Hydrological Summary
for the United Kingdom

October 2007

General

October was a mild and relatively dry month across most of the country; vying with 2003 as the 2nd driest October since 1977 for the UK as a whole. Correspondingly, reservoir stocks declined appreciably but still remain in the normal range across much of the country. Scheduled releases for maintenance purposes at Kielder Reservoir have contributed to the decline in overall stocks for England & Wales but they still remain appreciably above the late autumn average. Healthy stocks characterise most impoundments but stocks are seasonally low in parts of Scotland (e.g. Loch Katrine). Some minor spates were reported in response to significant frontal rainfall in October but, generally, river flows were considerably below average except in spring-fed streams and rivers. In marked contrast to the late summer, late October soils were drier than the seasonal norm over wide areas. Correspondingly, aquifer recharge rates were generally very modest. Whilst groundwater levels in most index wells are within, or above, the normal range, there is an unusual degree of spatial variability across the major outcrop areas. Beneficially, the dry autumn has substantially reduced the risk of groundwater flooding through the coming winter.

Rainfall

Despite an evident autumnal complexion to the weather, relatively few active frontal systems crossed the UK during October. High pressure dominated synoptic patterns but active low pressure systems generated widespread rainfall on the 9th and 16th (when 54mm was recorded in the Thames headwaters). The last week was also unsettled; Invergulas (Strathclyde) registered 59.5mm on the 27th. October rainfall totals exceeded the average in parts of central southern England (and the Outer Hebrides) but most catchment totals were well below average, falling below 40% in parts of Devon and eastern Scotland. Relatively dry conditions have prevailed since late July across much of the country; the provisional August-October rainfall total for England & Wales is the 2nd lowest since 1978. In this timeframe, the Severn-Trent region recorded its 2nd lowest rainfall (after 2003) in over 40 years; much of the North East was also notably dry. Some areas (e.g. in Gloucestershire) recorded only around 20% of the May-July rainfall in the subsequent three months: a remarkable contrast in a UK context. Notwithstanding the dry autumn, regional 6-month and 12-month rainfall totals are well above average across almost all of Great Britain.

River Flows

The seasonally belated recessions in river flows continued through most of October, punctuated by modest spates in mid-month in parts of the English Lowlands (the Bedford Ouse registered its 2nd highest October daily flow in the last 20 years). Upturns in runoff rates were more widespread near month-end in northern Britain. In a few index rivers, flows closely approached their October minimum in the third week; examples include the Annacloy (Northern Ireland) and the Teifi which reported its lowest October runoff in a series from 1959. Flows were also particularly depressed in parts of eastern Scotland (e.g. in the Dee) and October runoff totals were below average in responsive catchments across almost all of the UK. By contrast, flows remained well above average in many spring-fed rivers in eastern and southern England – much more a reflection of sustained high baseflow contributions than the October rainfall. The Lambourn registered its 4th successive new monthly maximum runoff total in a 45-yr record and, despite the notably low rainfall since July, Aug-Oct runoff totals were significantly greater than previous maxima in a number of groundwater-fed rivers (including the Lud, Coln and Kennet). Echoes of the extraordinary summer runoff are clearly evident in longer term runoff accumulations. Estimated total outflows for England & Wales for the Jan-Oct period are the highest on record (in a series from 1961) with unprecedented totals also registered for many of the flood-afflicted basins (e.g. the Warwickshire Avon, Teme, Coln and Dover Beck).

Groundwater

As a consequence of the spatially very variable rainfall patterns over the last six months, soil moisture conditions showed substantial regional and local variations in October. In many northern aquifer outcrop areas late-October soils were drier than average but soil moisture deficits were below average across much of the Cotswolds and large parts of the Chalk outcrop, from Wiltshire to Norfolk. This allowed modest infiltration in a few areas (e.g. in parts of the Cotswolds and the Chalk north of London). Generally however groundwater levels continued to recess through the month. There were exceptions: modest groundwater level rises were reported in a few minor aquifers (e.g. the Sandringham Sands) and, more widely, the post 2004-06 drought recovery continues in the slow-responding Permo-Triassic sandstones outcrops in the Midlands (see the Heathlanes hydrograph). The particularly dry autumn is more immediately reflected in the low groundwater levels in the most northerly index wells (e.g. Killyglen). To the south, most index wells reported above average October levels, notably so in the Chalk where, despite recent recessions, record October levels were reported for Washpit Farm and Aylesby; levels also remain seasonally high in parts of the south-western outcrop (e.g. at Rockley). After notable summer maxima, groundwater levels in most limestone aquifers have returned to the normal range. This is true of most Permo-Triassic sandstones outcrops also. The dry autumn has moderated, but not eliminated, the risk of groundwater flooding in vulnerable areas through the winter.

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

Rainfall accumulations and return period estimates

Area	Rainfall	Oct 2007	Aug 07-Oct 07	RP	May 07-Oct 07	RP	Jan 07-Oct 07	RP	Nov 06-Oct07	RP
England & Wales	**mm**	**48**	**159**		**556**		**843**		**1083**	
	%	**56**	**66**	**5-15**	**129**	**10-20**	**117**	**5-15**	**120**	**10-20**
North West	mm	**65**	249		695		1066		1434	
	%	**50**	70	5-10	116	5-10	110	5-10	118	10-20
Northumbrian	mm	**30**	136		490		730		922	
	%	**39**	58	10-20	115	2-5	105	2-5	106	2-5
Severn Trent	mm	**36**	115		536		778		957	
	%	**54**	57	10-20	143	30-40	126	20-30	125	10-20
Yorkshire	mm	**33**	124		521		766		956	
	%	**45**	56	10-20	129	5-15	114	5-10	114	5-10
Anglian	mm	**49**	136		461		627		746	
	%	**96**	86	2-5	150	50-70	128	20-30	124	10-20
Thames	mm	**53**	133		472		693		878	
	%	**83**	73	5-10	137	10-20	123	5-15	125	10-20
Southern	mm	**43**	129		437		677		873	
	%	**54**	62	5-15	120	2-5	110	2-5	111	2-5
Wessex	mm	**55**	143		516		797		1040	
	%	**68**	64	5-15	131	5-10	118	5-10	122	5-15
South West	mm	**48**	189		623		1074		1395	
	%	**41**	63	5-15	122	5-10	116	5-15	117	5-15
Welsh	mm	**60**	232		745		1202		1636	
	%	**43**	64	5-15	122	5-10	115	5-10	122	5-15
Scotland	**mm**	**96**	**338**		**711**		**1277**		**1780**	
	%	**60**	**80**	**2-5**	**103**	**2-5**	**110**	**5-10**	**121**	**60-90**
Highland	mm	**133**	456		843		1583		2207	
	%	**69**	93	2-5	107	5-10	117	10-20	127	>100
North East	mm	**38**	209		581		898		1120	
	%	**36**	73	5-10	115	5-10	108	5-10	109	5-10
Tay	mm	**65**	232		637		1141		1632	
	%	**48**	65	5-10	106	2-5	111	5-10	127	40-60
Forth	mm	**69**	243		606		1041		1468	
	%	**58**	74	5-10	109	2-5	114	5-10	128	40-60
Tweed	mm	**44**	184		551		862		1158	
	%	**44**	66	5-10	111	2-5	107	2-5	115	5-15
Solway	mm	**75**	281		678		1154		1650	
	%	**47**	66	5-10	98	2-5	101	2-5	115	10-20
Clyde	mm	**127**	394		786		1461		2127	
	%	**64**	76	2-5	95	2-5	106	2-5	121	20-35
Northern Ireland	**mm**	**62**	**218**		**568**		**894**		**1163**	
	%	**54**	**70**	**5-10**	**108**	**2-5**	**101**	**2-5**	**106**	**2-5**

% = percentage of 1961-90 average

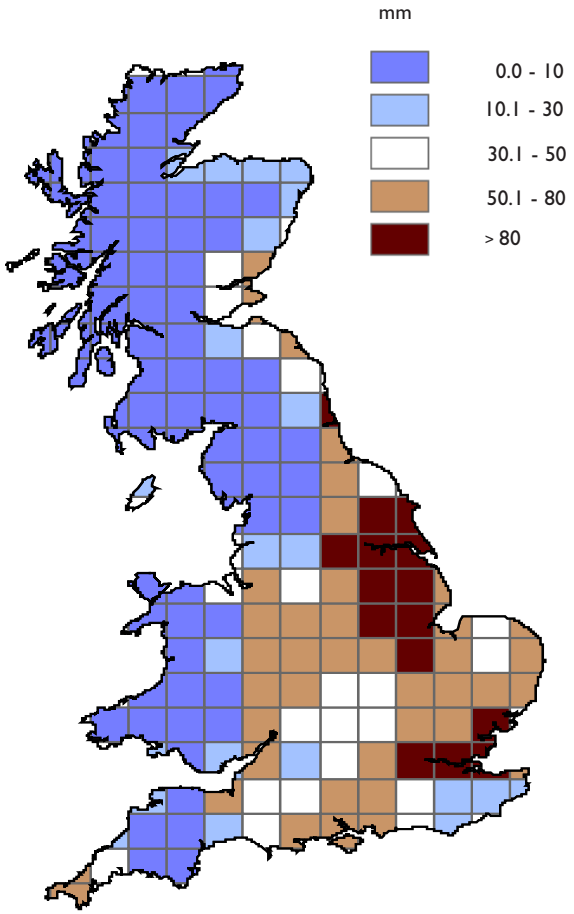
RP = Return period

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.

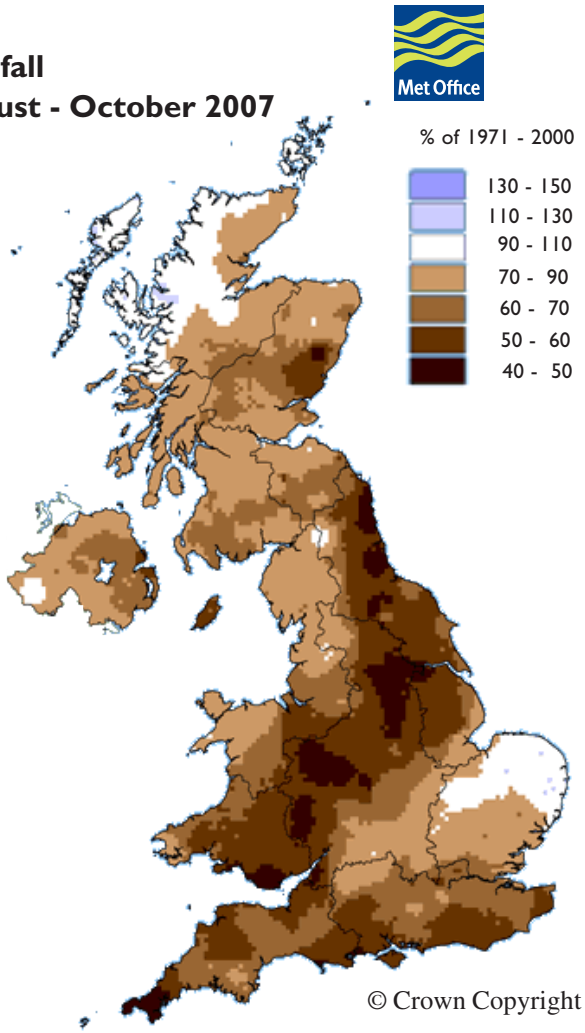
All monthly rainfall totals since May 2007 are provisional.

Rainfall . . . Rainfall . . .

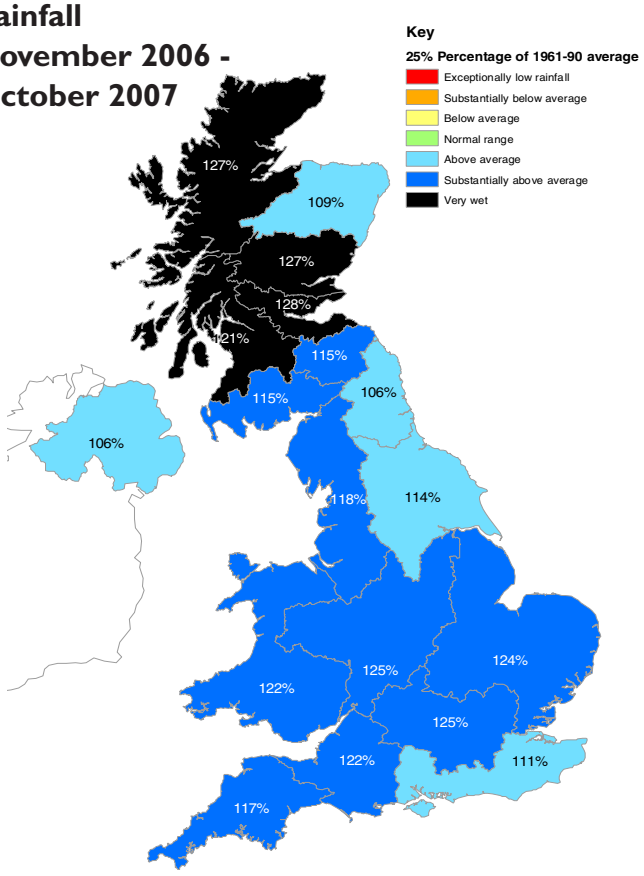
Soil Moisture Deficit
October 2007



Rainfall
August - October 2007



Rainfall
November 2006 - October 2007



Met Office Winter 2007/8 forecast

Forecast for Winter 2007/8 issued 23 October 2007

This year conditions in the North Atlantic ocean favour a near-neutral winter North Atlantic Oscillation (NAO), rather than the positive phase predicted and observed last winter. However, La Niña conditions are present in the tropical Pacific Ocean and are expected to intensify. There is evidence that La Niña has a weak influence on European winter climate; favouring positive NAO in the latter part of winter.

Temperature: For the UK as a whole, winter-mean temperatures are more likely to be above normal than near or below normal. Although a winter milder than the 1971-2000 average is favoured, temperatures are likely to be lower than those experienced in the very mild winter last year.

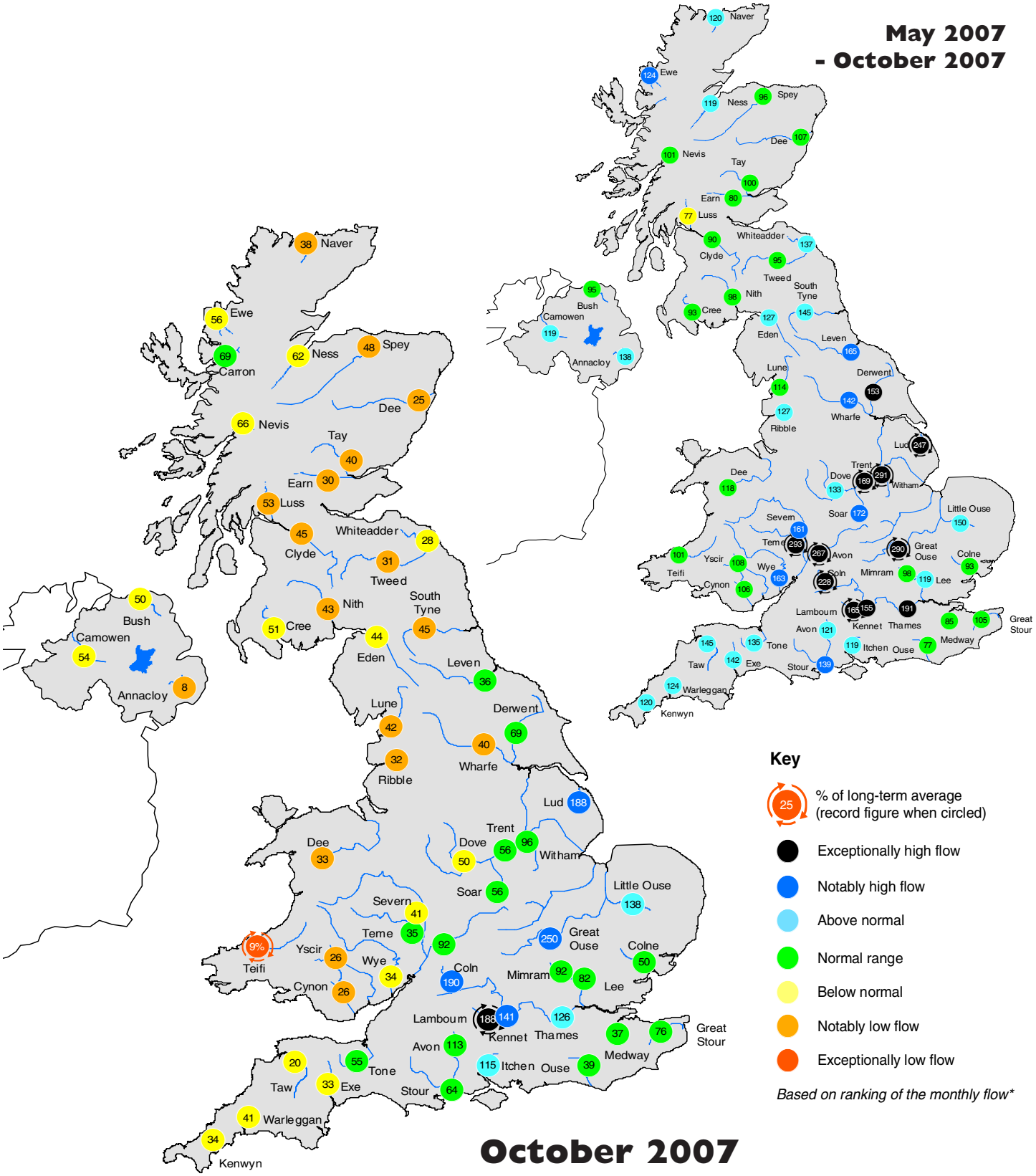
Precipitation: Forecast methods continue to favour a drier winter than last year over the UK as a whole. However, the signal is currently insufficient to indicate whether winter precipitation totals are more likely to be above, near or below the 1971-2000 average.

The autumn forecast will be next updated on 22 November 2007.

For further details please visit:

http://www.metoffice.gov.uk/weather/seasonal/winter2007_8/uk.index

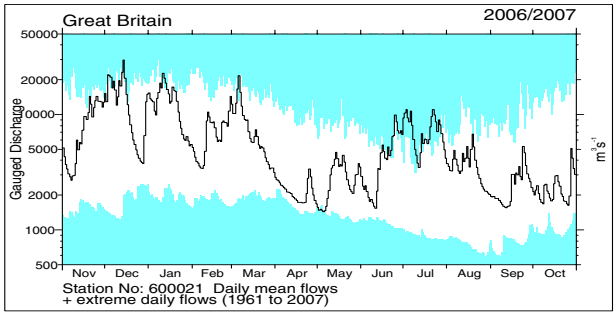
River flow . . . River flow . . .

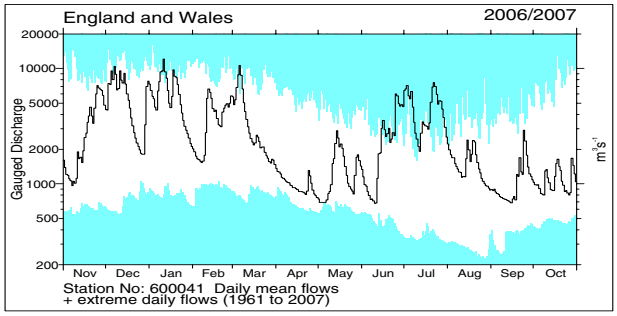


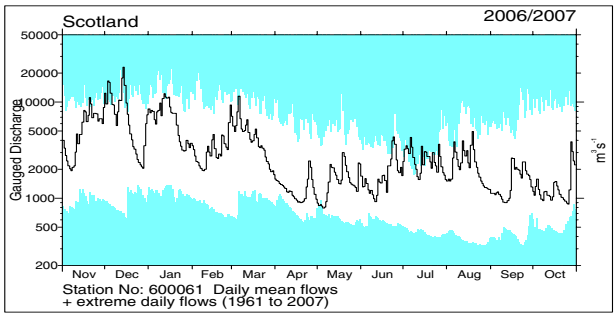
River flows

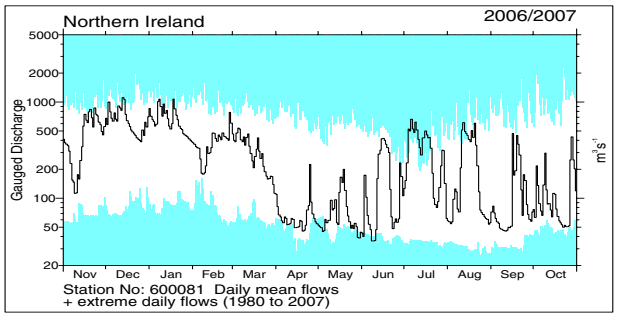
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much greater. Note: the period of record on which these percentages are based varies from station to station. Percentages may be omitted where flows are under review.

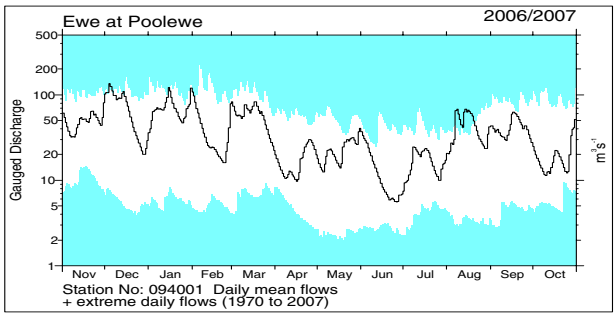
River flow . . . River flow . . .

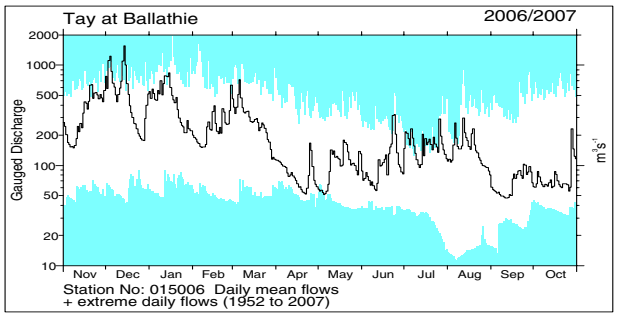


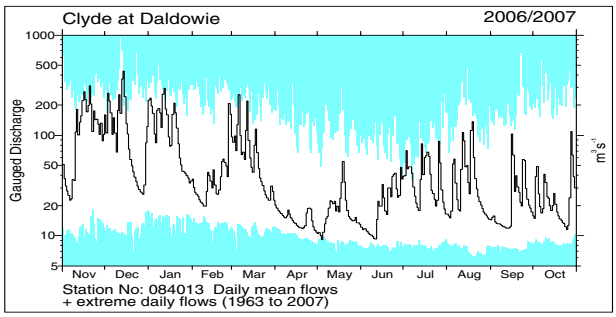


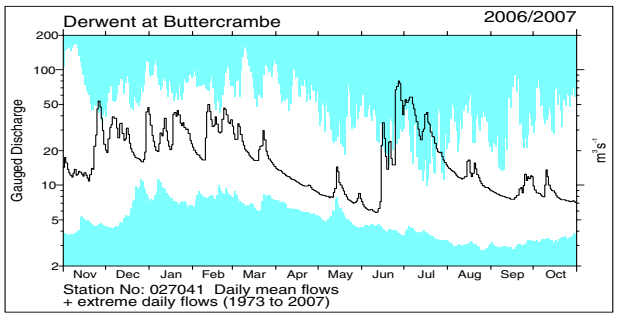


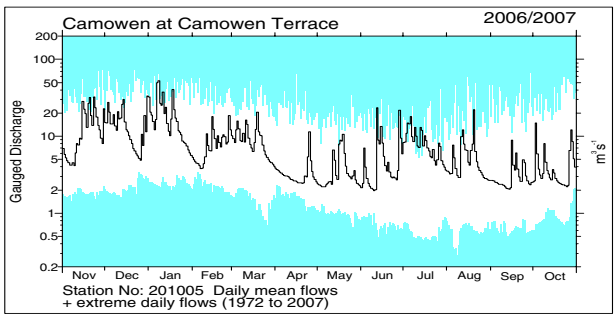


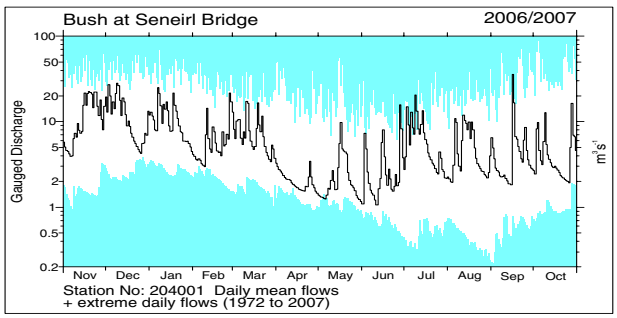








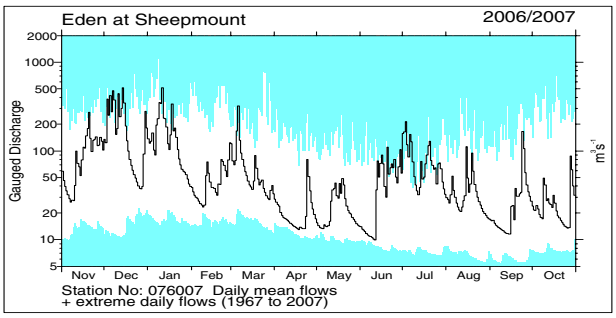


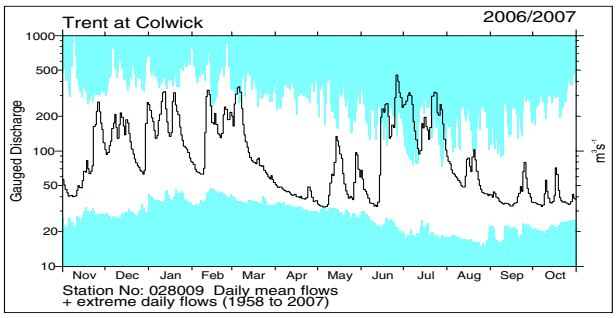


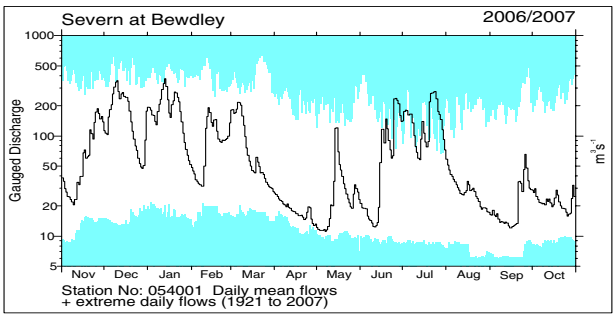
River flow hydrographs

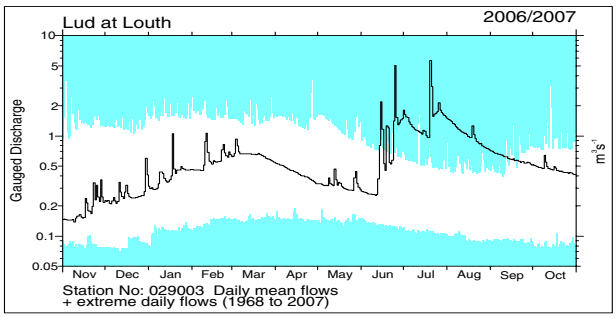
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to November 2006 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

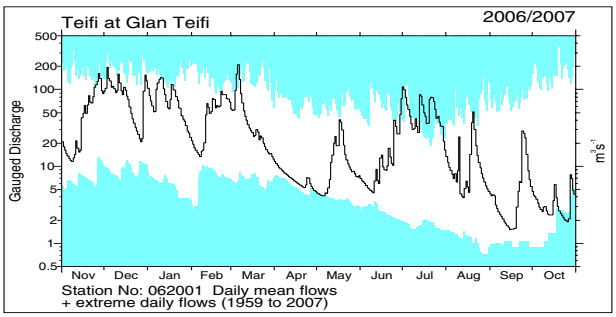
River flow . . . River flow . . .

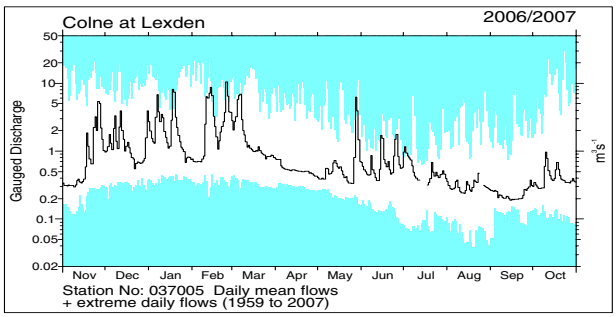


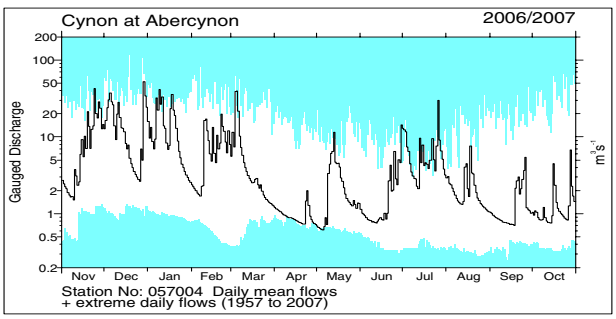


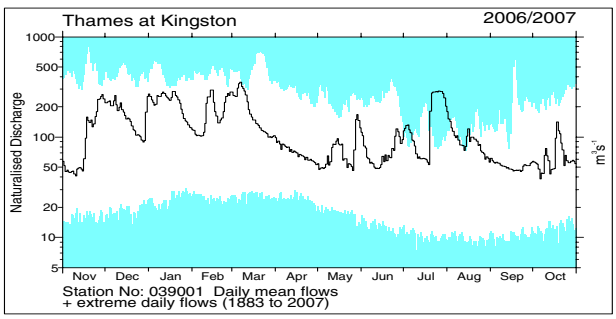


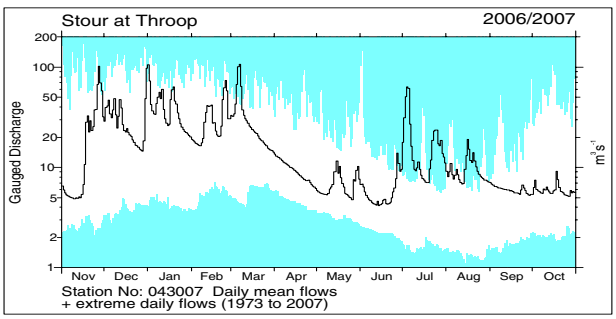


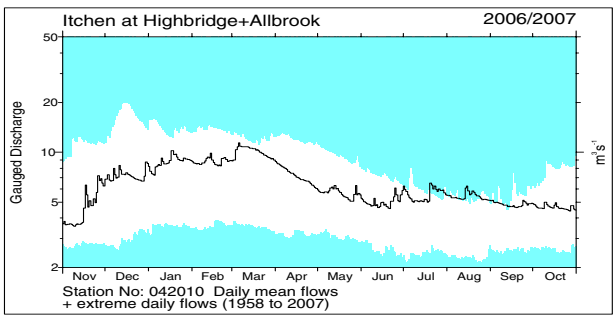












Notable runoff accumulations (a) Aug 2007 - Oct 2007, (b) May 2007 - Oct 2007

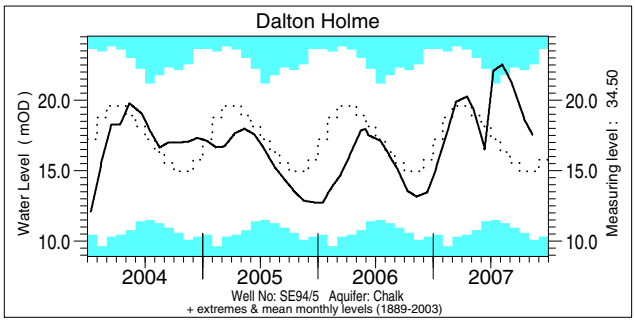
	River	%lta	Rank
a)	Forth	60	4/27
	Lud	276	40/40
	Little Ouse	150	36/38
	Kennet	172	46/46
	Lambourn	209	45/45
	Coln	313	44/44
	Itchen	131	47/49
	Teifi	34	4/48

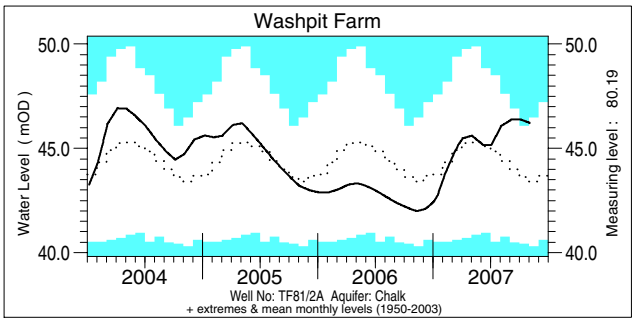
	River	%lta	Rank
b)	Derwent(Buttercrambe)	153	45/46
	Trent	169	49/49
	Dover Beck	292	32/32
	Witham	291	49/49
	Ouse (Bedford)	290	75/75
	Stringside	202	40/40
	Thames (nat)	191	122/125

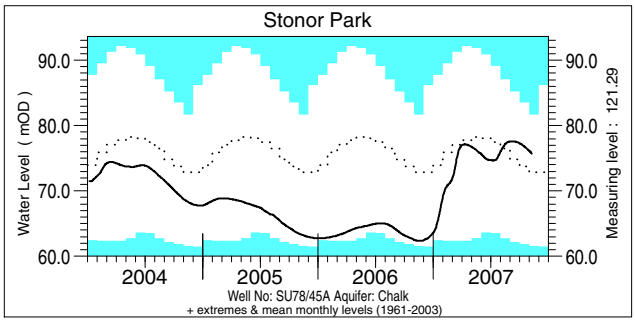
River	%lta	Rank
Blackwater	143	51/55
Stour	139	32/35
Brue	156	39/42
Avon (Evesham)	267	71/71
Teme	293	38/38
Luss	77	4/29
Annacloy	138	22/28

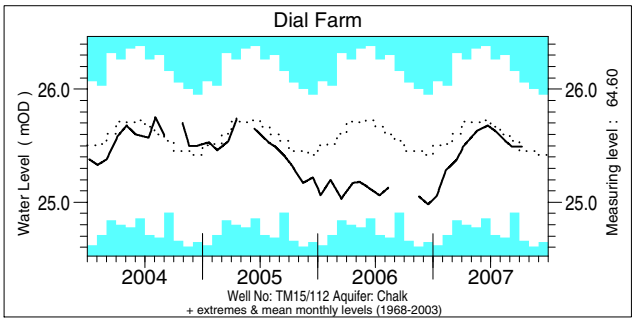
lta = long term average
Rank 1 = lowest on record

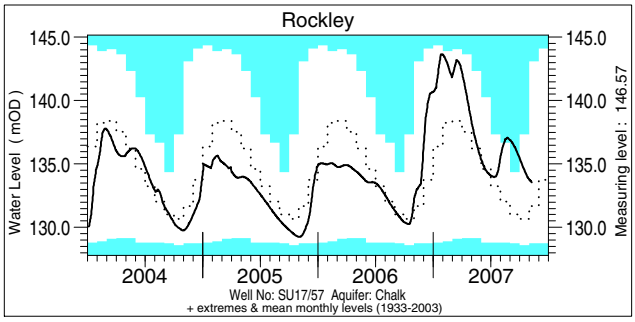
Groundwater . . . Groundwater

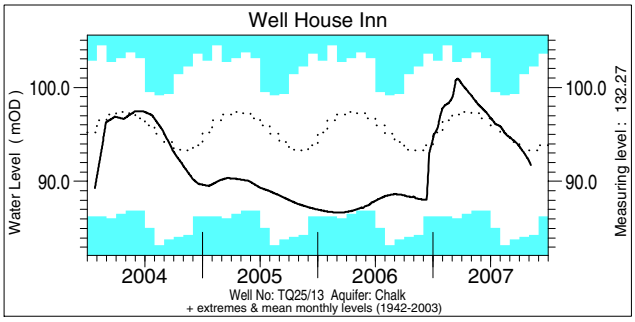


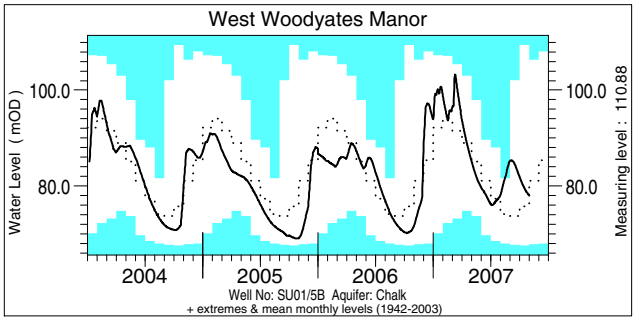


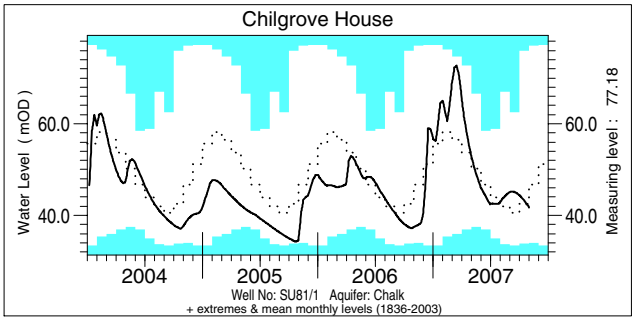


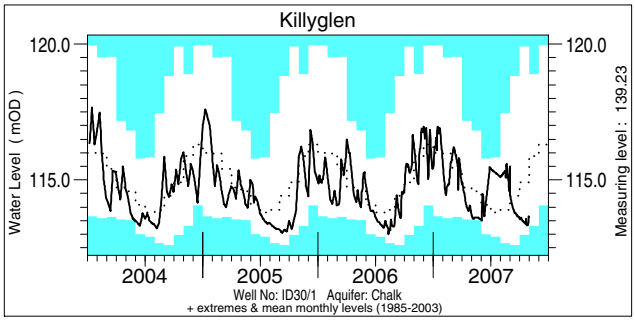


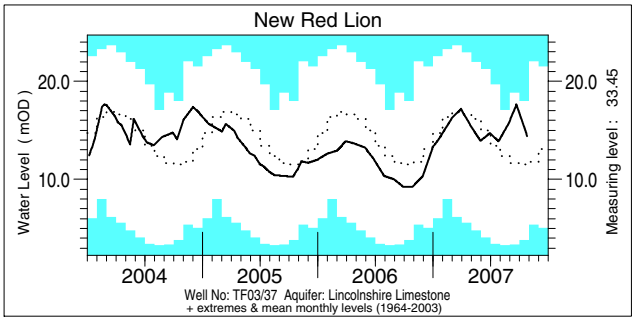






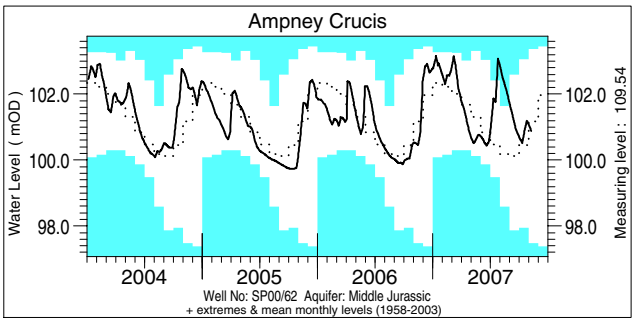


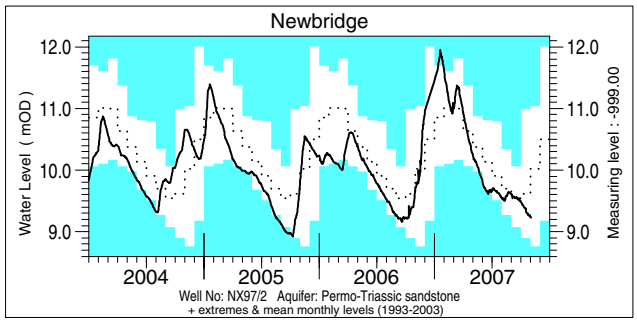


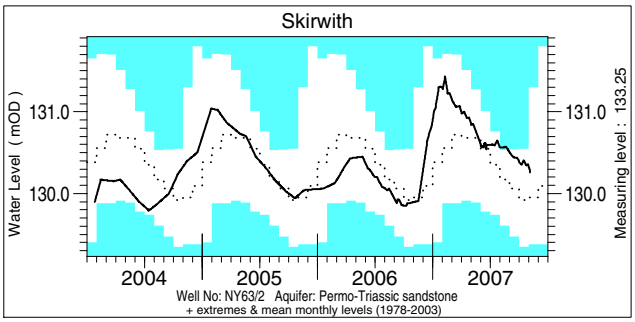


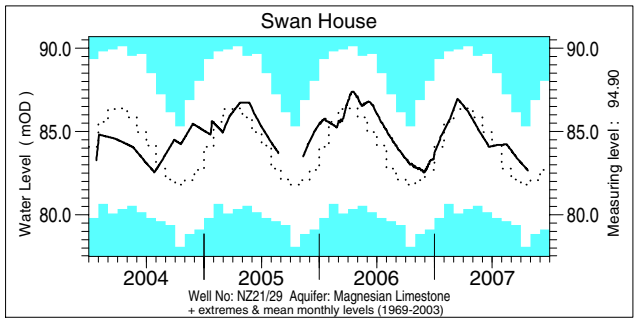
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined below overlying impermeable strata. The monthly mean and the highest and lowest levels recorded for each month are displayed in a similar style to the river flow hydrographs. Note that most groundwater levels are not measured continuously – the latest recorded levels are listed overleaf.

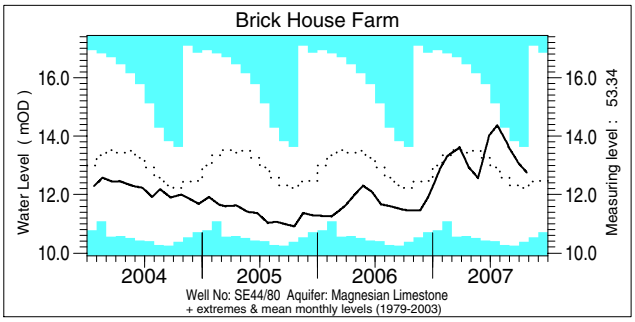
Groundwater . . . Groundwater

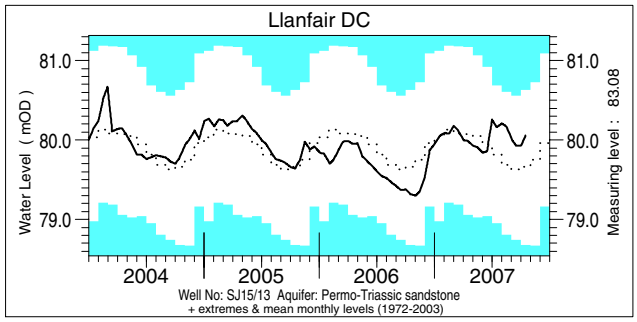


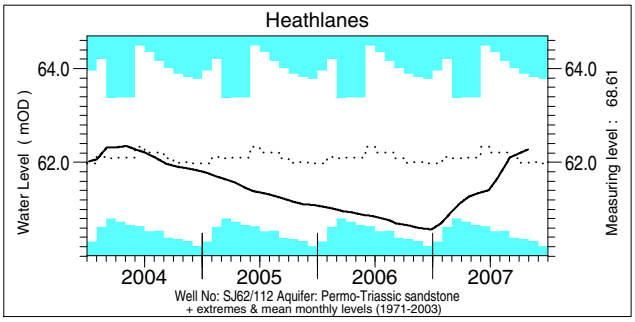


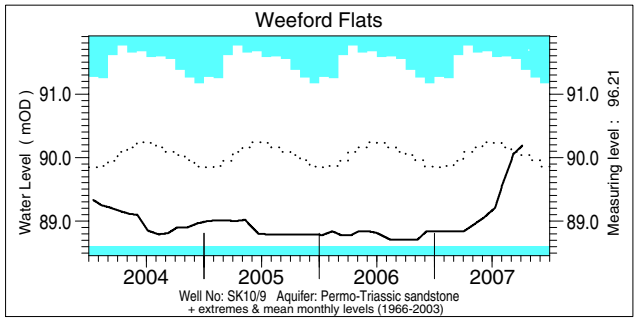


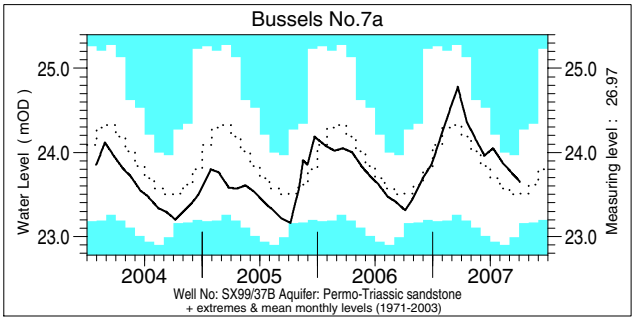


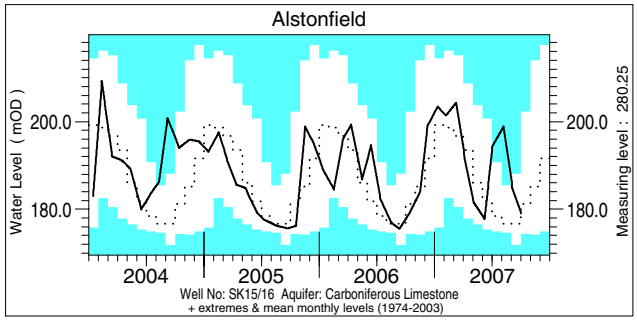










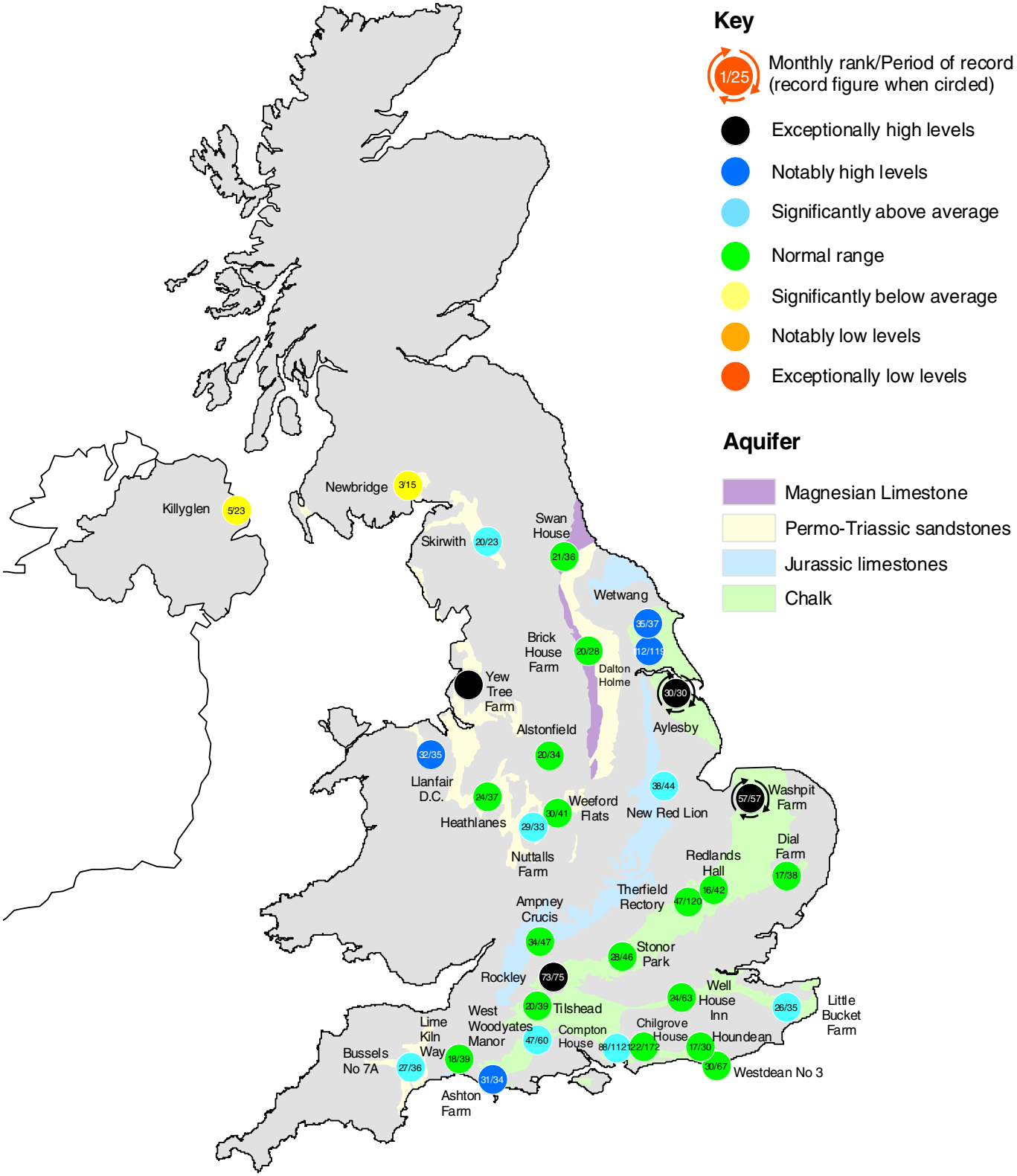


Groundwater levels October / November 2007

Borehole	Level	Date	Oct. av.	Borehole	Level	Date	Oct. av.	Borehole	Level	Date	Oct. av.
Dalton Holme	17.55	09/11	14.86	Chilgrove House	41.63	31/10	42.33	Brick House Farm	12.75	24/10	12.17
Washpit Farm	46.22	02/11	43.52	Killyglen	113.64	30/10	114.80	Llanfair DC	80.06	15/10	79.55
Stonor Park	75.75	07/11	73.02	New Red Lion	14.43	24/10	11.53	Heathlanes	62.28	29/10	61.92
Dial Farm	25.49	09/10	25.47	Ampney Crucis	100.88	07/11	100.42	Weeford Flats	90.19	05/10	89.71
Rockley	133.57	07/11	130.64	Newbridge	9.23	01/11	9.63	Bussels No.7a	23.65	03/10	23.51
Well House Inn	91.75	05/11	93.18	Skirwith	130.26	04/11	129.94	Alstonfield	179.00	01/10	181.20
West Woodyates	77.95	31/10	74.84	Swan House	82.64	22/10	82.13				

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



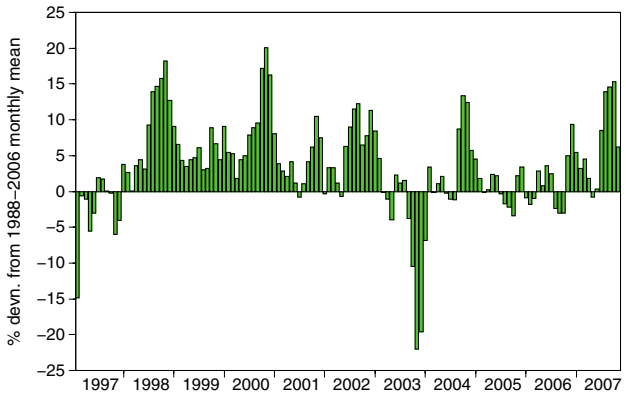
Groundwater levels - October 2007

The rankings are based on a comparison between the average level in the featured month (but often only single readings are available) and the average level in each corresponding month on record. They need to be interpreted with caution especially when groundwater levels are changing rapidly or when comparing wells with very different periods of record. Rankings may be omitted where they are considered misleading.

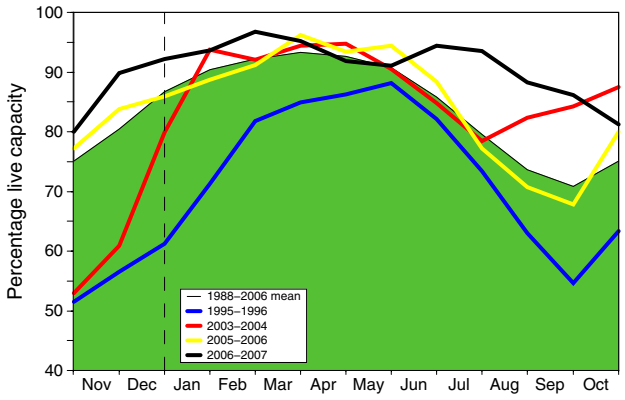
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.

Reservoirs . . . Reservoirs . . .

Guide to the variation in overall reservoir stocks for England and Wales



Comparison between overall reservoir stocks for England and Wales in recent years



These plots are based on the England and Wales figures listed below.

Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2007 Sep	2007 Oct	2007 Nov	Nov Anom.	Min. Nov	Year* of min.	2006 Nov	Diff 07-06
North West	N Command Zone	• 124929	77	72	**69**	7	33	2003	77	-8
	Vyrnwy	55146	95	90	**75**	3	25	1995	77	-2
Northumbrian	Teesdale	• 87936	87	88	**87**	17	33	1995	82	5
	Kielder	(199175)	(87)	(82)	**(66)**	-20	(63)	1989	(89)	-23
Severn Trent	Clywedog	44922	93	88	**83**	9	38	1995	69	14
	Derwent Valley	• 39525	90	86	**77**	8	15	1995	90	-13
Yorkshire	Washburn	• 22035	87	81	**72**	7	15	1995	89	-17
	Bradford supply	• 41407	92	87	**76**	6	16	1995	78	-2
Anglian	Grafham	(55490)	(95)	(93)	**(94)**	14	(44)	1997	(85)	9
	Rutland	(116580)	(89)	(86)	**(85)**	8	(59)	1995	(71)	14
Thames	London	• 202406	77	84	**87**	13	46	1996	92	-5
	Farmoor	• 13822	100	93	**98**	10	43	2003	91	7
Southern	Bewl	28170	79	72	**66**	5	33	1990	61	5
	Ardingly	4685	93	81	**65**	7	15	2003	73	0
Wessex	Clatworthy	5364	100	88	**77**	17	14	2003	51	26
	Bristol WW	• (38666)	(95)	(87)	**(83)**	24	(24)	1990	(66)	17
South West	Colliford	28540	83	80	**76**	10	38	2006	38	38
	Roadford	34500	95	91	**87**	20	18	1995	48	39
	Wimbleball	21320	98	91	**86**	21	26	1995	59	27
	Stithians	5205	83	73	**62**	9	18	1990	33	29
Welsh	Celyn and Brenig	• 131155	97	96	**92**	10	48	1989	85	7
	Brianne	62140	98	98	**95**	6	57	1995	95	0
	Big Five	• 69762	90	82	**77**	6	38	2003	72	5
	Elan Valley	• 99106	93	94	**89**	6	37	1995	80	9
Scotland(E)	Edinburgh/Mid Lothian	• 97639	88	84	**77**	-1	48	2003	82	-5
	East Lothian	• 10206	100	100	**93**	14	38	2003	66	27
Scotland(W)	Loch Katrine	• 111363	67	61	**59**	-27	40	2003	94	-35
	Daer	22412	96	88	**77**	-13	42	2003	99	-22
	Loch Thom	• 11840	72	68	**66**	-23	67	2007	95	-29
Northern Ireland	Total+	• 67270	89	78	**71**	-7	39	1995	85	-14
	Silent Valley	• 20634	97	82	**72**	4	34	1995	84	-12

() 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 1988-2006 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. Scheduled drawdown is affecting Kielder and Ladybower (Derwent Valley) levels.

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 Department of the Environment (NI). 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 the Northern Ireland Water Service.

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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Wallingford
Oxfordshire
OX10 8BB

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

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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11/07