Hydrological Summary
for the United Kingdom

August 2010

General

August was a dull and relatively cool month across much of the country with most rain-bearing weather systems favouring tracks across southern Britain. As a consequence, the highest percentage rainfall totals were generally registered in those southern and eastern regions with the largest spring-early summer rainfall deficiencies. Drought conditions have eased markedly through the late summer but rainfall deficiencies remain significant in some regions (e.g. Yorkshire and parts of western Scotland). Aided by seasonally moderate evaporation losses and water demand, reservoir stocks fell less than is normally the case in August, leaving overall stocks for England & Wales close to the early September average. Nonetheless stocks in a few reservoirs (including Loch Katrine and Clatworthy) remain relatively depressed. Seasonal river flow recessions were generally reversed during the latter half of the month and Flood Watches were relatively common (for the late summer) in the fourth week. Soil moisture deficits declined steeply across most major aquifer outcrop areas and some very localised infiltration was reported. Generally however, groundwater levels continued a gentle seasonal decline; late-summer levels were mostly below average but well within the normal seasonal range. The above average summer rainfall has substantially moderated drought stress and, with soils now relatively moist, it has provided a convincing foundation for a continuing recovery in river flow and groundwater recharge rates through the autumn – but rainfall amounts over the next two months will be crucial in translating the anticipated recovery into a reality.

Rainfall

Low pressure dominated synoptic patterns during August, most evidently in southern Britain where there was a distinct autumnal complexion to the weather. Daily rainfall totals >25mm were common, some being associated with particularly intense local storms (e.g. at Haywards Heath on the 4th when 40mm was recorded in around an hour). From the 22-30th a notably wet sequence of days produced rainfall totals exceeding the August average over much of the English Lowlands. Oxford registered its highest August rainfall in a series from 1767 and monthly totals reached three times the August average in a few localities (mostly in East Anglia). By contrast, some northern regions of the UK were relatively dry. The August rainfall total fell below 60% of average in much of Northern Ireland and some coastal districts of western Britain. Despite the arid conditions in June, summer (June-August) rainfall was above average for almost all regions, adding to a notable cluster of wet summers for England & Wales – the 2007-2010 period boasts the wettest 4-year sequence of summers on record (in the Met Office national series which begins in 1914). The wet late-summer has considerably moderated medium term rainfall deficiencies but residual deficiencies are still considerable in parts of western Scotland and northern England; for the North West region, the January-August rainfall was the 2nd lowest since 1984.

River Flows

August began with river flow recessions re-established following the July spates but, in most areas these were reversed, albeit temporarily, around mid-month. Flows were particularly notable in responsive rivers across much of southern Britain: the Bedford Ouse and Warwickshire Avon registered their highest August daily flows since 1980 and 1986 respectively. There were few significant floodplain inundations but Flood Watches were common over the five days beginning on the 23rd. During the latter half of the month particularly, rainfall intensities often exceeded the infiltration capacities of the soils – resulting in significant surface runoff and flash-flooding in urban areas (e.g. in Aberdeen, Herne Bay and Port Talbot); the associated transport disruption was considerable. Estimated outflows from England & Wales for August were below average (for the seventh successive month) but still well within the normal range – a characteristic that is replicated in catchments across a large part of the country. Low runoff rates persisted in a few catchments (e.g. the Annacloy in Northern Ireland) but, generally, the drought's impact is now most evident in runoff accumulations for the year thus far. Estimated January-August outflows for Great Britain are the 7th lowest in the 50-year national series and the lowest on record for several western rivers (including the Ribble and Luss).

Groundwater

August rainfall was exceptionally high across many major aquifer outcrop areas but generally served only to reduce soil moisture deficits – which had been exceptionally large in the early summer. Appreciable infiltration was confined to a few localities, manifesting itself as slight increases in groundwater levels in a few responsive wells and boreholes (e.g. at Ampney Crucis in the Cotswolds). August groundwater levels fell close to seasonal minima in a few index wells and boreholes (e.g. Alstonfield and Newbridge) but for the generality of index sites levels were within, or a little below, the normal late-summer range. Overall groundwater resources are modestly below average but well above drought minima, and typical for the time of year in most areas. The spatially very variable rainfall over the last eight months is clearly reflected in soil moisture conditions (soils remain significantly drier than normal in parts of northern England and the Midlands – see page 3). This variation will impact on the timing of the seasonal recoveries in recharge rates but the July/August rainfall has ensured that, given normal autumn rainfall patterns, a general rise in groundwater levels may be anticipated over the coming months (in the early summer, it seemed very likely that this recovery would be much delayed).

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.

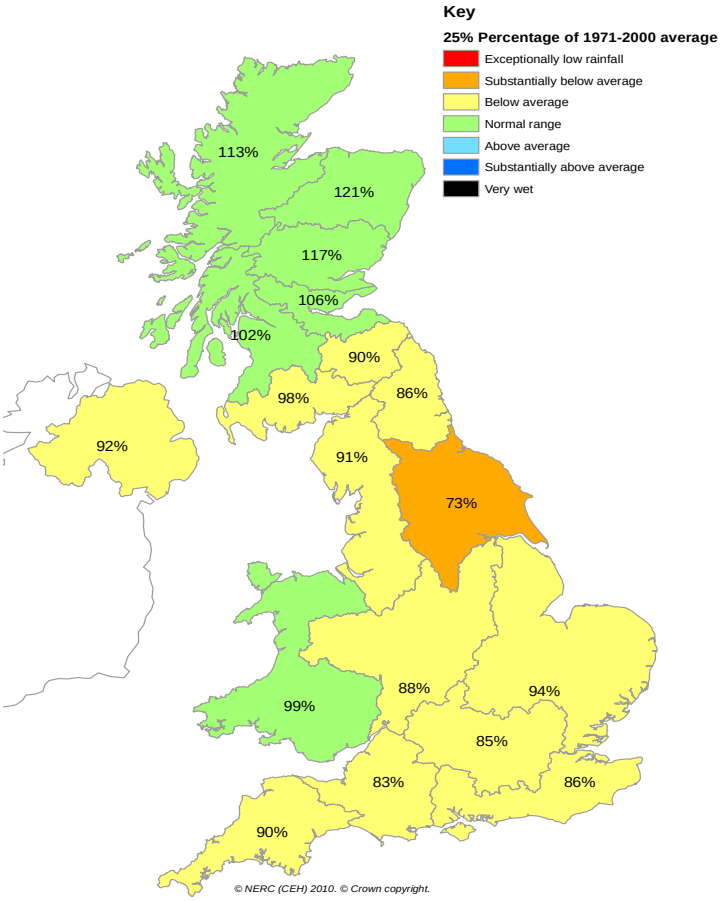
Area	Rainfall	Aug 2010	Jun10 - Aug10	RP	Apr10 - Aug10	RP	Jan10 - Aug10	RP	Sep09 - Aug10	RP
England & Wales	**mm**	**98**	**211**		**273**		**482**		**884**	
	%	**141**	**111**	**2-5**	**89**	**5-10**	**90**	**5-10**	**99**	**2-5**
North West	mm	**88**	288		350		556		1121	
	%	**92**	115	2-5	91	5-10	80	20-30	95	2-5
Northumbrian	mm	**74**	210		263		505		907	
	%	**105**	111	2-5	86	5-10	98	2-5	109	2-5
Severn Trent	mm	**93**	190		249		406		692	
	%	**149**	109	2-5	88	5-10	86	5-10	91	2-5
Yorkshire	mm	**64**	172		215		420		780	
	%	**97**	95	2-5	73	10-20	84	5-15	96	2-5
Anglian	mm	**118**	187		228		391		623	
	%	**227**	124	2-5	94	2-5	103	2-5	103	2-5
Thames	mm	**112**	162		220		412		722	
	%	**207**	105	2-5	85	2-5	96	2-5	103	2-5
Southern	mm	**99**	167		220		471		904	
	%	**185**	109	2-5	86	2-5	105	2-5	116	2-5
Wessex	mm	**98**	169		235		440		838	
	%	**149**	98	2-5	83	5-10	86	5-10	97	2-5
South West	mm	**107**	236		322		614		1146	
	%	**129**	109	2-5	90	2-5	88	2-5	95	2-5
Welsh	mm	**105**	295		397		651		1278	
	%	**107**	118	2-5	99	2-5	85	10-20	97	2-5
Scotland	**mm**	**103**	**313**		**453**		**731**		**1391**	
	%	**104**	**118**	**2-5**	**108**	**2-5**	**88**	**2-5**	**97**	**2-5**
Highland	mm	**130**	356		526		817		1543	
	%	**119**	121	2-5	113	2-5	84	2-5	90	2-5
North East	mm	**100**	275		397		686		1241	
	%	**143**	136	2-5	121	2-5	120	2-5	131	30-50
Tay	mm	**82**	300		429		683		1302	
	%	**99**	133	2-5	117	2-5	91	2-5	103	2-5
Forth	mm	**76**	264		370		622		1140	
	%	**93**	119	2-5	106	2-5	93	2-5	101	2-5
Tweed	mm	**67**	225		297		582		1067	
	%	**91**	110	2-5	90	2-5	100	<2	112	2-5
Solway	mm	**76**	288		419		687		1376	
	%	**72**	106	2-5	98	2-5	84	5-10	98	2-5
Clyde	mm	**110**	353		500		785		1554	
	%	**87**	109	2-5	102	2-5	79	5-15	90	2-5
Northern Ireland	**mm**	**62**	**242**		**346**		**603**		**1057**	
	%	**68**	**103**	**2-5**	**92**	**2-5**	**90**	**2-5**	**95**	**2-5**

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

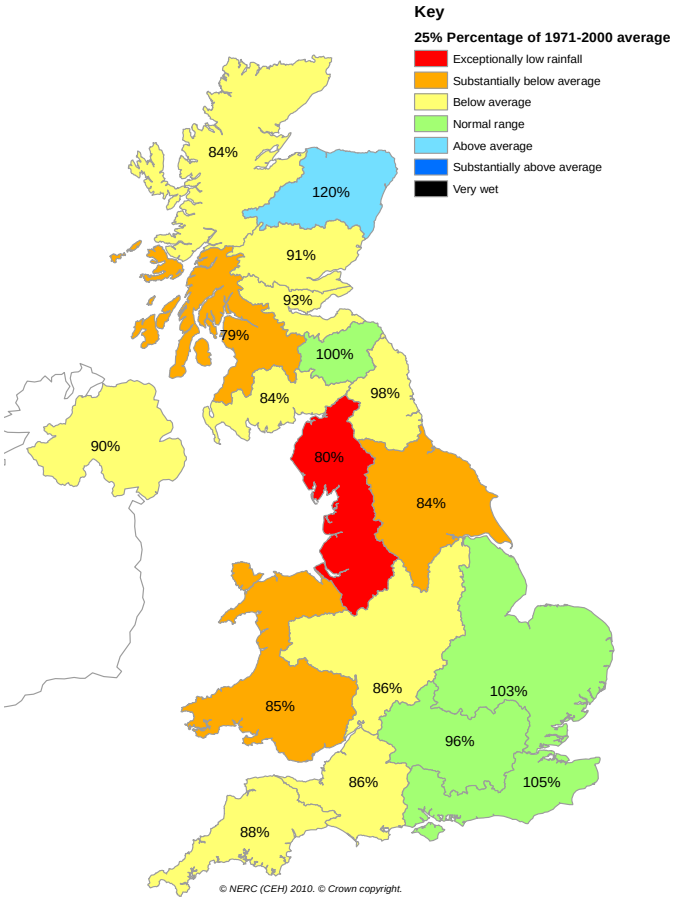
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic variability since 1913; they also assume a stable climate. The quoted RPs relate to the specific timespans only; for the same timespans, but beginning in any month the RPs would be substantially shorter. 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 March 2010 are provisional.

Rainfall . . . Rainfall . . .

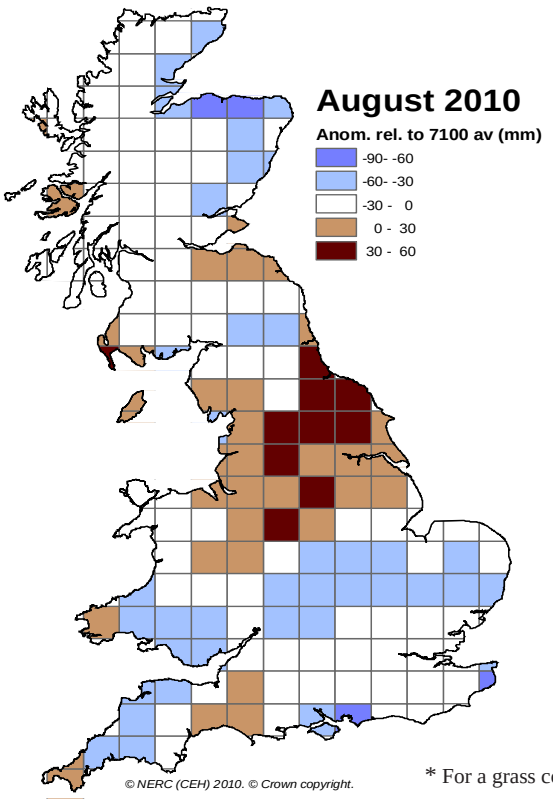
April - August 2010



January - August 2010



MORECS Soil Moisture Deficits *



* For a grass cover

Met Office Weather forecast

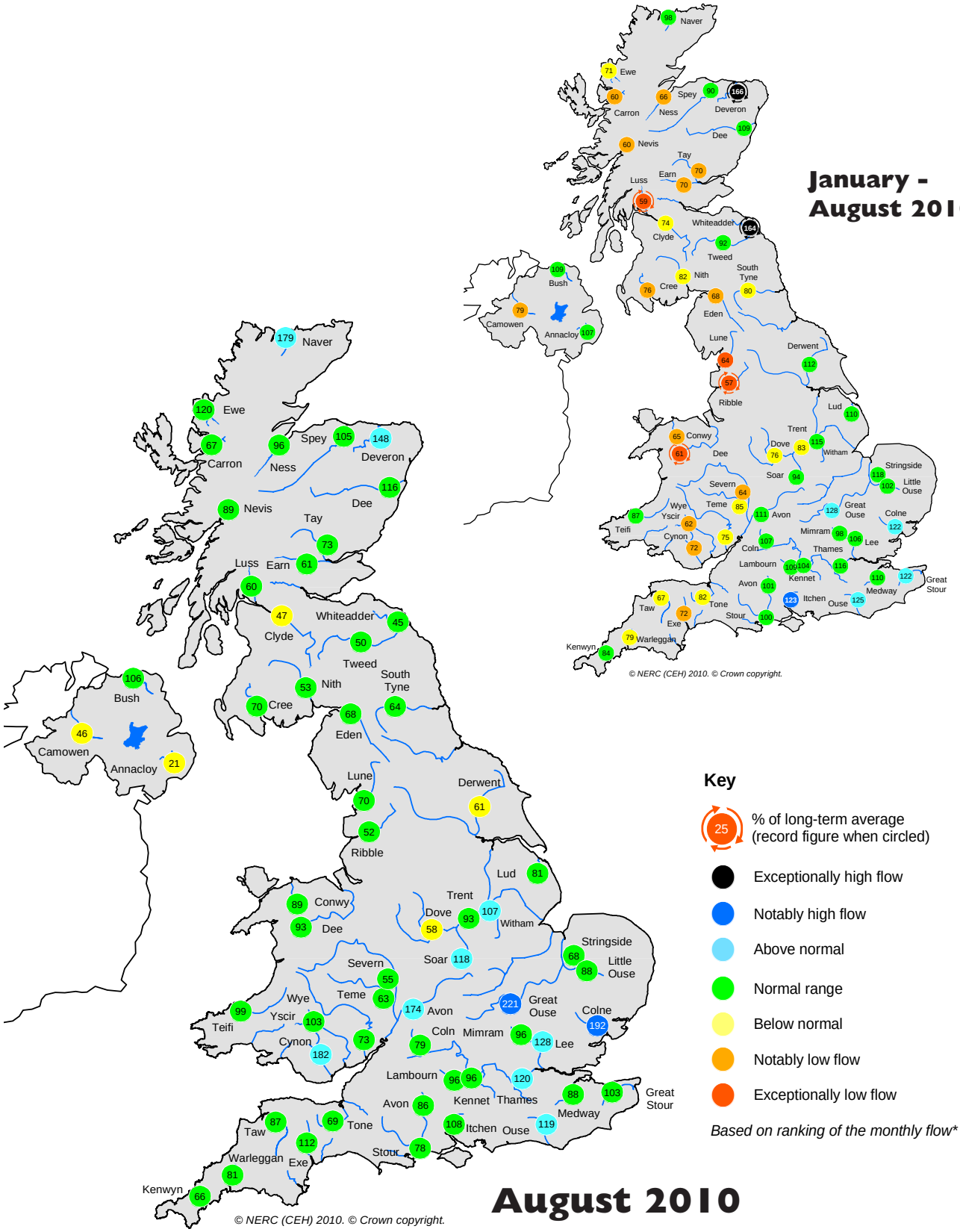
Updated: 1245 on Mon 13 Sep 2010

UK Outlook for Sat 18 Sep to Mon 27 Sep 2010:
Showers, some heavy, are expected in far northern parts of the UK at first over the weekend, otherwise it should be mainly dry and bright with only a few light showers. From Monday (20th), only the south and southeast are likely to hang onto the mainly dry weather at first, with rain or showers expected across northwestern parts of the country. This more unsettled weather is likely to spread to most parts of the UK by Wednesday, with rain turning heavy in northwestern parts. Winds will become strong in many parts, but lighter in the south and southeast at first. Temperatures will be a little below normal at first, with patchy frost possible in rural spots, but should recover to near normal from Monday (20th).

UK Outlook for Tues 28 Sep to Tues 12 Oct 2010:
It should remain fairly unsettled across many parts of the country during the last few days of September and into the beginning of October, with rain or showers at times but also some drier and brighter periods. It will also likely to be rather windy, especially in exposed areas. The rain is most likely to affect western Scotland, Northern Ireland and northwest England, with perhaps the best chance of any drier conditions towards southern and eastern England. Temperatures should be on the whole above normal for the time of year across the country.

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

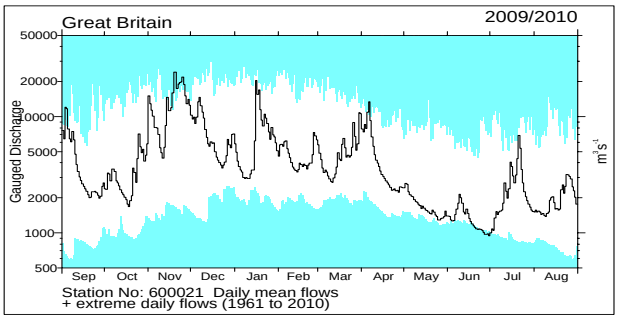
River flow . . . River flow . . .

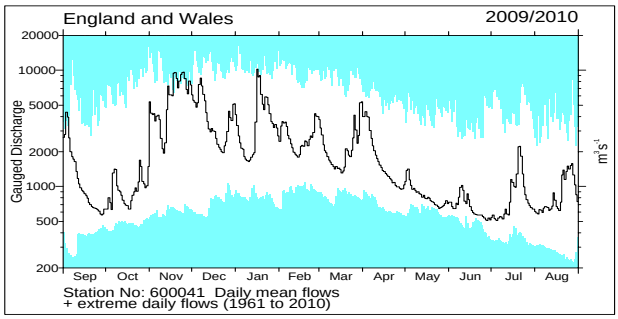


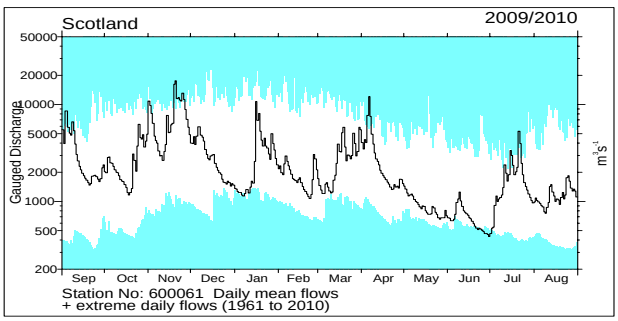
River flows

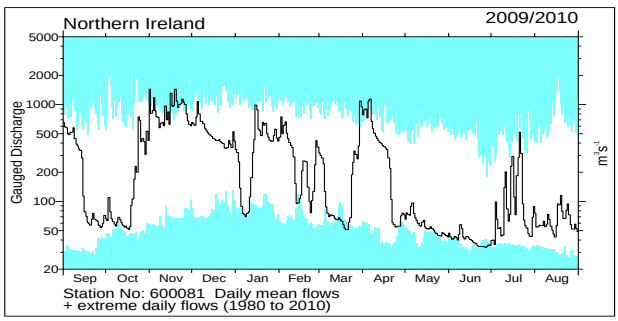
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

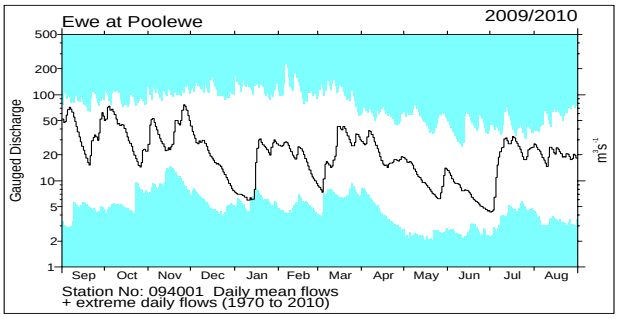
River flow . . . River flow . . .

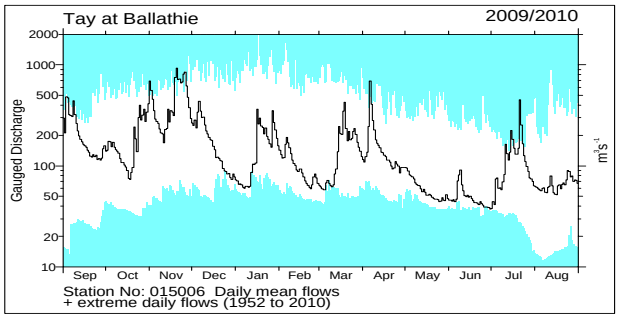


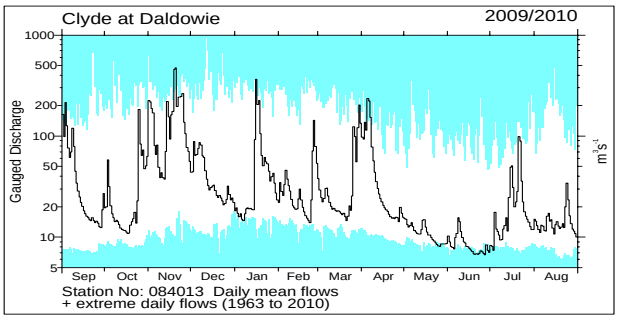


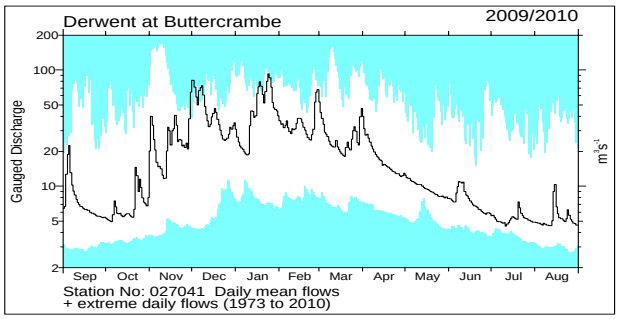


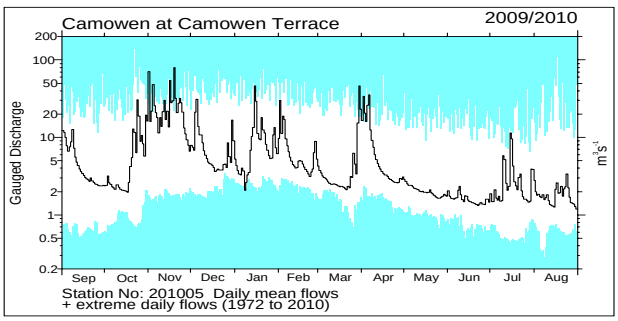


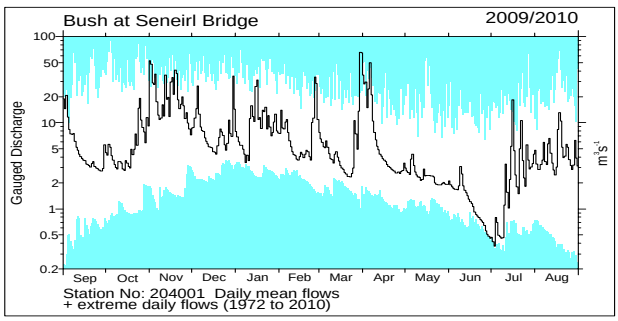








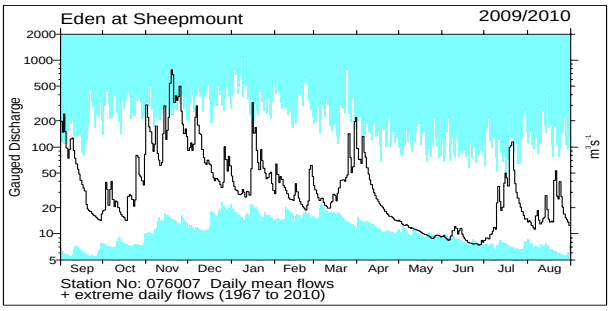


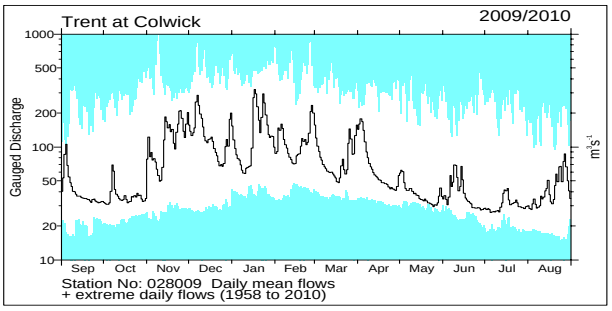


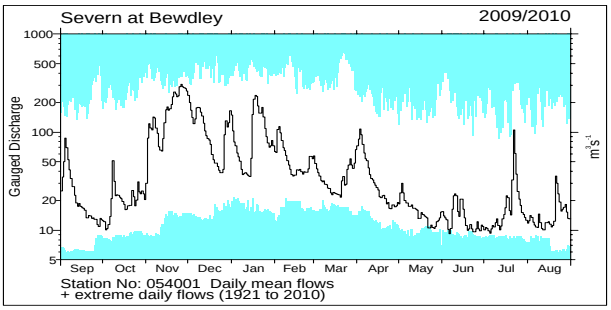
River flow hydrographs

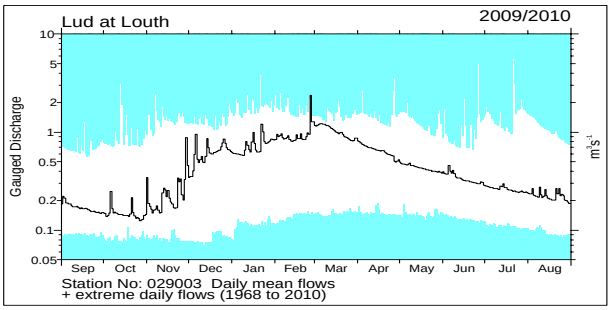
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to September 2009 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

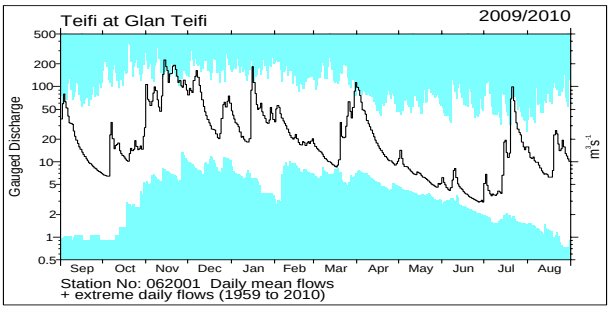
River flow . . . River flow . . .

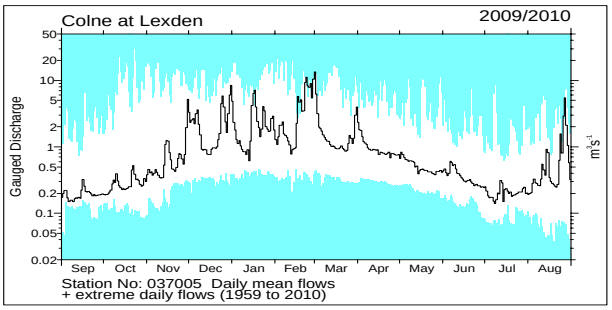


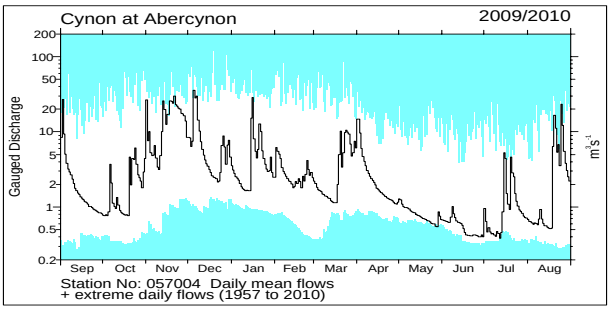


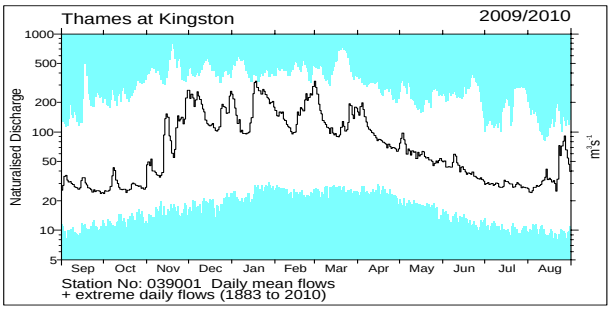


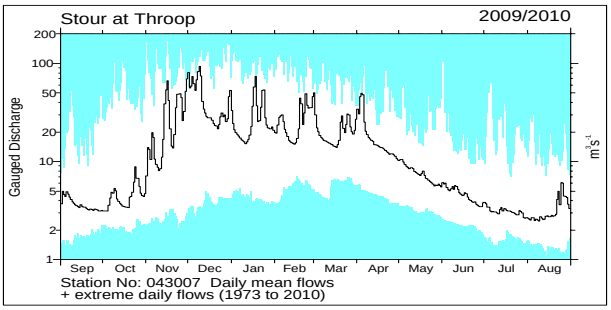


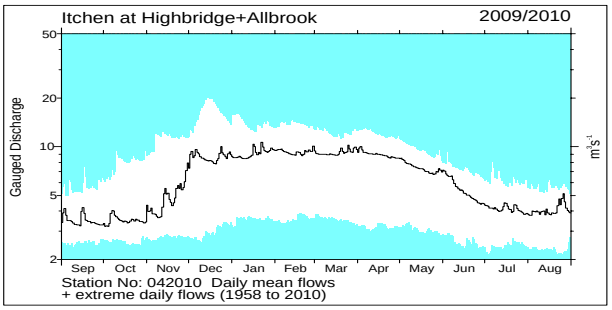












Notable runoff accumulations (a) July- August 2010 (b) January - August 2010

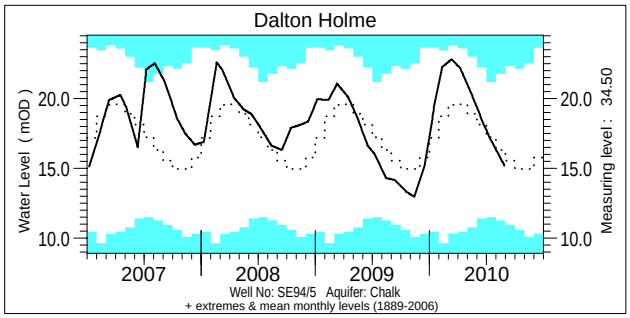
	River	%lta	Rank
a)	Ness	137	32/38
	Dove	55	9/49
	Dover Beck	112	28/36
	Bedford Ouse	153	69/78
	Stour	71	8/38
	Tone	62	7/50
	Brue	36	7/45
	Tawe	156	47/53
	Ewe	132	31/40

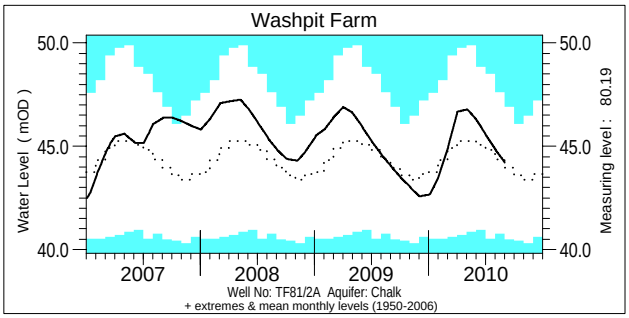
	River	%lta	Rank
b)	Deveron	166	50/50
	Tay	70	3/58
	Forth	56	1/29
	Tyne (Spilmersford)	166	44/45
	Whiteadder	164	41/41
	Yscir	62	2/38
	Conwy	65	3/43
	Dee (New Inn)	61	1/41

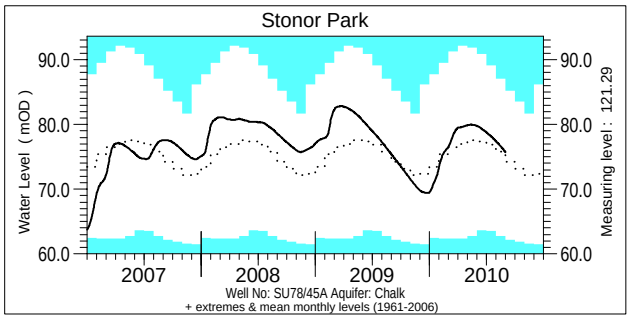
	River	%lta	Rank
b)	Ribble	57	1/50
	Lune	64	2/50
	Eden	68	3/43
	Luss	59	1/32
	Nevis	60	2/28
	Carron	60	3/32
	Mourne	70	2/28

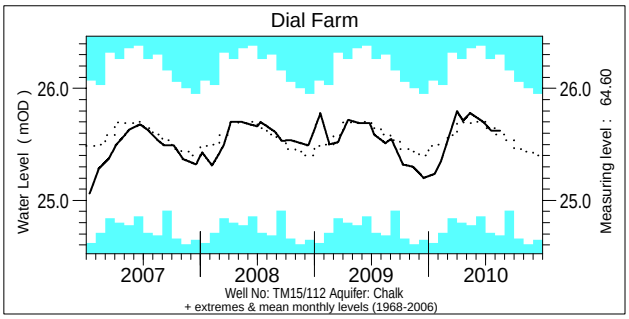
lta = long term average
Rank 1 = lowest on record

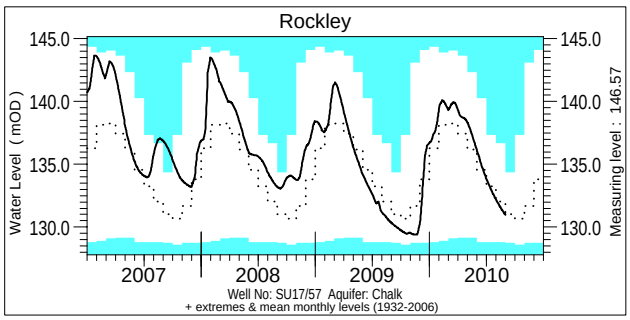
Groundwater . . . Groundwater

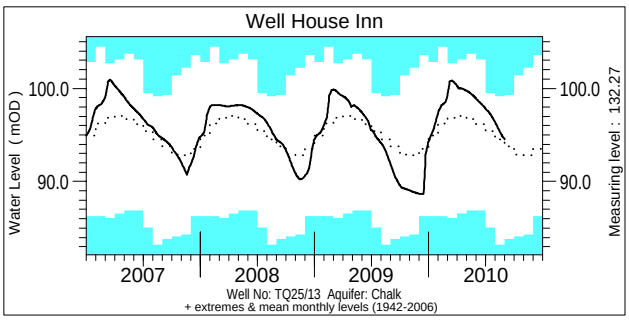


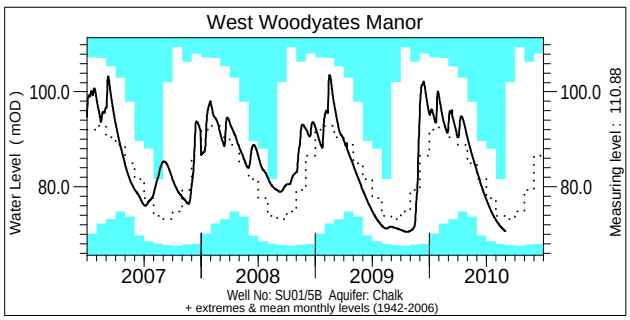


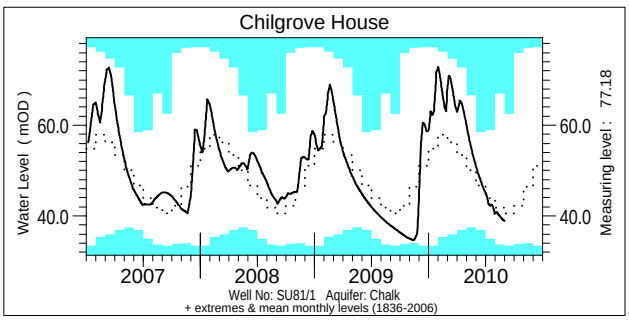


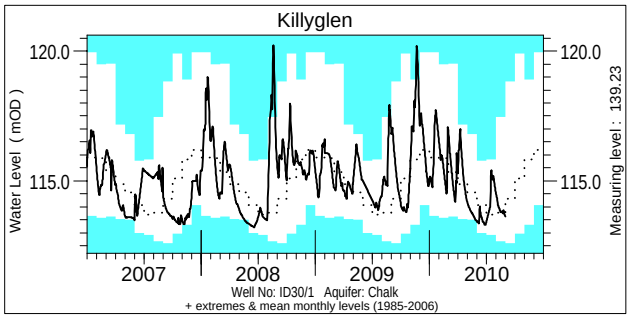


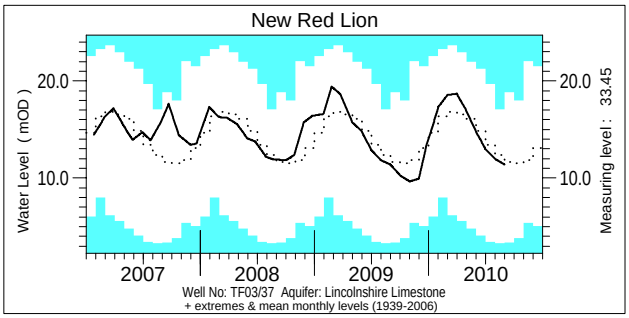






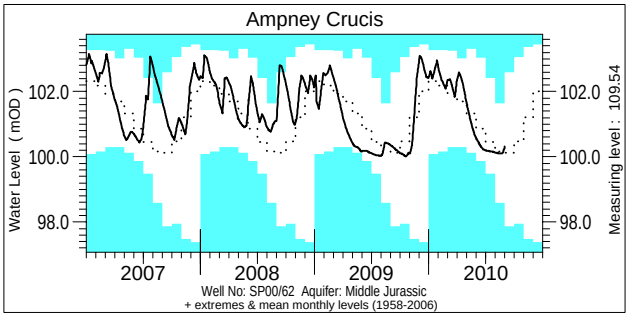


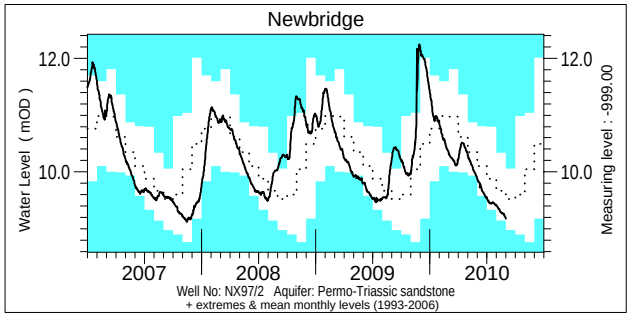


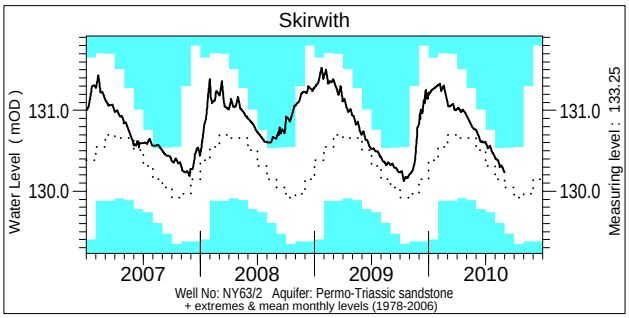


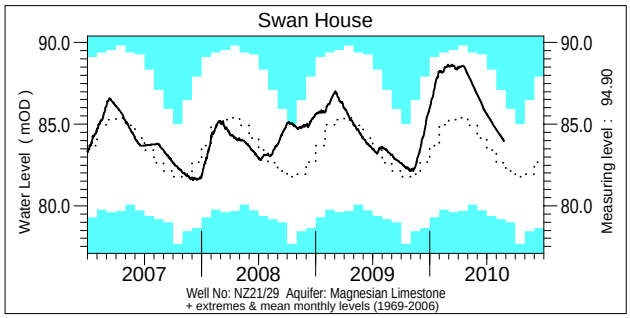
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined 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.

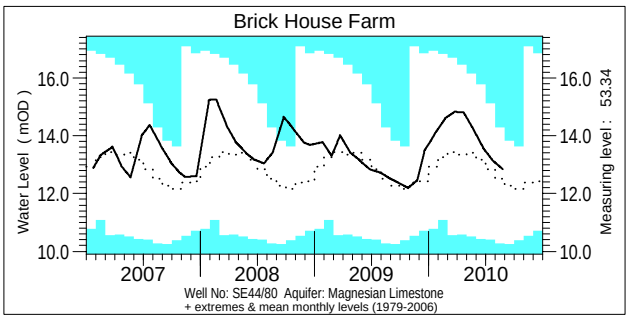
Groundwater . . . Groundwater

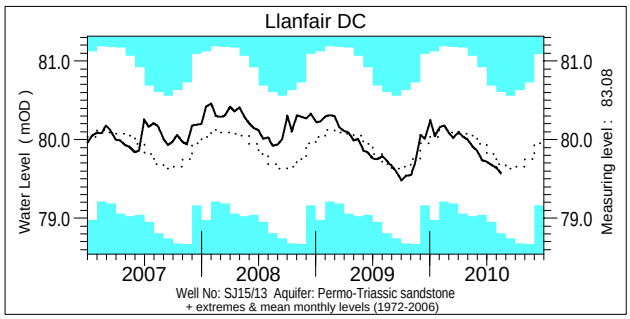


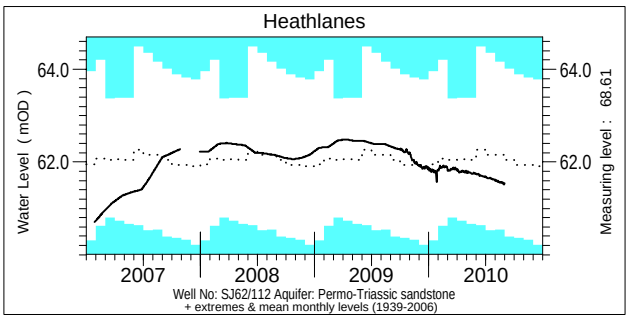


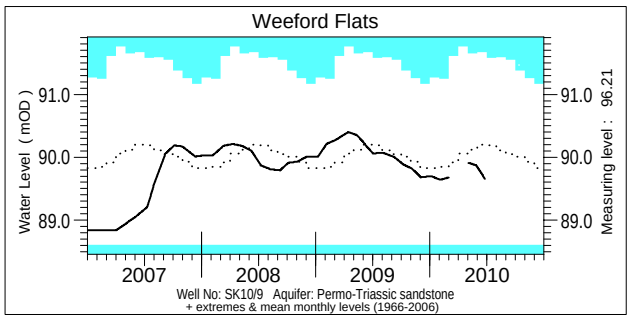


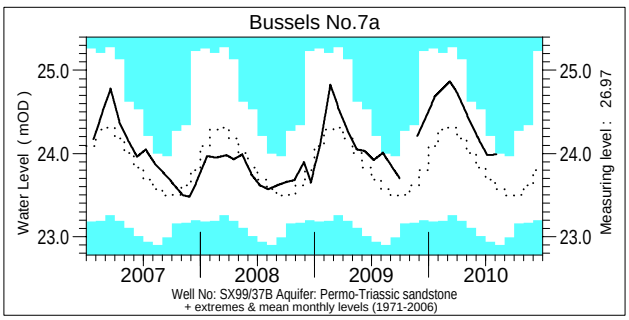


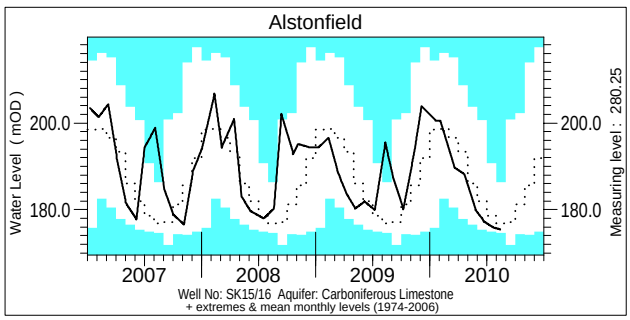






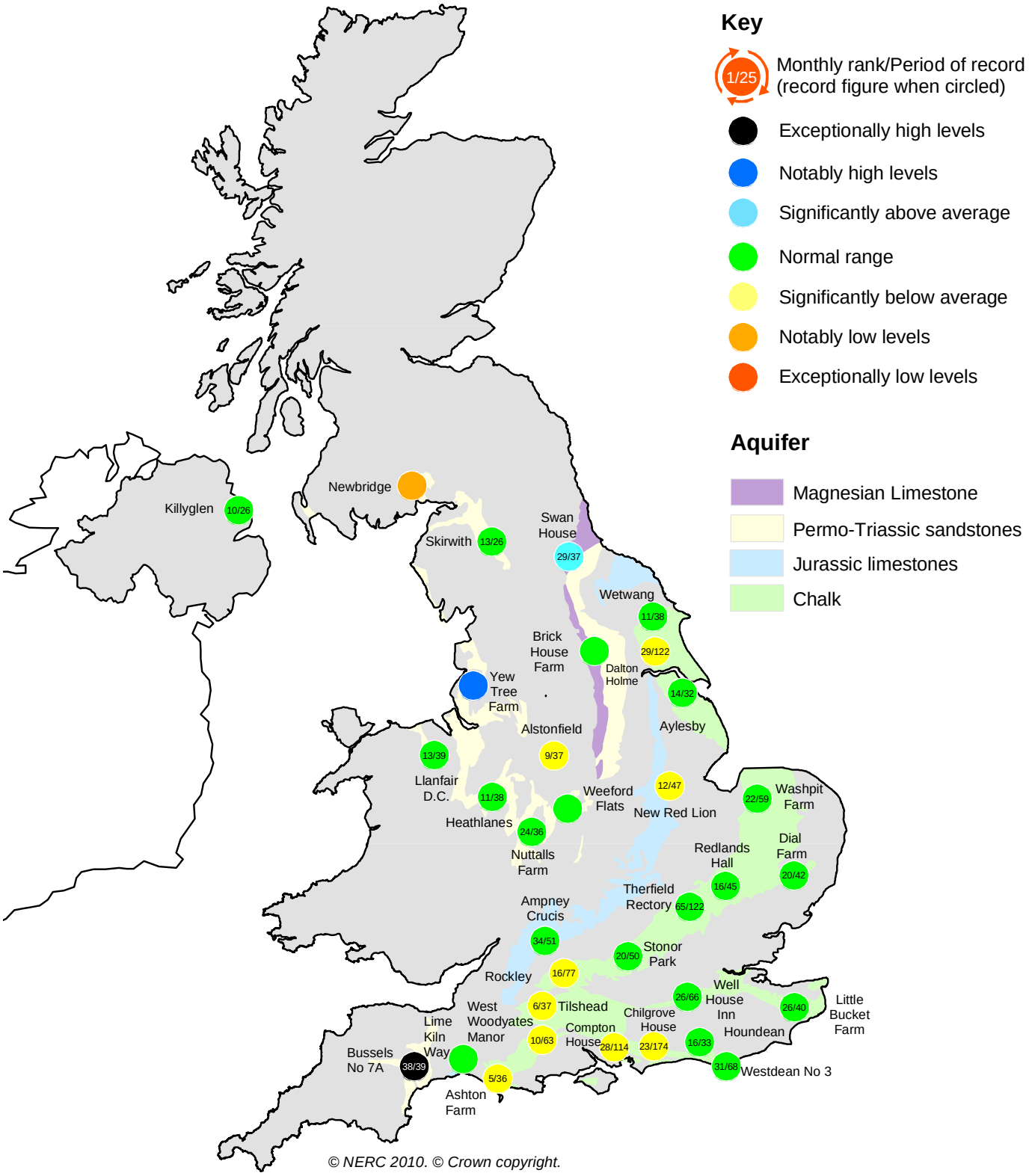






Groundwater levels August / September 2010

Borehole	Level	Date	Aug av.	Borehole	Level	Date	Aug. av.	Borehole	Level	Date	Aug. av.
Dalton Holme	15.18	27/08	16.28	Chilgrove House	38.84	31/08	41.72	Brick House Farm	12.83	25/08	12.54
Washpit Farm	44.21	31/08	44.51	Killyglen (NI)	113.62	31/08	114.09	Llanfair DC	79.57	15/08	79.65
Stonor Park	75.69	01/09	75.87	New Red Lion	11.37	31/08	12.37	Heathlanes	61.54	31/08	62.11
Dial Farm	25.62	17/08	25.58	Ampney Crucis	100.31	01/09	100.22	Weeford Flats	89.65	25/06	89.82
Rockley	130.96	01/09	132.08	Newbridge	9.18	31/08	9.65	Bussels No.7a	23.99	05/08	23.60
Well House Inn	94.52	31/08	94.88	Skirwith	130.23	31/08	130.20	Alstonfield	175.45	13/08	178.59
West Woodyates	70.62	31/08	74.08	Swan House	83.94	25/08	82.72	*Levels in metres above Ordnance Datum*			



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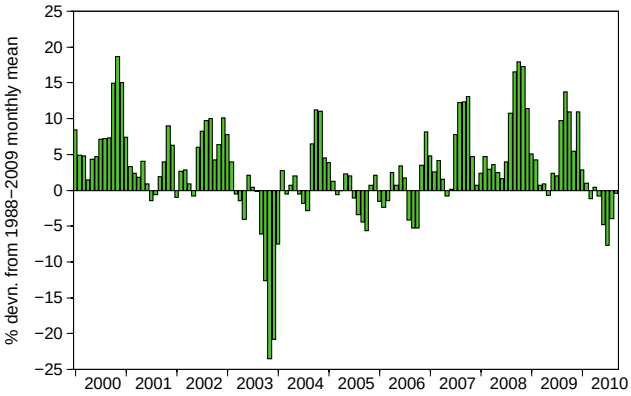
Groundwater levels - August 2010

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.

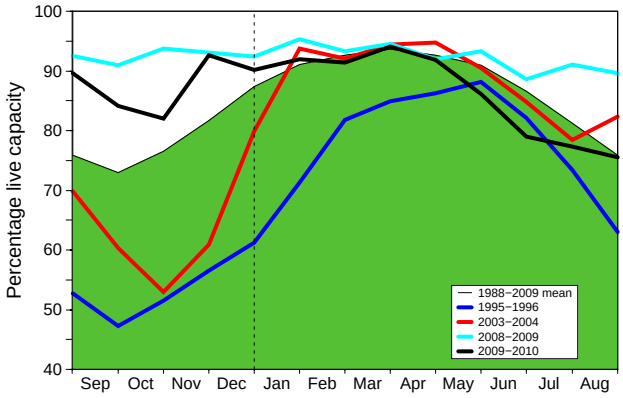
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.

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 Jul	Aug	Sep	Sep Anom.	Min Sep	Year* of min	2009 Sep	Diff 10-09
North West	N Command Zone	•	124929	52	65	**61**	3	24	1995	92	-31
	Vyrnwy		55146	68	69	**68**	-3	36	1995	77	-9
Northumbrian	Teesdale	•	87936	63	64	**62**	-5	38	1995	95	-33
	Kielder		(199175)	(84)	(91)	**(88)**	1	(66)	1989	(97)	-9
Severn Trent	Clywedog		44922	88	85	**83**	6	38	1989	93	-10
	Derwent Valley	•	39525	68	61	**57**	-11	34	1995	79	-22
Yorkshire	Washburn	•	22035	72	73	**71**	2	34	1995	81	-10
	Bradford supply	•	41407	65	64	**58**	-9	21	1995	79	-21
Anglian	Grafham		(55490)	(92)	(87)	**(87)**	2	(59)	1997	(89)	-2
	Rutland		(116580)	(87)	(78)	**(75)**	-6	(66)	1995	(78)	-3
Thames	London	•	202828	94	86	**87**	7	62	1995	91	-4
	Farmoor	•	13822	95	97	**98**	5	64	1995	98	0
Southern	Bewl		28170	81	71	**64**	-5	38	1990	57	7
	Ardingly		4685	93	82	**76**	3	47	1996	75	1
Wessex	Clatworthy		5364	70	59	**49**	-16	31	1995	93	-44
	Bristol WW	•	(38666)	(77)	(69)	**(62)**	-6	(43)	1990	(74)	-12
South West	Colliford		28540	88	80	**74**	2	43	1997	95	-21
	Roadford		34500	80	71	**68**	-6	40	1995	89	-21
	Wimbleball		21320	79	66	**57**	-14	40	1995	93	-36
	Stithians		4967	79	66	**56**	-5	30	1990	82	-26
Welsh	Celyn and Brenig	•	131155	83	82	**83**	2	49	1989	89	-6
	Brianne		62140	82	85	**86**	0	55	1995	100	-14
	Big Five	•	69762	70	67	**75**	5	29	1995	96	-21
	Elan Valley	•	99106	77	71	**67**	-11	46	1995	98	-31
Scotland(E)	Edinburgh/Mid Lothian	•	97639	81	83	**78**	0	45	1998	94	-16
	East Lothian	•	10206	94	84	**74**	-9	63	1989	100	-26
Scotland(W)	Loch Katrine	•	111363	55	66	**55**	-15	50	2000	100	-45
	Daer		22412	74	89	**84**	10	41	1995	98	-14
	Loch Thom	•	11840	82	82	**79**	-1	58	1997	96	-17
Northern Ireland	Total+	•	56920	73	83	**76**	0	40	1995	96	-20
	Silent Valley	•	20634	74	90	**81**	12	33	2000	97	-16

() 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.

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Location map . . . Location map

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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 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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09/10