Hydrological Summary
for the United Kingdom

May 2010

General

The continuing dearth of rain-bearing Atlantic frontal systems resulted in a notably dry May and, more significantly, increased medium term rainfall deficiencies across most of the country. For the UK as a whole, the provisional January-May rainfall total is the lowest since 1964 with exceptional deficiencies across parts of western Britain. The very limited rainfall, through the spring particularly, is reflected in current reservoir stocks. Overall stocks for England &Wales remain around 85% of capacity (about 5% below average) but this still represents the lowest overall early-June stocks since 1991. Stocks are generally well within the normal range in the English Lowlands but are seasonally low in index reservoirs from central Wales to parts of western Scotland, and the lowest for early June since the 1984 drought in a group major reservoirs in north-west England. River flow recessions through the late spring have been exceptionally steep and flows approached seasonal minima in many impermeable catchments towards the end of May (increasing stress on the aquatic environment). Generally, groundwater resources are much less vulnerable to a dry spring and, with groundwater levels near-average across most major aquifer outcrop areas, groundwater will have an important role in moderating drought impacts in the event of meagre rainfall through the summer.

Rainfall

With high pressure to the west of British Isles, synoptic patterns during much of May favoured winds from the northerly quadrant – resulting in seasonally cold and dry conditions, but the ingress of sub-tropical air in the third week triggered a short heat-wave and, as high pressure declined, an unsettled end to the month. After a wet start to May – Hampstead, in London, registering 67mm over the first two days – many areas recorded <5mm of rain over periods of three weeks or more. Several Atlantic frontal systems brought very welcome rainfall around the month end. It was the driest May since 1991 for the UK as a whole; rainfall totals exceeded the average in parts of eastern Scotland but most totals were in the 30-70% range declining to <25% in parts of Yorkshire and the north Midlands. The very limited rainfall, together with overnight frosts, caused local problems for farmers and growers. Rainfall for the spring (March-May) was also well below average, particularly in northern England, the Yorkshire Region recorded its 2nd driest spring since 1974, but the most significant deficiencies in a water resources context have built up since last November (which was outstandingly wet). Rainfall for the year thus far is the 2nd lowest in 35 years for England & Wales with the most significant deficiencies in the west: the North West and Welsh regions recorded their lowest January-May rainfall since 1929 and 1976 respectively. Substantial 5/6 month rainfall deficiencies also characterise much of western Scotland.

River Flow

Mostly minor spates were common at the beginning and the end of May but sustained recessions dominated river flow patterns; in some areas recessions extended over seven weeks by month-end. River flows were very depressed during the fourth week of the month and approaching seasonal minima in many river basins (including the Ribble, Forth, S Tyne, Welsh Dee and Clyde). Estimated runoff from the UK was the lowest for May since 1980; the associated contraction in the river network was substantial in many impermeable catchments. The spatial variability in current hydrological stress is well captured in the runoff maps featured on page 4. Helped by healthy baseflow contributions (in permeable catchments), May runoff totals were mostly near-average in south-eastern Britain but, elsewhere, runoff in most rivers was notably low (the Eden registered its lowest May runoff in a series from 1967). This spatial pattern is broadly replicated for runoff over the year thus far, and the sustained nature of the low flows is emphasised by the number of index rivers for which the Jan-May runoff is the lowest on record. Current flows in these rivers are generally above drought minima (e.g. those registered in the summers of 1976 and 1984) but with very little groundwater contribution, significant early summer rainfall is needed to moderate recession rates.

Groundwater

Most major outcrop areas received less than 60% of their average May rainfall and, although well below average temperatures moderated evaporative demands, soil moisture deficits still increased substantially over the month. Entering June, deficits were well above average (by 30-60mm across much of England) and soils across much of the Chalk outcrop were at their driest for the start of summer since 1997. Correspondingly, there was minimal infiltration during May and groundwater levels continued their seasonal decline. The impact of spring drought conditions is clearly evident in some responsive boreholes (e.g. Newbridge and Killyglen, where levels approached May minima) but, generally, groundwater levels are following a fairly typical recession. Most early summer levels in index wells and boreholes are well within the normal range; this, in part, reflects the continuing benefit of abundant recharge in the late autumn of 2009. A broad distinction can be drawn between the more responsive aquifers (e.g. the Carboniferous Limestone) where levels are considerably below average and the more sluggishly responding aquifers (e.g. much of the eastern Chalk) where groundwater status is healthier. It would need extreme rainfall (as in the 2007) to trigger any further significant recharge to the major aquifers this summer but, in the event of a dry summer, the benefits of groundwater, in both water resources and environmental terms, will be well demonstrated.

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

Percentages are from the 1971-2000 average.

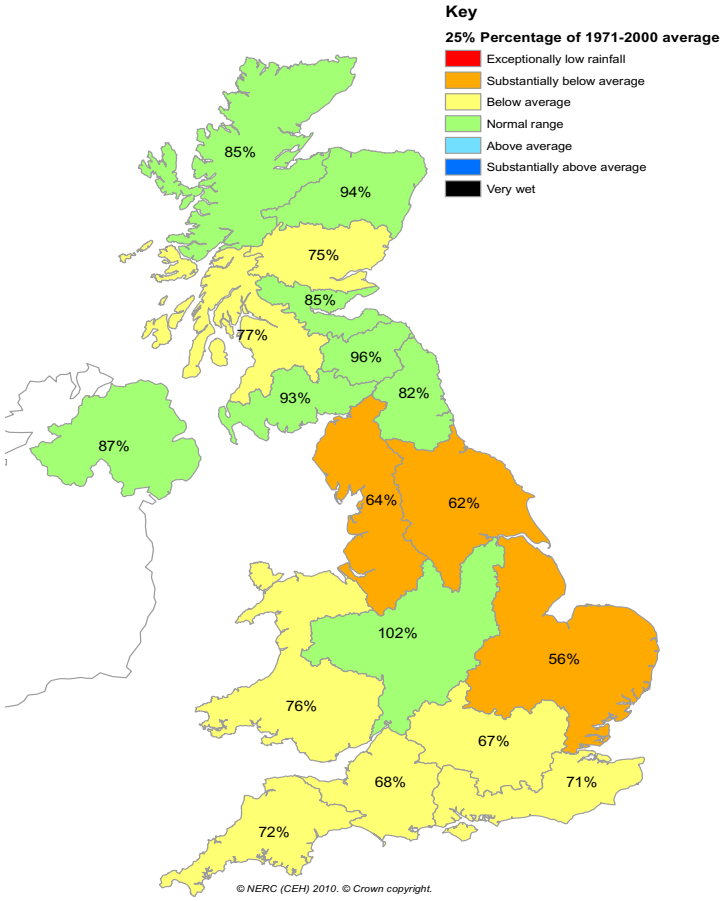
Area	Rainfall	May 2010	Mar10 - May10	RP	Jan10 - May10	RP	Sep09 - May10	RP	Jun09 - May10	RP
England & Wales	**mm**	**34**	**128**		**270**		**672**		**938**	
	%	**59**	**68**	**5-15**	**78**	**5-10**	**95**	**2-5**	**105**	**2-5**
North West	mm	**29**	149		266		831		1208	
	%	**43**	64	10-20	60	70-100	90	2-5	103	2-5
Northumbrian	mm	**32**	153		294		696		1009	
	%	**55**	82	2-5	90	2-5	108	2-5	121	5-10
Severn Trent	mm	**32**	106		217		503		758	
	%	**59**	63	10-20	73	10-20	86	2-5	100	<2
Yorkshire	mm	**19**	112		252		612		865	
	%	**35**	62	10-20	79	5-10	97	2-5	106	2-5
Anglian	mm	**23**	77		201		432		607	
	%	**50**	56	10-20	88	2-5	96	2-5	101	2-5
Thames	mm	**35**	105		250		560		738	
	%	**65**	67	5-10	91	2-5	103	2-5	105	2-5
Southern	mm	**30**	114		301		734		870	
	%	**60**	71	5-10	101	2-5	117	5-10	111	2-5
Wessex	mm	**33**	123		274		673		914	
	%	**58**	68	5-10	80	2-5	97	2-5	106	2-5
South West	mm	**48**	170		368		900		1239	
	%	**70**	72	5-10	76	5-10	91	2-5	103	2-5
Welsh	mm	**61**	199		361		988		1382	
	%	**82**	76	5-10	70	25-40	92	2-5	105	2-5
Scotland	**mm**	**51**	**240**		**411**		**1072**		**1499**	
	%	**69**	**84**	**2-5**	**72**	**5-10**	**91**	**2-5**	**104**	**2-5**
Highland	mm	**59**	284		462		1189		1622	
	%	**76**	85	2-5	68	5-10	84	2-5	95	2-5
North East	mm	**61**	191		389		944		1268	
	%	**98**	94	2-5	106	2-5	126	20-35	134	40-60
Tay	mm	**44**	196		367		986		1378	
	%	**60**	75	5-10	70	5-15	95	2-5	109	2-5
Forth	mm	**39**	197		350		867		1239	
	%	**58**	85	2-5	78	2-5	95	2-5	109	2-5
Tweed	mm	**34**	198		355		840		1202	
	%	**52**	96	2-5	94	2-5	112	2-5	126	10-20
Solway	mm	**48**	259		403		1092		1644	
	%	**63**	93	2-5	74	5-10	96	2-5	117	10-20
Clyde	mm	**41**	254		421		1190		1726	
	%	**51**	77	2-5	62	10-20	84	2-5	100	<2
Northern Ireland	**mm**	**45**	**203**		**348**		**801**		**1159**	
	%	**66**	**87**	**2-5**	**79**	**5-10**	**92**	**2-5**	**104**	**2-5**

% = percentage of 1971-2000 average *RP = Return period*

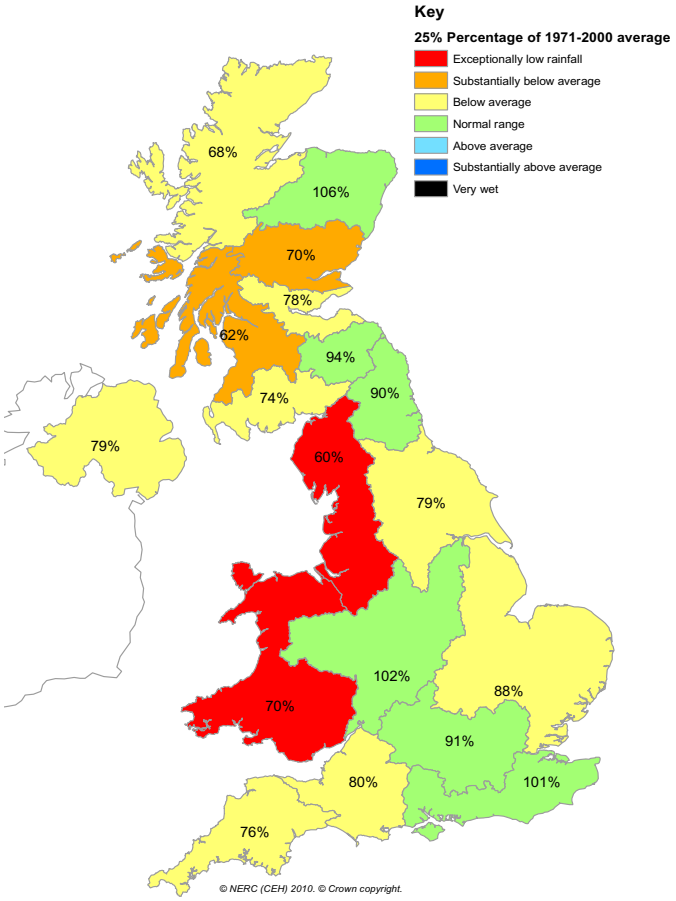
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and derived following the method described in: Tabony, R. C. 1977, *The variability of long duration rainfall over Great Britain*. Met Office Scientific Paper no. 37. The estimates reflect climatic variability since 1913 and assume a stable climate. The timespans featured do not purport to represent the critical periods for any particular water resource management zone. For hydrological or water resources assessments of drought severity, river flows and/or groundwater levels normally provide a better guide than return periods based on regional rainfall totals. All monthly rainfall totals since December 2009 are provisional.

Rainfall . . . Rainfall . . .

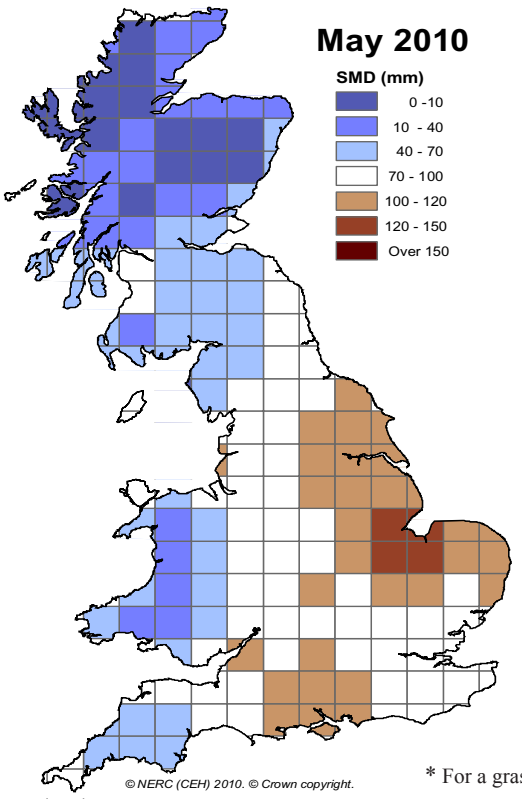
March - May 2010



January - May 2010



MORECS Soil Moisture Deficits *



* For a grass cover

Met Office Weather forecast

Updated: 1224 on Thu 10 June 2010

UK Outlook for Tues 15 June to Thurs 24 June 2010:

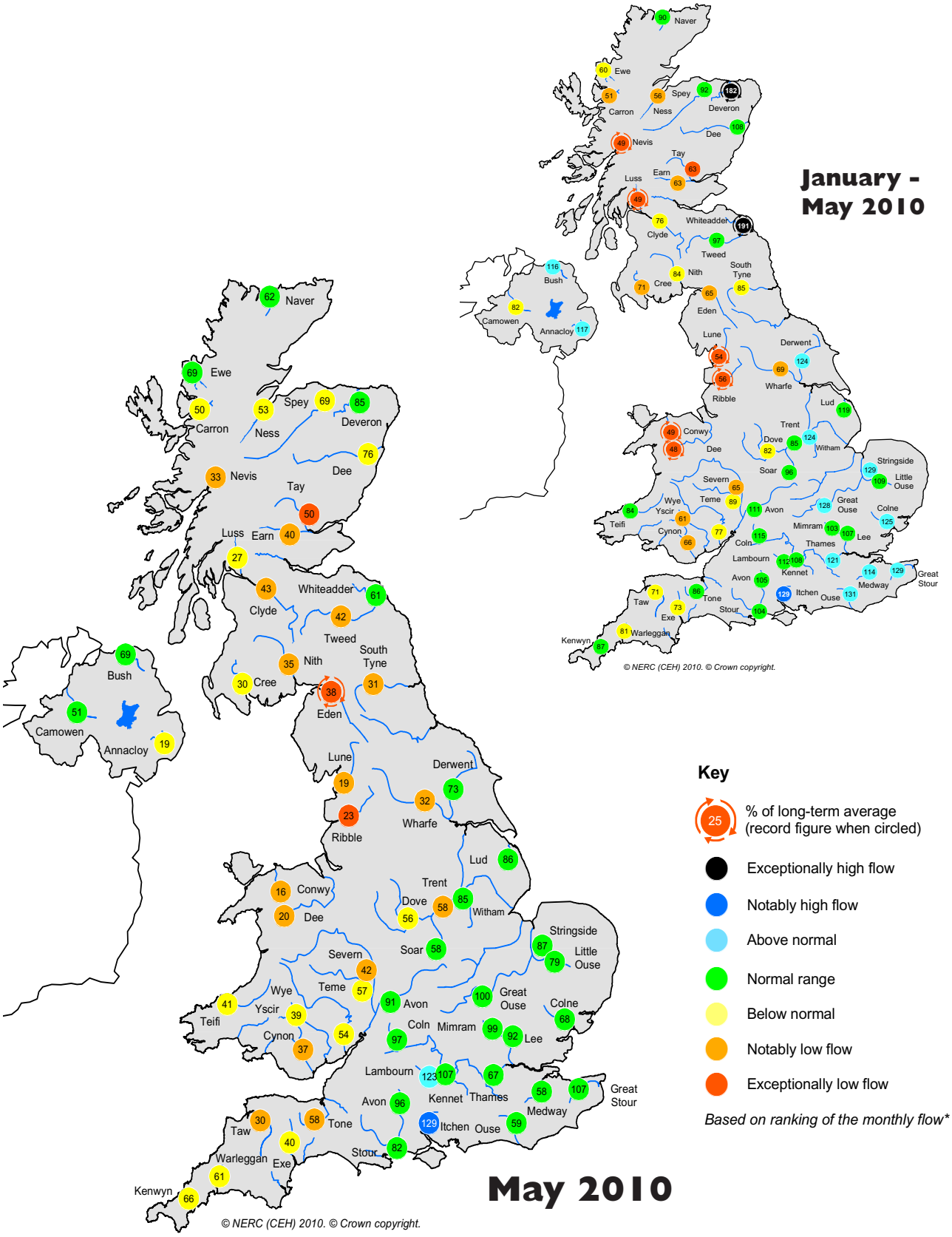
Most areas will be generally dry with bright or sunny spells at first, despite a low risk of rain in the southeast. More cloud is expected for the far north of Scotland with occasional rain or showers. This will gradually spread southwards, reaching Northern England and Wales by Saturday and bringing a risk of some rain or showers here also. From then on, indications suggest generally settled weather towards the south and east, with a higher chance of cloud and showery rain further north and west. Winds are expected to be generally light or moderate throughout, though perhaps fresh or strong at times in the north. Temperatures look to be around or slightly below average, but becoming rather warm in sunny periods in the south later.

UK Outlook for Fri 25 June to Fri 9 July 2010:

Indications continue to show a mixture of drier and brighter interludes but still with a signal of more unsettled weather at times. Rainfall and sunshine amounts are therefore expected to be around average throughout the period. Temperatures should be near or slightly below normal, but perhaps slightly above in parts of southern and eastern England.

For further details please visit:
http://www.metoffice.gov.uk/weather/uk/uk_forecast_alltext.html

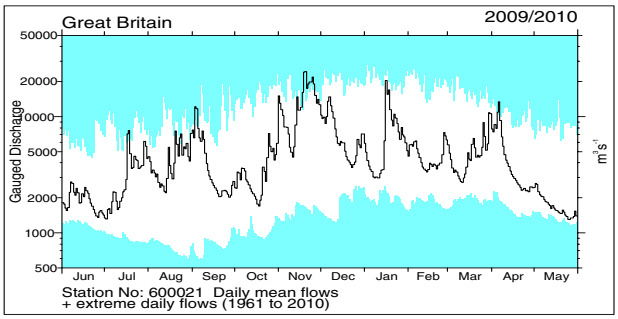
River flow . . . River flow . . .

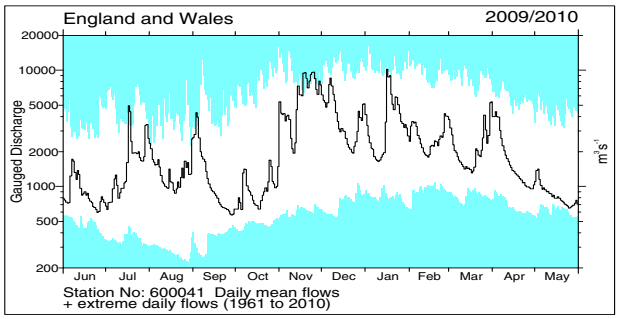


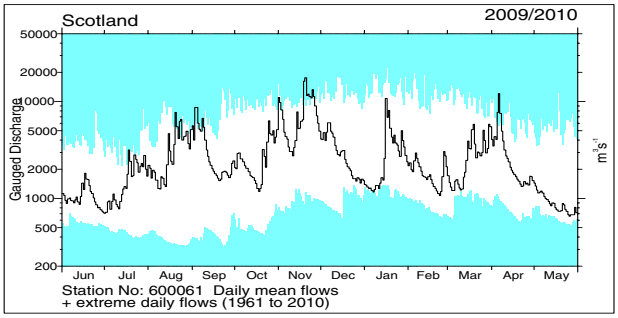
River flows

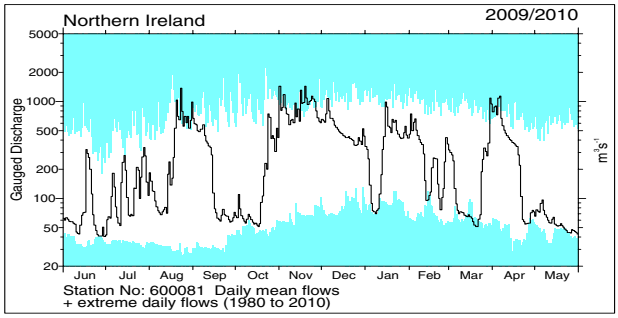
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

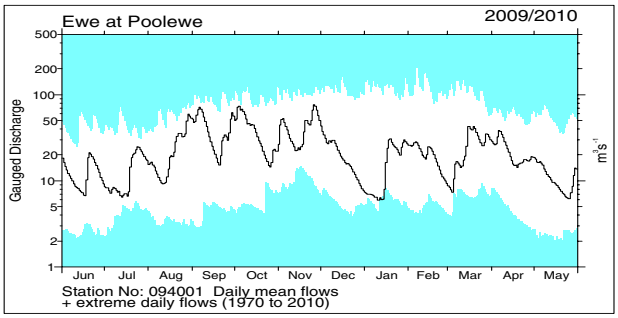
River flow . . . River flow . . .

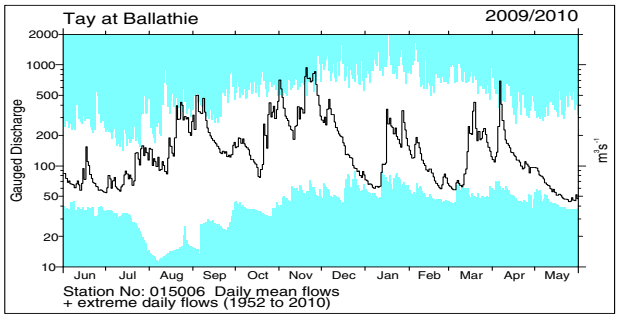


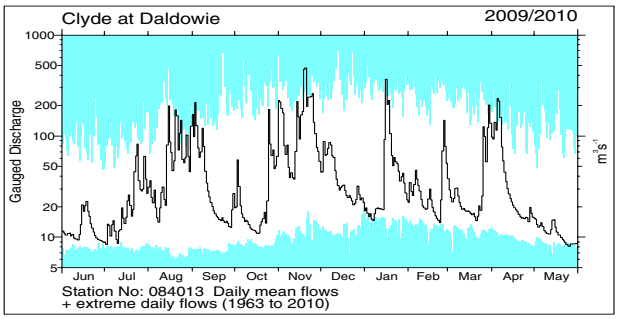


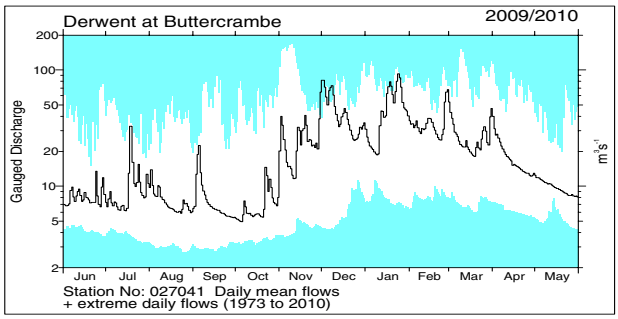


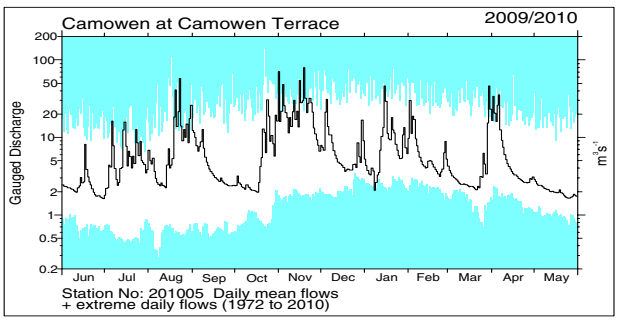


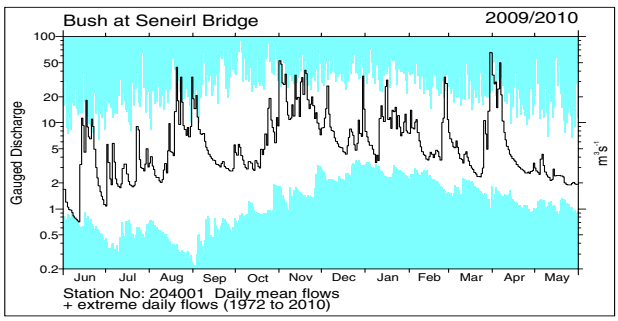








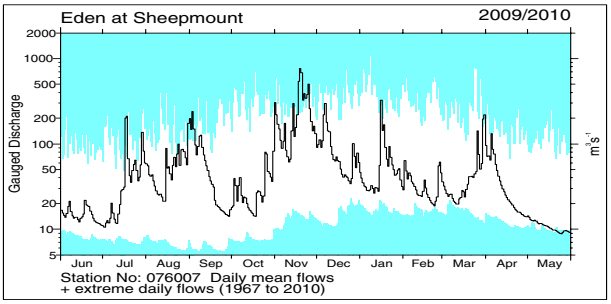


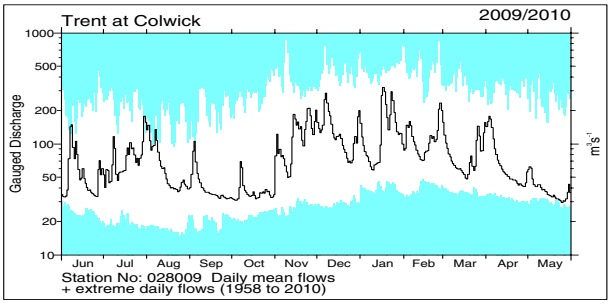


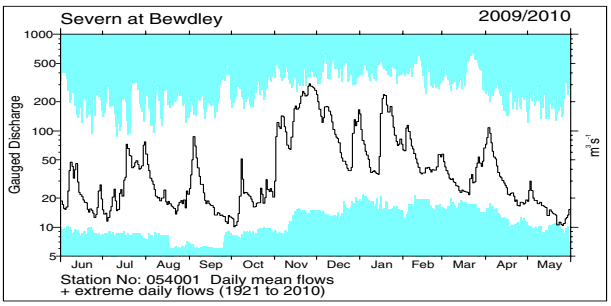
River flow hydrographs

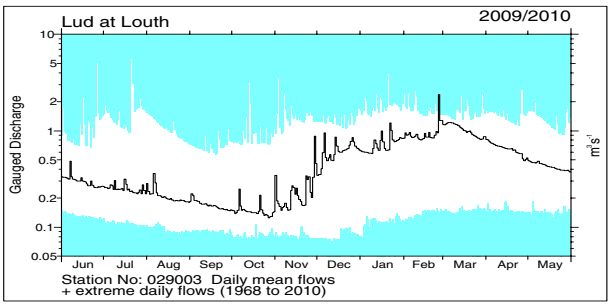
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to June 2009 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

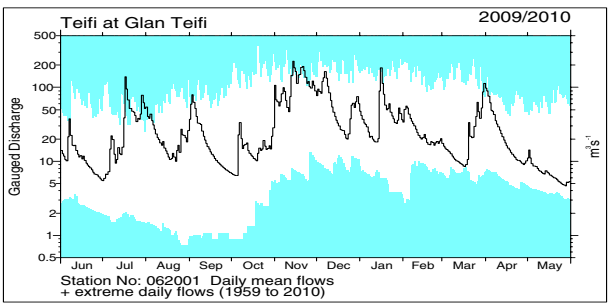
River flow . . . River flow . . .

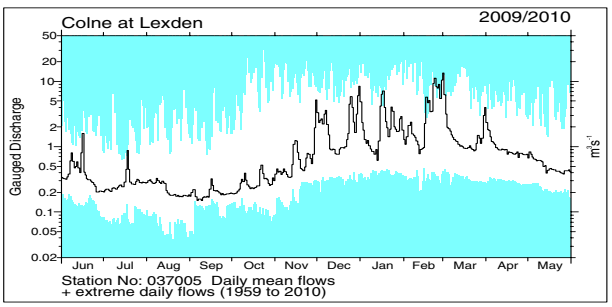


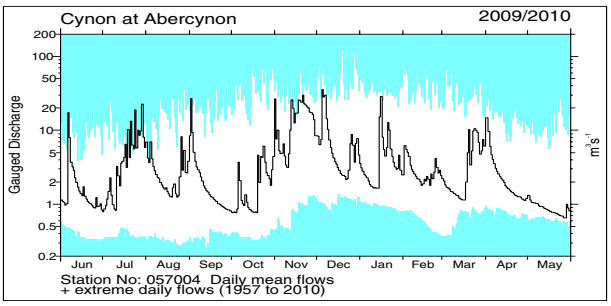


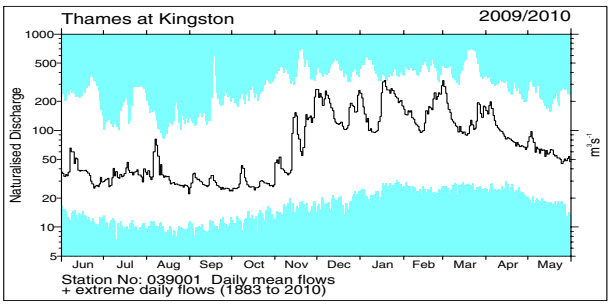


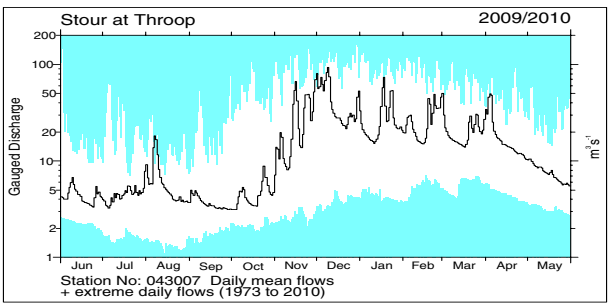


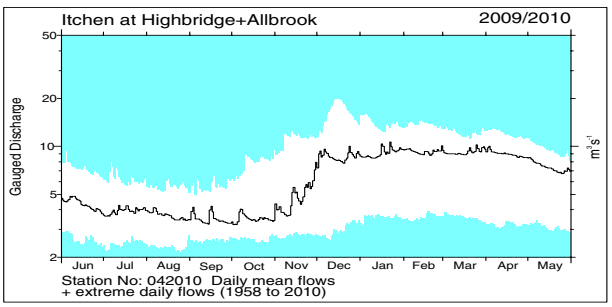












Notable runoff accumulations (a) January - May 2010, (b) June 2009 - May 2010

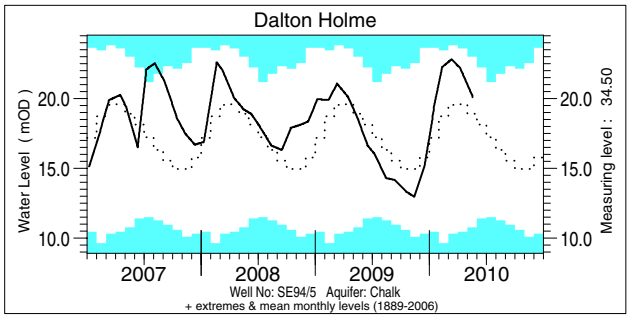
	River	%lta	Rank
a)	Ness	56	4/38
	Deveron	182	50/50
	Tay	63	2/58
	Tyne (Spilmersford)	189	46/46
	Whiteadder	191	41/41
	Wharfe	69	4/55
	Yscir	61	2/38
	Tawe	69	3/51
	Tywi	70	4/52
	Conwy	49	1/43

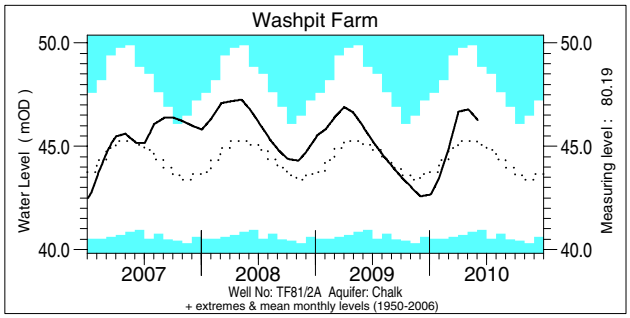
	River	%lta	Rank
a)	Dee (New Inn)	48	1/41
	Ribble	56	1/50
	Lune	54	1/50
	Eden	65	4/43
	Luss	49	1/33
	Nevis	49	1/28
	Carron	51	4/32
	Mourne	70	4/28

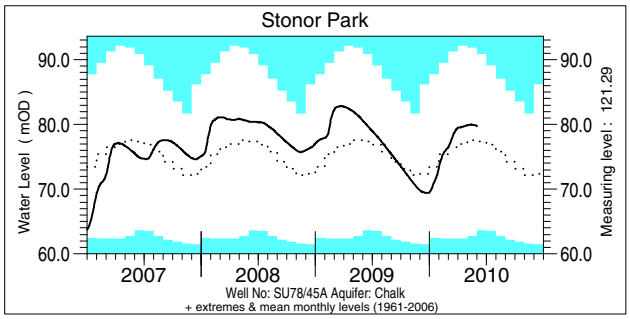
	River	%lta	Rank
b)	Dee (Park)	124	33/37
	Tweed (Norham)	129	48/50
	Dover Beck	145	31/34
	Mole	135	32/35
	Teifi	120	44/48
	Bush	121	31/35
	Annacloy	125	27/30

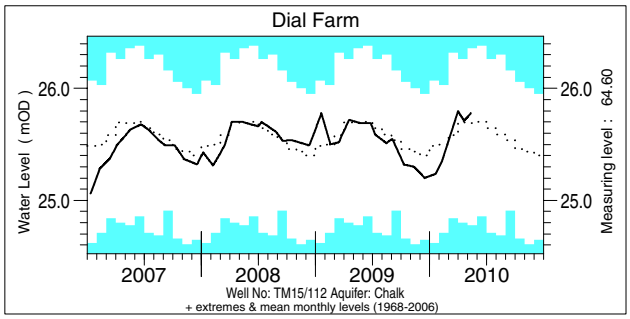
lta = long term average
Rank 1 = lowest on record

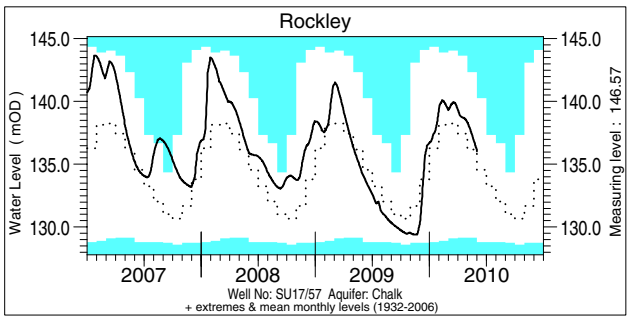
Groundwater . . . Groundwater

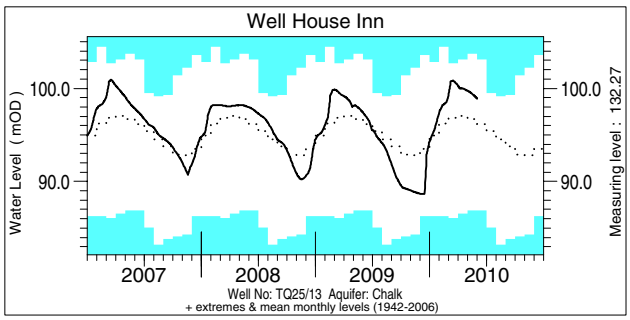


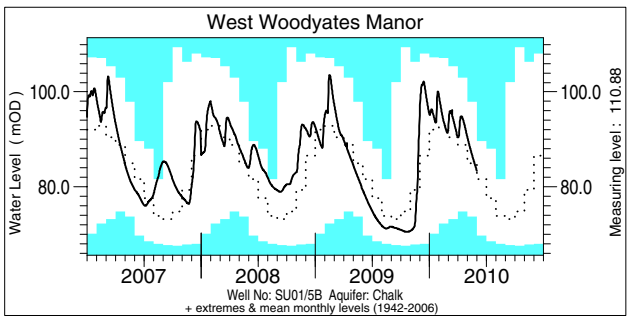


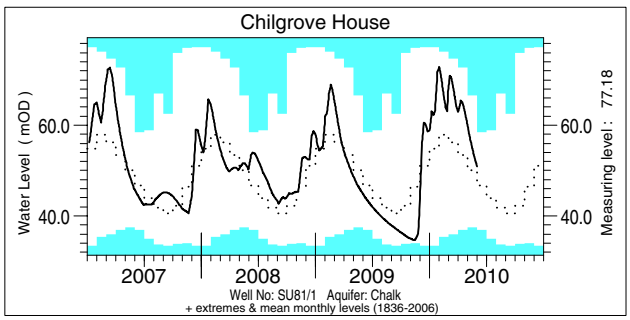


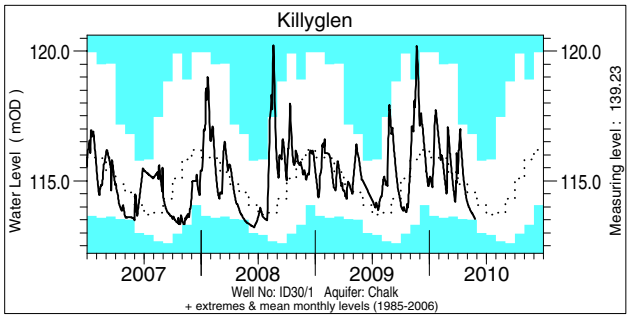


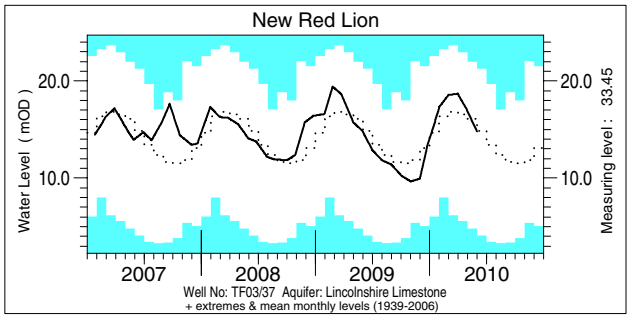






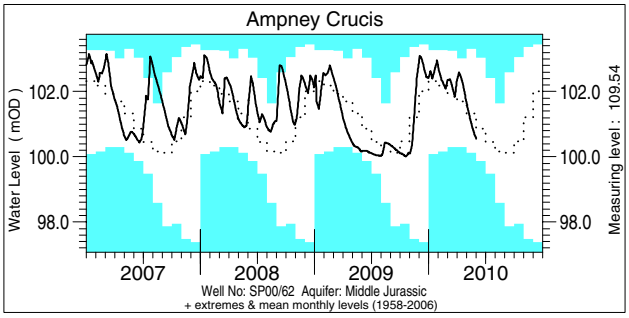


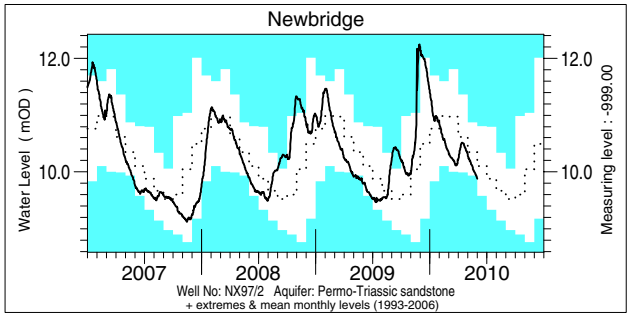


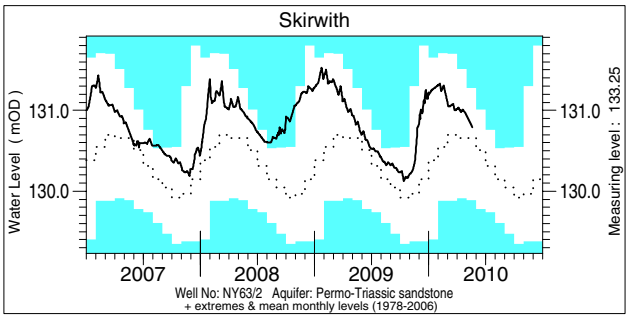


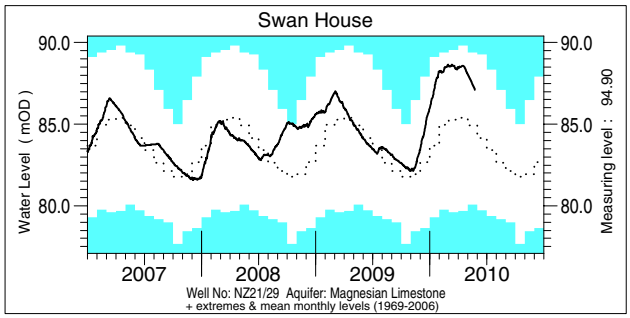
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined below overlying impermeable strata. The monthly mean and the highest and lowest levels recorded for each month 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.

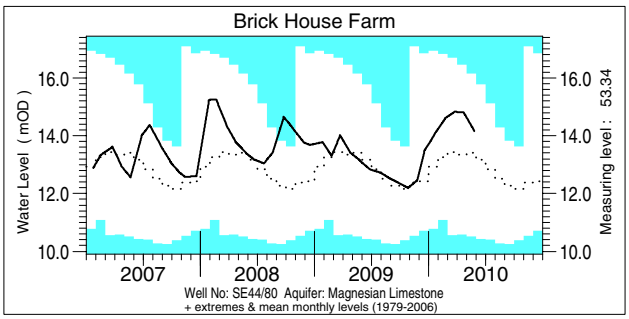
Groundwater . . . Groundwater

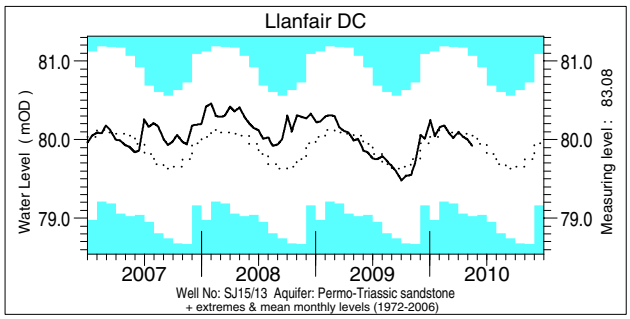


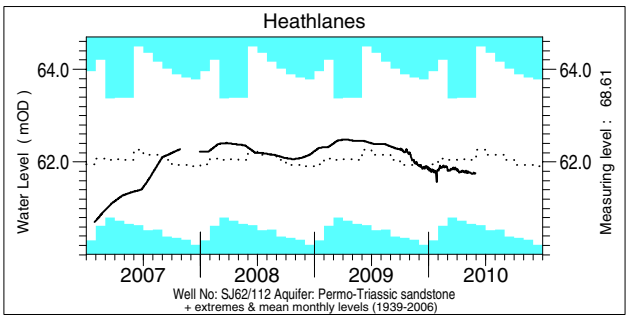


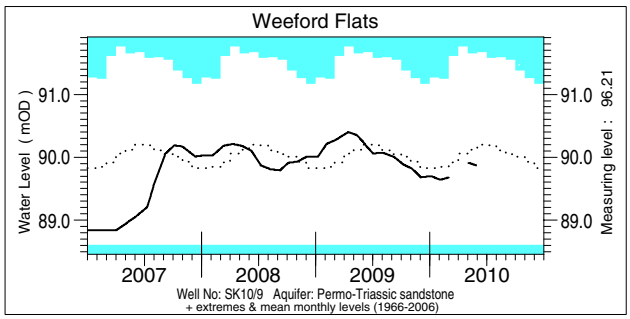


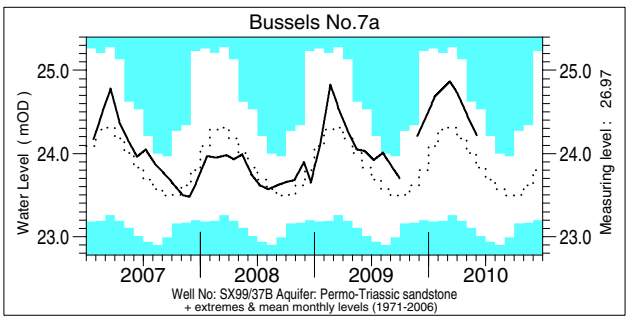


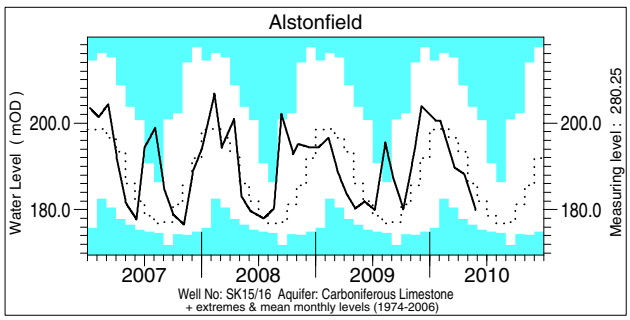












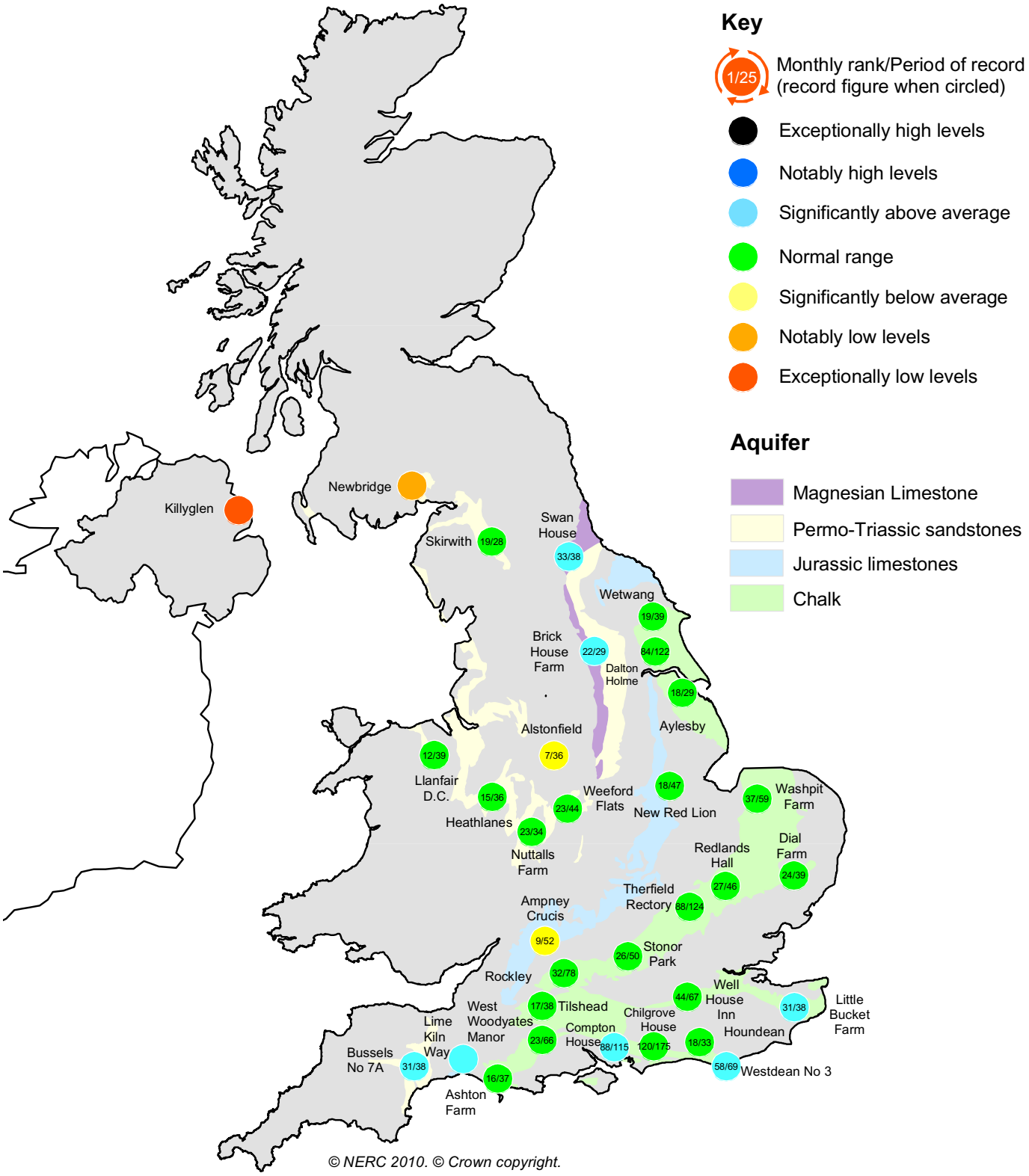
Groundwater levels May / June 2010

Borehole	Level	Date	May av.
Dalton Holme	20.10	18/05	18.95
Washpit Farm	46.27	02/06	45.51
Stonor Park	79.75	01/06	78.02
Dial Farm	25.78	12/05	25.69
Rockley	136.05	01/06	136.18
Well House Inn	98.86	01/06	97.05
West Woodyates	83.41	31/05	84.56

Borehole	Level	Date	May av.
Chilgrove House	50.89	31/05	48.95
Killyglen (NI)	113.52	26/05	114.49
New Red Lion	14.76	31/05	15.72
Ampney Crucis	100.56	01/06	101.24
Newbridge	9.88	31/05	10.26
Skirwith	130.79	19/05	130.61
Swan House	87.10	24/05	84.89

Borehole	Level	Date	May. av.
Brick House Farm	14.15	26/05	13.29
Llanfair DC	79.92	15/05	79.98
Heathlanes	61.76	29/05	62.05
Weeford Flats	89.87	28/05	89.94
Bussels No.7a	24.22	02/06	24.00
Alstonfield	179.94	26/05	186.34

Levels in metres above Ordnance Datum



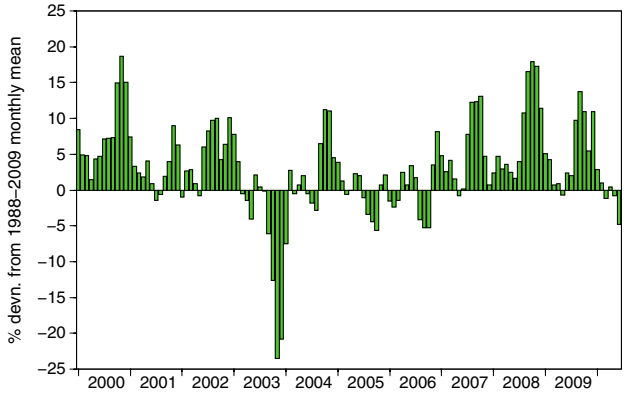
Groundwater levels - May 2010

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.

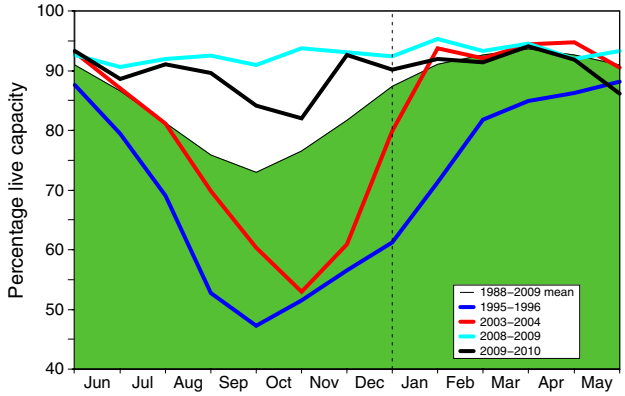
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.

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)	2010 Apr	May	Jun	Jun Anom.	Min Jun	Year* of min	2009 Jun	Diff 10-09
North West	N Command Zone	•	124929	82	82	**66**	-17	**66**	**2010**	89	-17
	Vyrnwy		55146	92	90	**79**	-10	72	1990	85	-10
Northumbrian	Teesdale	•	87936	96	85	**74**	-12	64	1991	92	-12
	Kielder		(199175)	(93)	(88)	**(87)**	-5	85	1989	94	-5
Severn Trent	Clywedog		44922	92	96	**95**	-2	83	1989	100	-2
	Derwent Valley	•	39525	100	94	**80**	-8	56	1996	84	-8
Yorkshire	Washburn	•	22035	95	87	**80**	-7	72	1990	88	-7
	Bradford supply	•	41407	99	89	**77**	-9	70	1996	87	-9
Anglian	Grafham		(55490)	(92)	(93)	**(91)**	-3	72	1997	94	-3
	Rutland		(116580)	(94)	(92)	**(90)**	-1	75	1997	87	-1
Thames	London	•	202828	92	93	**96**	3	83	1990	99	3
	Farmoor	•	13822	85	97	**92**	-5	90	2002	95	-5
Southern	Bewl		28170	100	100	**94**	7	57	1990	84	7
	Ardingly		4685	100	100	**100**	1	96	1990	98	1
Wessex	Clatworthy		5364	100	99	**87**	1	67	1990	78	1
	Bristol WW	•	(38666)	(96)	(95)	**(86)**	-3	70	1990	85	-3
South West	Colliford		28540	99	99	**94**	9	52	1997	100	9
	Roadford		34500	92	92	**88**	4	48	1996	91	4
	Wimbleball		21320	99	98	**90**	-1	76	1992	90	-1
	Stithians		4967	100	95	**81**	-5	66	1990	94	-5
Welsh	Celyn and Brenig	•	131155	100	99	**93**	-4	82	1996	100	-4
	Brianne		62140	99	97	**89**	-7	85	1995	99	-7
	Big Five	•	69762	98	93	**83**	-7	70	1990	90	-7
	Elan Valley	•	99106	95	94	**86**	-9	85	1990	99	-9
Scotland(E)	Edinburgh/Mid Lothian	•	97639	94	97	**95**	5	52	1998	97	5
	East Lothian	•	10206	100	100	**99**	3	84	1990	97	3
Scotland(W)	Loch Katrine	•	111363	74	80	**70**	-18	66	2001	98	-18
	Daer		22412	94	97	**85**	-6	70	1994	99	-6
	Loch Thom	•	11840	83	83	**98**	7	74	2001	96	7
Northern Ireland	Total+	•	56920	99	92	**82**	-3	69	2008	95	-3
	Silent Valley	•	20634	100	91	**82**	2	56	2000	91	2

() figures in parentheses relate to gross storage • denotes reservoir groups +excludes Lough Neagh *last occurrence

Details of the individual reservoirs in each of the groupings listed above are available on request. The percentages given in the Average and Minimum storage columns relate to the 1988-2009 period 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.
The London total has been revised to 202828 Ml as of April 2010.

Location map . . . Location map

National Hydrological Monitoring Programme

The National Hydrological Monitoring Programme (NHMP)[#] is undertaken jointly by the Centre for Ecology & Hydrology (CEH) 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 Northern Ireland Environment Agency. 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 Northern Ireland Water.

The National River Flow Archive (maintained by CEH) 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.
The monthly rainfall figures are provided by the Met Office (National Climate Information Centre) and are Crown Copyright and may not be passed on to, or published by, any unauthorised person or organisation.

[*]MORECS is the generic name for the Met Office services involving the routine calculation of evaporation and soil moisture throughout Great Britain.
[#] Instigated in 1988

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

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Selected text and maps are available on the WWW at
http://www.ceh.ac.uk/data/nrfa/index.html
Navigate via Water Watch

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