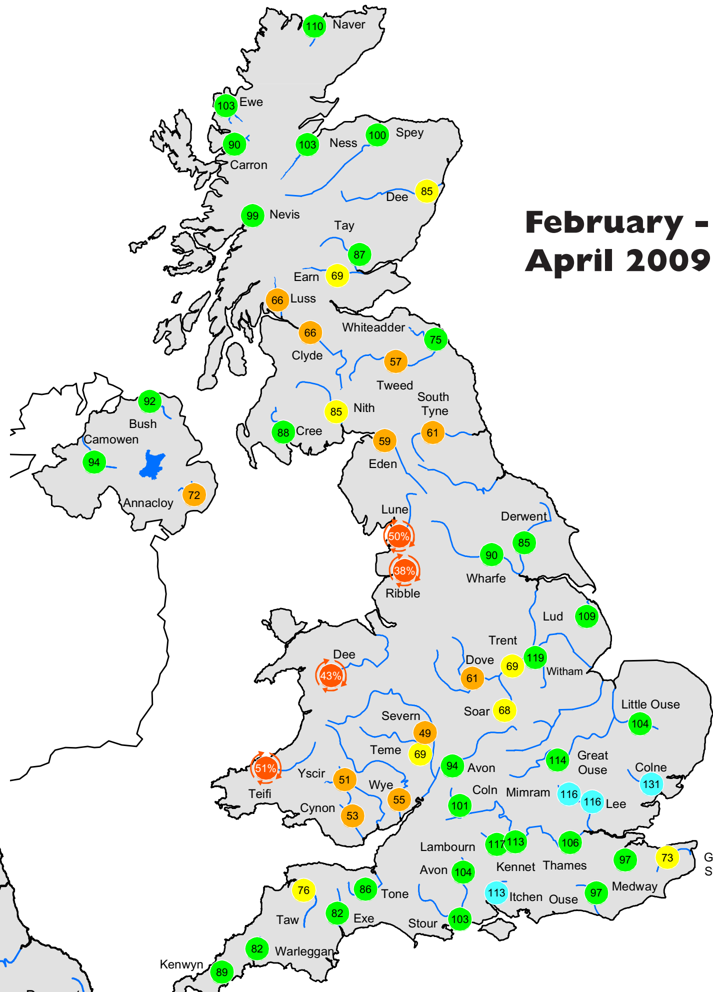
Forecast for the Summer 2009:
issued 30 April 2009

Temperature
For the UK and much of Europe temperatures are likely to be above average.

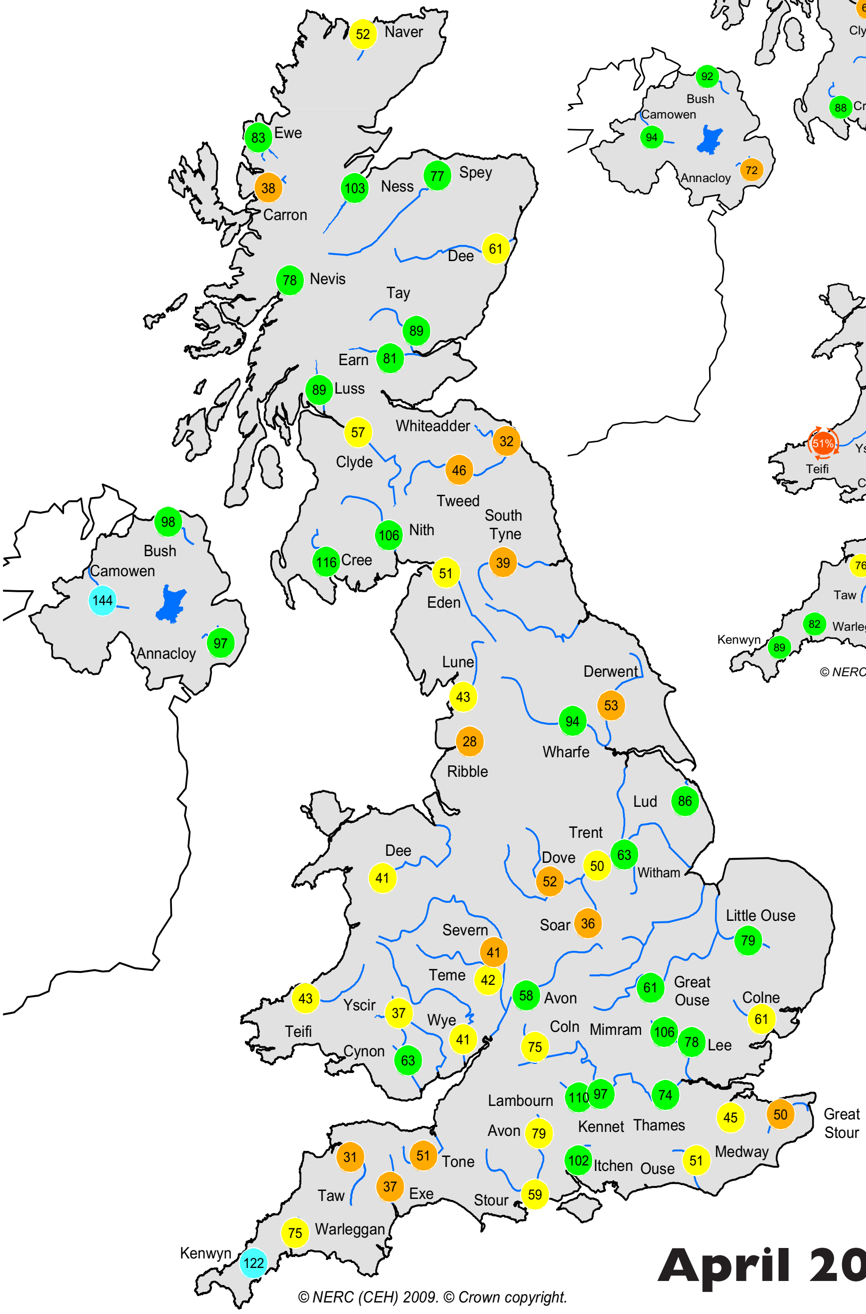
Rainfall
For the UK and much of northern Europe rainfall is likely to be near or below average. A repeat of the wet summers of 2007 and 2008 is unlikely.
Average or below-average rainfall is also likely over eastern Europe.

Updates and reviews of the forecast
The summer forecast will be updated by 11 a.m. on 28 May 2009.
For further details please visit:
http://www.metoffice.gov.uk/science/creating/monthsahead/seasonal/2009/summer.html

River flow . . . River flow . . .



February - April 2009



Key

25 % of long-term average (record figure when circled)

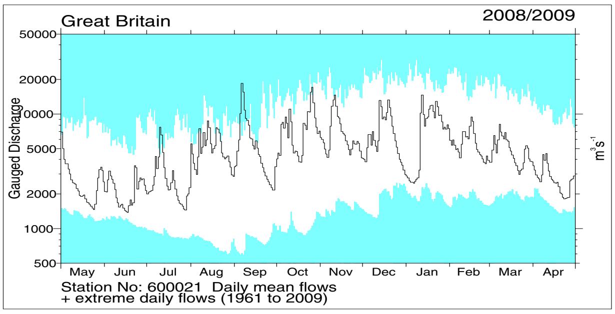
- Exceptionally high flow
- Notably high flow
- Above normal
- Normal range
- Below normal
- Notably low flow
- Exceptionally low flow

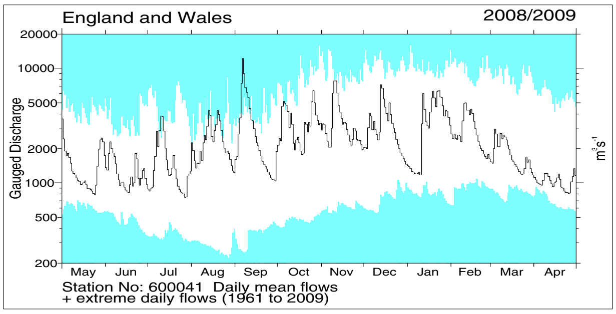
*Based on ranking of the monthly flow**

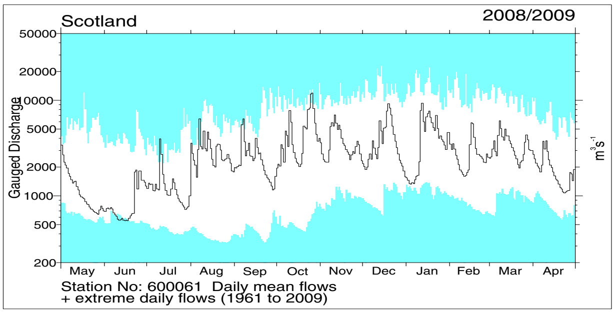
April 2009

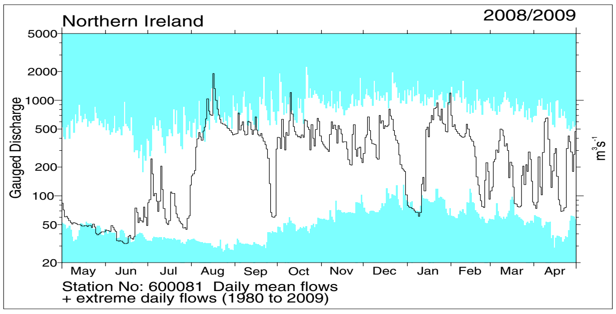
River flows

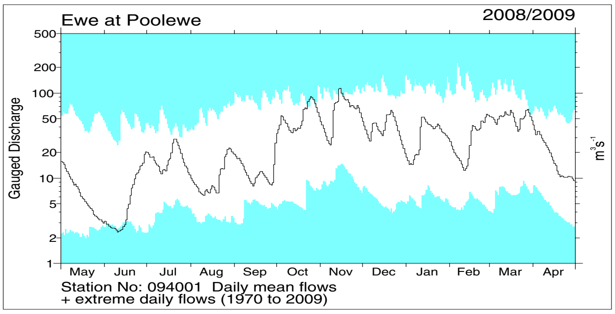
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

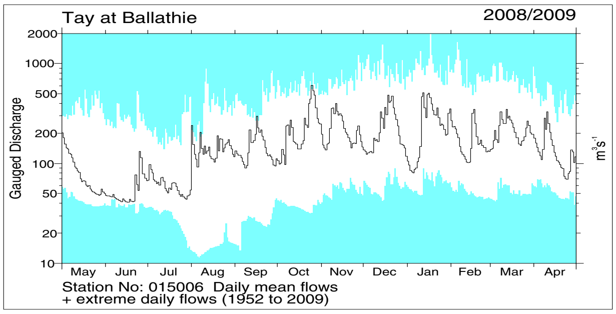


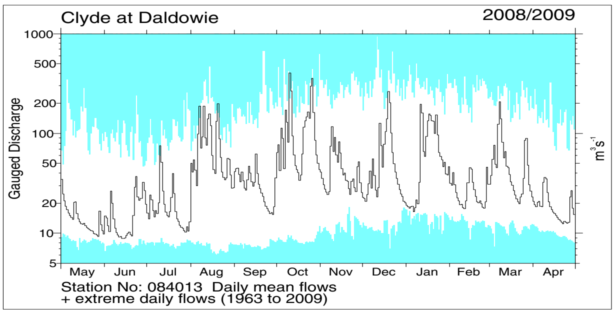


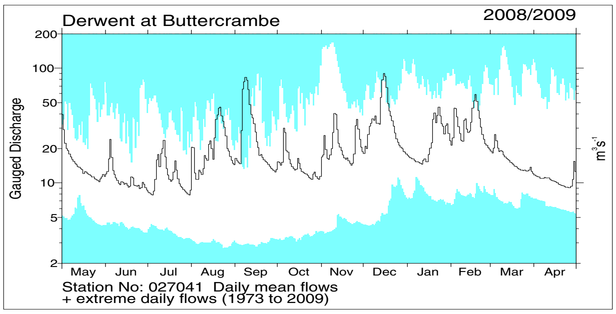


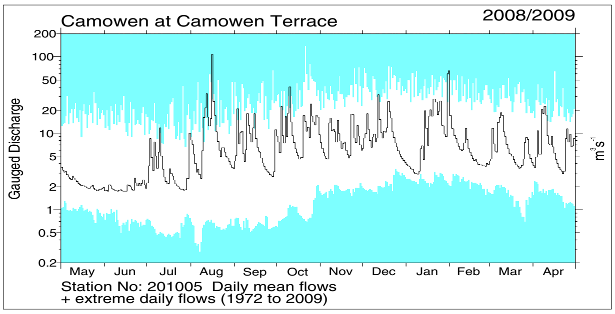


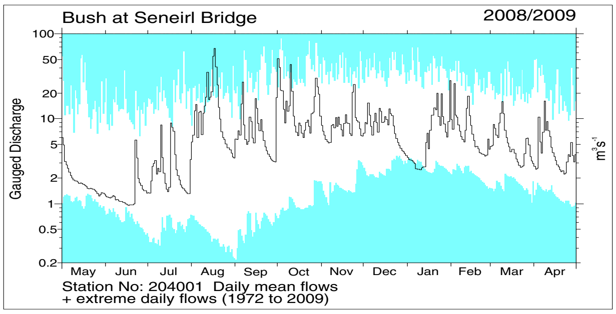








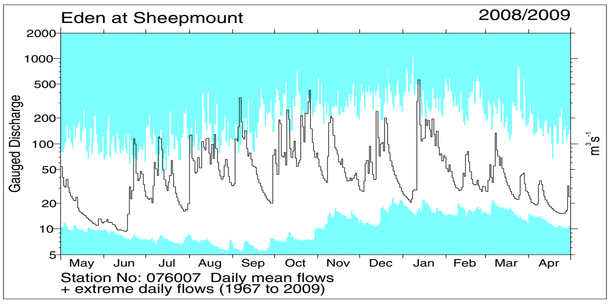


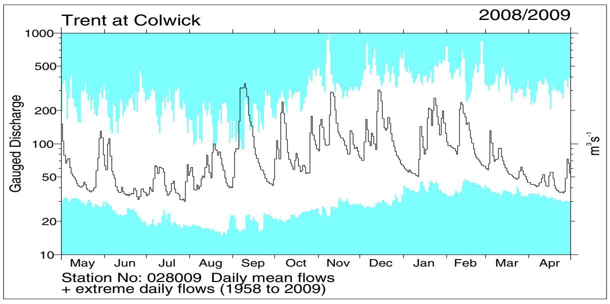


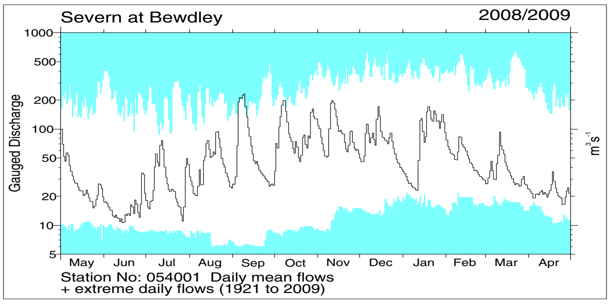
River flow hydrographs

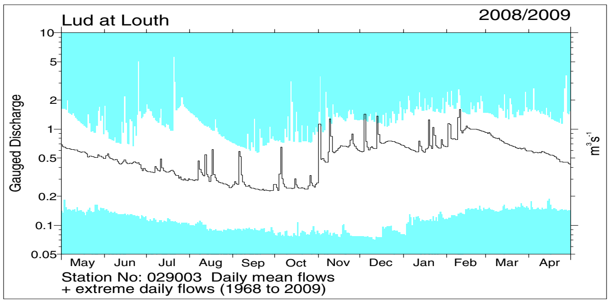
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to May 2008 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

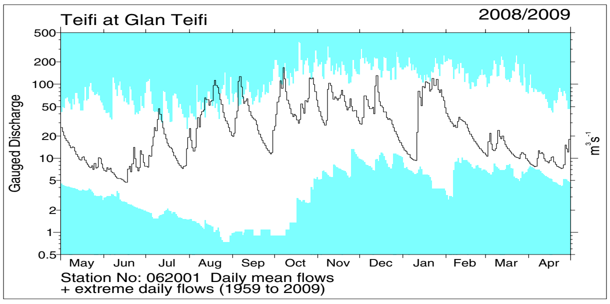
River flow . . . River flow . . .

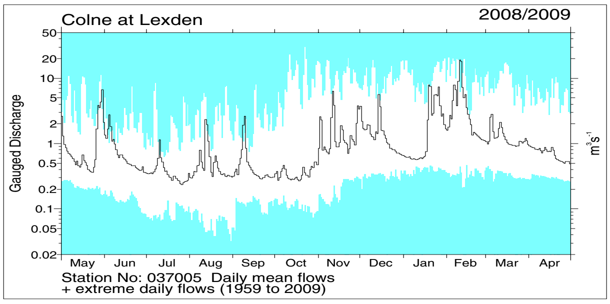


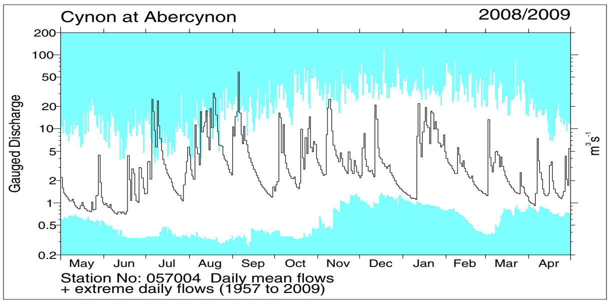


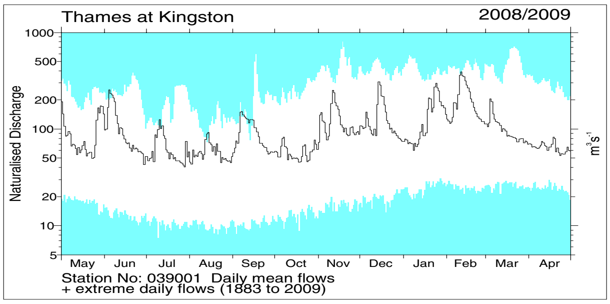


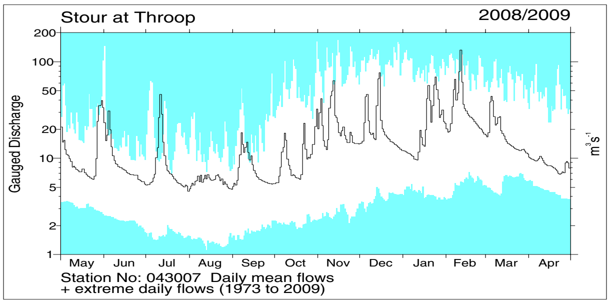


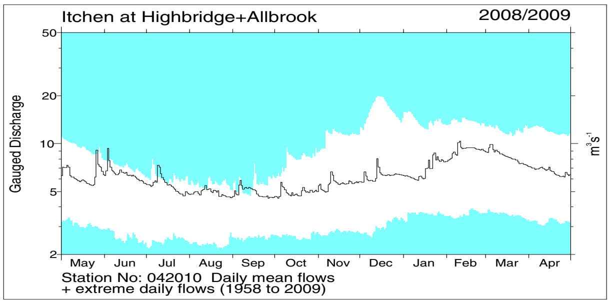












Notable runoff accumulations (a) February - April 2009, (b) November 2008 - April 2009

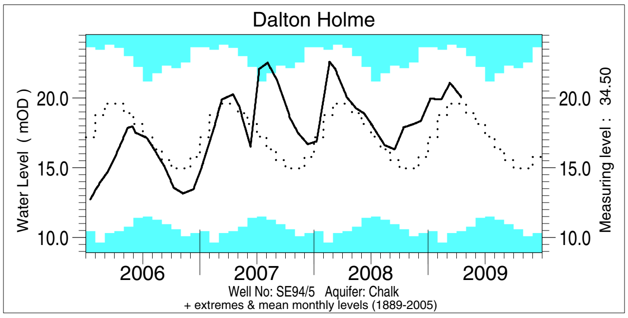
	River	%lta	Rank
a)	Forth	62	3/28
	Tweed (Boleside)	57	4/49
	Tyne (Bywell)	61	5/52
	Dove	61	3/48
	Severn	49	7/88
	Wye	55	6/73
	Cynon	53	3/51

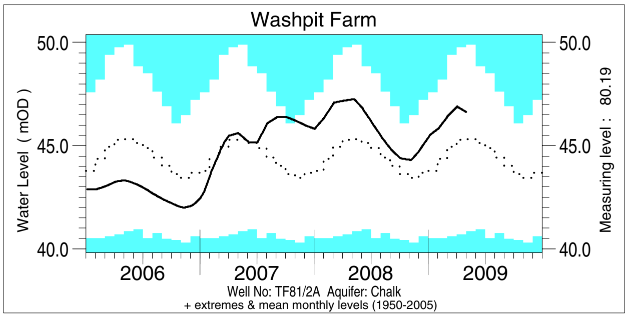
	River	%lta	Rank
a)	Teifi	51	=1/49
	Dee (Manley Hall)	46	1/72
	Ribble	38	1/49
	Lune	50	1/49
	Eden	59	4/42
	Annacloy	72	3/30

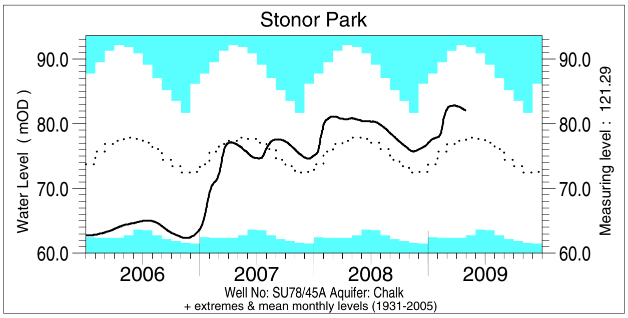
	River	%lta	Rank
b)	S Tyne	74	4/47
	Yscir	67	2/36
	Luss	73	2/30
	Faughan	80	5/33
	Bush	83	4/35
	Lagan	64	2/36

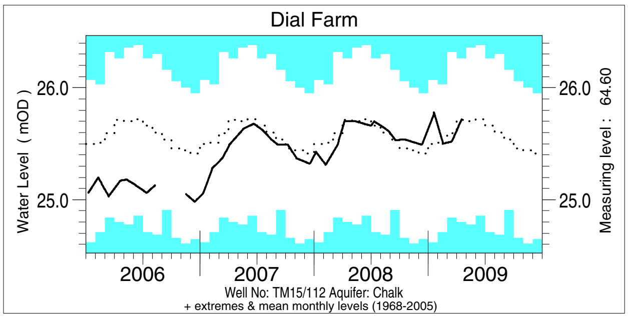
lta = long term average
Rank 1 = lowest on record

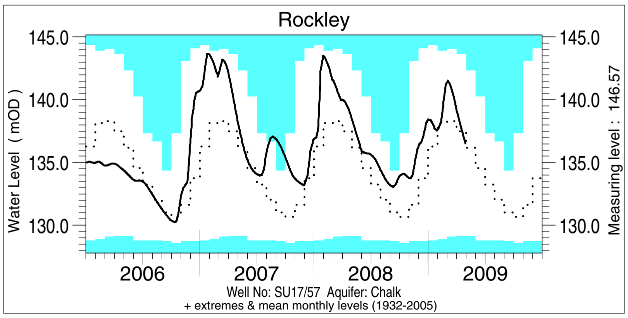
Groundwater . . . Groundwater

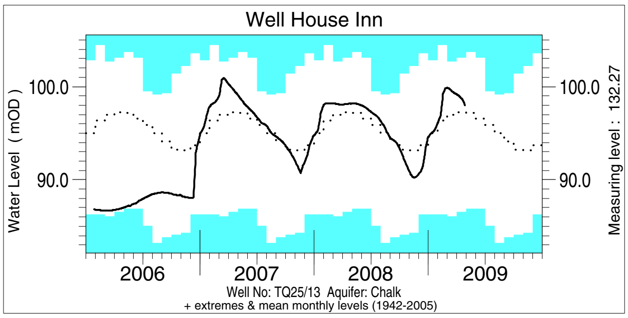


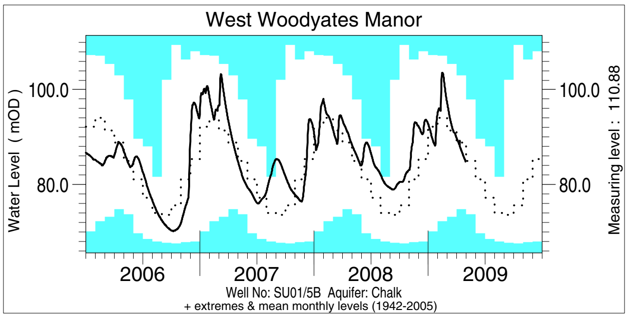


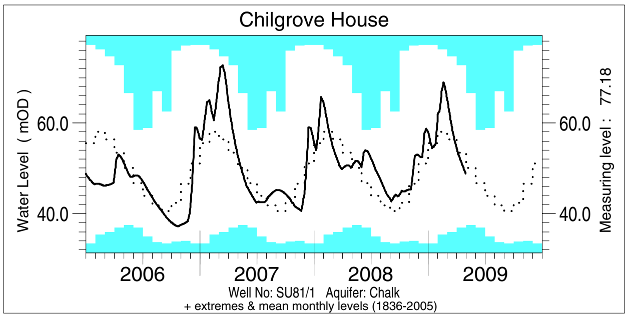


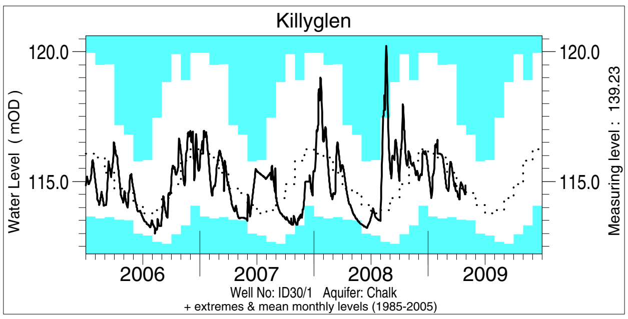


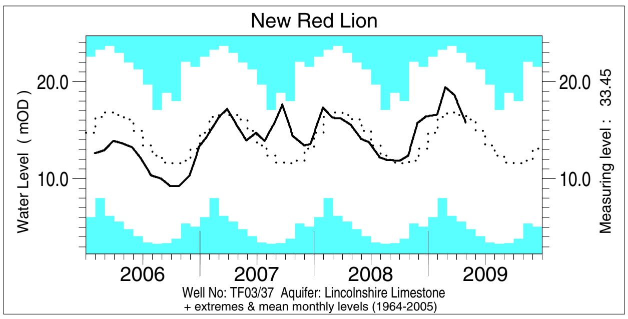






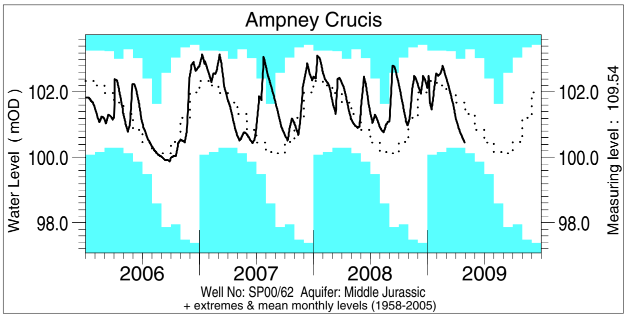


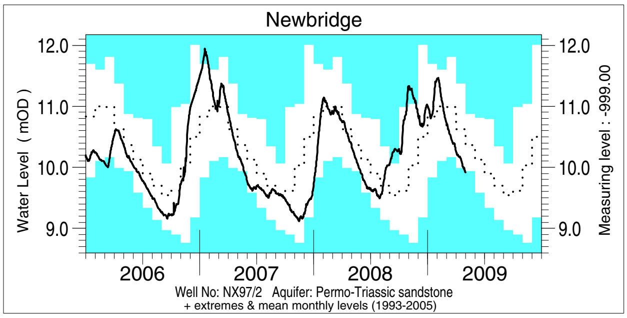


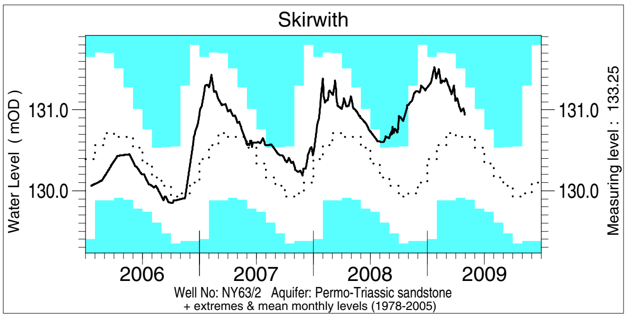


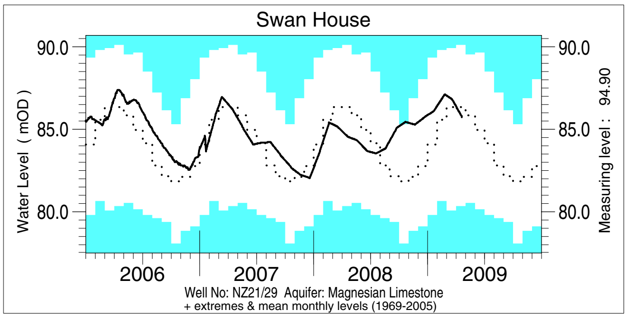
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

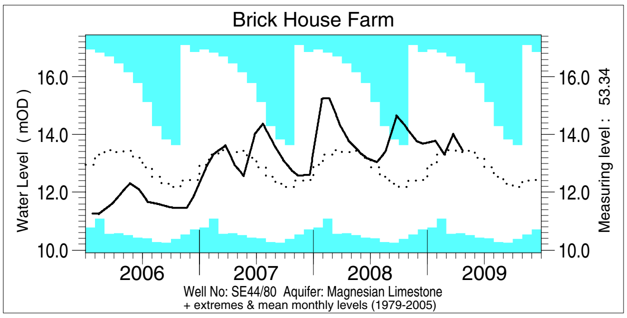
Groundwater . . . Groundwater

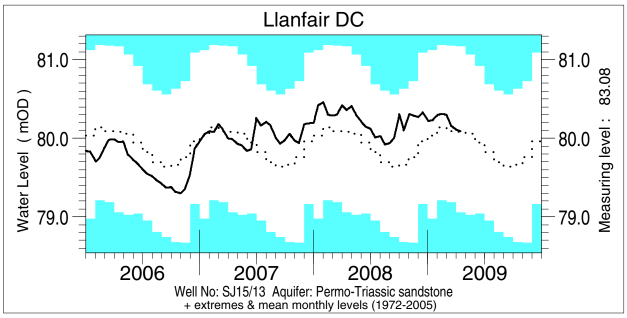


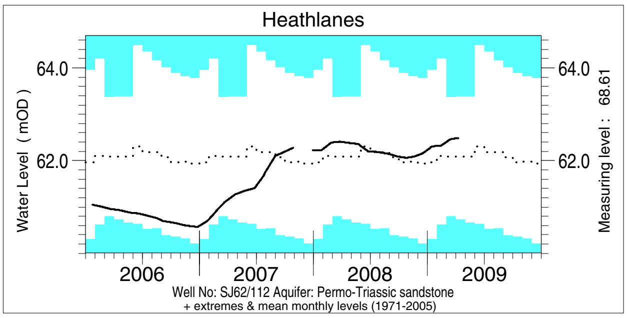


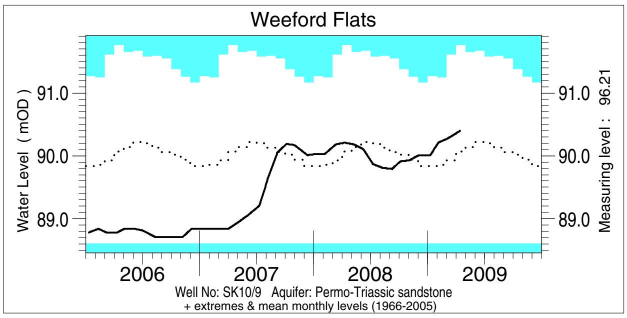


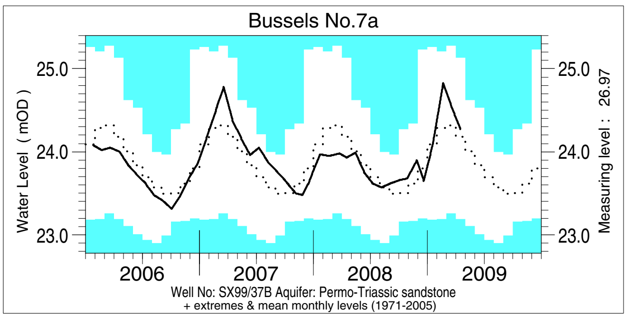


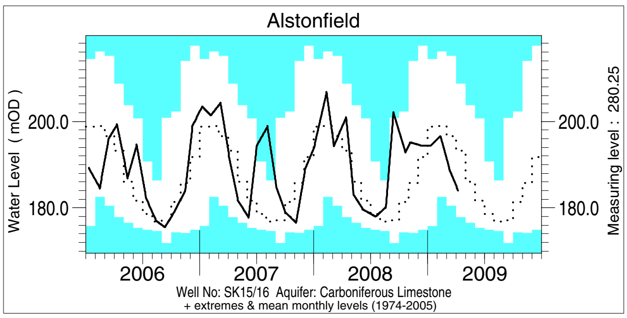












Groundwater levels April / May 2009

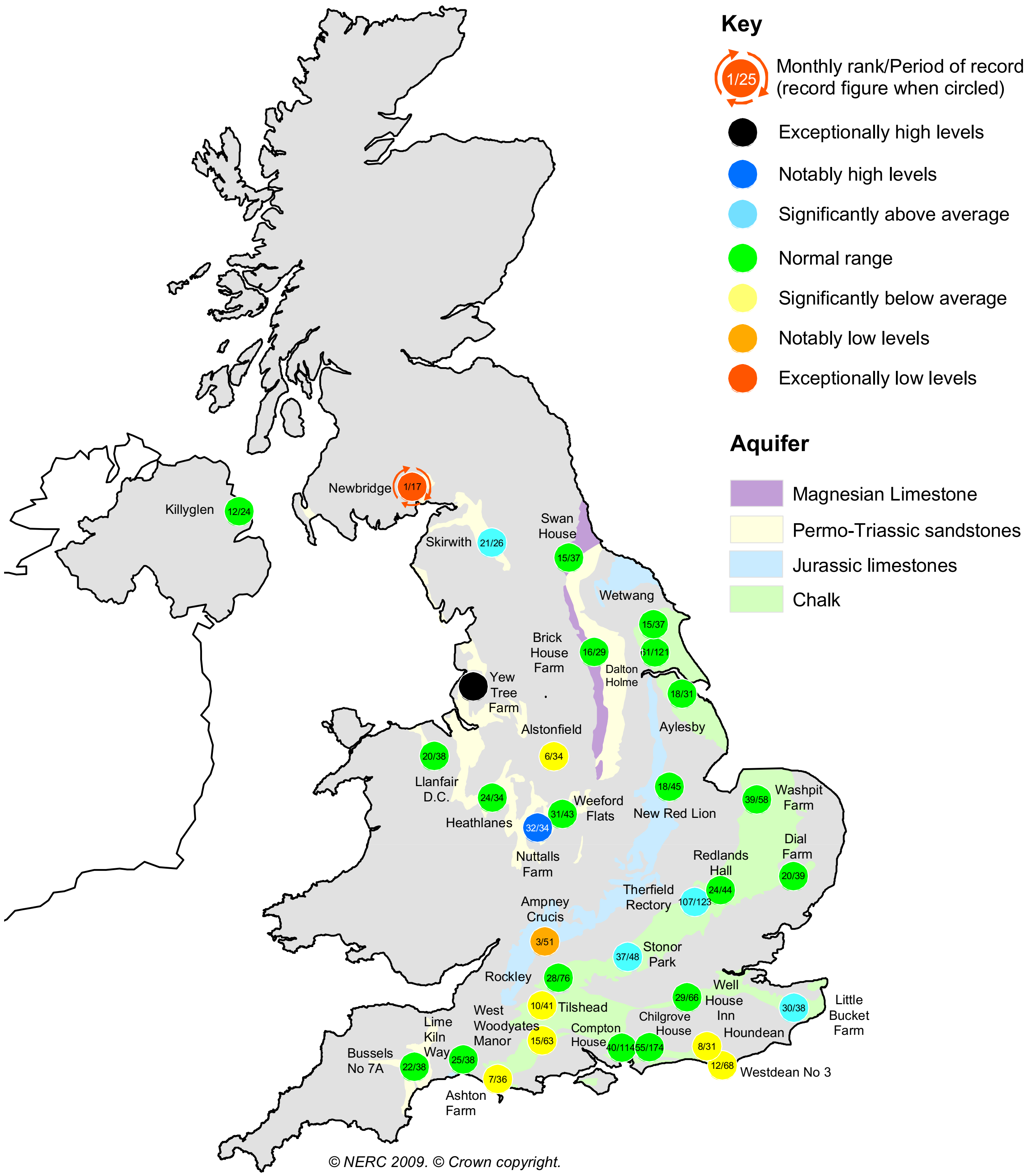
Borehole	Level	Date	Apr. av.
Dalton Holme	20.06	16/04	19.49
Washpit Farm	46.63	01/05	45.42
Stonor Park	82.08	29/04	77.48
Dial Farm	25.72	17/04	25.67
Rockley	136.52	29/04	137.54
Well House Inn	98.02	27/04	97.12
West Woodyates	84.83	30/04	88.43

Borehole	Level	Date	Apr. av.
Chilgrove House	48.87	30/04	52.25
Killyglen (NI)	114.86	30/04	114.92
New Red Lion	15.76	30/04	16.34
Ampney Crucis	100.46	29/04	101.71
Newbridge	9.92	01/05	10.56
Skirwith	130.94	30/04	130.65
Swan House	85.72	20/04	85.67

Borehole	Level	Date	Apr av.
Brick House Farm	13.43	23/04	13.34
Llanfair DC	80.09	15/04	80.06
Heathlanes	62.49	09/04	62.04
Weeford Flats	90.40	14/04	89.86
Bussels No.7a	24.27	16/04	24.16
Alstonfield	183.94	07/04	193.33

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



Groundwater levels - April 2009

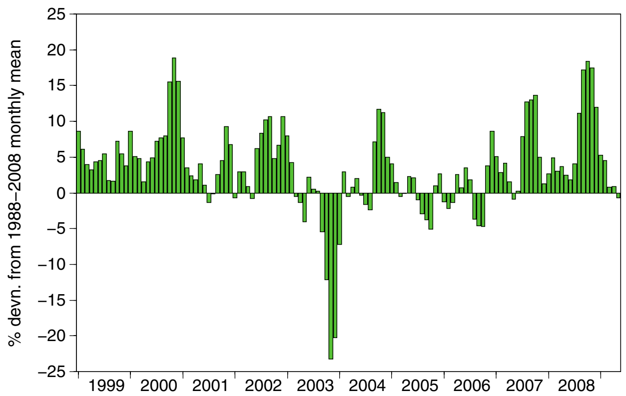
The rankings are based on a comparison between the average level in the featured month (but often only single readings are available) and the average level in each corresponding month on record. They need to be interpreted with caution especially when groundwater levels are changing rapidly or when comparing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

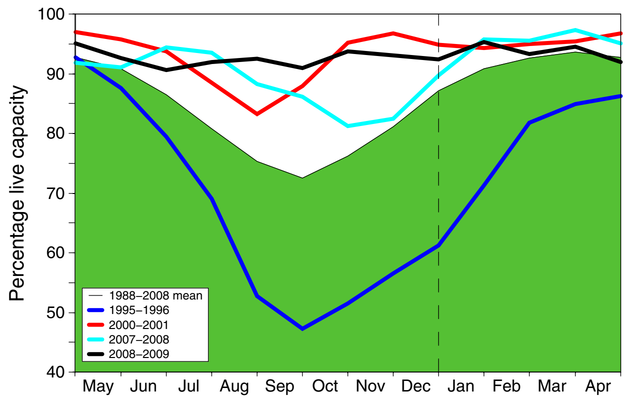
ii. Yew Tree Farm levels are received quarterly.

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 Mar	Apr	May	May Anom.	Min May	Year* of min	2008 May	Diff 09-08
North West	N Command Zone	•	124929	87	85	**80**	-9	74	2003	91	-11
	Vyrnwy		55146	92	94	**85**	-8	70	1996	99	-14
Northumbrian	Teesdale	•	87936	91	96	**95**	4	74	2003	97	-2
	Kielder		(199175)	(90)	(90)	**(90)**	-1	(85)	1990	(93)	-3
Severn Trent	Clywedog		44922	87	95	**97**	0	85	1988	100	-3
	Derwent Valley	•	39525	94	95	**84**	-9	54	1996	99	-15
Yorkshire	Washburn	•	22035	95	93	**86**	-4	76	1996	96	-10
	Bradford supply	•	41407	97	94	**85**	-6	60	1996	96	-11
Anglian	Grafham		(55490)	(94)	(95)	**(95)**	1	(73)	1997	(96)	-1
	Rutland		(116580)	(91)	(93)	**(90)**	-2	(72)	1997	(93)	-3
Thames	London	•	202828	95	97	**98**	4	86	1990	90	8
	Farmoor	•	13822	86	100	**95**	-2	81	2000	96	-1
Southern	Bewl		28170	88	92	**90**	0	63	1990	98	-8
	Ardingly		4685	100	100	**100**	0	98	2005	100	0
Wessex	Clatworthy		5364	100	98	**84**	-9	81	1990	94	-10
	Bristol WW	•	(38666)	(98)	(97)	**(92)**	-1	(85)	2005	(96)	-4
South West	Colliford		28540	100	100	**100**	15	56	1997	91	9
	Roadford		34500	97	95	**92**	7	41	1996	93	-1
	Wimbleball		21320	100	100	**96**	2	79	1992	99	-3
	Stithians		5205	100	96	**96**	6	65	1992	88	8
Welsh	Celyn and Brenig	•	131155	99	100	**99**	2	75	1996	100	-1
	Brianne		62140	96	97	**95**	-2	86	1997	100	-5
	Big Five	•	69762	93	95	**89**	-4	85	1997	96	-7
	Elan Valley	•	99106	97	98	**94**	-3	87	2003	99	-5
Scotland(E)	Edinburgh/Mid Lothian	•	97639	99	100	**98**	5	62	1998	99	-1
	East Lothian	•	10206	99	99	**100**	2	89	1992	100	0
Scotland(W)	Loch Katrine	•	111363	89	98	**93**	1	83	2001	90	3
	Daer		22412	99	99	**97**	1	89	2003	97	0
	Loch Thom	•	11840	94	96	**96**	1	88	2003	91	5
Northern Ireland	Total+	•	61600	93	87	**92**	5	77	2007	83	9
	Silent Valley	•	20634	91	82	**84**	2	58	2000	82	2

() 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.
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.

For further details please contact:

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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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