

Hydrological summary

for the United Kingdom

General

April was an exceptionally mild and sunny month in most regions. Rainfall for the UK as a whole was close to the April average, but spatial variations were large - much of eastern and southern Britain experienced an extremely dry spell until late in the month. The subsequent return of rain-bearing frontal systems was especially welcome to farmers but the late-April rainfall was too late to be hydrologically effective in the eastern lowlands – seasonally high evaporative demands produced very dry soil conditions by the third week, almost certainly signalling the end of the aquifer recharge season. Despite spate conditions late in the month April runoff totals were generally well below average. However, most pumped storage reservoirs modestly increased their stocks (as usual in April) whilst appreciable reductions over the month were reported from most gravity-fed impoundments. Early May stocks were relatively low in some small reservoirs (e.g. in Yorkshire, Cornwall and Northern Ireland), and generally, reservoirs were at their lowest, for the time of year, since 1996 or 1997. Nonetheless, overall stocks for England and Wales are only marginally below average whilst groundwaters levels remain close to, or above, average throughout almost all major aquifer outcrops.

Rainfall

High pressure dominated synoptic patterns over much of the country for most of April; most low pressure systems followed tracks well to the north of the English Lowlands. In western regions significant rainfall was associated with a slow-moving Atlantic frontal system in mid-month; 24-hour rainfall totals reached 60 mm at Nantmor (North Wales) and Belfast registered > 20 mm on both the 17th and 18th; some locally intense thunderstorms were reported in eastern England also. Boisterous weather conditions over the final week were associated with successive pulses of rain across much of the country - Loch Glascarnoch (NW Scotland) reported 52 mm on the 29th whilst, in the South, rainfall on the 26th terminated a short but intense drought stretching back 35 days. In some central areas, rainfall during this episode was < 5 mm (normally totals would be in the 40-60 mm range). April rainfall totals reflected the general synoptic pattern - the 100% isopleth broadly partitioning Britain between the wetter west where a few catchments registered > 150% and the much drier east where many sheltered catchments recorded less than 60%, a few localities on the north-east coast of England registered <35%. Provisional rainfall totals for January-April suggest that Scotland and Northern Ireland have both had their fourth wettest start to the year on record. Regional accumulations over longer timespans are mostly well within the normal range.

River Flows

April began with river flows in brisk recession across much of the UK. Locally, these recessions were interrupted in mid-month (e.g. in Northern Ireland) but generally continued well into the third week when particularly depressed flows characterised most western and northern catchments. On the 20th, the Tay registered its lowest April flow since 1974 and the Luss established a new April daily flow minima (on the 22nd). Long term April minima were approached over wide areas as flow patterns showed similarities to the sustained recessions experienced in the spring of 1997. The wet spell over the final week of the month generated a

dramatic increase in flows rates, in the west especially. In South Wales, the rivers Tawe and Cynon reported their highest April flow on record and modest floodplain inundations were common. However, these spates were generally insufficient to counterbalance the preceding low flows; only a few April runoff totals (e.g. in western Scotland and spring-fed streams in southern England) exceeded the average - most were in the lowest quartile, the Spey registered its lowest April runoff since 1981. Runoff totals for the last three months are generally above average, notably so in northern and western catchments.

Groundwater

High temperatures combined with record sunshine totals (in some areas) produced exceptional evaporative demands during April (> 25% above average for the month over wide areas). These, together with the limited rainfall over most aquifer outcrop areas, resulted in a steep increase in soil moisture deficits. Entering the final week of April lowland smds were more typical of early June. Some significant April infiltration occurred in the west but, in the absence of exceptional May rainfall, the recharge season has terminated in the east. Groundwater levels in all but the slowest responding Chalk wells and boreholes are in decline. April levels were close to, or a little above, the April average in almost all outcrop areas. Levels in most limestone aquifers are also very close to the seasonal average and generally a little above average in most minor eastern aquifers (e.g. the Norfolk Drift and Essex Gravels). However in most of the much slower responding Permo-Triassic sandstones outcrops levels remain exceptionally high – still above pre-2000 maxima in many areas (e.g. in North Wales and the North West). The importance of groundwater – both in relation to resources and its contribution to river flow, in the lowlands especially – will be underlined in the event of a dry summer.

April 2002



Centre for
Ecology & Hydrology

NATURAL ENVIRONMENT RESEARCH COUNCIL



British
Geological Survey

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Rainfall . . . Rainfall . . .



Rainfall accumulations and return period estimates

Area	Rainfall	Apr 2002	Mar02-Apr02 RP	Jan02-Apr02 RP	Oct01-Apr02 RP	May01-Apr02 RP
England & Wales	mm %	45 74	98 73 5-10	297 102 2-5	542 96 2-5	866 95 2-5
North West	mm %	83 116	144 86 2-5	496 136 10-20	824 111 2-5	1222 102 2-5
Northumbrian	mm %	39 70	93 74 2-5	311 116 2-5	540 106 2-5	838 98 2-5
Severn Trent	mm %	45 82	80 69 5-10	252 105 2-5	445 98 2-5	740 98 2-5
Yorkshire	mm %	39 65	81 64 5-10	259 98 2-5	463 93 2-5	764 93 2-5
Anglian	mm %	32 70	67 72 2-5	166 92 2-5	322 94 2-5	624 105 2-5
Thames	mm %	44 88	87 82 2-5	242 113 2-5	428 104 2-5	690 100 <2
Southern	mm %	38 71	84 72 2-5	262 105 2-5	466 94 2-5	724 93 2-5
Wessex	mm %	53 100	106 86 2-5	310 113 2-5	530 100 <2	767 92 2-5
South West	mm %	64 93	141 84 2-5	456 112 2-5	756 96 2-5	1011 86 5-10
Welsh	mm %	94 117	158 84 2-5	536 126 5-10	933 109 2-5	1333 101 2-5
Scotland	mm %	89 117	214 106 2-5	655 144 70-100	1101 121 10-20	1520 106 2-5
Highland	mm %	106 117	272 107 2-5	817 144 40-60	1405 121 5-15	1907 108 5-10
North East	mm %	45 75	106 77 2-5	331 109 2-5	638 108 2-5	982 101 2-5
Tay	mm %	67 108	181 106 2-5	602 147 30-45	964 122 5-15	1328 108 2-5
Forth	mm %	73 124	171 112 2-5	513 146 30-50	806 117 5-10	1144 103 2-5
Tweed	mm %	61 107	126 93 2-5	424 140 20-30	678 116 5-10	997 103 2-5
Solway	mm %	108 140	199 102 2-5	652 145 30-45	1041 116 5-10	1444 102 2-5
Clyde	mm %	115 137	272 118 2-5	812 151 80-120	1313 120 5-15	1819 107 2-5
Northern Ireland	mm %	101 158	167 110 2-5	453 133 5-15	705 107 2-5	1027 97 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 . . .

Key

00% Percentage of 1961-90 average



Very wet



Substantially above average



Above average



Normal range



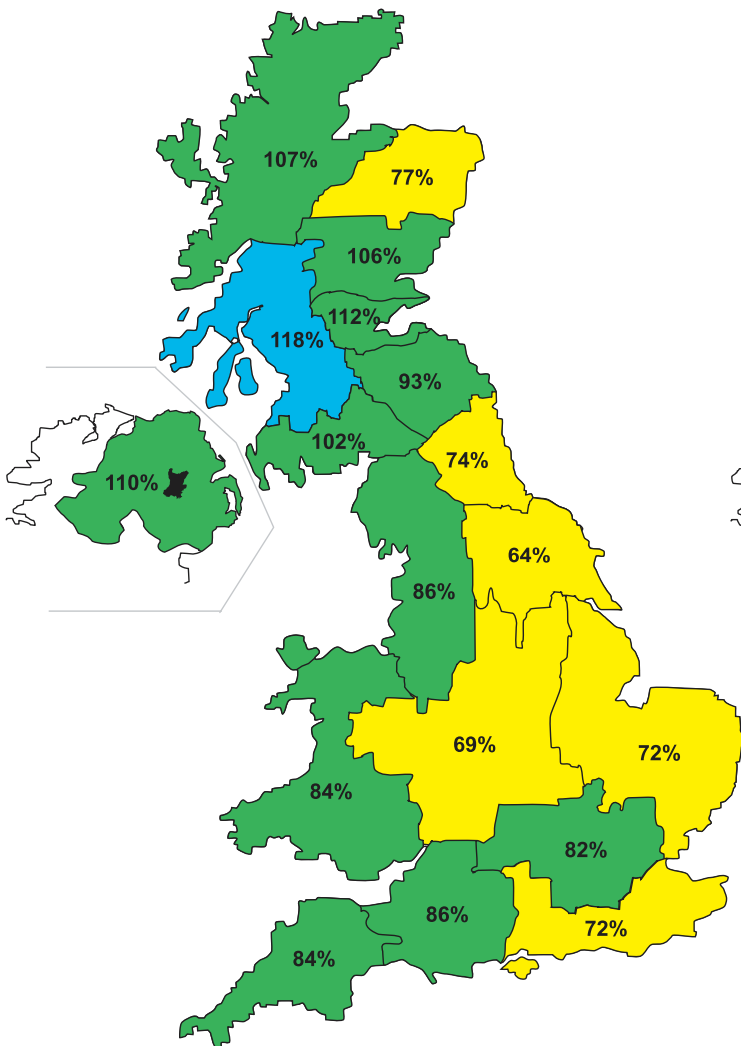
Below average



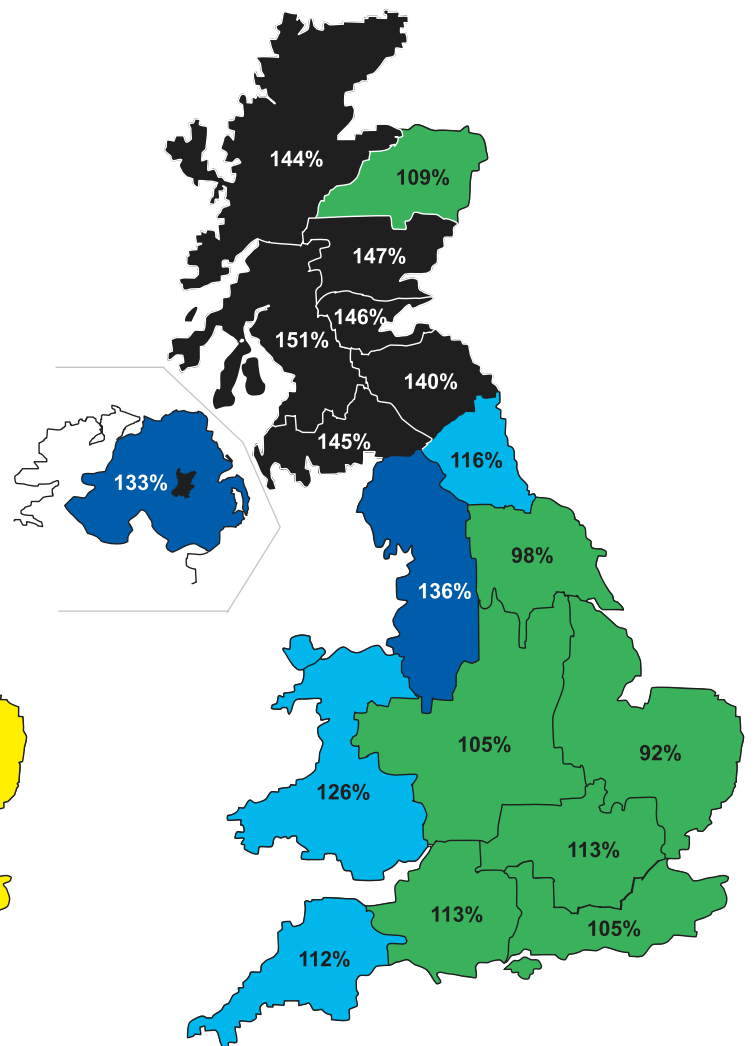
Substantially below average



Exceptionally low rainfall



March 2002 - April 2002

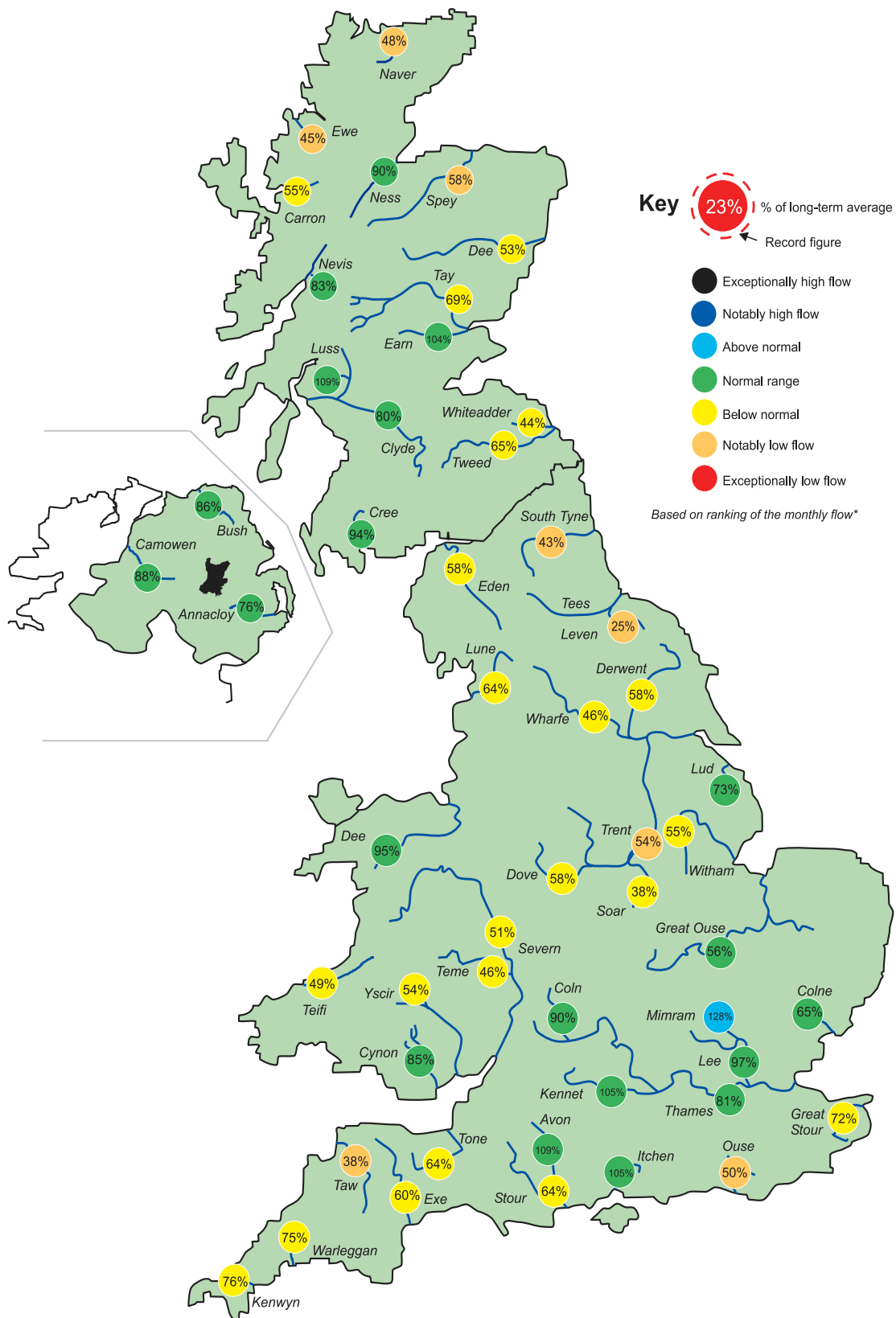


January 2002 - April 2002

Rainfall accumulation maps

Thanks in large parts to a notably wet February, rainfall totals for the year thus far for the UK as a whole are considerably above average – parts of Scotland and Northern Ireland have been especially wet. However, the combined March and April rainfall was modest in much of eastern England – much of Yorkshire registered its 4th driest late spring since 1976.

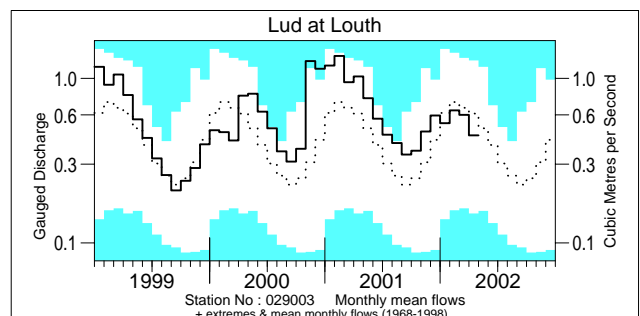
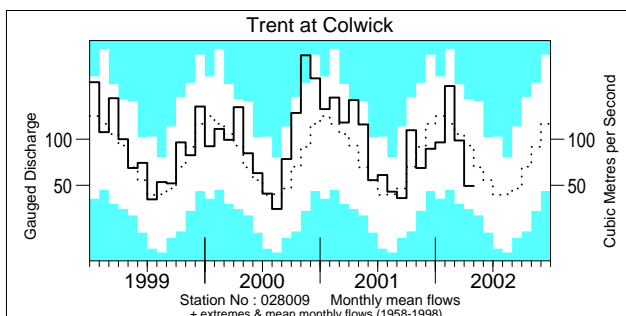
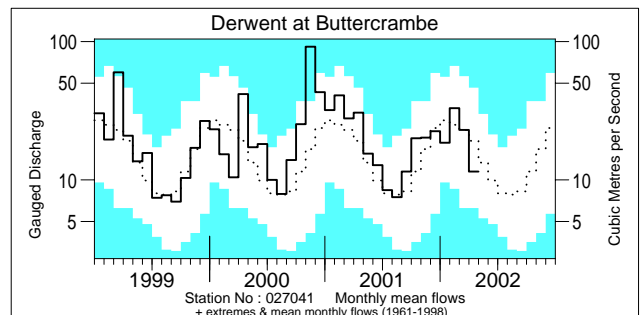
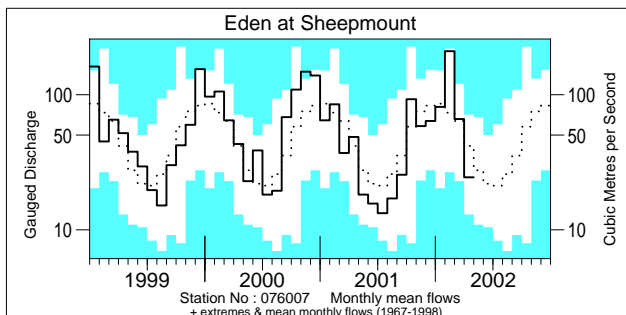
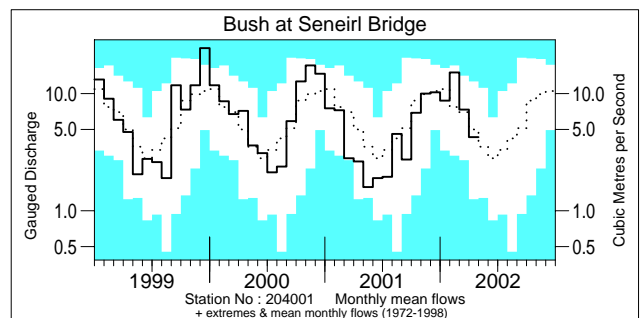
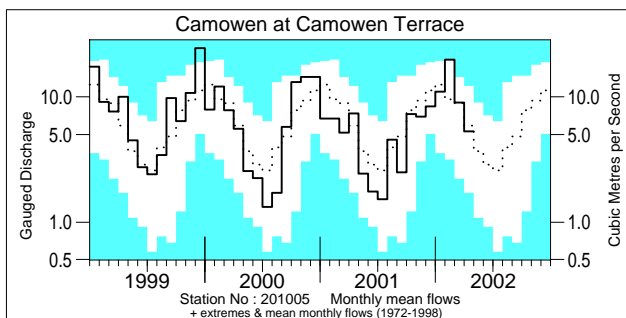
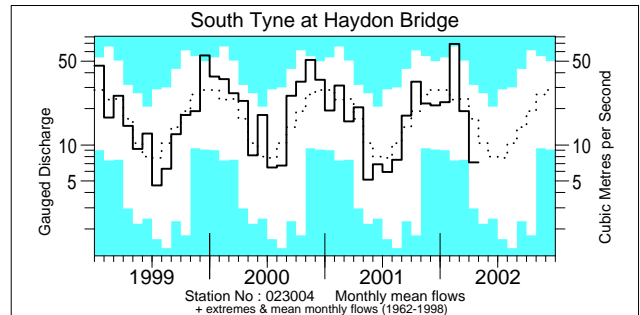
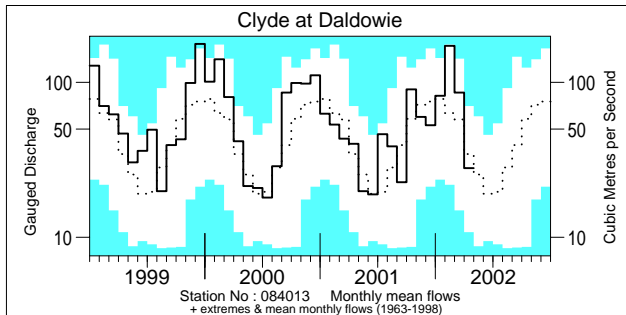
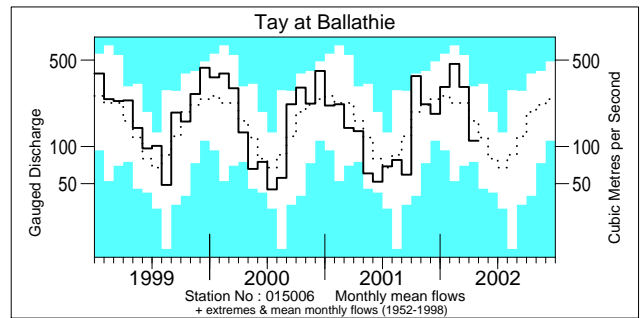
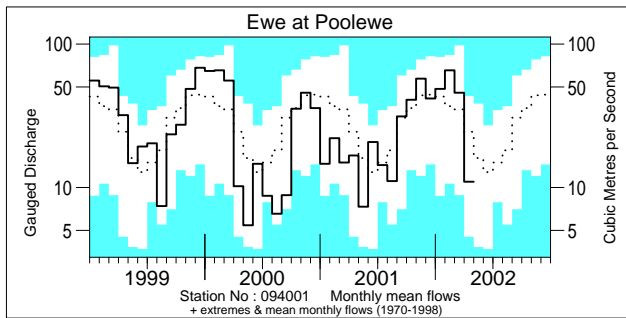
River flow . . . River flow . . .



River flows - April 2002

*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.

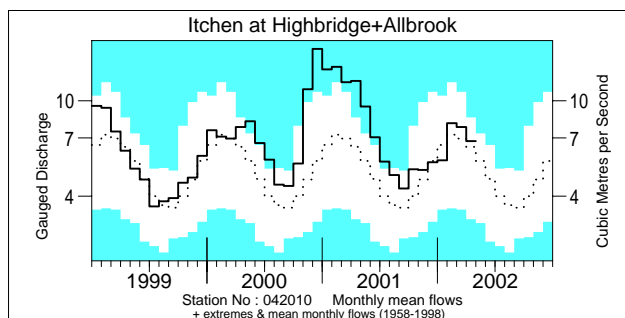
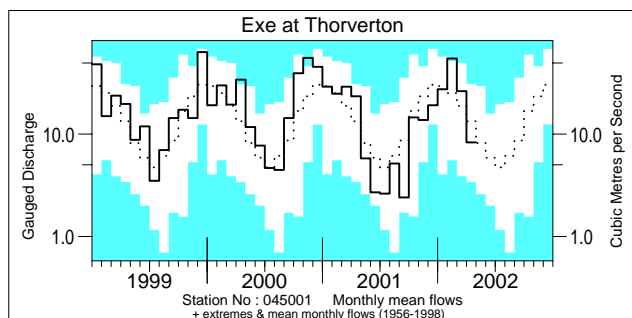
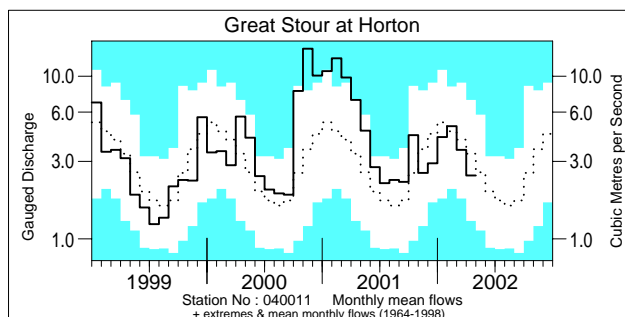
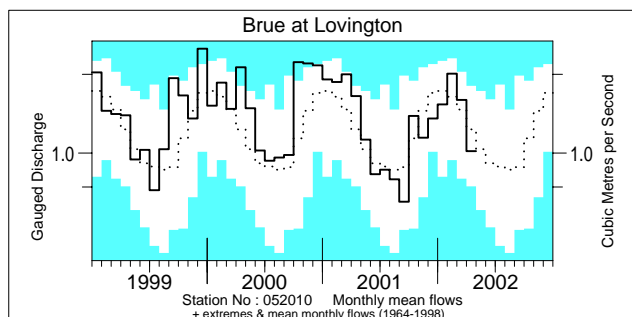
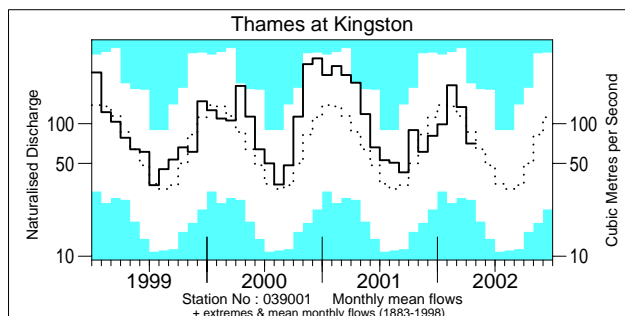
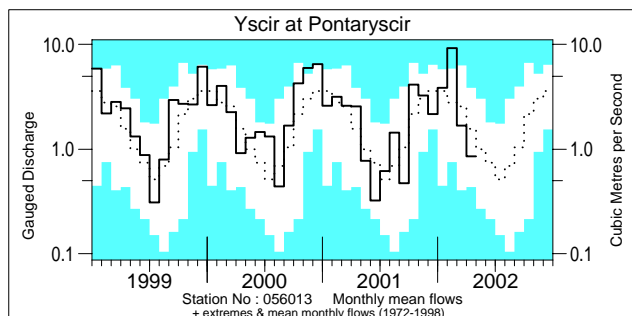
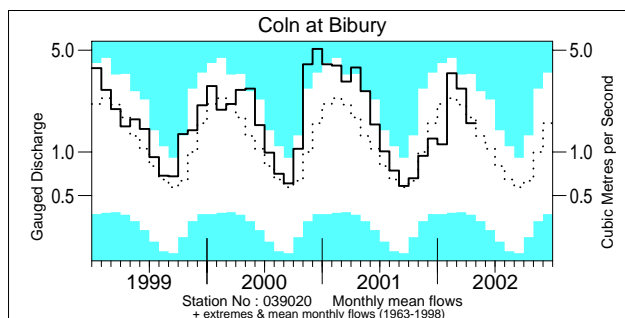
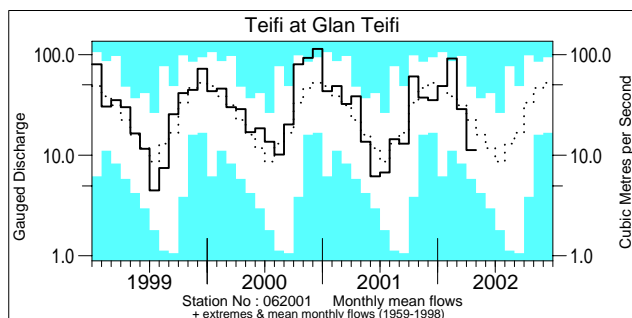
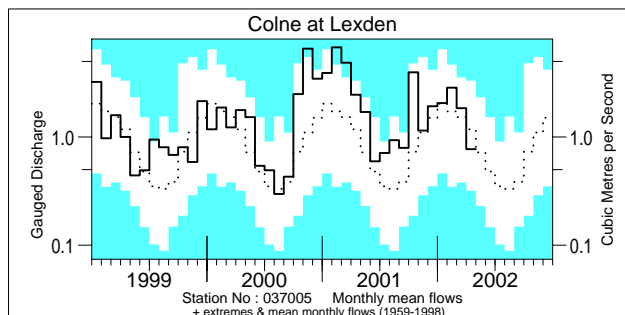
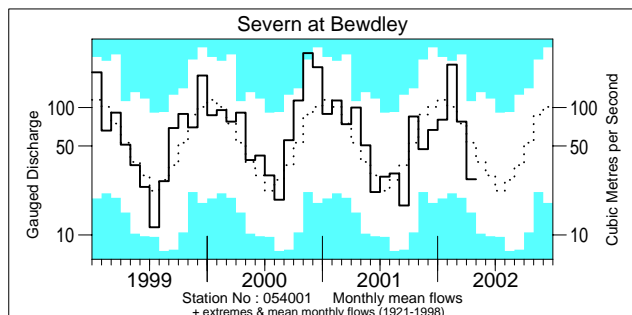
River flow . . . River flow . . .



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

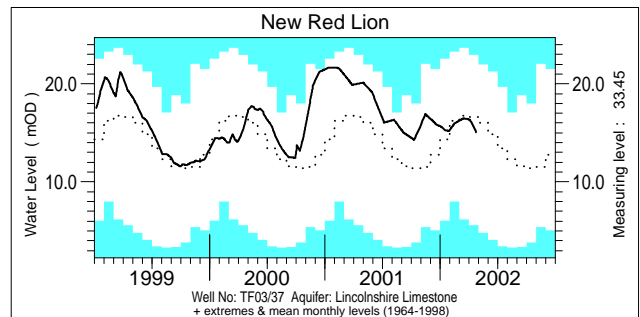
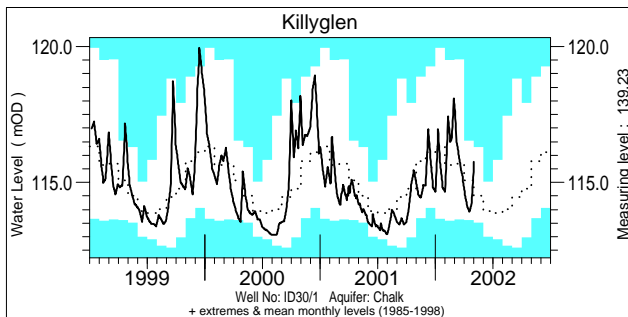
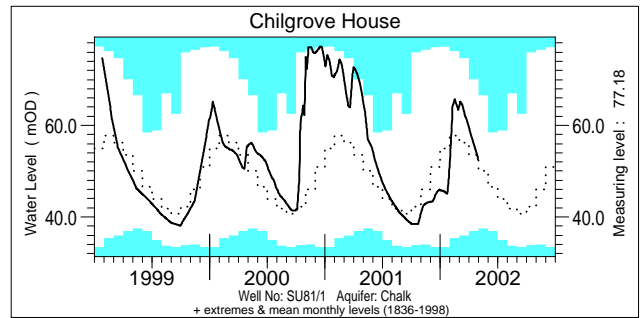
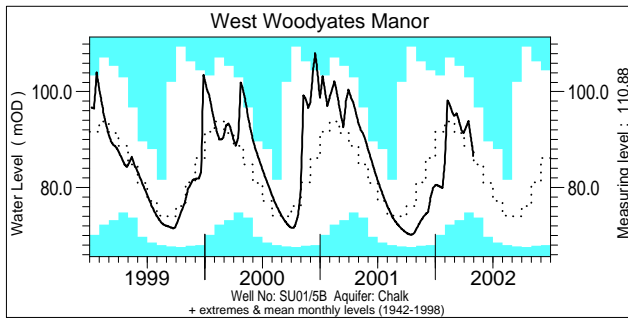
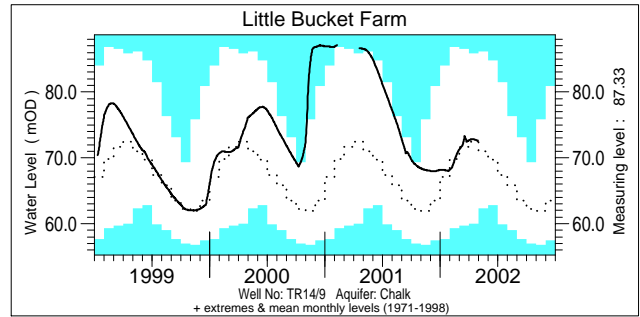
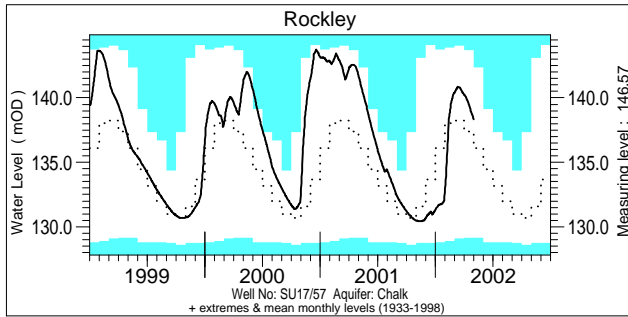
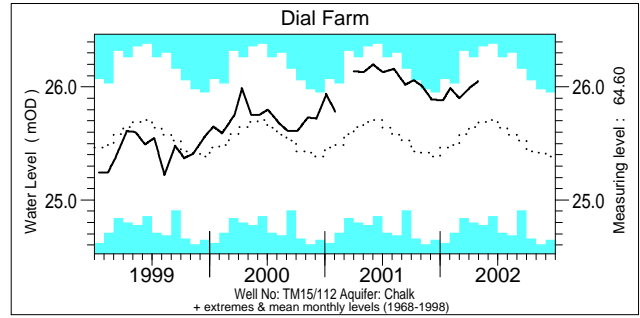
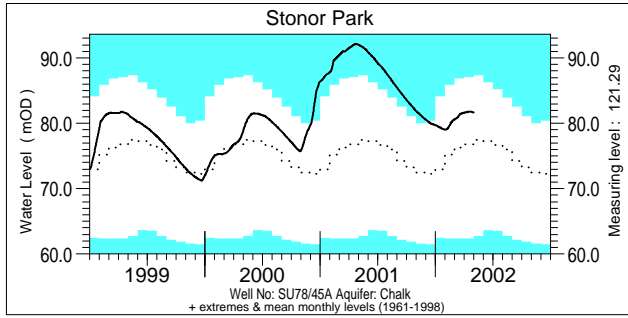
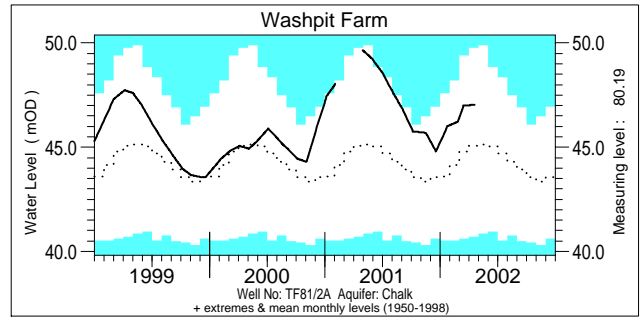
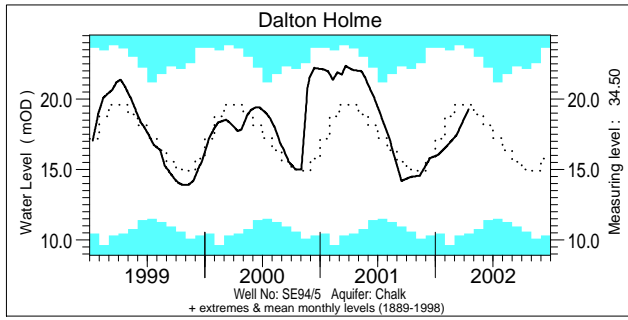
River flow . . . River flow . . .



Notable runoff accumulations (a) February 2002 - April 2002, (b) August 2001 - April 2002

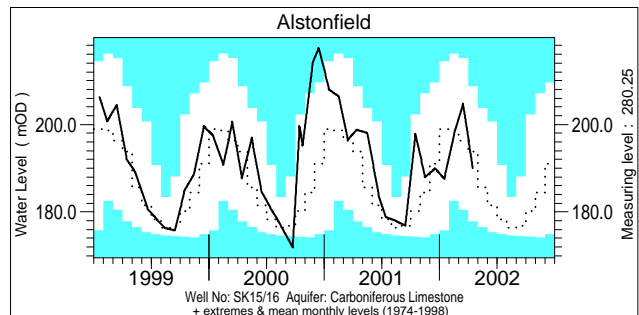
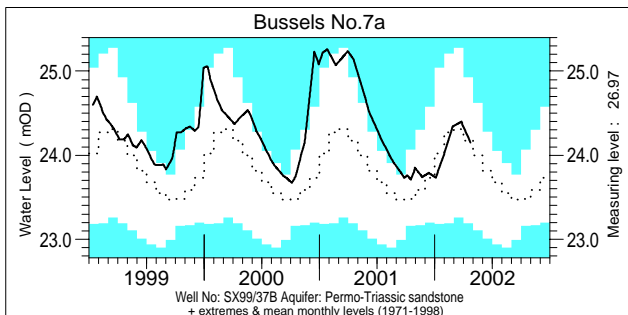
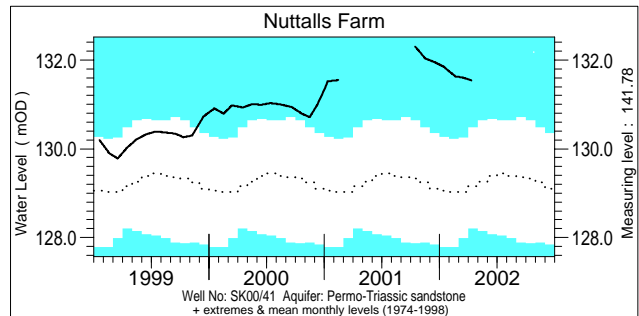
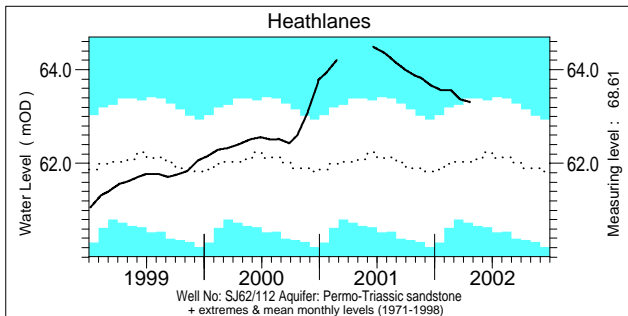
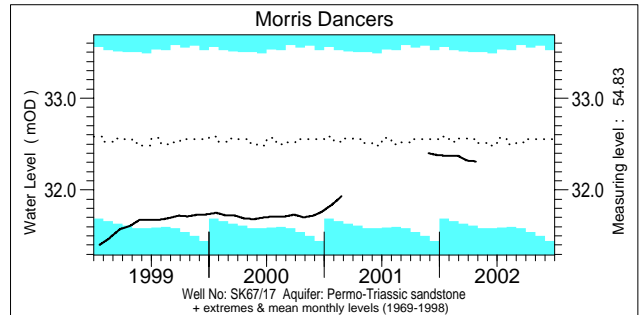
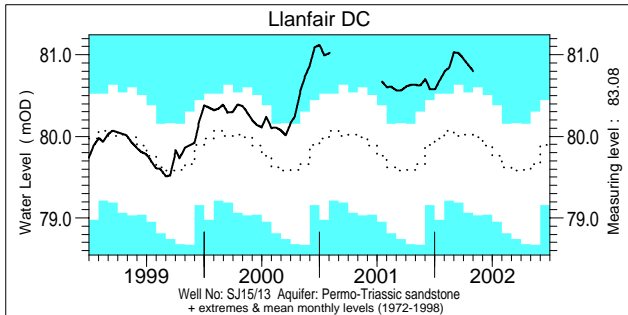
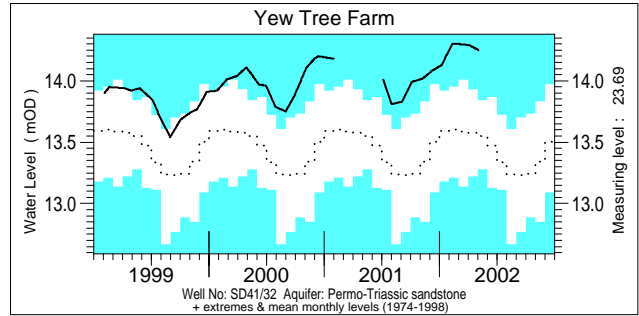
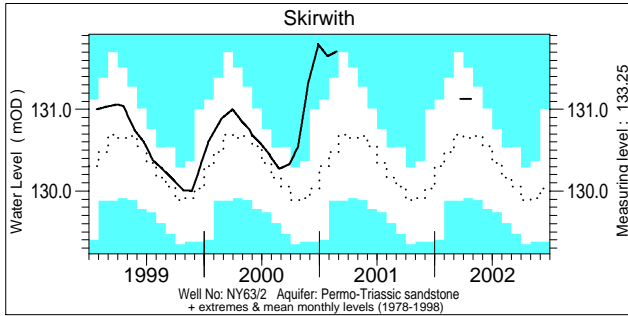
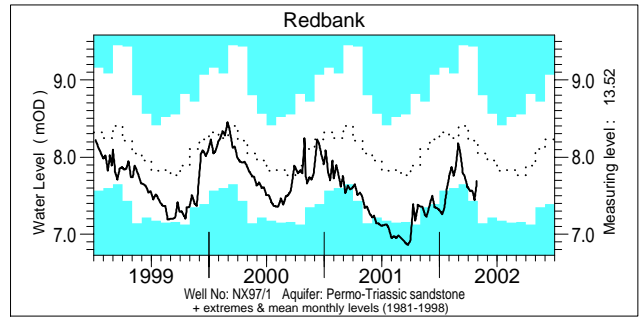
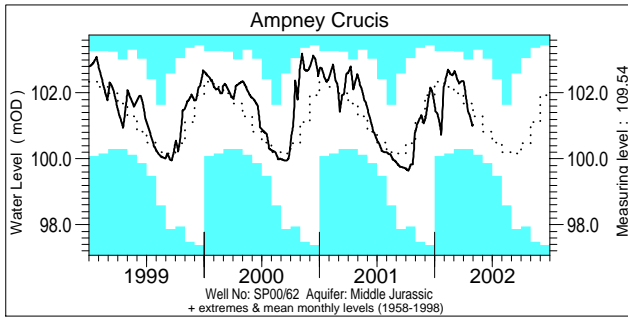
River	%Ita	Rank	River	%Ita	Rank	River	%Ita	Rank
a) Tweed	151	41/42	Dee	158	64/65	(b) Mimram	150	45/48
S Tyne	141	38/40	Lune	158	42/42	Kenwyn	72	3/33
Wharfe	149	45/47	Eden	159	34/35	Yscir	121	26/29
Exe	150	45/46	Clyde	174	38/39	Naver	116	22/25
Yscir	159	30/30	Leven (Glasgow)	161	38/39	Annacloy	77	3/22
Cynon	176	44/44	Camowen	135	28/29			
Tawe	140	40/43						

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

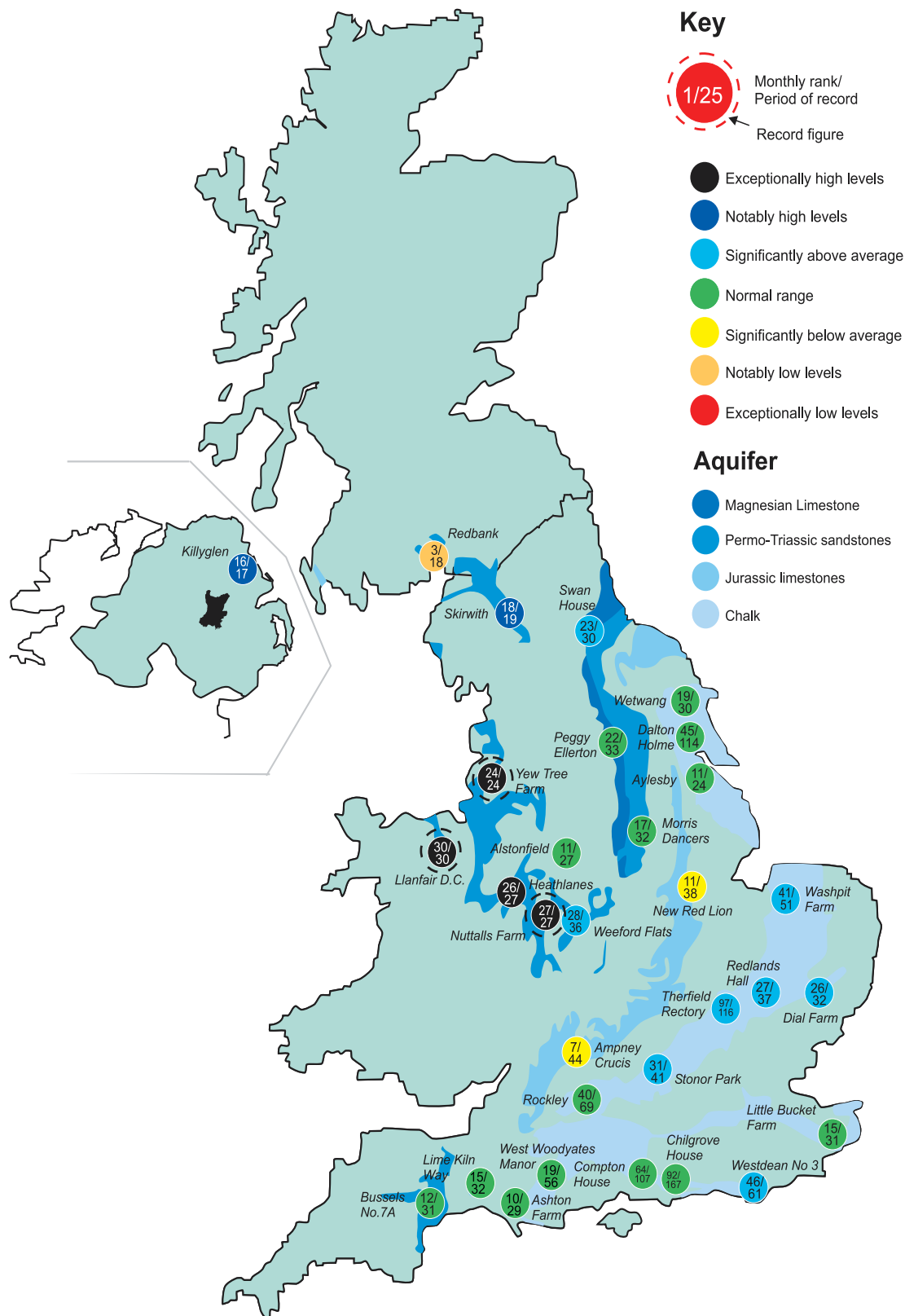


Groundwater levels April 2002 / May 2002

Borehole	Level	Date	Apr. av.	Borehole	Level	Date	Apr. av.	Borehole	Level	Date	Apr. av.
Dalton Holme	19.28	15/04	19.52	Chilgrove House	52.65	30/04	52.32	Llanfair DC	80.80	01/05	79.97
Washpit Farm	47.04	19/04	45.29	Killyglen	115.76	02/05	115.07	Morris Dancers	32.31	25/04	32.40
Stonor Park	81.71	01/05	77.74	New Red Lion	15.02	24/04	16.54	Heathlanes	63.31	22/04	62.03
Dial Farm	26.05	30/04	25.67	Ampney Crucis	101.04	01/05	101.74	Nuttalls Farm	131.54	12/04	129.37
Rockley	138.32	01/05	137.56	Redbank	7.69	28/04	8.21	Bussels No.7a	24.15	23/04	24.19
Little Bucket Farm	72.58	30/04	72.40	Skirwith	131.13	26/04	130.62	Alstonfield	189.98	15/04	193.70
West Woodyates	86.53	30/04	88.50	Yew Tree Farm	14.25	03/05	13.62				

Levels in metres above Ordnance Datum

Groundwater... Groundwater



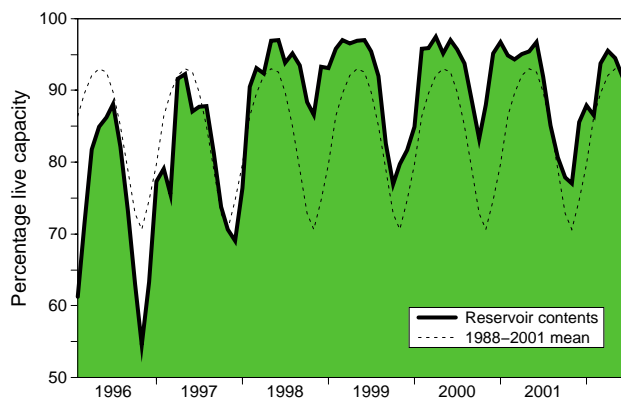
Groundwater levels - April 2002

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.

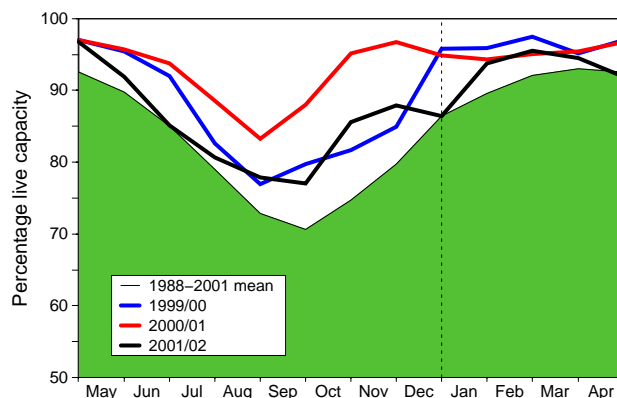
(Note: Redbank is affected by groundwater abstraction)

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

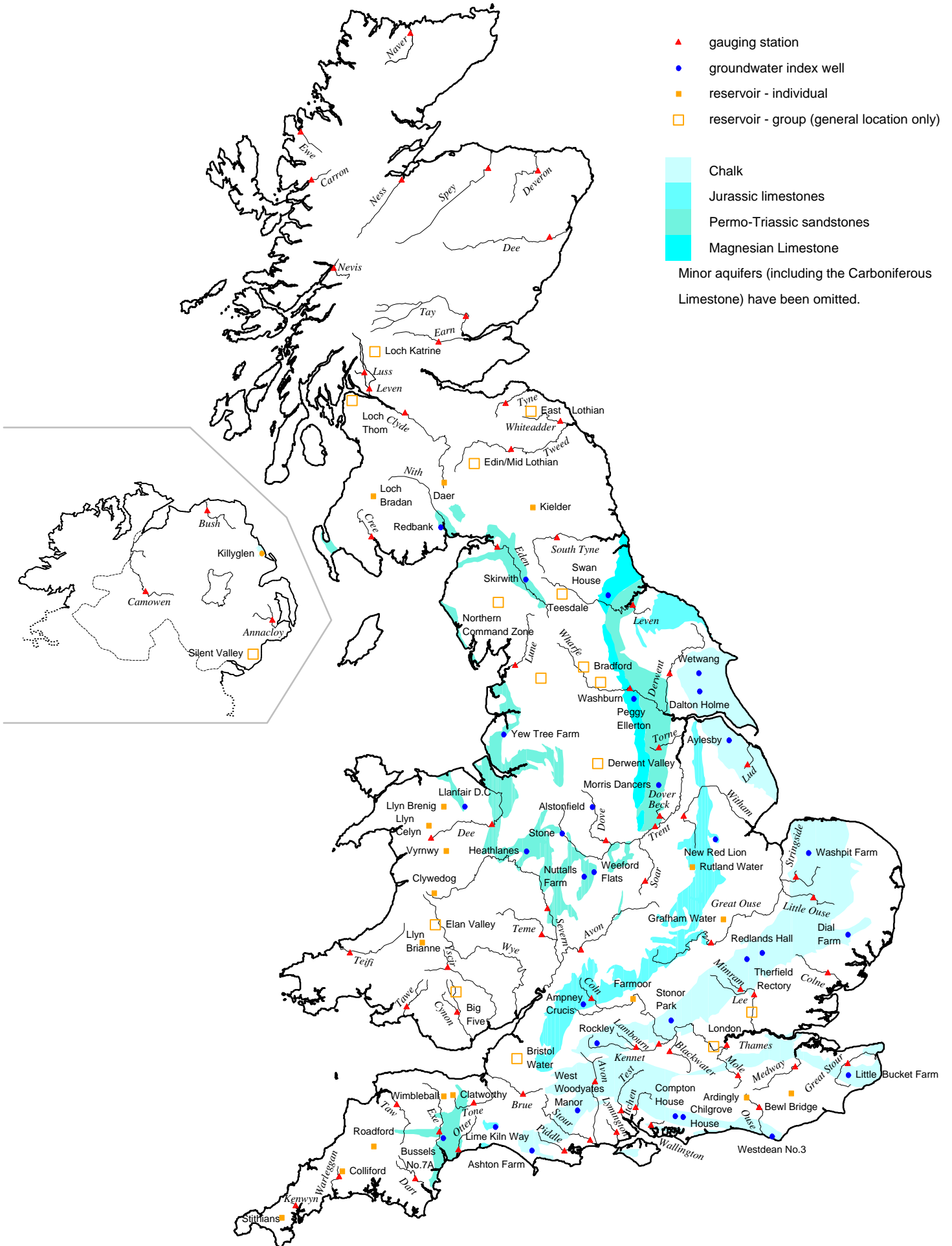
Area	Reservoir	Capacity (MI)	2001					2002					Min. May	Year* of min
			Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep		
NorthWest	N Command Zone	• 124929	84	84	100	100	97	89	80	1996				
	Vyrnwy	55146	91	88	100	100	100	94	70	1996				
Northumbrian	Teesdale	• 87936	83	84	99	100	97	89	81	1996				
	Kielder	(199175)	(95)	(89)	(100)	(96)	(92)	(91)	85	1990				
Severn Trent	Clywedog	44922	100	87	96	100	94	98	85	1988				
	DerwentValley	• 39525	86	100	100	100	98	88	54	1996				
Yorkshire	Washburn	• 22035	92	91	95	97	91	85	76	1996				
	Bradford supply	• 41407	90	90	99	100	96	84	60	1996				
Anglian	Grafham	(55490)	(88)	(88)	(87)	(87)	(89)	(91)	73	1997				
	Rutland	(116580)	(81)	(82)	(84)	(89)	(92)	(94)	72	1997				
Thames	London	• 202340	87	86	87	88	92	93	86	1990				
	Farmoor	• 13830	91	77	79	88	87	95	81	2000				
Southern	Bewl	28170	74	75	90	97	98	95	63	1990				
	Ardingly	4685	73	86	100	100	100	100						
Wessex	Clatworthy	5364	72	84	97	100	100	89	81	1990				
	BristolWW	• (38666)	(59)	(61)	(70)	(99)	(98)	(93)	85	1990				
South West	Colliford	28540	62	64	72	78	82	81	56	1997				
	Roadford	34500	73	72	84	94	94	91	41	1996				
	Wimbleball	21320	54	58	76	100	100	97	79	1992				
	Stithians	5205	29	33	49	78	88	85	65	1992				
Welsh	Celyn and Brenig	• 131155	97	94	100	100	98	99	75	1996				
	Brienne	62140	100	94	100	98	97	89	86	1997				
	Big Five	• 69762	95	93	99	97	94	90	85	1997				
	Elan Valley	• 99106	100	99	100	100	97	93	91	1997				
East of Scotland	Edinburgh/Mid Lothian	• 97639	90	89	92	100	98	94	62	1998				
	East Lothian	• 10206	100	100	100	100	100	100	89	1992				
West of Scotland	Loch Katrine	• 111363	93	88	99	100	99	95	83	2001				
	Daer	22412	100	97	100	100	100	99	91	1995				
Northern Ireland	Loch Thom	• 11840	93	93	100	100	98	95	89	2001				
	Silent Valley	• 20634	43	39	46	57	59	65	58	2000				

() 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.

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The National Hydrological Monitoring Programme depends on the active cooperation of many data suppliers. This cooperation is gratefully acknowledged.

Subscription

Subscription to the Hydrological Summaries costs £48 per year. Orders should be addressed to:

Hydrological Summaries
National Water Archive
CEH Wallingford
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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