Hydrological summary
for the United Kingdom

January 2002

General

January was a month of contrasts. High pressure was dominant initially – the associated cold, dry conditions increased the significant rainfall deficiencies that had been building since mid-November. Early 2002 river flows were depressed over wide areas and in Northern Ireland low reservoir stocks (in Silent Valley) triggered calls to moderate water usage (e.g. in Belfast). Subsequently, as the anticyclone weakened, active frontal systems began to cross the UK bringing very boisterous weather conditions - damaging gales afflicted much of the country, northern Britain especially. The associated rainfall resulted in a rapid shift in the focus of hydrological concern; by late January the risk of flooding was high in most regions, heralding frequent exceedances of bankfull flow in early February. Reservoir stocks, in most areas, responded smartly to the late January rainfall and, entering February, overall stocks for England and Wales were appreciably above average. Following very limited early winter infiltration, groundwater levels are rising once again. The overall water resources outlook is healthy.

Rainfall

The episodic weather patterns which have been a feature of the last five months continued in January. Dry conditions, which in some areas had extended over nine weeks or more, ended around mid-month as a westerly airflow fed a sustained sequence of active frontal systems across the country. The mild but very windy conditions were associated with substantial rainfall, in the west particularly. Capel Curig (North Wales) reported 48 mm in 24 hours on the 17th, heralding an exceptionally wet episode - over the four weeks to Feb 11th rainfall totals in a few western areas were the equivalent of 10-12 weeks average rainfall. Nationwide, the 26th was especially wet – triggering the first of many Flood Alerts. The influence of topography is very evident in the January precipitation totals. Substantial positive anomalies characterised much of the uplands; the Cheviots and parts of the central Scottish Highlands registered more than 180% of the monthly average. By contrast, a few sheltered catchments close to the eastern seaboard reported only a little over 50% of average rainfall (e.g. parts of the North-East coast). Most regional rainfall totals for January fell in the 80-140% range and the provisional England and Wales total was very close to the 1961-90 average. Notwithstanding the wet end to January, regional three-month rainfall totals are notably below average across large parts of England – much of Yorkshire experienced its second driest Nov-Jan period since 1963. Six-month regional rainfall totals are mostly well within the normal range.

River flow

Spring-fed streams aside, river flows during January spanned a very wide range in most regions. Following lengthy recessions in December, the frozen conditions in early January resulted in daily flows approaching early January minima in a number of impermeable catchments (from the Tay to the Lymington in Hampshire); similar flows occurred in January 1997. Thereafter, the changing synoptic conditions were generally accompanied by a dramatic increase in runoff rates with spate conditions being common over the last week of the month - by which time baseflow contributions to spring-fed streams were also increasing steadily. Particularly heavy runoff followed substantial rainfall on the 26th and 28th and resulted in widespread Flood Alerts (around 100 across England and Wales). In Scotland, the Earn was among many river approaching or exceeding bankfull at month end. The counterbalancing effect of depressed flows early in the month and the subsequent spates resulted in mean flows for January being in the normal range in most regions. However, in Northern Ireland, the Annacloy registered its ninth successive below average monthly runoff – establishing a new May-Jan mimima (in a relatively short record). By contrast, flows in a few Chalk streams in eastern England (e.g. the Mimram) were still well above average. With catchments remaining close to saturation and frontal systems continuing to penetrate from the west, the risk of flooding remained high in early February.

Groundwater

Generally, the distribution of rain in January did not favour the outcrop areas of the major aquifers, and the very modest recharge rates of the early winter continued over the first fortnight. Thereafter, with soil moisture deficits remaining close to zero (a few areas close to the Wash excepted), the successive pulses of moderate intensity rainfall resulted in very substantial late-January infiltration - which continued well into February. Groundwater levels in most index wells and boreholes were, however, measured too early in January to capture the water-table response. Nonetheless, an upturn in levels is evident at, for example, the responsive Bussels and Llanfair DC boreholes, in the latter levels remain above pre-2000 maxima – this is true throughout much of the slower responding Permo-Triassic sandstones aquifer also. There is less spatial coherence throughout the Chalk but generally levels are within the normal late-winter range, but still exceptionally high in some slower responding outcrops e.g. in the Chilterns. Levels in the limestone aquifers reflect the erratic recharge patterns of recent months, but are mostly close to the late winter average. Weather patterns and soil conditions in early February were conducive to further substantial groundwater replenishment.

Centre for Ecology & Hydrology
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Rainfall accumulations and return period estimates

Area	Rainfall	Jan 2002	Nov01-Jan02	RP	Aug01-Jan02	RP	May01-Jan02	RP	Feb01-Jan02	RP
England	**mm**	**85**	**192**		**495**		**654**		**953**	
& Wales	**%**	**93**	**69**	**5-15**	**95**	**2-5**	**92**	**2-5**	**104**	**2-5**
North West	mm	131	293		680		856		1140	
	%	108	80	2-5	95	2-5	89	2-5	95	2-5
Northumbrian	mm	82	206		471		608		841	
	%	97	82	2-5	98	2-5	91	2-5	99	2-5
Severn Trent	mm	63	146		386		551		784	
	%	90	67	5-10	93	2-5	94	2-5	104	2-5
Yorkshire	mm	58	152		435		563		801	
	%	73	63	10-20	95	2-5	88	2-5	98	2-5
Anglian	mm	44	119		351		503		727	
	%	89	73	5-10	110	2-5	108	2-5	122	10-20
Thames	mm	71	138		397		518		777	
	%	110	69	5-10	105	2-5	96	2-5	113	2-5
Southern	mm	84	152		450		546		844	
	%	105	61	5-15	99	2-5	90	2-5	108	2-5
Wessex	mm	92	174		423		550		823	
	%	106	66	5-10	88	2-5	85	5-10	98	2-5
South West	mm	152	301		561		707		1035	
	%	110	75	5-10	81	5-10	78	5-15	88	2-5
Welsh	mm	160	355		756		956		1320	
	%	112	81	2-5	96	2-5	93	2-5	101	2-5
Scotland	**mm**	**211**	**447**		**857**		**1076**		**1321**	
		139	**99**	**2-5**	**99**	**2-5**	**95**	**2-5**	**92**	**2-5**
Highland	mm	261	596		1073		1351		1612	
	%	139	101	2-5	99	2-5	98	2-5	92	2-5
North East	mm	108	266		597		759		983	
	%	109	91	2-5	106	2-5	99	2-5	101	2-5
Tay	mm	214	362		751		940		1210	
	%	148	92	2-5	103	2-5	98	2-5	98	2-5
Forth	mm	159	295		606		790		1015	
	%	134	87	2-5	92	2-5	90	2-5	92	2-5
Tweed	mm	130	253		533		703		934	
	%	130	88	2-5	95	2-5	92	2-5	96	2-5
Solway	mm	203	391		788		996		1275	
	%	130	87	2-5	91	2-5	88	2-5	90	2-5
Clyde	mm	252	514		990		1259		1527	
	%	133	94	2-5	94	2-5	93	2-5	90	2-5
Northern	**mm**	**124**	**270**		**526**		**698**		**903**	
Ireland	**%**	**112**	**85**	**2-5**	**85**	**2-5**	**84**	**5-10**	**85**	**5-10**

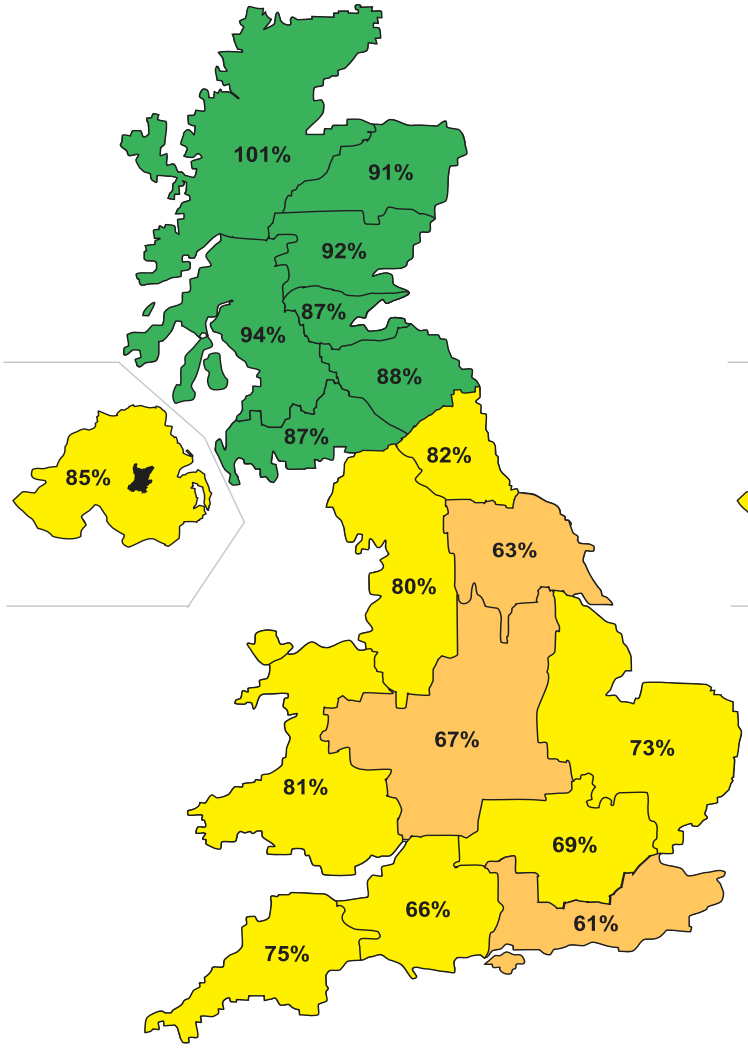
RP = Return period

 All monthly totals since December 1998 are provisional (see page 12). The figures for England & Wales are derived by the Hadley Centre and are updates of the homogenised series developed by the Climate Research Unit; the other national figures are derived from different raingauge networks to those used to derive the CRU data series. The return period estimates are based on tables provided by the Meteorological Office (see Tabony, R.C., 1977, *The variability of long duration rainfall over Great Britain*, Scientific Paper No. 37) and relate to the specified span of months only (return periods may be up to an order of magnitude less if n-month periods beginning in any month are considered); RP estimates for Northern Ireland are based on the tables for north-west England. The tables reflect rainfall over the period 1911-70 and assume a stable climate. Artifacts, in the Scottish rainfall series in particular, can exaggerate the relative wetness of the recent past.
*See page 12.

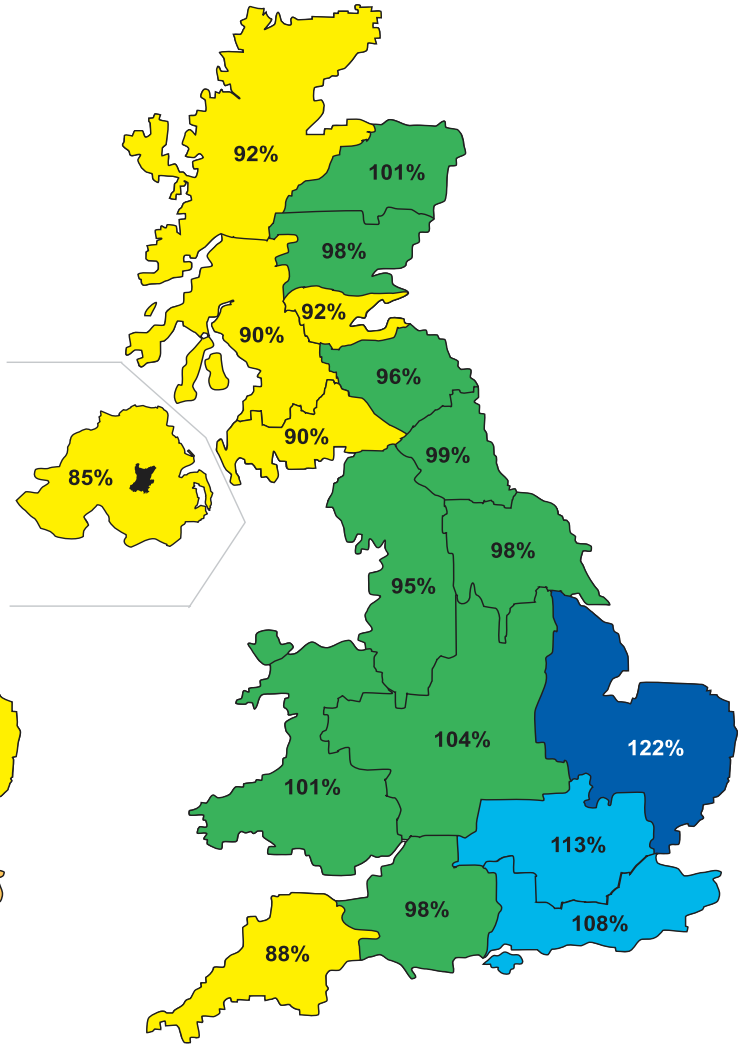
Rainfall . . . Rainfall . . . Rainfall

Key

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



November 2001 - January 2002

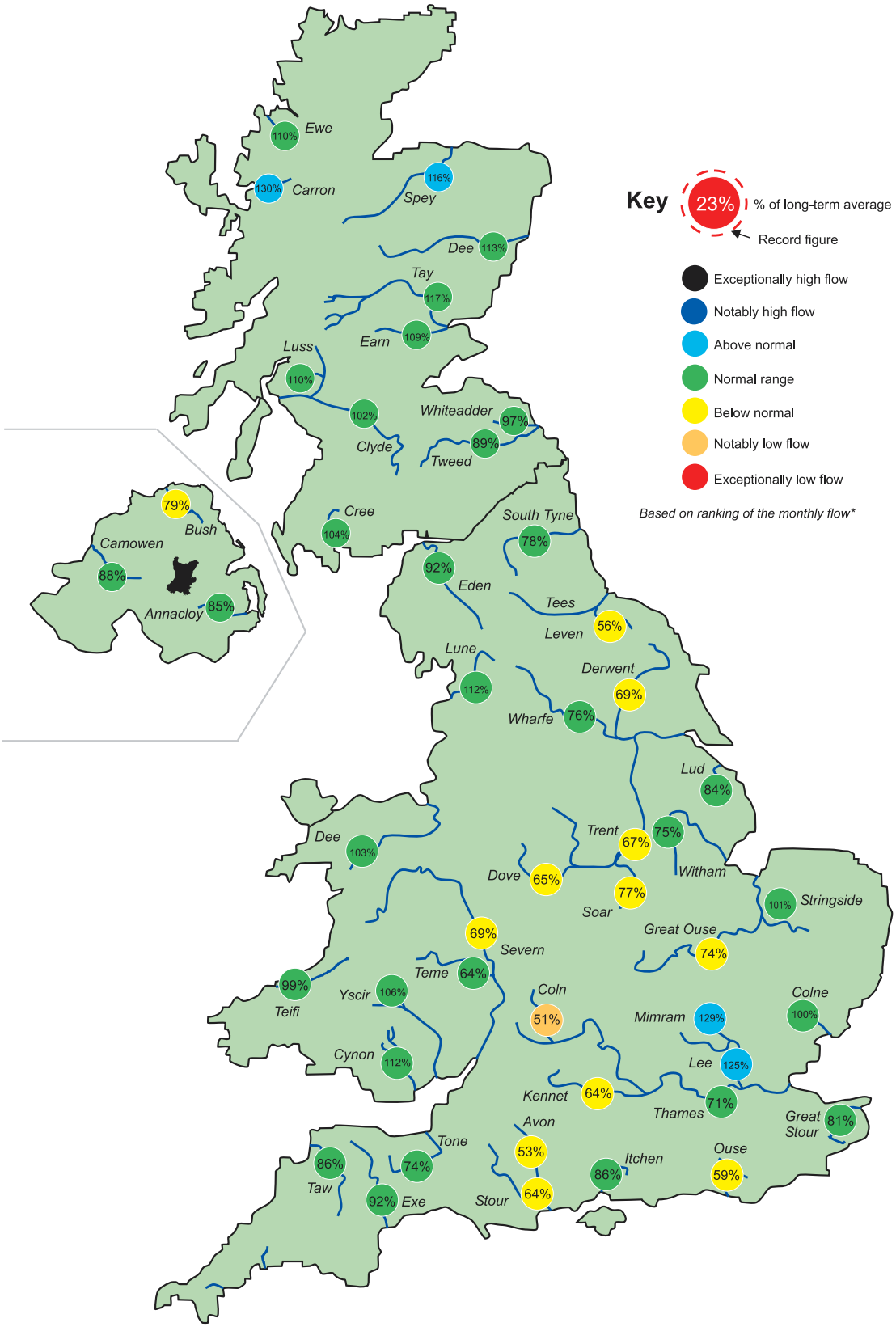


February 2001 - January 2002

Rainfall accumulation maps

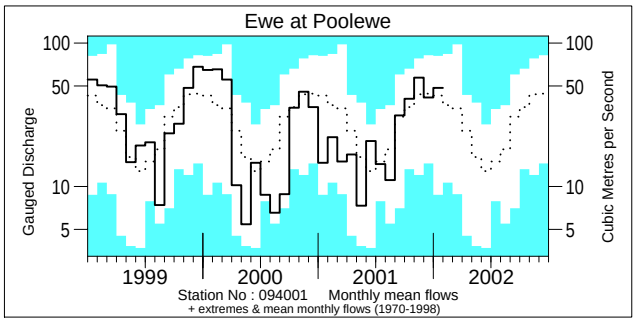
The November 2001-January 2002 regional percentage rainfalls underline why in water resources terms the recent very unsettled interlude was particularly welcome; large parts of England recorded less than 70% of average rainfall over this period. Rainfall patterns for the last 12 months echo the moderation in the NW/SE rainfall gradient which was a feature of the recent past. In the February - January timeframe, the Anglian Region has registered six wet 'years' in the last decade.

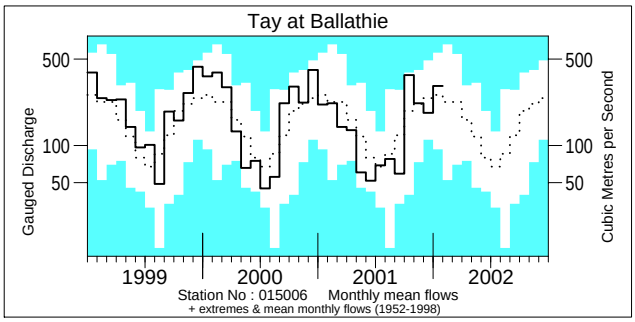
River flow . . . River flow . . .

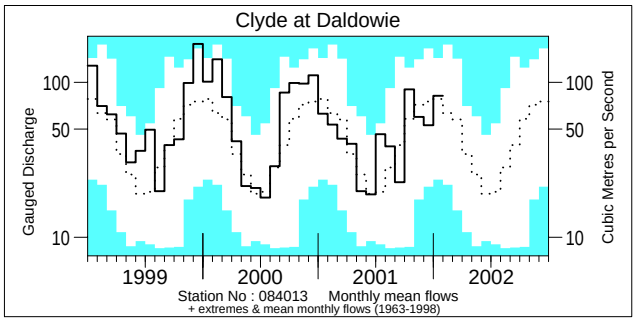


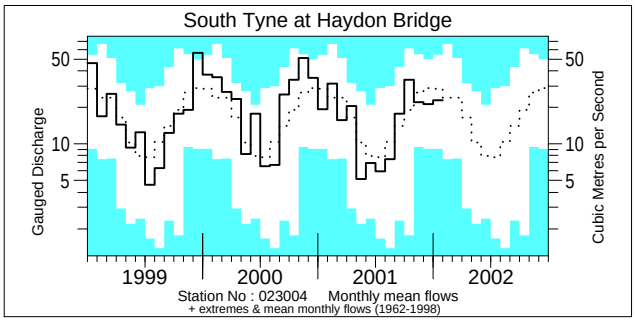
River flows - January 2002

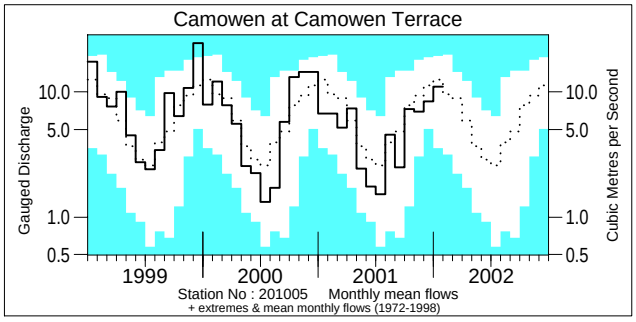
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

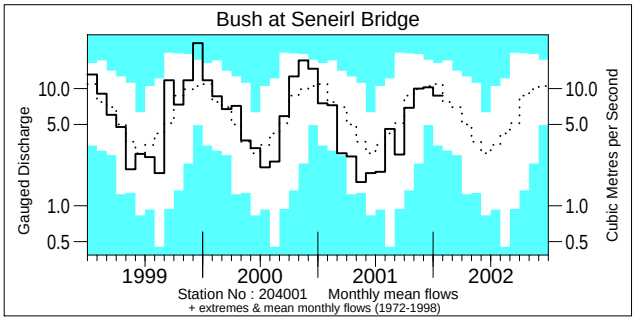


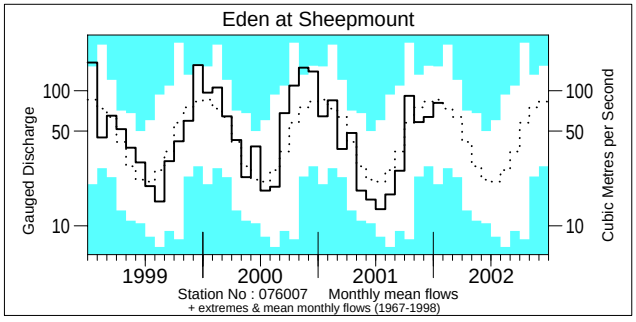


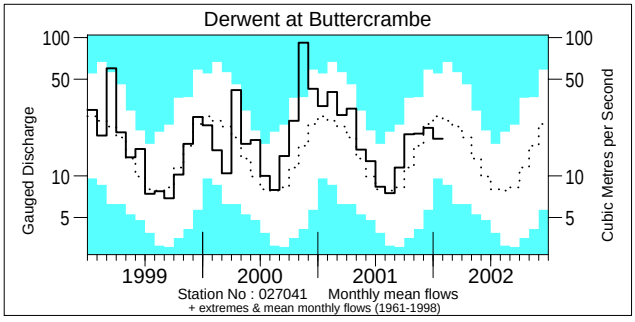


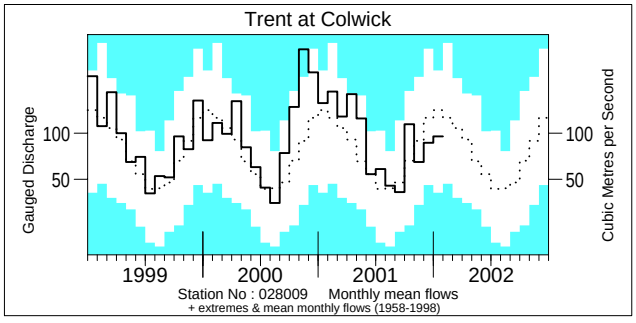


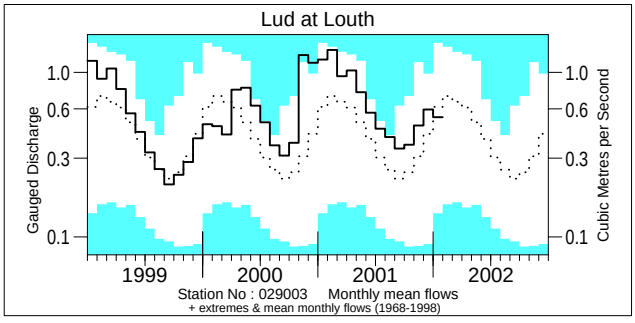








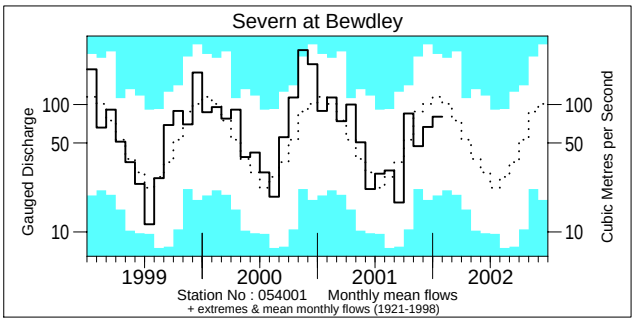


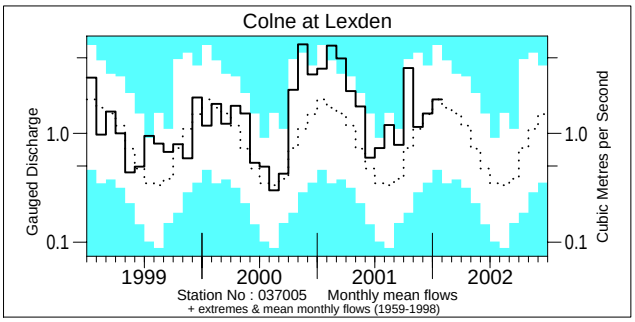


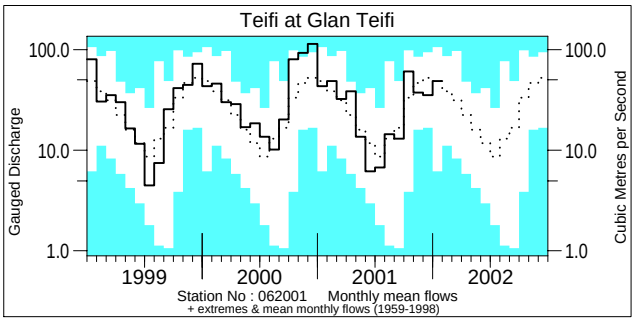
Monthly river flow hydrographs

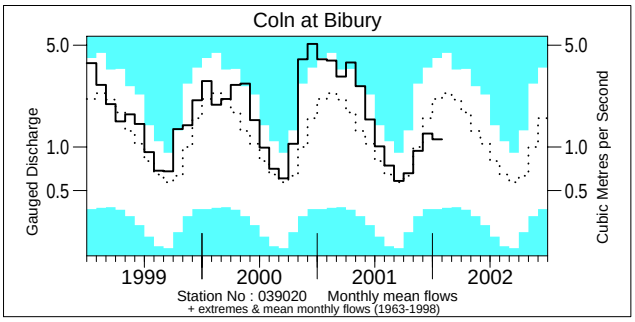
The river flow hydrographs show the monthly mean flow (bold trace), the long term average monthly flow (dotted trace) and the maximum and minimum flow prior to 1999 (shown by the shaded areas). Monthly flows falling outside the maximum/ minimum range are indicated where the bold trace enters the shaded areas.

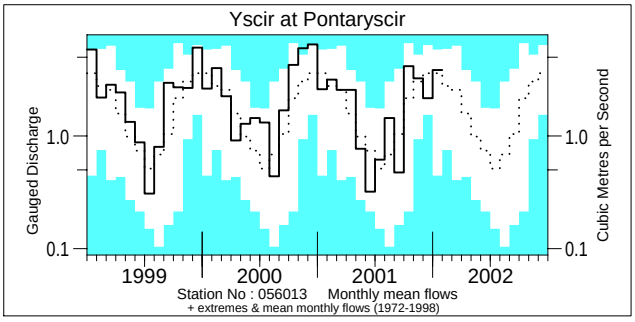
River flow . . . River flow . . .

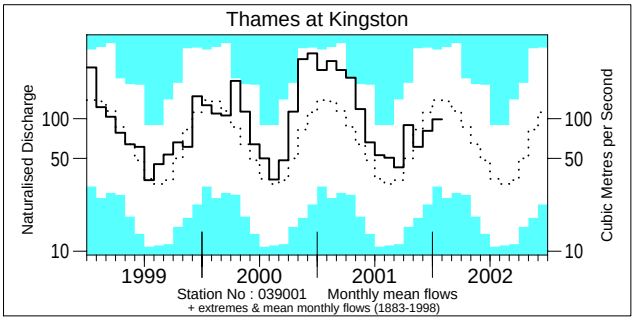


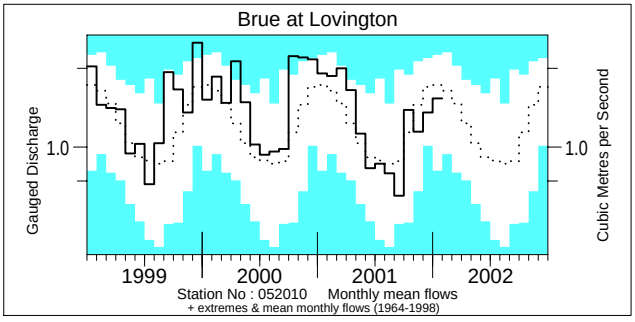


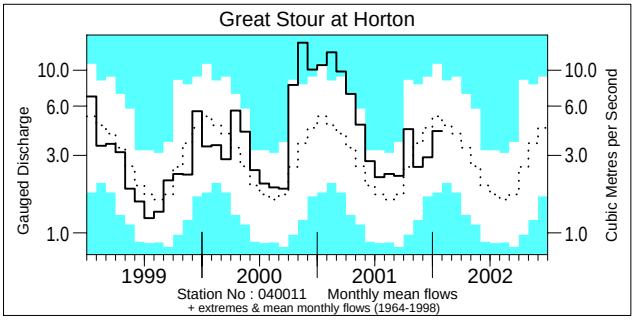


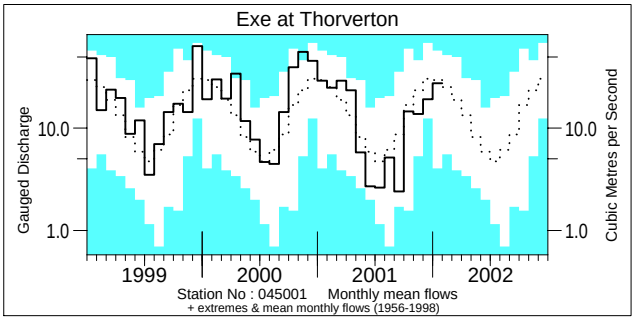


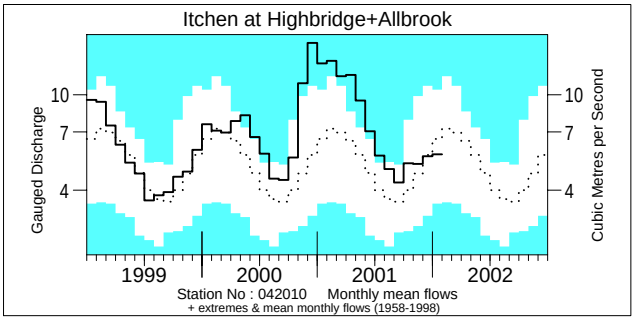












Notable runoff accumulations (a) November 2001 - January 2002, (b) February 2001 - January 2002

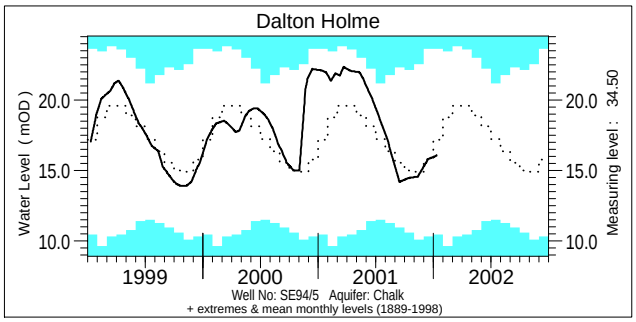
	River	%lta	Rank
(a)	Wharfe	66	4/47
	Torne	62	=5/30
	Mimram	143	44/48
	Teme	55	5/32
	Luss	75	4/23
	Annacloy	54	1/22

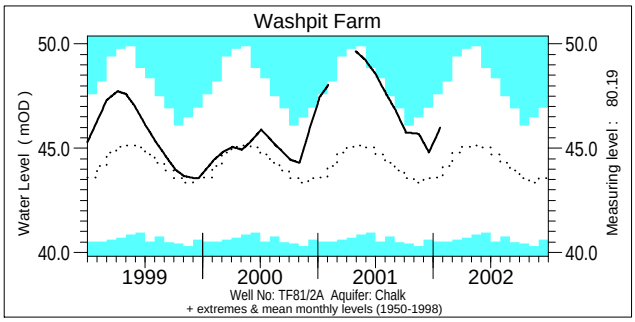
	River	%lta	Rank
(b)	Witham	171	41/42
	Stringside	173	34/34
	Colne	214	41/41
	Lee	212	114/115
	Mimram	213	48/48
	Blackwater	158	48/49
	Kennet	136	39/40

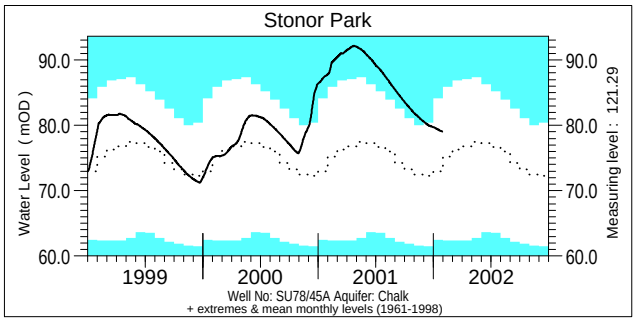
River	%lta	Rank
Lambourn	152	38/39
Test	136	41/42
Itchen	140	42/43
Avon (Hants)	131	36/37
Luss	74	1/23
Camowen	79	2/27
Annacloy	77	2/22

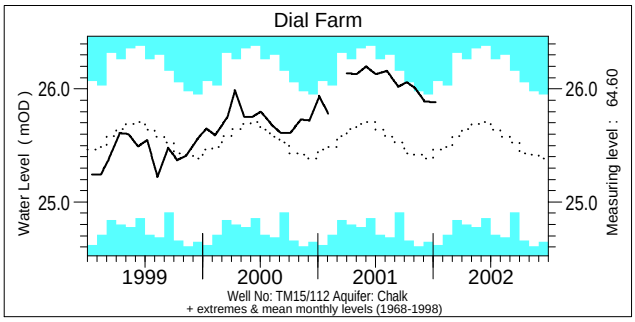
lta = long term average
Rank 1 = lowest on record

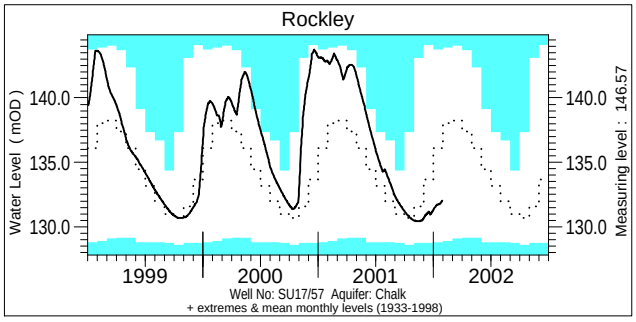
Groundwater…Groundwater

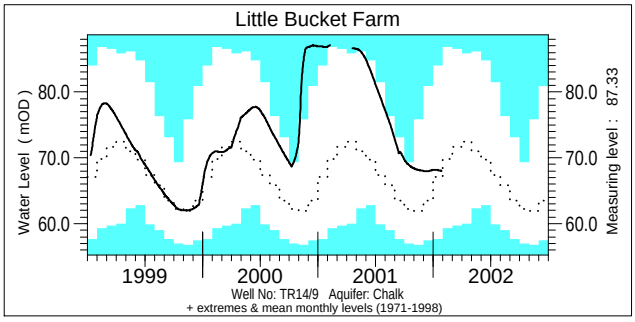


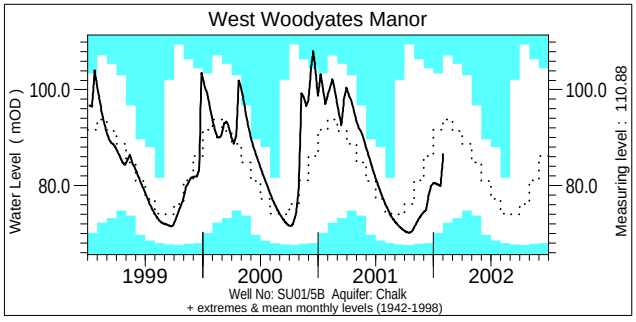


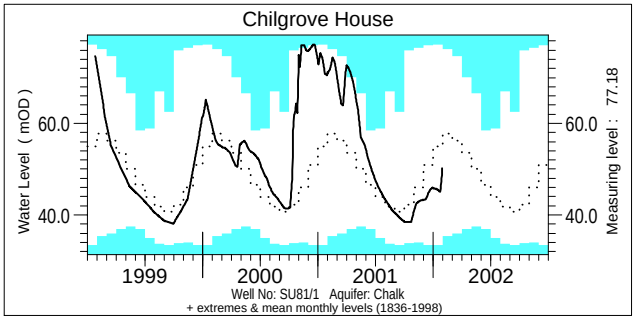


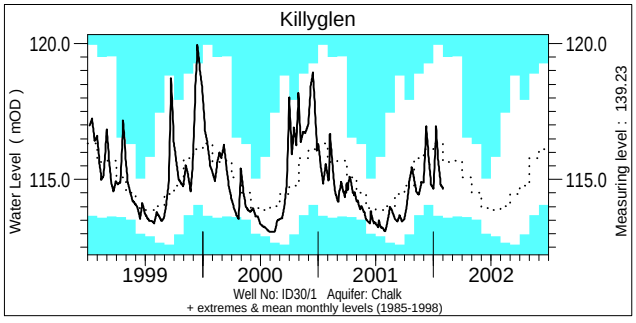


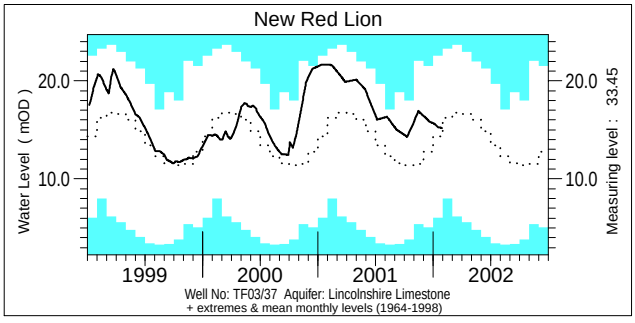








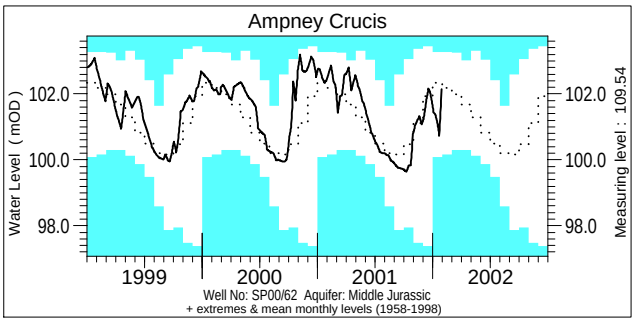


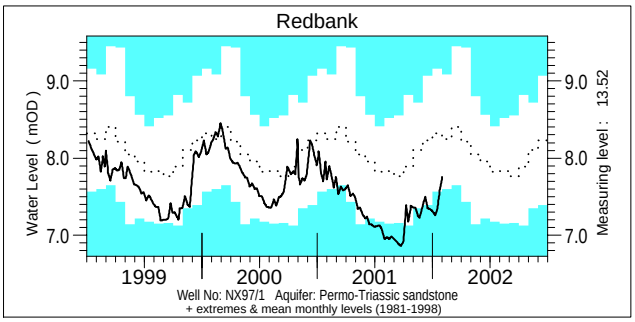


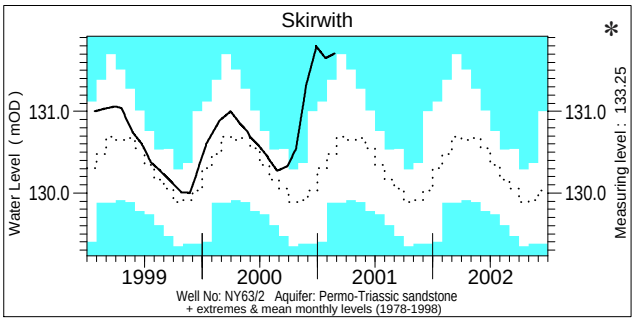
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined below overlying impermeable strata. The monthly max., min. and mean levels are displayed in a similar style to the river flow hydrographs. Note that most groundwater levels are not measured continuously – the latest recorded levels are listed overleaf.

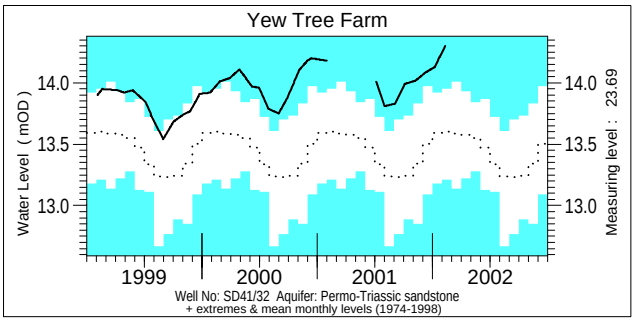
* No March -February groundwater levels available.

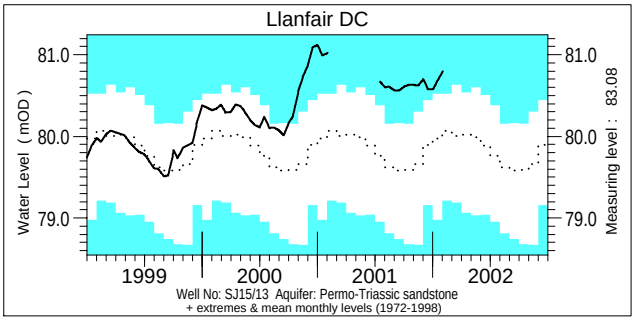
Groundwater . . . Groundwater

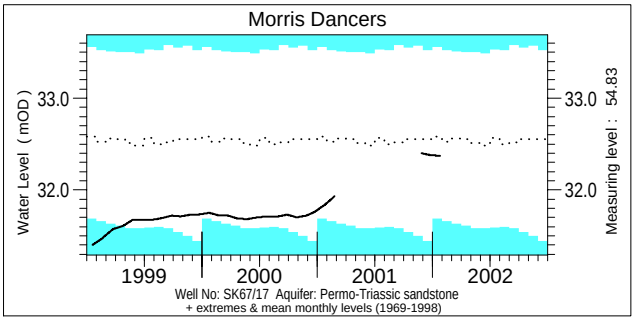


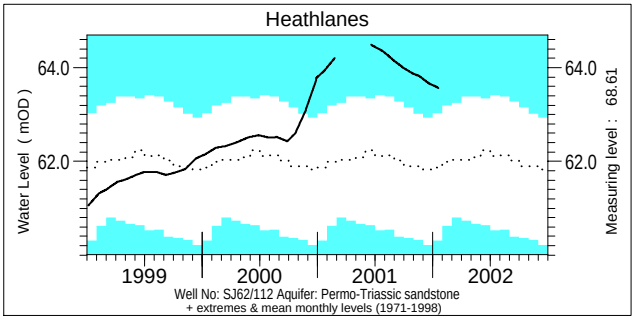


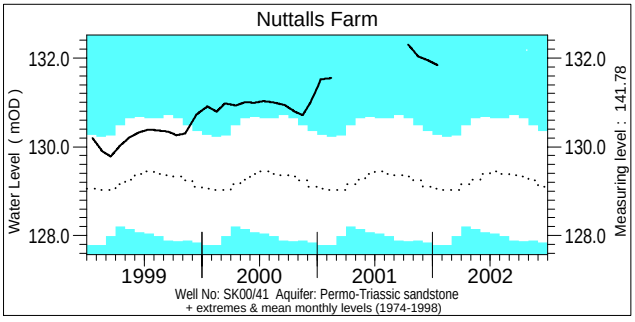


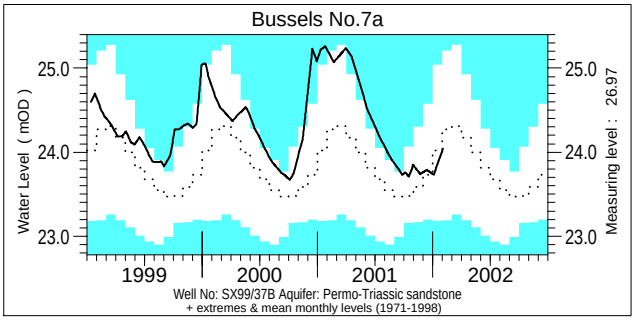


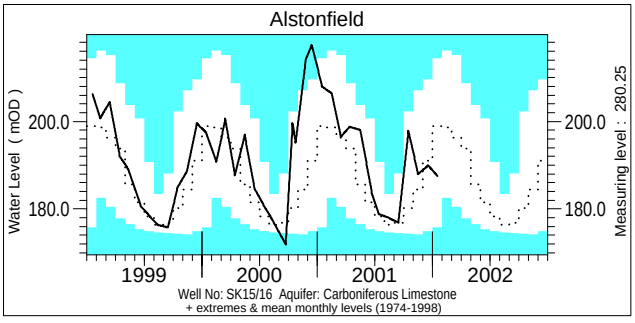












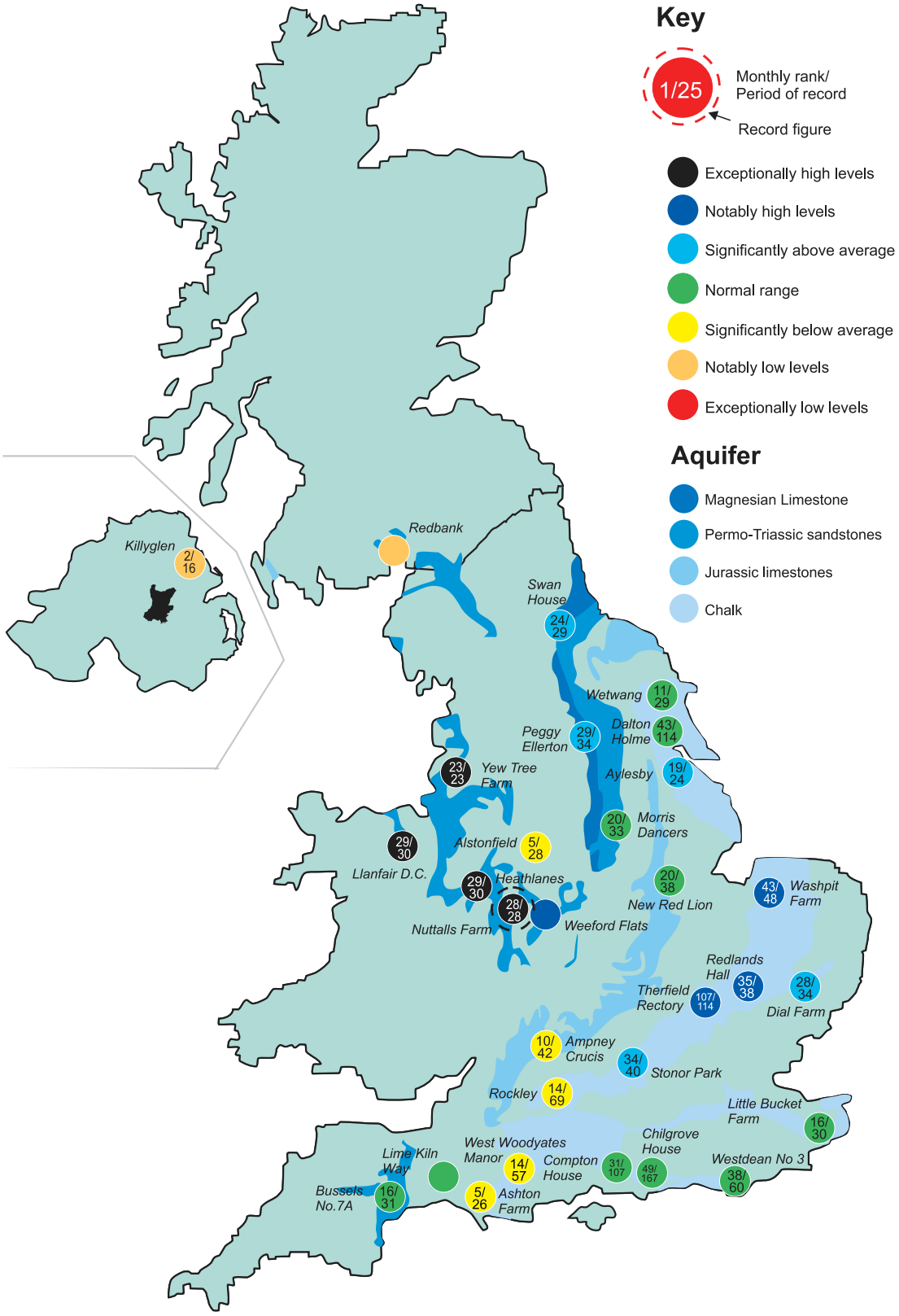
Groundwater levels January 2002 / February 2002

Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.
Dalton Holme	16.08	11/01	17.20	Chilgrove House	50.16	29/01	56.18	Morris Dancers	32.37	25/01	32.39
Washpit Farm	46.00	22/01	43.67	Killyglen	114.66	31/01	116.25	Heathlanes	63.57	18/01	61.88
Stonor Park	79.07	28/01	73.42	New Red Lion	15.21	29/01	14.68	Nuttalls Farm	131.84	15/01	129.37
Dial Farm	25.88	08/01	25.48	Ampney Crucis	102.14	28/01	102.34	Bussels No.7a	24.04	01/02	24.13
Rockley	132.02	28/01	136.30	Redbank	7.76	31/01	8.32	Alstonfield	187.47	15/01	199.66
Little Bucket Farm	68.02	27/01	68.12	Yew Tree Farm	14.30	09/02	13.61				
West Woodyates	86.62	31/01	91.63	Llanfair DC	80.80	01/02	79.91				

Data missing due to access restrictions

Levels in metres above Ordnance Datum

Groundwater . . . Groundwater



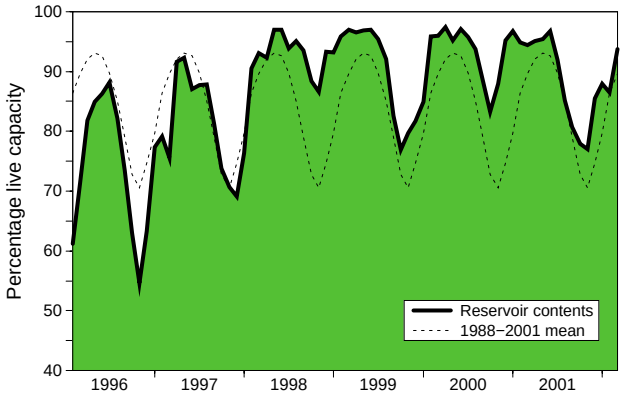
Groundwater levels - January 2002

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.

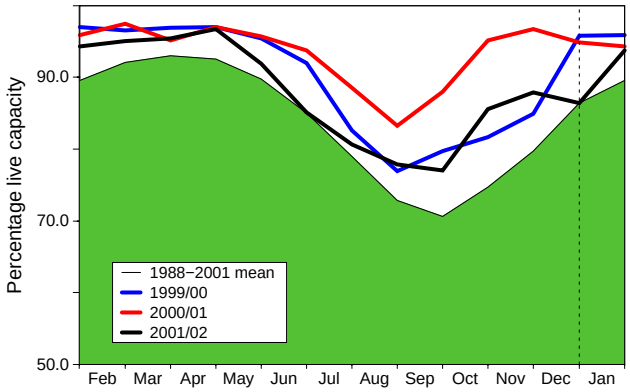
(Note: Redbank is affected by groundwater abstraction)

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.

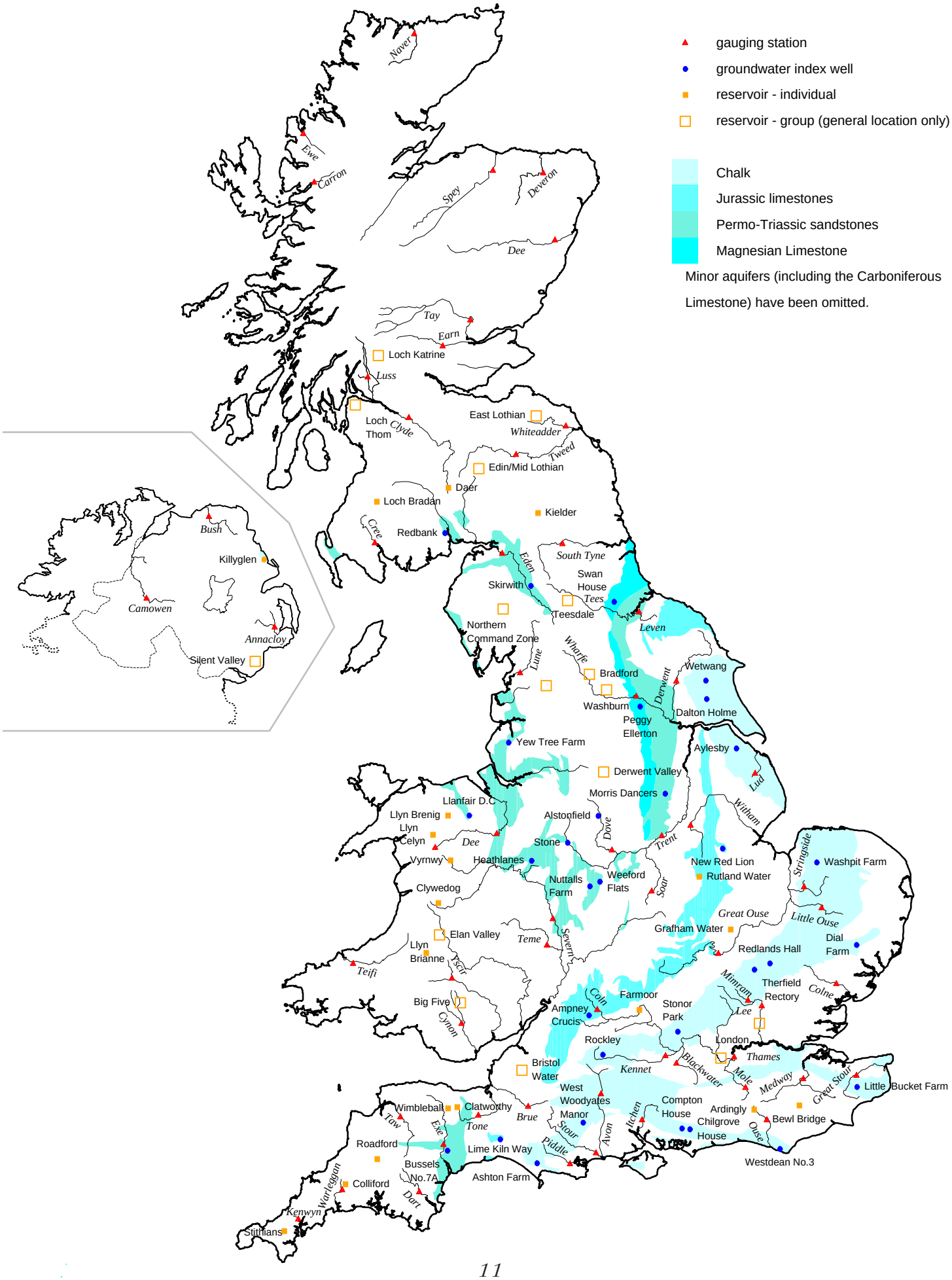
Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2001 Sep	Oct	Nov	Dec	2002 Jan	Feb	Min. Feb	Year* of min
North West	N Command Zone	• 124929	44	44	75	84	84	100	63	1996
	Vyrnwy	55146	74	71	86	91	88	100	45	1996
Northumbrian	Teesdale	• 87936	57	63	96	83	84	99	51	1996
	Kielder	(199175)	(87)	(86)	(80)	(95)	(89)	(100)	85	1989
Severn Trent	Clywedog	44922	46	49	73	100	87	96	62	1996
	Derwent Valley	• 39525	69	81	99	86	100	100	15	1996
Yorkshire	Washburn	• 22035	69	69	89	92	91	95	34	1996
	Bradford supply	• 41407	61	64	86	90	90	99	33	1996
Anglian	Grafham	(55490)	(95)	(95)	(93)	(88)	(88)	(87)	67	1998
	Rutland	(116580)	(80)	(78)	(80)	(81)	(82)	(84)	68	1997
Thames	London	• 202340	91	90	90	87	86	87	70	1997
	Farmoor	• 13830	92	94	92	91	77	79	72	2001
Southern	Bewl	28170	79	72	74	74	75	90	47	1990
	Ardingly	4685	70	67	72	73	86	100	68	1997
Wessex	Clatworthy	5364	54	44	67	72	84	97	62	1989
	Bristol WW	• (38666)	(69)	(60)	(61)	(59)	(61)	(70)	58	1992
South West	Colliford	28540	72	62	60	62	64	72	52	1997
	Roadford	34500	80	73	73	73	72	84	30	1996
	Wimbleball	21320	61	50	52	54	58	76	59	1997
	Stithians	5205	51	37	32	29	33	49	38	1992
Welsh	Celyn and Brenig	• 131155	92	92	94	97	94	100	61	1996
	Brianne	62140	86	86	100	100	94	100	84	1997
	Big Five	• 69762	82	77	97	95	93	99	67	1997
	Elan Valley	• 99106	93	93	100	100	99	100	73	1996
East of Scotland	Edinburgh/Mid Lothian	• 97639	75	70	89	90	89	92	72	1999
	East Lothian	• 10206	90	84	97	100	100	100	68	1990
West of Scotland	Loch Katrine	• 111363	58	55	85	93	88	99	85	2000
	Daer	22412	55	48	91	100	97	100	91	1997
	Loch Thom	• 11840	66	62	84	93	93	100	93	1998
Northern Ireland	Silent Valley	• 20634	59	47	54	43	39	46	46	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.

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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

NATURAL ENVIRONMENT RESEARCH COUNCIL

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