Hydrological Summary
for the United Kingdom

May 2003

General

The episodic weather patterns which have been a feature of the last year continued during May. Notable late-winter and spring rainfall deficiencies increased in a number of lowland catchments, but were greatly moderated in most regions as the late-April rainfall heralded a prolonged unsettled spell. Due to the seasonally high soil moisture deficits, the rainfall – though very welcome to farmers and growers – was too late to be hydrologically effective in much of the English Lowlands; correspondingly some river flows were relatively depressed by late May. In the west and north however, the abundant late spring rainfall provided a very valuable late boost to reservoir stocks – entering June, overall stocks for England and Wales were appreciably above the early summer average. This, together with groundwater levels which, despite notably falls through the spring, remain mostly within, or above, the normal early summer range, confirms that the water resources outlook is much healthier than the spring rainfall deficiencies might imply. Nonetheless, in the event of a dry summer notably low river flows may be expected in impermeable catchments and the autumn recovery in runoff and recharge rates may be significantly delayed.

Rainfall

The breakdown of the long-dominant anticyclonic conditions during the third week of April allowed Atlantic frontal systems to cross the UK with a greatly increased frequency – the majority following tracks across western and northern regions. Mid-May was especially wet – a daily rainfall total of 52.2 mm was reported for Silent Valley (Northern Ireland) on the 15th and the month ended dramatically with heatwave conditions and violent thunderstorms with hailstones and localised flash flooding. An especially severe storm – with remarkable surface runoff and debris slides – afflicted Yarrowford and Selkirk (in the Tweed basin) on the 30th. The showery nature of much of the rainfall resulted in significant spatial variability but the May totals strongly reflect the synoptic pattern. Parts of the western Highlands and Northern Ireland reported over 200% of average rainfall; provisional data suggest that Scotland had its 2nd wettest May since 1925. By contrast, May rainfall in a few southern and eastern coastal areas fell below 70% and spring (March-May) totals were particularly low throughout the English Lowlands (and parts of the North-East). In such areas a notable drought can be traced back to mid-February – for the Thames basin the Feb-May rainfall is (provisionally) the second lowest, after 1976, since 1956. Fortunately, in a water resources context, the 9- and 12-month rainfall accumulations are above average, and close to the average in all regions apart from northern Scotland.

River Flow

In most western and northern catchments, the protracted recessions which resulted in notably low flows in mid-April were smartly reversed towards month-end. May began with spate conditions characterising many responsive catchments and relatively high late-spring runoff continued into the third week. At the same time flows in groundwater-fed rivers across the English Lowlands were also healthy (following abundant winter recharge) but, by month-end flows were substantially below average in many impermeable catchments. The Thames and Warwickshire Avon both reported their second lowest May minima since 1992 and May runoff totals fell below 60% of average for a number of index rivers. By contrast, runoff in many Scottish rivers was well above average - the second highest in a 21-year record for the Nevis - terminating a protracted low runoff episode in the Highlands (the Ness and Ewe were among many rivers for which a new July-April runoff minimum had just been established). May runoff totals were high also in Northern Ireland and North Wales – the Dee reported its second highest May flow since 1969. With the exception of some groundwater-fed rivers, spring (March-May) runoff totals were significantly below average, notably so in north-eastern England, but over the last 12 months most runoff accumulations are well within the normal range (northern Scotland excepted).

Groundwater

High evaporative demands and below average rainfall resulted in soil moisture deficits across much of the English Lowlands that were more typical of early August than the end of May – serving to confirm the end of the 2002/03 recharge season across most major aquifers. Infiltration during May was minimal (thunderstorms produced some very localised infiltration) and drought conditions throughout much of the spring resulted in March-May recharge totals of less than a quarter of the long term average across much of the eastern Chalk. Fortunately a counterbalance is provided by the notably high recharge during the Sept 2002-Jan 2003 period (and preceding winters). The net result in the Chalk is that, although groundwater levels are relatively depressed in the south-western outcrops, levels are in the normal range across most of the aquifer. A similar picture characterises levels in a number of minor aquifers (e.g. the Norfolk Drift and Essex Gravels). The 2003 spring recession was particularly steep in the limestone aquifers, at Ampney Crucis especially where only during the 1976 and 1984 droughts have lower May levels been recorded. Steep spring declines were evident in the more responsive Permo-Triassic units but, generally, the large storage within the aquifer - which mitigates against rapid change - has generally left levels well above the early summer average.

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

Rainfall accumulations and return period estimates

Area	Rainfall	May 2003	Feb 03-May 03	*RP*	Dec 02-May 03	*RP*	Sep 02-May 03	*RP*	Jun 02-May 03	*RP*
England & Wales	**mm**	**71**	**193**		**432**		**793**		**1018**	
	%	**109**	**73**	**5-15**	**96**	**2-5**	**112**	**2-5**	**112**	**5-10**
North West	mm	113	292		529		897		1200	
	%	150	92	2-5	94	2-5	96	2-5	100	<2
Northumbrian	mm	78	168		361		633		875	
	%	126	68	10-20	88	2-5	98	2-5	103	2-5
Severn Trent	mm	68	168		336		600		783	
	%	115	73	5-10	89	2-5	104	2-5	104	2-5
Yorkshire	mm	77	184		380		655		913	
	%	128	75	5-10	93	2-5	104	2-5	111	2-5
Anglian	mm	52	117		287		512		689	
	%	109	66	10-20	101	2-5	116	5-10	116	5-10
Thames	mm	49	133		335		604		773	
	%	87	64	10-20	98	2-5	115	2-5	112	2-5
Southern	mm	47	137		376		690		853	
	%	87	61	10-20	97	2-5	111	2-5	109	2-5
Wessex	mm	54	170		380		760		914	
	%	89	68	5-15	89	2-5	115	2-5	109	2-5
South West	mm	80	264		538		957		1134	
	%	111	78	5-10	87	2-5	101	2-5	97	2-5
Welsh	mm	116	317		603		1072		1284	
	%	141	87	2-5	91	2-5	102	2-5	98	2-5
Scotland	**mm**	**140**	**339**		**574**		**952**		**1294**	
	%	**163**	**87**	**2-5**	**83**	**5-10**	**83**	**5-15**	**90**	**5-10**
Highland	mm	175	421		690		1020		1362	
	%	190	89	2-5	80	5-10	71	50-80	77	35-50
North East	mm	95	217		412		819		1128	
	%	138	80	5-10	89	2-5	110	2-5	116	5-15
Tay	mm	120	299		517		919		1281	
	%	144	86	2-5	83	5-10	93	2-5	104	2-5
Forth	mm	100	244		426		784		1126	
	%	135	80	5-10	80	5-10	90	2-5	101	2-5
Tweed	mm	103	218		412		746		1024	
	%	145	79	5-10	88	2-5	100	<2	106	2-5
Solway	mm	129	343		589		1085		1456	
	%	152	90	2-5	86	2-5	96	2-5	102	2-5
Clyde	mm	167	394		631		1077		1478	
	%	183	90	2-5	78	5-15	79	10-20	87	5-10
Northern Ireland	**mm**	**123**	**286**		**463**		**870**		**1141**	
	%	**173**	**95**	**2-5**	**90**	**2-5**	**105**	**2-5**	**108**	**2-5**

RP = Return period

The monthly rainfall figures* are copyright of The Met Office and may not be passed on to, or published by, any unauthorised person or organisation. **All monthly totals since December 1998 are provisional (see page 12)**. 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 Meteorological 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

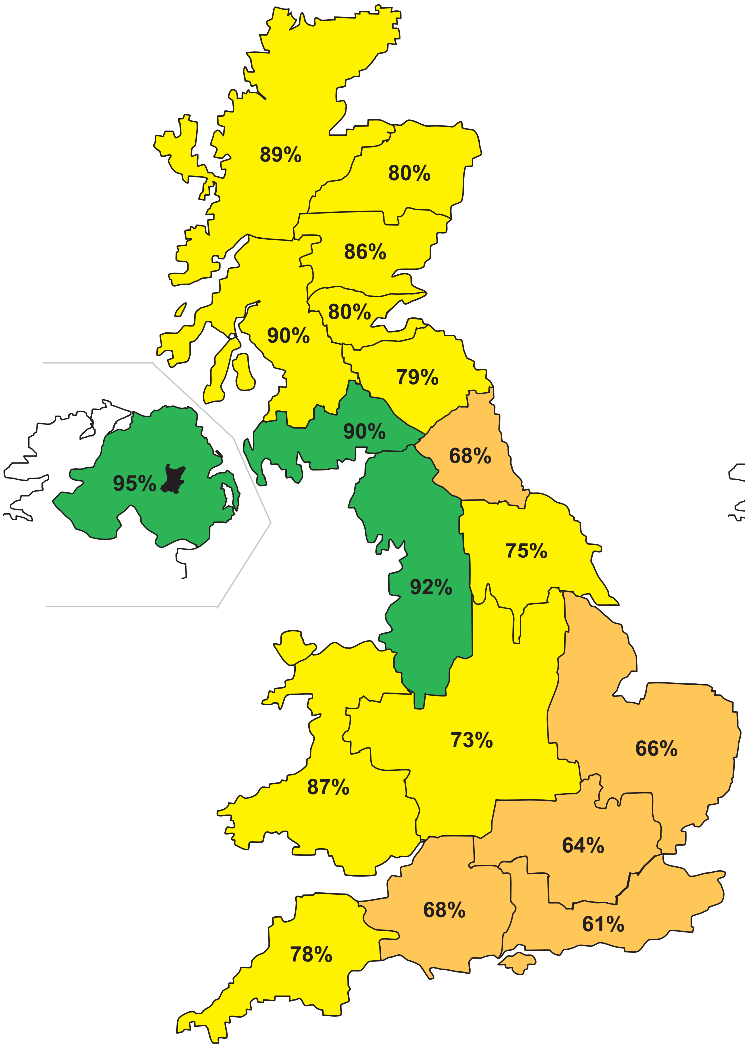
Above average

Normal range

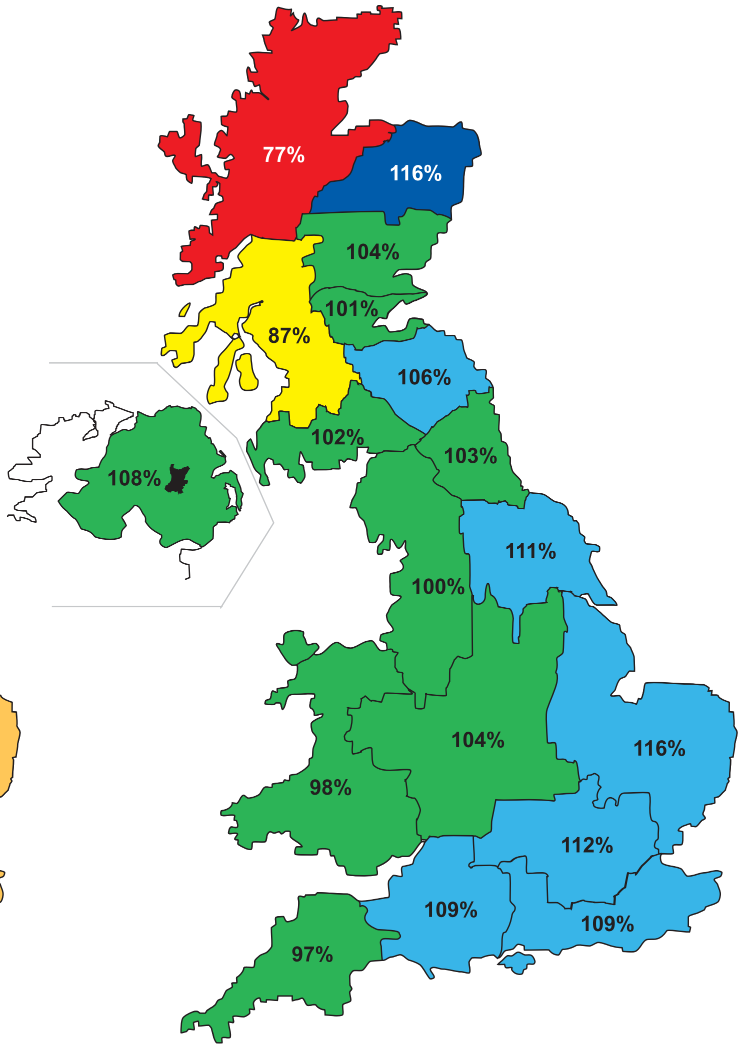
Below average

Substantially below average

Exceptionally low rainfall



February 2003 - May 2003

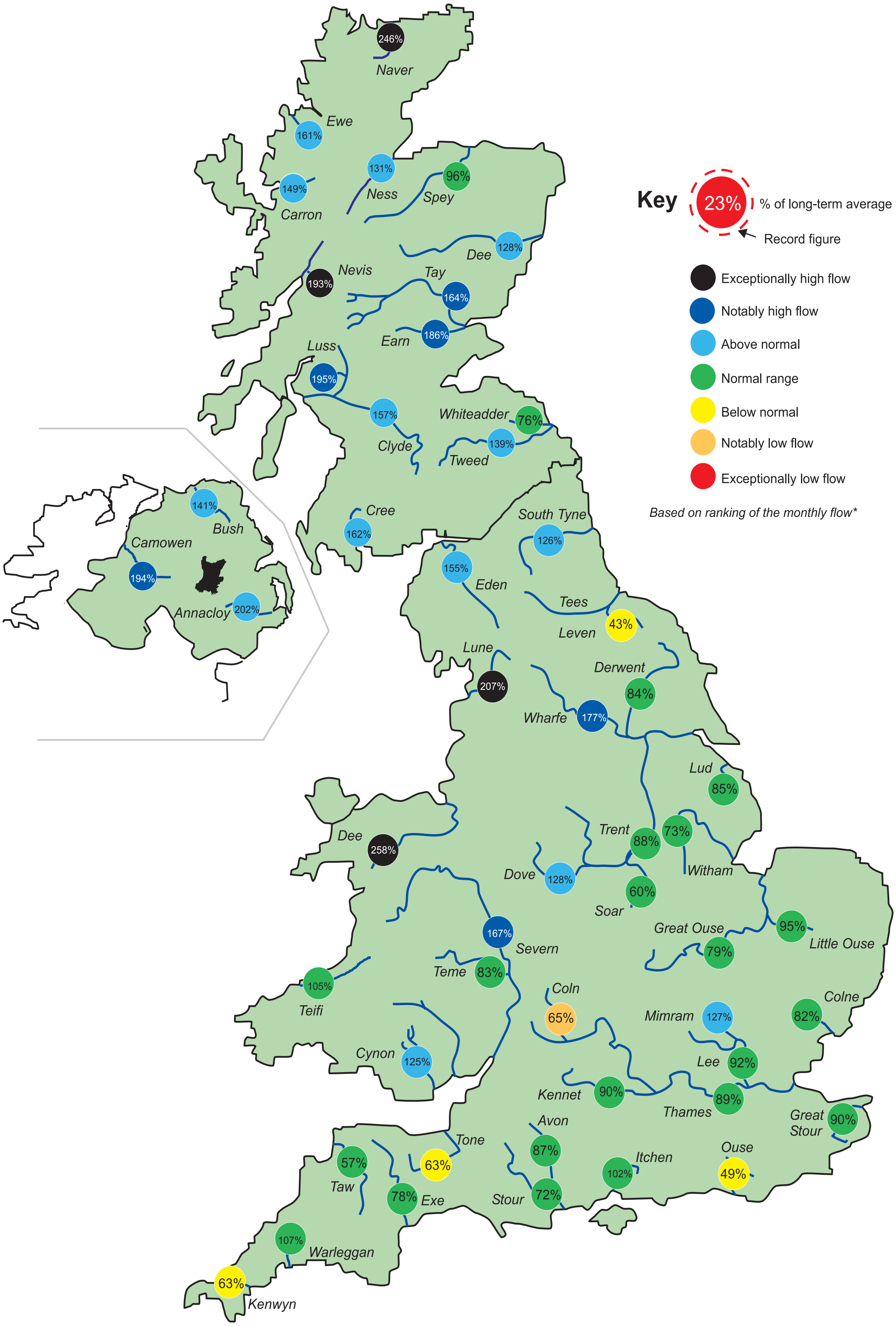


June 2002 - May 2003

Rainfall accumulation maps

Notwithstanding the wet May in the west and north, appreciable rainfall defiencies exist over the Feb-May period for all regions. Provisional figures indicate that the 4-month total for Great Britain was the second lowest (after 1984) since 1975. The twelve-month timeframe presents a contrasting picture. Aside from the still notable deficiencies in northern and western Scotland, the June-May rainfall was close to, or above, average in all regions.

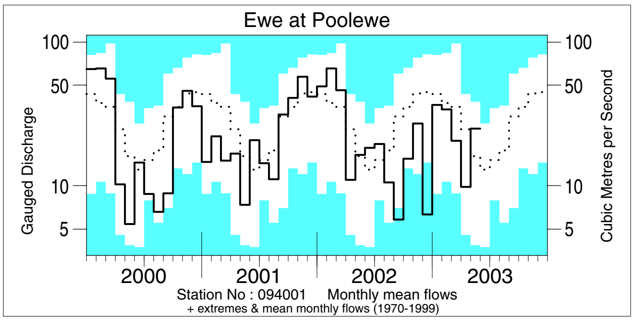
River flow . . . River flow . . .

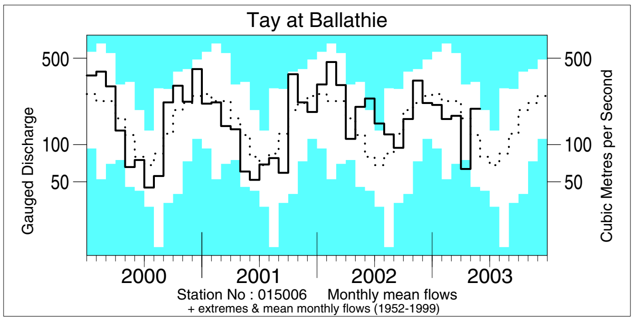


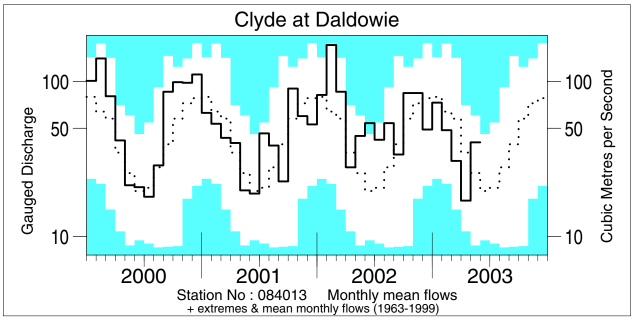
River flows - May 2003

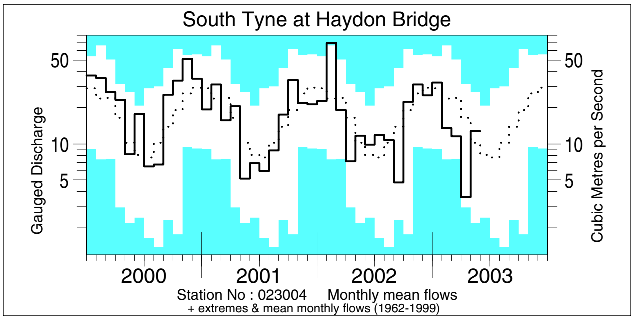
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

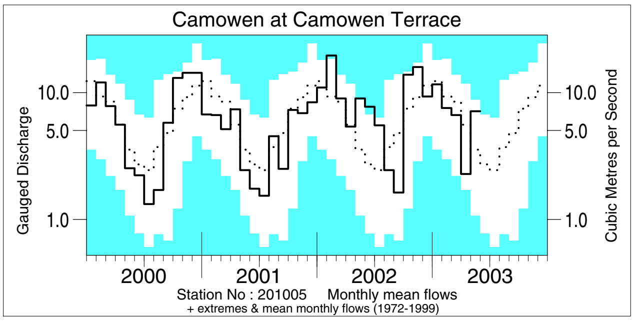
River flow . . . River flow . . .

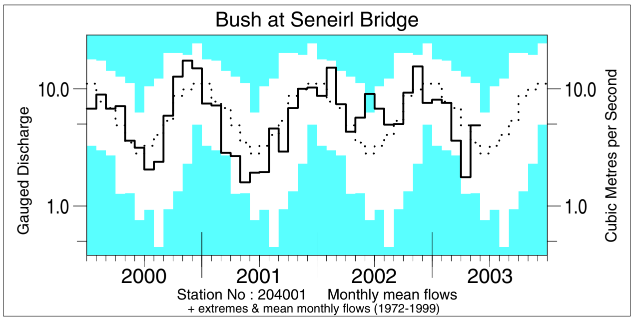


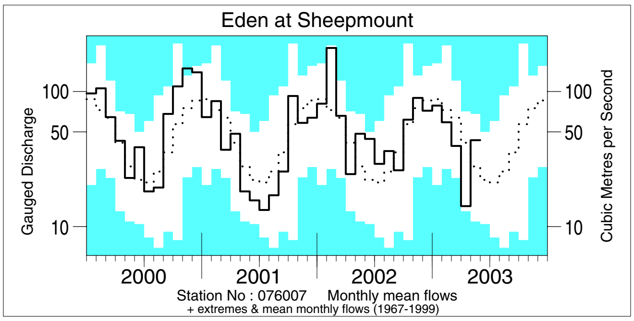


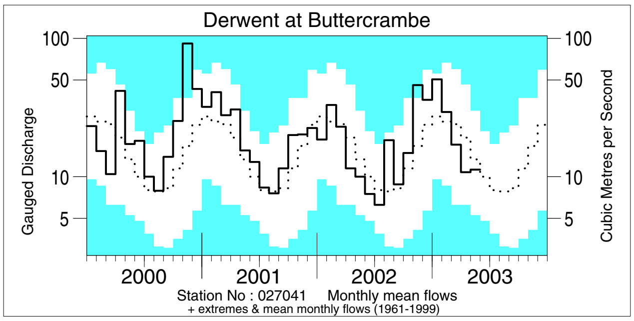


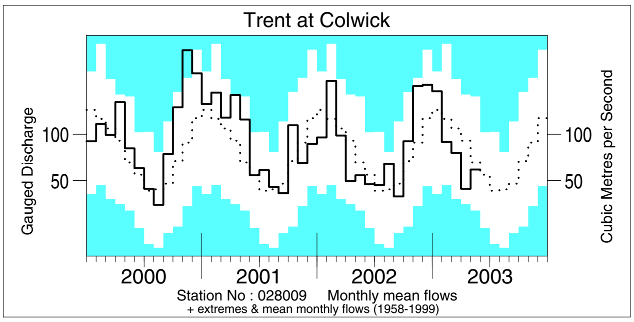


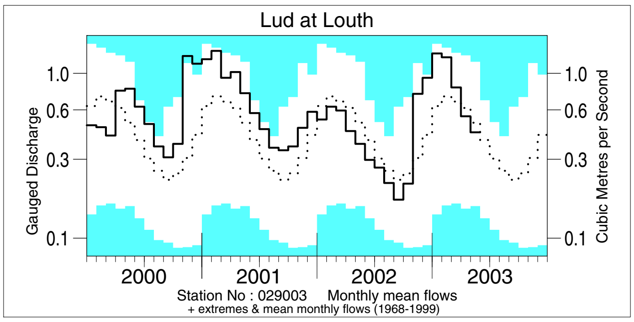








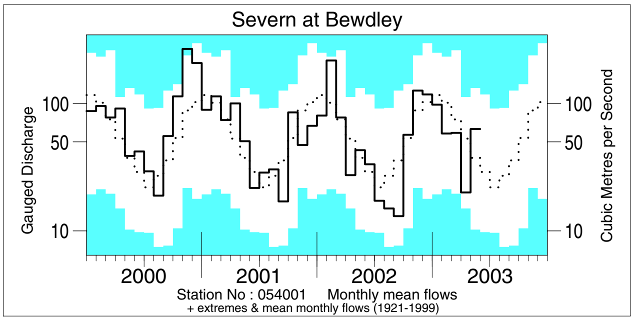


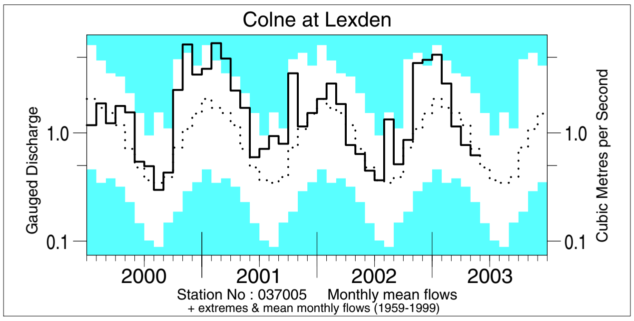


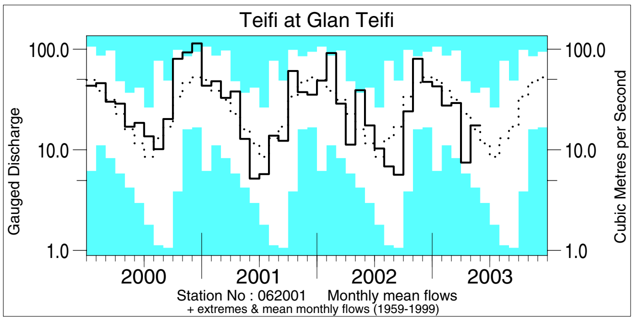
Monthly river flow hydrographs

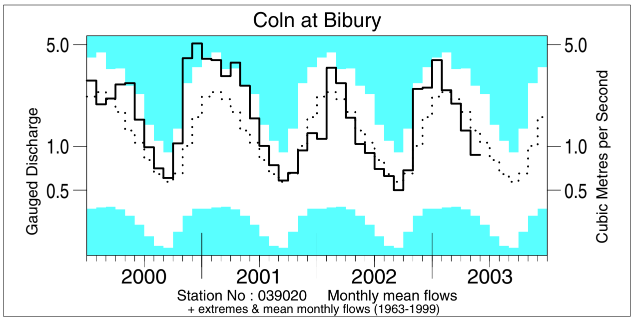
The river flow hydrographs show the monthly mean flow (bold trace), the long term average monthly flow (dotted trace) and the maximum and minimum flow prior to 2000 (shown by the shaded areas). Monthly flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

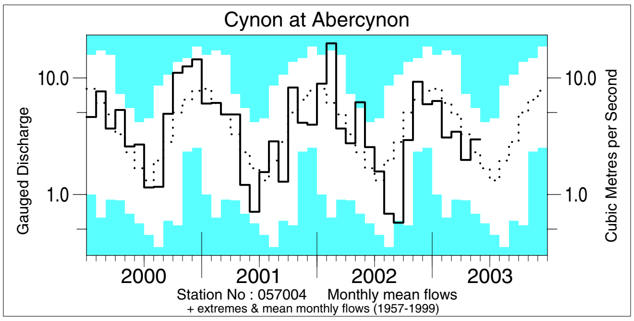
River flow . . . River flow . . .

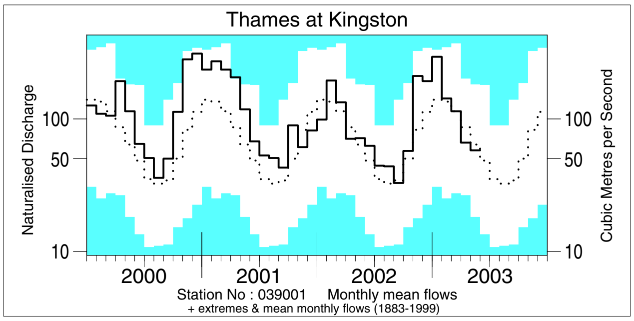


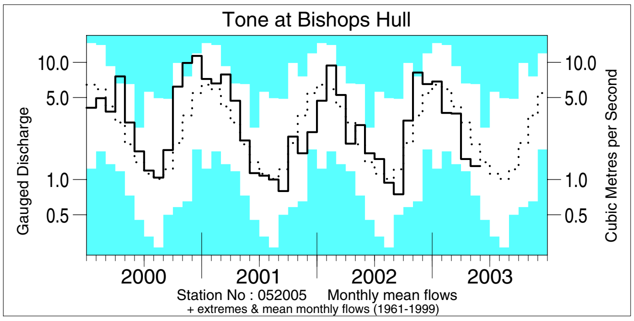


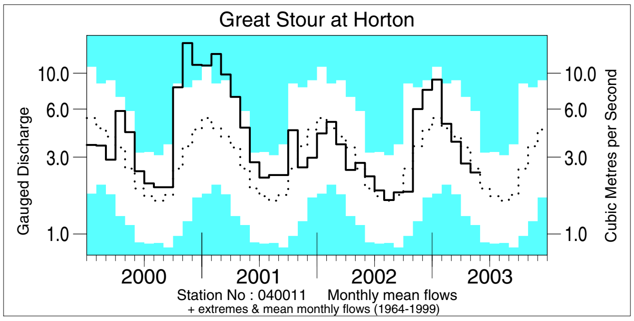


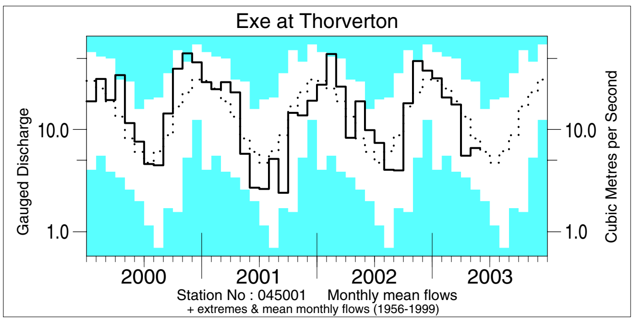


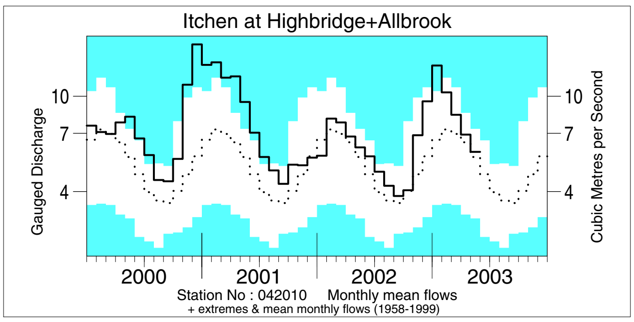












Notable runoff accumulations (a) February 2003 - May 2003, (b) June 2002 - May 2003

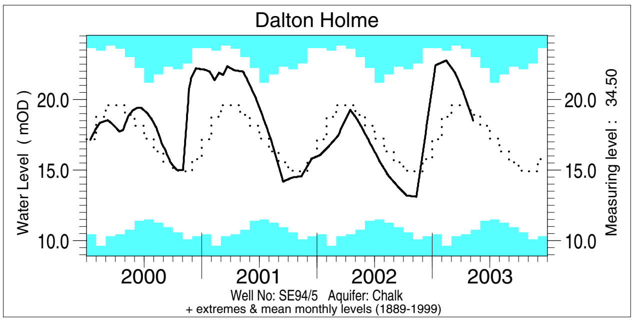
	River	%lta	Rank
a)	Spey	73	5/51
	Tyne	59	4/39
	Whiteadder	46	2/34
	South Tyne	55	1/41
	Soar	50	4/32
	Taw	59	5/45
	Teme	63	4/33

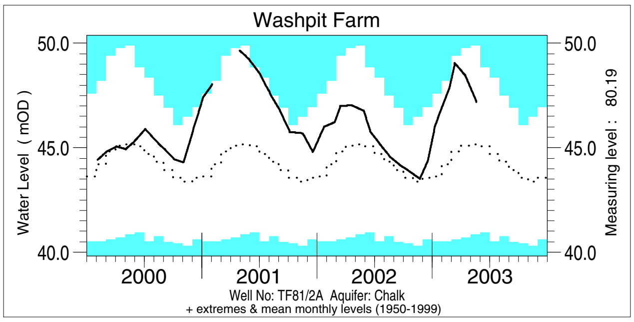
	River	%lta	Rank
b)	Ness	63	2/30
	Deveron	131	37/40
	Dee	131	30/30
	Dover Beck	145	25/27
	Mimram	141	46/49
	Blackwater	146	49/50
	Wilts. Avon	152	37/38

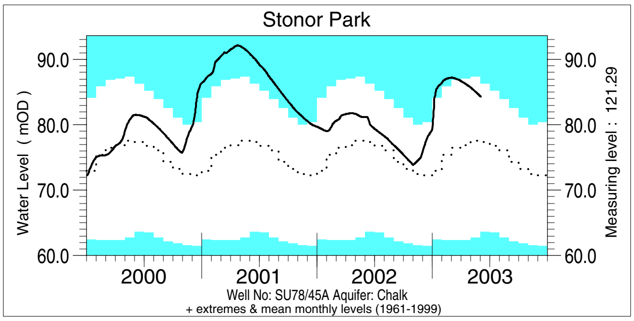
River	%lta	Rank
Brue	127	33/37
Cynon	78	5/43
Luss	75	1/24
Nevis	69	2/20
Carron	53	1/24
Ewe	64	1/32
Naver	72	1/25
Annacloy	147	22/23

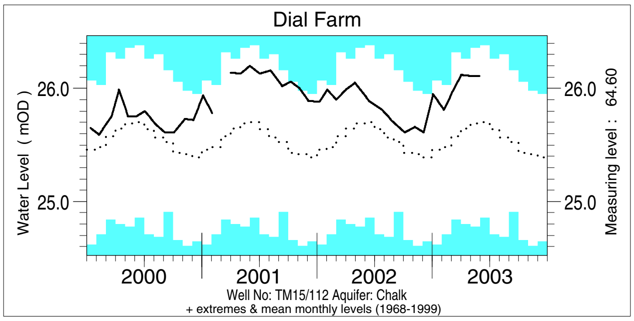
lta = long term average
Rank 1 = lowest on record

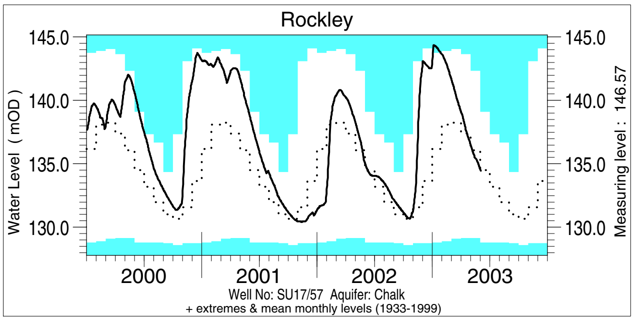
Groundwater . . . Groundwater

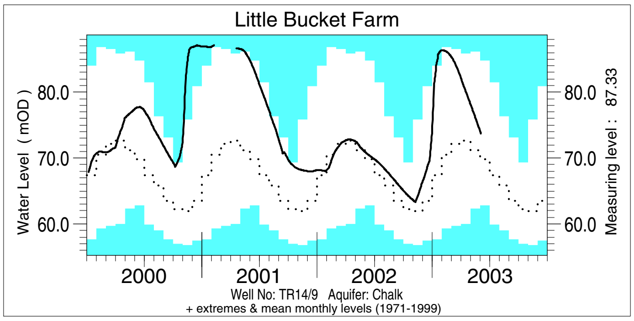


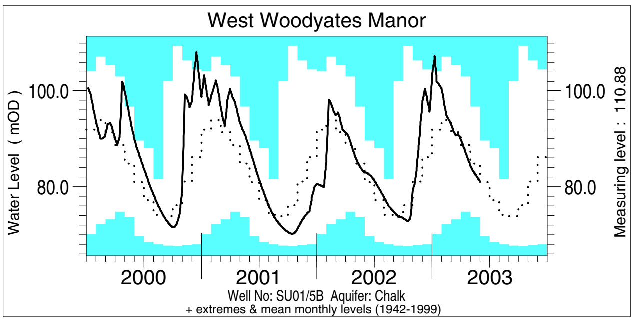


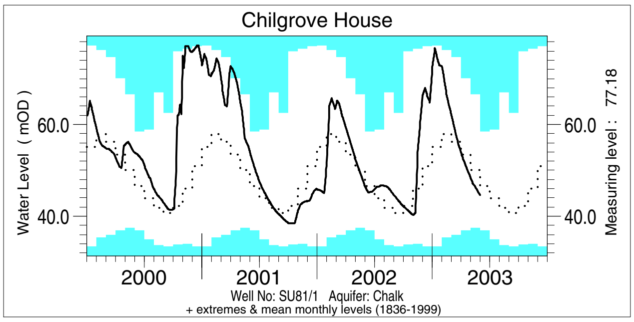


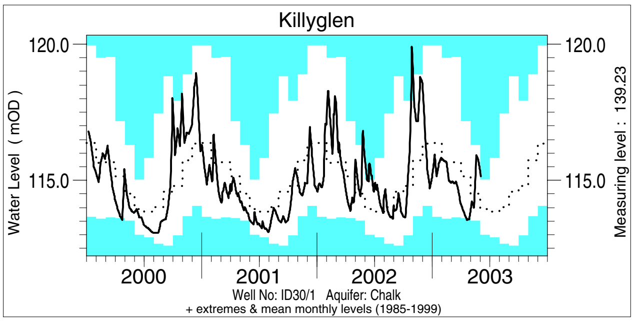


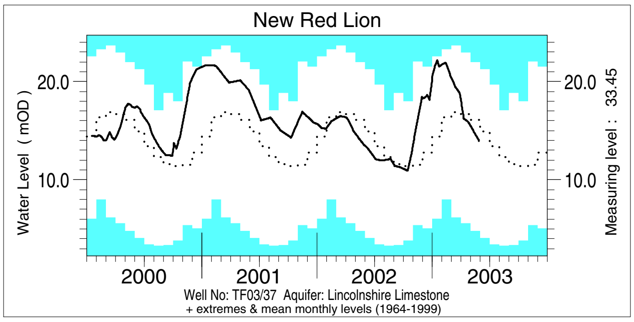






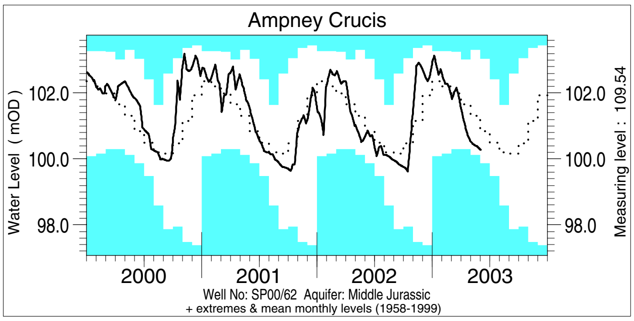


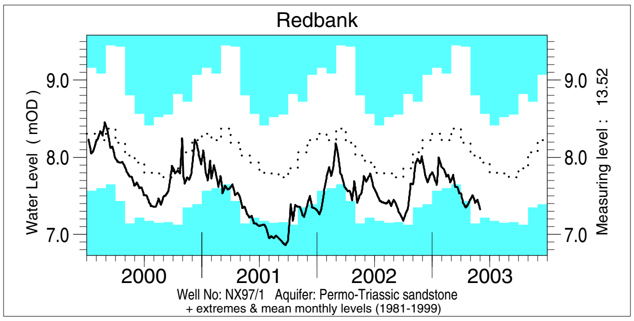


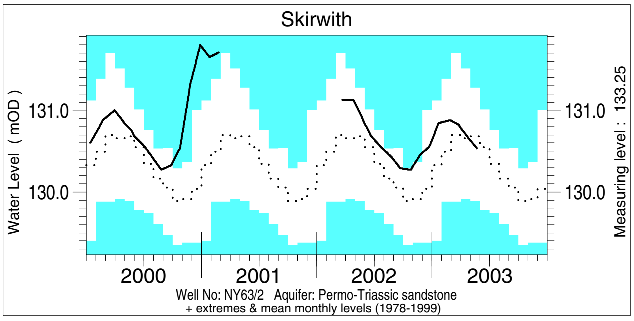


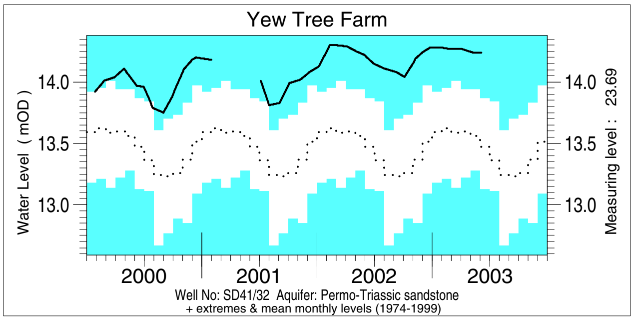
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined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

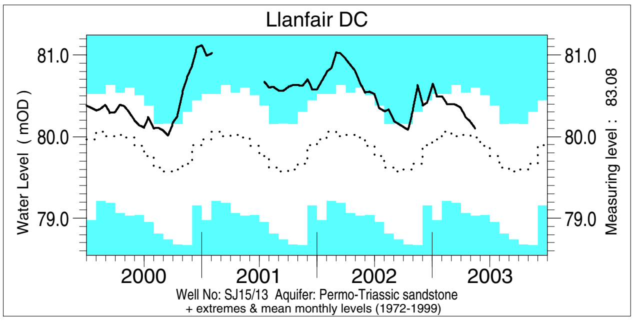
Groundwater . . . Groundwater

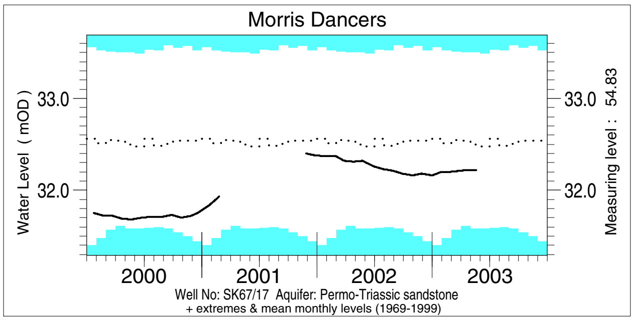


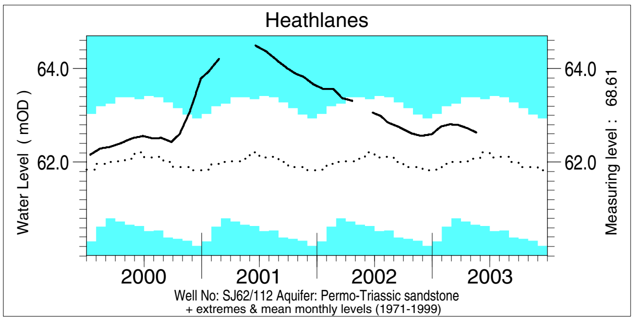


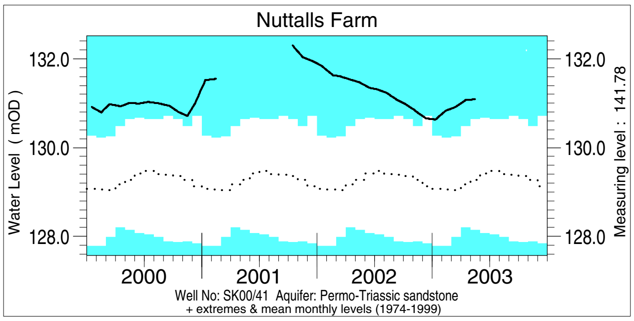


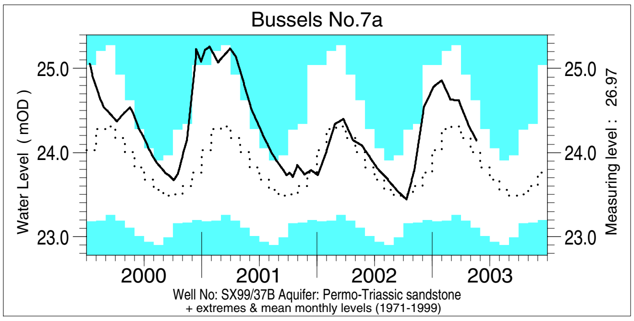


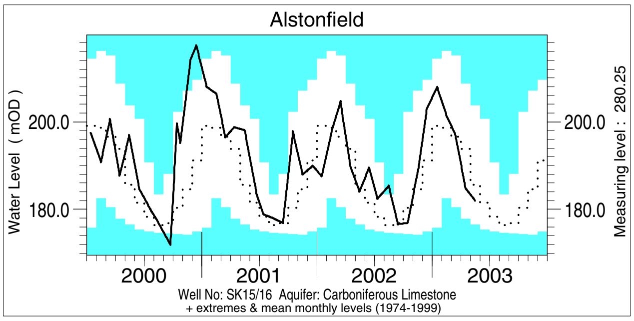










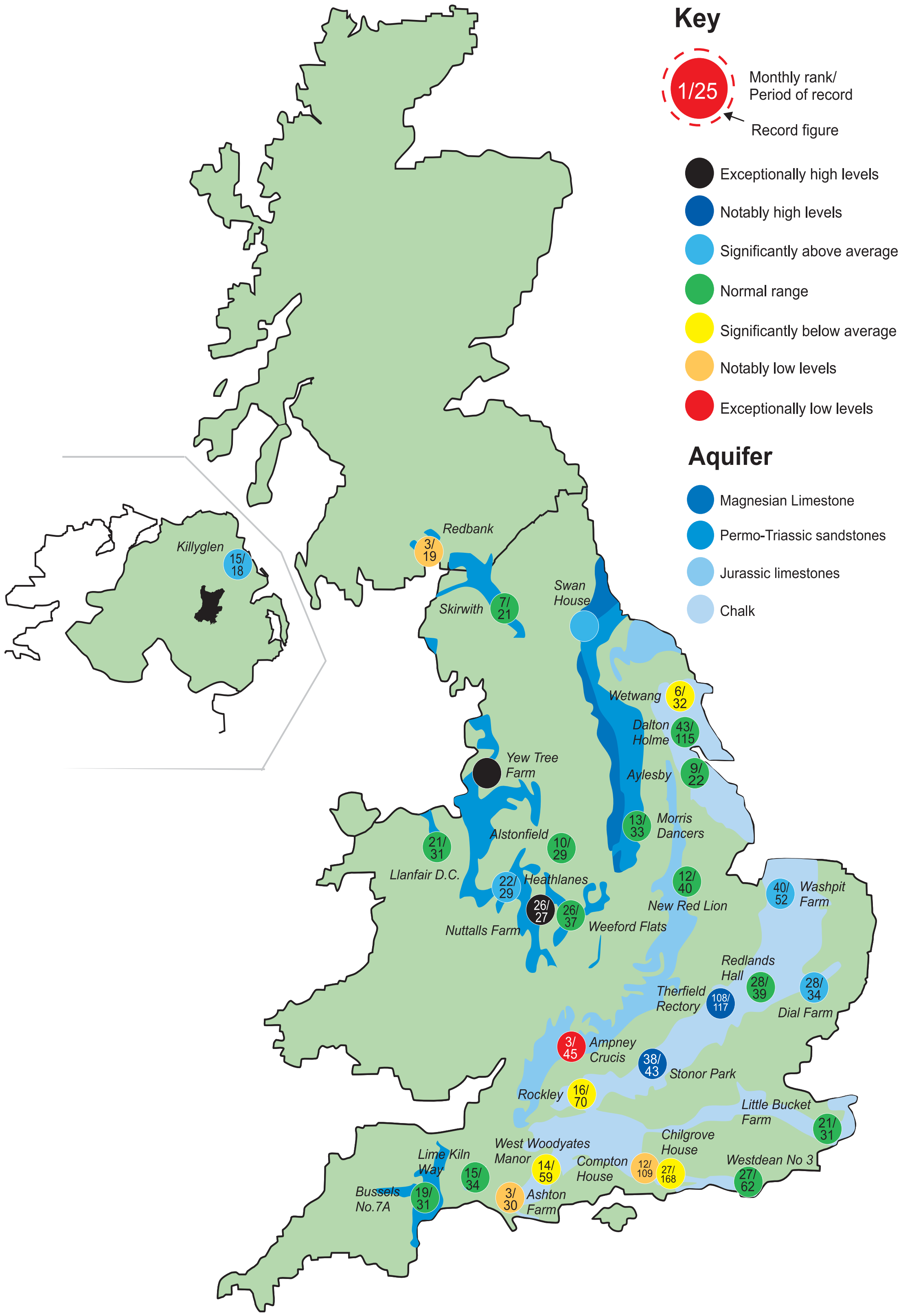


Groundwater levels May 2003 / June 2003

Borehole	Level	Date	May av.	Borehole	Level	Date	May av.	Borehole	Level	Date	May av.
Dalton Holme	18.51	09/05	18.96	Chilgrove House	44.57	31/05	49.01	Llanfair DC	80.10	15/05	79.92
Washpit Farm	47.18	20/05	45.42	Killyglen	115.15	02/06	114.53	Morris Dancers	32.22	20/05	32.38
Stonor Park	84.28	02/06	78.42	New Red Lion	13.95	28/05	16.03	Heathlanes	62.63	20/05	62.08
Dial Farm	26.11	30/05	25.71	Ampney Crucis	100.27	02/06	101.28	Nuttalls Farm	131.09	16/05	129.57
Rockley	134.46	02/06	136.24	Redbank	7.33	31/05	8.00	Bussels No.7a	24.14	20/05	24.01
Little Bucket Farm	73.74	03/06	72.48	Skirwith	130.53	22/05	130.60	Alstonfield	182.02	15/05	186.93
West Woodyates	81.10	31/05	84.67	Yew Tree Farm	14.24	05/06	13.61				

Levels in metres above Ordnance Datum

Groundwater . . . Groundwater



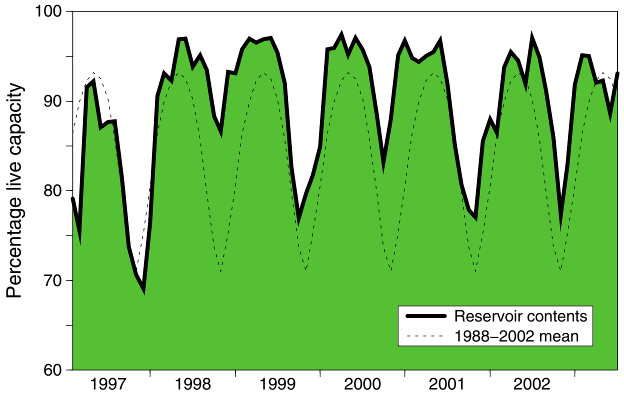
Groundwater levels - May 2003

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.

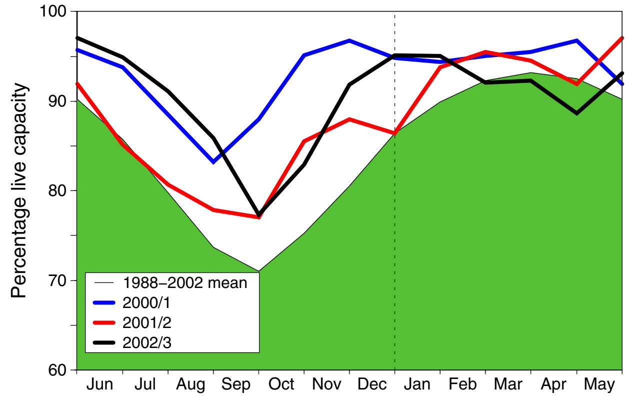
(Note: Redbank is affected by groundwater abstraction.)

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.

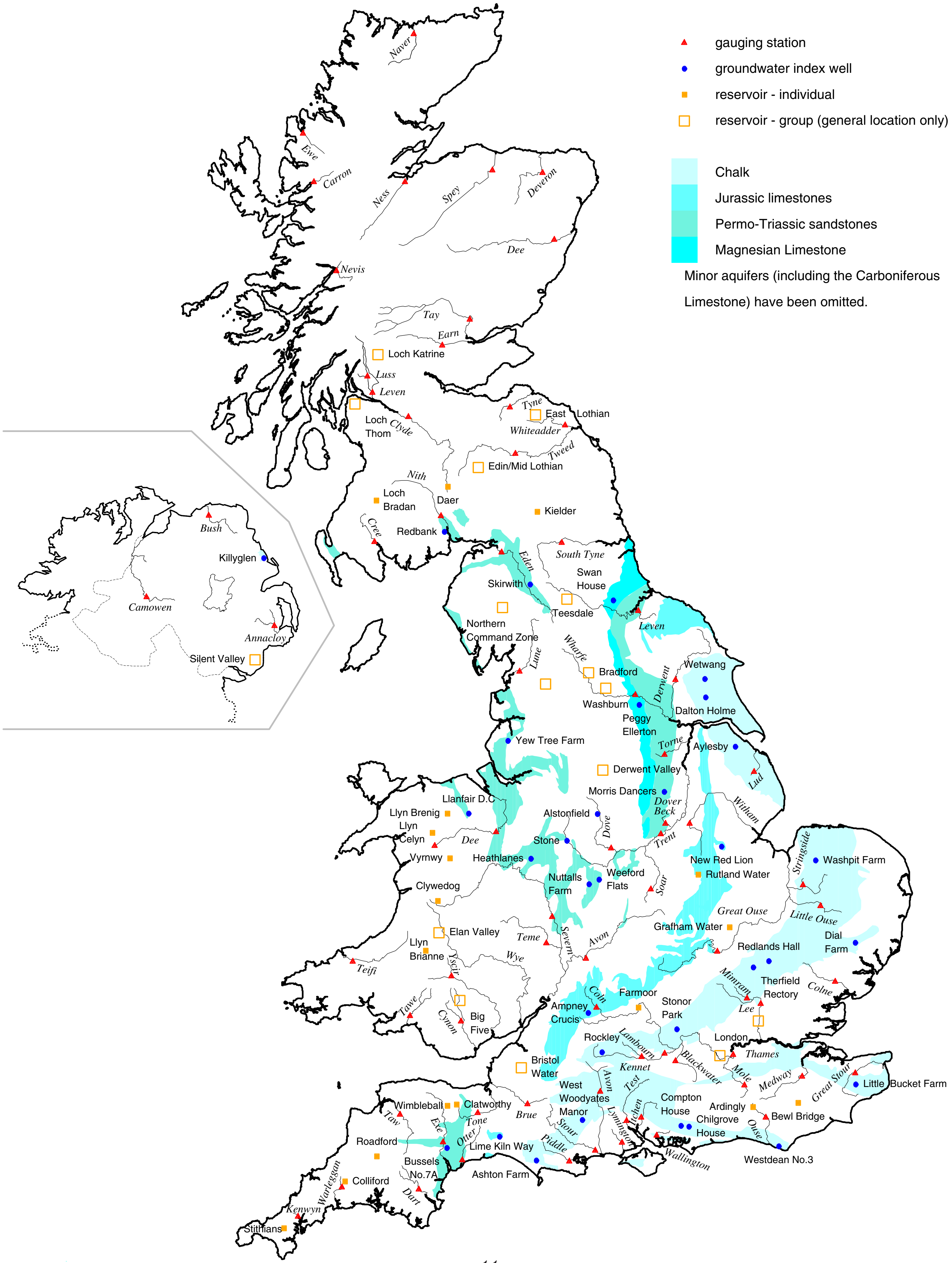
Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2003 Jan	Feb	Mar	Apr	May	Jun	Min. Jun	Year* of min.
North West	N Command Zone	• 124929	86	93	89	88	74	**85**	72	1991
	Vyrnwy	55146	99	94	92	94	90	**97**	72	1990
Northumbrian	Teesdale	• 87936	93	93	79	77	74	**75**	64	1991
	Kielder	(199175)	(99)	(99)	(91)	(90)	(92)	**(97)**	(85)	1989
Severn Trent	Clywedog	44922	88	81	85	96	97	**99**	83	1989
	Derwent Valley	• 39525	100	98	98	96	86	**94**	56	1996
Yorkshire	Washburn	• 22035	99	97	97	90	78	**90**	72	1990
	Bradford supply	• 41407	100	100	96	94	85	**95**	70	1996
Anglian	Grafham	(55490)	(89)	(84)	(86)	(91)	(94)	**(97)**	(72)	1997
	Rutland	(116580)	(93)	(90)	(87)	(93)	(95)	**(94)**	(75)	1997
Thames	London	• 202340	97	97	92	94	94	**94**	83	1990
	Farmoor	• 13830	91	91	93	93	94	**91**	90	2002
Southern	Bewl	28170	86	92	92	92	90	**86**	57	1990
	Ardingly	4685	100	100	100	100	100	**100**	96	1990
Wessex	Clatworthy	5364	100	100	100	99	86	**79**	67	1990
	Bristol WW	• (38666)	(99)	(98)	(97)	(96)	(91)	**(88)**	(70)	1990
South West	Colliford	28540	78	81	83	83	81	**81**	52	1997
	Roadford	34500	95	92	92	91	87	**83**	48	1996
	Wimbleball	21320	100	100	100	98	92	**86**	76	1992
	Stithians	5205	100	99	100	96	89	**86**	66	1990
Welsh	Celyn and Brenig	• 131155	96	96	99	98	94	**100**	82	1996
	Brianne	62140	99	99	97	95	88	**100**	85	1995
	Big Five	• 69762	96	99	98	95	86	**96**	70	1990
	Elan Valley	• 99106	100	100	99	96	87	**99**	85	1990
Scotland(E)	Edinburgh/Mid Lothian	• 97639	95	99	96	94	87	**92**	52	1998
	East Lothian	• 10206	99	100	98	96	95	**91**	84	1990
Scotland(W)	Loch Katrine	• 111363	89	97	95	89	87	**88**	66	2001
	Daer	22412	100	99	95	97	89	**98**	70	1994
	Loch Thom	• 11840	100	100	100	94	88	**95**	74	2001
Northern	Total+	•	99	98	96	94	80	**93**	81	2000
Ireland	Silent Valley	• 20634	98	98	92	93	79	**95**	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 minimum storage figures relate to the 1988-2003 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 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. An initiative is underway with The Met Office to provide more accurate areal figures and, since October 1999, to include more raingauges in the analysis. A significant number of additional monthly rainfall totals are currently being provided by the Environment Agencies. 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 Meteorological 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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Fax: 01491 692424
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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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