

Hydrological summary

for the United Kingdom

General

February was a very mild and notably wet month particularly in western and northern regions. Provisional data suggest that the February rainfall total was amongst the three highest for the UK in a record from 1900. Notwithstanding drawdown releases for flood alleviation purposes in some major impoundments, most reservoirs were at, or close to, capacity entering March (and a brisk recovery was underway at Silent Valley in Northern Ireland). Overall reservoir stocks for England and Wales are around 95% of capacity. Following heavy late winter aquifer replenishment water-tables are mostly well above the seasonal average. The general water resources outlook is very healthy. With most catchments saturated, the flood risk remained high throughout February; flood warnings were very common and floodplain inundations were widespread – adding to a notable cluster of high flow events over the last three years.

Rainfall

Weather patterns were dominated by a westerly airflow during February, bringing a sequence of vigorous – and damaging - frontal systems across the UK. A particularly active depression produced notable rainfalls in western areas on the 1st (approx. 75 mm at Shap in Cumbria) and regular pulses of significant rainfall continued throughout the month. Eskdalemuir (Borders) reported 11 days with rainfall > 38 mm and even across the English Lowlands dry days were rare. Below average February rainfall was confined to a few sheltered eastern coastal districts but most of the country reported more than twice the 1961-90 average. Some western upland catchments from the Cumbrian Mts to the western Highlands recorded more than three times the 1961-90 average (corresponding return periods exceed 200 years). An exceptionally wet interlude can be traced back to mid January; many western areas registered outstanding precipitation totals over the ensuing 7 weeks or so. At Bala (N Wales), a new 40-day maximum rainfall total was established – 522 mm, the equivalent of around four months average winter rainfall. Regional two-month rainfall totals are generally very high (see page 2) but the counterbalancing effect of the dry early winter means that Dec-Feb rainfall totals are mostly in the normal range; this is also true of most regional accumulations over the 4-12 month timespans.

Runoff

The month began with many flood warnings (both fluvial and tidal) in operation, and bankfull – or higher – flows were common throughout February. The rapid passage of frontal systems helped to moderate the risk of extreme flooding and, in many catchments, multiple spates were reported rather than outstanding flow maxima. The natural ability of the drainage network to cope with exceptional runoff was well demonstrated but, locally, flooding was severe (e.g. in Monmouth) and floodplain inundations were widespread in mid-month. On the 11th the Wharfe closely approached the peak of Oct 2000 (the highest in a record from 1955). In a broad zone from South Wales to the Southern Uplands, many rivers registered flows around the mean annual flood level (or greater) on four or more separate occasions. In the English lowlands, a

combination of sustained rainfall and increasing groundwater contributions made for a brisk and sustained increase in streams draining permeable catchments. Monthly runoff totals were well above average in almost all index rivers and gauging stations establishing new maxima Feb runoff totals showed a wide distribution (from the Naver to the Exe). Runoff in February for the Welsh Dee was the highest for any month in a 65-year record (marginally exceeding the November 2000 figure). The much belated onset of a sustained seasonal recovery in river flows (mid-January in many areas) is reflected in the winter (December-February) runoff totals – most are well within the normal range). Continued unsettled weather saw the flood risk extend into March.

Groundwater

Very modest early winter infiltration rates have been followed by a surge in aquifer replenishment over the last eight weeks. Over wide areas the sustained February rainfall (mostly of moderate intensity) on near-saturated catchments resulted in two-to-three times the average infiltration for the month. A proportion of this has yet to reach water-tables but groundwater levels are rising briskly with a corresponding upturn in spring outflows. Groundwater levels in the Chalk are considerably below the remarkable 2000/01 peaks, but still well above average – notably so in some eastern units. In most index wells in the limestone aquifers, late winter levels are close to the seasonal average (and rising). Levels are well above average throughout most of the Permo-Triassic sandstones outcrops – notably so in the west where Yew Tree Farm and Nuttals Farm were amongst those wells and boreholes establishing new record February levels – a response both to recent rainfall and abundant recharge over the previous three winters. A strong recovery is also evident at Redbank where levels are influenced by significant abstraction. Around average spring rainfall would ensure a very healthy groundwater resources outlook – and sustained baseflow support for spring-fed rivers through the coming summer and autumn.

February 2002



Rainfall . . . Rainfall . . . Rainfall .

Rainfall accumulations and return period estimates

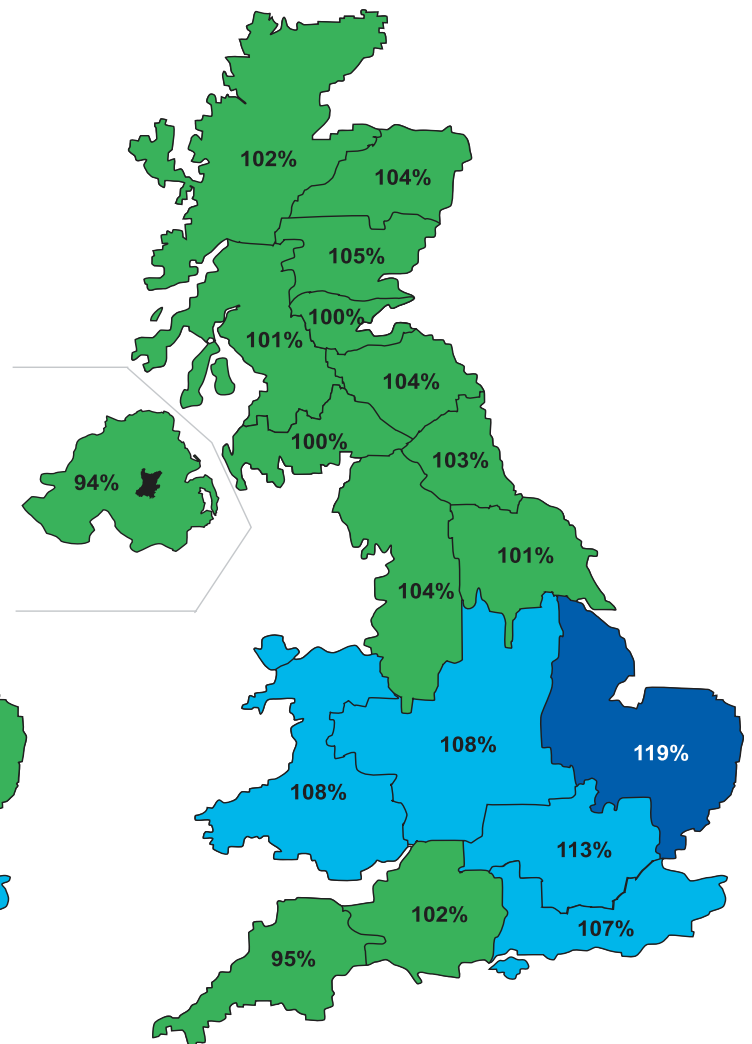
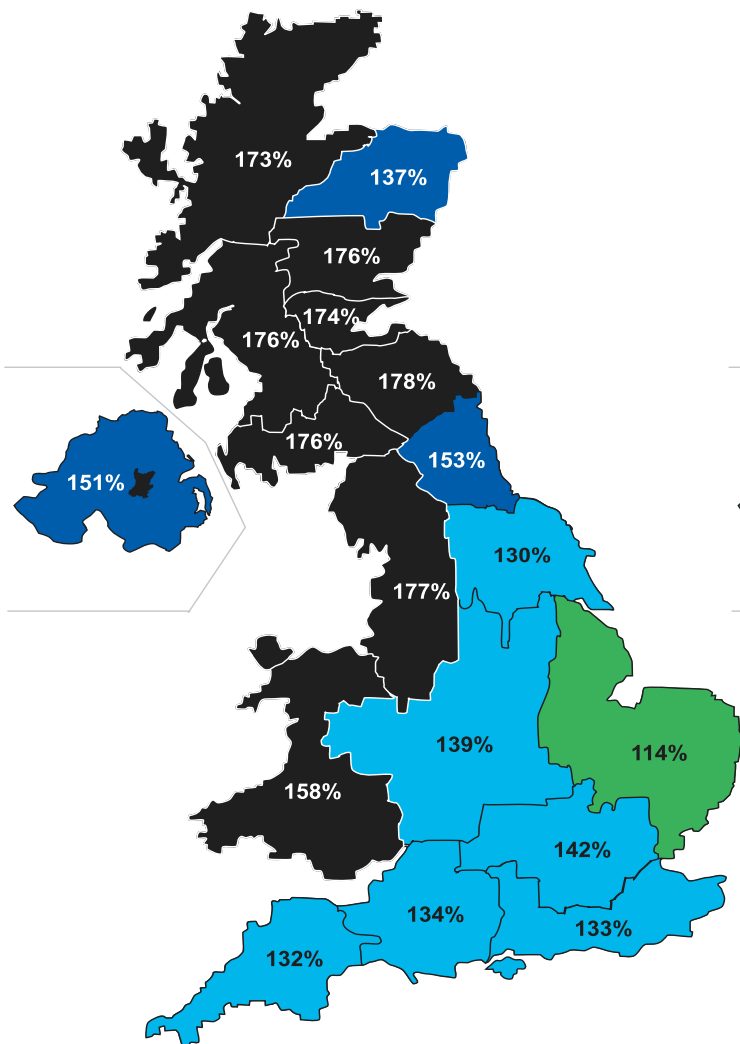
Area	Rainfall	Feb 2002	Jan02-Feb02 RP	Sep01-Feb02 RP	Jun01-Feb02 RP	Mar01-Feb02 RP
England & Wales	mm %	114 175	199 128 5-10	523 103 2-5	726 102 2-5	963 105 2-5
North West	mm %	222 285	353 177 50-80	804 117 5-10	1023 106 2-5	1253 104 2-5
Northumbrian	mm %	137 232	219 153 10-20	538 117 5-10	729 110 2-5	878 103 2-5
Severn Trent	mm %	109 202	172 139 5-10	425 106 2-5	599 104 2-5	818 108 2-5
Yorkshire	mm %	120 207	178 130 5-10	476 108 2-5	650 103 2-5	828 101 2-5
Anglian	mm %	55 148	99 114 2-5	336 112 2-5	516 113 2-5	707 119 5-10
Thames	mm %	85 188	155 142 5-10	402 110 2-5	564 107 2-5	779 113 2-5
Southern	mm %	94 174	178 133 5-10	466 104 2-5	615 101 2-5	836 107 2-5
Wessex	mm %	112 173	204 134 5-10	461 96 2-5	631 96 2-5	858 102 2-5
South West	mm %	164 162	316 132 5-10	660 93 2-5	844 90 2-5	1118 95 2-5
Welsh	mm %	218 225	378 158 15-25	856 109 2-5	1113 107 2-5	1425 108 2-5
Scotland	mm	231 227	442 175 >200	979 115 5-10	1267 110 2-5	1450 101 2-5
Highland	mm %	284 224	545 173 110-150	1241 114 5-10	1573 111 5-10	1791 102 2-5
North East	mm %	117 180	225 137 5-15	615 114 2-5	844 110 2-5	1010 104 2-5
Tay	mm %	207 218	421 176 50-80	853 117 5-10	1111 114 5-10	1289 105 2-5
Forth	mm %	183 232	342 174 60-90	698 108 2-5	945 107 2-5	1108 100 < 2
Tweed	mm %	168 250	298 178 60-90	620 116 5-10	849 111 2-5	1009 104 2-5
Solway	mm %	250 247	453 176 70-100	941 111 2-5	1208 106 2-5	1420 100 < 2
Clyde	mm %	288 244	540 176 110-150	1137 109 2-5	1507 110 2-5	1714 101 2-5
Northern Ireland	mm %	162 207	286 151 10-20	588 97 2-5	811 97 2-5	1000 94 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 rain gauge 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... Rainfall

Key



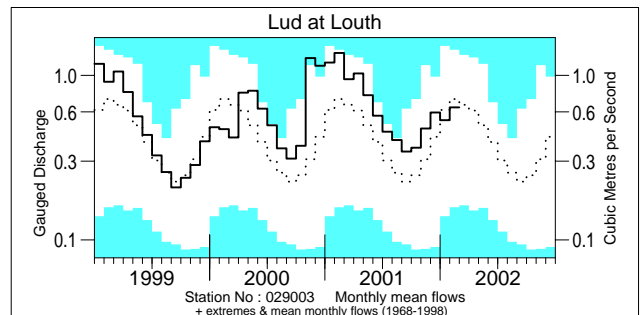
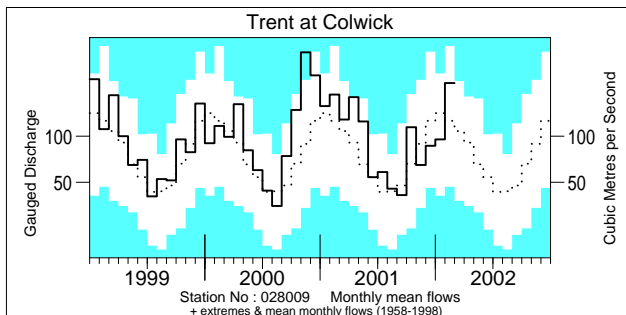
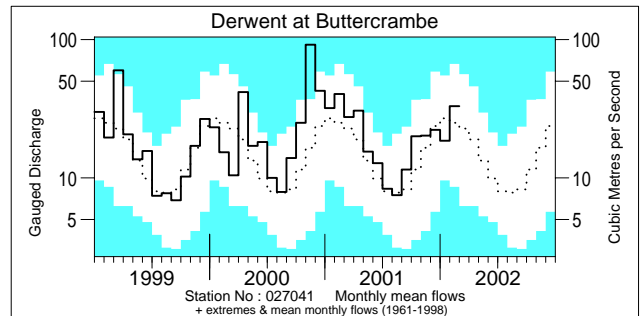
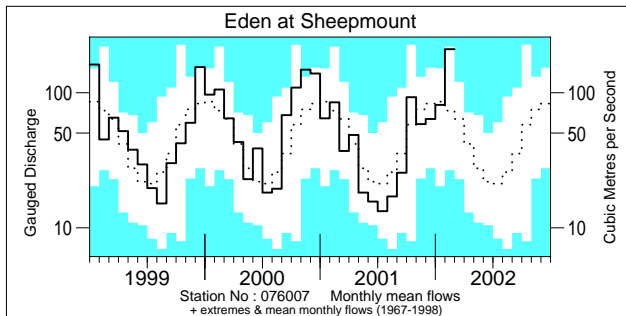
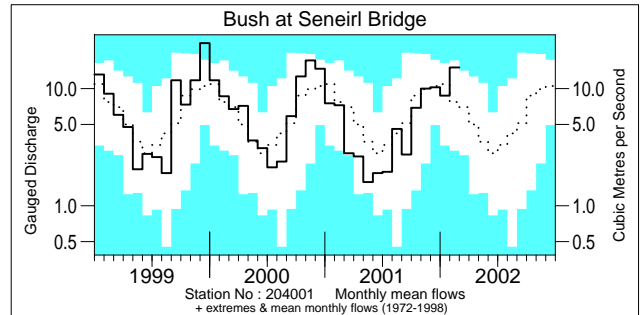
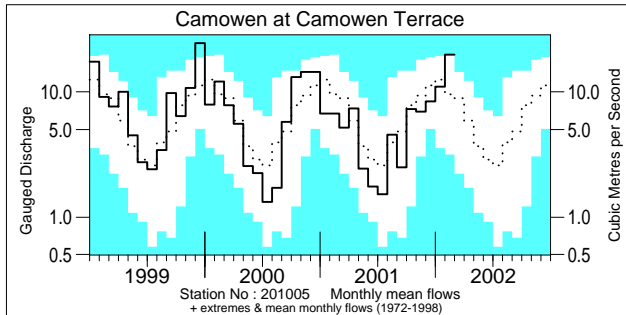
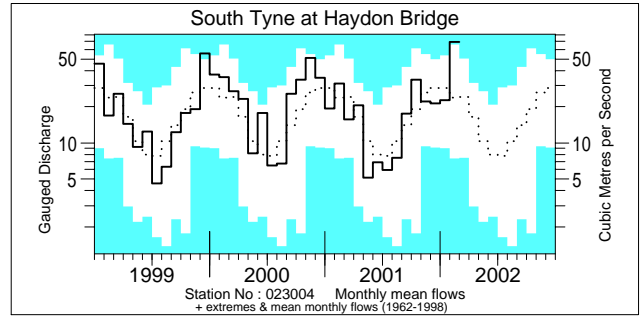
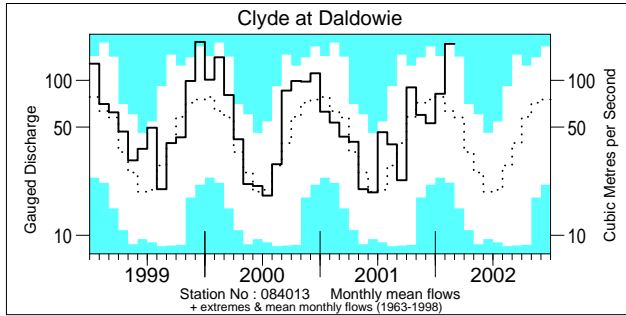
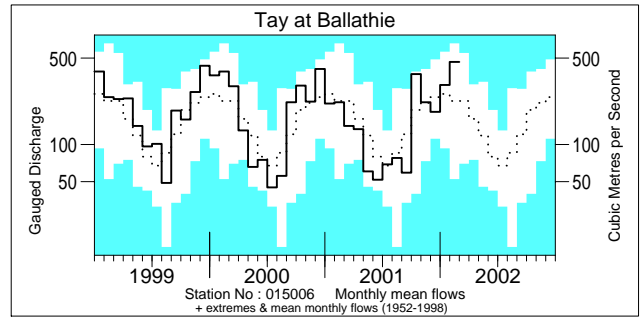
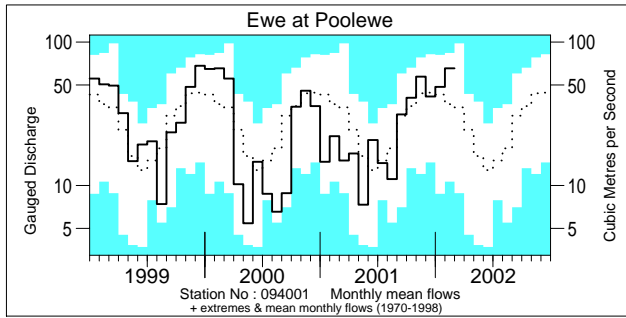
January 2002 - February 2002

March 2001 - February 2002

Rainfall accumulation maps

The combined January and February rainfall totals were high in all regions but an accentuation in the normal NW/SE rainfall gradient may also be recognised - a reflection of the prevailing synoptic conditions. Provisional figures suggest that the two-month rainfall totals rank as the third highest - in that specific timespan - for Scotland (in a series from 1869) and fifth highest for Northern Ireland (from 1900). Over the last 12-months regional rainfall has been well within the normal range in all regions.

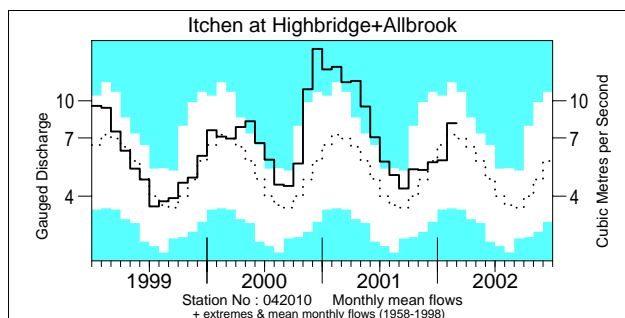
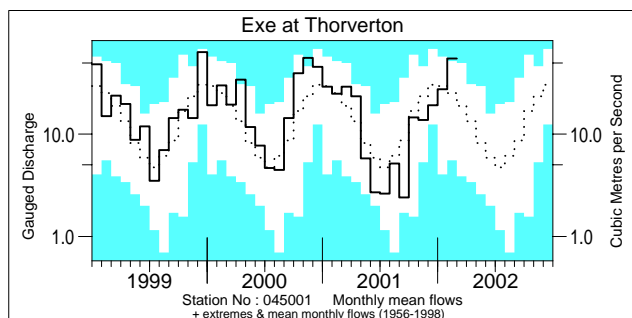
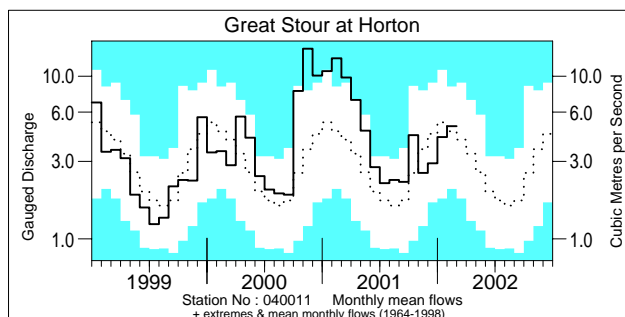
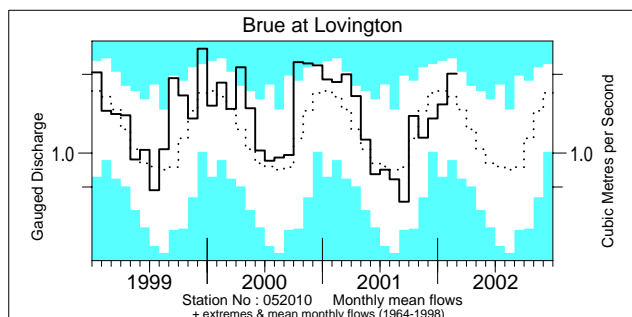
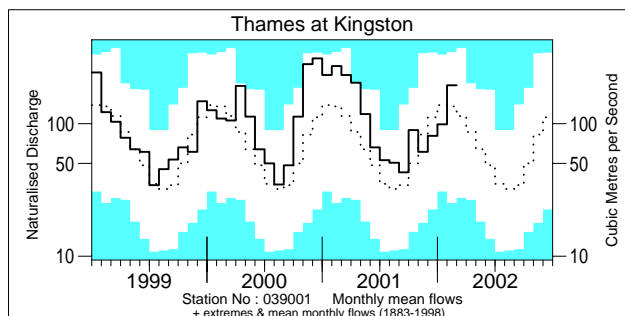
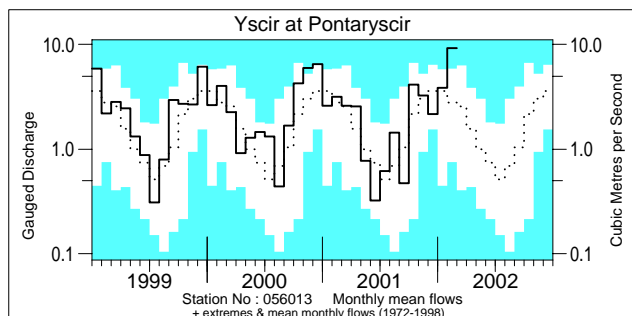
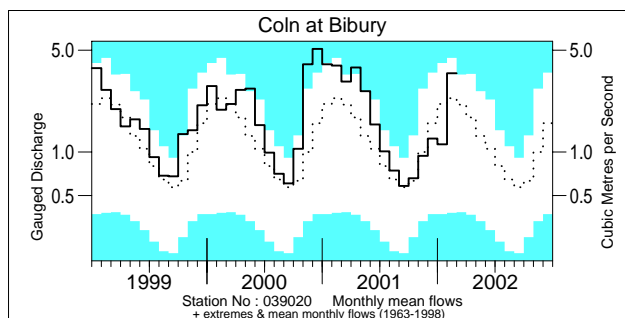
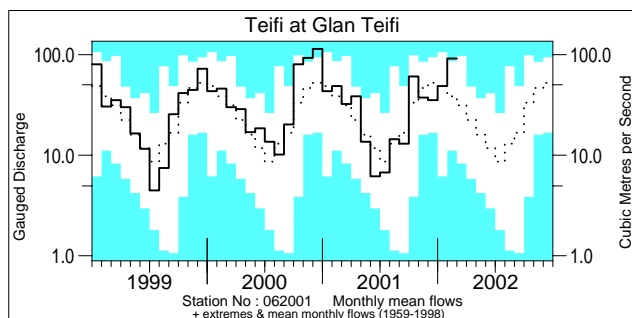
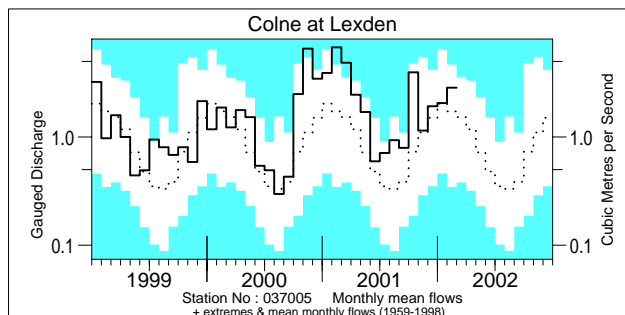
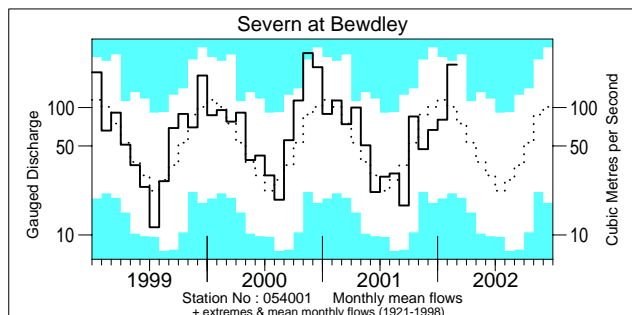
River flow . . . River flow . . .



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 1999 (shown by the shaded areas). Monthly flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

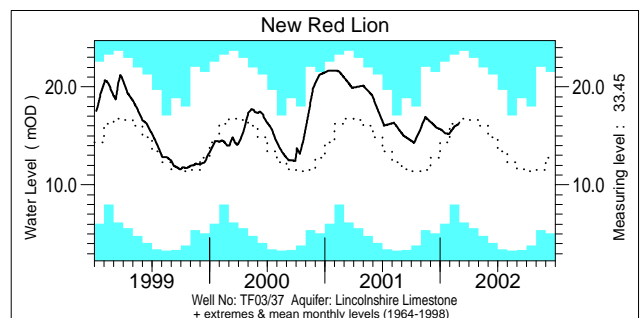
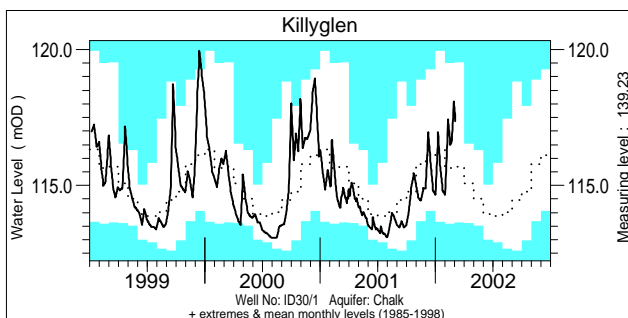
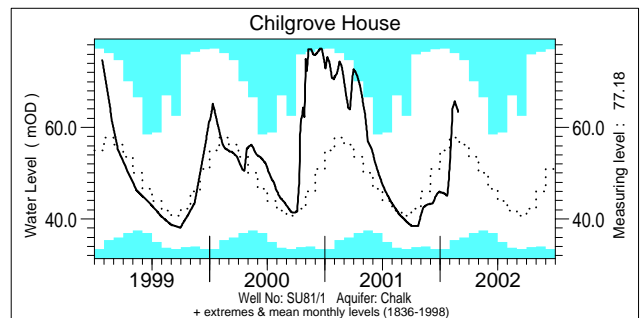
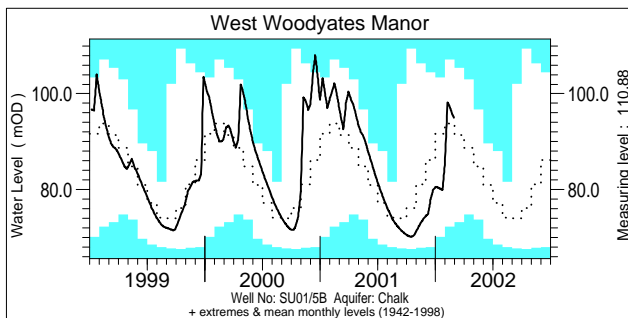
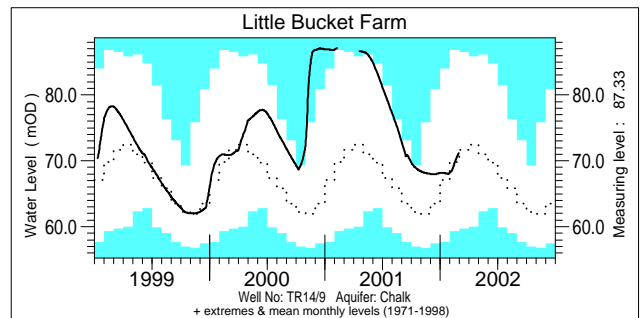
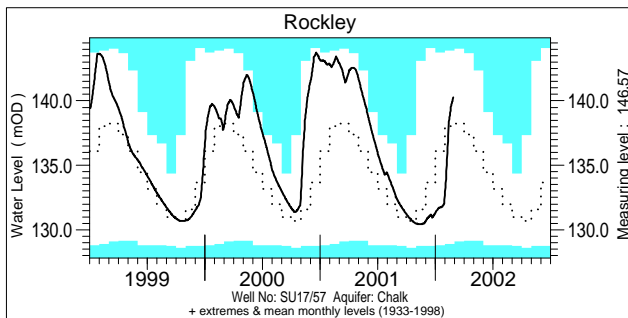
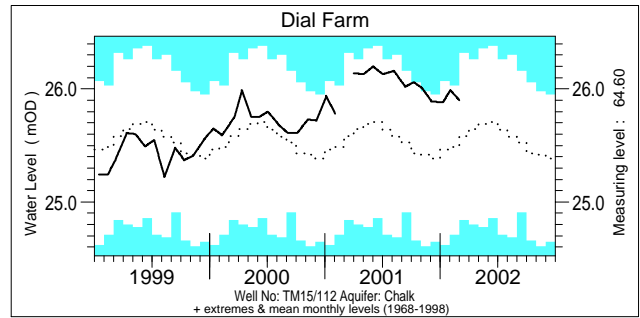
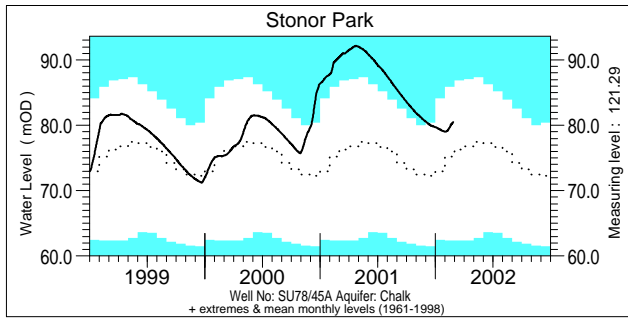
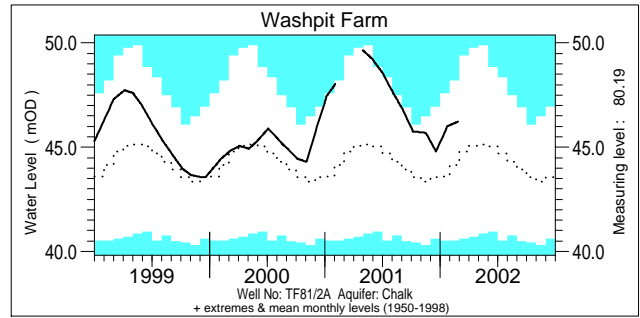
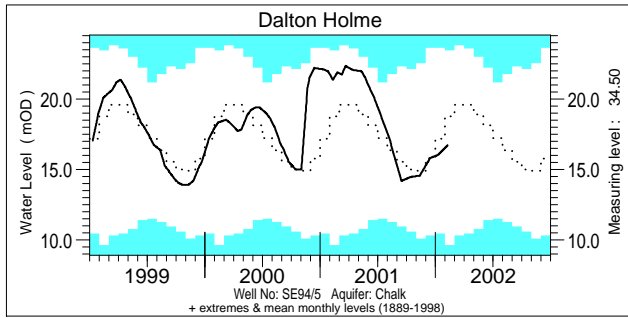
River flow . . . River flow . . .



Notable runoff accumulations (a) December 2001 - February 2002, (b) March 2001 - February 2002

River	%Ita	Rank	River	%Ita	Rank	River	%Ita	Rank
(a) S Tyne	131	36/40	(b) Witham	162	41/42	Lambourn	136	38/39
Yscir	141	27/29	Stringside	163	33/34	G Stour	129	31/35
Cynon	142	40/44	Colne	189	39/41	Test	126	38/42
Dee	133	60/65	Lee	193	113/115	Itchen	132	42/43
Lune	137	37/40	Mimram	201	48/48	Avon (Hants)	122	33/37
Naver	140	23/25	Blackwater	150	48/49	Yscir	127	26/29
Bush	112	25/30	Kennet	127	37/40	Annacloy	84	4/22

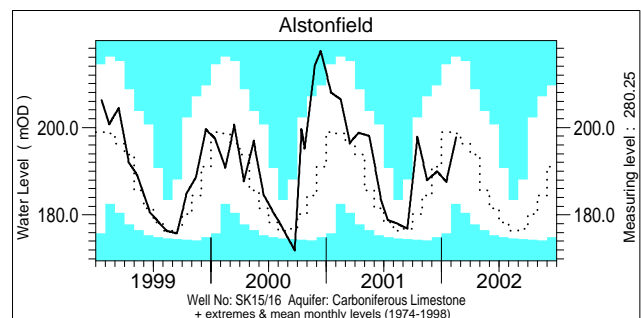
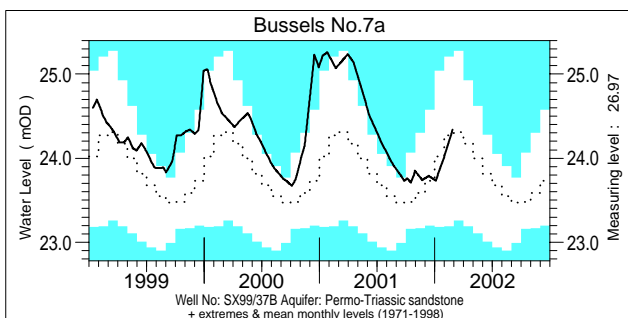
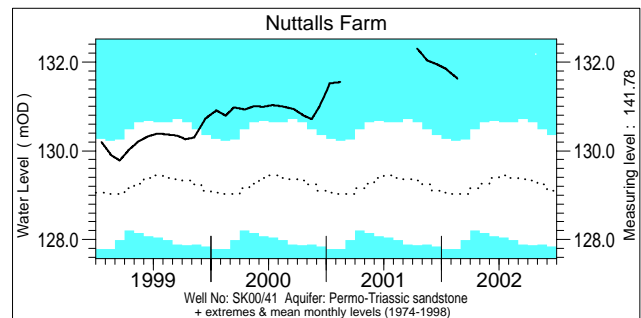
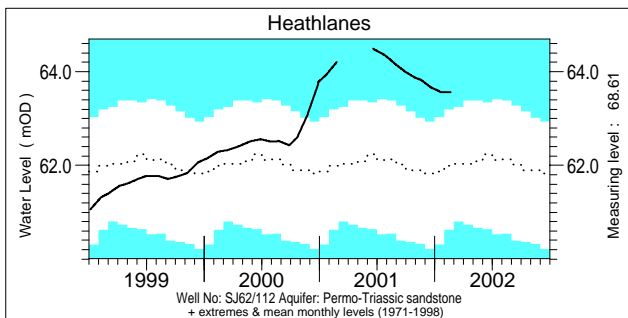
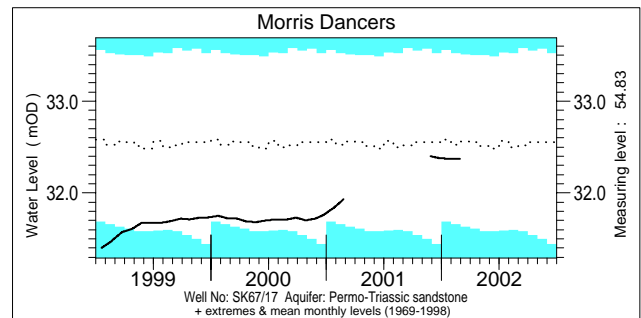
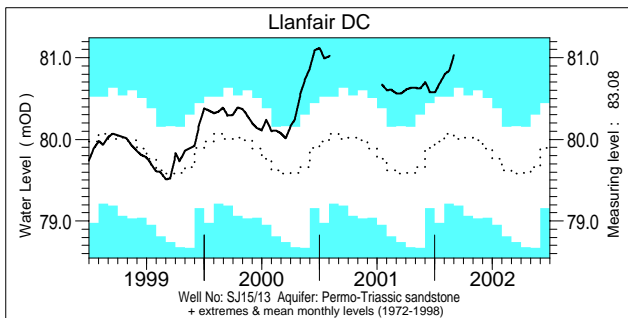
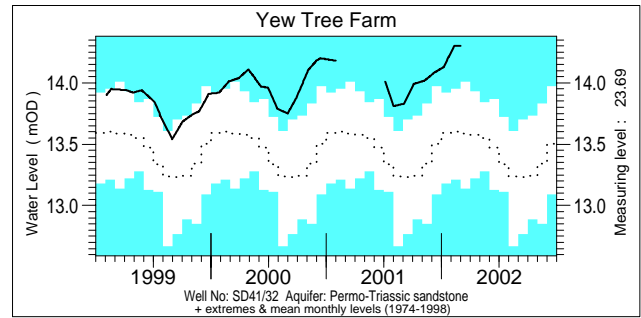
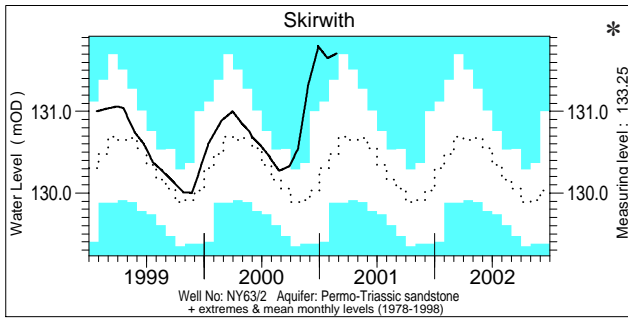
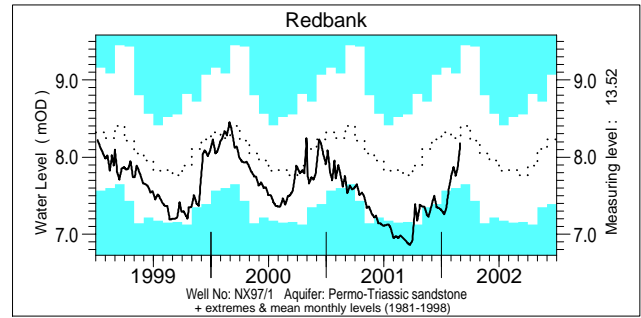
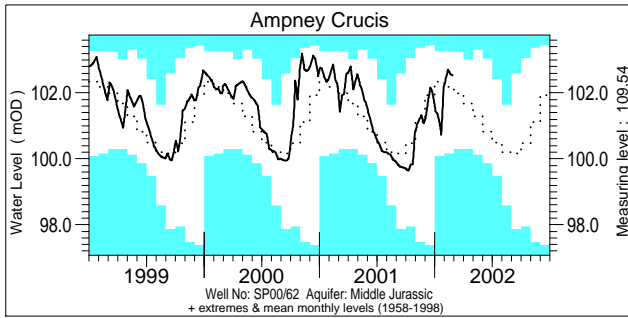
Groundwater... Groundwater



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.

* No March 2001 - March 2002 groundwater levels available.

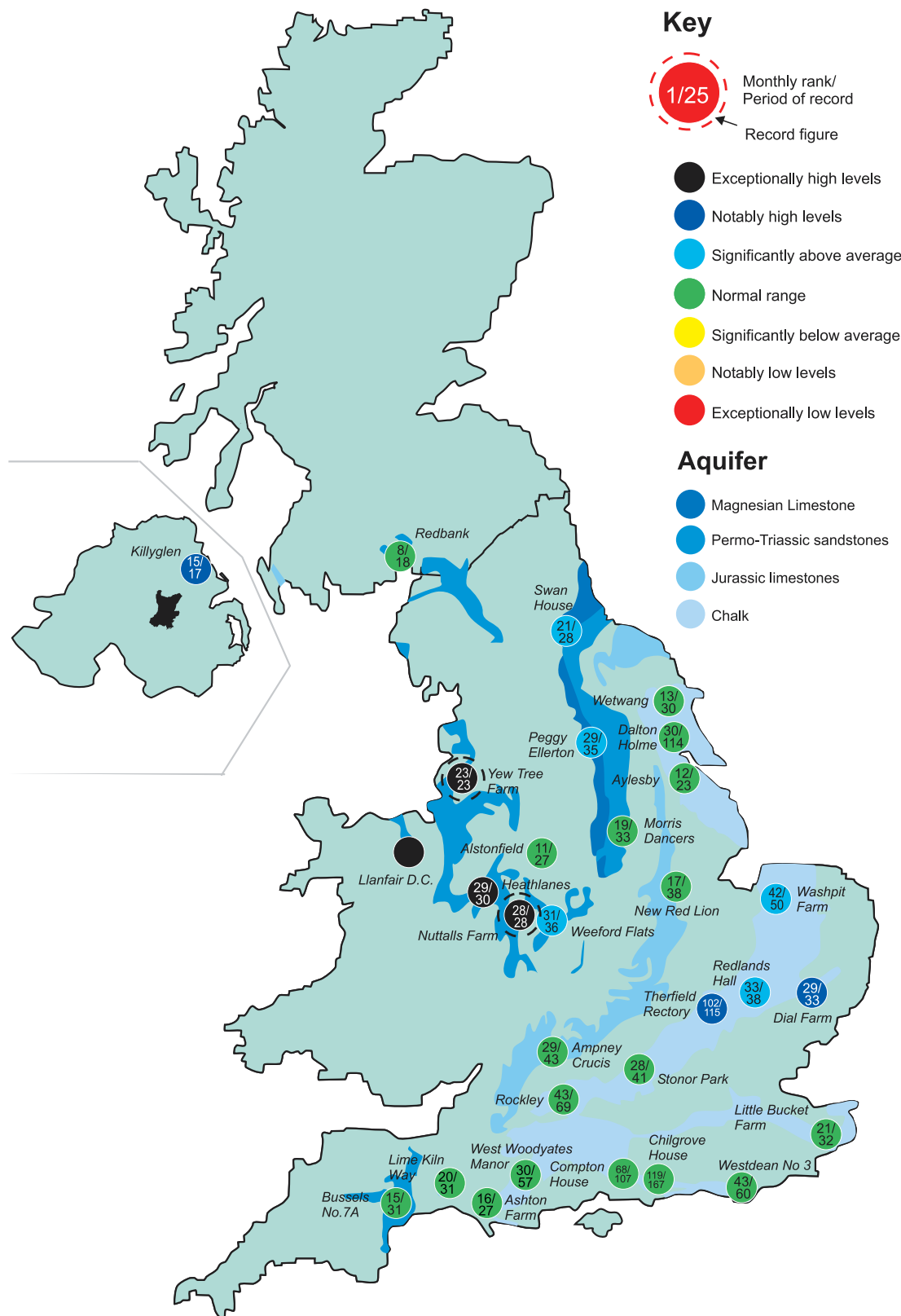
Groundwater . . . Groundwater



Groundwater levels February 2002 / March 2002

Borehole	Level	Date	Feb. av.	Borehole	Level	Date	Feb. av.	Borehole	Level	Date	Feb. av.
Dalton Holme	16.73	08/02	18.73	Chilgrove House	63.34	26/02	57.56	Morris Dancers	32.37	28/02	32.39
Washpit Farm	46.23	25/02	44.29	Killyglen	117.37	04/03	115.67	Heathlanes	63.57	20/02	61.97
Stonor Park	80.50	25/02	75.65	New Red Lion	16.21	27/02	16.25	Nuttalls Farm	131.63	19/02	129.33
Dial Farm	25.90	01/03	25.49	Ampney Crucis	102.54	25/02	102.22	Bussels No.7a	24.34	25/02	24.33
Rockley	140.25	25/02	138.27	Redbank	8.18	28/02	8.33	Alstonfield	197.81	15/02	198.65
Little Bucket Farm	71.21	28/02	70.15	Yew Tree Farm	14.30	01/03	13.63	Skirwith data missing due to access restrictions.			
West Woodyates	94.92	28/02	93.16	Llanfair DC	81.03	01/03	80.00	Levels in metres above Ordnance Datum			

Groundwater... Groundwater



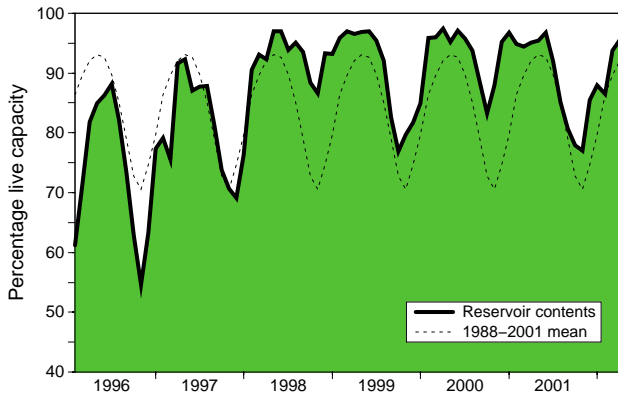
Groundwater levels - February 2002

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.

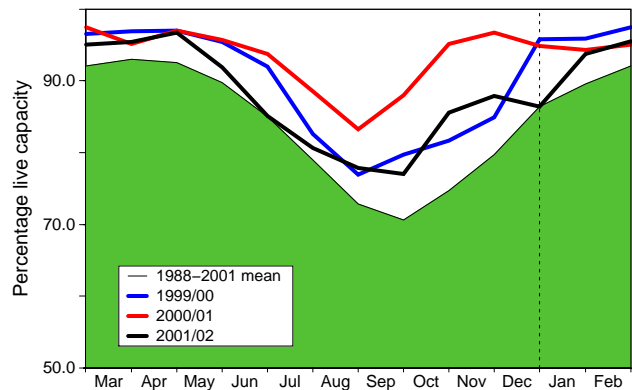
(Note: Redbank is affected by groundwater abstraction)

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

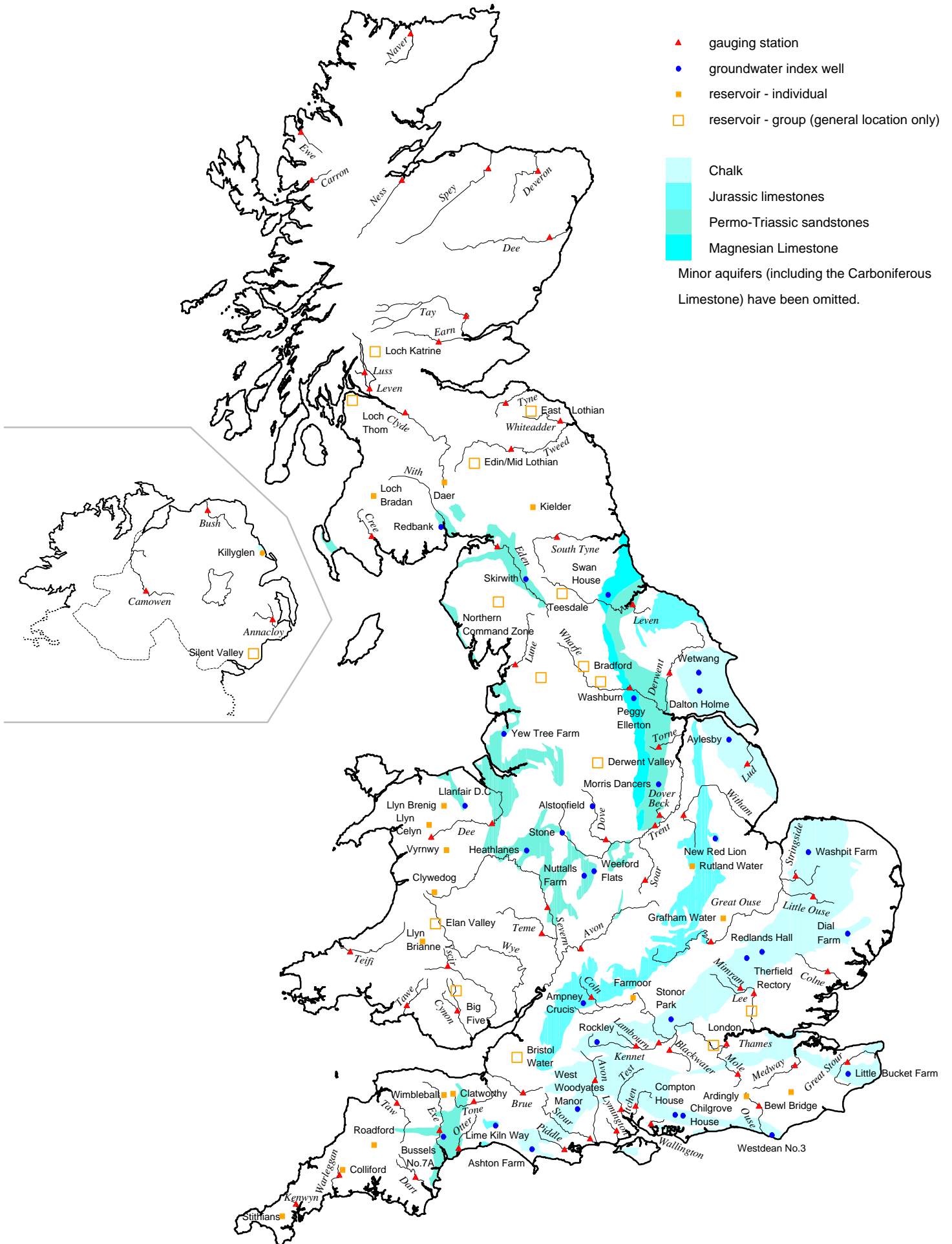
Area	Reservoir	Capacity (MI)	2001					2002		Min. Mar	Year* of min
			Oct	Nov	Dec	Jan	Feb	Mar	Mar		
NorthWest	N Command Zone	• 124929	44	75	84	84	100	100	78	1996	
	Vyrnwy	55146	71	86	91	88	100	100	59	1996	
Northumbrian	Teesdale	• 87936	63	96	83	84	99	100	72	1996	
	Kielder	(199175)	(86)	(80)	(95)	(89)	(100)	(96)	81	1993	
Severn Trent	Clywedog	44922	49	73	100	87	96	100	77	1996	
	DerwentValley	• 39525	81	99	86	100	100	100	46	1996	
Yorkshire	Washburn	• 22035	69	89	92	91	95	97	53	1996	
	Bradford supply	• 41407	64	86	90	90	99	100	53	1996	
Anglian	Grafham	(55490)	(95)	(93)	(88)	(88)	(87)	(87)	72	1997	
	Rutland	(116580)	(78)	(80)	(81)	(82)	(84)	(89)	71	1992	
Thames	London	• 202340	90	90	87	86	87	88	83	1988	
	Farmoor	• 13830	94	92	91	77	79	88	64	1991	
Southern	Bewl	28170	72	74	74	75	90	97	50	1989	
	Ardingly	4685	67	72	73	86	100	100	89	1992	
Wessex	Clatworthy	5364	44	67	72	84	97	100	82	1992	
	BristolWW	• (38666)	(60)	(61)	(59)	(61)	(70)	(99)	65	1992	
South West	Colliford	28540	62	60	62	64	72	78	57	1997	
	Roadford	34500	73	73	73	72	84	94	35	1996	
	Wimbleball	21320	50	52	54	58	76	100	72	1996	
	Stithians	5205	37	32	29	33	49	78	45	1992	
Welsh	Celyn and Brenig	• 131155	92	94	97	94	100	100	69	1996	
	Briante	62140	86	100	100	94	100	98	94	1998	
	Big Five	• 69762	77	97	95	93	99	97	85	1988	
	Elan Valley	• 99106	93	100	100	99	100	100	88	1993	
East of Scotland	Edinburgh/Mid Lothian	• 97639	70	89	90	89	92	100	73	1999	
	East Lothian	• 10206	84	97	100	100	100	100	91	1990	
West of Scotland	Loch Katrine	• 111363	55	85	93	88	99	100	93	1999	
	Daer	22412	48	91	100	97	100	100			
Northern Ireland	Loch Thom	• 11840	62	84	93	93	100	100	98	2001	
	Silent Valley	• 20634	47	54	43	39	46	57	57	2002	

() figures in parentheses relate to gross storage • denotes reservoir groups

* 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 1988-2002 period only (except for West of Scotland and Northern Ireland where data commence in 1994 and 1993 respectively). 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 regional divisions of the EA (England and Wales) and SEPA (Scotland), data for Northern Ireland are provided by 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, the West of Scotland and East of Scotland Water Authorities, 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 (address 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; over the coming months further monthly raingauge totals will be included for selected regions. Until the access to these additional

data has stabilised the regional figures (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.

The Met Office
Johnson House
London Road
Bracknell
RG122SY
Tel.: 01344 856849
Fax: 01344 854906

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
Maclean Building
Crowmarsh Gifford
Wallingford
Oxfordshire
OX10 8BB
Tel.: 01491 838800
Fax: 01491 692424

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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