Hydrological Summary
for the United Kingdom

May 2005

General
Following a now familiar pattern, most Atlantic frontal systems tracked across northern Britain during May – consequently western Scotland was wet but the drought intensified across much of England and Wales, particularly in those regions where rainfall deficiencies were already most significant. Provisional data indicate that E&W had its 2nd lowest Nov-May rainfall since 1943/44 (1975/76 was substantially drier). Correspondingly, river flows are notably low over wide areas. Flows in the Medway, approached the minimum on record for May – consequently Weir Wood reservoir stocks declined to around 50%, triggering the introduction of a sprinkler and hosepipe ban (in early June). Importantly however, reservoir stocks are generally well within the normal early summer range and overall stocks for E&W, helped by healthy pumped-storage replenishment, remain modestly above average. Similarly, groundwater levels, whilst exhibiting large spatial variations, are mostly typical of the early summer. Exceptions include wells in parts of the Chalk outcrop – mostly in the South-East where a combination of exceptional 7-month rainfall deficiencies, low river flows and seasonally depressed groundwater resources signal significant water resources and environmental stress. With soil moisture deficits climbing briskly through May, no termination to the hydrological drought may be expected before the autumn and, in the event of a dry summer, further measures to moderate water demand are likely to be required.

Rainfall
Sustained high pressure, which has created an intense drought in large parts of western Europe, continued to dominate synoptic patterns in May. A few vigorous frontal incursions produced notable rainfall totals – In Scotland, Sloy (Strathclyde) registered 31mm on the 25th and Aultbea (Highland) 47mm on the following day. To the south however, rainfall was again meagre with few storm totals exceeding 10mm. Rainfall totals for May reached twice the average in parts of north-west Scotland but most of England and Wales reported <70%, with totals falling below 30% to the west of London. Useful May rainfall – a proportion associated with thunderstorms – in parts of East Anglia (Northern Ireland also) helped to moderate the winter/spring rainfall deficiencies but Nov-May totals are exceptionally low across much of E&W. Many southern catchments have now reported seven successive months with below average rainfall and accumulated rainfall totals are commonly the lowest on record with the exception of 1975/76. Local and catchment scale differences can be very influential as droughts enter a severe phase; the largest rainfall deficiencies – below 60% of average – are found in west Cornwall and in a broad zone from Dorset to London (embracing much of the southern region); much of the Midlands has been very dry also. The wet conditions in the late summer and October last year have helped moderate the drought's impact thus far but these benefits are being exhausted as the drought continues to intensify.

River Flows
May runoff for the UK as a whole was near-average but, more significantly, the normal NW/SE runoff gradient was greatly exaggerated. Localised, mostly urban, flooding was reported in Scotland where notable spates occurred in the final week – the Cree registered its 2nd highest May flow in a 43-yr series on the 26th (and, in Northern Ireland, the Mourne established a new May maxima in a 23-yr record). To the east and south, the general picture is of protracted recessions punctuated by minor short-lived spates. May flows were depressed in many lowland rivers – the Medway and Piddle (Dorset) both registered their lowest May runoff since 1976. Throughout the rest of E&W runoff was mostly well below average but substantially above drought minima. The severity of the hydrological drought is best illustrated by the runoff deficiencies over the last seven months. Runoff for the Sussex Ouse eclipsed the exceptional 1975/76 minimum and the Medway, Wallington (Hants), Exe and Yscir are among a significant number of rivers across southern Britain reporting their 2nd or 3rd lowest runoff in this timeframe; for some rivers runoff has been appreciably less than half the long term average. In many spring-fed southern rivers, the exceptional stability in flow rates through the winter and spring (as aquifer recharge struggled to match outflows) gave way to recessions in May, these are very likely to herald very low late-summer flows (albeit mostly above those of 1997, 1992 and 1976).

Groundwater
Rainfall over most outcrop areas was well below average in May; around 60% for much of the Chalk. Correspondingly, soil moisture deficits increased briskly and were notably above average by early June in parts of central southern England; effectively terminating the 2004/05 recharge season – with wide areas receiving 40%, or less, of the long term average. Generally, groundwater level recessions gathered momentum during May but there is substantial spatial variation in the current health of groundwater resources. This reflects differences in winter recharge, the responsiveness of individual aquifer units and the degree to which heavy recharge over the 2000-03 period is still exercising a residual influence. Broadly, levels in the southern Chalk (the Chilterns also) are very low (albeit mostly above 1997 and 1976 minima). To the east and north, levels remain mostly in the normal range. Levels fell substantially in the Carboniferous limestone (Alstonfield) in May but in most limestone aquifers they remain in the normal range. This is true of most index wells in the Permo-Triassic sandstones but regional and more local contrasts are considerable; very low levels characterize parts of the Midlands whilst groundwater resources remain exceptionally healthy in some more northerly outcrops. Generally, groundwater levels are low in the context of the last 6-8 years but much less remarkable when considered in a longer timespan. Early June soil moisture deficits suggest no general recharge can now be expected until the autumn; a longer term concern is the prospect of a second successive dry winter and its impact on groundwater resources in 2006.

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

Rainfall accumulations and return period estimates

Area	Rainfall	May 2005	Mar 05-May 05	RP	Jan 05-May 05	RP	Nov 04-May 05	RP	Jun 04-May 05	RP
England & Wales	**mm**	**45**	**179**		**288**		**408**		**903**	
	%	**69**	**89**	**2-5**	**81**	**5-10**	**75**	**5-15**	**99**	**2-5**
North West	mm	**67**	229		432		645		1344	
	%	**89**	94	2-5	98	2-5	93	2-5	110	2-5
Northumbrian	mm	**47**	217		372		466		1031	
	%	**75**	113	2-5	111	2-5	92	2-5	119	5-15
Severn Trent	mm	**35**	145		230		317		762	
	%	**58**	82	2-5	76	5-10	70	15-25	99	2-5
Yorkshire	mm	**40**	182		310		396		888	
	%	**66**	97	2-5	95	2-5	81	5-10	106	2-5
Anglian	mm	**40**	113		180		250		616	
	%	**82**	80	2-5	78	5-10	72	10-20	102	2-5
Thames	mm	**31**	128		181		267		613	
	%	**55**	78	2-5	66	10-20	65	25-40	87	2-5
Southern	mm	**31**	136		201		297		651	
	%	**58**	80	2-5	66	10-20	63	30-45	83	5-10
Wessex	mm	**39**	173		254		363		765	
	%	**63**	93	2-5	74	5-10	70	10-20	90	2-5
South West	mm	**54**	210		355		521		1076	
	%	**74**	86	2-5	73	5-15	69	15-25	90	2-5
Welsh	mm	**56**	246		439		652		1338	
	%	**67**	89	2-5	84	2-5	79	5-10	99	2-5
Scotland	**mm**	**118**	**347**		**696**		**1009**		**1783**	
	%	**137**	**118**	**5-10**	**125**	**10-20**	**116**	**5-10**	**121**	**30-50**
Highland	mm	**140**	425		909		1371		2227	
	%	**149**	123	*5-10*	139	*10-20*	131	*15-25*	128	*30-50*
North East	mm	**93**	244		463		618		1214	
	%	**127**	109	2-5	117	5-10	103	2-5	118	10-20
Tay	mm	**114**	329		642		826		1597	
	%	**131**	123	5-10	125	5-15	107	2-5	124	20-30
Forth	mm	**95**	275		550		727		1414	
	%	**124**	116	2-5	126	10-20	109	2-5	123	25-40
Tweed	mm	**80**	254		451		563		1203	
	%	**109**	118	2-5	117	5-10	97	2-5	120	10-20
Solway	mm	**126**	333		612		859		1620	
	%	**144**	116	2-5	113	2-5	103	2-5	113	5-10
Clyde	mm	**133**	380		754		1149		2075	
	%	**139**	113	2-5	116	5-10	113	2-5	118	10-20
Northern Ireland	**mm**	**102**	**256**		**448**		**616**		**1140**	
	%	**140**	**111**	**2-5**	**105**	**2-5**	**96**	**2-5**	**104**	**2-5**

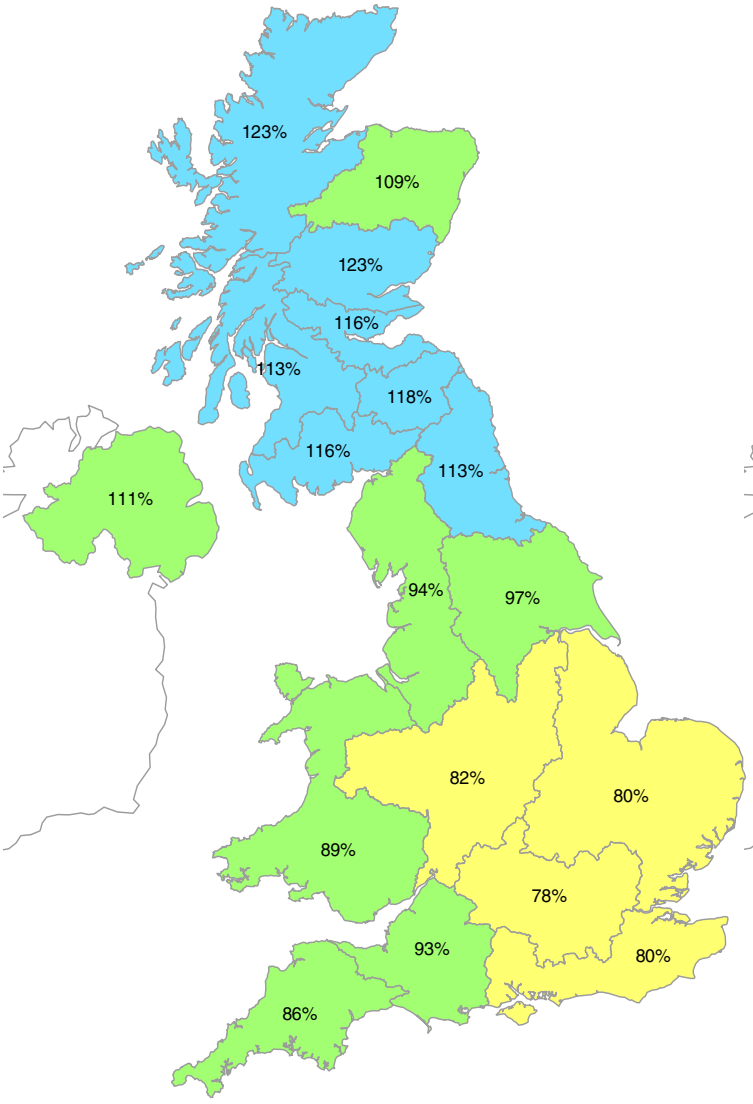
% = percentage of 1961-90 average *RP = Return period*

 All monthly totals since January 2005 are provisional (see page 12). 1961-2003 regional monthly totals were revised by the Met Office in 2004. The figures for England & Wales are derived by the Hadley Centre and are updates of the homogenised series developed by the Climate Research Unit; the other national figures are derived from different raingauge networks to those used to derive the CRU data series. Most of the return period estimates are based on tables provided by the Met Office (see Tabony, R. C., 1977, *The variability of long duration rainfall over Great Britain*, Scientific Paper No. 37) and relate to the specified span of months only (return periods may be up to an order of magnitude less if n-month periods beginning in any month are considered); RP estimates for Northern Ireland are based on the tables for north-west England and those for the Highland region take account of ranking positions. The tables reflect rainfall over the period 1911-70 and assume a stable climate. Artifacts, in the Scottish rainfall series in particular, can exaggerate the relative wetness of the recent past. *See page 12.

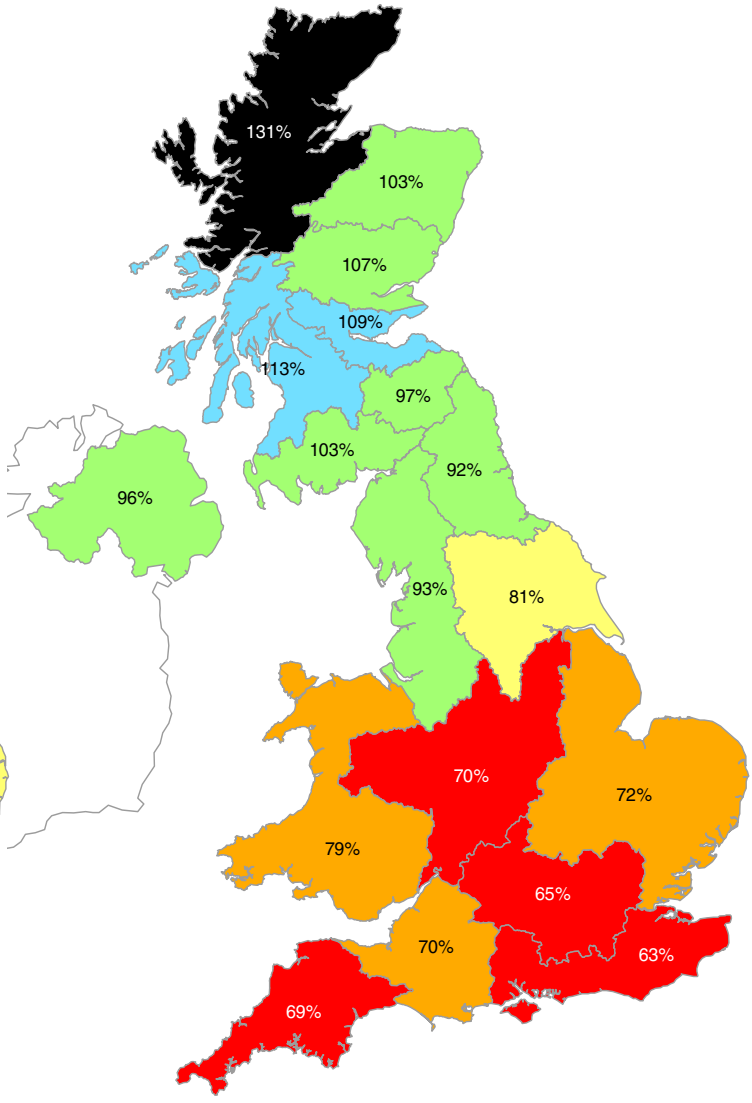
Rainfall . . . Rainfall . .

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 2005 - May 2005

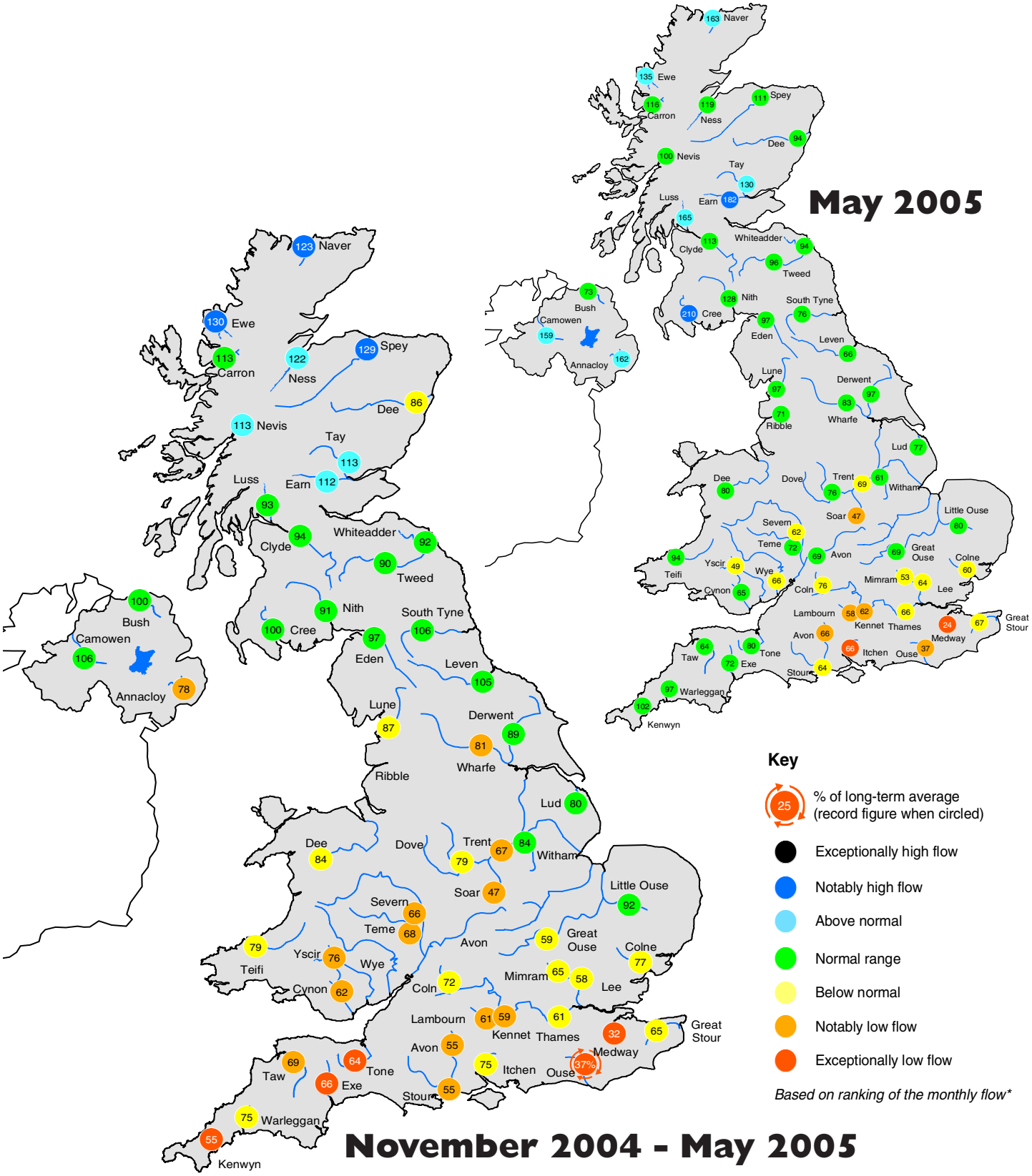


November 2004 - May 2005

Rainfall accumulation maps

Regional rainfall totals for the spring reflect the predominant synoptic patterns – Scotland reporting its wettest March-May period since 1994 (Northern Ireland was also relatively wet), whilst substantial rainfall deficiencies typify much of the English Lowlands. The November-May rainfall figures paint a broadly similar picture but with more significant and extensive regional deficiencies. The England and Wales deficiency is exceptional in the context of the last 50 years but winter/spring droughts were substantially more common in the 19th century.

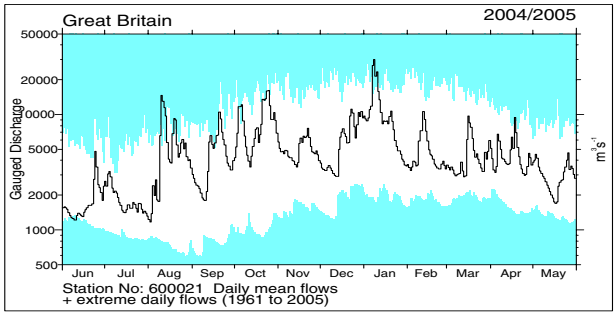
River flow . . . River flow . . .

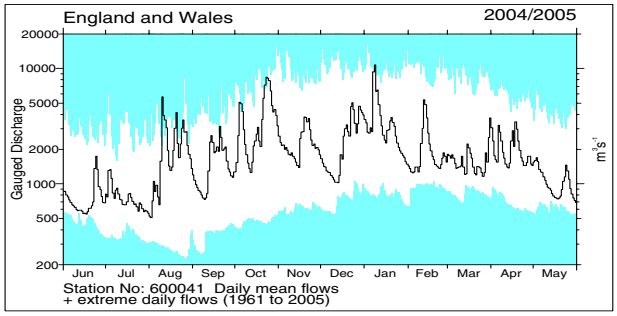


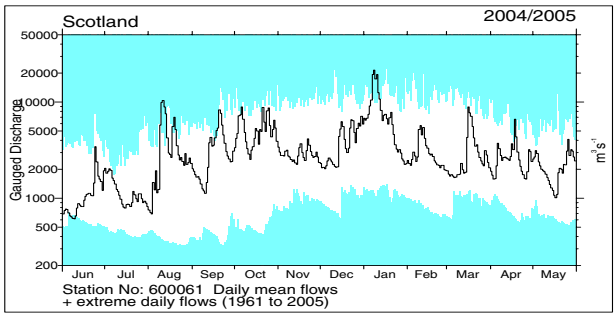
River flows

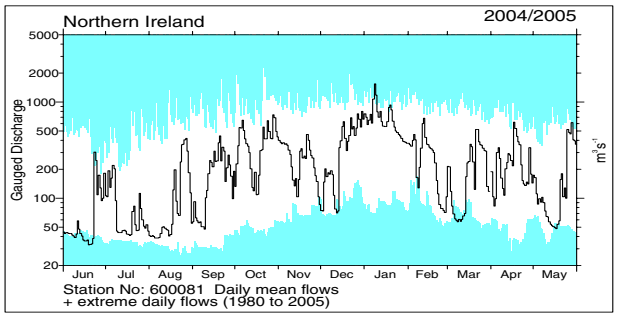
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

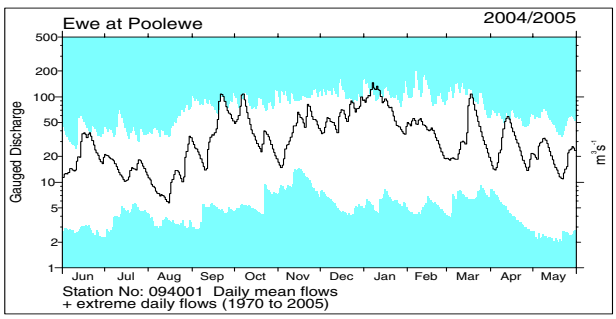
River flow . . . River flow . . .

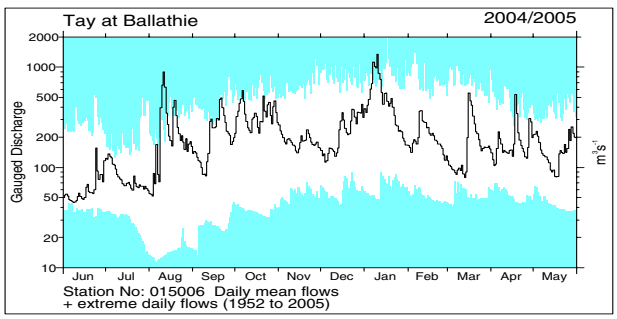


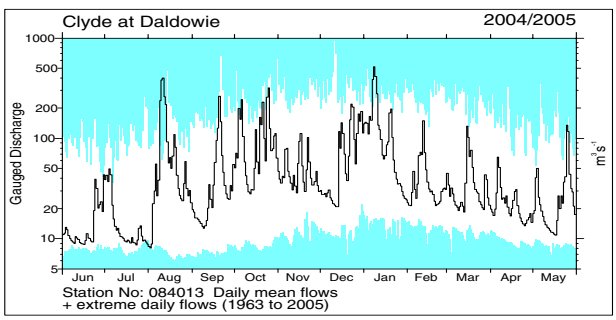


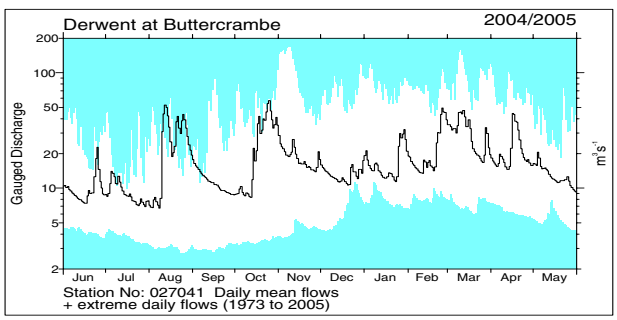


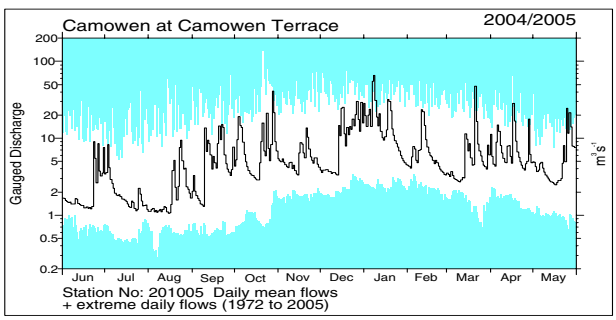


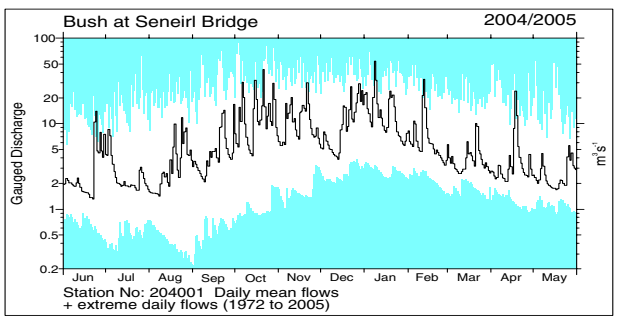








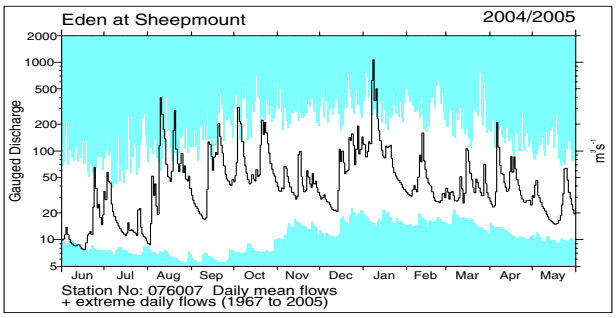


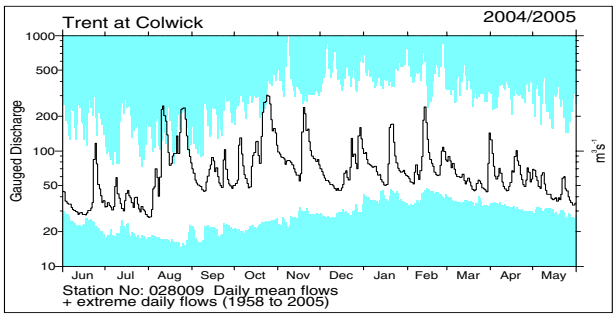


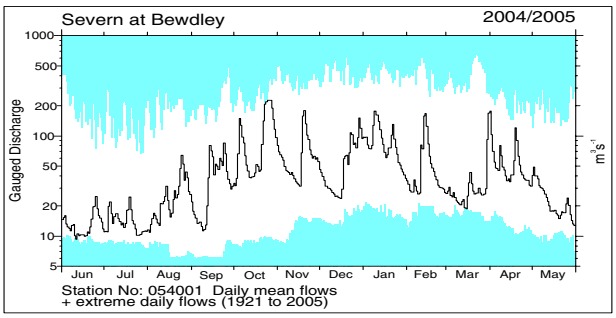
River flow hydrographs

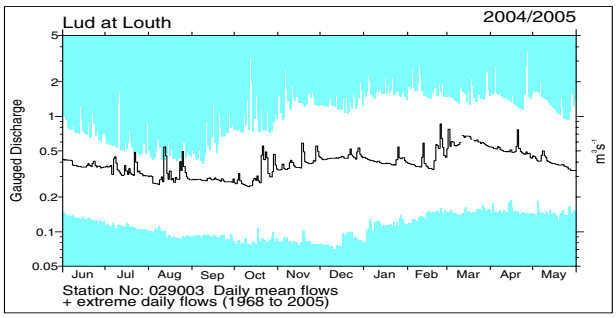
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to June 2004 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The 'national' hydrographs are based on representative networks of gauging stations commanding relatively large catchments.

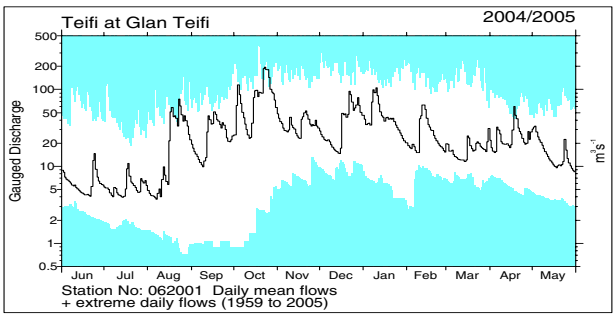
River flow . . . River flow . . .

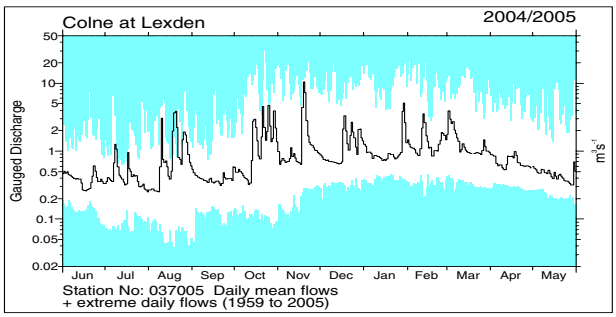


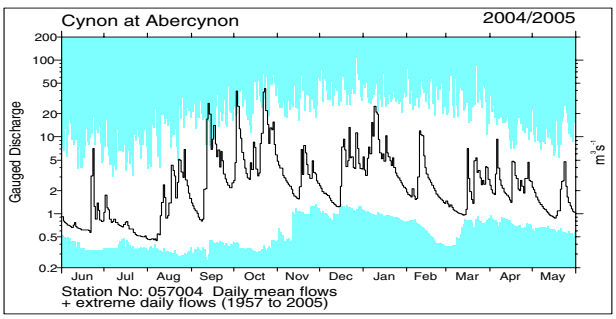


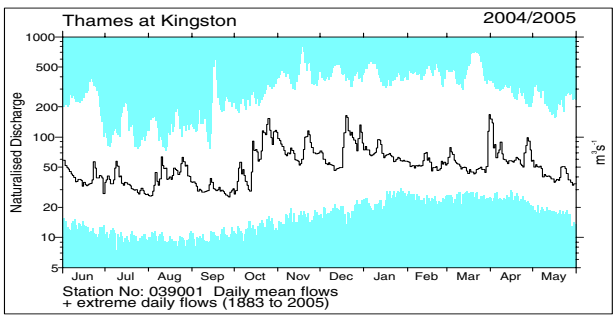


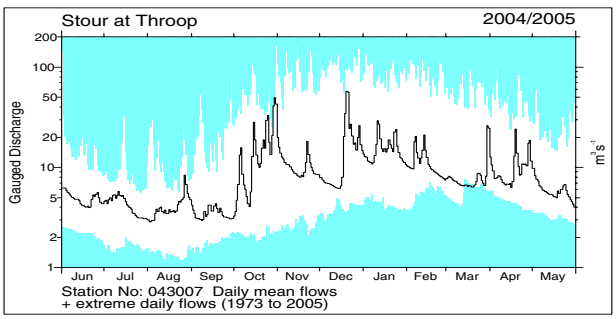


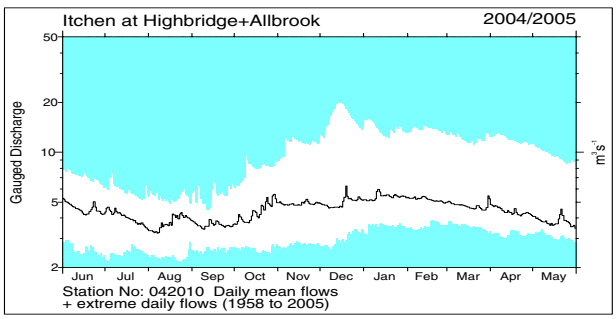












Notable runoff accumulations

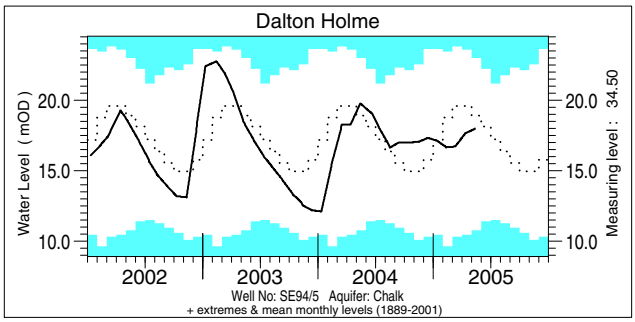
(a) March 2005 - May 2005, (b) November 2004 - May 2005

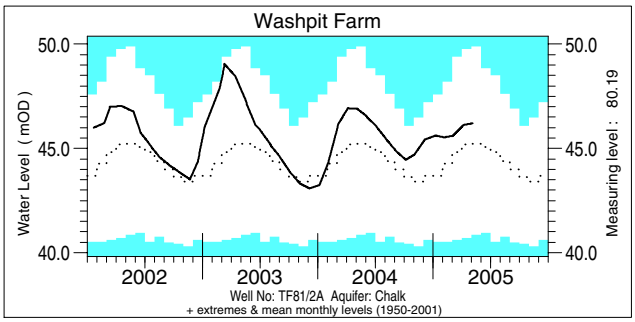
	River	%lta	Rank
a)	Whiteadder	142	32/36
	Torne	54	5/33
	Thames (Nat)	64	26/123
	Kennet	59	5/44
	Test	59	3/47
	Itchen	67	4/47
	Stour (Throop)	56	3/33
	Warleggan	69	3/36
	Faughan	68	4/29

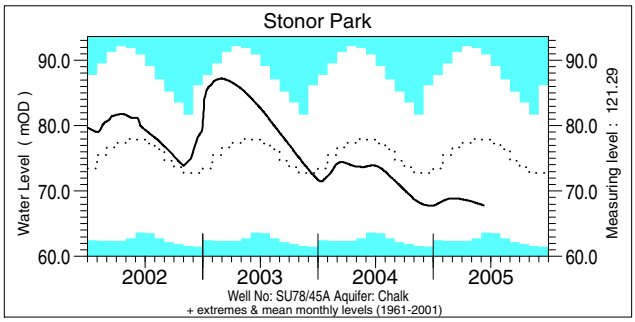
	River	%lta	Rank
b)	Spey (Boat o'Brig)	129	50/53
	Soar	46	3/34
	Mole	50	1/30
	Medway	32	2/44
	Ouse (Gold Bridge)	37	1/41
	Wallington	38	2/51
	Piddle	58	3/41
	Exe	66	2/49
	Otter	55	3/43
	Kenwyn	55	2/37
	Tone	64	3/44
	Yscir	76	3/32
	Ewe	130	33/35
	L Bann	76	1/25

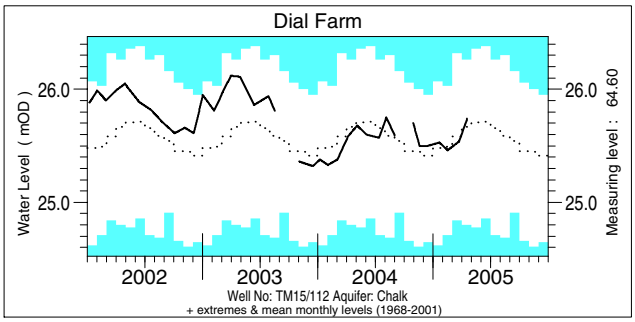
lta = long term average
Rank 1 = lowest on record

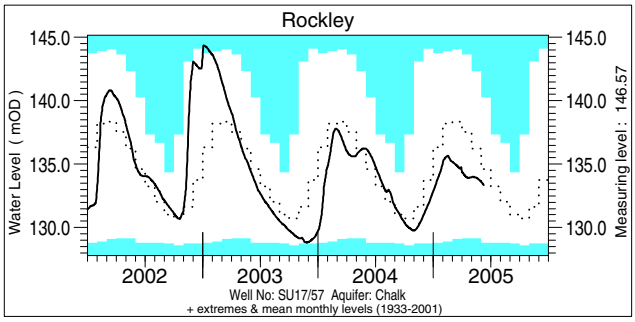
Groundwater . . . Groundwater

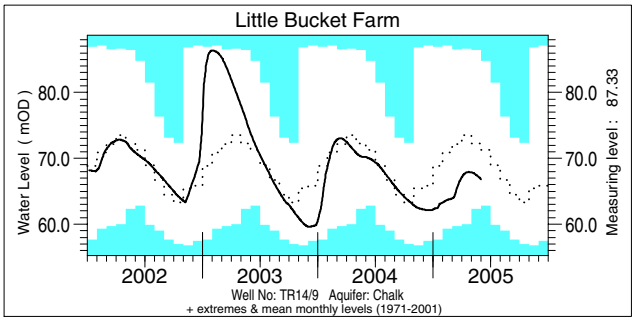


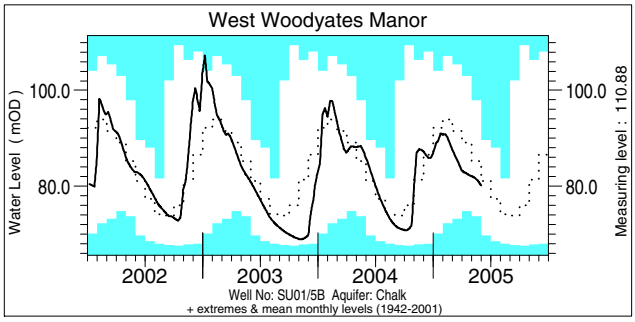


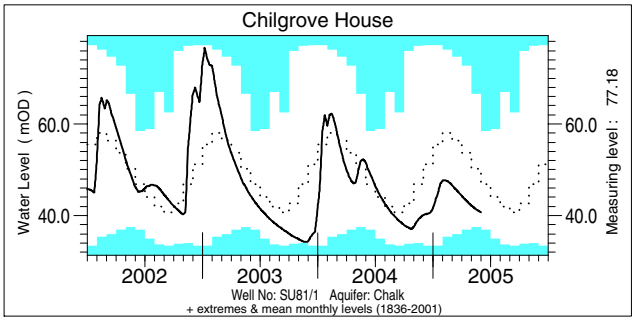


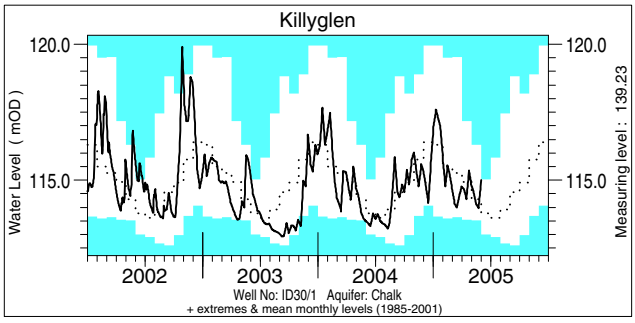


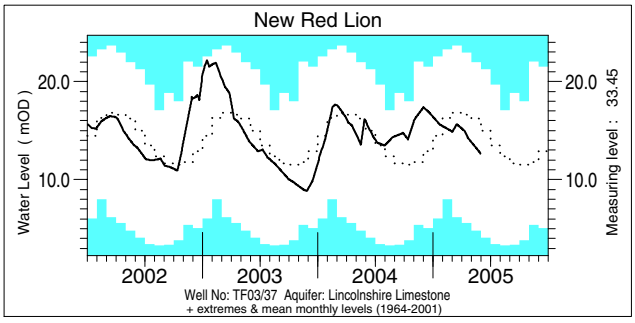






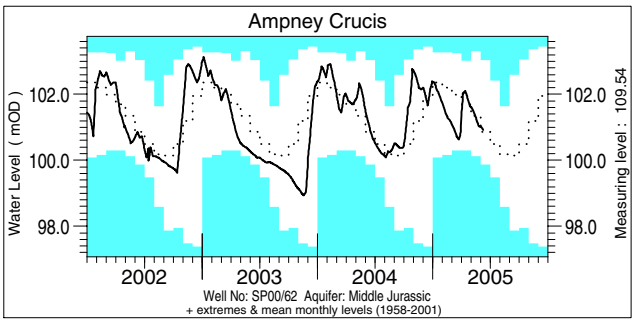


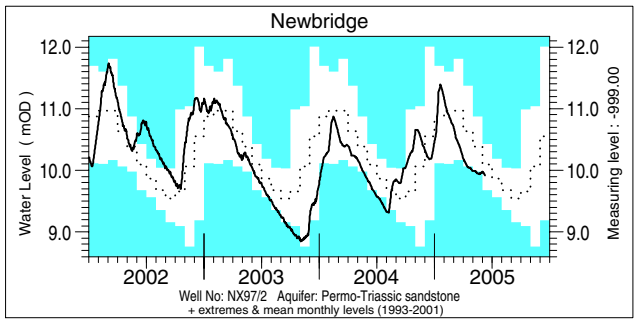


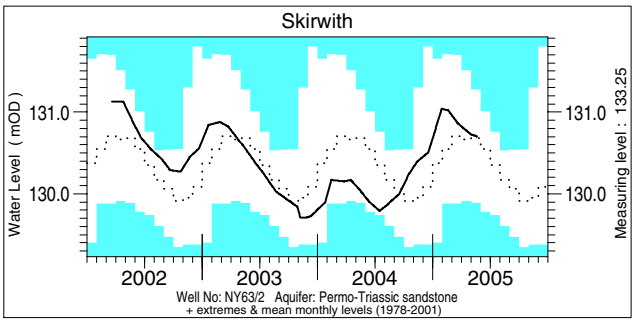


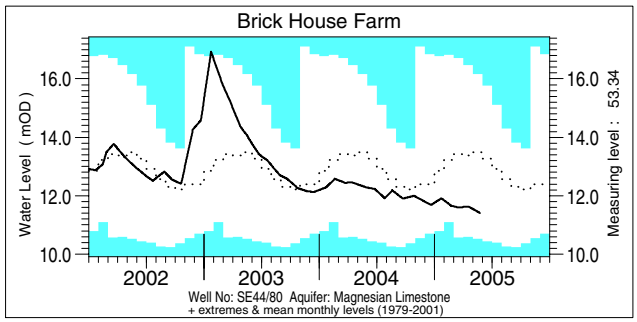
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

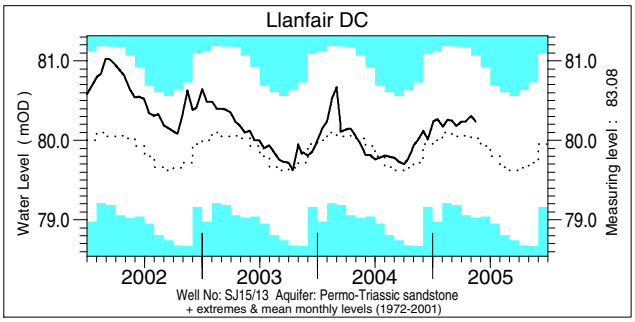
Groundwater . . . Groundwater

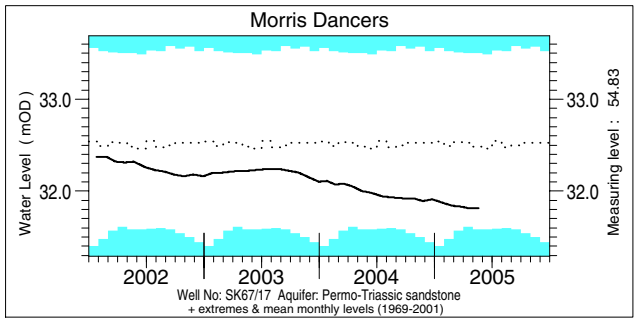


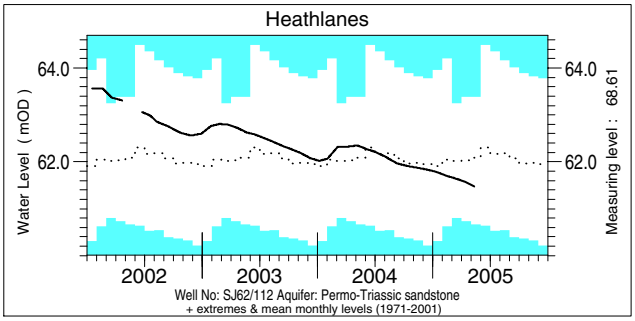


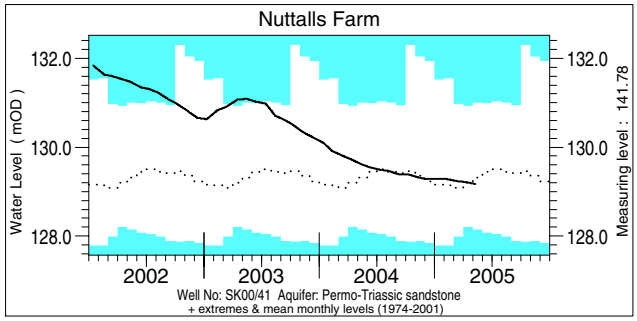


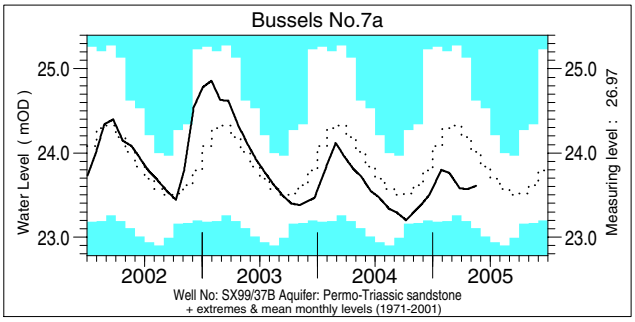


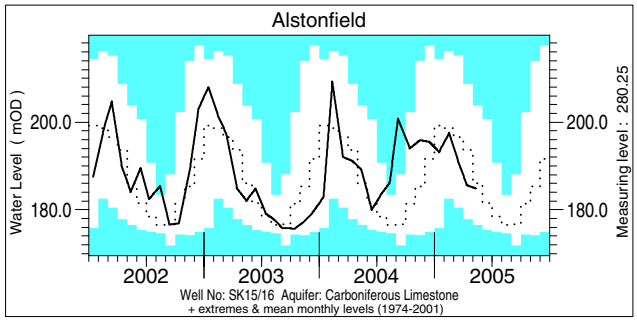












Groundwater levels May/June 2005

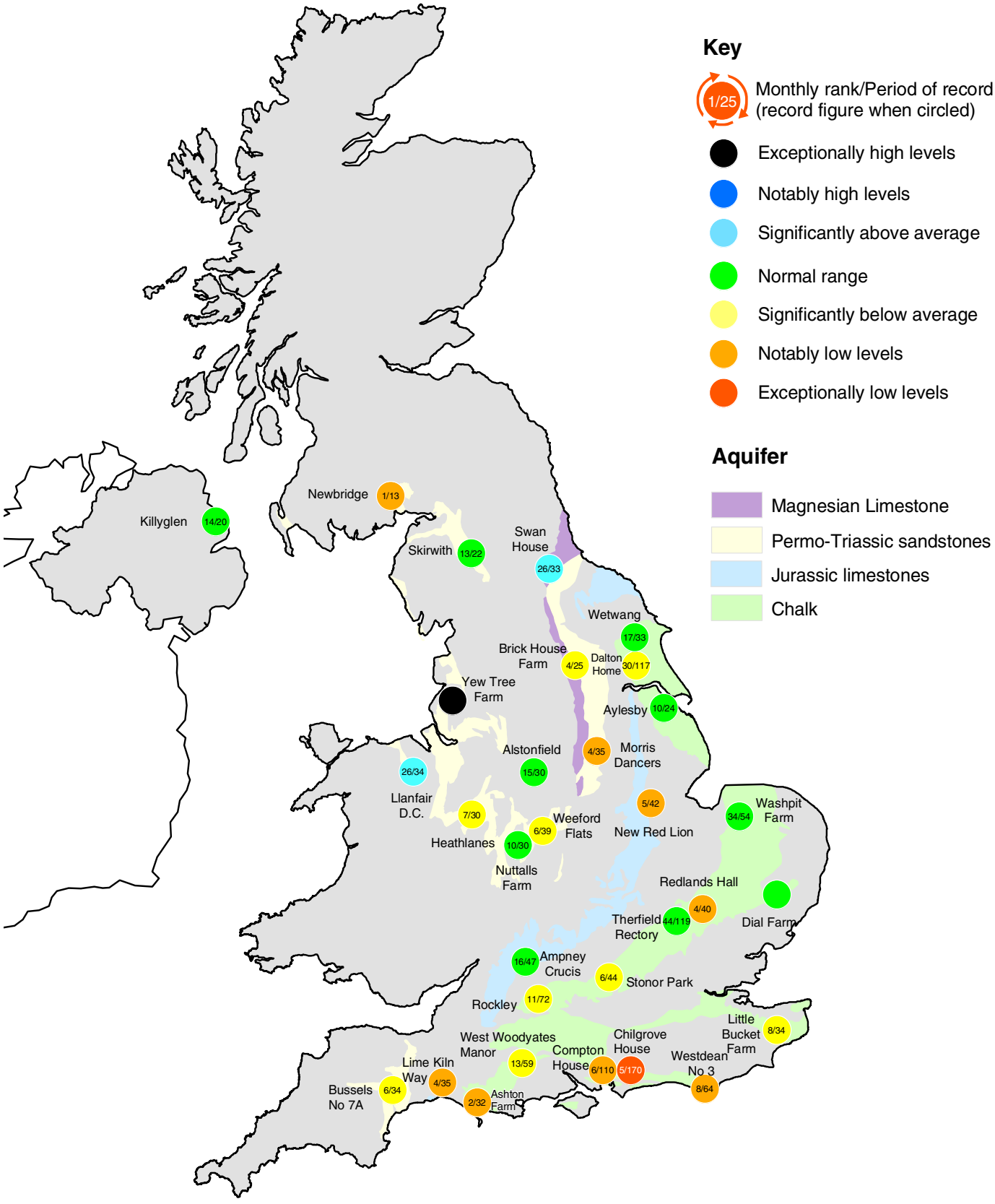
Borehole	Level	Date	May. av.
Dalton Holme	17.98	12/05	18.96
Washpit Farm	46.21	05/05	45.49
Stonor Park	67.79	08/06	78.46
Dial Farm	25.74	18/04	25.71
Rockley	133.35	08/06	136.22
Little Bucket Farm	66.85	31/05	72.53
West Woodyates	80.08	31/05	84.68

Borehole	Level	Date	May. av.
Chilgrove House	40.68	31/05	49.00
Killyglen	115.00	31/05	114.52
New Red Lion	12.65	30/05	15.96
Ampney Crucis	100.92	08/06	101.28
Newbridge	9.92	08/06	10.34
Skirwith	130.70	20/05	130.57
Brick House Farm	11.41	23/05	13.45

Borehole	Level	Date	May. av.
Llanfair DC	80.24	15/05	79.97
Morris Dancers	31.81	20/05	32.36
Heathlanes	61.47	12/05	62.11
Nuttalls Farm	129.17	09/05	129.63
Bussels No.7a	23.61	17/05	24.01
Alstonfield	184.83	11/05	186.84

Levels in metres above Ordnance Datum

Groundwater . . . Groundwater



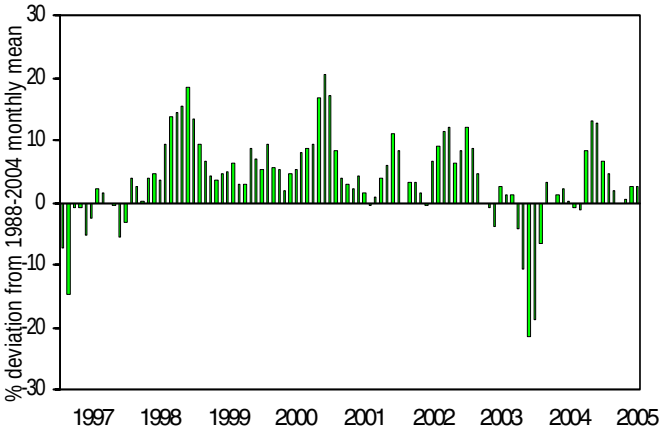
Groundwater levels - May 2005

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

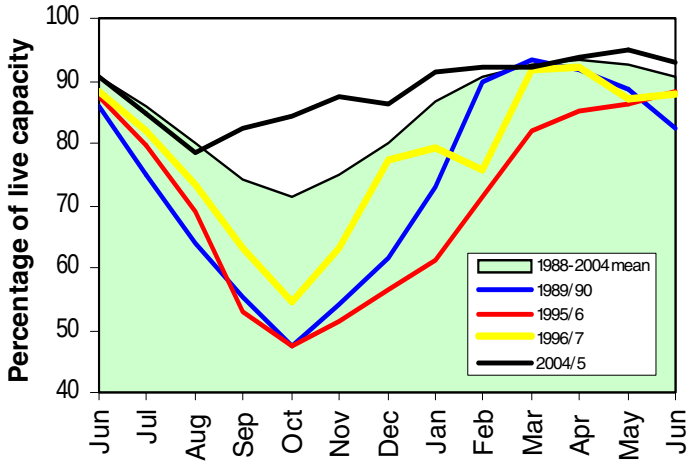
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.
ii. Yew Tree Farm levels are now received quarterly.

Reservoirs . . . Reservoirs . .

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



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



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

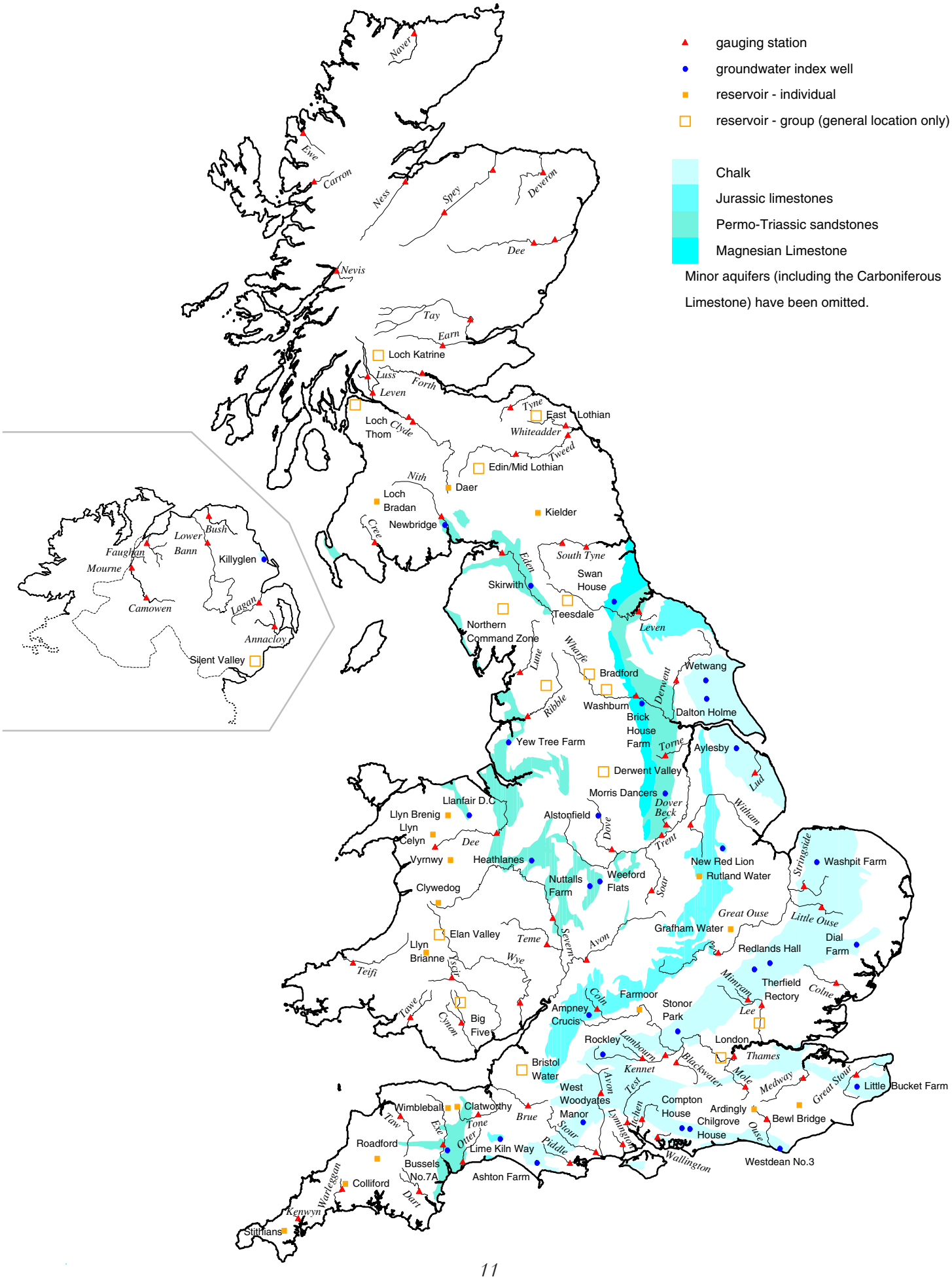
Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2005 Feb	Mar	Apr	May	Jun	Avg. Jun	Min. Jun	Year* of min.
North West	N Command Zone	• 124929	100	91	90	90	**86**	83	72	1991
	Vyrnwy	55146	99	97	97	98	**94**	89	72	1990
Northumbrian	Teesdale	• 87936	93	89	95	98	**95**	85	64	1991
	Kielder	(199175)	(91)	(90)	(91)	(93)	**(94)**	(92)	(85)	1989
Severn Trent	Clywedog	44922	79	89	94	100	**100**	96	83	1989
	Derwent Valley	• 39525	99	95	99	100	**92**	88	56	1996
Yorkshire	Washburn	• 22035	86	83	80	85	**77**	88	72	1990
	Bradford supply	• 41407	99	94	98	100	**93**	85	70	1996
Anglian	Grafham	(55490)	(92)	(94)	(96)	(96)	**(93)**	(93)	(72)	1997
	Rutland	(116580)	(95)	(94)	(94)	(94)	**(95)**	(91)	(75)	1997
Thames	London	• 202340	91	95	96	99	**98**	93	83	1990
	Farmoor	• 13830	99	98	97	98	**99**	97	90	2002
Southern	Bewl	28170	70	75	86	85	**78**	87	57	1990
	Ardingly	4685	79	83	93	98	**98**	99	96	1990
Wessex	Clatworthy	5364	100	100	94	100	**94**	86	67	1990
	Bristol WW	• (38666)	(77)	(83)	(82)	(85)	**(82)**	(88)	(70)	1990
South West	Colliford	28540	70	71	70	71	**71**	85	52	1997
	Roadford	34500	71	73	72	75	**73**	84	48	1996
	Wimbleball	21320	86	90	96	96	**93**	90	76	1992
	Stithians	5205	68	75	78	84	**87**	85	66	1990
Welsh	Celyn and Brenig	• 131155	97	98	100	100	**100**	97	82	1996
	Brianne	62140	94	96	97	100	**100**	96	85	1995
	Big Five	• 69762	98	96	97	96	**91**	90	70	1990
	Elan Valley	• 99106	99	98	99	99	**94**	95	85	1990
Scotland(E)	Edinburgh/Mid Lothian	• 97639	98	99	99	99	**99**	89	52	1998
	East Lothian	• 10206	100	100	100	100	**100**	96	84	1990
Scotland(W)	Loch Katrine	• 111363	89	86	91	97	**100**	87	66	2001
	Daer	22412	100	97	95	100	**100**	90	70	1994
	Loch Thom	• 11840	100	100	100	100	**100**	89	74	2001
Northern Ireland	Total+	• 67270	86	83	84	89	**89**	86	74	2004
	Silent Valley	• 20634	78	73	73	89	**93**	79	56	2000

() figures in parentheses relate to gross storage • denotes reservoir groups +excludes Lough Neagh *last occurrence - see footnote

Details of the individual reservoirs in each of the groupings listed above are available on request. The featured reservoirs may not be representative of the storage conditions across each region; this can be particularly important during droughts. The storage figures relate to the 1988-2005 period only (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.

*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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