Hydrological Summary
for the United Kingdom

April 2006

General
April was a generally mild and unsettled month but, north-western Britain aside, rainfall deficiencies increased in most areas broadening the drought's impact but also reinforcing its regional focus. For England & Wales, rainfall over the 18 months to April is the second lowest since 1975/76 but deficiencies over parts of central and southern England are the greatest since 1932-34. Overall reservoir stocks for E&W are marginally above average and very similar to early May 2005. Aided by drought mitigation measures (e.g. at Bewl Water), reservoir levels are generally healthy apart from a few southern impoundments (e.g. Weir Wood, Colliford). Modest spates in many responsive southern catchments helped raise April runoff totals well above drought minima but flows are very meagre in many spring-fed streams. Correspondingly, groundwater levels are very depressed in parts of the English Lowlands, albeit mostly above corresponding levels recorded during in the protracted droughts of the 1990s. In much of central and southern England, increasing evaporation rates and soil moisture deficits in early May very probably signal the end of the 2005/06 recharge season. Groundwater levels and river flows are set to decline through the summer with the prospect of exceptionally low flows by the autumn.

Rainfall
Westerly airflows predominated during April bringing abundant rainfall to western Scotland but most low pressure systems weakened crossing the UK. Some catchments in Kent and Sussex benefited from seasonally late snow (up to 15cm in places on the 10th) but light showers and drizzle were the primary precipitation types in eastern and southern Britain; the only sustained frontal rainfall in parts of the South being registered on the 30th. Reflecting a recurring pattern in the recent past, north-western Britain was notably wet – parts of the western Highlands reporting twice the average April rainfall. By contrast, much of southern England registered well below average totals with many catchments in the South West registering <50%. Much of north-eastern Britain was also notably dry – some localities in Fife reporting monthly totals of only around 5mm. Rainfall for E&W over the Nov-April period for both 2004/05 and 2005/06 ranks amongst the lowest five in the last 50 years. More significantly, the 2-year winter/spring deficiencies for the Thames catchment are, provisionally, the lowest since 1890-92. Rainfall deficiencies since October 2004 are the equivalent of 4-5 months average rainfall over much of southern and central England but local variations in drought severity are significant; parts of London, east Kent, the Test basin (Hampshire) and south Dorset constitute pockets of particular intensity.

Flows
April river flow patterns were characterised by steep recessions in most index rivers across the UK. However for a few of the most drought-affected rivers (including the Medway and Sussex Ouse), April runoff was close to average; a valuable recovery at a critical time. More generally in southern England minor spates in responsive catchments helped maintain flows above drought minima. April runoff totals testify to an exaggeration in the normal NW/SE runoff gradient across the UK. Whilst the River Naver registered its highest April mean flow in a 30-year series, flows in some lowland spring-fed rivers in the South East were among the lowest on record. Nonetheless, April runoff for most index rivers was in the normal range. This contrasts with runoff accumulations over the winter and early spring and, more significantly, over the last 18 months; these confirm the drought's focus on southern Britain. Index rivers establishing new 18-month (ending in April) runoff minima include the Kenwyn, Medway and Test; flows in the latter have been below average for >30 months and the April runoff was the 2nd lowest (after 1976) on record. Flows in many Chalk streams are already well below those of a typical late summer and set to decline further – with a substantial contraction in the stream network, associated habitat loss and an increasing risk of algal blooms and other water quality problems.

Groundwater
April was a further month with below average, and spatially very variable, rainfall across most of the main aquifer outcrop areas. In a few areas, late-season recharge substantially improved the groundwater outlook (e.g. in parts of Sussex and Kent). But generally, April's patchy rainfall produced very limited infiltration in most of the drought affected region where, after two of the least productive winter/spring recharge seasons in the modern era, the 2006 groundwater level recessions will begin from well below normal spring maxima. The health of groundwater resources currently displays large regional and more local variations but groundwater levels are generally less depressed than at the same time in 1997 or 1992. However, previous late spring minima in the Chalk have been eclipsed in parts of the North Downs and the Chilterns. On the Isle of Wight, levels in the Greensand (at Alverstone) are also at their lowest on record for April. Recharge to the limestone aquifers was erratic over the winter but moderate spring recoveries have generally left levels in index boreholes well within the normal range. Outcrops of the Permo-Triassic sandstones present a much less spatially coherent picture but with exceptionally low levels in many Midland index wells. Morris Dancers is at its lowest April level in a 37-year record, Weeford Flats is dry, and levels at Heathlanes are approaching late spring minima. Levels are also depressed in some eastern minor aquifers (e.g. Woburn Sands and Suffolk Crag). The incidence of spring failures and wells drying-up will increase as summer groundwater level recessions develop – these are likely to be relatively gentle as natural base levels are approached.

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Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

Area	Rainfall	Apr 2006	Jan 06- Apr 06	RP	Nov 05- Apr 06	RP	May 05- Apr 06	RP	Nov 04- Apr 06	RP
England & Wales	**mm**	**46**	**221**		**380**		**800**		**1166**	
	%	**77**	**77**	**5-10**	**80**	**5-10**	**88**	**5-10**	**84**	**10-20**
North West	mm	**74**	328		528		1078		1660	
	%	**104**	90	2-5	86	2-5	89	2-5	91	2-5
Northumbrian	mm	**38**	238		384		821		1253	
	%	**66**	87	2-5	87	2-5	95	2-5	96	2-5
Severn Trent	mm	**44**	171		294		673		955	
	%	**78**	70	5-15	75	5-15	88	2-5	82	10-20
Yorkshire	mm	**48**	234		361		749		1096	
	%	**80**	88	2-5	84	2-5	90	2-5	87	5-15
Anglian	mm	**39**	135		207		535		743	
	%	**83**	74	5-10	70	10-20	89	2-5	83	10-20
Thames	mm	**38**	158		265		561		797	
	%	**74**	72	5-10	74	5-15	80	5-15	75	30-50
Southern	mm	**43**	189		307		640		903	
	%	**81**	75	5-10	73	5-15	82	5-15	75	35-50
Wessex	mm	**27**	169		336		720		1038	
	%	**50**	60	10-20	73	5-15	84	5-10	79	15-25
South West	mm	**33**	265		538		1054		1532	
	%	**47**	64	10-20	79	5-10	88	2-5	82	10-20
Welsh	mm	**65**	349		642		1238		1824	
	%	**79**	80	2-5	87	5-10	92	2-5	88	5-10
Scotland	**mm**	**110**	**426**		**696**		**1422**		**2320**	
	%	**137**	**91**	**2-5**	**89**	**2-5**	**97**	**2-5**	**103**	**2-5**
Highland	mm	**174**	533		896		1758		2992	
	%	**185**	95	2-5	94	2-5	101	2-5	111	5-10
North East	mm	**47**	251		481		970		1499	
	%	**69**	78	5-10	92	2-5	94	2-5	96	2-5
Tay	mm	**54**	358		586		1192		1908	
	%	**79**	84	2-5	85	2-5	92	2-5	97	2-5
Forth	mm	**56**	294		465		1052		1701	
	%	**90**	82	5-10	79	5-15	92	2-5	98	2-5
Tweed	mm	**47**	266		422		938		1424	
	%	**78**	85	2-5	83	5-10	94	2-5	94	2-5
Solway	mm	**84**	441		660		1350		2084	
	%	**107**	98	2-5	88	2-5	94	2-5	95	2-5
Clyde	mm	**126**	497		765		1626		2664	
	%	**141**	90	2-5	83	5-10	93	2-5	100	<2
Northern Ireland	**mm**	**66**	**297**		**487**		**1000**		**1532**	
	%	**100**	**84**	**2-5**	**85**	**2-5**	**91**	**2-5**	**92**	**2-5**

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

 All monthly totals since November 2005 are provisional (see page 12). 1961-2003 regional monthly totals were revised by the Met Office in 2004. 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. 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

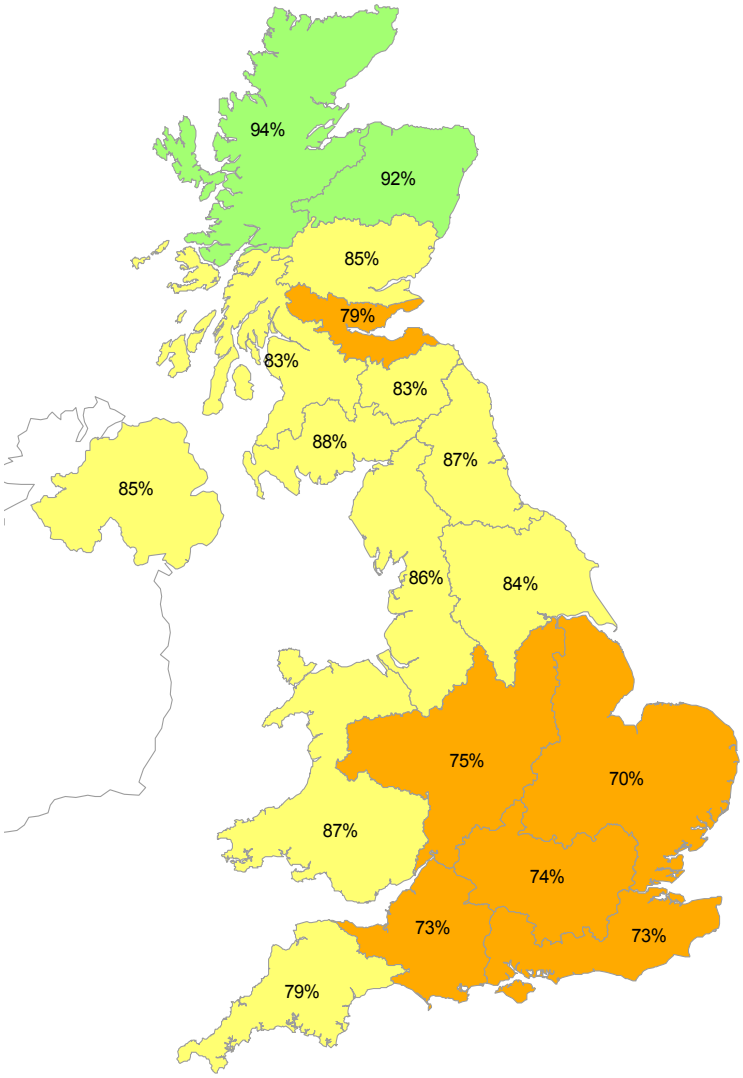
Above average

Normal range

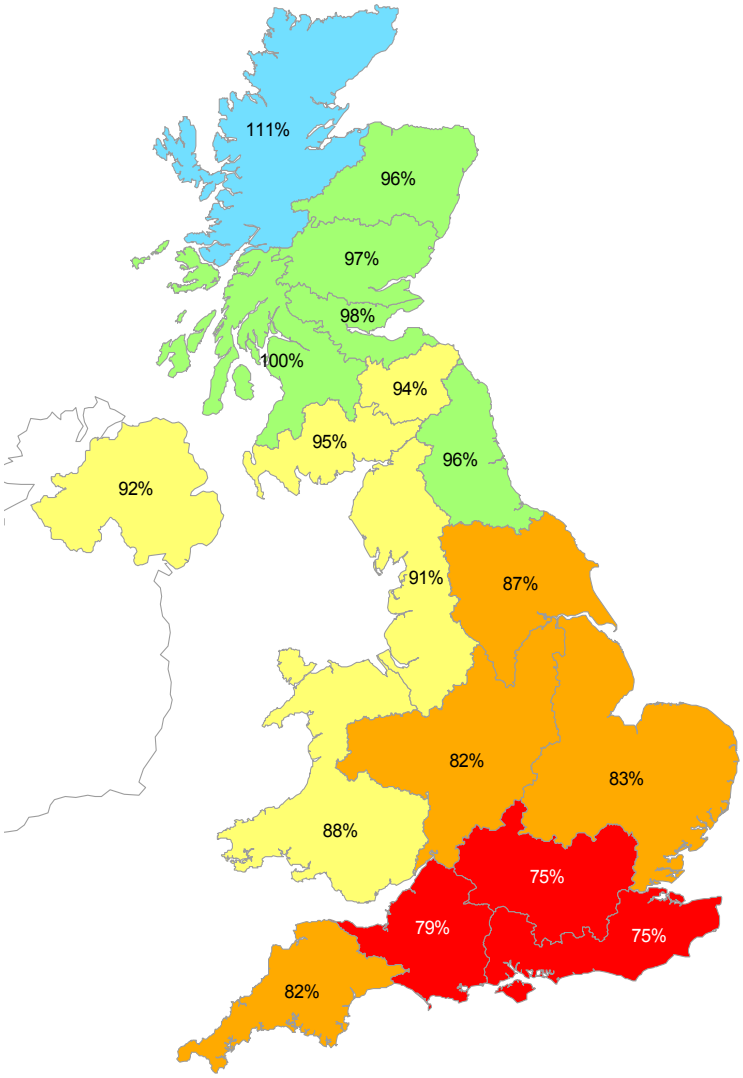
Below average

Substantially below average

Exceptionally low rainfall



November 2005 - April 2006

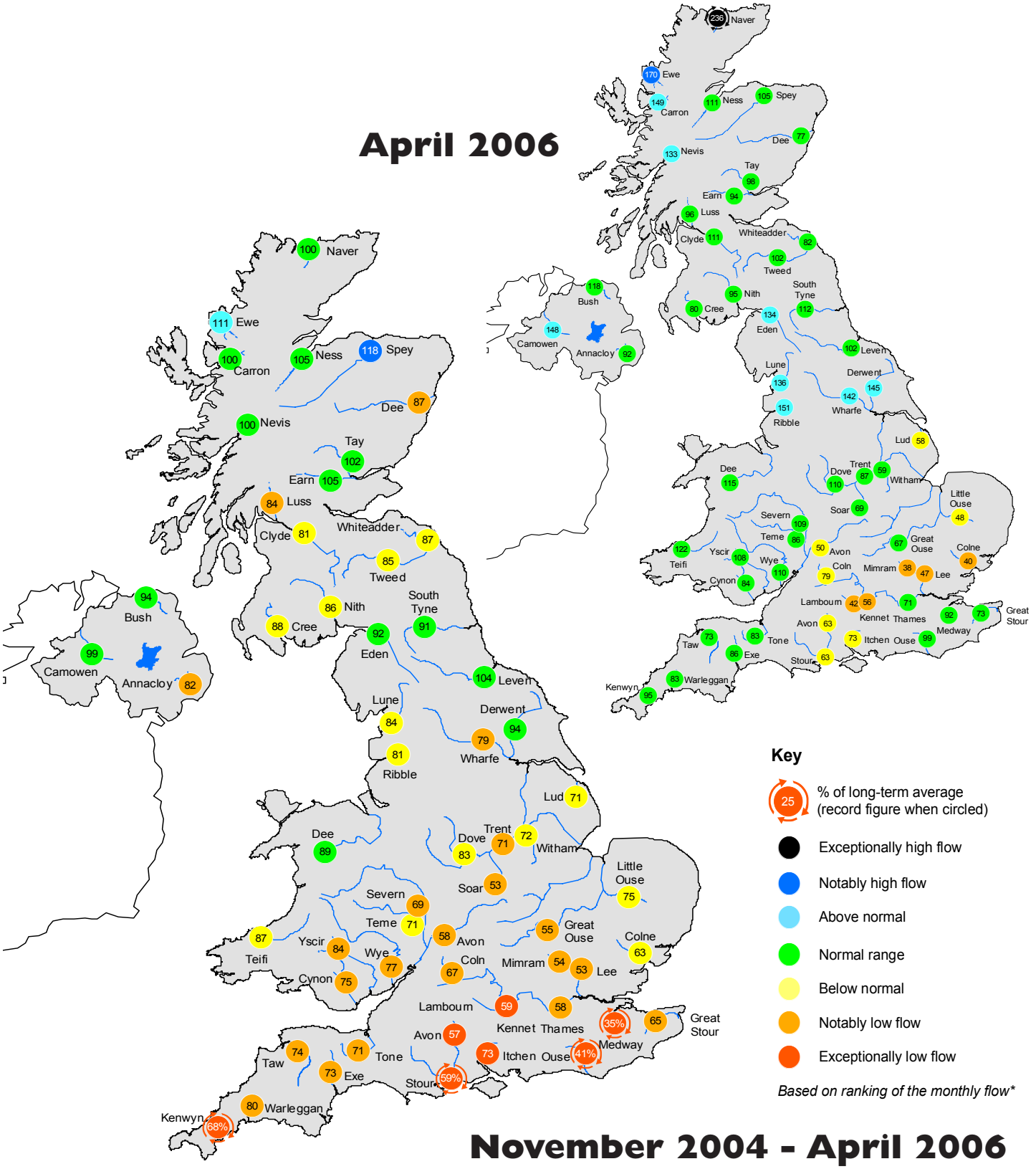


November 2004 - April 2006

Rainfall accumulation maps

Rainfall over the six months to April 2006 was considerably below average in almost all regions and the UK registered its 2nd lowest rainfall, in this timeframe, since 1975/76. The greatest deficiencies were across the English Lowlands and their significance is underlined by the map of 18-month rainfall percentages which confirms that large parts of southern England are experiencing long term deficiencies - the drought's severity reflects the disproportionate contribution of the winter months to this overall deficiency.

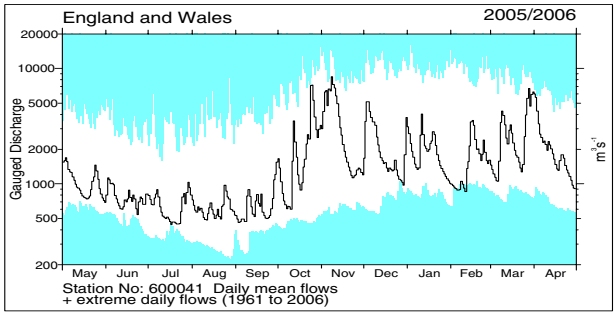
River flow . . . River flow . . .

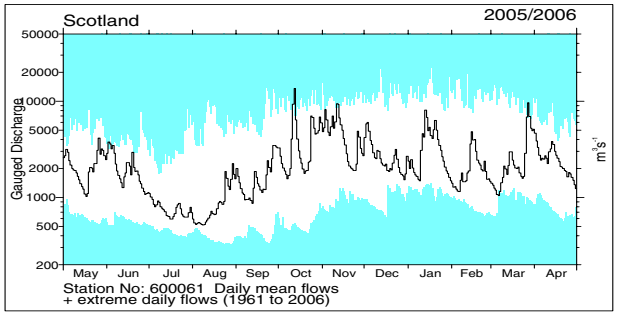


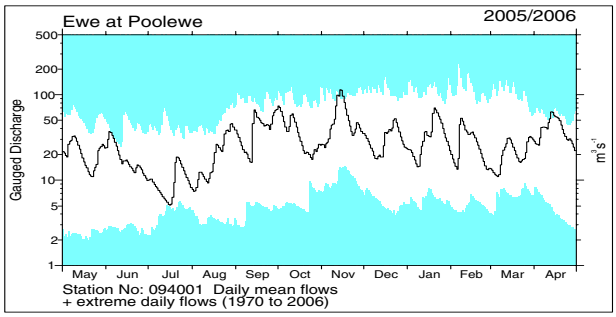
River flows

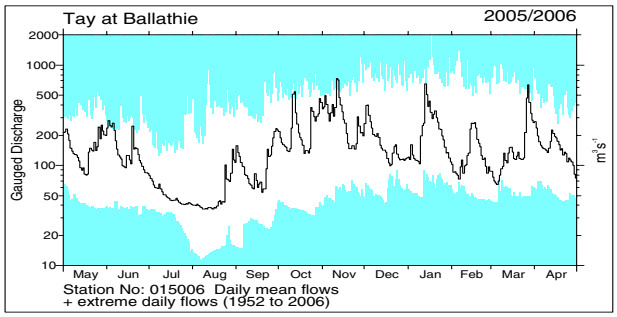
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

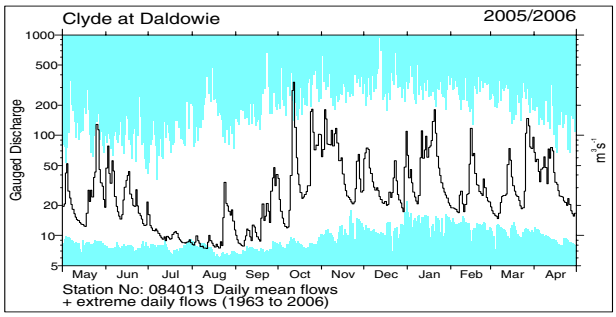
River flow . . . River flow . . .

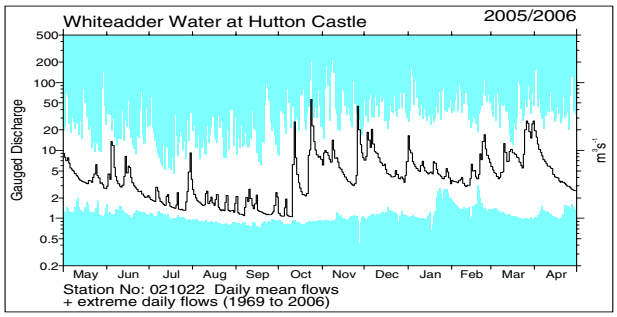


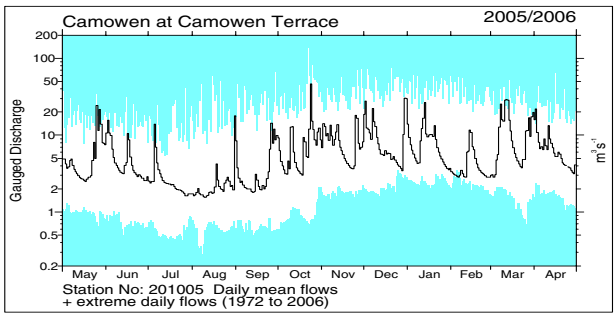


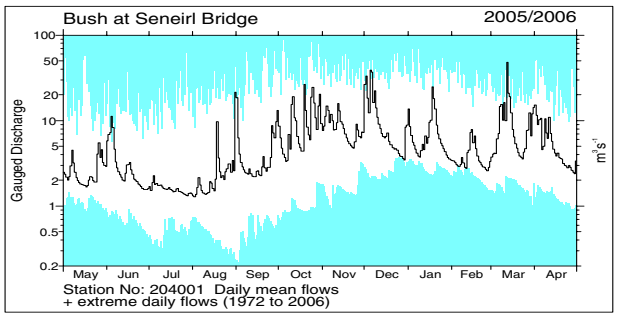


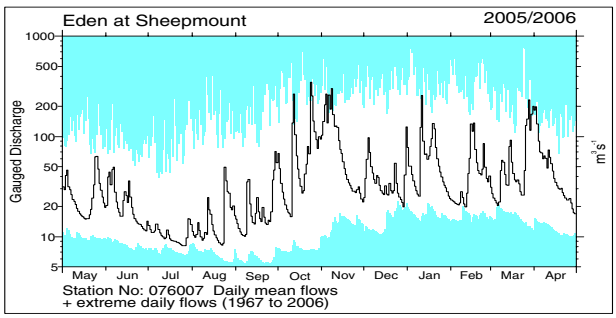


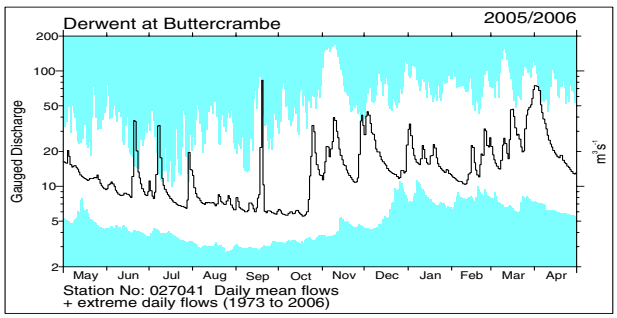








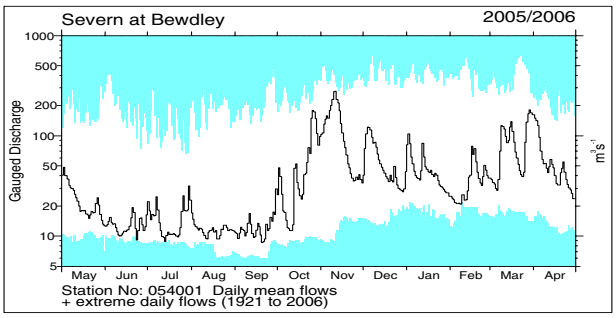


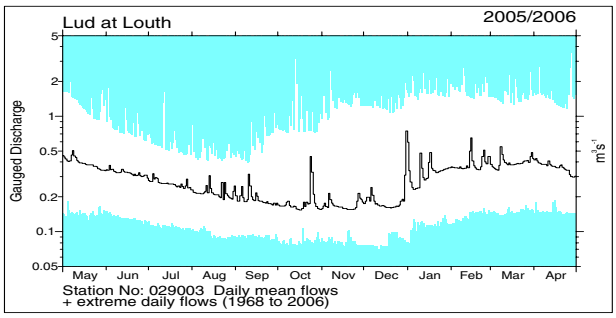


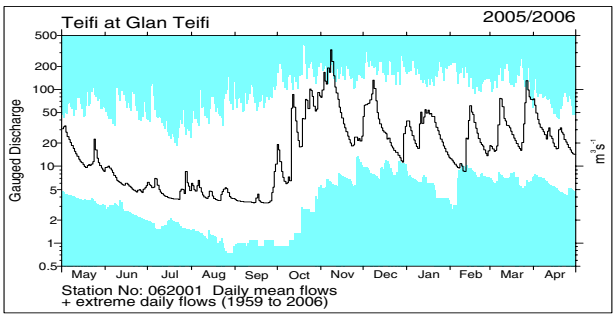
River flow hydrographs

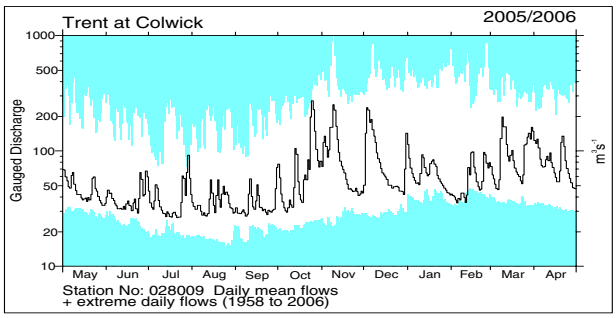
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to May 2005 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

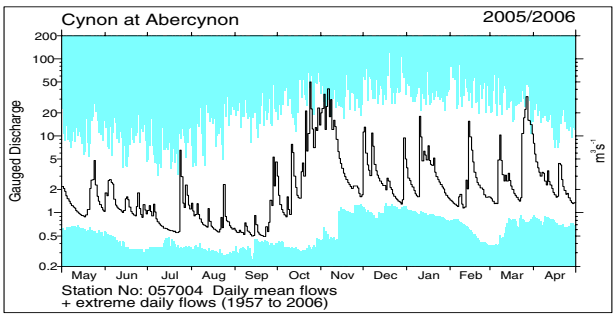
River flow . . . River flow . . .

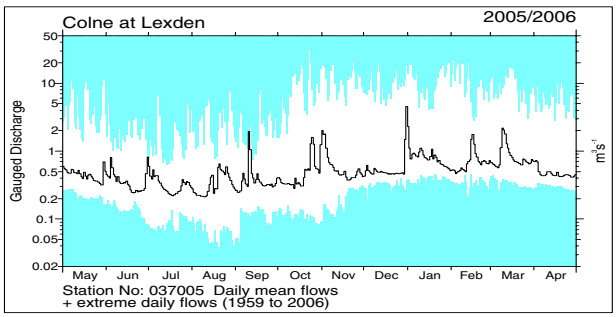


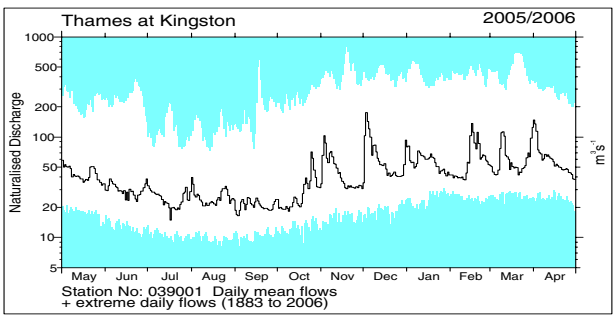


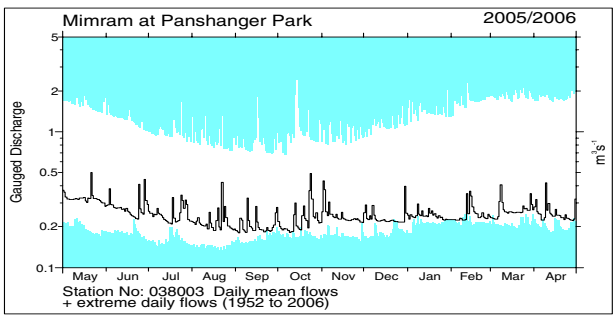


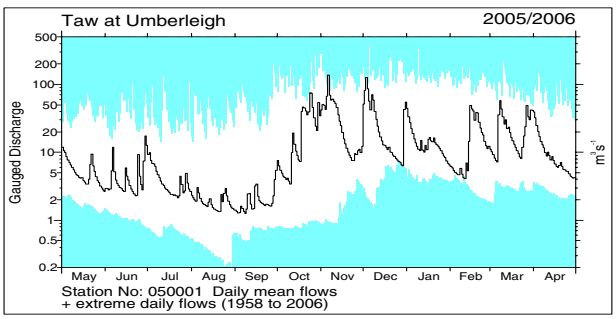


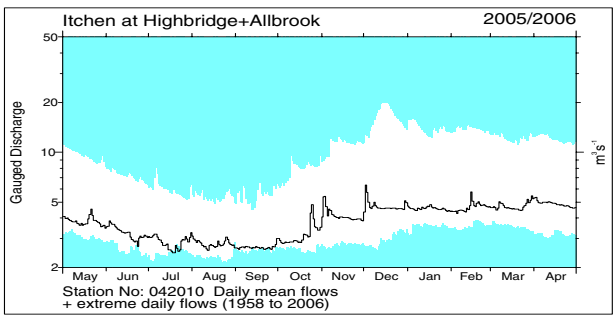












Notable runoff accumulations (a) November 2005- April 2006, (b) November 2004 - April 2006

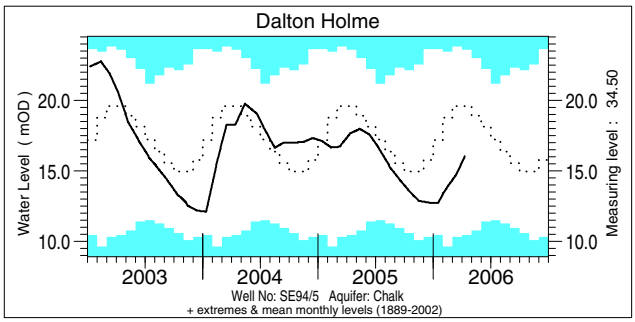
	River	%lta	Rank
a)	Forth	65	3/25
	Tweed (Boleside)	76	4/45
	Mimram	43	2/52
	Mole	65	3/31
	Luss	71	2/27
	Mourne	79	3/24
	Faughan	71	2/30

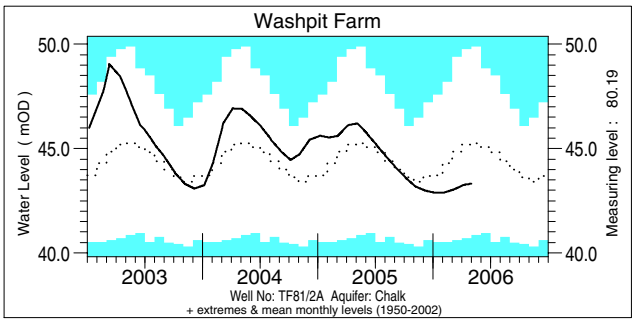
	River	%lta	Rank
b)	Soar	53	2/34
	Thames	58	9/122
	Kennet	59	2/44
	Lambourn	57	2/43
	Medway	35	1/42
	Ouse (Gold Bridge)	41	1/38
	Wallington	44	1/48

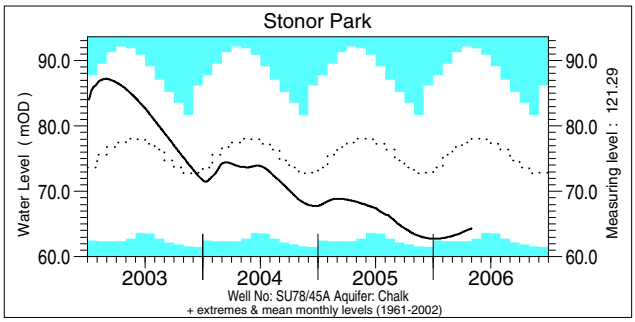
River	%lta	Rank
Test	63	1/47
Itchen	73	2/47
Avon (Amesbury)	57	2/40
Stour (Throop)	59	1/32
Piddle	61	1/40
Kenwyn	68	1/37
Annacloy	82	2/25

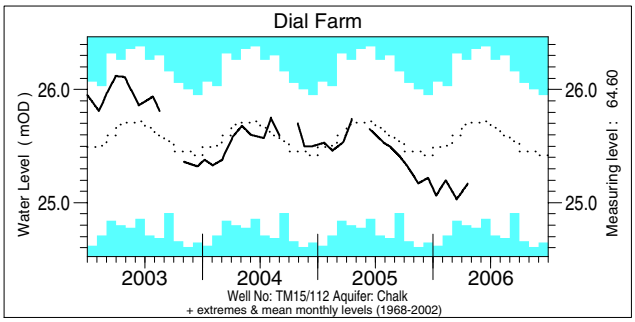
lta = long term average
Rank 1 = lowest on record

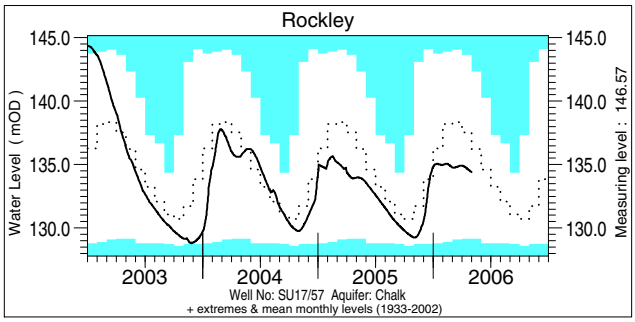
Groundwater . . . Groundwater

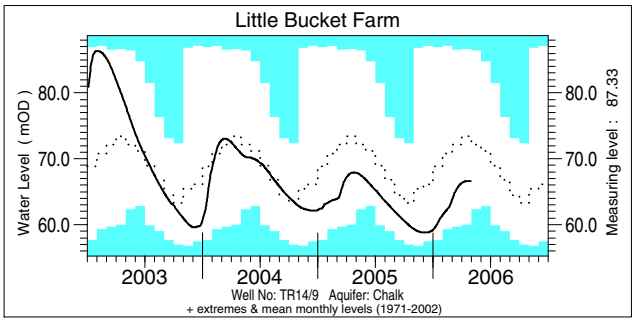


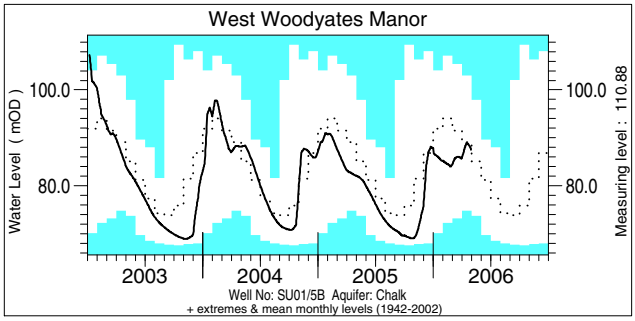


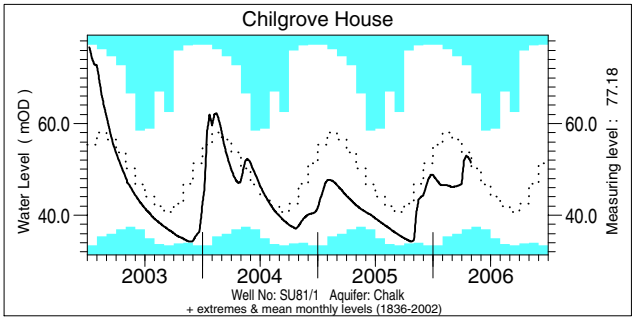


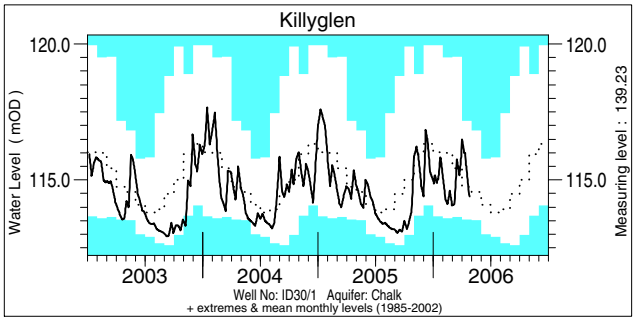


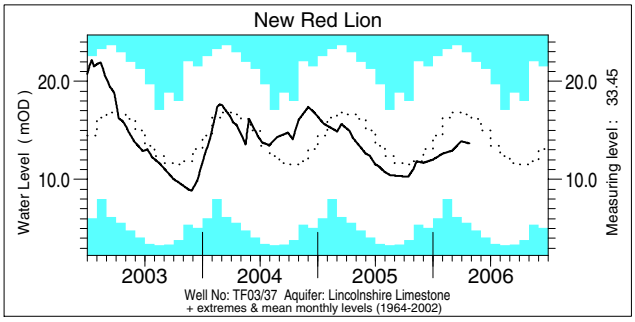






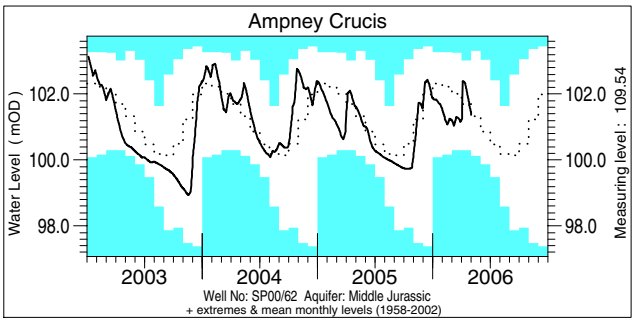


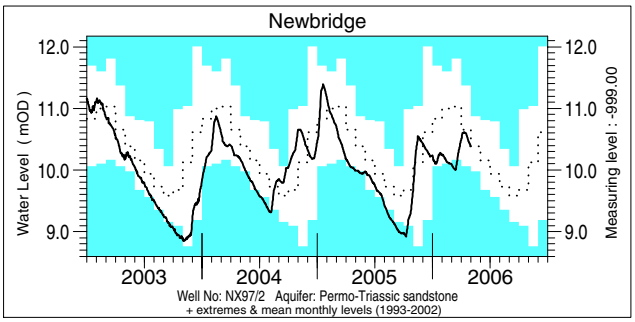


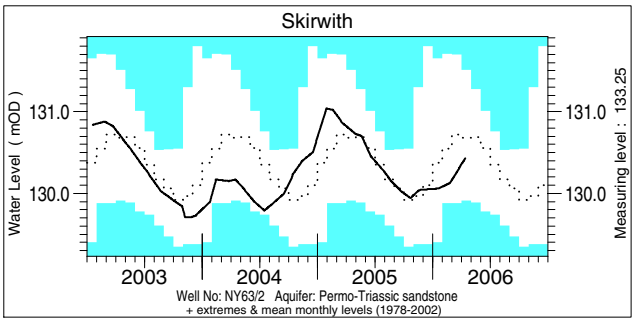


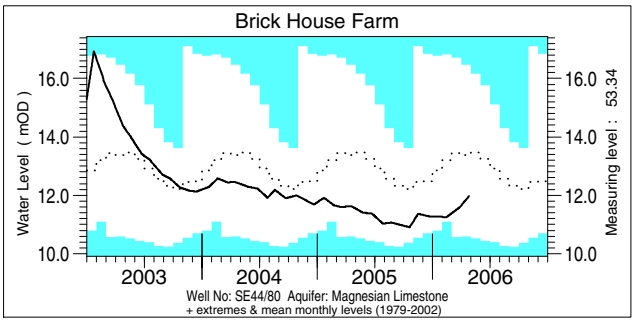
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

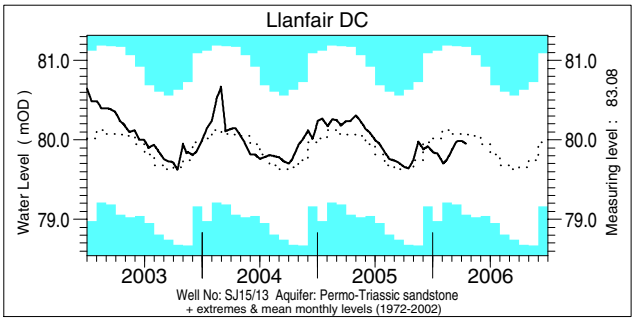
Groundwater . . . Groundwater

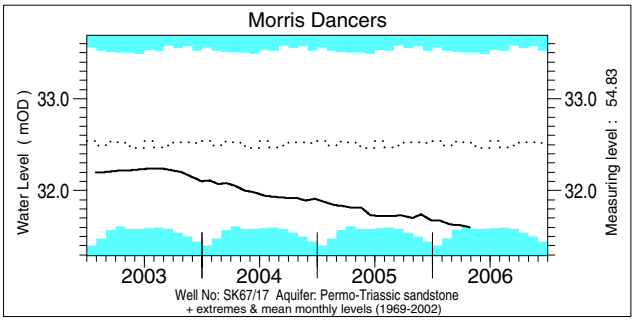


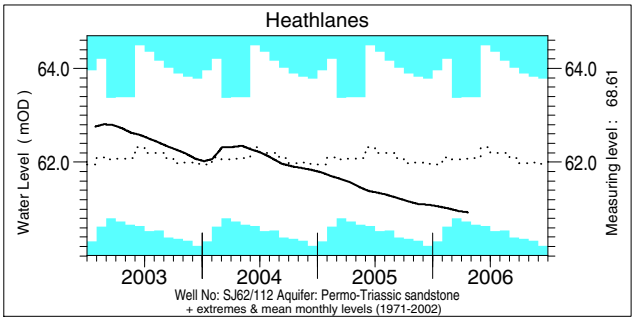


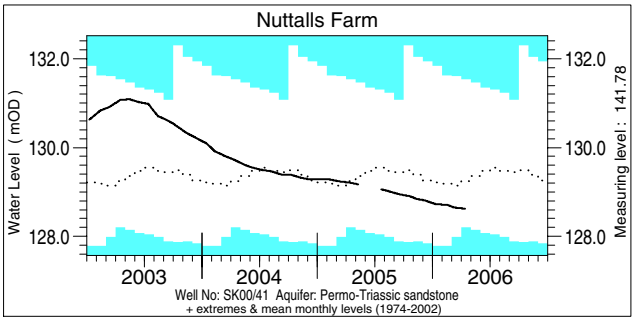


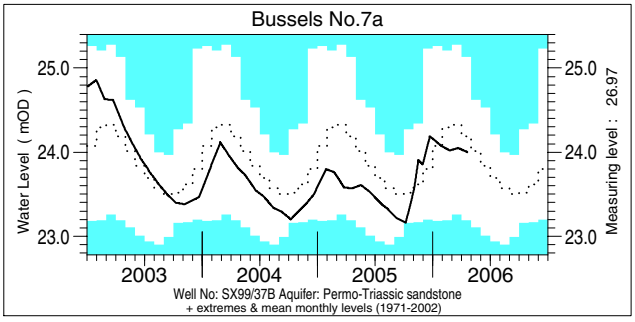


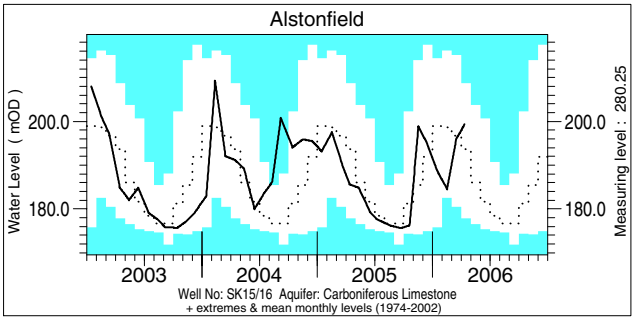










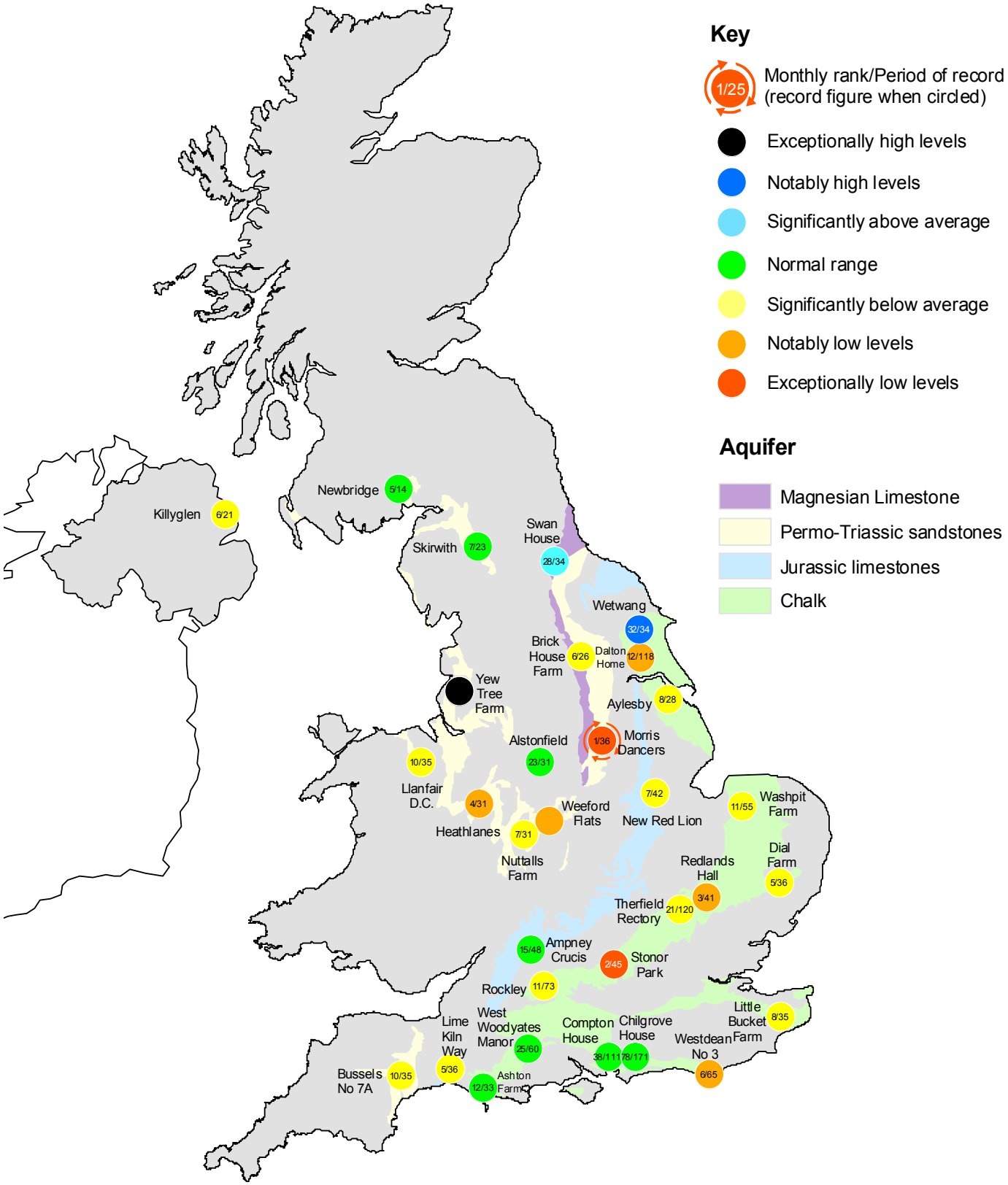


Groundwater levels April / May 2006

Borehole	Level	Date	Apr. av.	Borehole	Level	Date	Apr. av.	Borehole	Level	Date	Apr. av.
Dalton Holme	16.07	10/04	19.50	Chilgrove House	51.49	30/04	52.23	Llanfair DC	79.95	15/04	80.05
Washpit Farm	43.32	02/05	45.43	Killyglen	114.40	25/04	114.94	Morris Dancers	31.60	27/04	32.36
Stonor Park	64.34	02/05	77.72	New Red Lion	13.65	26/04	16.44	Heathlanes	60.93	21/04	62.09
Dial Farm	25.17	20/04	25.69	Ampney Crucis	101.37	02/05	101.72	Nuttalls Farm	128.62	14/04	129.50
Rockley	134.40	02/05	137.51	Newbridge	10.39	30/04	10.56	Bussels No.7a	24.00	20/04	24.17
Little Bucket Farm	66.64	29/04	72.47	Skirwith	130.43	13/04	130.63	Alstonfield	199.30	11/04	192.93
West Woodyates	87.50	30/04	88.37	Brick House Farm	11.97	25/04	13.39				

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



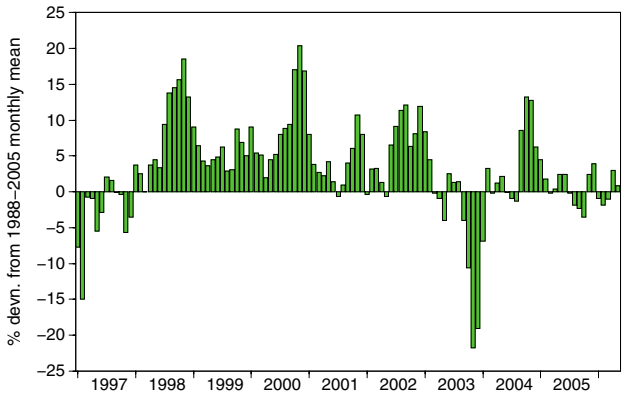
Groundwater levels - April 2006

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.

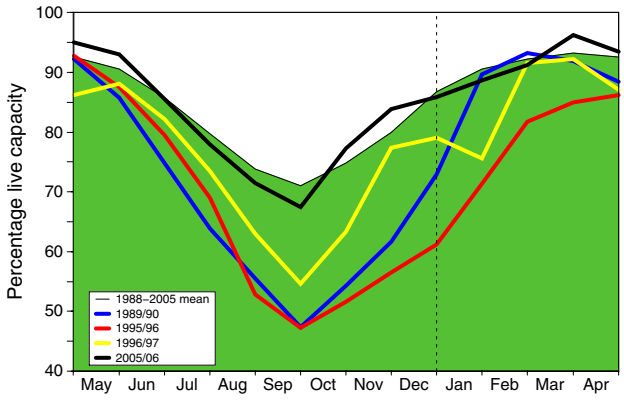
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.
ii. Yew Tree Farm levels are now received quarterly.

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.

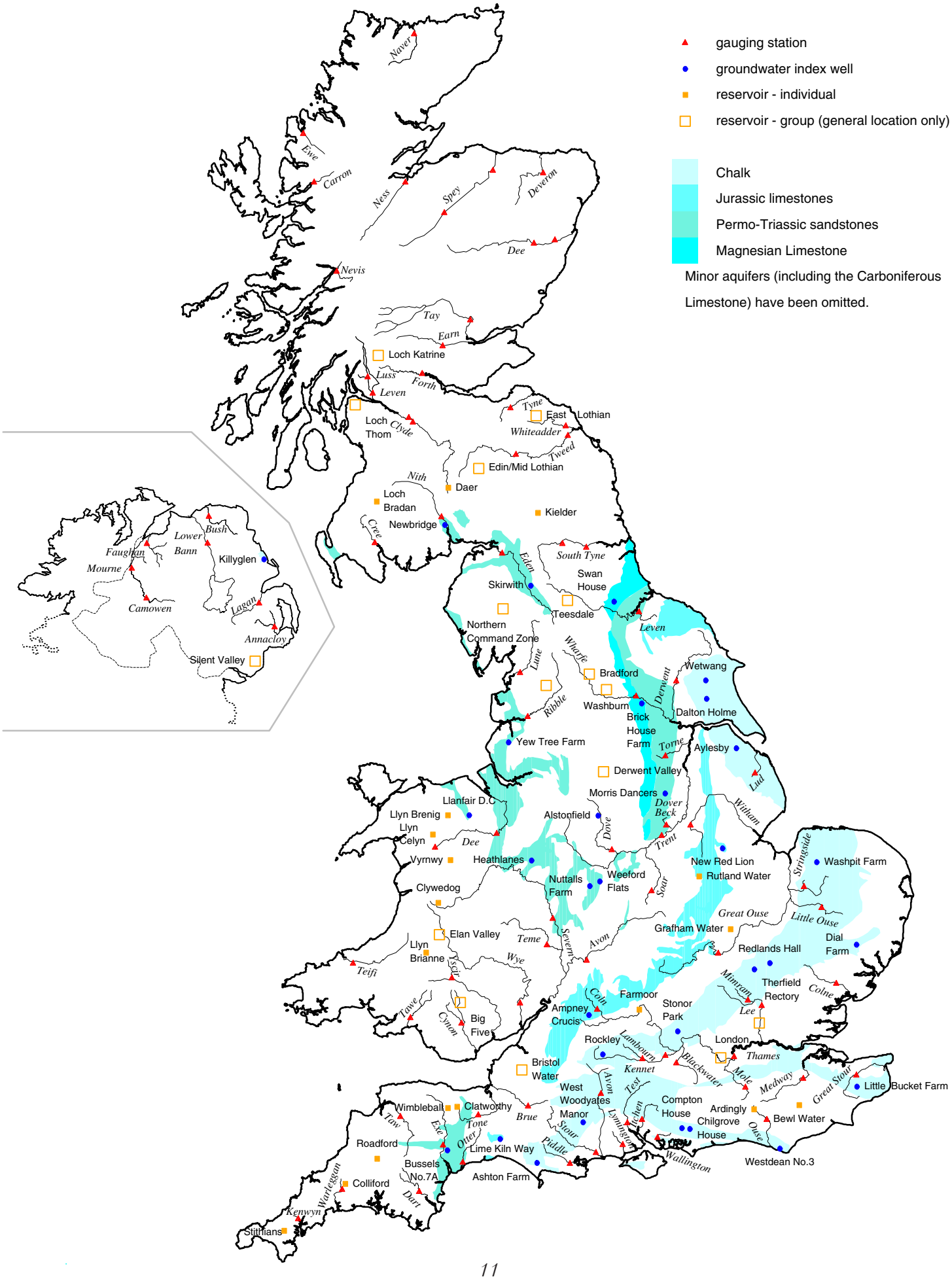
Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2006 Jan	Feb	Mar	Apr	May	Avg. May	Min. May	Year* of min.
North West	N Command Zone	• 124929	82	89	90	100	**91**	89	74	2003
	Vyrnwy	55146	85	91	90	100	**98**	93	70	1996
Northumbrian	Teesdale	• 87936	93	94	100	100	**94**	91	74	2003
	Kielder	(199175)	(92)	(93)	(92)	(98)	**(89)**	(91)	(85)	1990
Severn Trent	Clywedog	44922	86	87	88	99	**100**	96	85	1988
	Derwent Valley	• 39525	92	93	98	100	**99**	93	54	1996
Yorkshire	Washburn	• 22035	92	85	89	99	**94**	90	76	1996
	Bradford supply	• 41407	81	82	83	97	**95**	91	60	1996
Anglian	Grafham	(55490)	(79)	(85)	(89)	(96)	**(99)**	(93)	(73)	1997
	Rutland	(116580)	(72)	(80)	(83)	(88)	**(91)**	(92)	(72)	1997
Thames	London	• 202406	87	92	98	99	**91**	94	86	1990
	Farmoor	• 13822	98	93	99	97	**99**	97	81	2000
Southern	Bewl	28170	34	37	50	65	**85**	90	63	1990
	Ardingly	4685	57	65	77	88	**100**	100	98	2005
Wessex	Clatworthy	5364	99	100	100	100	**98**	93	81	1990
	Bristol WW	• (38666)	(71)	(76)	(81)	(87)	**(92)**	(93)	(85)	2005
South West	Colliford	28540	56	60	62	68	**70**	86	56	1997
	Roadford	34500	68	69	71	76	**75**	85	41	1996
	Wimbleball	21320	77	84	95	100	**99**	94	79	1992
	Stithians	5205	74	83	88	96	**94**	90	65	1992
Welsh	Celyn and Brenig	• 131155	94	96	98	100	**100**	97	75	1996
	Brianne	62140	97	95	95	100	**100**	97	86	1997
	Big Five	• 69762	97	97	97	99	**97**	93	85	1997
	Elan Valley	• 99106	100	98	98	100	**99**	97	87	2003
Scotland(E)	Edinburgh/Mid Lothian	• 97639	93	95	94	96	**92**	92	62	1998
	East Lothian	• 10206	93	100	99	100	**100**	98	89	1992
Scotland(W)	Loch Katrine	• 111363	82	94	95	99	**94**	93	83	2001
	Daer	22412	97	100	99	100	**97**	96	89	2003
	Loch Thom	• 11840	100	100	100	100	**100**	95	88	2003
Northern Ireland	Total+	• 67270	92	90	88	93	na	88	80	2003
	Silent Valley	• 20634	99	94	90	98	na	81	58	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 1988-2006 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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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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