Hydrological Summary for the United Kingdom

General

January was a dull and notably dry month across almost the entire country; the UK rainfall total is the 3rd lowest since 1964. An especially arid episode, from the second week until well into February served to intensify drought conditions in most areas. Consequently most reservoirs reported meagre storage increases but at month-end overall stocks for England and Wales were still only 2% below average, and well above corresponding stocks in 1997 and 1992. Stocks are, however, seasonally depressed in a number of southern reservoirs – the lowest on record (for January) at Bewl Water. The drought's clear regional dimension is further emphasised by the exceptionally low long term runoff accumulations for many rivers in central and southern England; flows in many spring-fed streams are more typical of the mid-summer. In parts of the South-East especially (e.g. the Chilterns), the continuing lack of any substantial winter recharge has left groundwater levels approaching long term minima. Two successive notably dry winters have made for a fragile – but spatially variable – water resources outlook with the prospect of very depressed summer flows and associated stress on the aquatic environment. The window of opportunity for the necessary groundwater replenishment is becoming narrow and significant drought stress is now almost inevitable. To moderate its extent and magnitude, rainfall in excess of 120% of average (about a 1 in 5 chance) is needed over the next 10-12 weeks.

Rainfall

High pressure dominated synoptic patterns throughout January. A few frontal incursions brought significant rainfall, e.g. on the 10th when Capel Curig registered 62mm. Thereafter, most areas reported remarkedly dry conditions - with rainfall totals of <5mm in parts of central southern England over sequences of 30, or more, days. Correspondingly, January rainfall totals were <40% across much of the country, with totals below 20% in a few areas (e.g. the Isle of Wight). More importantly, the last three months have been dry in all regions. For E&W the Nov-Jan period (on average, the wettest 3-month sequence in the year) was the 2nd driest since 1976 (with some eastern and southern catchments reporting only around 50% of average). Last year, the same period was only marginally wetter and, taken together, they closely match 1962-64 as the driest successive Nov-Jan periods since 1932-34. In many catchments the drought began during November 2004 and rainfall deficiencies over the last 15-months exceed 30% in the most severely affected areas - a zone from east Dorset to northern Kent (and extending into the Thames basin). Substantially drier 15-month periods have recorded for E&W (e.g. in 1975/76 & 1933/34) but a distinguishing feature of the current drought is the disproportionate contribution of the winter months to the overall rainfall deficiency. Correspondingly, the impact on reservoir and aquifer replenishment, and on river flows, has been severe in many areas.

River Flow

Modest spate conditions characterised many responsive rivers early in January but sustained and steep recessions better typified flow patterns during the month. With baseflows very moderate and field drains running weakly if at all, flows in many rivers (including the Trent, Cree, Luss and Faughan) were approaching seasonal minima by early February. January runoff totals were well below average in almost all index rivers. In northern Scotland, the Naver reported its lowest January runoff on record but depressed runoff totals were most widespread in southern Britain – below 50% of average in many catchments with river flows more typical of mid summer in the worst affected areas. Importantly however, only in a few cases (e.g. the Mimram and Soar) was runoff less than in January 1997. More revealing in terms of drought



severity are the accumulated runoff totals since October 2004. Across much of E&W (parts of Northern Ireland also) 15-month runoff accumulations are notably low, and unprecedented in this timeframe for a significant minority of southern rivers (from the Medway to the Kenwyn; also the Soar in the Midlands). For the Sussex Ouse, runoff since the beginning of 2005 matches 1975/76 as the lowest for *any* 13-month sequence in a 46-year record. Particular concern focuses on spring-fed streams and rivers where flows, in some cases, have been below average for more than 30 months and should, in a typical year, be approaching their maximum flow. In the absence of a sharp, and much belated, seasonal recovery, very depressed flows are likely in the late summer (with a much diminished stream network).

Groundwater

Rainfall to most outcrop areas was only 30-40% of average in January and, with soil moisture deficits yet to be satisfied across much of the English Lowlands, infiltration rates were again very modest (minimal in many eastern areas). As a consequence, the late autumn seasonal recoveries in groundwater levels, evident in many western and northern index boreholes, have faltered – with declines at some sites reporting late in January (e.g. at West Woodyates and Alstonfield). Of particular concern is the continuing failure of any significant seasonal recovery to be initiated in substantial parts of the central and eastern Chalk outcrop. Horizontal groundwater level hydrograph traces for some index boreholes confirm that, thus far, winter recharge only just matches natural outflows from the aquifer; at other index sites (in both the Chalk and Permo-Triassic sandstones) recessions have continued from 2005. Levels in many Chalk boreholes are seasonally depressed - closely approaching the long term minimum at Stonor, in the Chilterns - but overall storage in the Chalk is greater than in early 1997 and early 1992 (both very severe groundwater drought winters). Groundwater levels in most Limestone and Permo-Triassic outcrops are seasonally low but above drought minima; Morris Dancers in the East Midlands is an exception - reporting its 2nd lowest January level on record. As usual, accelerating evaporation rates are expected to curtail lowland recharge during (or before) the late-spring; this underlines the importance of sustained rainfall in the interim.





British

Rainfall . . . Rainfall . . .



Rainfall accumulations and return period estimates

Area	Rainfall	Jan 2006	Nov 0	5-Jan 06 RP	Aug 0	5-Jan 06 <i>RP</i>	Feb 05	-Jan 06 RP	Nov (94-Jan 06 RP		
England & Wales	mm %	33 37	189 68	5-15	441 85	2-5	788 87	5-10	977 83	10-20		
North West	mm %	62 52	255 69	5-15	638 88	2-5	1066 88	2-5	1416 89	5-10		
Northumbrian	mm %	38 45	184 73	5-10	448 92	2-5	874 101	2-5	1065 95	2-5		
Severn Trent	mm %	21 29	142 64	5-15	352 84	2-5	669 87	5-10	795 80	10-20		
Yorkshire	mm %	29 37	159 65	5-15	390 84	2-5	75 I 90	2-5	906 84	5-15		
Anglian	mm %	17 33	90 55	20-30	279 87	2-5	535 89	2-5	63 I 82	10-20		
Thames	mm %	21 32	132 65	5-15	315 82	2-5	551 79	10-20	667 74	30-45		
Southern	mm %	27 33	141 57	10-20	335 73	5-15	593 76	10-20	730 71	50-80		
Wessex	mm %	23 26	184 68	5-10	390 80	5-10	719 84	5-10	884 79	10-20		
South West	mm %	46 33	316 77	2-5	608 86	2-5	1040 87	5-10	1305 82	10-20		
Welsh	mm %	56 39	332 75	5-10	701 87	2-5	78 88	5-10	1506 84	5-15		
Scotland	mm %	106 68	374 80	5-10	83 I 93	2-5	1444 98	2-5	1997 103	2-5		
Highland	mm %	134 74	495 87	2-5	1056 99	2-5	1798 103	2-5	2597 112	5-15		
North East	mm %	46 45	272 89	2-5	543 92	2-5	1001 97	2-5	1285 96	2-5		
Тау	mm %	91 62	321 79	2-5	686 90	2-5	1234 96	2-5	1633 96	2-5		
Forth	mm %	69 58	235 67	10-20	561 83	5-10	1077 94	2-5	1446 97	2-5		
Tweed	mm %	52 51	206 70	5-15	517 90	2-5	958 96	2-5	1202 93	2-5		
Solway	mm %	102 67	321 72	5-10	766 88	2-5	1304 91	2-5	1748 93	2-5		
Clyde	mm %	140 74	406 73	5-15	955 88	2-5	1641 94	2-5	2305 100	<2		
Northern Ireland	mm %	47 40	234 70	5-10	549 85	2-5	98 I 89	2-5	I 285 90	2-5		
	% = percentage (of 1961-90) average				RP = Return period					

The monthly rainfall figures' provided by the Met Office (National Climate Information Centre) are Crown Copyright and may not be passed on to, or published by, any unauthorised person or organisation. All monthly totals since August 2005 are provisional (see page 12). 1961-2003 regional monthly totals were revised by the Met Office in 2004. Most of the return period estimates are based on tables provided by the Met 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 . . .



November 2005 - January 2006

November 2004 - January 2006

Rainfall accumulation maps

The persistance of a high pressure over the British Isles was a primary factor in the very moderate Nov-Jan rainfall across the UK; provisional data rank it the 5th driest such period since 1964. Rainfall deficiencies were especially notable for the Anglian region - the 2nd driest (after 1988/89) in the last 52 years. The 15-month deficiencies emphasise the regional focus of thecurrent drought but also demonstrate how the region experiencing significant drought conditions has extended through the winter.

River flow ... River flow ...



River flows

*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. Percentages may be omitted where flows are under review.

River flow ... River flow ...



River flow hydrographs

The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to February 2005 (shown by the shaded areas). Daily 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 2005- January 2006, (b) November 2004 - January 2006

	River	%lta	Rank		River	%lta	Rank	River	%lta	Rank	
a)	Forth	63	2/25	b)	Spey (Boat o'Brig)	125	51/53	Test	65	2/47	
	Wharfe	65	3/51	í í	Soar	53	1/34	Stour (Throop)	59	1/32	
	Dover Beck	55	4/31		Thames(naturalised)	59	10/122	Piddle	61	2/40	
	Lee(naturalised)	39	14/121		Mole	53	1/29	Exe	71	2/49	
	Mimram	47	3/52		Medway	31	1/42	Otter	70	1/43	
	Lambourn	56	3/44		Ouse (Gold Bridge)	37	1/39	Kenwyn	67	1/37	
	Cree	70	4/43		Wallington	42	2/48	L Bann	76	1/25	
	Luss	65	2/27		0.1			14			
	Faughan	67	1/30			6		lia = long teriRank 1 = low	n uverage est on rec	r ord	

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.

Groundwater... Groundwater



Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.
Dalton Holme	12.74	16/01	17.19	Chilgrove House	46.62	01/02	56.17	Llanfair DC	79.92	15/12	79.97
Washpit Farm	42.90	06/02	43.79	Killyglen	115.17	30/01	116.21	Morris Dancers	31.67	25/01	32.37
Stonor Park	62.85	31/01	73.67	New Red Lion	12.63	30/01	14.86	Heathlanes	61.05	23/01	61.96
Dial Farm	25.06	09/01	25.50	Ampney Crucis	101.51	31/01	102.33	Nuttalls Farm	128.72	11/01	129.51
Rockley	134.99	31/01	136.27	Newbridge	10.25	01/02	10.77	Bussels No.7a	24.08	25/01	24.12
Little Bucket Farm	61.50	31/01	68.28	Skirwith	130.06	19/01	130.44	Alstonfield	189.20	11/01	198.79
West Woodyates	85.18	31/01	91.64	Brick House Farm	11.27	23/01	12.89	Levels in metres	above Ord	nance D	atum

Groundwater . . . Groundwater



Groundwater levels - January 2006

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.

Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.

ii. Yew Tree Farm levels are now received quarterly.

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)	2005		2006			Avg.	Min.	Year*
			Oct	Nov	Dec	Jan	Feb	Feb	Feb	of min
North West	N Command Zone	• 124929	52	74	90	82	89	92	63	1996
	Vyrnwy	55146	56	82	88	85	91	91	45	1996
Northumbrian	Teesdale	• 87936	73	85	91	93	94	91	51	1996
	Kielder	(199175)	(86)	(98)	(91)	(92)	(93)	(94)	(85)	1989
Severn Trent	Clywedog	44922	70	82	82	86	87	87	62	1996
	DerwentValley	• 39525	55	75	86	92	93	93	15	1996
Yorkshire	Washburn	• 22035	57	69	79	92	85	88	34	1996
	Bradford supply	• 41407	55	65	80	81	82	93	33	1996
Anglian	Grafham	(55490)	(80)	(79)	(81)	(79)	(85)	(86)	(67)	1998
	Rutland	(116580)	(76)	(73)	(73)	(72)	(80)	(85)	(68)	1997
Thames	London	• 202406	65	65	80	87	92	89	70	1997
	Farmoor	• 13822	98	100	99	98	93	92	72	2001
Southern	Bewl	28170	44	39	36	34	37	82	37	2006
	Ardingly	4685	47	44	50	57	65	94	65	2006
Wessex	Clatworthy	5364	53	55	92	99	100	94	62	1989
	Bristol WW	• (38666)	(47)	(47)	(59)	(71)	(76)	(84)	(58)	1992
South West	Colliford	28540	45	46	51	56	60	83	52	1997
	Roadford	34500	53	57	63	68	69	81	30	1996
	Wimbleball	21320	61	62	73	77	84	89	59	1997
	Stithians	5205	41	43	64	74	83	87	38	1992
Welsh	Celyn and Brenig	• 131155	77	87	95	94	96	94	61	1996
	Brianne	62140	82	99	92	97	95	98	84	1997
	Big Five	• 69762	54	75	87	97	97	93	67	1997
	Elan Valley	• 99106	64	83	98	100	98	97	73	1996
Scotland(E)	Edinburgh/Mid Lothian	• 97639	72	80	94	93	95	93	72	1999
	East Lothian	• 10206	66	72	93	93	100	97	68	1990
Scotland(W)	Loch Katrine	• 111363	81	95	88	82	94	93	85	2000
	Daer	22412	69	100	98	97	100	99	91	1997
	Loch Thom	• 11840	87	87	100	100	100	98	90	2004
Northern	Total⁺	• 67270	65	80	85	92	90	89	75	2002
Ireland	Silent Valley	• 20634	64	82	92	99	94	82	46	2002
() figures in parent	heses relate to gross storage	 denotes reservoir 	groups	*e	xcludes L	ough N	eagh	*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 storage figures relate to the 1988-2006 period only (except for West of Scotland and Northern Ireland where data commence in the mid-1990's). 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 (NHMP) 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 Environment Agency, the Environment Agency Wales, the Scottish Environment Protection Agency and, for Northern Ireland, 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, Scottish Water 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 (see 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. A significant number of additional monthly raingauge totals are provided by the EA and SEPA to help derive the contemporary regional rainfalls. Revised monthly national and regional rainfall totals for the post-1960 period (together with revised 1961-90 averages) were made available by the Met Office in 2004; these have been adopted by the NHMP. As with all regional figures based on limited raingauge networks the monthly tables and accumulations (and the return periods associated with them) should be regarded as a guide only.



*MORECS is the generic name for the Met 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 E-mail: nwamail@ceh.ac.uk

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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