Hydrological Summary

for the United Kingdom

June 2021

General

June was generally a settled month with summery conditions but was punctuated by occasional thunderstorms and heavy rainfall, particularly in the south-east of England. Although rainfall for the UK as a whole was around two-thirds of average, there was a dramatic contrast between drier conditions in the north and west and wet weather in the south-east with corresponding below and above normal river flows, respectively. Elsewhere, flows in a band from the north-east to the south-west of England were generally in the normal range. Soils were drier than average in the majority of regions, with the exception of those in south-east England where soils were wetter than average. Groundwater levels fell as the usual seasonal recession continued and were generally in the normal range or above. Reservoir stocks in some impoundments in northern Britain fell relative to average and ended the month substantially below average – with Daer, Loch Thom and Teesdale around two-thirds of capacity. Long-term precipitation deficits continued in Scotland, where customers have been advised to use water wisely and the water scarcity alert level has been raised in some areas. Given the current water resources situation and current outlooks favouring a continuation of dry conditions (despite a more unsettled start to July), vigilance will be required over the rest of the summer in areas where supplies are dependent on surface water resources.

Rainfall

June was dominated by high pressure, interspersed with a sequence of thunderstorms and localised heavy rainfall, but with few appreciable rainfall totals. Settled conditions at the start of June were rapidly interrupted by thunderstorms and heavy localised rainfall on the 3rd in England and the 5th/6th in Wales. Then, between the 16th and 20th, organised convective rainfall and thunderstorms in southern England caused surface water flooding in multiple locations, and closed some mobile Covid-19 testing sites on the 18th (e.g. 68mm at Otterbourne Water Works, Winchester). Further rainfall in this area between the 25th and 29th (e.g. 74mm registered on the 28th at Princetown, Devon) resulted in transport disruption in and around London. Away from south-east England, June saw largely dry, settled conditions with only localised showers, with the exception of thunderstorms on the 24th/25th resulting in surface water flooding of roads and properties in the Midlands. For the UK as a whole, June rainfall was 61% of average, with the majority of the country receiving less than 70% of average and some parts in north-east Scotland and the Pennines registering less than 30% of average. Around a third of average was received in several regions of the UK, with North East Scotland recording the second driest June on record (behind 1932) and North West England recording its driest June since 1941, both in series from 1910. Above average rainfall was mostly confined to south-east England, with more than 170% of average in Kent, Surrey and West Sussex. Only the Thames and Southern regions registered above average rainfall, the latter almost twice the average, making it the wettest June since 2012. It was the second wettest May-June on record (behind 2007) for the Southern and South West regions (in series from 1910).

River flows

Recessions accompanied the settled start to June and dominated the month in most catchments away from the south-east of England. In the second week, recessions were interrupted in the east and south-west of England (new daily maxima were recorded on the Wensum on five of the six days between the 5th and 10th, inclusive). Further responses mid-month established new daily maxima in eight catchments in south-east England between the 17th and 19th, with the second highest June peak flow maxima recorded on the Mimram on the 18th (in series from 1952). Flows remained high on the Thames, whilst responses continued to interrupt recessions elsewhere in the south of England to month-end. The focus of the rainfall in southern England is reflected in the national outflows with responses to rainfall in the series for England, whilst outflows from Wales continued the recession established in mid-May. Monthly mean flows for June were generally in the normal range although flows were mostly below average. Flows were below normal to notably low in the north-west of England, Northern Ireland and north Wales with less than 30% of the June average recorded on the Annacloy and Welsh Dee (the latter being the fourth lowest June flows in a series from 1937). In contrast, flows in the south of England were above normal with notably high flows exceeding one and half times the average on the Wensum and Blackwater. Over the two month period from May-June, flows were generally above normal to exceptionally high with a new maximum recorded on the Wensum and over two and half times the average for this period on the Cynon (second behind 2012 in a series from 1958).

Groundwater

Soil Moisture Deficits (SMDs) reflected the rainfall distribution in June, with wetter soils in the south and south-west of England; in Southern region SMDs were the third lowest for June in a record from 1961. Groundwater levels receded at all index boreholes in the Chalk, with the majority in the normal range for June. Some below normal levels were observed in the far south of England (Tilshead, Chilgrove House and Compton House) and in Northern Ireland (Killyglen). Levels remained above normal at Little Bucket Farm and notably high at Washpit Farm. Levels fell in the Magnesian Limestone, but at Aycliffe and Brick House Farm the level was exceptionally high for June. In the Jurassic Limestones, the seasonal recession disrupted in May began again in early June at Ampney Crucis, while levels continued to fall at New Red Lion. Levels fell in the Carboniferous Limestone at Greenfield Garage (remaining in the normal range) and Pant y Lladron (falling from notably high to normal). Levels also fell in the Permo-Triassic sandstones, however, they remained a record high for the month at Weir Farm, exceptionally high at Skirwith and Llanfair DC, and normal or above elsewhere. In the Upper Greensand at Lime Kiln Way levels rose slightly to notably high, whilst in the Fell Sandstone levels fell and remained above normal.

Note that due to continuing issues with data access, no data are available for Scotland.

National Hydrological Monitoring Programme | UK Centre for Ecology & Hydrology | BGS British Geological Survey

Rainfall . . . Rainfall . . .

Met Office

Rainfall accumulations and return period estimates

Percentages are from the 1981-2010 average.

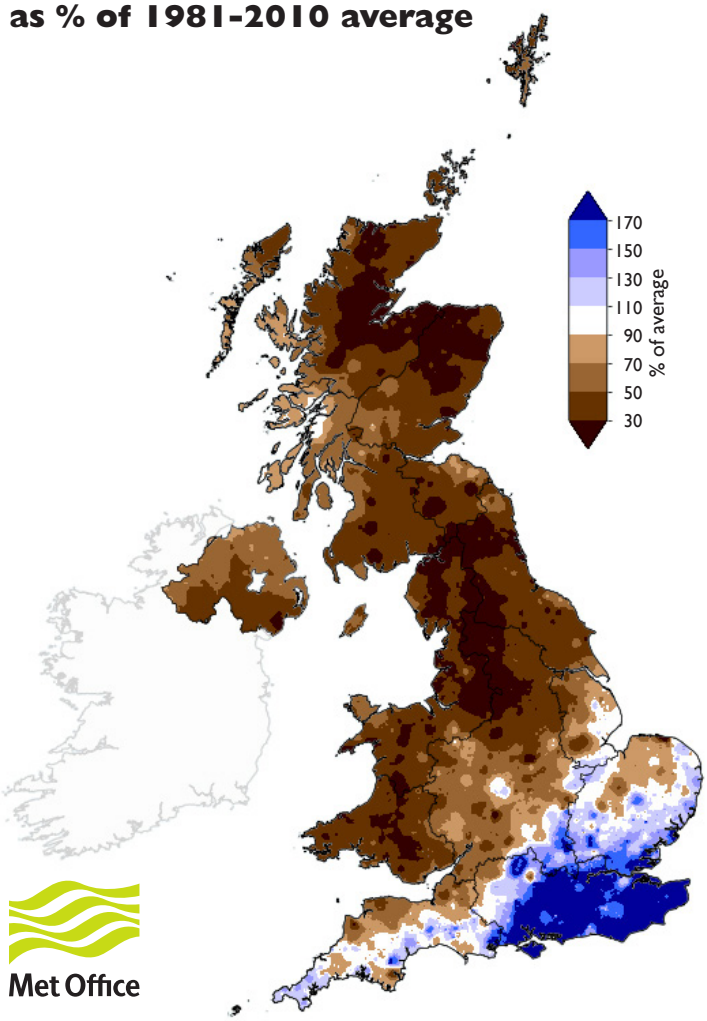
Region	Rainfall	Jun 2021	May21 – Jun21	RP	Apr21 – Jun21	RP	Jan21 – Jun21	RP	Jul20 – Jun21	RP
United Kingdom	mm	**43**	163		183		506		1238	
	%	**61**	117	2-5	87	2-5	100	2-5	110	10-15
England	mm	**48**	159		170		417		970	
	%	**78**	134	8-12	96	2-5	110	2-5	115	5-10
Scotland	mm	**39**	149		184		602		1563	
	%	**47**	91	2-5	74	8-12	88	2-5	103	5-10
Wales	mm	**32**	242		259		719		1682	
	%	**39**	146	10-20	103	2-5	115	5-10	119	15-25
Northern Ireland	mm	**39**	156		180		481		1248	
	%	**52**	105	2-5	81	2-5	93	2-5	110	8-12
England & Wales	mm	**46**	170		182		458		1067	
	%	**71**	136	8-12	98	2-5	111	5-10	116	8-12
North West	mm	**24**	157		170		609		1487	
	%	**30**	104	2-5	77	5-10	114	5-10	122	25-40
Northumbria	mm	**23**	121		136		444		990	
	%	**35**	100	2-5	75	2-5	112	5-10	114	5-10
Severn-Trent	mm	**33**	150		163		386		874	
	%	**52**	125	5-10	92	2-5	108	2-5	112	5-10
Yorkshire	mm	**25**	149		161		445		994	
	%	**36**	122	2-5	88	2-5	114	5-10	118	5-10
Anglian	mm	**52**	135		141		311		721	
	%	**97**	130	5-10	95	2-5	109	2-5	116	5-10
Thames	mm	**72**	171		183		359		847	
	%	**142**	160	15-25	115	2-5	110	2-5	118	5-10
Southern	mm	**99**	183		189		388		897	
	%	**197**	178	50-80	121	2-5	110	2-5	112	2-5
Wessex	mm	**52**	172		189		397		949	
	%	**94**	148	10-15	108	2-5	100	2-5	107	2-5
South West	mm	**64**	243		253		587		1364	
	%	**92**	168	30-50	114	2-5	106	2-5	111	5-10
Welsh	mm	**32**	238		255		693		1627	
	%	**40**	147	10-20	104	2-5	115	5-10	119	15-25
Highland	mm	**42**	139		196		654		1660	
	%	**46**	78	5-10	70	10-15	79	2-5	92	2-5
North East	mm	**22**	155		190		435		1151	
	%	**31**	113	2-5	94	2-5	96	2-5	114	5-10
Tay	mm	**33**	185		207		594		1505	
	%	**43**	119	2-5	90	2-5	95	2-5	112	8-12
Forth	mm	**37**	150		166		529		1353	
	%	**48**	101	2-5	77	2-5	96	2-5	112	10-20
Tweed	mm	**28**	146		163		516		1216	
	%	**40**	107	2-5	82	2-5	111	5-10	119	15-25
Solway	mm	**31**	160		174		646		1708	
	%	**37**	96	2-5	68	5-10	99	2-5	115	25-40
Clyde	mm	**60**	151		176		705		1945	
	%	**62**	82	2-5	62	15-25	87	2-5	107	5-10

% = percentage of 1981-2010 average *RP = Return period*

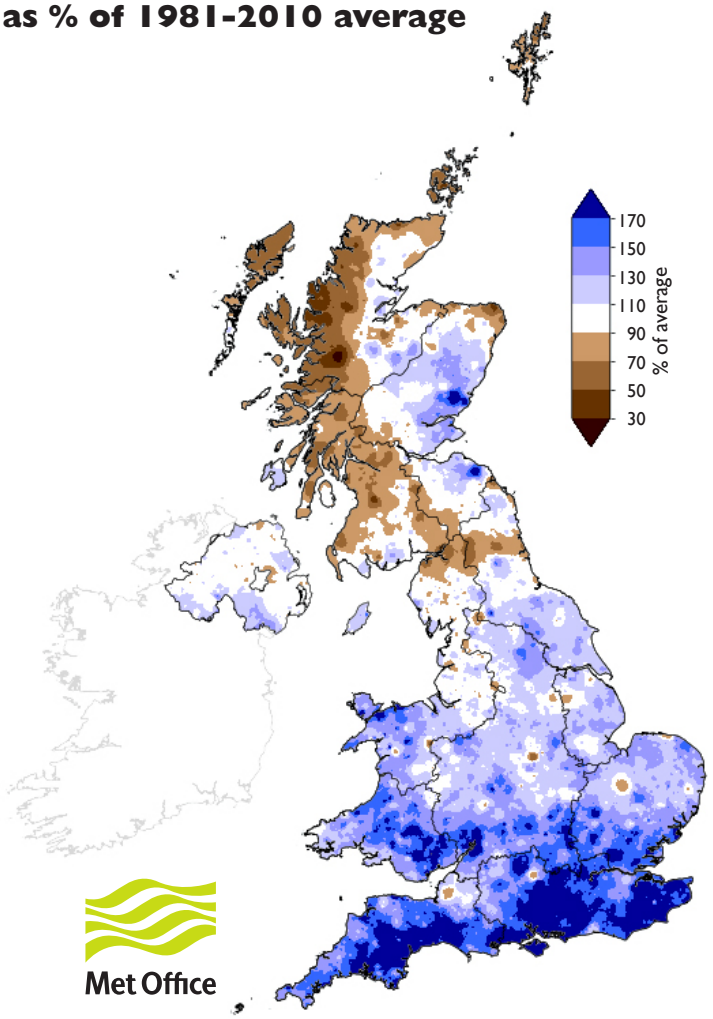
Important note: Figures in the above table may be quoted provided their source is acknowledged (see page 12). Where appropriate, specific mention must be made of the uncertainties associated with the return period estimates. The RP estimates are based on data provided by the Met Office and reflect climatic variability since 1910; 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. Note that precipitation totals in winter months may be underestimated due to snowfall undercatch. All monthly rainfall totals since January 2018 are provisional.

Rainfall . . . Rainfall . . .

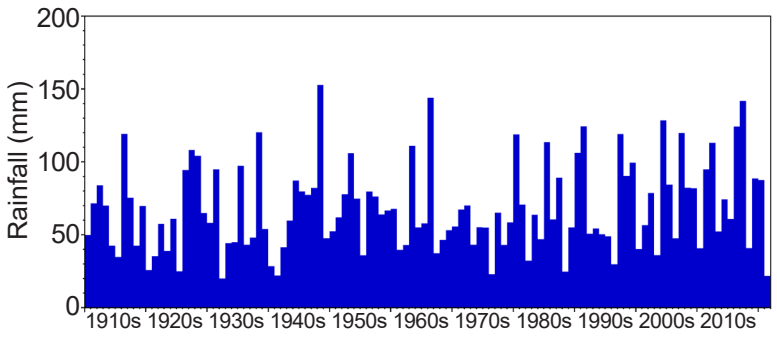
June 2021 rainfall
as % of 1981-2010 average



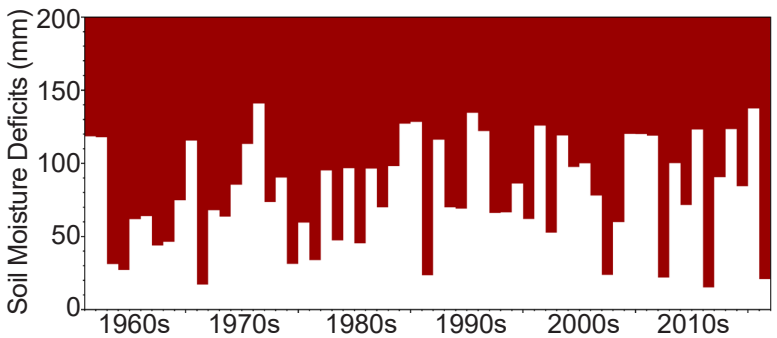
May 2021 - June 2021 rainfall
as % of 1981-2010 average



June rainfall for North East Scotland



End of June SMDs for Southern region



Hydrological Outlook UK

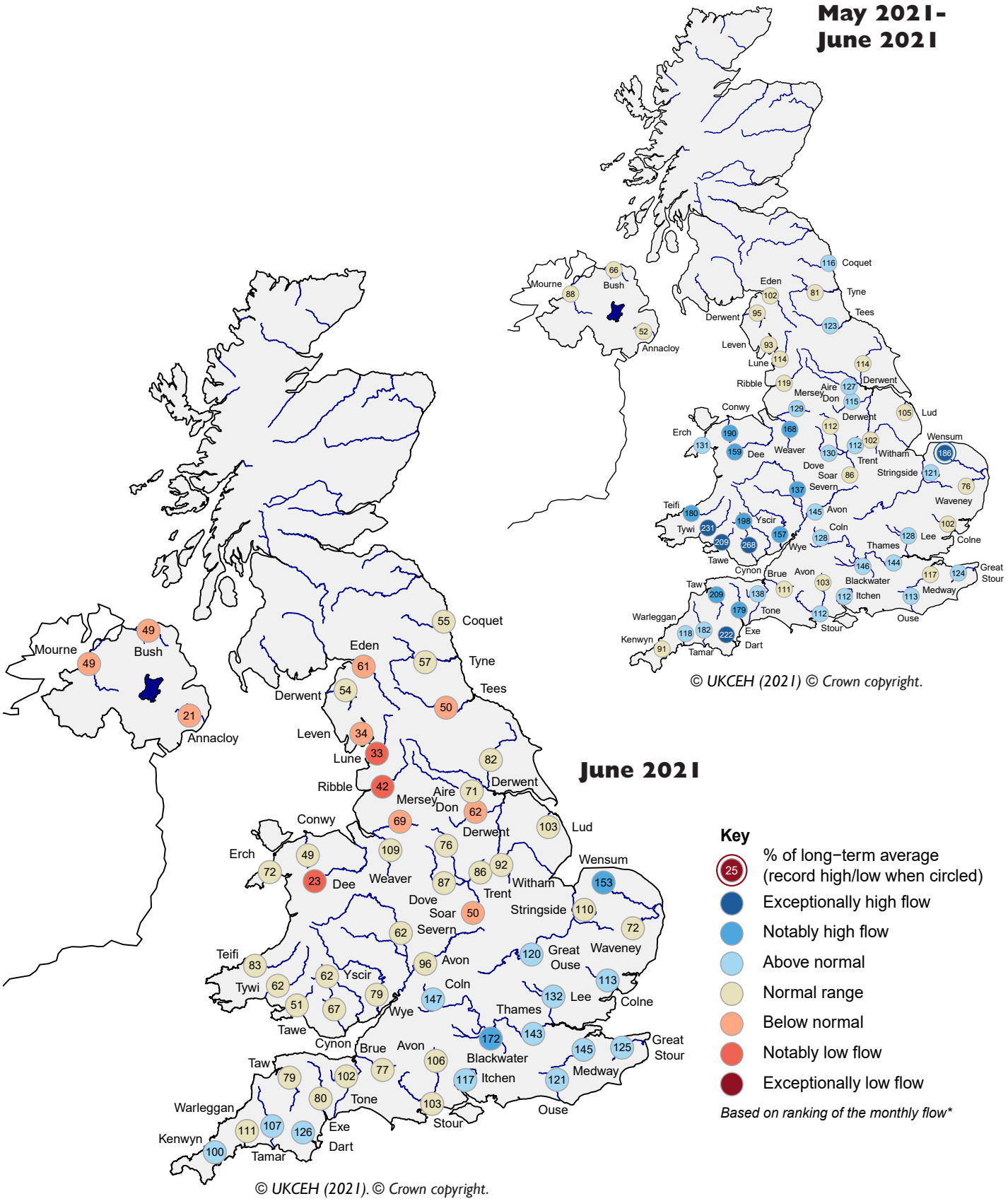
The Hydrological Outlook provides an insight into future hydrological conditions across the UK. Specifically it describes likely trajectories for river flows and groundwater levels on a monthly basis, with particular focus on the next three months.

The complete version of the Hydrological Outlook UK can be found at: www.hydoutuk.net/latest-outlook/

Period: **from July 2021**
Issued: **08.07.2021**
using data to the end of June 2021

The outlook for July and for the July-September period is for river flows to be normal to below normal for northern areas of the UK, and normal to above normal elsewhere. Groundwater levels in July, and for the next three months, are likely to be normal to above normal across most of the UK, the exception being the far south of England where normal to below normal levels are expected.

River flow . . . River flow . . .

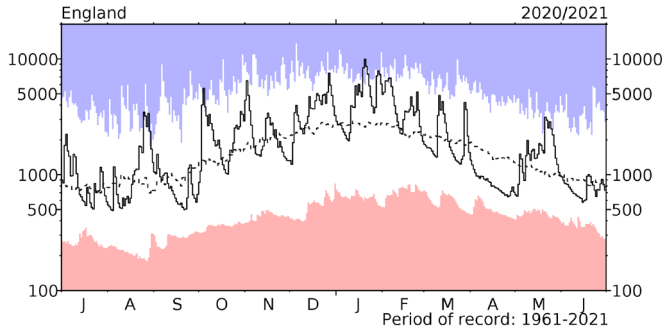


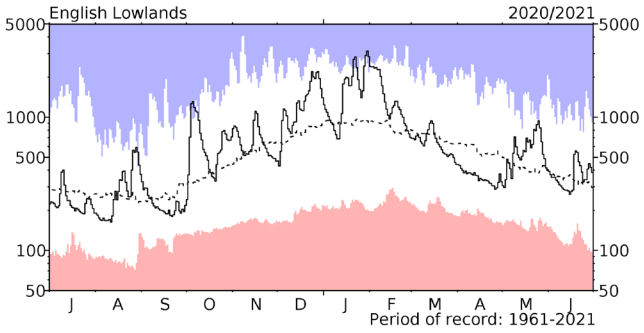
River flows

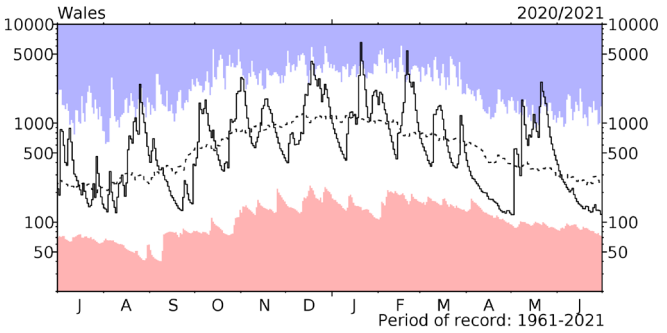
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much greater. Note: the averaging period on which these percentages are based is 1981-2010. Percentages may be omitted where flows are under review.

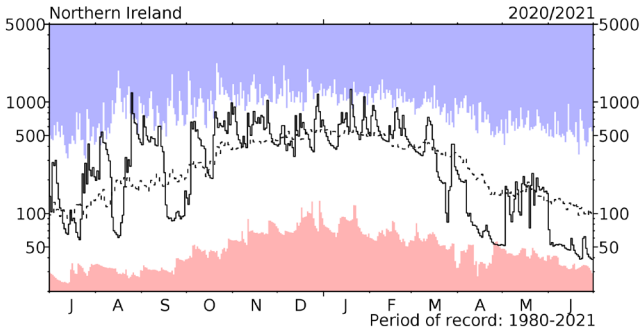
Note that due to continuing issues with data access, no data are available for Scotland.

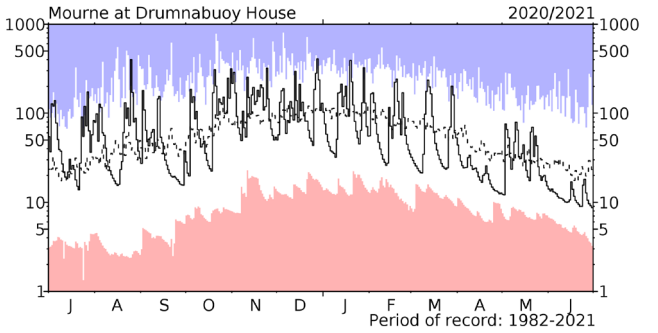
River flow . . . River flow . . .

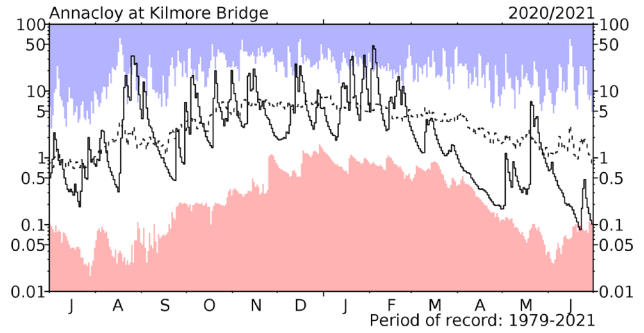


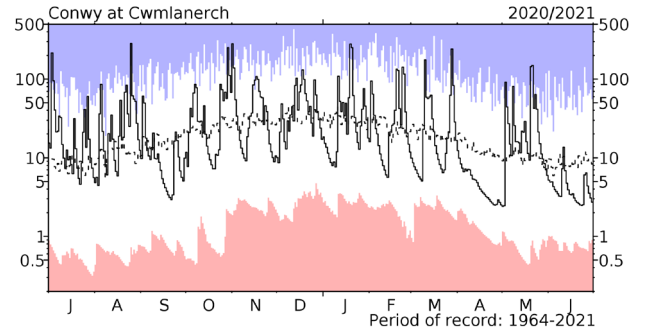


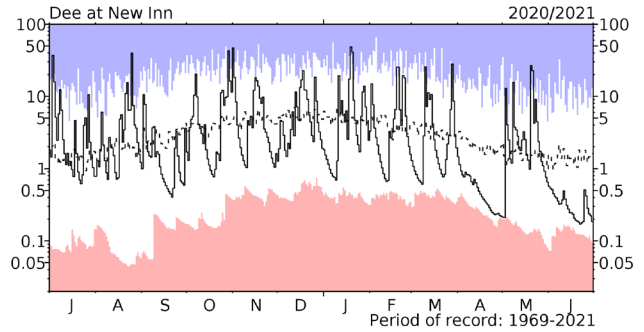


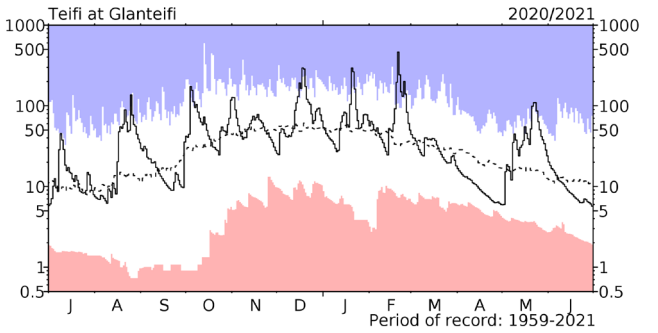


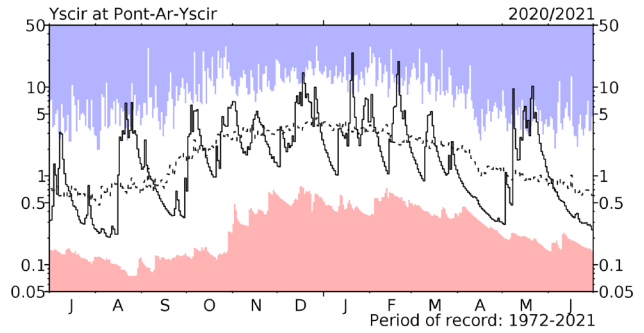








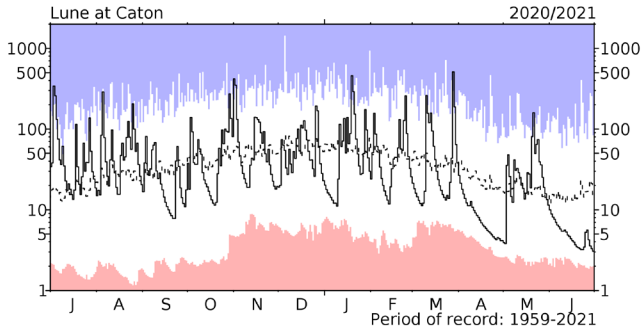


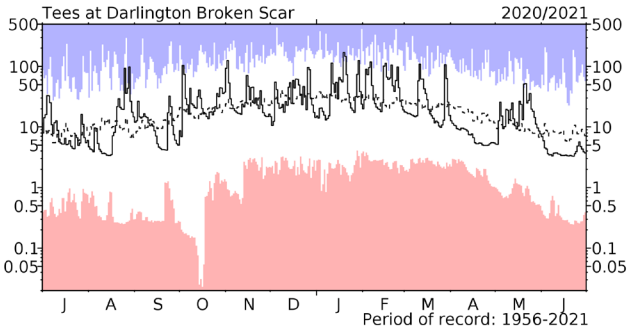


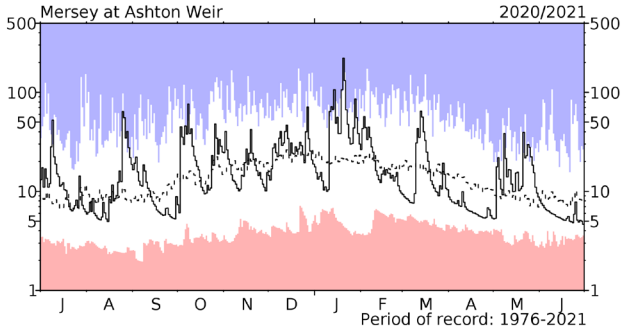
River flow hydrographs

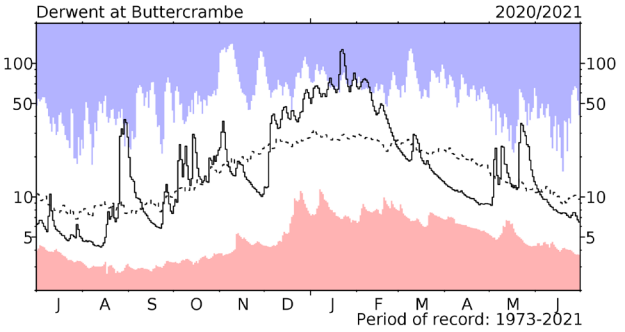
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to July 2019 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed line represents the period-of-record average daily flow.

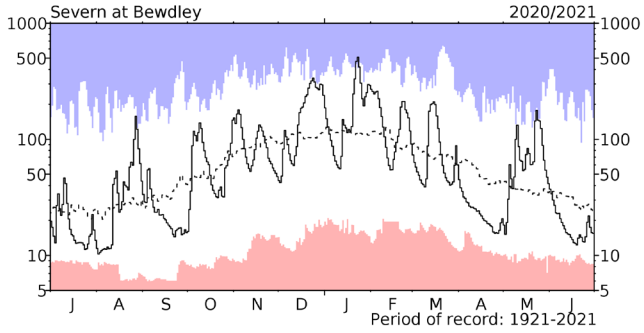
River flow . . . River flow . . .

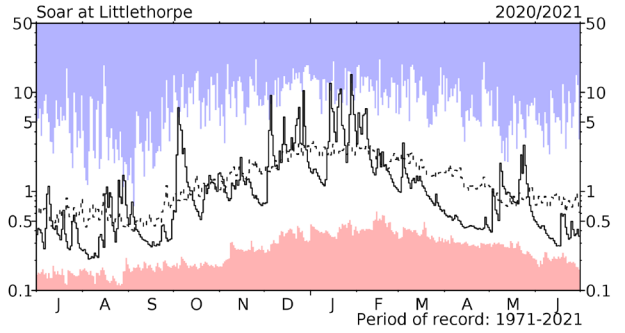


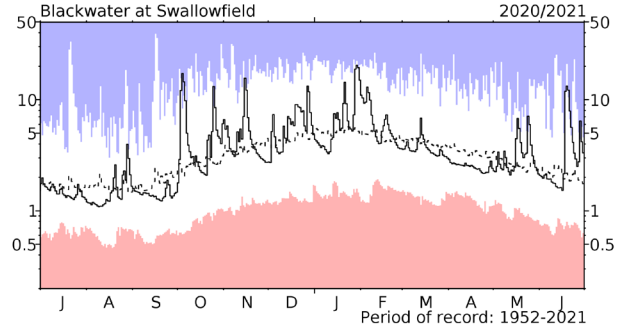


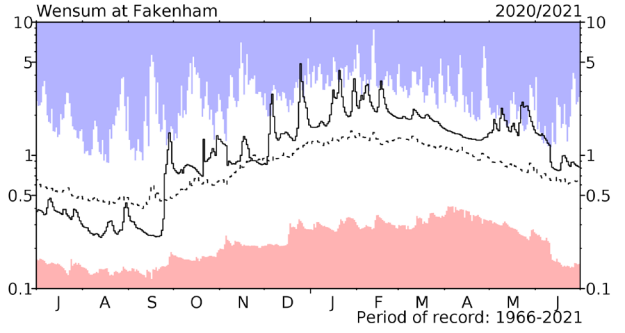


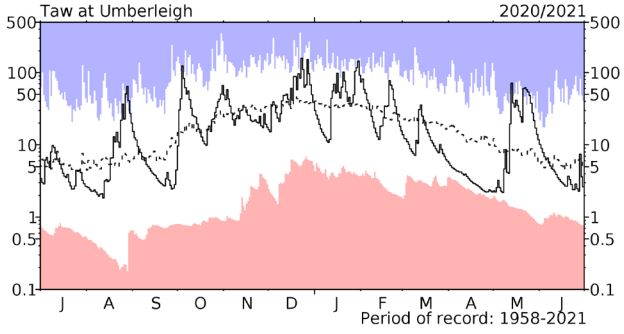


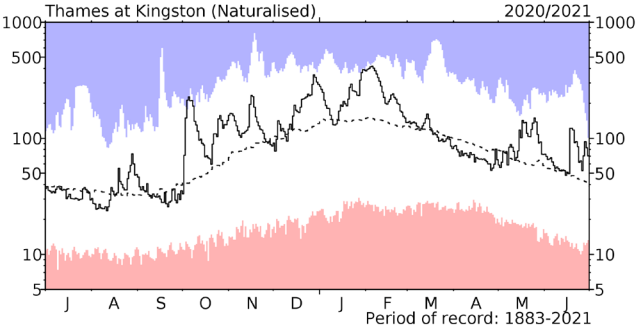


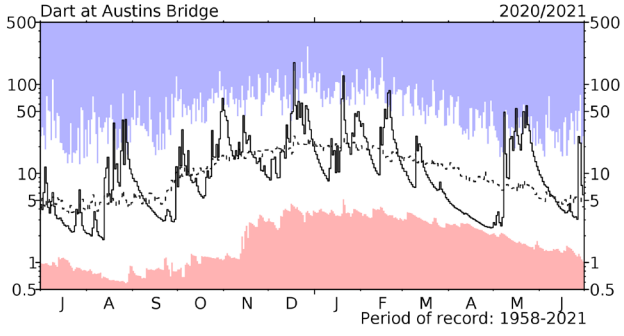


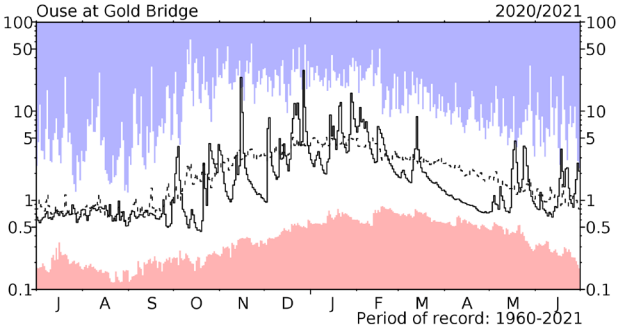




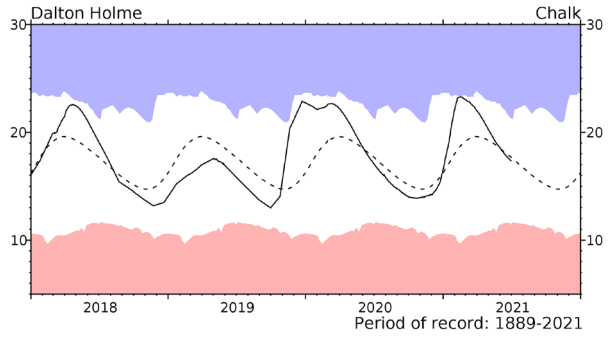


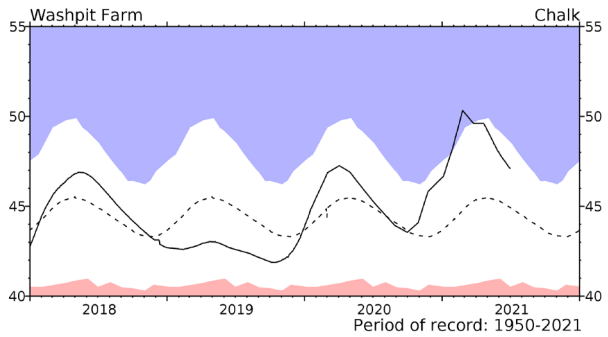


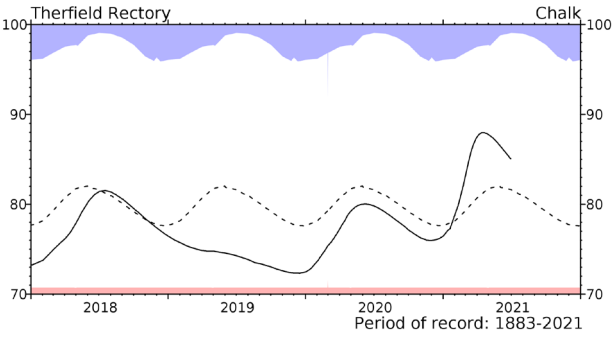


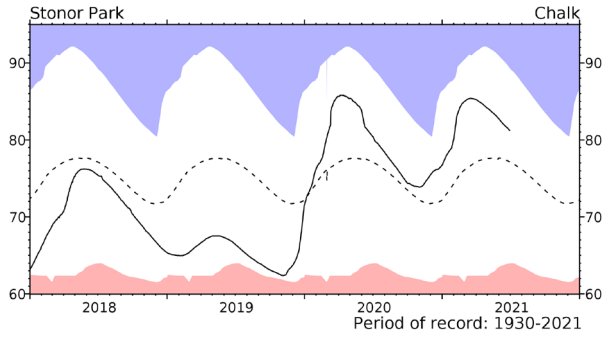


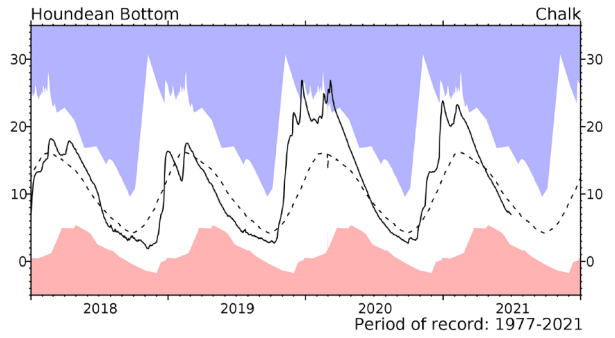
Groundwater…Groundwater

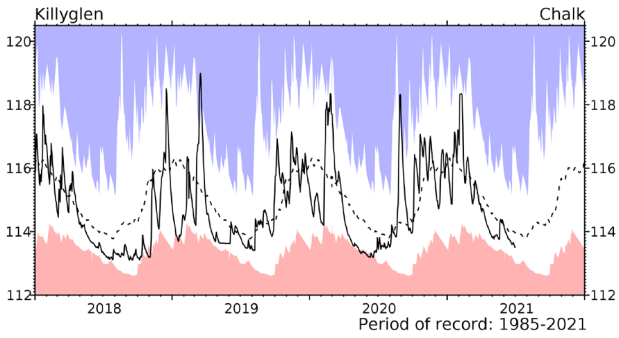


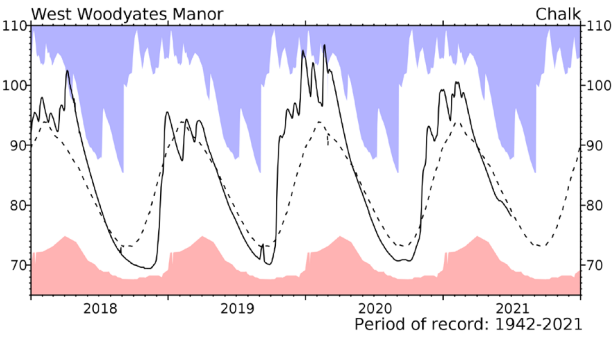


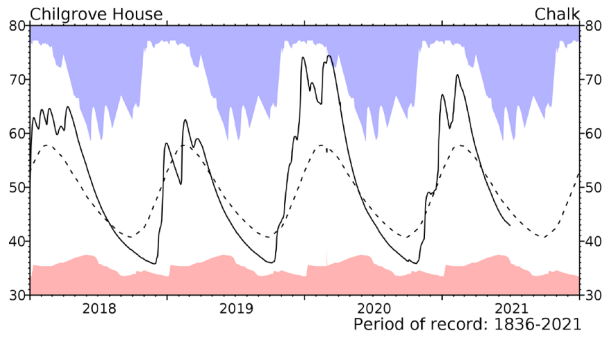


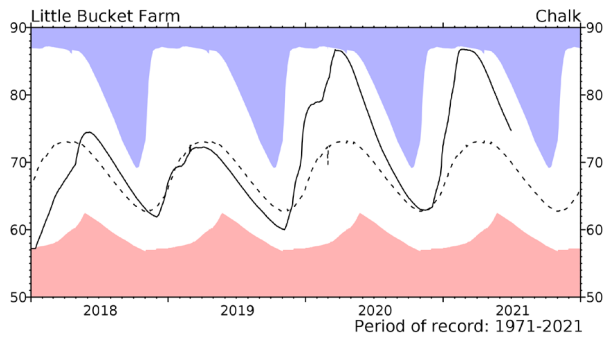


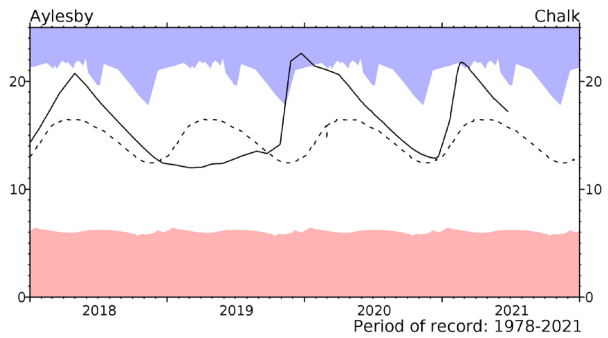






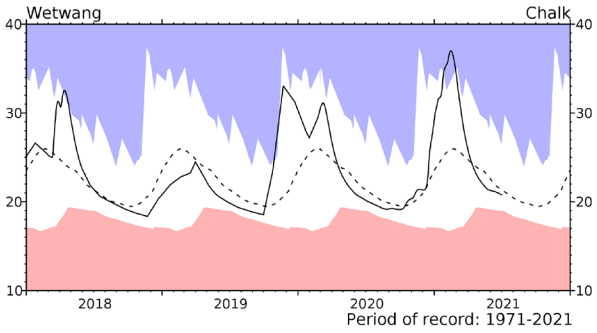


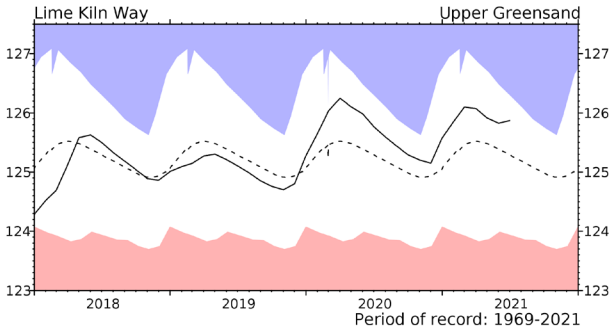


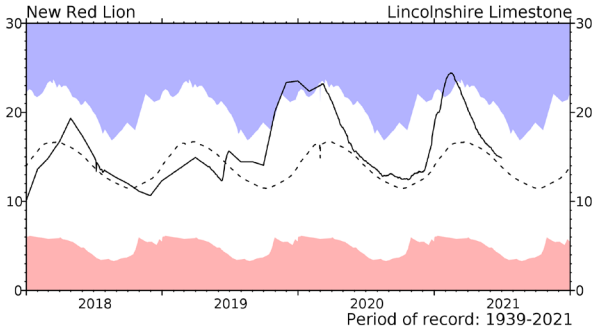


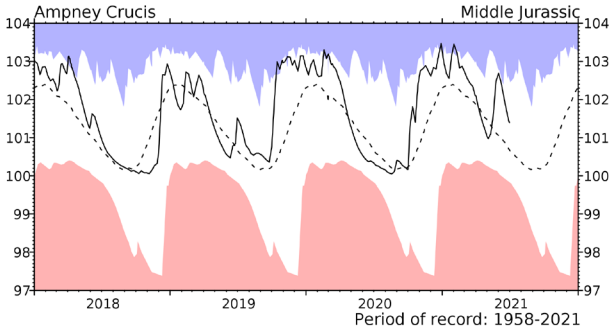
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is 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 calculated with data from the start of the record to the end of 2017. Note that most groundwater levels are not measured continuously and, for some index wells, the greater frequency of contemporary measurements may, in itself, contribute to an increased range of variation.

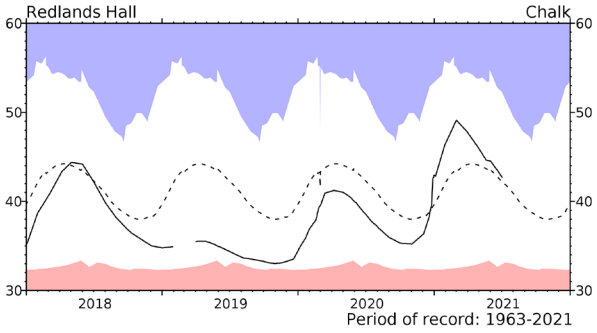
Groundwater… Groundwater

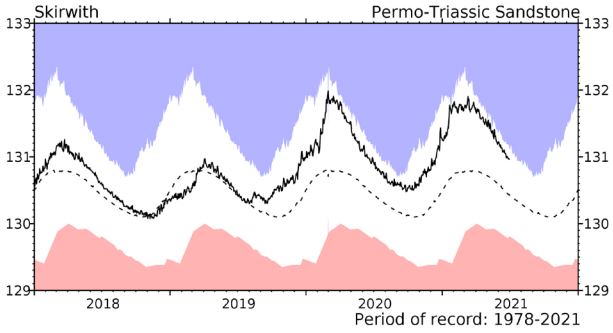


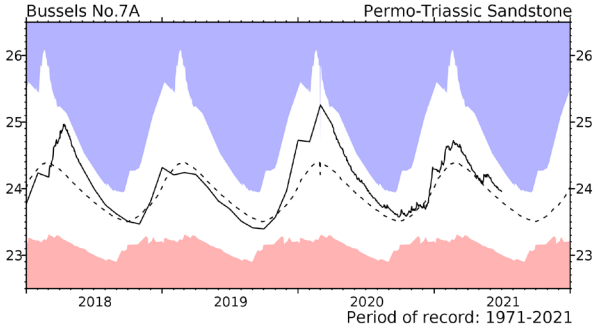


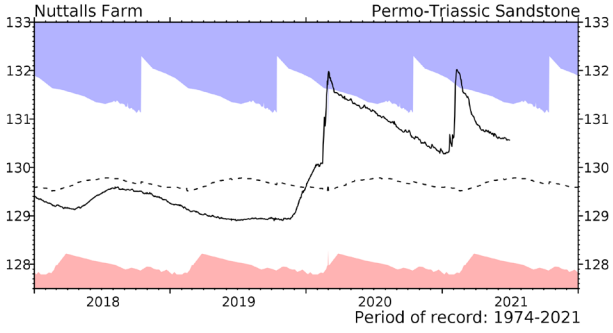


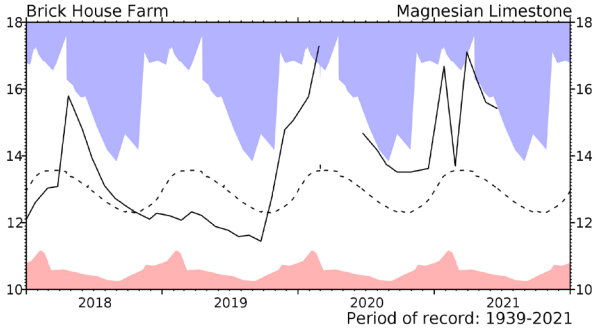


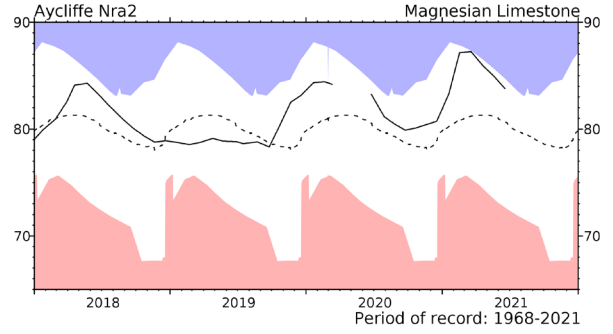


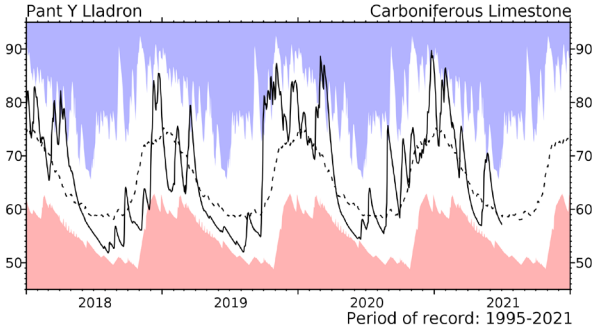


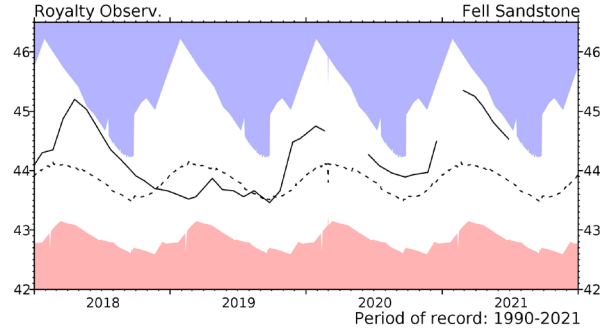




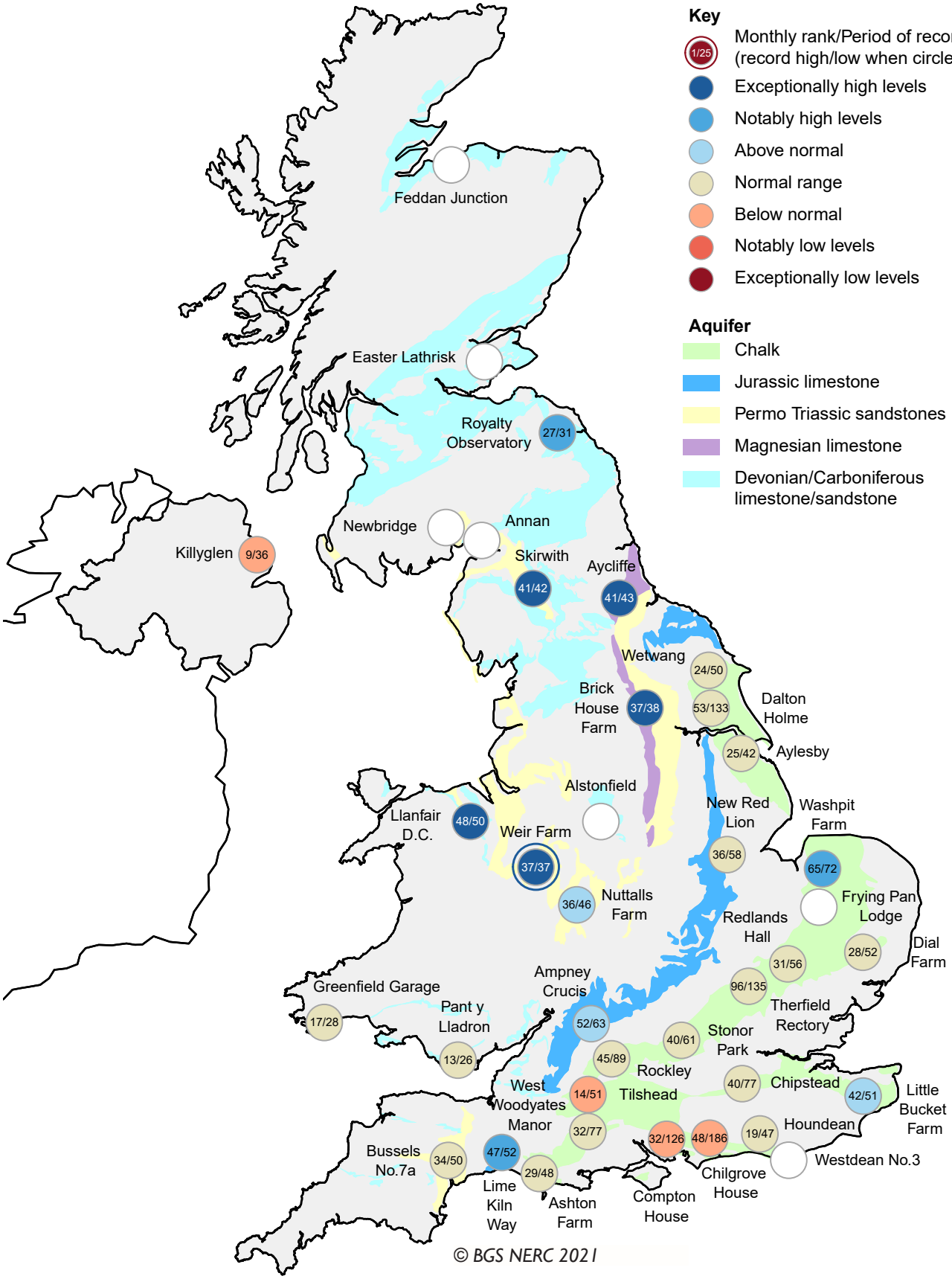








Groundwater…Groundwater



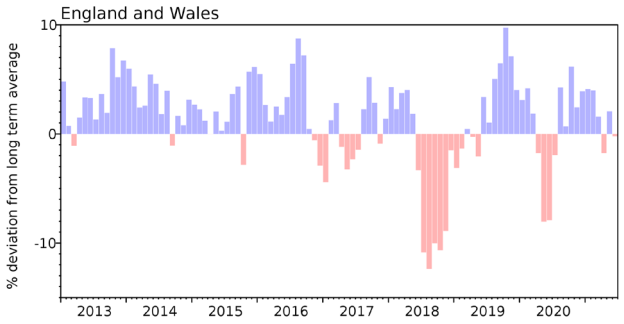
Groundwater levels - June 2021

The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. The rankings are designed as a qualitative indicator, and ranks at extreme levels, and when levels are changing rapidly, need to be interpreted with caution.

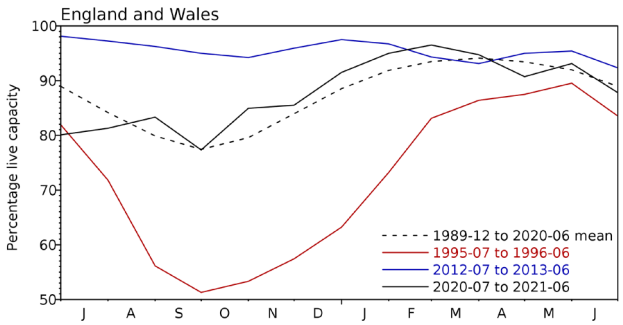
Note that due to continuing issues with data access, no data are available for Scotland.

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*



Note: Due to data access issues, the England and Wales stocks for June do not include the Northern Command Zone group or Vyrnwy.

Percentage live capacity of selected reservoirs at end of month

Area	Reservoir		Capacity (Ml)	2021 Apr	2021 May	2021 Jun	Jun Anom.	Min Jun	Year* of min	2020 Jun	Diff 21-20
North West	Haweswater & Thirlmere	•	111132	83	85	67	-5	51	2010	52	15
	Pennines		126991	81	89	76	1	56	2010	59	17
Northumbrian	Teesdale	•	87936	74	74	65	-14	58	1989	59	7
	Kielder		(199175)	89	96	89	-2	71	1989	85	3
Severn-Trent	Clywedog		49936	99	99	96	3	32	1976	90	6
	Derwent Valley	•	46692	83	92	78	-2	53	1996	66	12
Yorkshire	Washburn	•	23373	76	87	81	1	63	1995	67	14
	Bradford Supply	•	40942	84	97	83	5	54	1995	67	16
Anglian	Grafham		(55490)	96	92	93	1	70	1997	93	1
	Rutland		(116580)	96	95	95	6	75	1997	94	1
Thames	London	•	202828	96	91	91	-1	85	1990	93	-3
	Farmoor	•	13822	96	96	99	1	94	1995	97	2
Southern	Bewl		31000	90	90	87	4	52	1990	82	5
	Ardingly		4685	99	100	99	4	77	2020	77	22
Wessex	Clatworthy		5662	89	100	91	9	61	1995	70	21
	Bristol	•	(38666)	89	89	81	-2	64	1990	78	4
South West	Colliford		28540	86	87	83	0	51	1997	75	7
	Roadford		34500	91	93	90	10	49	1996	79	12
	Wimbleball		21320	85	98	97	12	63	2011	74	23
	Stithians		4967	89	88	82	2	53	1990	80	2
Welsh	Celyn & Brenig	•	131155	98	100	96	2	70	2020	70	25
	Brianne		62140	88	93	86	-7	76	1995	81	5
	Big Five	•	69762	87	92	81	-4	61	1989	68	13
	Elan Valley	•	99106	90	98	87	-1	68	1976	70	17
Scotland(E)	Edinburgh/Mid-Lothian	•	97223	93	92	82	-5	54	1998	83	-1
	East Lothian	•	9317	99	100	98	3	81	1992	91	7
Scotland(W)	Loch Katrine	•	110326	88	85	75	-5	55	2010	71	4
	Daer		22494	87	85	68	-16	62	1994	84	-16
	Loch Thom		10721	72	73	65	-22	65	2021	73	-8
Northern Ireland	Total+	•	56800	89	91	80	-2	61	2008	73	7
	Silent Valley	•	20634	84	87	76	-3	54	1995	66	10

( ) figures in parentheses relate to gross storage

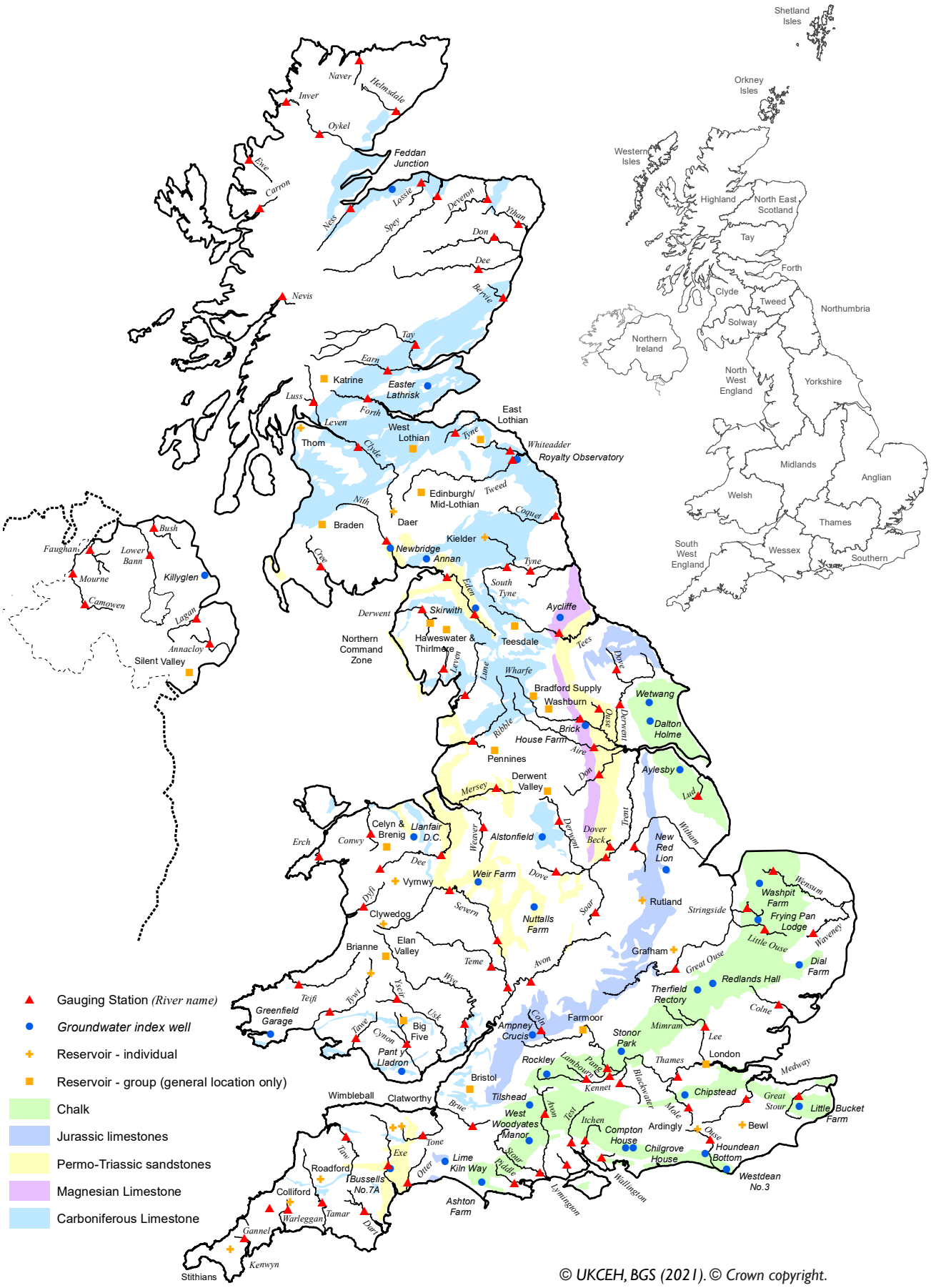
• denotes reservoir groups

*last occurrence

+ excludes Lough Neagh

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 1988-2012 period except for West of Scotland and Northern Ireland where data commence in the mid-1990s. In some gravity-fed reservoirs (e.g. Clywedog) stocks are kept below capacity during the winter to provide scope for flood attenuation purposes. Monthly figures may be artificially low due to routine maintenance or turbidity effects in feeder rivers.

Location map…Location map



NHMP

The National Hydrological Monitoring Programme (NHMP) was started in 1988 and is undertaken jointly by the UK Centre for Ecology & Hydrology (UKCEH) and the British Geological Survey (BGS). The NHMP aims to provide an authoritative voice on hydrological conditions throughout the UK, to place them in a historical context and, over time, identify and interpret any emerging hydrological trends. Hydrological analysis and interpretation within the Programme is based on the data holdings of the National River Flow Archive (NRFA; maintained by UKCEH) and National Groundwater Level Archive (NGLA; maintained by BGS), including rainfall, river flows, borehole levels, and reservoir stocks.

The Hydrological Summary is supported by the Natural Environment Research Council award number NE/R016429/1 as part of the UK-SCAPE programme delivering National Capability.

Data Sources

The NHMP depends on the active cooperation of many data suppliers. This cooperation is gratefully acknowledged. River flow and groundwater level data are provided by the Environment Agency (EA), Natural Resources Wales - Cyfoeth Naturiol Cymru (NRW), the Scottish Environment Protection Agency (SEPA) and, for Northern Ireland, the Department for Infrastructure - Rivers and the Northern Ireland Environment Agency. In all cases the data are subject to revision following validation (high flow and low flow data in particular may be subject to significant revision).

Details of reservoir stocks are provided by the Water Service Companies, the EA, Scottish Water and Northern Ireland Water.

The Hydrological Summary and other NHMP outputs may also refer to and/or map soil moisture data for the UK. These data are provided by the Meteorological Office Rainfall and Evaporation Calculation System (MORECS). MORECS provides estimates of monthly soil moisture deficit in the form of averages over 40 x 40 km grid squares over Great Britain and Northern Ireland. The monthly time series of data extends back to 1961.

Rainfall data are provided by the Met Office. To allow better spatial differentiation the rainfall data for Britain are presented for the regional divisions of the precursor organisations of the EA, NRW and SEPA. The areal rainfall figures have been produced by the Met Office National Climate Information Centre (NCIC), and are based on 5km resolution gridded data from rain gauges. The majority of the full rain gauge network across the UK is operated by the EA, NRW, SEPA and Northern Ireland Water; supplementary rain gauges are operated by the Met Office. The Met Office NCIC monthly rainfall series extend back to 1910 and form the official source of UK areal rainfall statistics which have been adopted by the NHMP. The gridding technique used is described in Perry MC and Hollis DM (2005) available at https://doi.org/10.1002/joc.1161

Long-term averages are based on the period 1981-2010 and are derived from the monthly areal series.

The regional figures for the current month in the hydrological summaries are based on a limited rain gauge network so these (and the associated return periods) should be regarded as a guide only.

The monthly rainfall figures are provided by the Met Office NCIC and are Crown Copyright and may not be passed on to, or published by, any unauthorised person or organisation.

For further details on rainfall or MORECS data, please contact the Met Office:

Tel: 0870 900 0100
Email: enquiries@metoffice.gov.uk

Enquiries

Enquiries should be directed to the NHMP:

Tel: 01491 692599
Email: nhmp@ceh.ac.uk

A full catalogue of past Hydrological Summaries can be accessed and downloaded at:

http://nrfa.ceh.ac.uk/monthly-hydrological-summary-uk

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