Hydrological summary

for Great Britain

January 1998

General

The rapid improvement in water resources over the early winter continued into January but stalled in mid-month as anticyclonic conditions produced an exceptionally dry episode - a timely reminder of the sensitivity of the water resources outlook to rainfall over the later winter and early spring. Nonetheless, most reservoirs remain close to capacity and groundwater levels climbed briskly during January in most aquifer units. Residual drought conditions are largely confined to a zone from the lower Thames basin to the East Midlands where groundwater level recoveries have only recently begun. In such areas above average February-April rainfall is needed to substantially lift water-tables from an extremely low base.

Rainfall

January was a month of two halves. The first week was notably wet, rainfall in some parts of southern England exceeding the monthly average by the 6th; very mild and unsettled conditions continued until around the 18th. Thereafter many localities registered barely a trace of rainfall. Notwithstanding this very dry interlude, regional rainfall totals for January were close to the average in Scotland and well above average throughout almost all of England and Wales. More significantly, the November-January rainfall total, although substantially less than in 1994/95 and 1993/94, was considerably above average - by 15-40% in most regions; in a few lowland areas it was the second wettest such period in the last 25 years. Rainfall totals in the six-month timeframe are well within the normal range and, for the last 12 months, exceed the 1961-90 average in all regions (albeit marginally in the English lowlands). Long term deficiencies (from the spring of 1995) remain very notable in parts of northern and eastern England but are only of water resources relevance in those areas where groundwater recoveries are still awaited - see below.

River Flow

In contrast to the preceding two years, 1998 opened with spate conditions in many rivers. With catchments close to saturation modest daily pulses of rainfall kept runoff rates high throughout the first two weeks. Over this period, many rivers in southern Britain registed their highest flows for around three years; flood warnings (mostly amber alerts) were common. Despite the steep recessions which began around mid-month, January runoff totals were very healthy in all but the most slow-responding eastern catchments. Overall runoff from England and Wales was the highest since February 1995 but catchment geology and soil moisture conditions exerted a strong influence on the spatial variation in flow rates. The River Teifi registered its second highest January runoff total in a 39-year record and the Severn its third highest since 1960. Similarly high runoff typified most impervious catchments and a few groundwater-fed rivers in the South-West - The Dorset Piddle recorded its third highest monthly runoff on record. By contrast, recoveries in some eastern spring-fed streams remain very sluggish. The Mimram (at Panshanger) recorded its 4th lowest January runoff in a 46-year record - flows in the headwaters were unprecedented - and runoff in many rivers in a broad zone to the north of London were considerably below average. In such catchments 3-month runoff totals are only around 50-70% of average; elsewhere they are mostly well above average - notably so in parts of the South-West.

Groundwater

With soil moisture deficits minimal in most areas, the abundant infiltration over the latter half of December continued into early January when a succession of daily rainfall totals in the 5-10 mm range provided ideal conditions for groundwater replenishment. After well over two years with levels greatly below the seasonal average, marked increases were recorded in the northern and Welsh Permo-Triassic sandstones outcrops during January and levels in most limestone boreholes exceeded the average by mid-month, by a wide margin at Alstonfield. In the Chalk, brisk rises over the 8-10 weeks to the end of January left levels well above average throughout most of the western and northern outcrop; the recent upturn in Kent has been notable also. However, in parts of the English lowlands where significant infiltration was delayed until well into January, levels are still depressed. In the Chalk, Therfield remains dry and Redlands recorded its lowest January level on record. Levels remain depressed in parts of the Permo-Triassic sandstones also - principally in the Midlands. Nationally, groundwater resources have improved greatly since the late autumn of 1997 but the recent four-week dry interlude - at time when overall infiltration is, on average, at a maximum - underlines the need for substantial rainfall in the lowlands to extend the recharge season well into the spring. In those parts of the Chalk where levels are most depressed rainfall over the next 6-8 weeks (before evaporation rates begin to accelerate) will be crucial.

Institute of Hydrology

British Geological Survey

Rainfall . . . Rainfall . . . Rainfall. .

Rainfall accumulations and return period estimates

Area	Rainfall	Jan 1998	Nov 97-Jan 98	RP	Aug 97-Jan 98	RP	Feb 97-Jan 98	RP	Apr 95-Jan 98	RP
England	**mm**	**110**	**330**		**525**		**952**		**2208**	
& Wales	**%**	**125**	**121**	**5-10**	**103**	**2-5**	**106**	**2-5**	**86**	**20-30**
North West	mm	155	420		640		1249		2753	
	%	128	114	2-5	89	2-5	104	2-5	80	110-150
Northumbrian	mm	99	305		415		908		2177	
	%	117	121	2-5	86	2-5	106	2-5	90	5-15
Severn Trent	mm	99	257		429		820		1858	
	%	141	118	2-5	104	2-5	109	2-5	87	10-20
Yorkshire	mm	112	296		439		866		1965	
	%	142	122	2-5	96	2-5	106	2-5	84	30-45
Anglian	mm	68	205		331		627		1443	
	%	135	125	5-10	104	2-5	105	2-5	85	20-35
Thames	mm	82	237		398		692		1657	
	%	129	119	2-5	105	2-5	100	2-5	84	20-30
Southern	mm	110	362		549		868		1961	
	%	138	147	10-20	121	5-10	111	2-5	88	5-15
Wessex	mm	116	367		609		977		2351	
	%	134	140	5-15	127	5-15	117	5-10	99	2-5
South West	mm	148	498		819		1307		3148	
	%	107	124	5	118	5-10	111	2-5	95	2-5
Welsh	mm	178	516		819		1427		3292	
	%	124	118	2-5	104	2-5	109	2-5	88	10-20
Scotland	**mm**	**173**	**498**		**754**		**1542**		**3785**	
	%	**115**	**110**	**2-5**	**87**	**5-10**	**107**	**2-5**	**93**	**5-10**
Highland	mm	218	542		850		1836		4420	
	%	116	92	2-5	78	10-15	104	2-5	89	15-25
North East	mm	83	364		514		1098		2874	
	%	84	125	5-10	91	2-5	113	5-10	104	2-5
Tay	mm	163	499		694		1374		3376	
	%	113	127	5-10	95	2-5	112	5-10	97	2-5
Forth	mm	129	378		575		1207		2931	
	%	109	111	2-5	87	2-5	109	2-5	93	5-10
Tweed	mm	115	365		515		1106		2656	
	%	115	128	5-10	92	2-5	114	5-10	96	2-5
Solway	mm	170	556		840		1549		3746	
	%	109	124	5-10	97	2-5	109	2-5	93	5-10
Clyde	mm	207	583		909		1738		4309	
	%	110	106	2-5	86	2-5	102	2-5	89	10-20

%= % of 1961-90

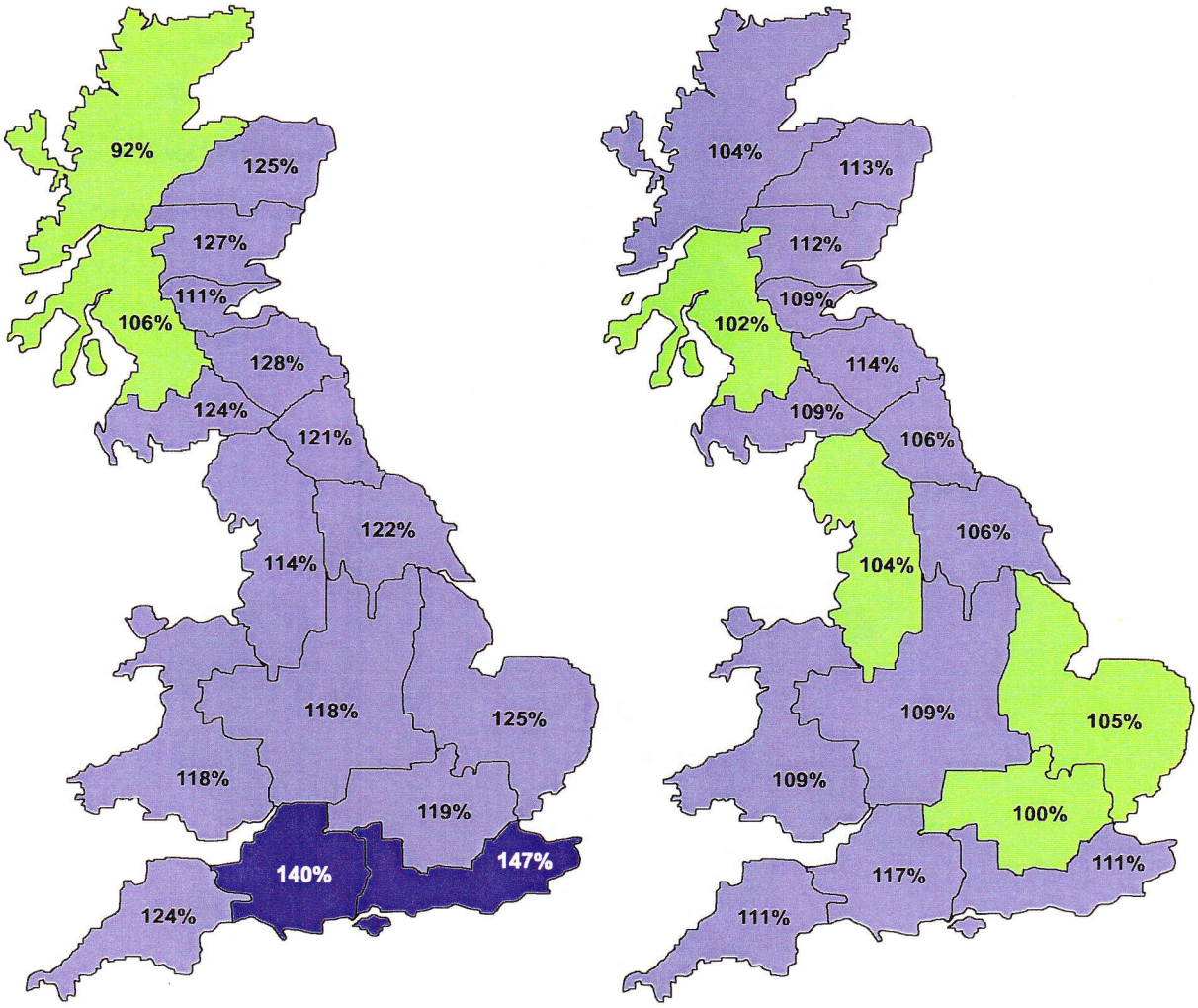
RP = Return period

 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
	Very wet
	Substantially above average
	Above average
	Normal range
	Below average
	Substantially below average
	Exceptionally low rainfall



November 1997 - January 1998 **February 1997 - January 1998**

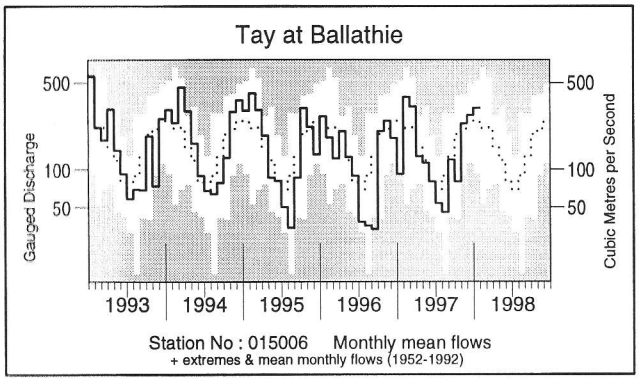
Rainfall accumulation maps

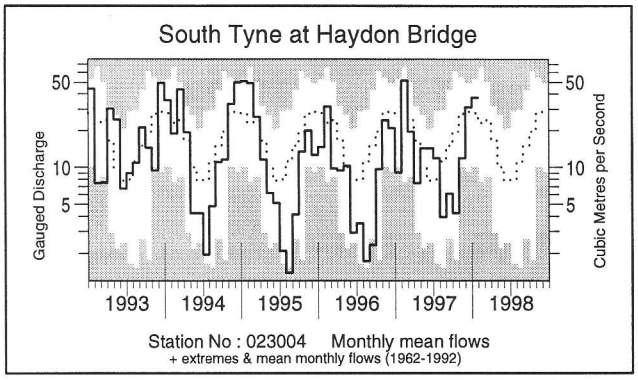
Long term rainfall deficiencies (from March 1995) remain the equivalent of more than four months average rainfall in parts of northern and western England but above average rainfall over the last year and the last three months in particular, have produced a very substantial improvement in the water resources situation.

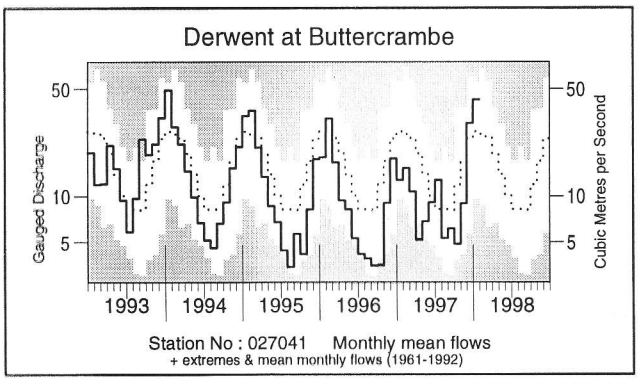
River flow . . . River flow . . .

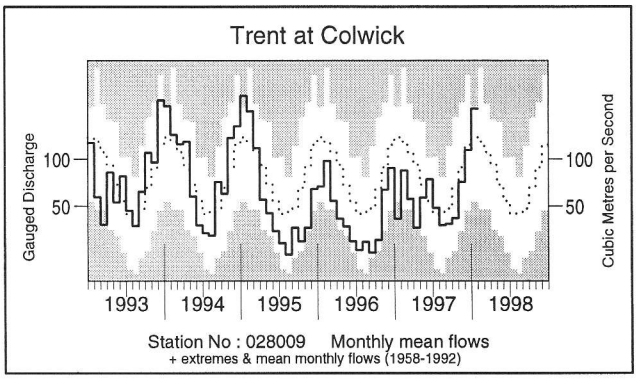
River flows - January 1998

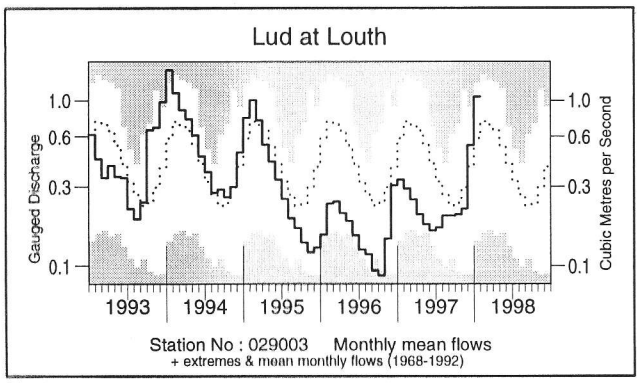
Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

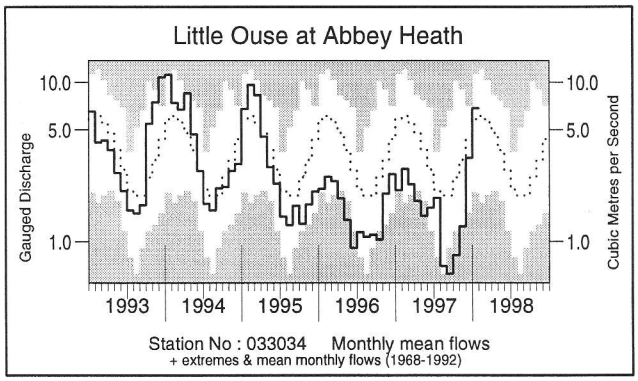


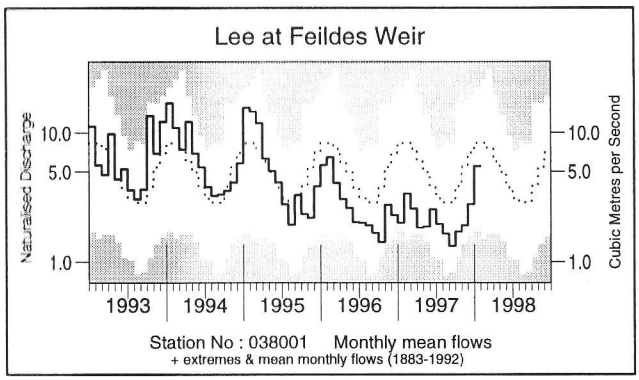


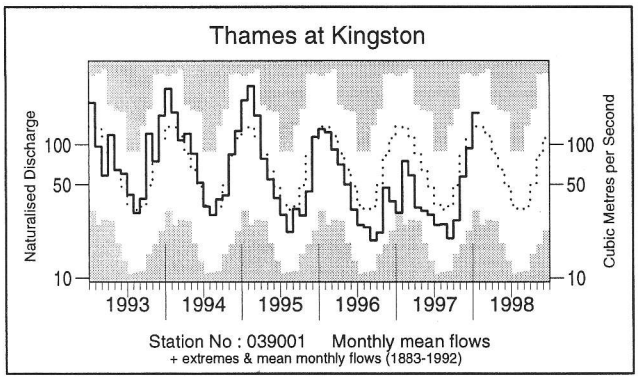








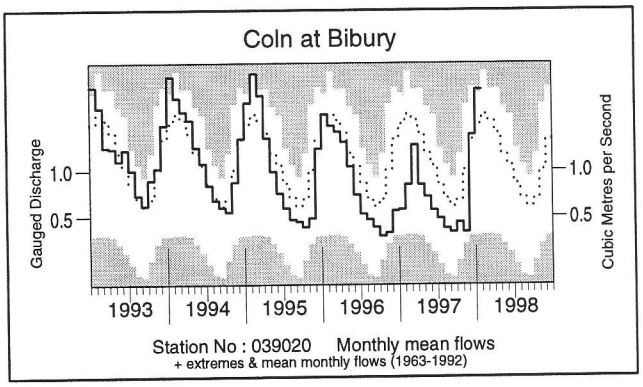


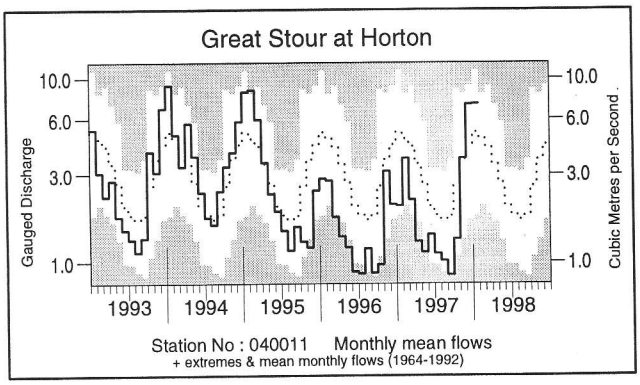


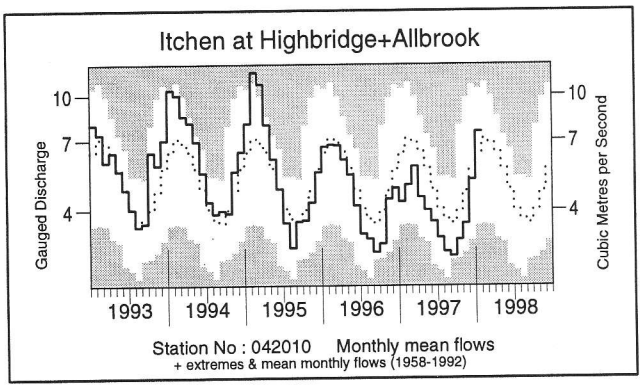
Monthly river flow hydrographs

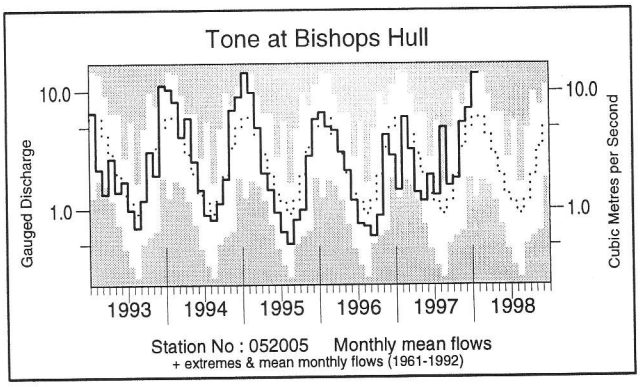
The river flow hydrographs show the monthly mean flow (bold trace), the long term average monthly flow (dotted trace) and the maximum and minimum flow prior to 1992 (shown by the shaded areas). Monthly flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded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

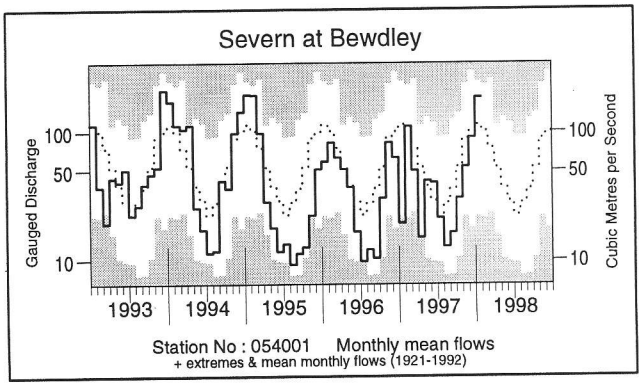
River flow . . . River flow . . .

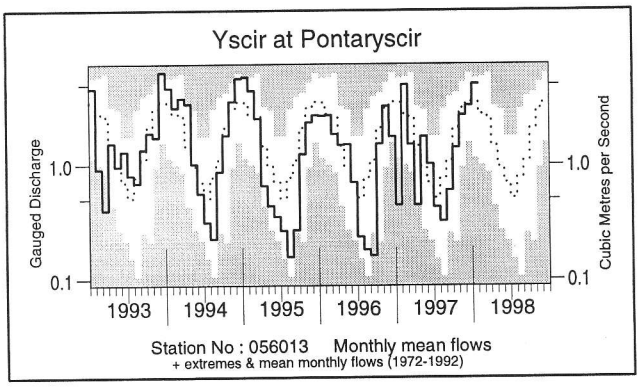


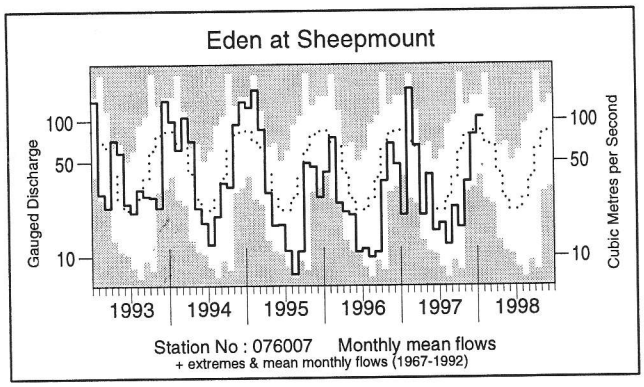


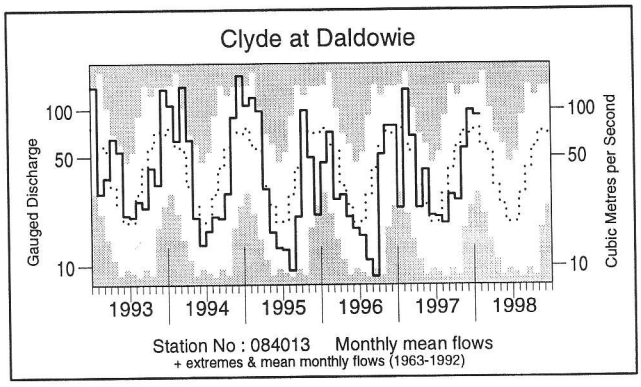












Notable runoff accumulations November 1997 - January 1998 (a); February 1997 - January 1998 (b)

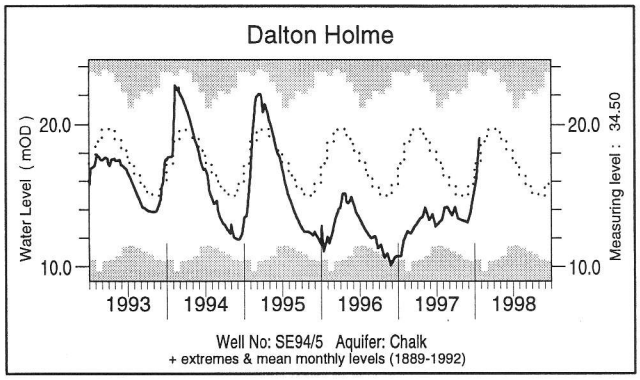
(a) River	%lta	Rank
Carron	66	2/19
Mimram	51	3/45
Lymington	**162**	**36/38**
Stour	**153**	**22/25**
Piddle	**180**	**34/34**
Dee(Scot)	**144**	**25/26**

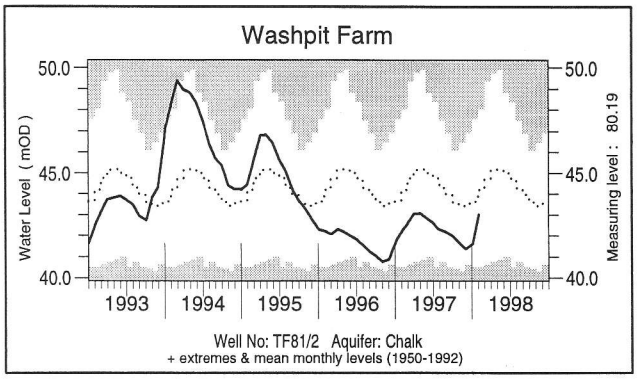
River	%lta	Rank
Otter	145	36/36
Kenwyn	144	27/30
Tone	174	36/37

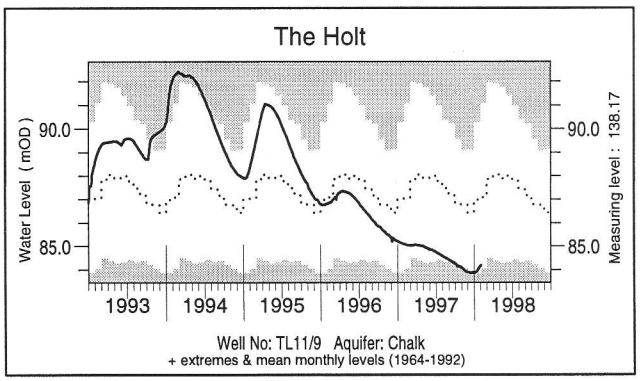
(b) River	%lta	Rank
Mimram	46	2/45
Blackwater	65	3/36
Test	70	3/39
Avon	63	3/33
Tone	**136**	**36/37**

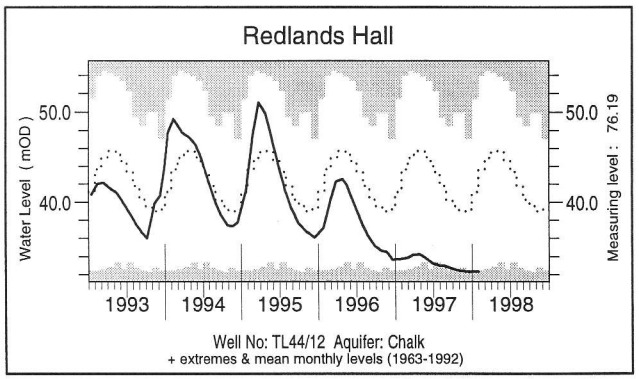
lta = long term average
Rank 1 = lowest on record

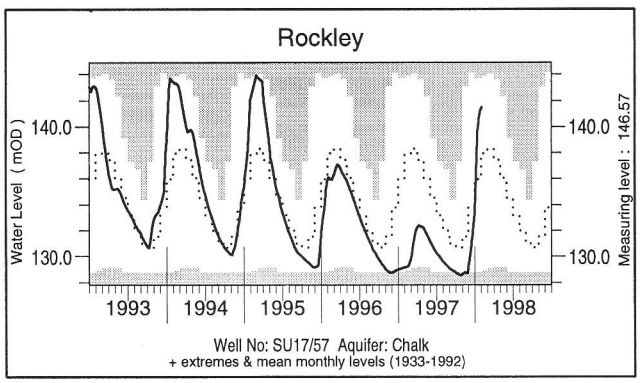
Groundwater . . . Groundwater

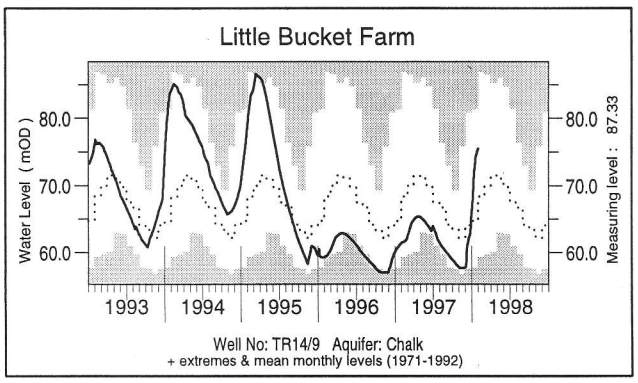


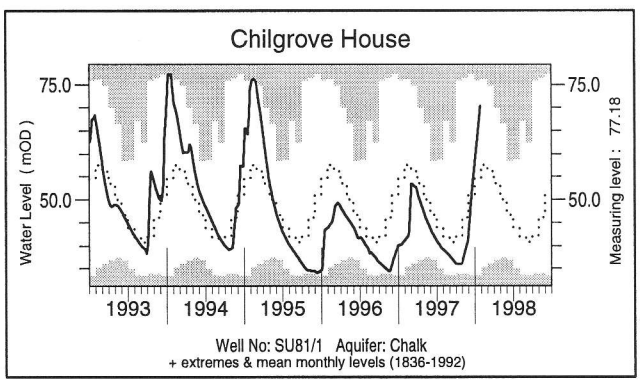


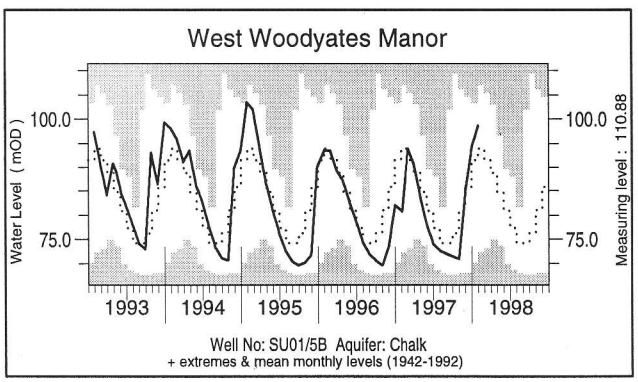








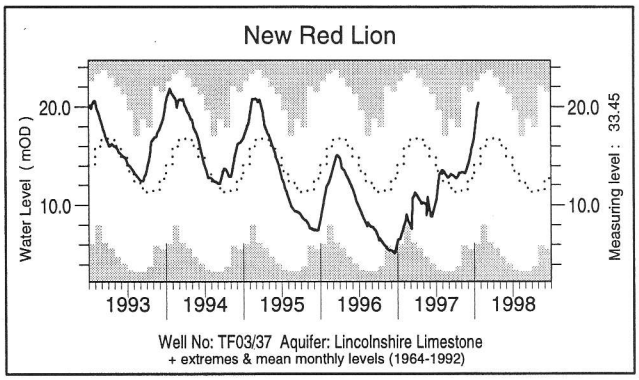


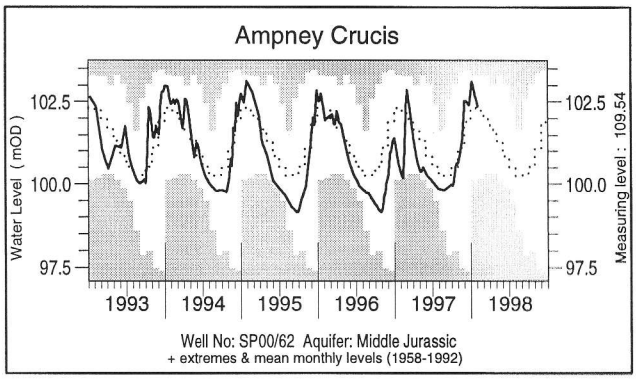


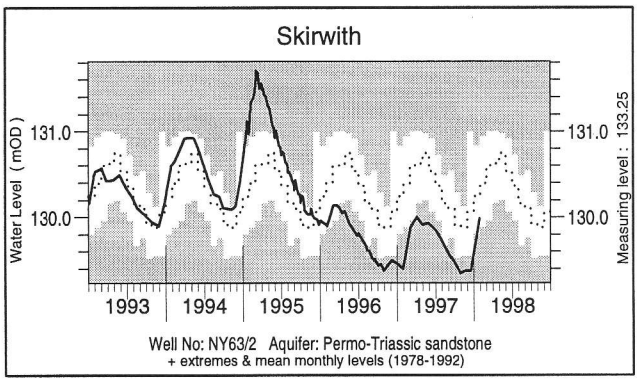
What is groundwater?

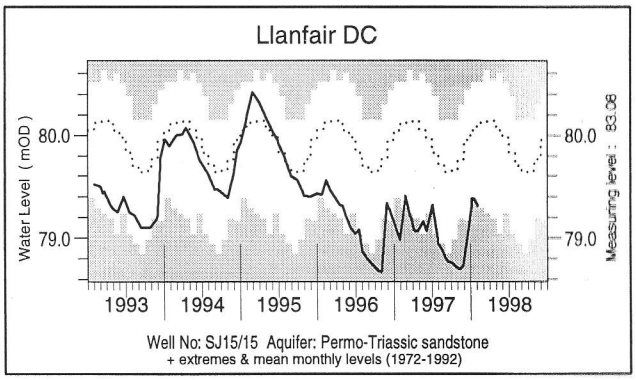
Groundwater is stored in the natural water bearing rock strata (or aquifers) which are found mostly in southern and eastern England (see page 11) where groundwater is the major water supply source. Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment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

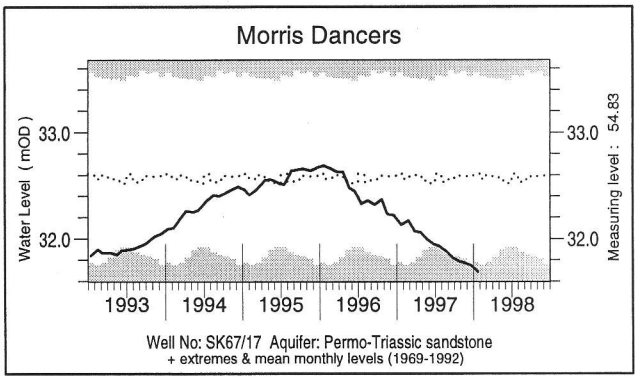
Groundwater . . . Groundwater

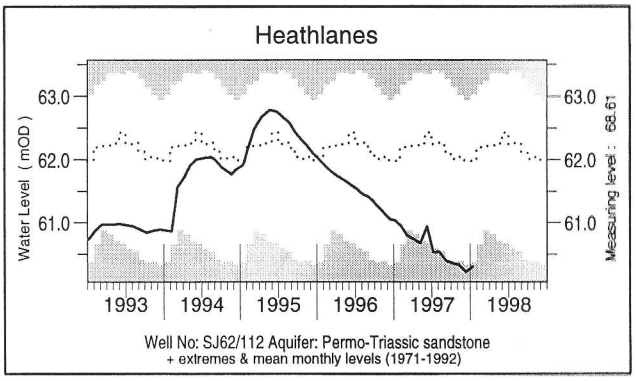


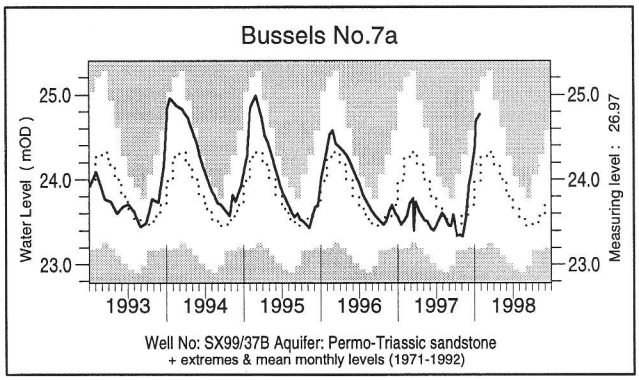


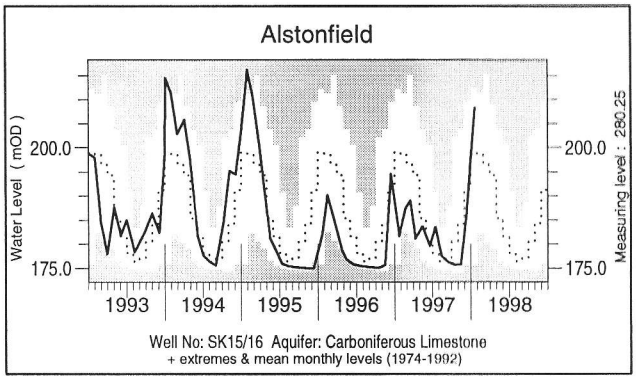










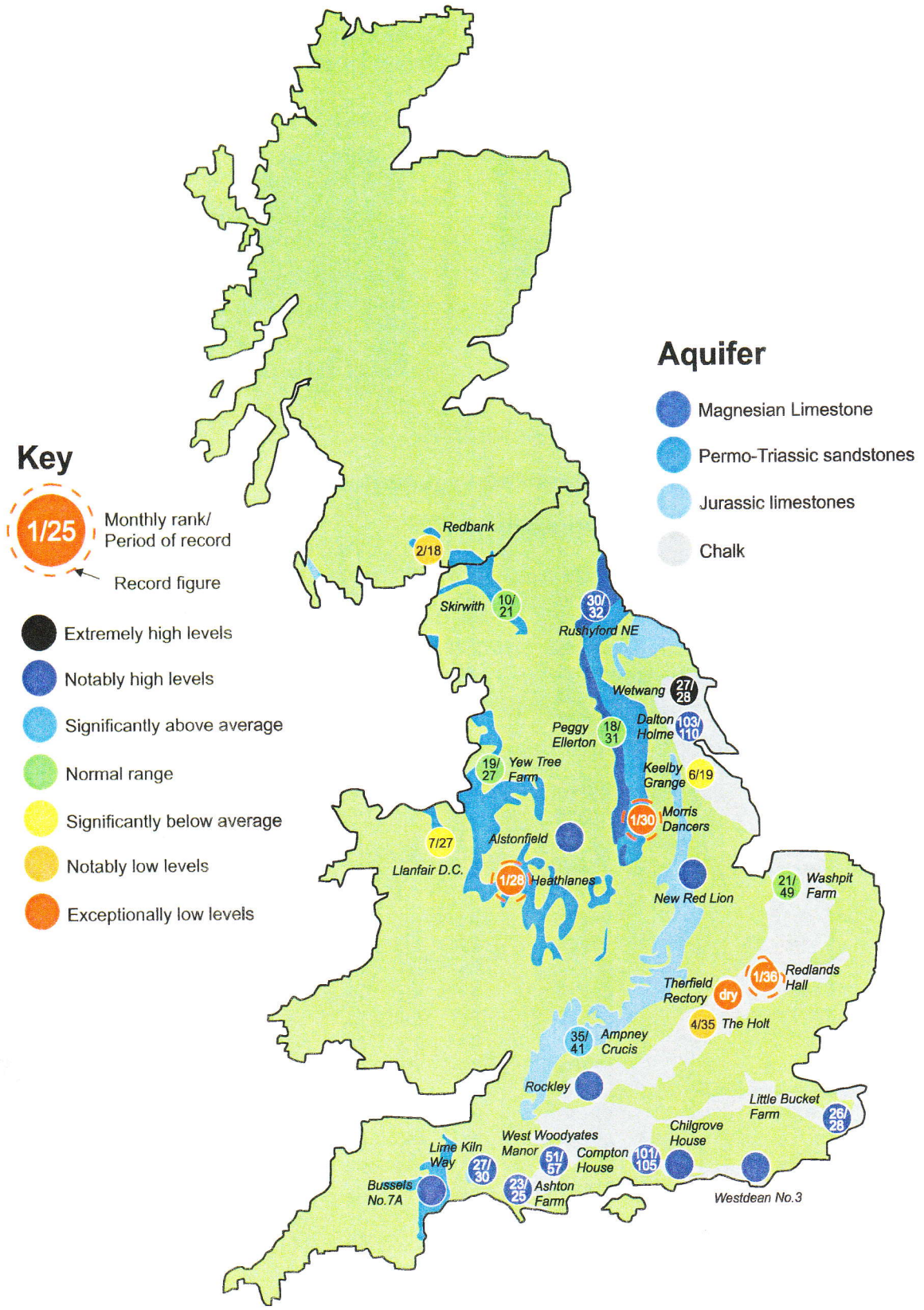


Groundwater levels January/February 1998

Borehole	Level	Date	Jan av.	Borehole	Level	Date	Jan av.	Borehole	Level	Date	Jan av.
Dalton Holme	19.03	23/01	14.79	Chilgrove	70.28	26/01	46.50	Llanfair DC	79.31	03/02	79.55
Washpit Farm	43.03	02/02	43.17	W Woodyates	98.71	31/01	80.53	Morris Dancers	31.69	22/01	32.48
The Holt	84.18	02/02	86.87	New Red Lion	20.37	21/01	11.66	Heathlanes	60.31	13/01	61.84
Redlands Hall	32.34	29/01	38.22	Ampney Crucis	102.4	02/02	101.1	Bussels	24.77	27/01	23.57
Ashton Farm	71.13	31/01	66.20	Skirwith	130.0	27/01	129.9	Alstonfield	208.3	20/01	184.1
Little Bucket	75.49	30/01	62.32								

Levels in metres above Ordnance Datum

Groundwater . . . Groundwater

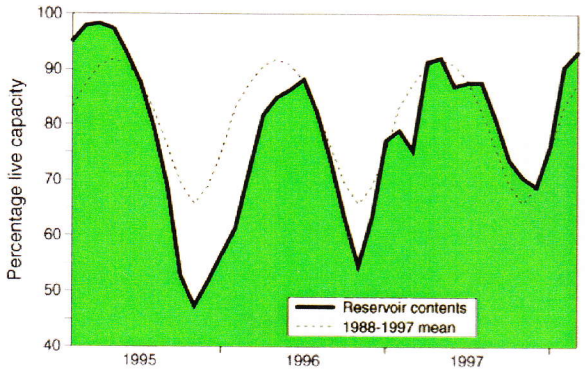


Groundwater levels - January 1998

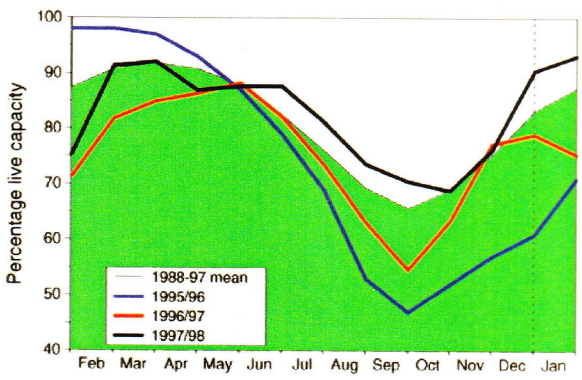
The rankings are based on a comparison of current levels (usually a single reading in a month) with the average level in each corresponding month on record. Caution needs to be exercised when interpreting the ranking, especially during periods of rapid changes in groundwater level. Rankings may be omitted 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)	1997/98 Sep	Oct	Nov	Dec	Jan	**1998 Feb**	Min. Feb	Year* of min
North West	N. Command Zone	• 133375	53	60	53	64	95	**94**	63	1996
	Vyrnwy	55146	65	61	59	67	100	**93**	45	1996
Northumbrian	Teesdale	• 87936	74	73	65	73	96	**97**	51	1996
	Kielder	(199175)	(85)	(82)	(82)	(75)	(95)	**(91)**	(85)	1996
Severn Trent	Clywedog	44922	80	82	81	86	86	**89**	62	1996
	Derwent Valley	• 39525	80	72	73	79	100	**100**	15	1996
Yorkshire	Washburn	• 22035	77	72	60	73	98	**98**	34	1996
	Bradford supply	•	41407	76	76	72	85	**99**	98	33
1996										
Anglian	Grafham	58707	59	46	44	47	57	**67**	67	**1998**
	Rutland	130061	76	72	71	75	88	**96**	68	1997
Thames	London	• 206399	67	53	51	68	72	**93**	70	1997
	Farmoor	• 13843	99	96	97	92	96	**94**	82	1991
Southern	Bewl	28170	65	58	56	76	98	**100**	47	1990
	Ardingly	4685	86	68	68	100	100	**100**	68	1997
Wessex	Clatworthy	5364	91	85	85	100	100	**92**	62	1989
	Bristol WW	• (38666)	(72)	(67)	(62)	(71)	(97)	**(97)**	(58)	1992
South West	Colliford	28540	43	43	44	53	62	**68**	52	1997
	Roadford	34500	56	56	56	65	78	**84**	30	1996
	Wimbleball	21320	84	79	80	91	100	**100**	59	1997
	Stithians	5205	70	70	68	84	100	**100**	38	1992
Welsh	Celyn and Brenig	• 131155	83	83	82	86	99	**97**	61	1996
	Brianne	62140	92	94	97	100	100	**94**	84	1997
	Big Five	• 69762	71	68	69	87	98	**96**	67	1997
	Elan Valley	• 99106	84	87	92	100	100	**97**	73	1996
East of	Edinburgh/Mid	• 97639	71	66	62	67	74	**80**	80	**1998**
Scotland	East Lothian	• 10206	80	71	62	63	100	**100**	68	1990
West of	Loch Katrine	• 111363	56	72	76	86	97			

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.

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