Hydrological Summary
for the United Kingdom

May 2007

General

Episodic weather patterns are a characteristic of the UK climate but the dramatic contrast between April and May rainfall totals has few close modern parallels. Following a very arid April, Britain registered its 2nd wettest May for 72 years. Initially the parched soils limited the rainfall's effectiveness but appreciable reservoir replenishment occurred over the latter half of the month. Most reservoir stocks remained fairly static at a time when a modest decline is normally expected and, entering June, overall stocks for England & Wales were marginally above the early summer average. Stocks in most index reservoirs are within 5% of the early June average but overall stocks in Northern Ireland are moderately low. Contrary to the normal seasonal pattern, May runoff totals exceeded those for April in many areas and minor spate conditions were relatively common, around month-end especially. Notwithstanding record soil moisture conditions early in May, some modest but very useful infiltration was reported late in the month. Groundwater levels throughout the major aquifers are mostly within the normal range and set to follow recessions considerably above those which typified the last two summers. Correspondingly, no repetition of the degree of water resources and environmental stress experienced last year is anticipated through the summer of 2007.

Rainfall

The high pressure, which was responsible for the remarkably dry and warm April, continued into May. After the first week however synoptic patterns changed decisively – allowing cyclonic conditions to become dominant across almost all of the country. The associated passage of a sequence of frontal systems produced two notably wet interludes. Storm totals exceeding 30 mm were common on the 13th and, more exceptionally, a number of areas in the English Lowlands (e.g. parts of south Oxfordshire, Isle of Wight and Hertfordshire) registered 24-hr rainfall totals (27/28th)which exceeded the May average; Runley Wood, Luton reported 79.2mm. At Wallingford, the difference between the April and May rainfall totals was the 2nd greatest for any monthly pairing in a series from 1962. A few areas (mostly in a zone from Northern Ireland to Northumbria) registered modestly below average May rainfall. By contrast, parts of northern Scotland were very wet and most catchments to the south-east of a line from the Bristol Channel to the Humber estuary reported more than twice the average rainfall. In the Thames valley, rainfall across the Thame catchment exceeded the previous May maximum in a series from 1920. Regional variations in rainfall anomalies for the spring (March-May) are large: Yorkshire and Northern Ireland reported their driest spring since 1997 and 1984 respectively whilst, in Scotland, the Highland Region added a further wet spring to a notable cluster in the last 20 years. Regional rainfall accumulations over a longer timespan (6-15 months) are generally above average, exceptionally so for much of Scotland.

River flows

The protracted April recessions continued into early May when exceptionally low late-spring flows were registered over wide areas. On the 5th, the Ribble marginally eclipsed its lowest May daily flow in a record from 1960. More notably, estimated total outflow from Britain for the first week of May was the lowest in a 48-year series. From the second week, flows recovered briskly in many western, central and northern catchments with widespread modest spate conditions in mid-month. More unusually, flows in many rivers across the English Lowlands increased steeply following the notable Bank Holiday rainfall. Bankfull flows were exceeded (modestly) in some responsive rivers (e.g. the Thame) and several Flood Warnings were operational around month-end; some locally severe urban flooding was also reported (e.g. in Luton). May runoff totals generally reflect the counterbalancing effect of the contrasting flows in early and late month – most were well within the normal range. There were some exceptions: May runoff was high across most of north-west Scotland and in parts of the South West but considerably below average in some sheltered eastern catchments. The Whiteadder registered it 2nd lowest runoff in a 39-yr series and, in Northern Ireland, the Annacloy reported its lowest May runoff since the 1984 drought. Spring runoff for index catchments was mostly within the normal range but the Lower Bann registered its lowest March-May runoff in a series from 1980. By contrast, the lagged response to the very wet winter is evident in groundwater-fed rivers across southern England – the Lambourn reported its 3rd highest spring runoff since 1975. Correspondingly, the lowland stream network is much more extensive than in the early summer of 2006. In Scotland, exceptional n-month runoff accumulations continue to be registered.

Groundwater

May rainfall patterns favoured the outcrop areas of the major aquifers – large parts of the Chalk registered around twice the monthly average. The exceptionally high soil moisture deficits over the early part of the month greatly limited the hydrological effectiveness of the rainfall but, as soils in many areas approached saturation towards month-end, infiltration was reported over many outcrop areas (estimated at over twice the May average in parts of the Chilterns). This seasonally late pulse of recharge is particularly useful at a time when groundwater level recessions are normally well established. However, the modest recharge is not reflected in the generality of index borehole hydrographs – most reporting dates preceded the notably wet spell around month end. Modest increases in groundwater levels were registered in the responsive Oolitic Limestone of the Cotswolds (Ampney Crucis) and in the Lower Greensand at Frith Cottage (South Downs). Elsewhere, and notwithstanding the very erratic recharge patterns in 2007, the May hydrographs mostly testify to a typical spring recession. However in Northern Ireland, well below average spring rainfall has seen levels at Killyglen decline to close to the May minimum. The legacy of drought conditions in 2004-06 is still evident in the slowest-responding parts of the Permo-Triassic sandstones aquifer but levels are continuing to rise – reaching their highest level for two years at Heathlanes.

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

Rainfall accumulations and return period estimates

Area	Rainfall	May 2007	Mar 07-May 07	RP	Jan 07-May 07	RP	Oct 06-May 07	RP	Jun 06-May 07	RP
England & Wales	**mm**	**111**	**187**		**396**		**753**		**987**	
	%	**174**	**95**	**2-5**	**113**	**2-5**	**121**	**5-15**	**109**	**2-5**
North West	mm	**88**	198		443		969		1291	
	%	**117**	81	2-5	100	<2	118	5-10	106	2-5
Northumbrian	mm	**73**	141		336		631		856	
	%	**116**	74	5-10	100	<2	109	2-5	99	2-5
Severn Trent	mm	**109**	176		348		626		847	
	%	**182**	99	2-5	115	2-5	121	5-10	110	2-5
Yorkshire	mm	**77**	128		309		591		847	
	%	**127**	68	5-10	95	2-5	105	2-5	101	2-5
Anglian	mm	**114**	160		285		470		685	
	%	**234**	113	2-5	123	2-5	119	5-10	114	5-10
Thames	mm	**121**	177		347		629		837	
	%	**215**	108	2-5	126	5-10	132	15-25	119	5-15
Southern	mm	**99**	160		348		673		856	
	%	**183**	94	2-5	114	2-5	121	5-10	109	2-5
Wessex	mm	**125**	198		406		773		981	
	%	**203**	107	2-5	119	2-5	128	10-20	115	5-10
South West	mm	**158**	268		570		1050		1263	
	%	**214**	110	2-5	117	2-5	121	5-10	106	2-5
Welsh	mm	**129**	259		594		1205		1469	
	%	**153**	94	2-5	114	2-5	126	10-20	109	2-5
Scotland	**mm**	**135**	**323**		**700**		**1399**		**1790**	
	%	**157**	**110**	**2-5**	**126**	**10-20**	**136**	**70-100**	**122**	**40-80**
Highland	mm	**184**	451		943		1821		2251	
	%	**196**	130	5-15	144	30-50	147	>100	129	50-100
North East	mm	**117**	219		431		831		1094	
	%	**159**	98	2-5	109	2-5	119	5-15	106	2-5
Tay	mm	**109**	248		596		1234		1590	
	%	**126**	93	2-5	116	2-5	136	50-100	123	20-30
Forth	mm	**92**	203		488		1054		1380	
	%	**120**	86	2-5	122	5-10	134	70-100	120	15-25
Tweed	mm	**95**	184		398		804		1105	
	%	**129**	85	2-5	103	2-5	118	5-10	110	2-5
Solway	mm	**107**	262		582		1252		1655	
	%	**122**	92	2-5	108	2-5	126	15-25	115	5-10
Clyde	mm	**131**	354		784		1643		2154	
	%	**137**	105	2-5	121	5-10	135	50-100	123	25-40
Northern Ireland	**mm**	**74**	**181**		**407**		**802**		**1134**	
	%	**101**	**79**	**2-5**	**95**	**2-5**	**106**	**2-5**	**103**	**2-5**

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

Important note: Figures in the above table may be quoted provided that their source is acknowledged. See page 12. Where appropriate, specific reference must be made to the uncertainties associated with the return period estimates. Generally, the return period estimates are based on tables provided by the Met Office* but those for Northern Ireland are based on the estimates for north-west England. The estimates relate to the specified region and span of months only (RPs may be an order of magnitude less if n-month periods beginning in any month are considered), they reflect rainfall variability over the period 1911-70 only, and assume a stable climate. (For further details see Tabony, R. C., 1977, *The variability of long duration rainfall over Great Britain*, Scientific Paper No. 37). The timespans featured do not purport to represent the critical periods for any particular water resource management zone and, normally, for hydrological or water resources assessments of drought severity, river flows and groundwater levels provide a better guide than return periods based on rainfall totals. *In some cases ranking positions of accumulated rainfalls are also considered.

All monthly rainfall totals since December 2006 are provisional.

Rainfall . . . Rainfall . . .

Key

00% Percentage of 1961-90 average

Very wet

Substantially above average

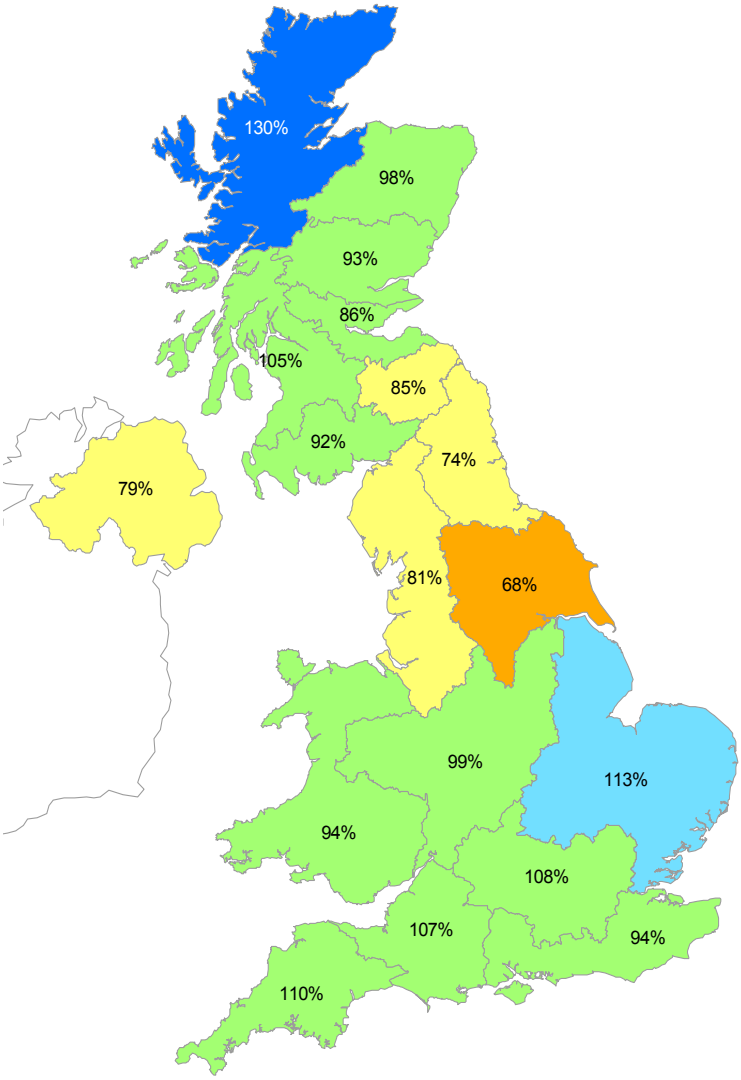
Above average

Normal range

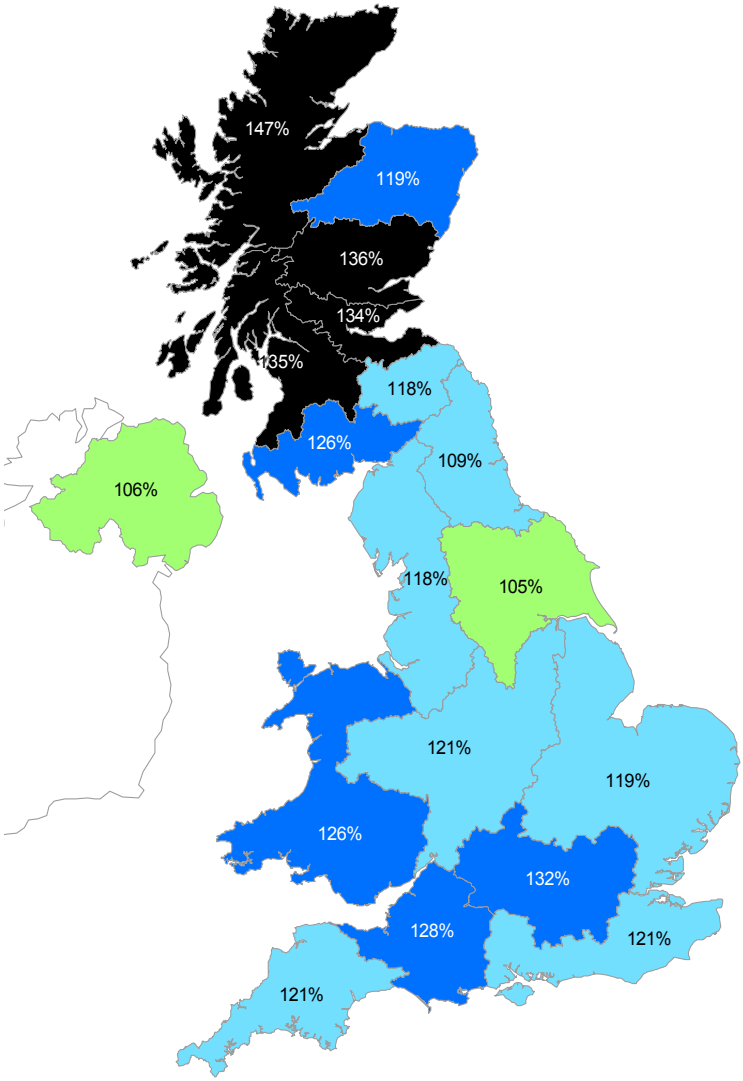
Below average

Substantially below average

Exceptionally low rainfall



March 2007 - May 2007

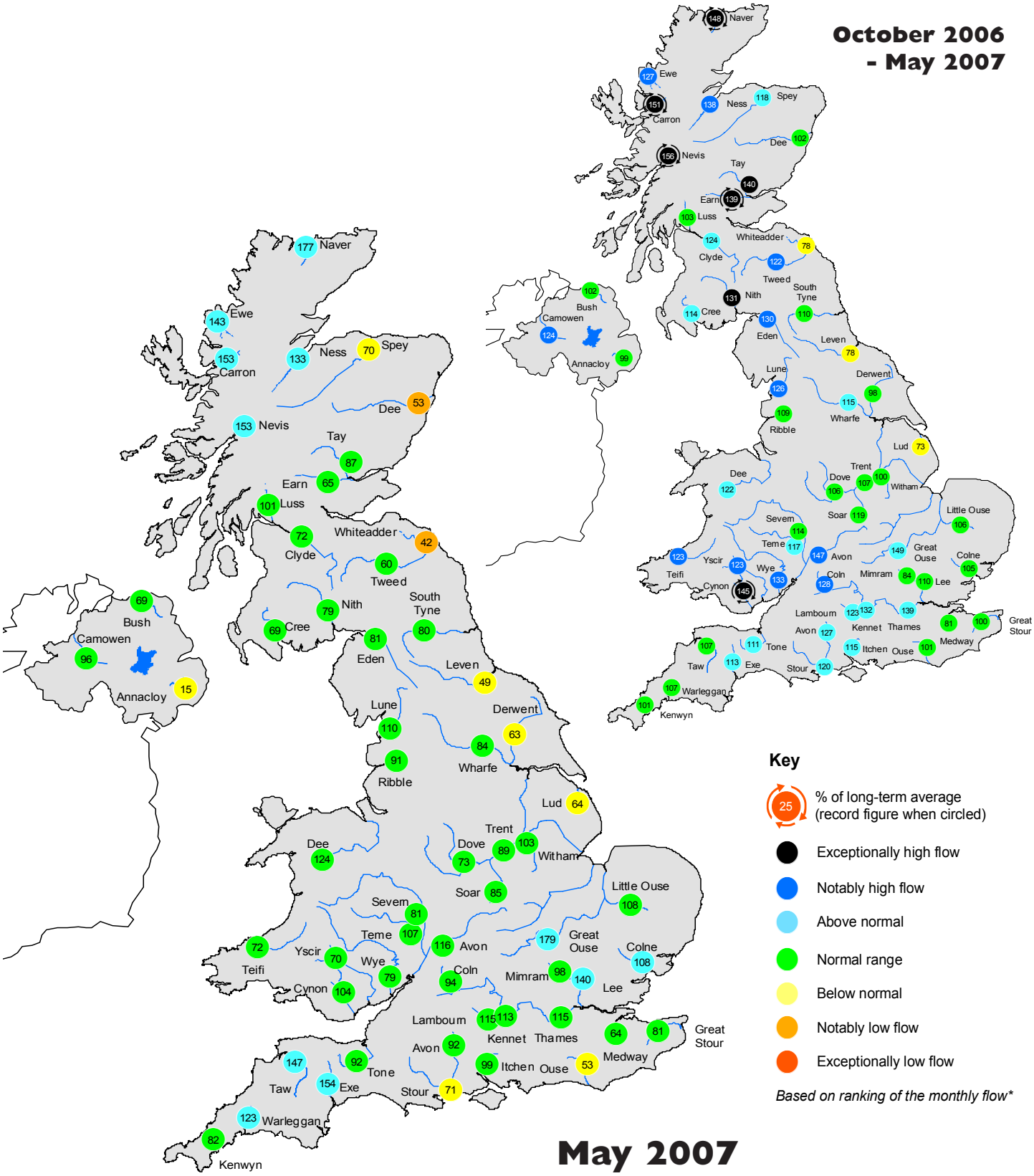


October 2006 - May 2007

Rainfall accumulation map

Spring rainfall (March-May) for the UK as a whole was marginally above average but spatial variations were substantial. Rainfall totals were considerably below average in a broad zone from south-east Scotland to the north Midlands (and extending to Northern Ireland). Over the post-September 2006 period however, all regional rainfall anomalies are positive, notable so across most of Scotland and much of southern Britain.

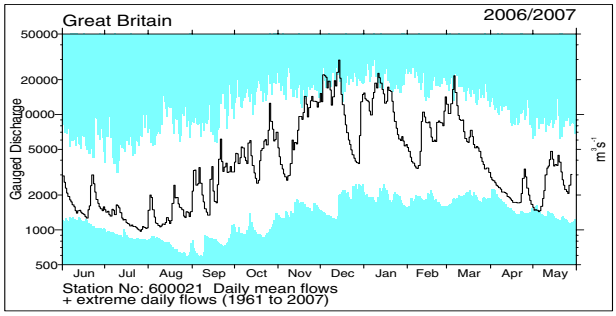
River flow . . . River flow . . .

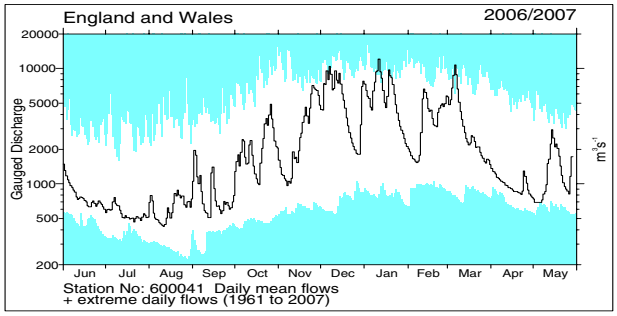


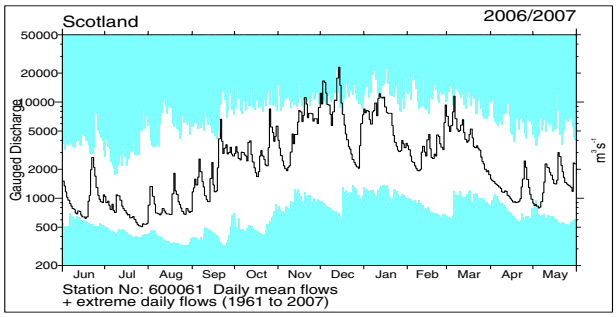
River flows

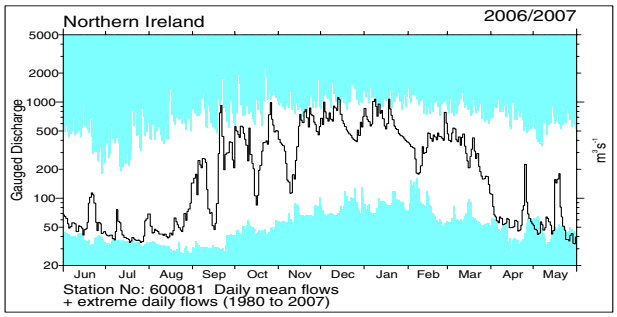
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

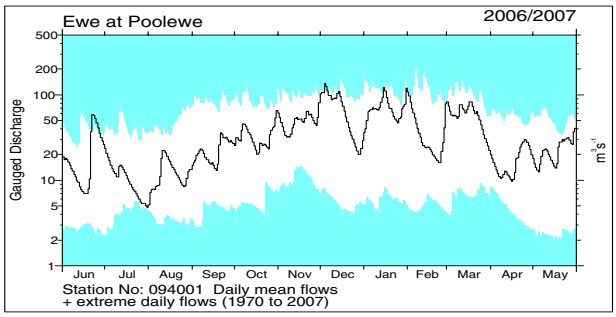
River flow . . . River flow . . .

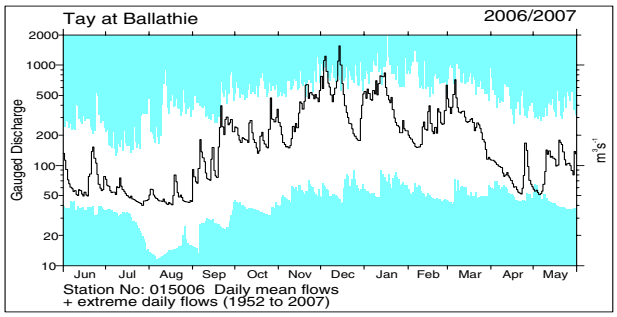


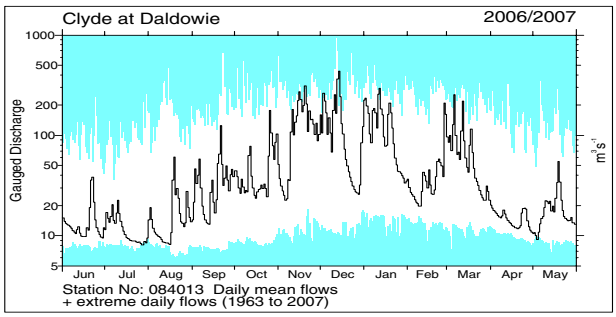


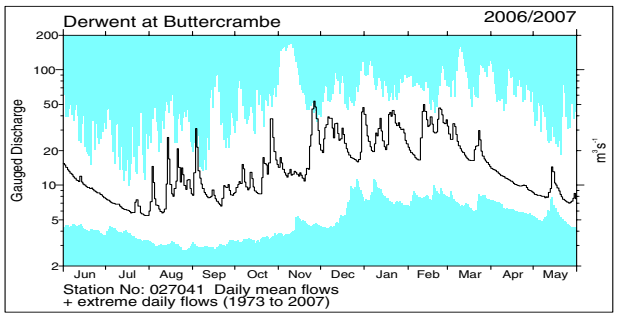


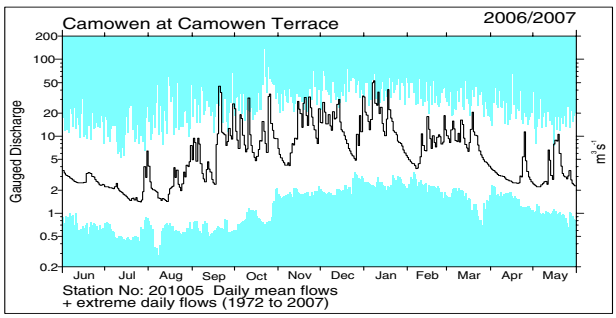


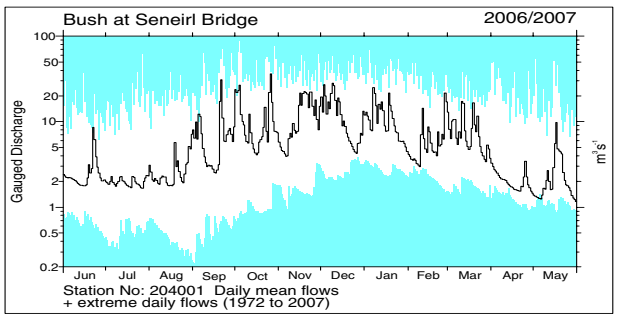








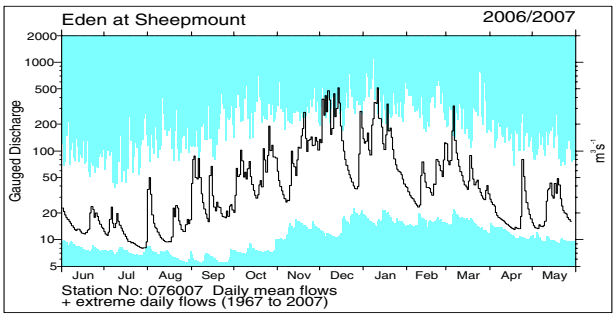


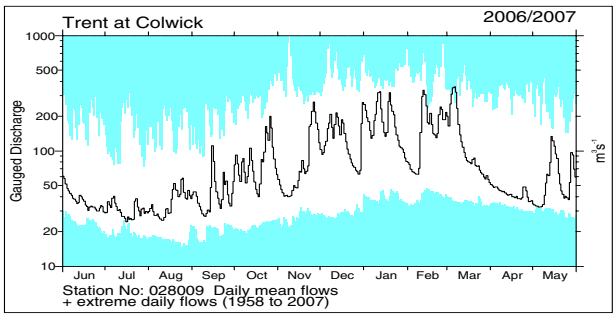


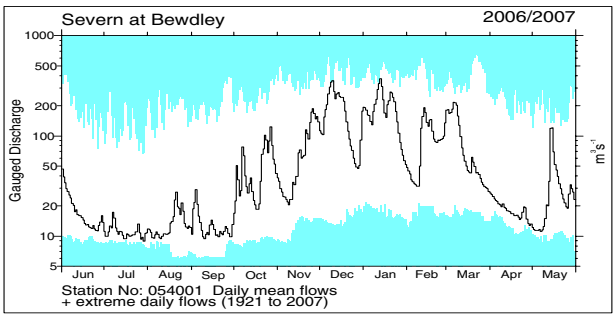
River flow hydrographs

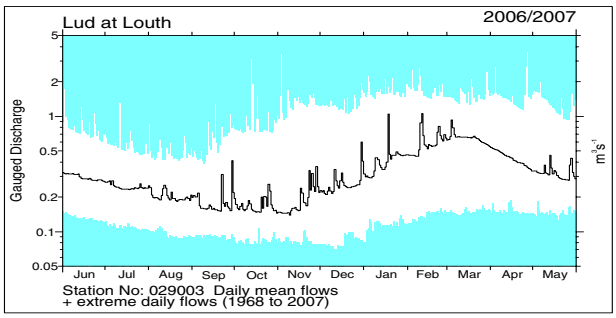
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to June 2006 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

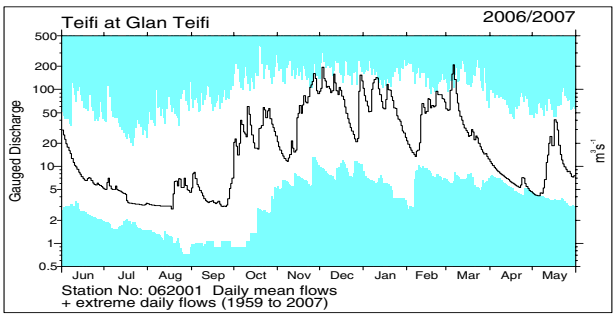
River flow . . . River flow . . .

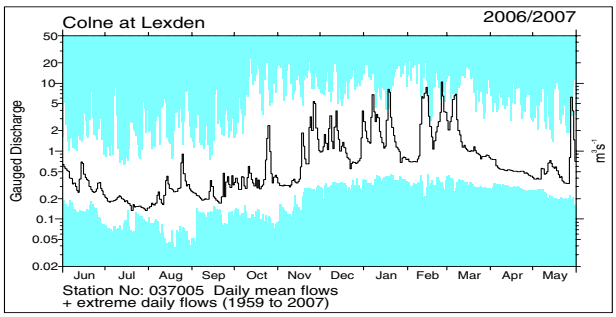


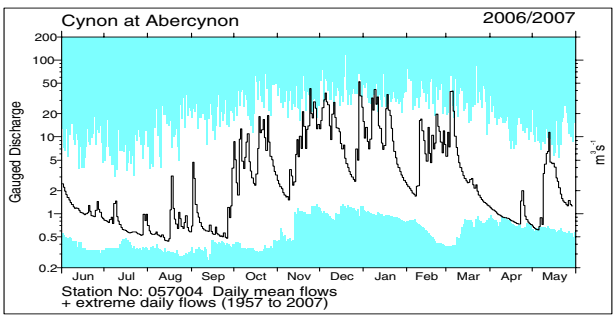


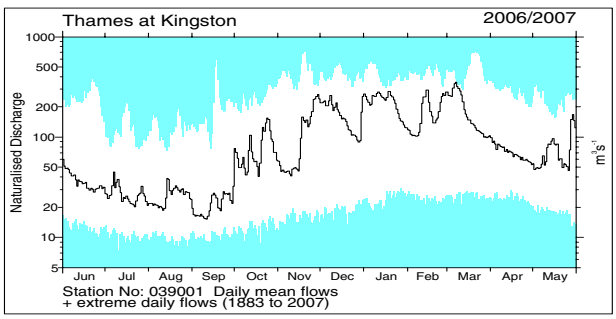


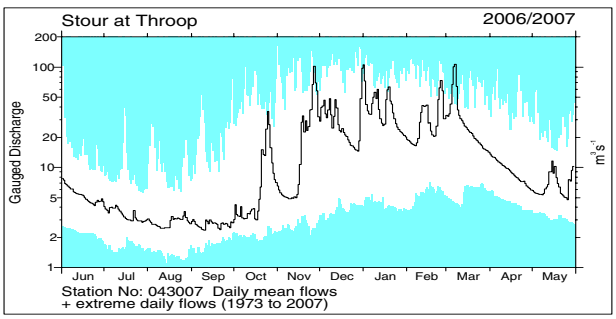


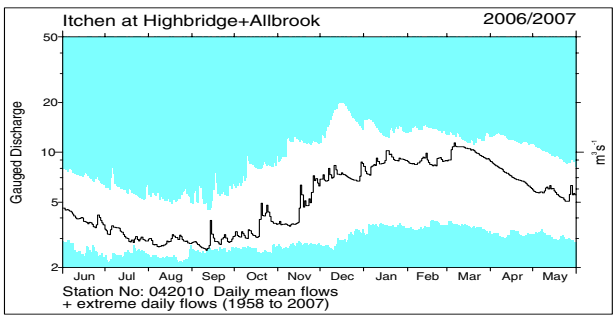












Notable runoff accumulations (a) March 2007 - May 2007, (b) October 2006 - May 2007

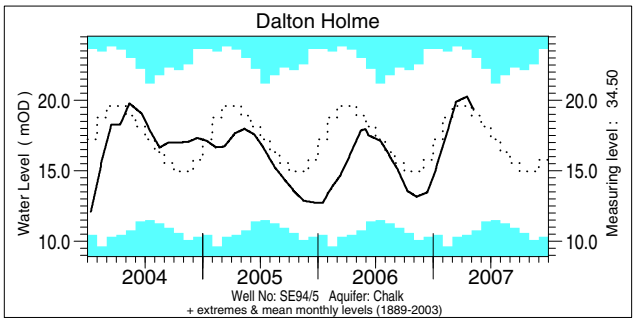
	River	%lta	Rank
a)	Dee (Park)	70	3/35
	Thames (Kingston)	126	101/125
	Lambourn	134	41/45
	Itchen	118	44/49
	Luss	73	4/31
	Mourne	67	2/25
	Faughan	59	3/31
	L Bann	52	1/27
	Annacloy	54	4/28

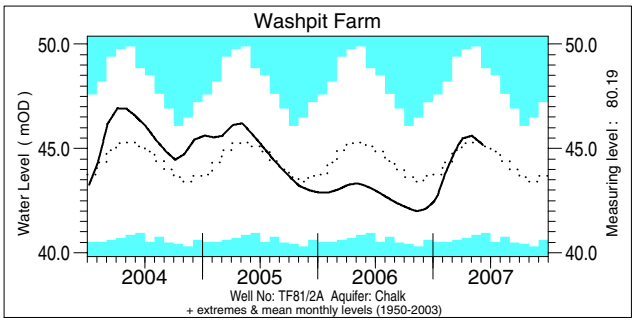
	River	%lta	Rank
b)	Ness	138	33/34
	Tay	140	54/55
	Earn	139	59/59
	Forth	123	24/26
	Dart	132	46/49
	Cynon	145	49/49
	Teifi	123	45/47

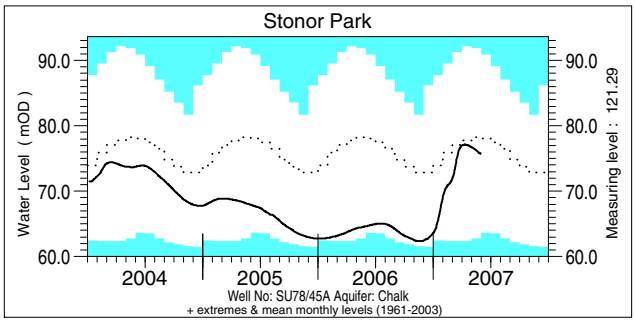
River	%lta	Rank
Eden	130	38/40
Nith	131	49/50
Nevis	156	25/25
Carron	151	28/28
Ewe	127	35/36
Naver	148	30/30
Camowen	124	33/34

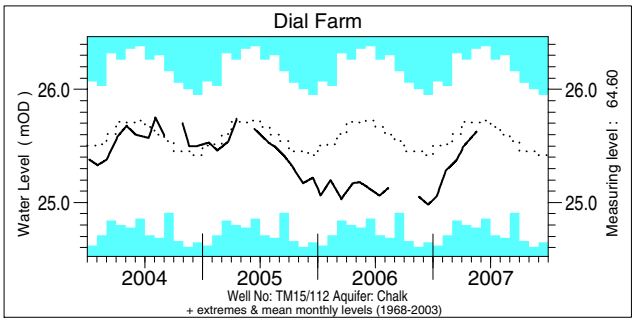
lta = long term average
Rank 1 = lowest on record

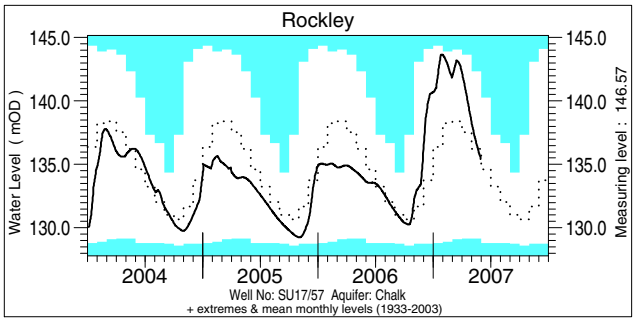
Groundwater . . . Groundwater

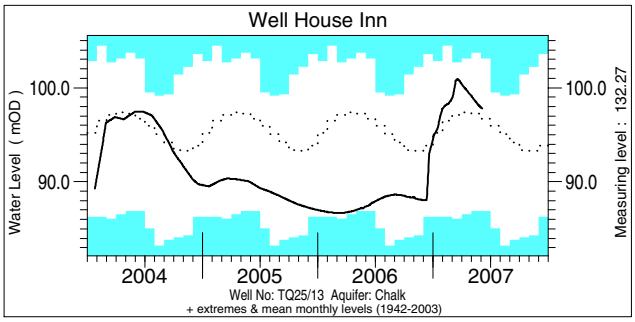


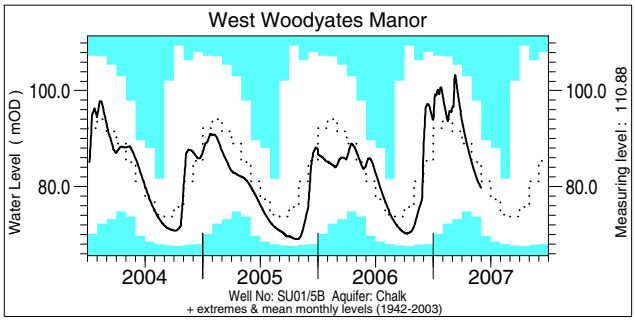


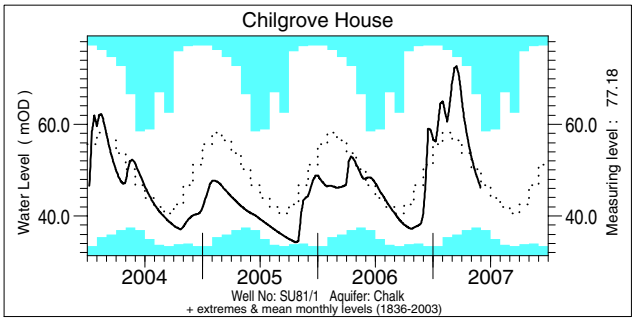


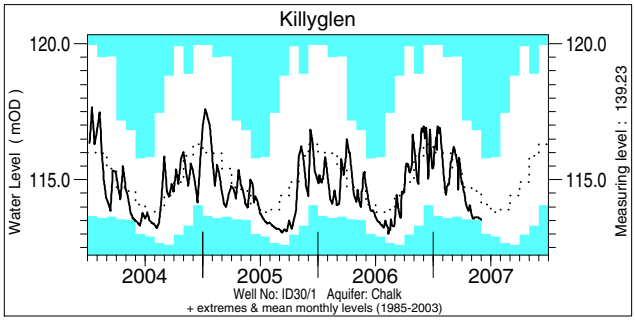


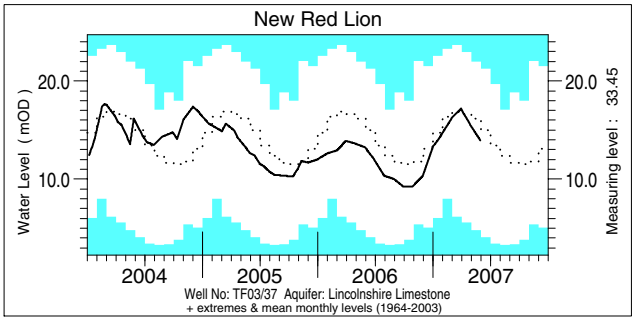






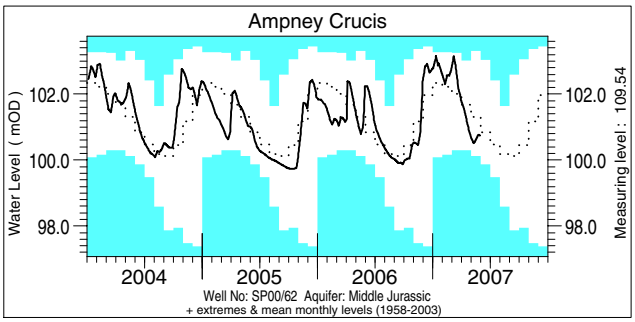


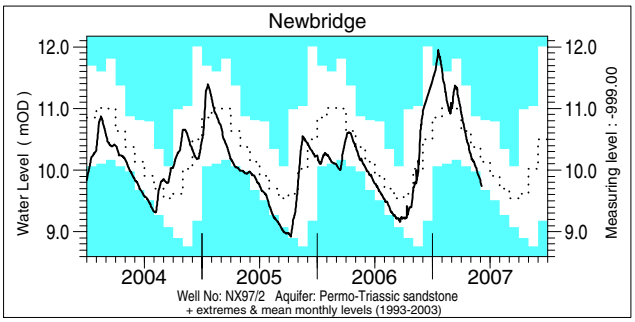


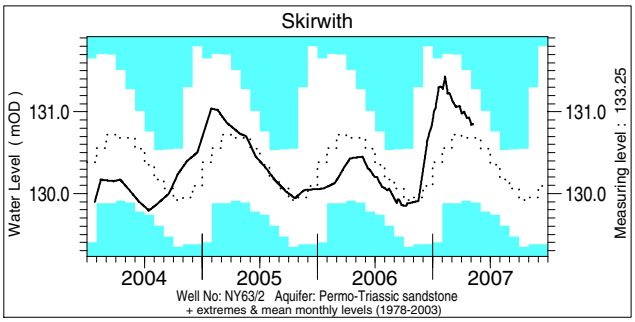


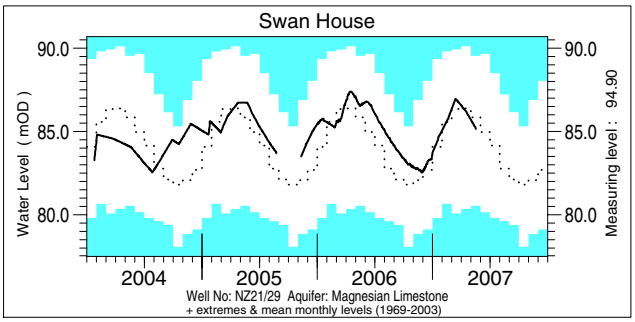
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

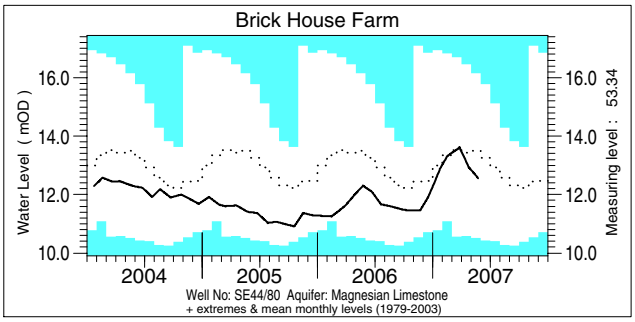
Groundwater . . . Groundwater

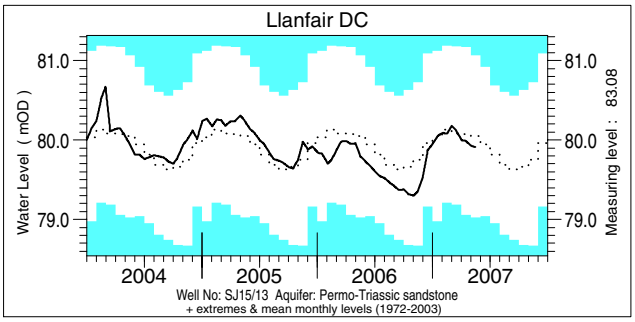


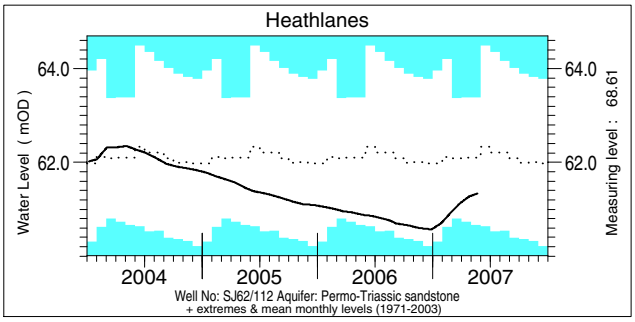


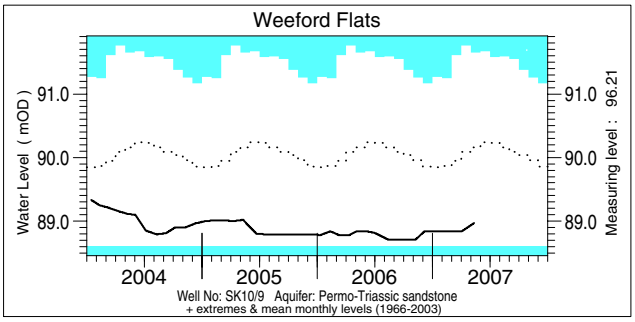


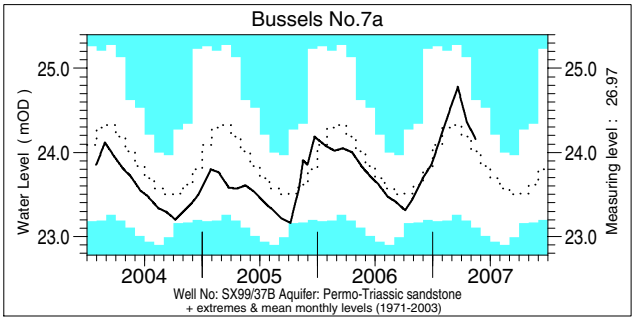


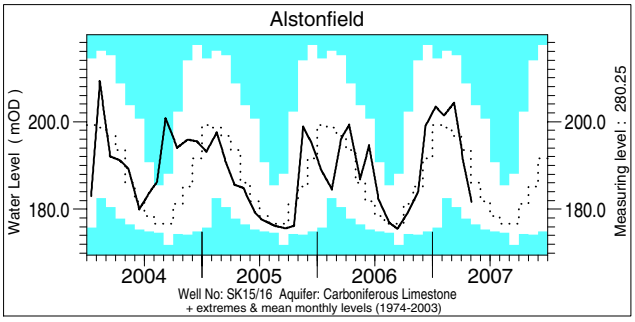










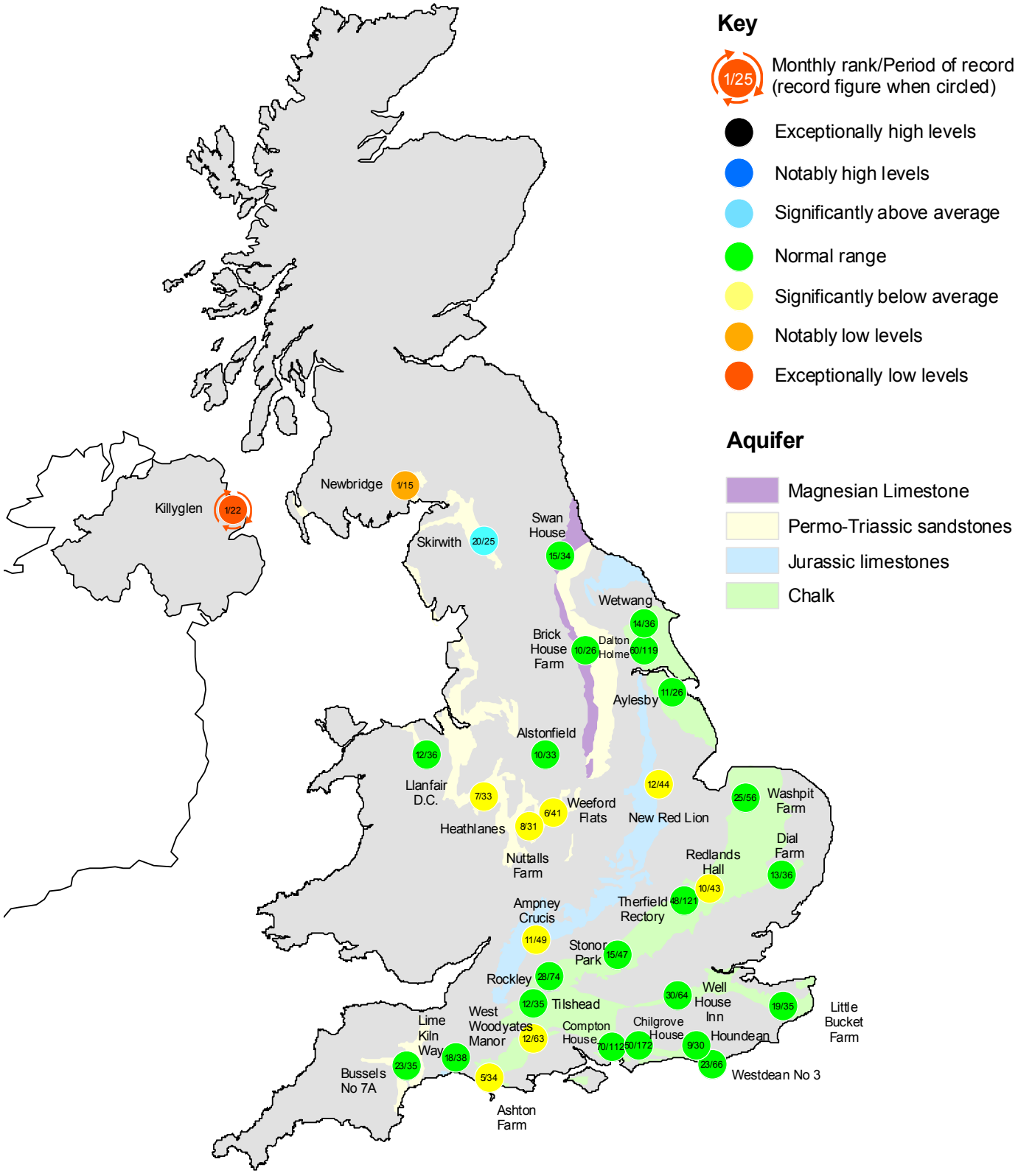


Groundwater levels May / June 2007

Borehole	Level	Date	May. av.	Borehole	Level	Date	May. av.	Borehole	Level	Date	May. av.
Dalton Holme	19.30	08/05	18.95	Chilgrove House	46.17	30/05	48.96	Brick House Farm	12.56	23/05	13.32
Washpit Farm	45.17	06/06	45.46	Killyglen	113.53	31/05	114.52	Llanfair DC	79.91	15/05	79.97
Stonor Park	75.73	30/05	77.93	New Red Lion	13.92	29/05	15.82	Heathlanes	61.34	22/05	62.05
Dial Farm	25.63	18/05	25.70	Ampney Crucis	100.74	30/05	101.28	Weeford Flats	88.97	11/05	89.95
Rockley	135.44	30/05	136.16	Newbridge	9.74	04/06	10.31	Bussels No.7a	24.16	15/05	23.99
Well House Inn	97.77	04/06	96.99	Skirwith	130.85	08/05	130.57	Alstonfield	181.67	03/05	186.77
West Woodyates	79.73	31/05	84.62	Swan House	85.15	17/05	85.25				

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



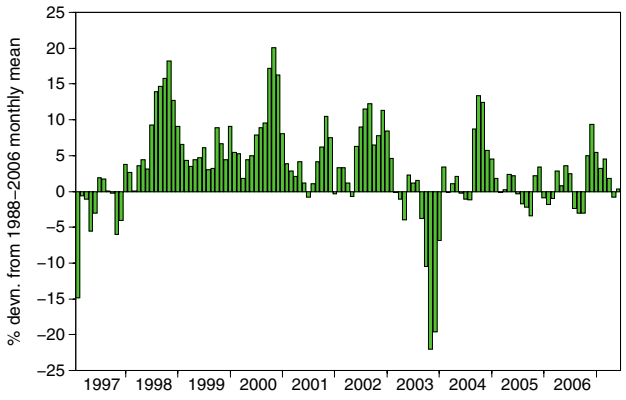
Groundwater levels - May 2007

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.

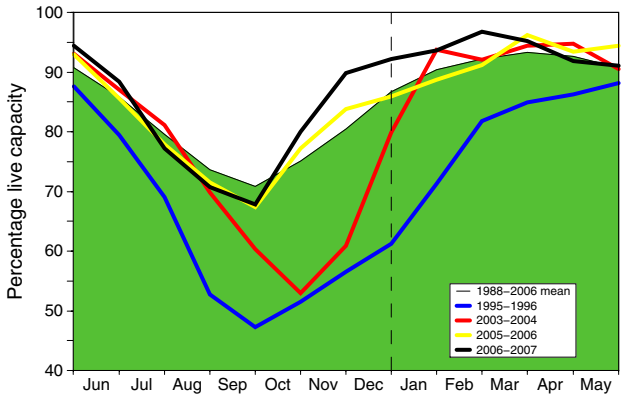
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.
ii. Yew Tree Farm levels are now received quarterly.
iii. Data for Nuttalls Farm are currently under review.

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.

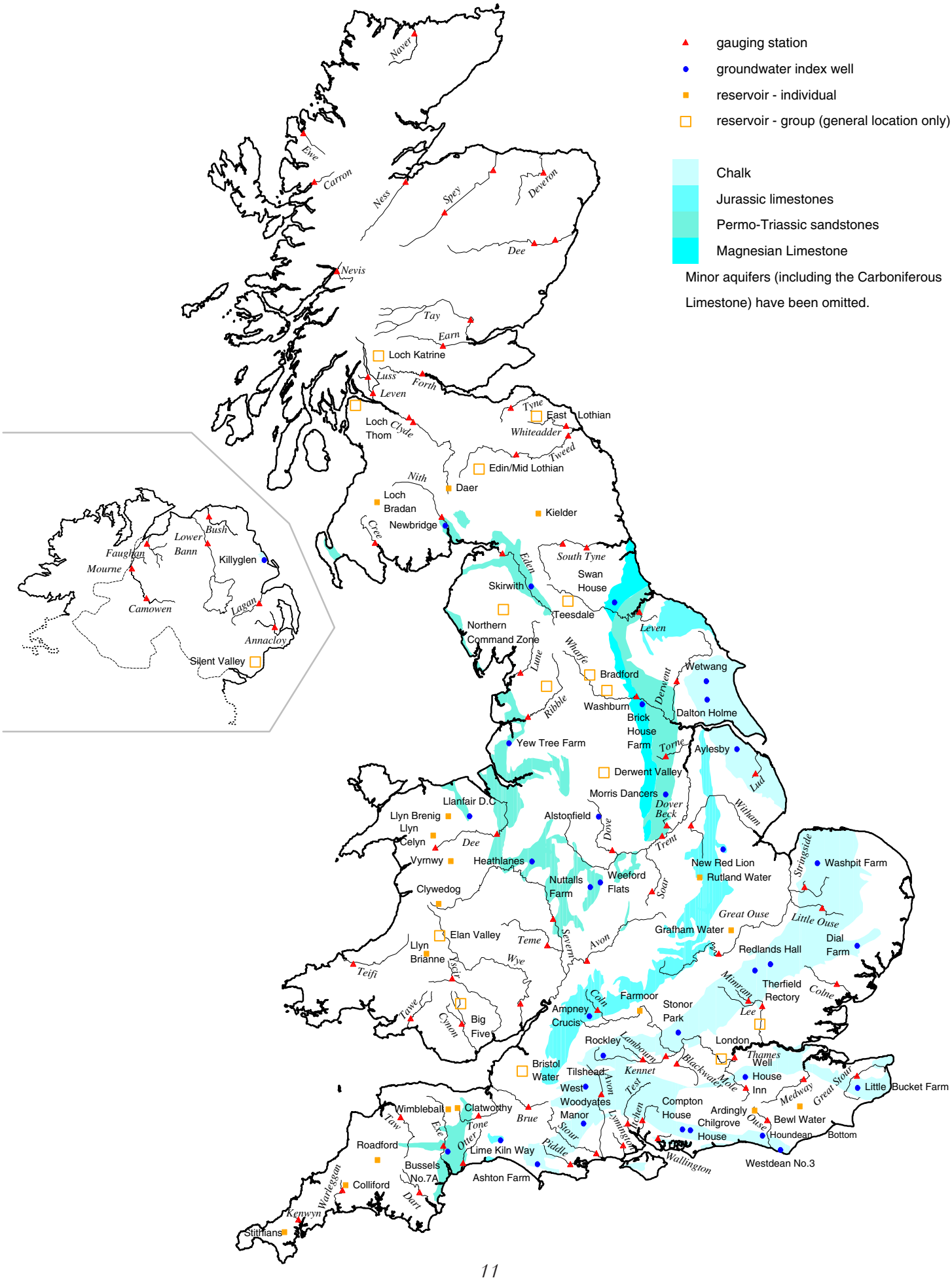
Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2007 Apr	May	Jun	Jun Anom.	Min. Jun	Year* of min.	2006 Jun	Diff **07-06**
North West	N Command Zone	· 124929	94	88	83	0	72	1991	85	-2
	Vyrnwy	55146	97	88	85	-5	72	1990	98	-13
Northumbrian	Teesdale	· 87936	94	85	84	-2	64	1991	95	-11
	Kielder	(199175)	(89)	(89)	(93)	1	(85)	1989	(93)	0
Severn Trent	Clywedog	44922	98	98	98	2	83	1989	100	-2
	Derwent Valley	· 39525	98	84	86	-3	56	1996	100	-14
Yorkshire	Washburn	· 22035	91	84	82	-6	72	1990	98	-16
	Bradford supply	· 41407	96	85	81	-6	70	1996	99	-18
Anglian	Grafham	(55490)	(97)	(97)	(98)	4	(72)	1997	(100)	-2
	Rutland	(116580)	(95)	(94)	(96)	5	(75)	1997	(93)	3
Thames	London	· 202406	97	100	94	1	83	1990	93	1
	Farmoor	· 13822	99	100	98	0	90	2002	100	-2
Southern	Bewl	28170	100	91	88	1	57	1990	91	-3
	Ardingly	4685	100	100	99	0	96	1990	100	-1
Wessex	Clatworthy	5364	100	85	80	-7	67	1990	86	-6
	Bristol WW	· (38666)	(95)	(90)	(92)	3	(70)	1990	(96)	-4
South West	Colliford	28540	79	77	78	-6	52	1997	70	8
	Roadford	34500	91	89	91	8	48	1996	77	14
	Wimbleball	21320	99	94	92	1	76	1992	100	-8
	Stithians	5205	97	90	87	1	66	1990	90	-3
Welsh	Celyn and Brenig	· 131155	100	96	96	-1	82	1996	100	-4
	Brianne	62140	96	89	94	-2	85	1995	100	-6
	Big Five	· 69762	97	89	91	1	70	1990	96	-5
	Elan Valley	· 99106	98	97	92	-3	85	1990	100	-8
Scotland(E)	Edinburgh/Mid Lothian	· 97639	98	92	89	0	52	1998	92	-3
	East Lothian	· 10206	100	97	95	-1	84	1990	99	-4
Scotland(W)	Loch Katrine	· 111363	83	84	78	-11	66	2001	98	-20
	Daer	22412	98	87	88	-3	70	1994	94	-6
	Loch Thom	· 11840	98	90	86	-5	74	2001	100	-14
Northern Ireland	Total+	· 67270	87	77	71	-16	71	2007	89	-18
	Silent Valley	· 20634	93	79	68	-13	56	2000	94	-26

() 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.

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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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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06/07