Hydrological Summary
for the United Kingdom

July 2004

General

Weather patterns in July were unsettled in most regions and some parts of the English Lowlands were notably wet. However, more than half of the UK reported below average rainfall - increasing long term rainfall deficiencies in some regions (e.g. parts of eastern Scotland). The damp complexion to the weather, over the first two weeks particularly, was very welcome for farmers and gardeners, and helped to moderate water demand. Reservoir stocks declined, as usual, through July leaving overall stocks for England and Wales marginally below average for early August – but still the lowest for the late summer since 1996. Stocks are relatively low in some reservoirs in the South-West and north-west England, and also well below average in parts of Scotland and Northern Ireland. July river flows were mostly a little below corresponding flows last year but, generally, most July runoff totals were within the normal range. Similarly, groundwater levels across much the greater part of the major aquifer outcrop areas are following a typical summer recession with levels in most index boreholes close to the late-summer average. The remarkable, if spatially very uneven, early August rainfall has helped reinforce a broadly healthy water resources outlook.

Rainfall

July began in autumnal mode across much of the UK with boisterous, cool, wet and cloudy conditions as a sequence of westerly frontal systems brought high winds and significant pulses of rain, often with thunderstorms in their wake. This very unsettled interlude culminated on the 7th when a particularly vigorous depression moved north across the UK. Daily rainfall totals exceeded 15 mm over wide areas and convective activity generated some extreme storm totals: Wittering (Cambs) reported a remarkable 107.4 mm in 19 hours on the 7/8th; an event with a return period exceeding 100 years. Thereafter thunderstorms remained common (Scampton, Lincs reported 28.6mm in an hour on the 22nd) but rainfall totals were modest at the regional scale and many areas registered <5 mm over the final three weeks of the month. July rainfall totals showed an unusual consistency across much of the country (mostly in the 40-70mm range) – this translates into well above average rainfall across much of eastern England but generally below average throughout most of the rest of the UK. Parts of eastern and northern Scotland were particularly dry as were catchments to the south of Lough Neagh in Northern Ireland. Regional rainfall totals for the year thus far are all relatively close to the long term average but some short term deficiencies are notable (e.g. May-July for parts of Wales) and many regions have 10-15% deficiencies over the period since July 2003; in this timeframe the Tay and South West regions registered their 2nd and 3rd lowest rainfalls in series from 1960.

River Flows

Significant late-June and early July flow recoveries in impermeable catchments were soon reversed as brisk recessions again became established – by month-end these had produced very depressed runoff rates in a few western rivers, including the Clyde, Eden, Ribble and Yscir, the latter registered its lowest July daily flow since the 1984 drought. Most rivers, however, followed a normal summer recession punctuated locally by short-lived spates (often thunderstorm generated); a few were notable – the Soar reported its highest recorded July peak on the 24th. Natural groundwater support through springs and seepages, though declining, helped ensure that flows in rivers draining permeable catchments in the English Lowlands remained well within the normal range. Monthly runoff totals for a few index gauging stations were notable – the lowest July runoff for 20 years on the Yscir - but the generality of index stations reported typical July runoff totals, albeit mostly below average. Longer term accumulations testify to notable deficiencies, in the west and north especially. The August-July runoff for the Annacloy is the lowest for *any* 12-month sequence in a series from 1979 and a significant minority of other rivers in Northern Ireland, and northern and eastern Scotland, closely approached previous August-July minima.

Groundwater

As usual in mid-summer, very dry soil conditions across the major aquifer outcrop areas restricted infiltration to very localised events associated with convective storms. However, the impact of the exceptional early July rainfall in a zone from Cambridgeshire to the Humber is reflected in the (very modest) increase in levels in the Chalk at Aylesby and an inflection the recession for the New Red Lion borehole (Lincolnshire Limestone). Elsewhere, the great majority of index boreholes were in well established seasonal recessions. In the Chalk, levels closely followed the mean seasonal trace in most areas, but current levels are relatively low in the more south-westerly outcrops (and in parts of the Chilterns) but still well within the normal range. This situation is broadly replicated in the limestone aquifers but the Permo-Triassic sandstones display much less geographical coherence. Levels are notably low in the most northerly outcrops but still very high in some of slowest responding aquifer units. Again however, most index sites are in the normal range. The overall 'near-average' groundwater resources picture has changed little over the summer but the torrential storms of early August have substantially increased the likelihood that the seasonal onset of recharge in the autumn will not be as delayed as last year.

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Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

Area	Rainfall	Jul 2004	May 04-Jul 04	RP	Feb 04-Jul 04	RP	Aug 03-Jul 04	RP	Feb 03-Jul 04	RP
England & Wales	**mm**	**74**	**178**		**368**		**833**		**1163**	
	%	**119**	**93**	**2-5**	**94**	**2-5**	**91**	**2-5**	**89**	**5-10**
North West	mm	79	217		450		1051		1524	
	%	91	89	2-5	92	2-5	86	5-10	89	5-10
Northumbrian	mm	67	184		369		774		1075	
	%	100	96	2-5	97	2-5	89	2-5	86	5-15
Severn Trent	mm	58	151		328		671		979	
	%	105	87	2-5	95	2-5	87	5-10	88	5-10
Yorkshire	mm	75	181		383		764		1092	
	%	122	98	2-5	103	2-5	91	2-5	91	2-5
Anglian	mm	86	173		312		600		838	
	%	171	115	2-5	111	2-5	99	2-5	95	2-5
Thames	mm	52	138		293		638		867	
	%	104	86	2-5	93	2-5	91	2-5	85	5-10
Southern	mm	51	133		281		731		971	
	%	104	85	2-5	86	2-5	93	2-5	87	5-10
Wessex	mm	62	144		323		754		1068	
	%	116	84	2-5	89	2-5	88	2-5	88	5-10
South West	mm	73	182		415		979		1425	
	%	103	85	2-5	85	2-5	82	5-15	85	5-15
Welsh	mm	71	201		486		1131		1649	
	%	88	82	2-5	90	2-5	84	5-10	88	5-10
Scotland	**mm**	**73**	**262**		**590**		**1336**		**1835**	
	%	**76**	**98**	**2-5**	**101**	**2-5**	**91**	**5-10**	**89**	**5-15**
Highland	mm	80	310		733		1656		2235	
	%	74	103	2-5	108	2-5	95	2-5	92	2-5
North East	mm	56	215		461		941		1247	
	%	72	98	2-5	105	2-5	91	2-5	85	10-20
Tay	mm	56	241		496		1036		1491	
	%	69	99	2-5	94	2-5	80	10-20	82	15-25
Forth	mm	60	233		460		966		1377	
	%	77	103	2-5	98	2-5	84	5-15	85	10-20
Tweed	mm	67	212		439		901		1247	
	%	90	98	2-5	103	2-5	90	2-5	87	5-15
Solway	mm	70	211		536		1242		1774	
	%	75	79	2-5	95	2-5	86	5-10	89	5-10
Clyde	mm	95	307		651		1587		2203	
	%	83	100	<2	97	2-5	91	2-5	91	5-10
Northern Ireland	**mm**	**66**	**219**		**432**		**918**		**1394**	
	%	**92**	**101**	**2-5**	**95**	**2-5**	**84**	**5-15**	**90**	**5-10**

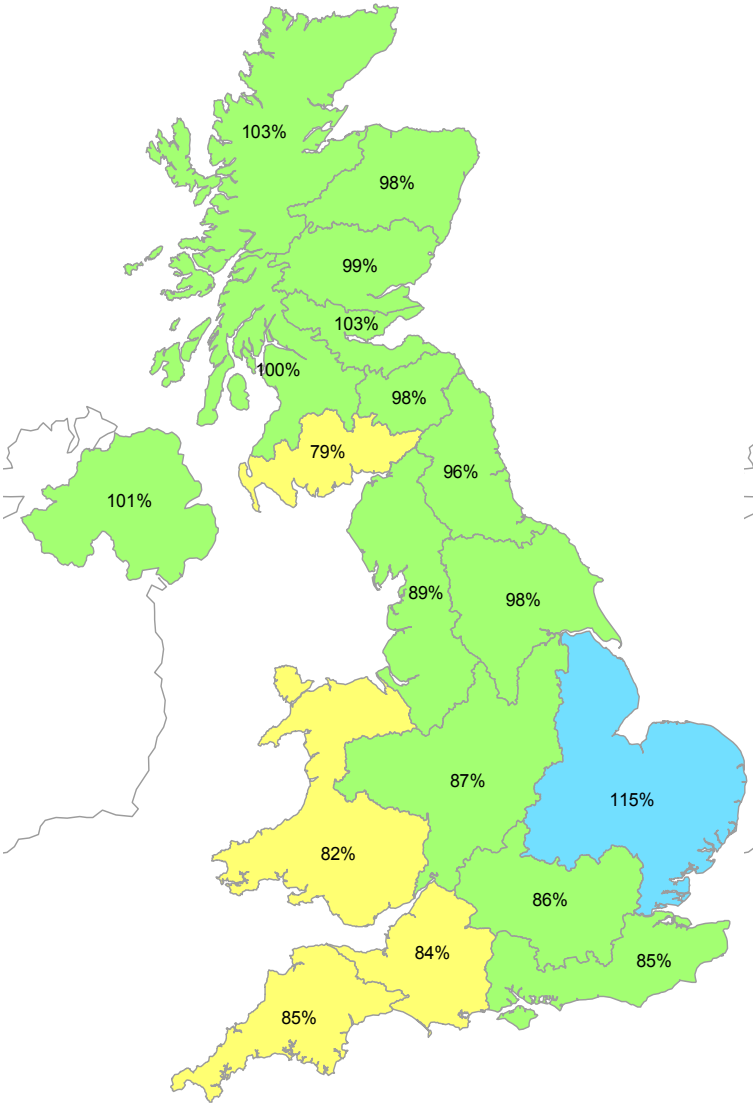
% = percentage of 1961-90 average *RP = Return period*

 All monthly totals since March 2004 are provisional (see page 12). Revised Met Office totals for 1961-2003 recently incorporated. 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. 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.

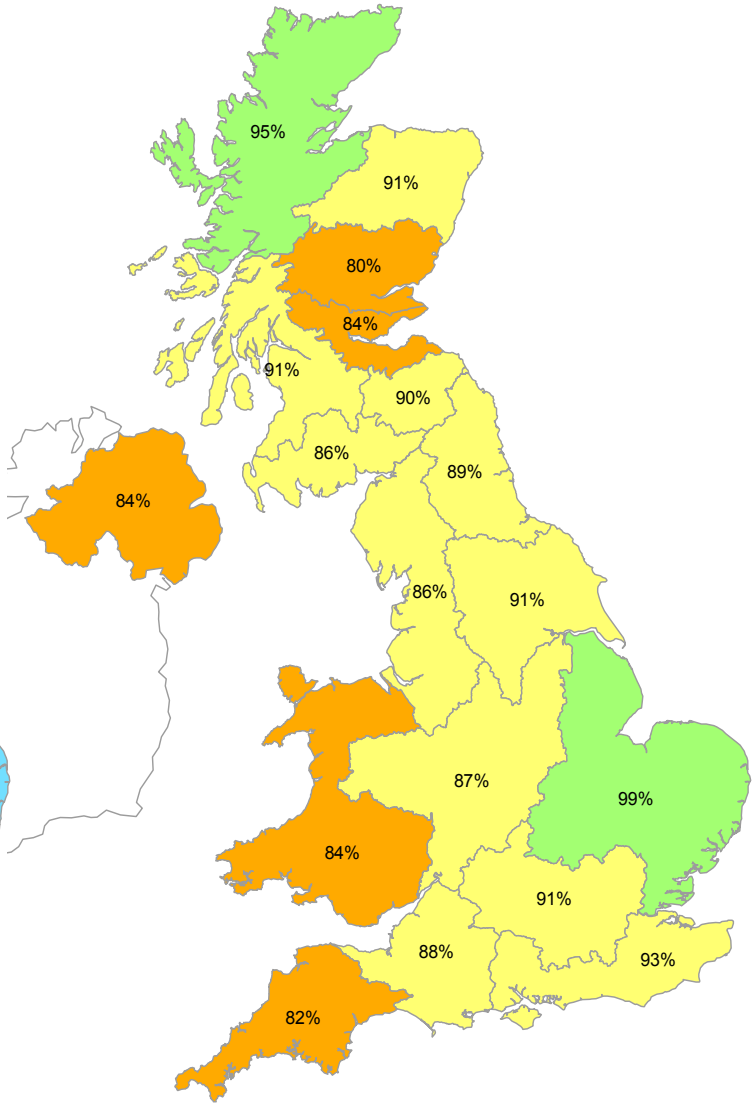
Rainfall . . . Rainfall . .

Key

00%	Percentage of 1961-90 average
	Very wet
	Substantially above average
	Above average
	Normal range
	Below average
	Substantially below average
	Exceptionally low rainfall



May 2004 - July 2004

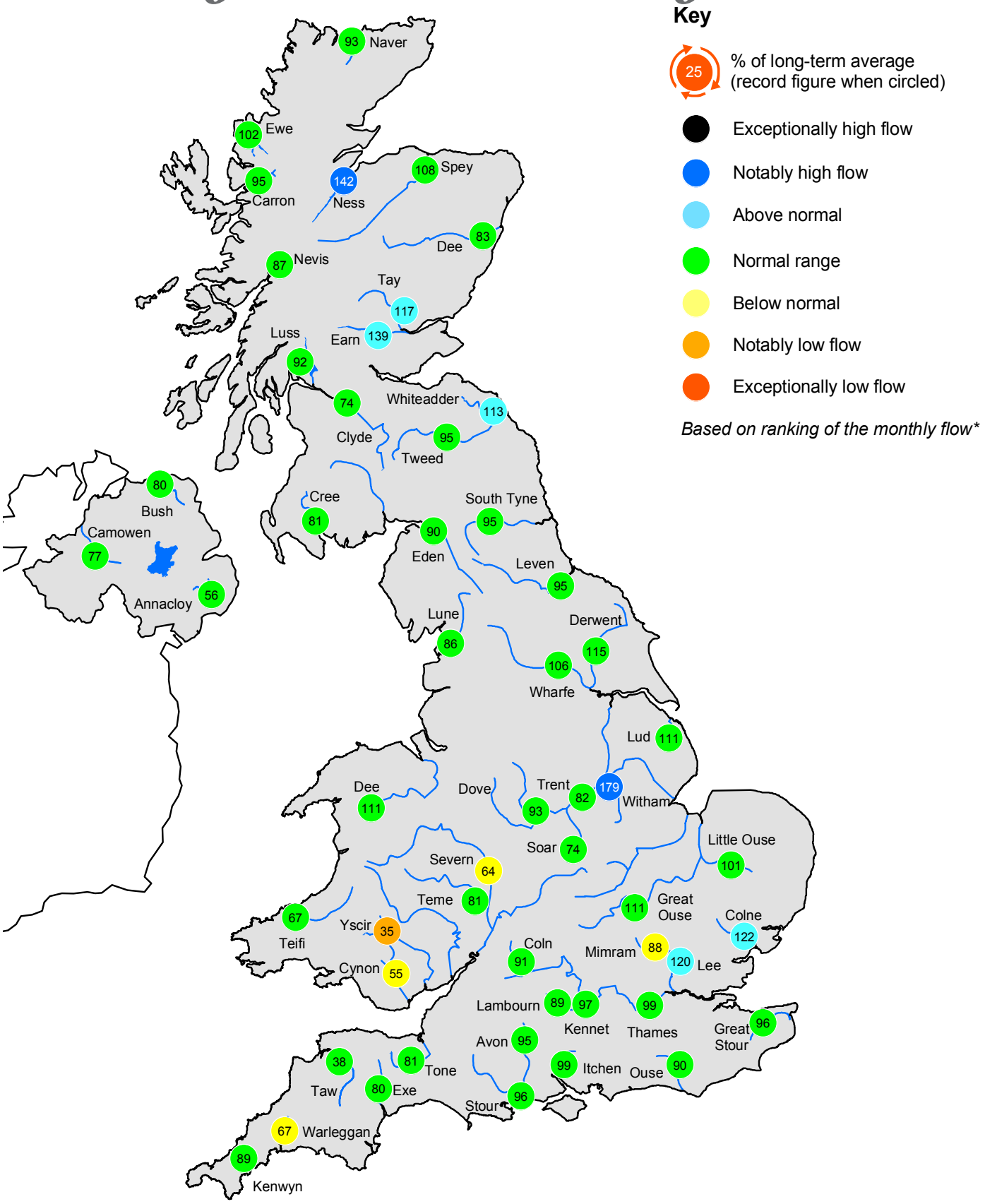


August 2003 - July 2004

Rainfall accumulation maps

Rainfall over the May-July period was well within the normal range in all regions but with appreciable rainfall deficiencies across large parts of western Britain. In the 12-month timeframe, deficiencies remain substantial in most regions. The UK recorded its second lowest August-July rainfall in the last 20 years. More notably, the rainfall deficiency for Northern Ireland was the largest since 1972/73, a distinction shared with the Tay basin in eastern Scotland.

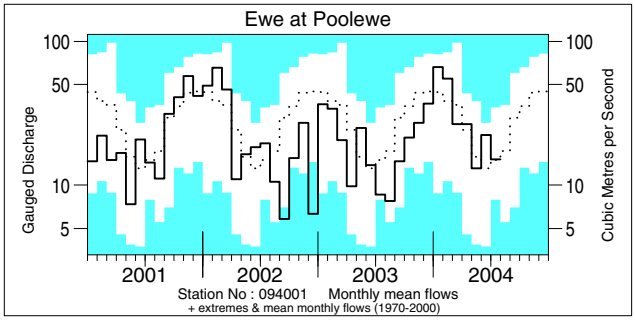
River flow . . . River flow . . .

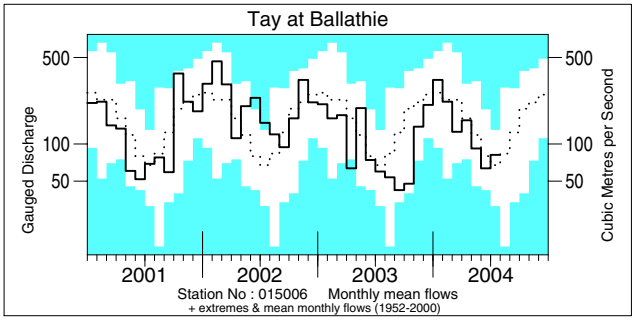


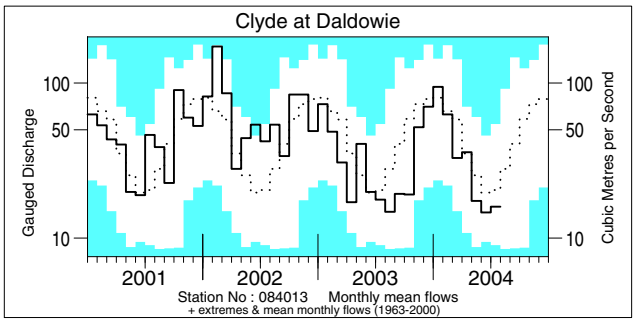
River flows - July 2004

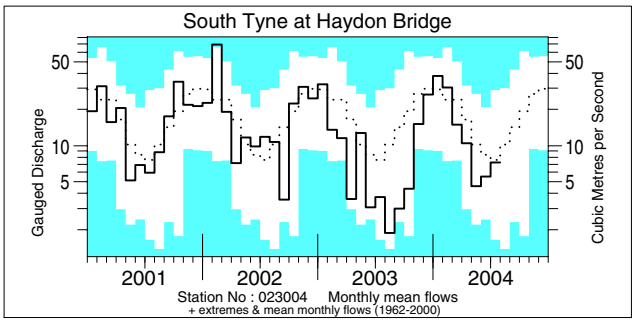
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

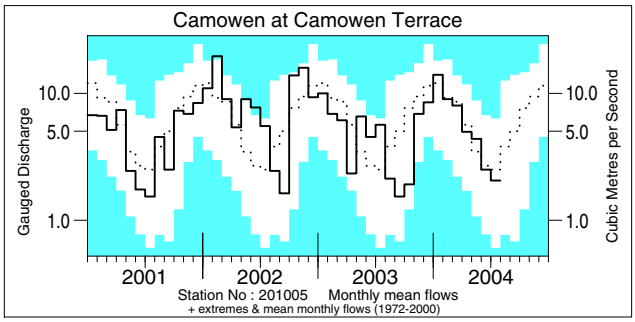
River flow . . . River flow . . .

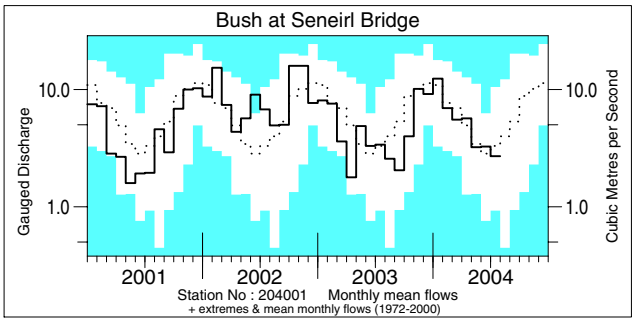


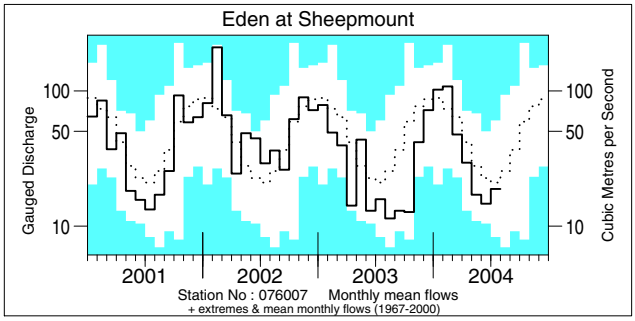


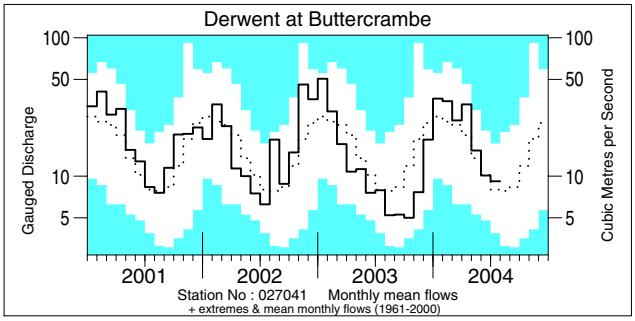


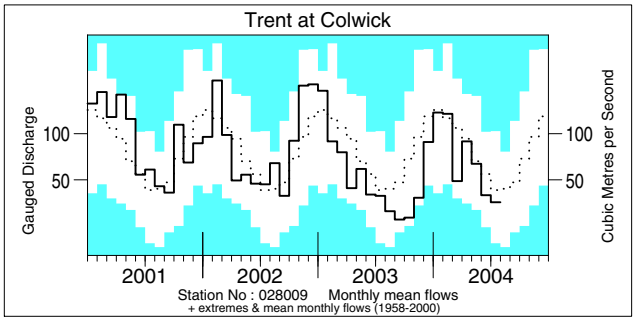


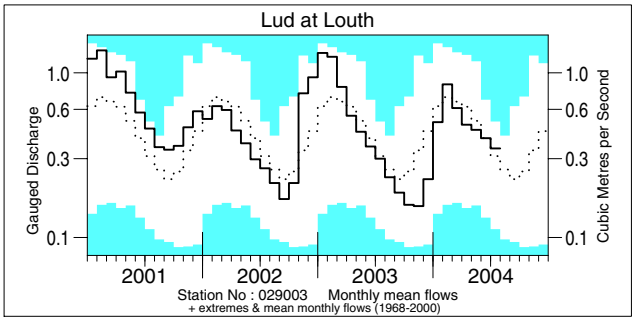








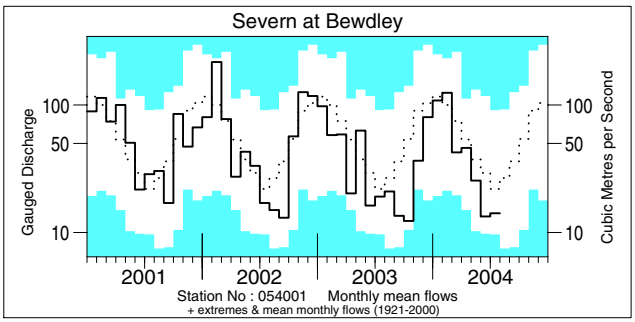


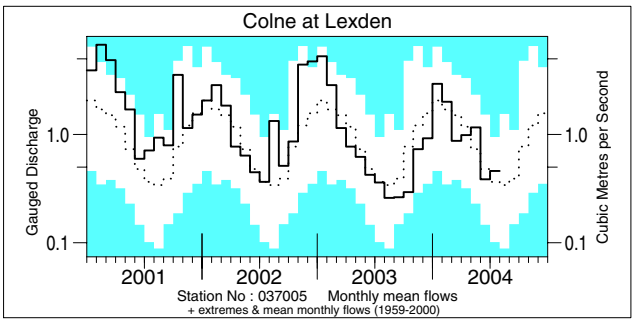


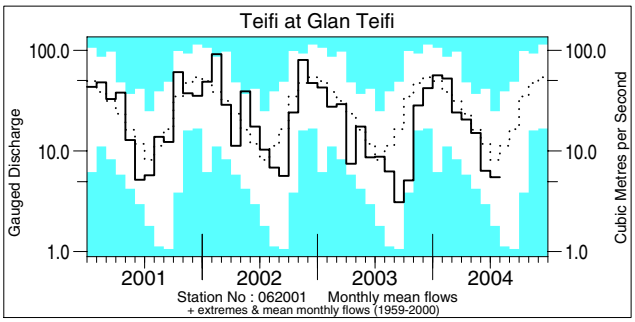
Monthly river flow hydrographs

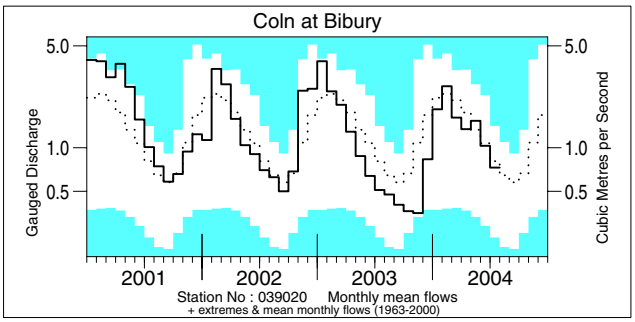
The river flow hydrographs show the monthly mean flow (bold trace), the long term average monthly flow (dotted trace) and the maximum and minimum flow prior to 2001 (shown by the shaded areas). Monthly flows falling outside the maximum/ minimum range are indicated where the bold trace enters the shaded areas.

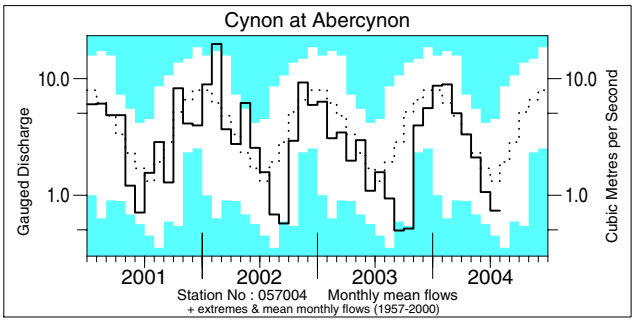
River flow . . . River flow . . .

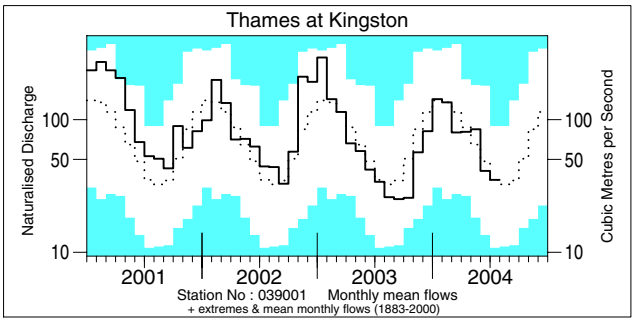


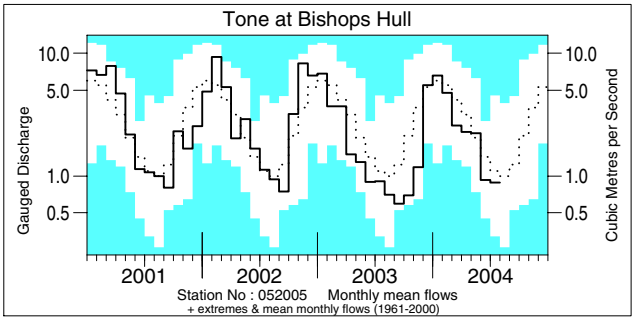


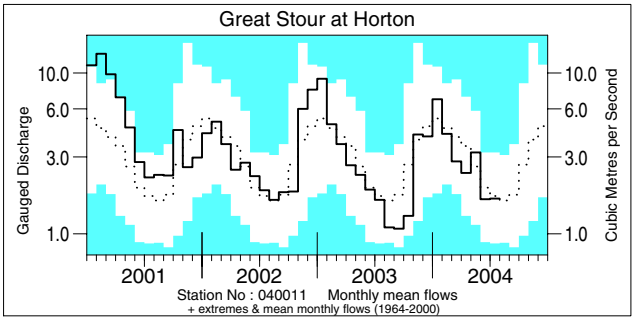


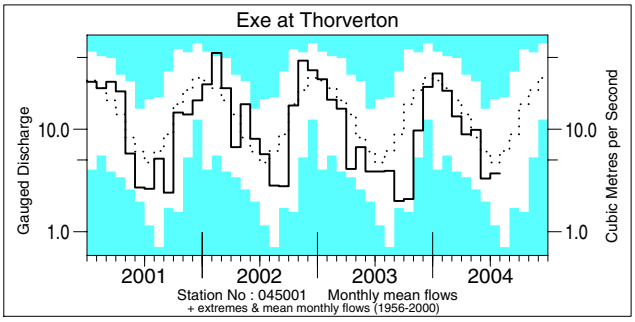


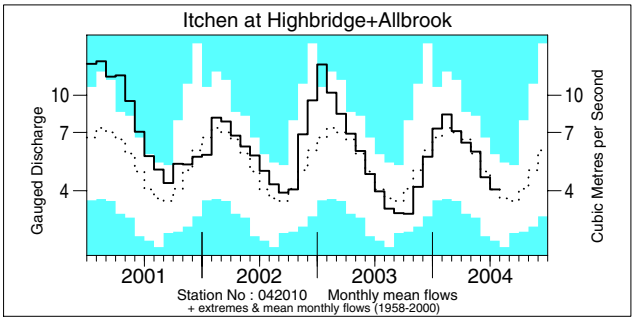












Notable runoff accumulations **(a) May 2004 - July 2004, (b) August 2003 - July 2004**

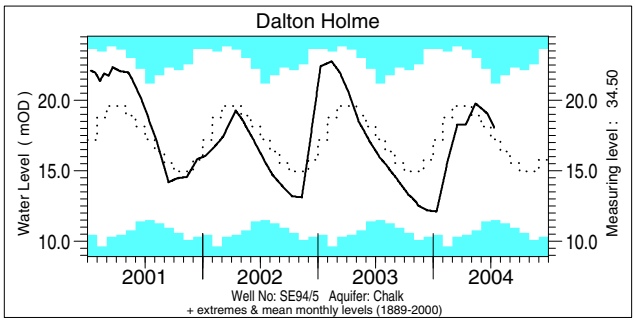
	River	%lta	Rank
a)	Deveron	155	40/44
	Tawe	48	5/46
	Ribble	54	5/45
	Carron	114	21/26
	Naver	144	22/27
	L Bann	49	3/24
	Annacloy	42	5/25

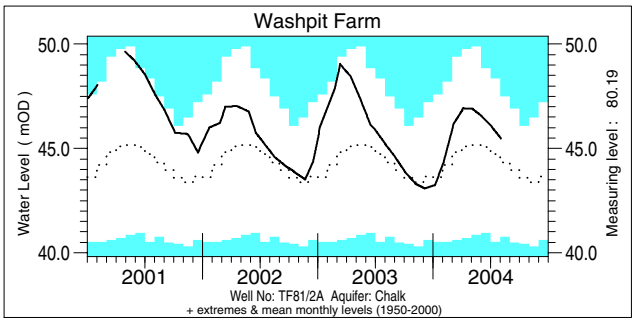
	River	%lta	Rank
b)	Dee (Woodend)	77	4/74
	Tay	77	3/51
	Tweed (Norham)	74	4/44
	S Tyne	74	4/39
	Wharfe	75	3/48
	Soar	61	4/33
	Exe	73	5/48

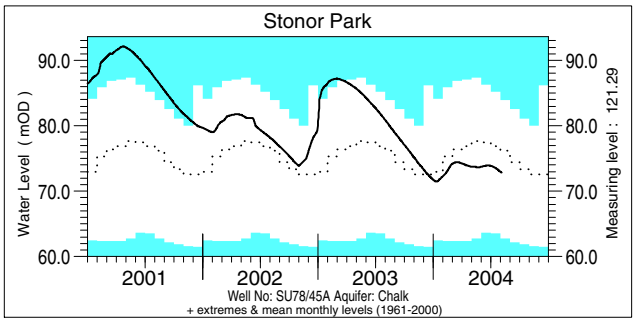
River	%lta	Rank
Taw	63	3/45
Yscir	77	5/31
Eden	79	5/36
Nith	79	4/46
Luss	73	2/24
Mourne	79	2/22
Faughan	70	1/27

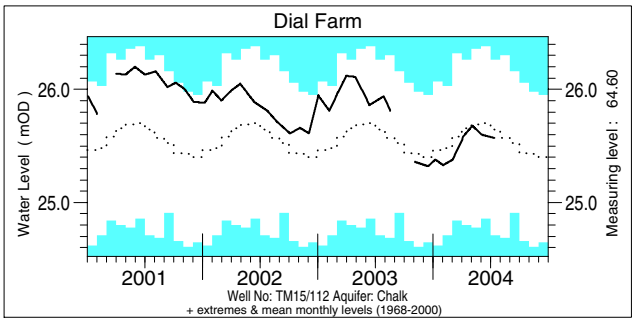
lta = long term average
Rank 1 = lowest on record

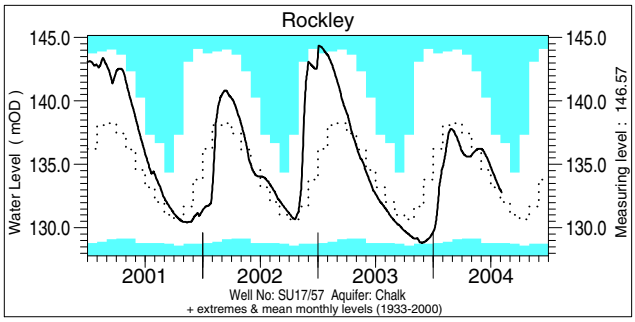
Groundwater . . . Groundwater

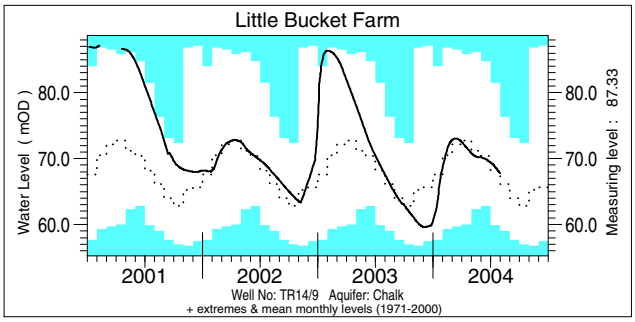


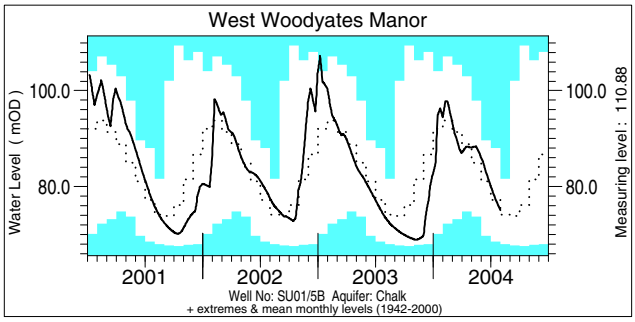


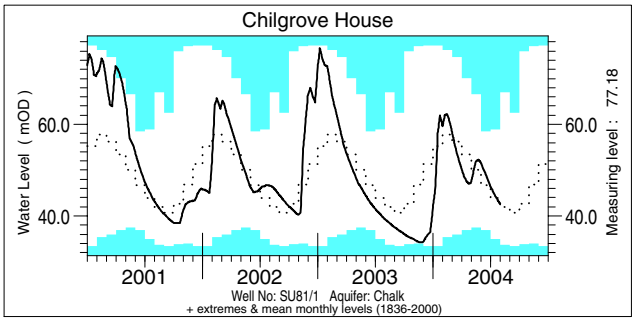


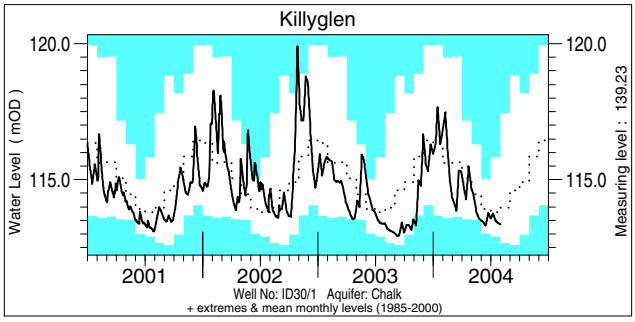


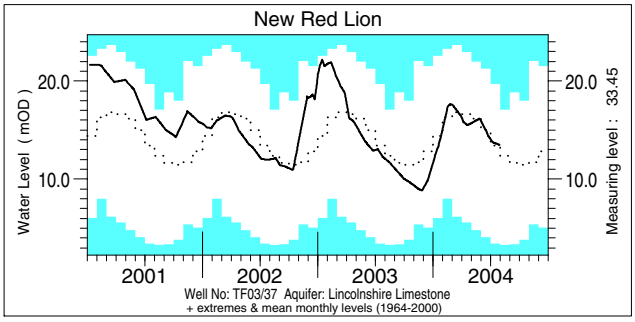






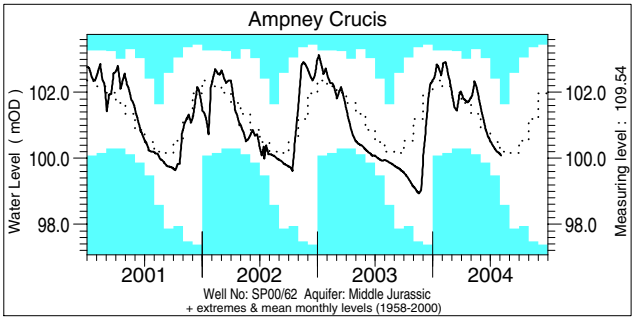


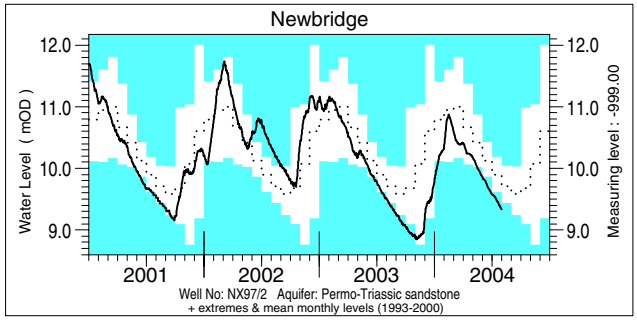


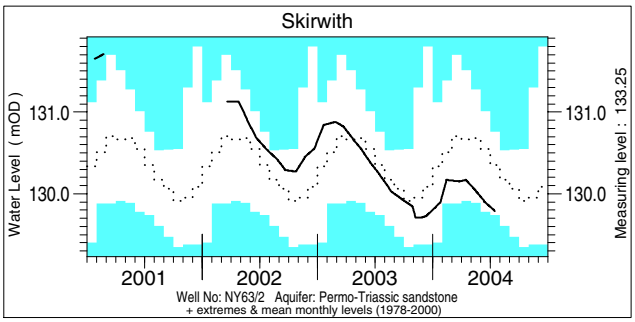


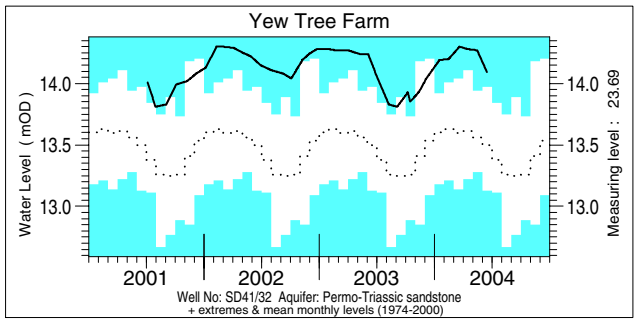
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

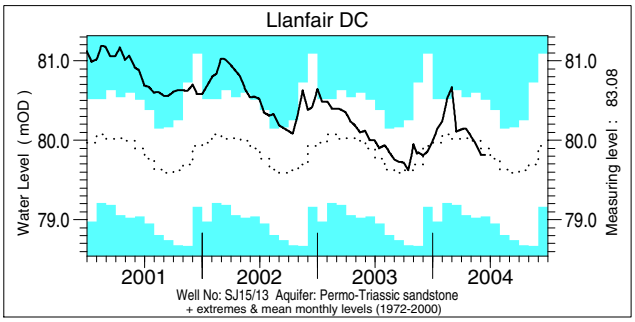
Groundwater . . . Groundwater

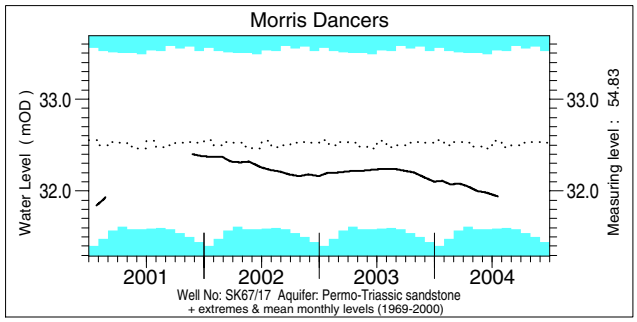


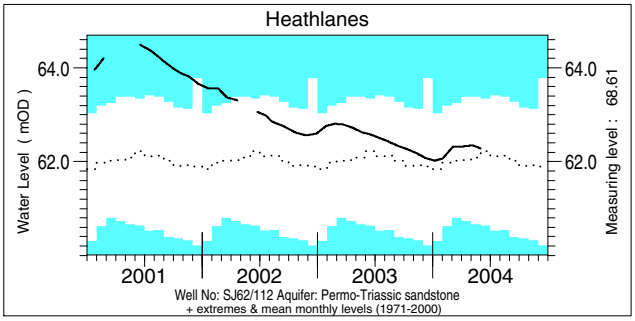


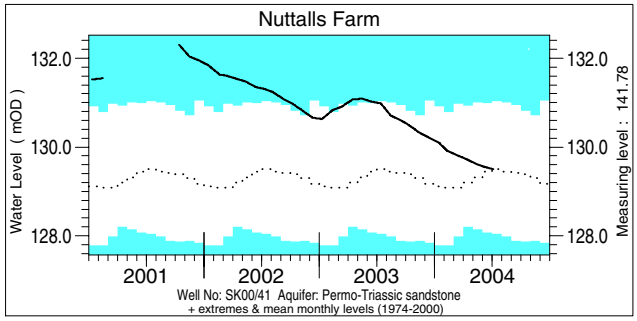


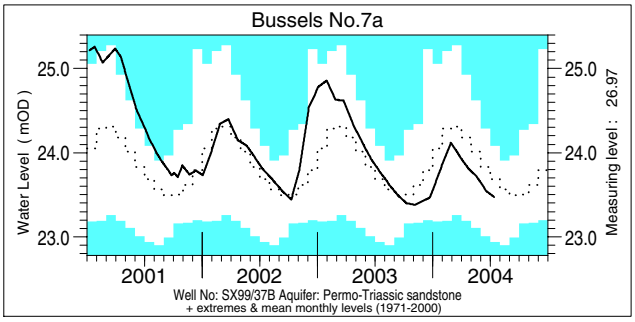


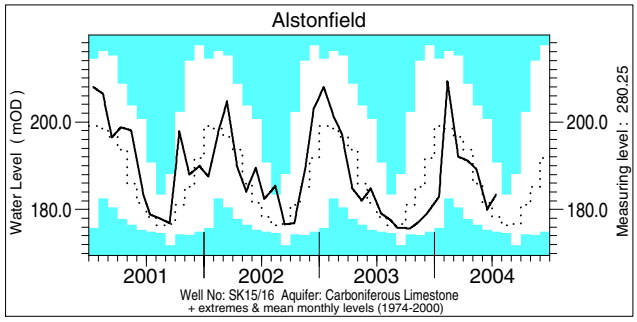










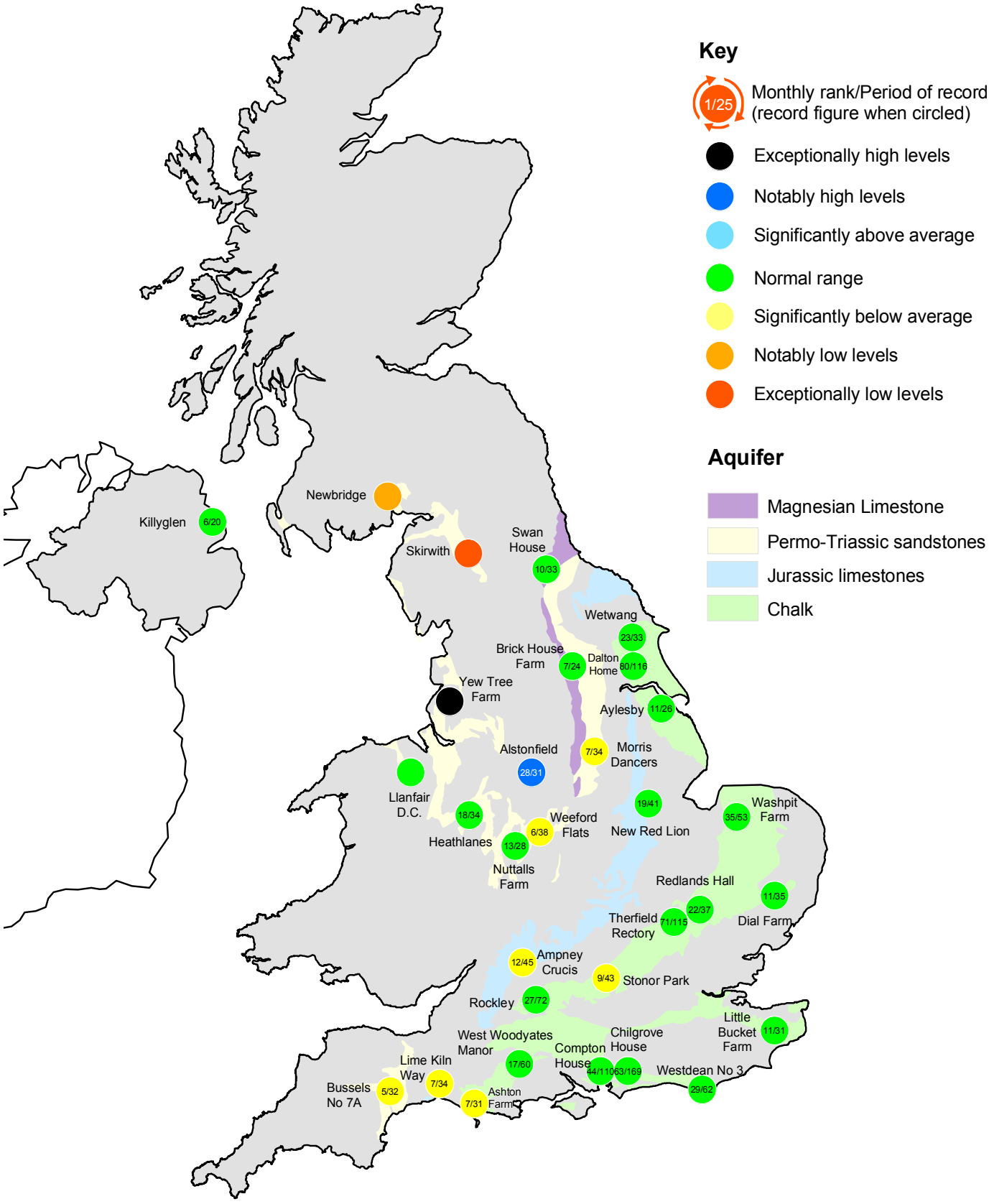


Groundwater levels July/ August 2004

Borehole	Level	Date	Jul. av.	Borehole	Level	Date	Jul. av.	Borehole	Level	Date	Jul. av.
Dalton Holme	18.06	12/07	17.18	Chilgrove House	42.56	31/07	43.59	Llanfair DC	79.82	15/06	79.74
Washpit Farm	45.46	03/08	44.88	Killyglen	113.36	31/07	113.76	Morris Dancers	31.94	19/07	32.36
Stonor Park	72.85	04/08	77.76	New Red Lion	13.48	30/07	13.39	Heathlanes	62.21	02/07	62.20
Dial Farm	25.57	13/07	25.68	Ampney Crucis	100.09	04/08	100.44	Nuttalls Farm	129.50	05/07	129.64
Rockley	132.80	04/08	133.22	Newbridge	9.33	31/07	9.91	Bussels No.7a	23.47	14/07	23.74
Little Bucket Farm	67.74	31/07	68.90	Skirwith	129.79	15/07	130.29	Alstonfield	183.35	13/07	179.06
West Woodyates	75.08	31/07	76.97	Yew Tree Farm	14.09	14/06	13.48				

Levels in metres above Ordnance Datum

Groundwater . . . Groundwater



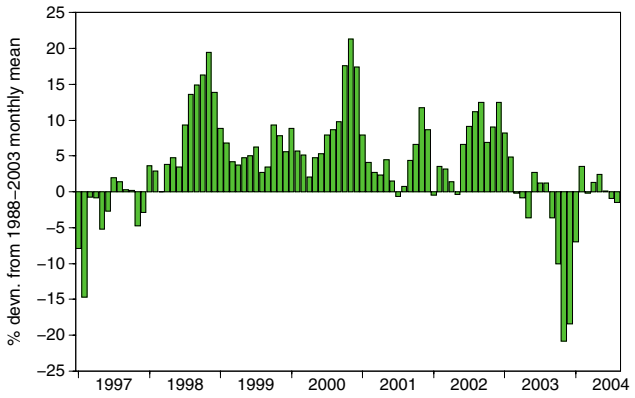
Groundwater levels - July 2004

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.

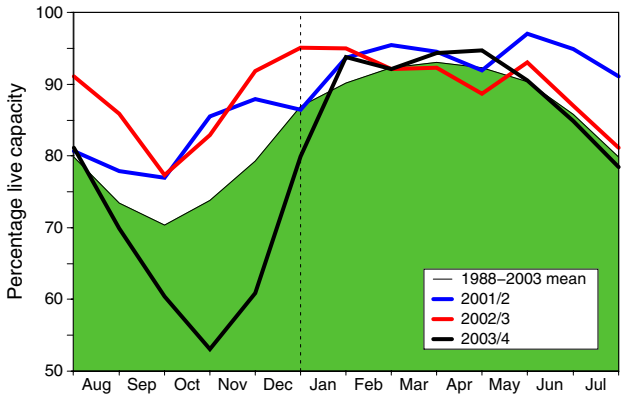
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.
ii. Yew Tree Farm levels are now received quarterly.

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.

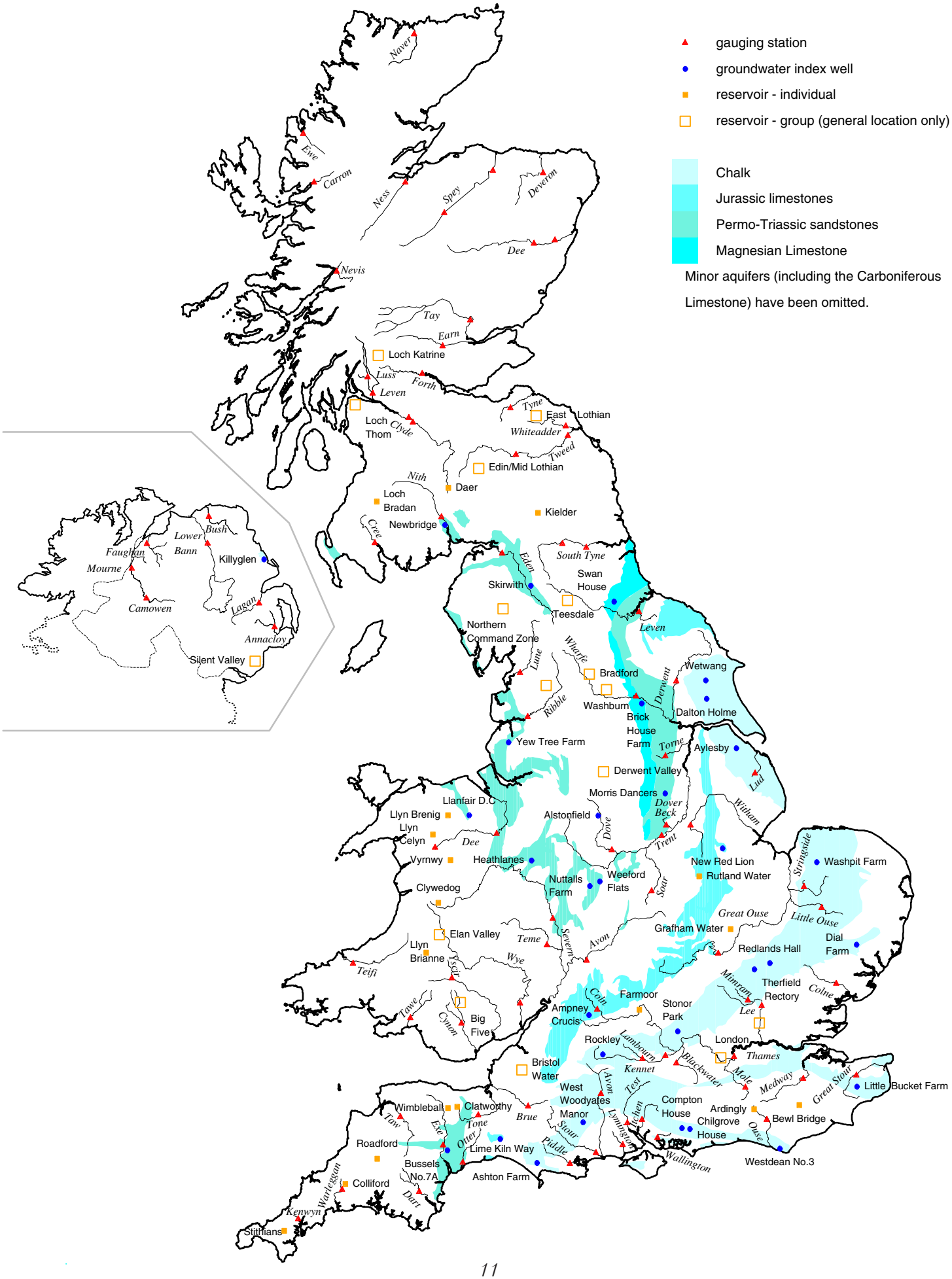
Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2004 Apr	May	Jun	Jul	Aug	Avg. Aug	Min. Aug	Year* of min.
North West	N Command Zone	• 124929	88	89	76	63	**55**	62	38	1989
	Vyrnwy	55146	99	95	88	73	**68**	76	56	1996
Northumbrian	Teesdale	• 87936	96	95	83	79	**68**	68	45	1989
	Kielder	(199175)	(91)	(92)	(91)	(94)	**(89)**	(88)	(66)	1989
Severn Trent	Clywedog	44922	99	100	100	97	**94**	83	57	1989
	Derwent Valley	• 39525	96	100	92	91	**83**	71	43	1996
Yorkshire	Washburn	• 22035	92	95	89	84	**79**	72	50	1995
	Bradford supply	• 41407	92	93	85	75	**67**	68	38	1995
Anglian	Grafham	(55490)	(95)	(98)	(95)	(95)	**(84)**	(89)	(66)	1997
	Rutland	(116580)	(94)	(97)	(95)	(91)	**(90)**	(85)	(74)	1995
Thames	London	• 202340	97	97	94	89	**84**	86	73	1990
	Farmoor	• 13830	96	100	99	97	**99**	95	84	1990
Southern	Bewl	28170	100	100	99	92	**87**	76	45	1990
	Ardingly	4685	100	100	100	89	**82**	87	66	1995
Wessex	Clatworthy	5364	95	100	96	86	**77**	69	43	1992
	Bristol WW	• (38666)	(92)	(92)	(89)	(81)	**(75)**	(73)	(53)	1990
South West	Colliford	28540	75	75	73	67	**60**	78	47	1997
	Roadford	34500	68	68	67	62	**56**	79	46	1996
	Wimbleball	21320	100	100	97	87	**79**	75	53	1992
	Stithians	5205	97	94	88	78	**68**	68	39	1990
Welsh	Celyn and Brenig	• 131155	100	99	97	88	**83**	87	65	1989
	Brianne	62140	98	99	96	88	**81**	88	67	1995
	Big Five	• 69762	98	99	93	82	**68**	74	41	1989
	Elan Valley	• 99106	99	95	93	87	**79**	82	63	1989
Scotland(E)	Edinburgh/Mid Lothian	• 97639	80	81	78	74	**69**	81	51	1998
	East Lothian	• 10206	100	100	98	100	**97**	86	72	1992
Scotland(W)	Loch Katrine	• 111363	91	93	84	74	**66**	75	53	2000
	Daer	22412	100	97	89	75	**65**	77	58	1994
	Loch Thom	• 11840	94	97	92	88	**93**	80	59	2000
Northern Ireland	Total+	•	85	84	74	72	**62**	78	54	1995
	Silent Valley	• 20634	66	64	58	56	**48**	68	42	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 1988-2004 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 ans regional rainfall totals for the post-1960 period (together with revised 1961-90 averages) were made available 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:

Hydrological Summaries
National Water Archive
CEH Wallingford
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Wallingford
Oxfordshire
OX10 8BB

Tel.: 01491 838800
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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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