Hydrological summary

for Great Britain

May 1998

General

May was a relatively dry month especially in parts of southern Britain. The seasonal decline in runoff, recharge and reservoir replenishment is underway but the wet spring has left overall reservoirs stocks for England and Wales at their highest (for early June) for at least a decade. With groundwater levels now mostly within the normal range the resources outlook is healthy in almost all areas (although exceptional water demands could still produce local water supply stress through the summer).

Rainfall

The very unsettled April weather continued into early May but the frequency and vigour of frontal systems declined thereafter, heralding a dry and increasingly warm spell in mid-month. Evaporation rates climbed steeply during a notably hot spell beginning on the 12th - this helped trigger several thundery episodes with some intense downpours (e.g. 33 mm at Penzance on the 13th). Temperatures declined over the last third of the month but continuing convectional activity produced further notable storm totals (including 49 mm at Horsham on the 26th). Such thunderstorms contributed to large local variations in rainfall totals for May. Above average monthly totals were largely restricted to parts of north-eastern Britain, regional totals for England and Wales were generally in the 30-70% range although some districts (e.g. in eastern Wales and in Essex) registered less than a quarter of the May average. Provisionally, May 1998 ranks as the equal 10th driest this century for England and Wales (but 1989, 1990 and 1991 were drier) and, notwithstanding its dry conclusion, the spring (March-May) rainfall was the highest for 15 years, the Northumbria region was especially wet. Rainfall has been very erratic over the last year but regional rainfall totals are well within the normal range in both the 6- and 12-month timeframes.

River Flow

Following outstanding runoff rates in April river flows generally declined very briskly in May. The decline in flows was interrupted, locally, by a number of minor flood events associated with thunderstorms (eg in Guildford on the 26th), and substantially moderated in many permeable catchments in eastern and southern England where the benefit of heavy April groundwater replenishment was still evident; in some areas higher level springs flowed for the first time in three years. Modest May runoff totals characterised a number of catchments in Scotland but most monthly totals were well within the normal range, typically 70%-120% of average. In most index catchments spring runoff totals exceeded the average and 12-month accumulations are in the normal range. However, the general termination to the drought has not prevented the Mimram recording its 32nd successive month with below average monthly runoff - over the last two years the mean flow has been only half of the preceding average. Protracted low flow episodes during 1989-92 and 1995-98 have served to largely redefine the low flow regimes of many rivers over the last decade (this is particularly true of those with flow records commencing after the mid-1970s).

Groundwater

Infiltration rates, which were at record levels in some areas during April, were very modest in May. The dry and warm weather encouraged a rapid increase in soil moisture deficits - which exceeded the late spring average by month-end in many eastern areas, effectively ending the 1997/98 recharge season. In most of the more westerly and northerly Chalk outcrops the summer recession began with water-tables close to the seasonal average. In some central and eastern units, where levels in the early spring were exceptionally depressed, the heavy April infiltration triggered a continuing water-table rise; the lagged water-table response was most clearly evident in the deeper wells. Levels have begun to recover at Therfield after being dry for around a year (the well also dried-up in 1991/92 but no dry periods were registered over the preceding 70 years). Significant May rises were also recorded at the Holt and Redlands boreholes where levels - albeit well below average - are significantly above drought minima for the early summer. Levels in most limestone wells have fluctuated greatly in 1998 thus far but the summer recessions have commenced from around average levels. Levels in the Permo-Triassic sandstones outcrops display wide spatial variations but are commonly significantly above the corresponding levels for May 1997 - exceptions include the very slow responding boreholes like Morris Dancers. The particular value of heavy spring recharge has been underlined in 1998 but many lowland groundwater units (e.g. in Hertfordshire and Cambridgeshire) can now expect below average groundwater levels for the third successive summer.

Institute of Hydrology

British Geological Survey

Rainfall accumulations and return period estimates

Area	Rainfall	May 1998	Mar 98-May 98	RP	Dec 97-May 98	RP	Jun 97-May 98	RP	Jun 96-May 98	RP
England & Wales	**mm**	**33**	**255**		**498**		**988**		**1712**	
	%	**51**	**130**	**5-10**	**113**	**2-5**	**110**	**2-5**	**96**	**2-5**
North West	mm	51	292		644		1154		2221	
	%	68	121	2-5	114	2-5	96	2-5	92	2-5
Northumbrian	mm	82	300		555		990		1710	
	%	133	160	35-50	135	20-30	116	5-10	100	<2
Severn Trent	mm	20	215		403		842		1440	
	%	34	123	2-5	107	2-5	112	2-5	95	2-5
Yorkshire	mm	46	265		489		920		1605	
	%	77	142	10-20	120	5-10	112	5-10	98	2-5
Anglian	mm	18	187		336		700		1167	
	%	37	132	5-10	119	5-10	117	5-10	98	2-5
Thames	mm	27	206		365		749		1234	
	%	48	127	5-10	107	2-5	109	2-5	90	5-10
Southern	mm	21	185		408		893		1475	
	%	39	109	2-5	106	2-5	115	5-10	95	2-5
Wessex	mm	36	239		480		1006		1692	
	%	59	130	5-10	112	2-5	120	5-15	101	2-5
South West	mm	42	328		661		1365		2314	
	%	58	137	5-15	107	2-5	116	5-10	99	2-5
Welsh	mm	33	361		741		1441		2522	
	%	41	134	5-15	112	2-5	110	2-5	96	2-5
Scotland	**mm**	**56**	**302**		**849**		**1441**		**2881**	
	%	**65**	**105**	**2-5**	**123**	**10-20**	**100**	**<2**	**100**	**<2**
Highland	mm	55	346		1079		1717		3537	
	%	60	100	<2	126	10-20	98	2-5	100	<2
North East	mm	48	283		545		1069		2001	
	%	70	137	10-20	117	5-10	110	2-5	103	2-5
Tay	mm	47	279		702		1266		2433	
	%	57	110	2-5	113	2-5	103	2-5	99	2-5
Forth	mm	60	258		666		1144		2244	
	%	81	114	2-5	125	10-15	103	2-5	101	2-5
Tweed	mm	94	287		598		1067		2025	
	%	132	139	10-20	128	10-20	110	2-5	104	2-5
Solway	mm	70	301		804		1432		2782	
	%	82	108	2-5	118	5-10	101	2-5	98	2-5
Clyde	mm	46	274		939		1583		3234	
	%	51	85	5-10	116	5-10	93	2-5	95	2-5

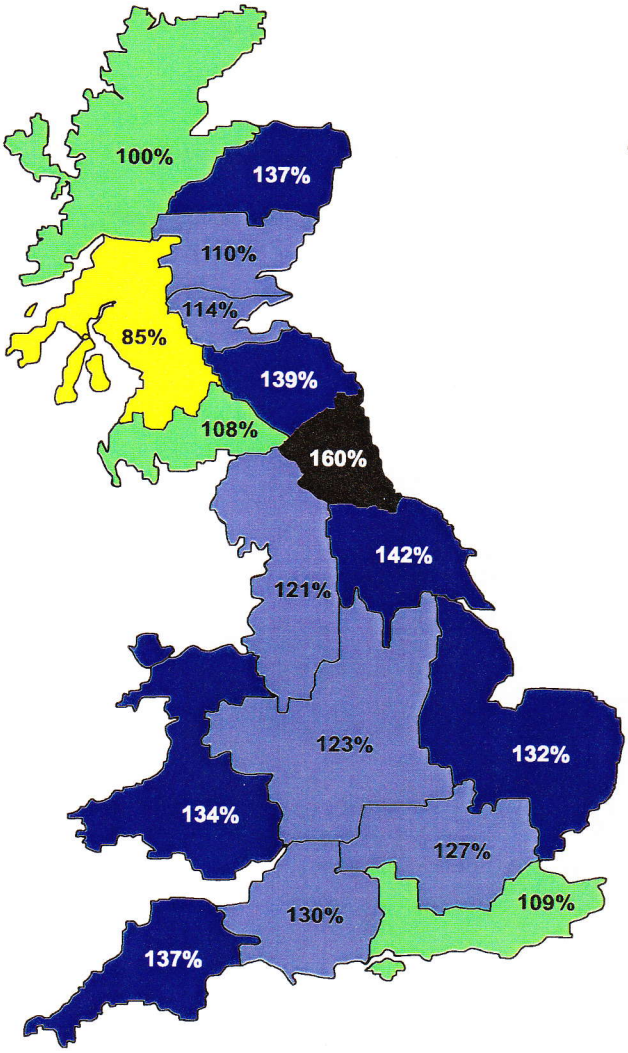
RP = Return period

 Recent monthly rainfall figures for the Scottish regions have ben compiled using data provided by the Scottish Environment Protection Agency. 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). The tables reflect rainfall over the period 1911-70 and assume a stable climate. Artifacts in the England & Wales and Scotland rainfall series can exaggerate the relative wetness of the recent past.

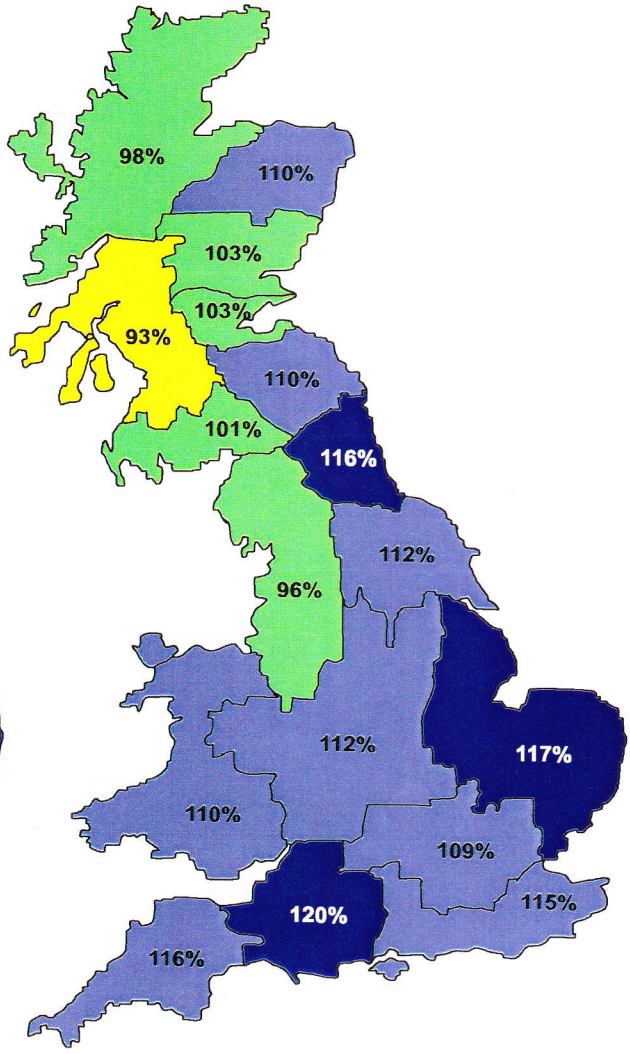
Rainfall . . . Rainfall . . . Rainfall

Key

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



March 1998 - May 1998

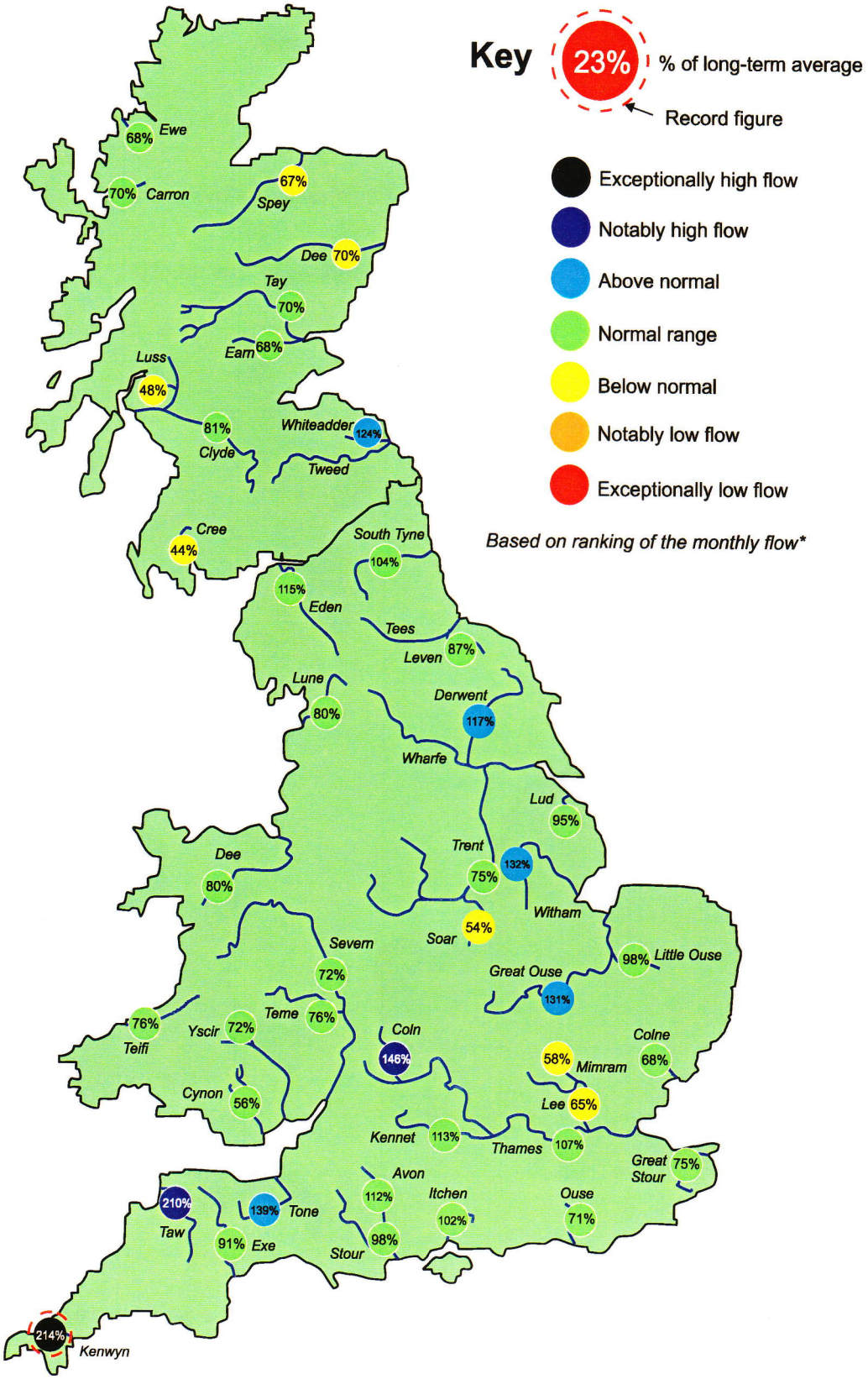


June 1997 - May 1998

Rainfall accumulation maps

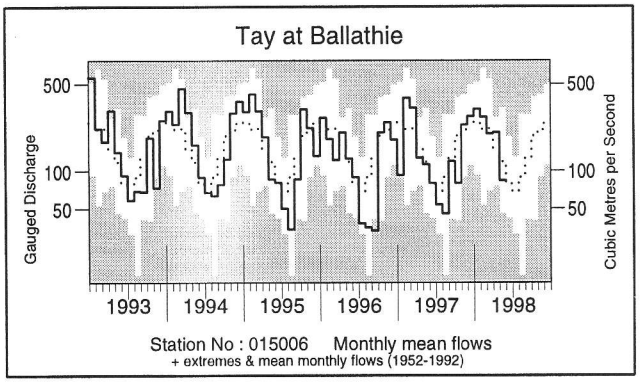
Despite the dry May, the provisional rainfall total for Britain for the first five months of the year is more than 20% above average. Over the spring period only the Clyde region has recorded below average rainfall and, in the June 1997-May 1998 timespan, most of southern Britain has been persistently above average. Very long term (around 36 month) rainfall deficiencies persist in parts of the English lowlands.

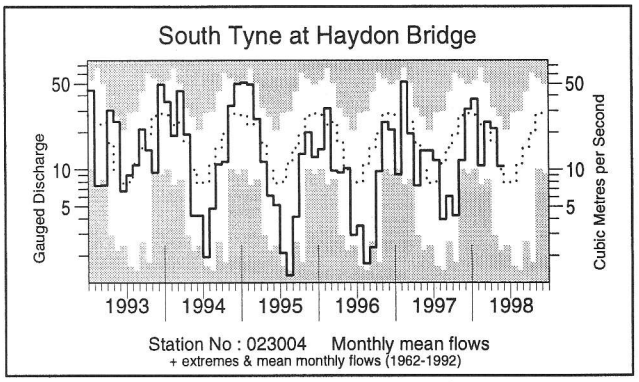
River flow . . . River flow . . .

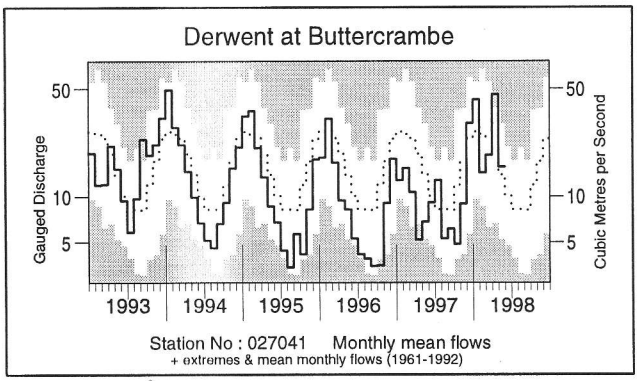


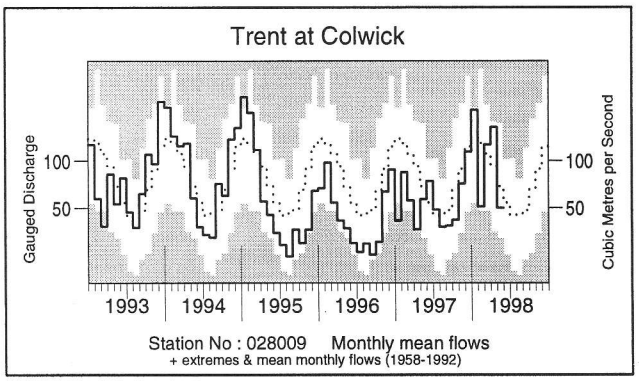
River flows - May 1998

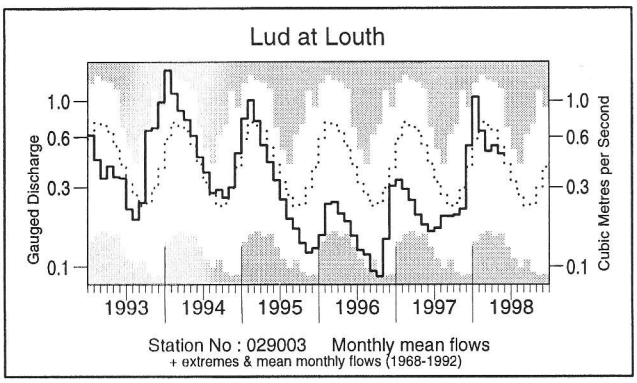
Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

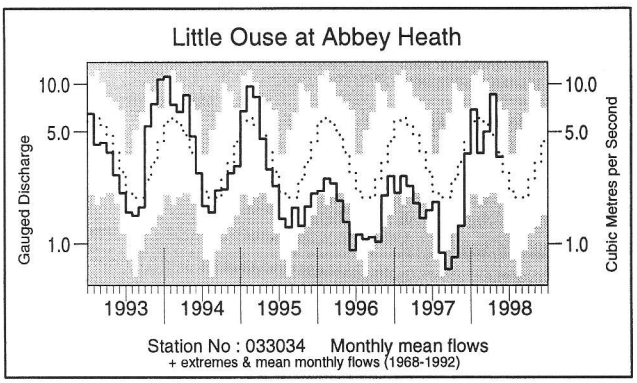


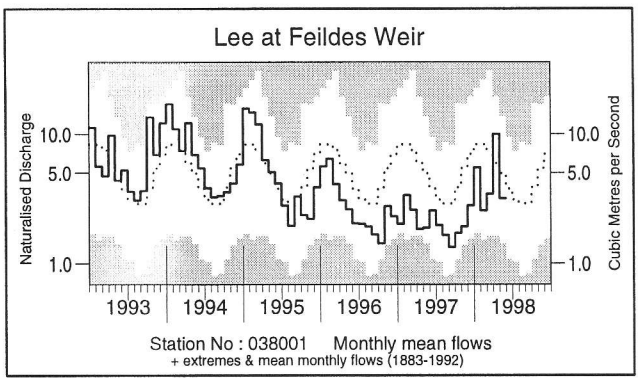


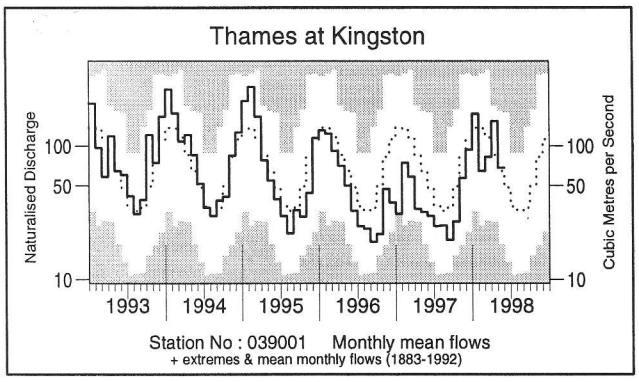








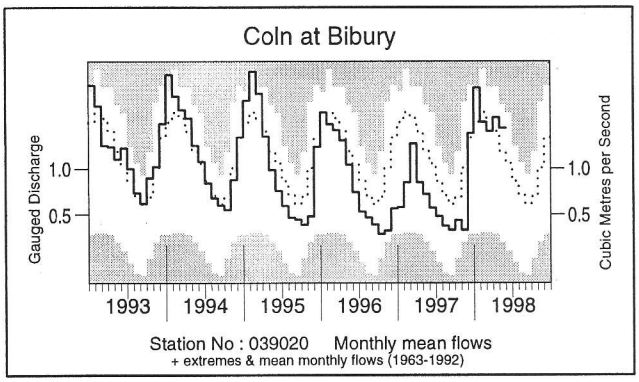


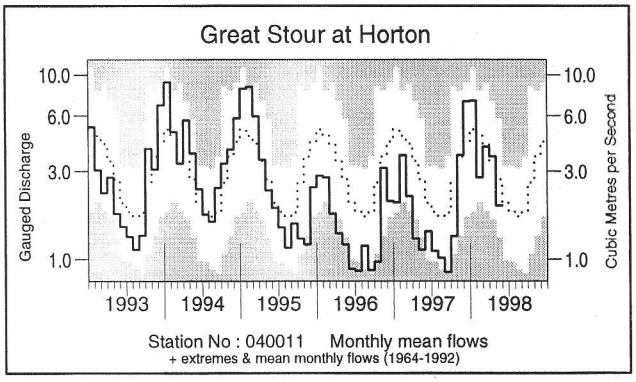


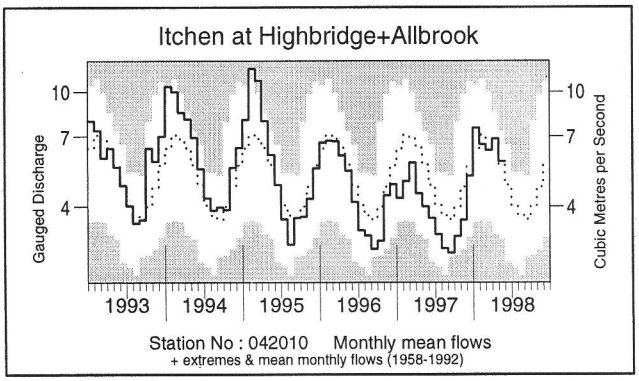
Monthly river flow hydrographs

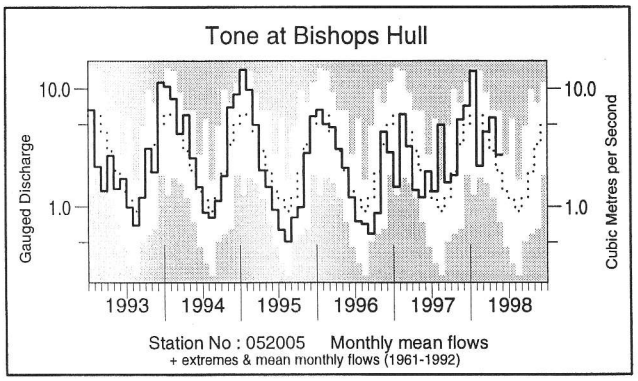
The river flow hydrographs show the monthly mean flow (bold trace), the long term average monthly flow (dotted trace) and the maximum and minimum flow prior to 1992 (shown by the shaded areas). Monthly flows falling outside the maximum/ minimum range are indicated where the bold trace enters the shaded areas.

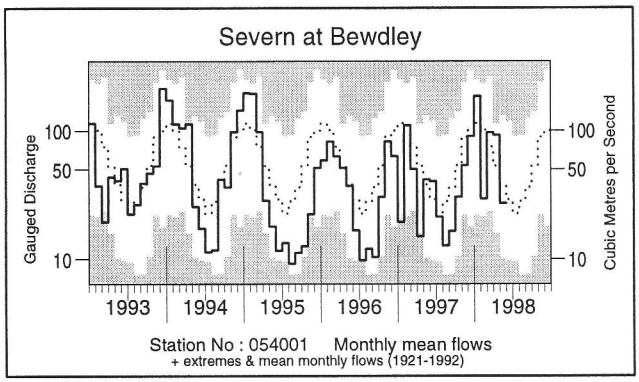
River flow . . . River flow . . .

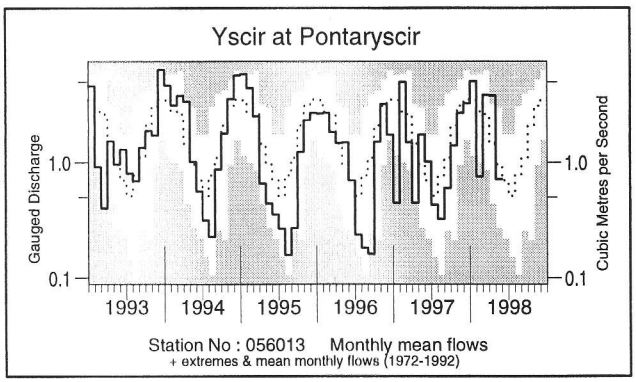


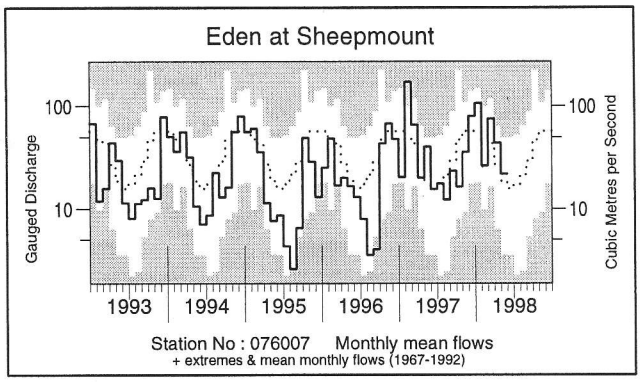


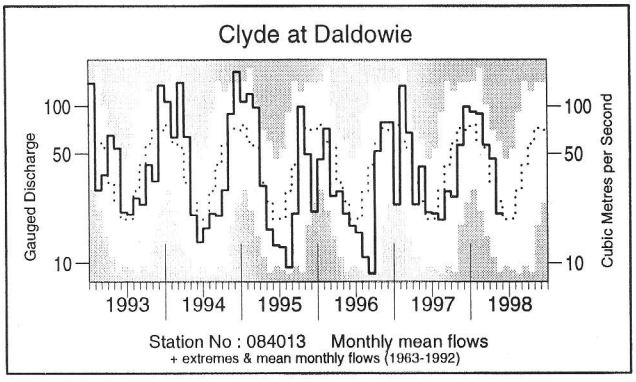










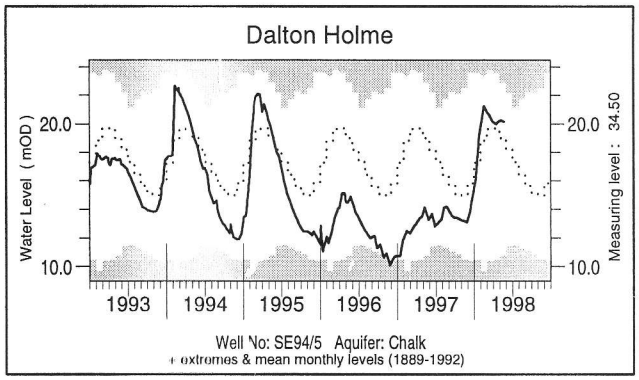


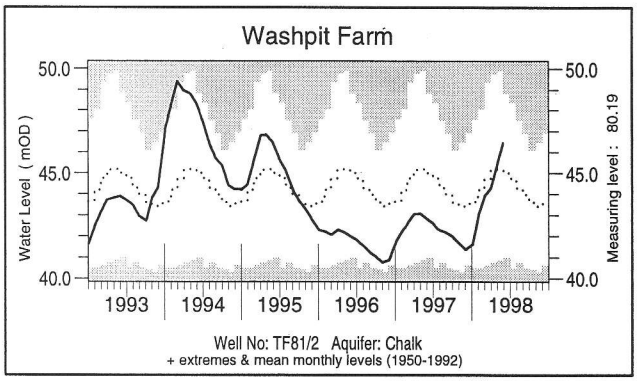
Notable runoff accumulations March 1998 - May 1998 (a); June 1997 - May 1998 (b)

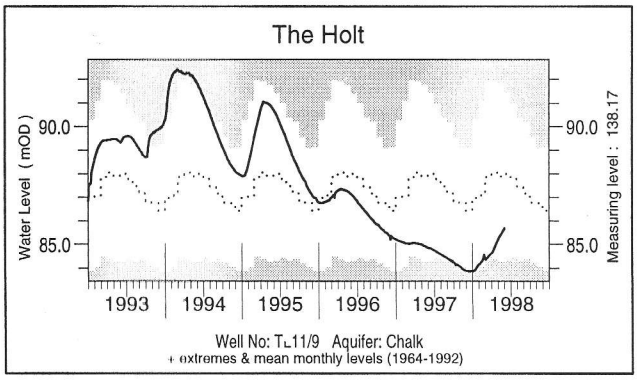
(a) River	%lta	Rank	(b) River	%lta	Rank	River	%lta	Rank
Luss Water	81	4/22	Carron	86	4/19	Avon	83	7/33
Derwent	**144**	**33/37**	S Tyne	86	6/34	**Otter**	**123**	**32/35**
Mimram	56	8/46	**Witham**	**150**	**34/39**	**Kenwyn**	**120**	**24/29**
Brue	**137**	**30/34**	Mimram	50	3/45	**Tone**	**145**	**35/37**
Yscir	**165**	**24/26**	**Mole**	**134**	**20/23**			
Lune	**157**	**30/31**						

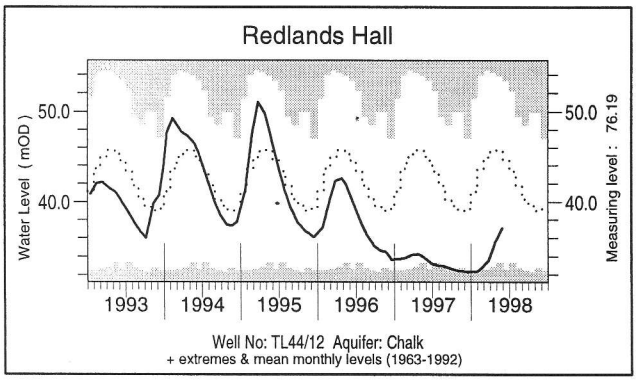
lta = long term average
Rank 1 = lowest on record

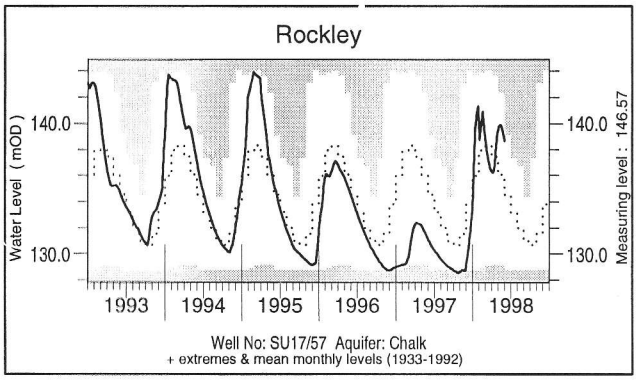
Groundwater . . . Groundwater

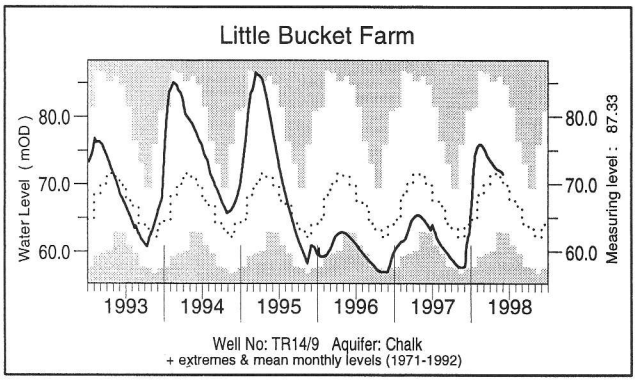


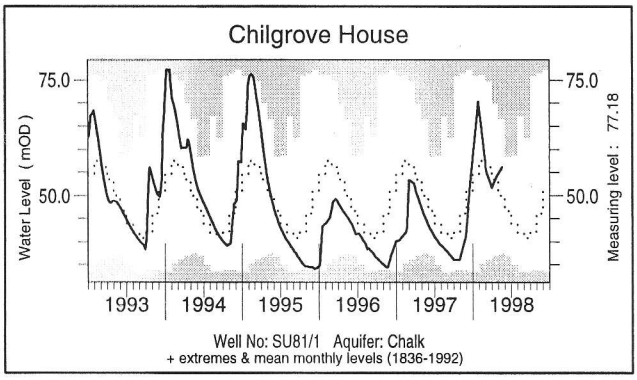


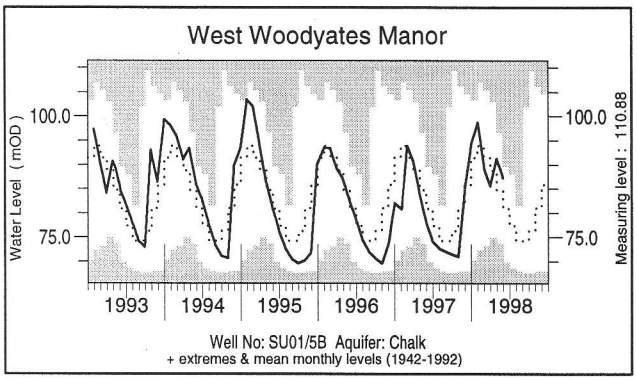








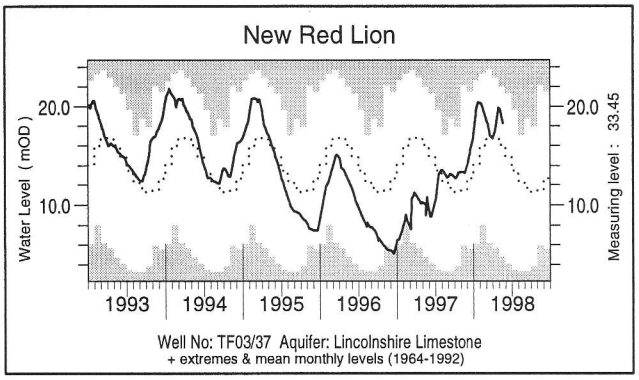


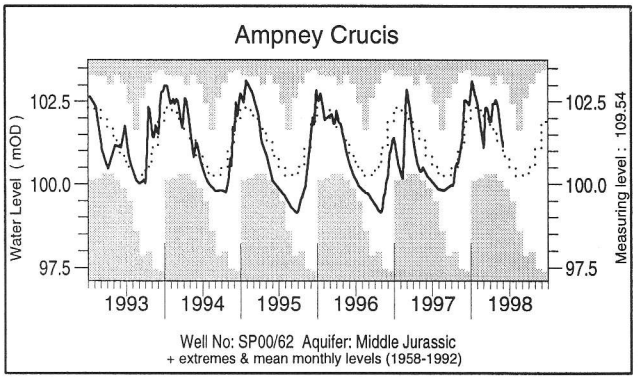


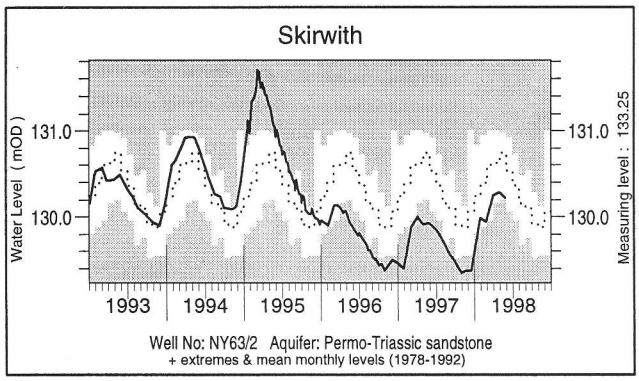
What is groundwater?

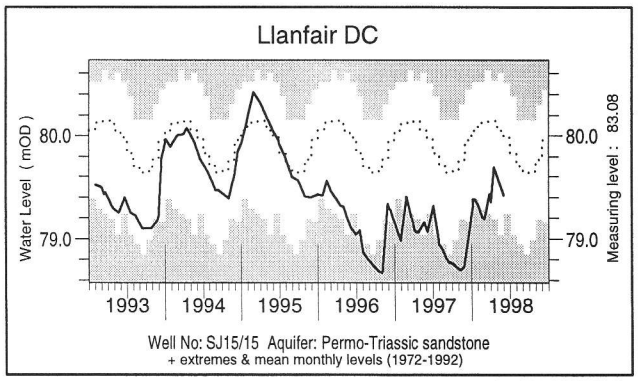
Groundwater is stored in the natural water bearing rock strata (or aquifers) which are found mostly in southern and eastern England (see page 11) where groundwater is the major water supply source. Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment 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.

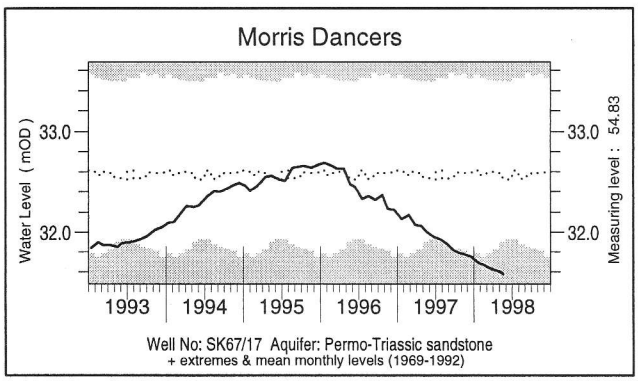
Groundwater . . . Groundwater

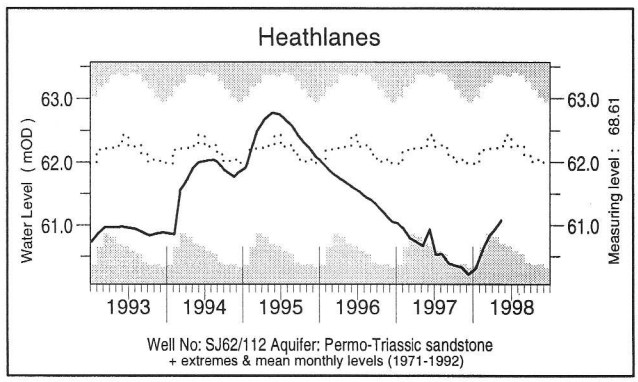


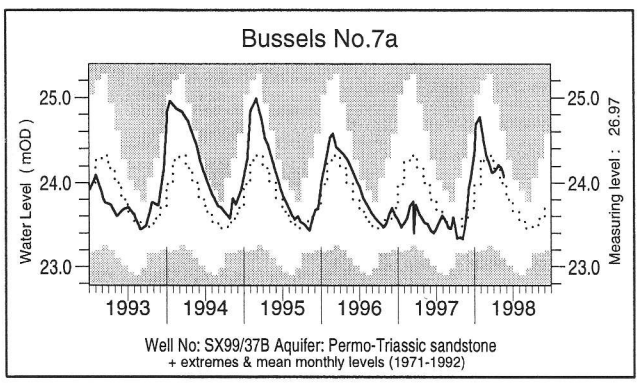


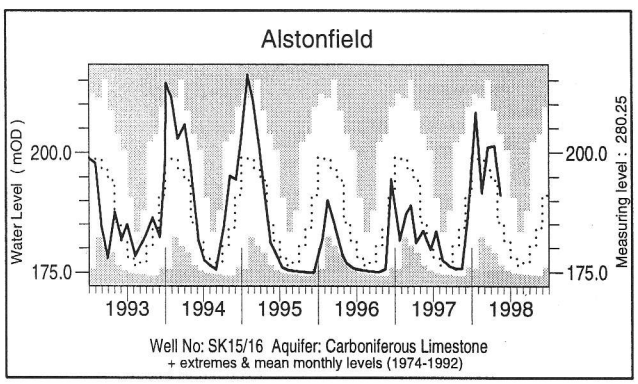












Groundwater levels May/June 1998

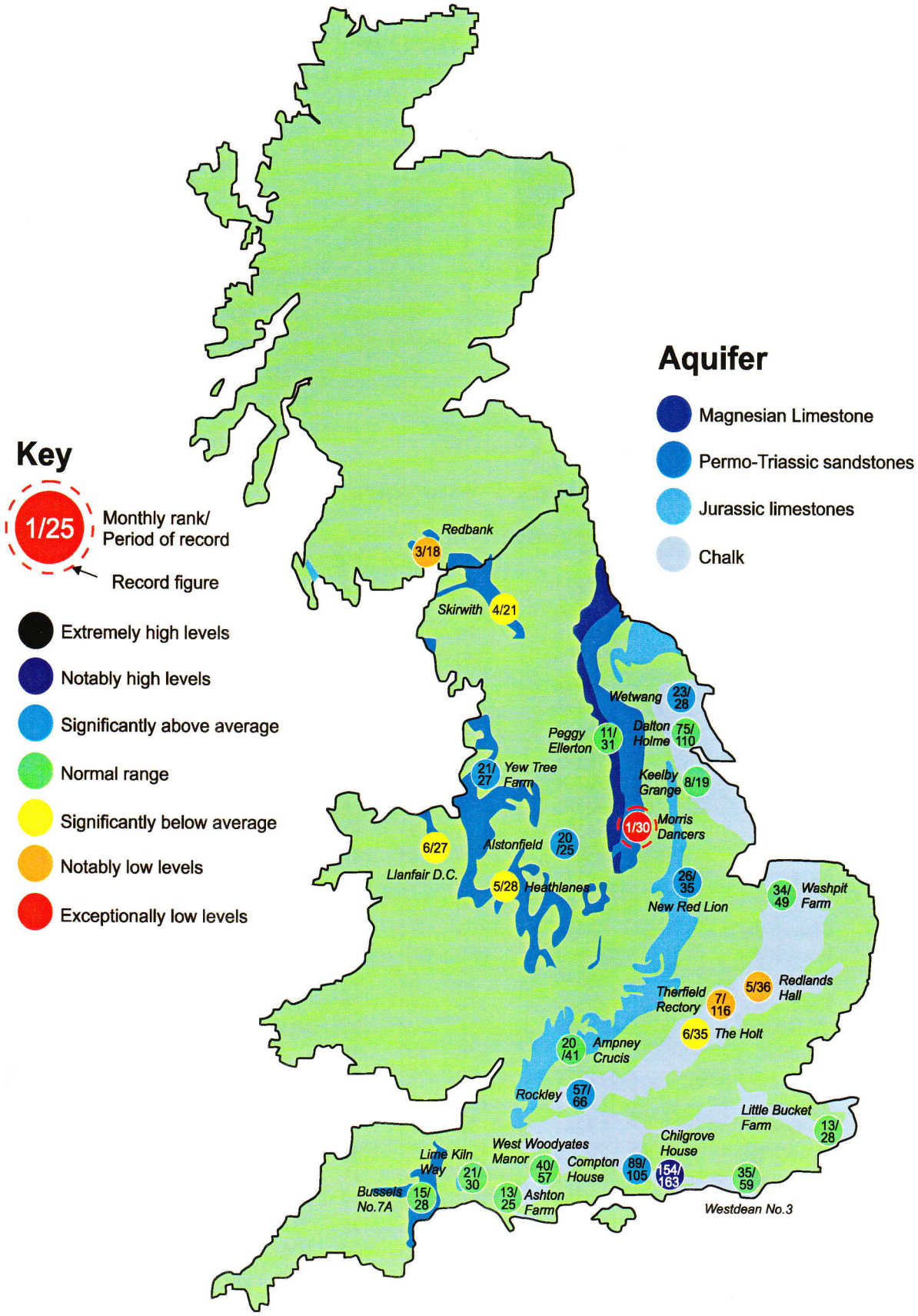
Borehole	Level	Date	May av.
Dalton Holme	20.15	22/05	18.92
Washpit Farm	46.43	28/05	45.27
The Holt	85.68	02/06	88.24
Redlands Hall	37.12	27/05	44.65
Ashton Farm	68.46	31/05	68.52
Little Bucket	71.49	02/06	72.02

Borehole	Level	Date	May av.
Chilgrove	56.17	19/05	48.88
W Woodyates	87.27	31/05	84.35
New Red Lion	18.29	20/05	15.80
Ampney Crucis	101.2	02/06	101.22
Skirwith	130.2	27/05	130.59

Borehole	Level	Date	May av.
Llanfair DC	79.42	01/06	79.89
Morris Dancers	31.58	21/05	32.46
Heathlanes	61.08	14/05	62.12
Bussels	24.07	21/05	23.98
Alstonfield	191.2	15/05	185.86

Levels in metres above Ordnance Datum

Groundwater . . . Groundwater

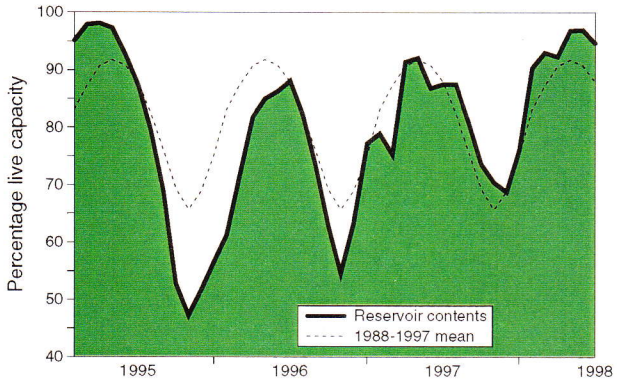


Groundwater levels - May 1998

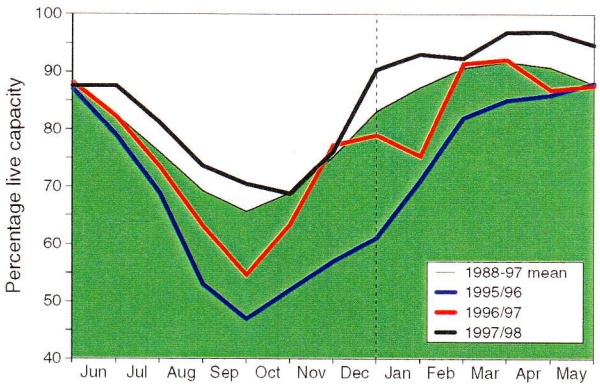
The rankings are based on a comparison of current levels (usually a single reading in a month) with the average level in each corresponding month on record. Caution needs to be exercised when interpreting the ranking, especially during periods of rapid changes in groundwater level. Rankings may be omitted where they are considered misleading.

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

Area	Reservoir	Capacity (Ml)	1998 Jan	Feb	Mar	Apr	May	**Jun**	Min. Jun	Year* of min
NorthWest	N Command Zone	• 133375	95	94	92	94	93	87	72	1991
	Vyrnwy	55146	100	93	87	100	97	95	72	1990
Northumbrian	Teesdale	• 87936	96	97	93	99	97	90	64	1991
	Kielder	(199175)	(95)	(91)	(91)	(96)	(95)	(92)	(85)	1989
SevernTrent	Clywedog	44922	86	89	86	96	99	98	83	1989
	DerwentValley	• 39525	100	100	90	98	99	90	56	1996
Yorkshire	Washburn	• 22035	98	98	95	99	95	91	72	1990
	Bradford supply	• 41407	99	98	96	100	99	93	70	1996
Anglian	Grafham	58707	57	67	75	86	92	99	72	1997
	Rutland	130061	88	96	96	98	98	96	75	1997
Thames	London	• 206399	72	93	97	99	98	99	83	1990
	Farmoor	• 13843	96	94	97	100	97	99	97	1995
Southern	Bewl	28170	98	100	99	100	100	96	57	1990
	Ardingly	4685	100	100	100	100	100	100	96	1990
Wessex	Clatworthy	5364	100	92	86	100	92	88	67	1990
	BristolWW	• (38666)	(97)	(97)	(94)	(98)	(98)	(91)	(70)	1990
SouthWest	Colliford	28540	62	68	68	73	77	76	52	1997
	Roadford	34500	78	84	84	91	98	97	48	1996
	Wimbleball	21320	100	100	97	100	100	99	76	1992
	Stithians	5205	100	100	96	100	100	98	66	1990
Welsh	Celyn and Brenig	• 131155	99	97	98	100	100	100	82	1996
	Brianne	62140	100	94	94	97	100	99	85	1995
	Big Five	• 69762	98	96	91	98	99	96	70	1990
	Elan Valley	• 99106	100	97	93	99	100	97	85	1990
East of Scotland	Edinburgh/Mid Lothian	• 97639	74	80	79	71	62	52**		
	East Lothian	• 10206	100	100	99	100	100	99	84	1990
West of Scotland	Loch Katrine	• 111363	97	88	95	97	99	90	85	1995
	Daer	22412	100	98	100	100	100	90	70	1994
	LochThom	• 11840	93	93	100	100	100	92	83	1994

( ) figures in parentheses relate to gross storage
** Megget drawdown for maintainence
• denotes reservoir groups
* last occurrence

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 area; this can be particularly important during droughts.
The minimum storage figures relate to the 1988-1997 period only. In some gravity-fed reservoirs (eg. Clywedog) stocks are kept below capacity during the winter to provide scope for flood alleviation.

Location map . . . Location map

Where the information comes from

The National Hydrological Monitoring Programme was instigated in 1988 and is undertaken jointly by 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 of the Environment, Transport and the Regions, the Environment Agency (EA), the Scottish Environment Protection Agency (SEPA) and the Office of Water Services (OFWAT).

River flow and groundwater levels

The National River Flow Archive (maintained by IH) and the National Groundwater Level Archive (maintained by BGS) provide the historical perspective within which to examine contemporary hydrological conditions.

River flow and groundwater level data are provided by the regional divisions of the EA (England and Wales) and SEPA (Scotland). In all cases the data are subject to revision following validation (flood and drought data in particular may be subject to significant revision).

Reservoirs

Reservoir level information is provided by the Water Service Companies, the EA and, in Scotland, the West of Scotland and East of Scotland Water Authorities.

Rainfall

Most rainfall data are provided by the Met Office. To allow better spatial differentiation the rainfall data are presented for the regional divisions of the precursor organisations of the EA and SEPA. The recent rainfall estimates for the Scottish regions are derived by IH in collaboration with the SEPA regions. In England and Wales the recent rainfall figures derive from MORECS. MORECS is the generic name for the Meteorological Office services involving the routine calculation of evaporation and soil moisture throughout Great Britain. The provisional regional rainfall figures are regularly updated using figures derived from a much denser rainguage network. Further details of Met. Office services can be obtained from:

The Meteorological Office
Sutton House
London Road
Bracknell
RG12 2SY.
Tel. 01344 856858; 01344 854024.

The cooperation of all data suppliers is gratefully acknowledged.

Subscription

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