Hydrological Summary

for the United Kingdom

April 2020

General

April was a transformative month, with little appreciable rainfall and widespread river flow recessions in dramatic contrast to the record-breaking wet weather and flooding only two months ago. For the UK as a whole, it was warm (the fifth warmest April in a series from 1910) and sunny (the sunniest April in a series from 1929), with some wildfires reported in Scotland and Northern Ireland. At the national scale rainfall was less than half the average, with a large swathe of northern Britain registering less than a third of average. The Northumbria region recorded its driest month since records began (in 1910). Correspondingly, river flows were substantially below average across large parts of the north and west with new record low April mean flows in several catchments. By month-end, flows approached or surpassed seasonal minima and in some catchments in north-west England flows were lower than those recorded in previous notable drought events. Soil Moisture Deficits (SMDs) increased markedly during April and for the UK, late-April soils were the second driest (behind 2011) in a series from 1961. Groundwater levels fell at nearly all index sites but generally remained above normal or higher, following the healthy recharge season over the winter. Reservoir stocks at the end of April were moderately below average at the national scale, however, some individual impoundments in Scotland and northern England were nearly 20% below the average for the time of year. Given the current hydrological situation of drier than average soils, low river flows and depleted reservoir stocks in some impoundments, close monitoring of the development of these deficits is required as we move towards summer. Furthermore, the current outlook favours drier conditions extending into the early summer, increasing the likelihood of agricultural stress and environmental impacts of low flows in the coming months, with the potential for localised water resources pressure later in 2020.

Rainfall

April was dominated by high pressure, with only brief interruptions bringing little appreciable rainfall to large parts of the UK (particularly in the north and east). In the first week, fronts traversed Scotland and Northern Ireland, although no notable rainfall totals were recorded. There was another more unsettled period mid-month with thunderstorms and heavy rainfall mainly affecting Wales and southern England – 38mm recorded at Portsea (Hampshire) on the 17th. In most areas (away from the south), the majority of the month's rainfall fell in the last few days with a slow moving frontal system crossing the UK – 34mm was recorded at Capel Curig (Snowdonia) on the 30th. In a month of predominantly dry weather, the country as a whole registered 41% of average, with the vast majority of the UK recording below average rainfall. The only exception was an area of central southern England where rainfall was moderately above average. A large swathe of northern and eastern Britain recorded less than 30% of average and it was the driest April for the North East (Scotland) and Tweed regions in a series from 1910. Northumbria recorded its driest month in a series from 1910, with only 8% of the April average rainfall. For the spring so far (March-April), rainfall was two thirds of average for the UK, with some regions registering less than half of average.

River flows

The recessions which began in mid-March continued into April in most catchments with only modest interruptions in response to the unsettled periods during the month. By month-end, flows approached the seasonal minima in several catchments and surpassed the previously recorded daily flow minima for the time of year for more than two weeks (in consecutive days) on the Luss (16 days), Annacloy (17 days), Dyfi and Lagan (both 21 days). In north-west England, flows on the Lune and Eden were lower than those recorded in the notable drought years of 1976, 1984 and 2011. Mean monthly river flows for April were generally below normal or lower, with the exception of groundwater-fed rivers in central southern England (flows were exceptionally high on the Itchen). Away from the south east, flows in the Midlands were below normal, generally notably or exceptionally low elsewhere and less than a quarter of average in several catchments (e.g. the Lune, Conwy and Tywi). New record minimum April mean flows were set on the Luss, Forth, Annacloy, Welsh Dee (all in records exceeding 40 years) and for the English Leven (in a record from 1939). The spatial footprint of protracted flow recessions is evident in the national outflow series with flows approaching seasonal minima in Scotland and Wales. For the spring so far (March-April), flows were predominantly in the normal range across the UK, with above normal flows in the Midlands (following the exceptionally wet February causing high flows in early March) and southern England and below normal flows in isolated catchments in northern Britain. On the Helmsdale, average flows were exceptionally low, surpassed only in 2003 (in a series from 1975).

Groundwater*

SMDs increased markedly during April and soils were appreciably drier than the long-term average at month-end across the main aquifer areas of England. In the Chalk, groundwater levels receded during April, except at Therfield Rectory and Hay Farm in the Chilterns where levels are slower to respond. However, due to the high rainfall recorded over the winter, levels remained in the normal range in Yorkshire and notably high in parts of southern England, where a few groundwater flood alerts remained at the end of the month and some minor impacts on cellars and sewerage systems continued. In the Jurassic limestones, levels fell into the normal range at Ampney Crucis, and from notably high to above normal at New Red Lion. In the Carboniferous Limestone, levels fell at Pant y Lladron and were below normal. In the Permo-Triassic sandstones, levels fell at Newbridge, Skirwith and Bussells No.7a and stabilised in North Wales and the Midlands. Levels varied from above normal at Newbridge to exceptionally high at Skirwith, Nuttalls Farm and Weir Farm, where at the latter a new record monthly maximum was established for the third consecutive month. In the Upper Greensand at Lime Kiln Way, levels fell, but remained notably high for the time of year.

**Note: Due to COVID-19 restrictions, data were unavailable for several sites, including none in the Magnesian Limestone or Fell Sandstone.*

UK Centre for Ecology & Hydrology

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Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

Percentages are from the 1981-2010 average.

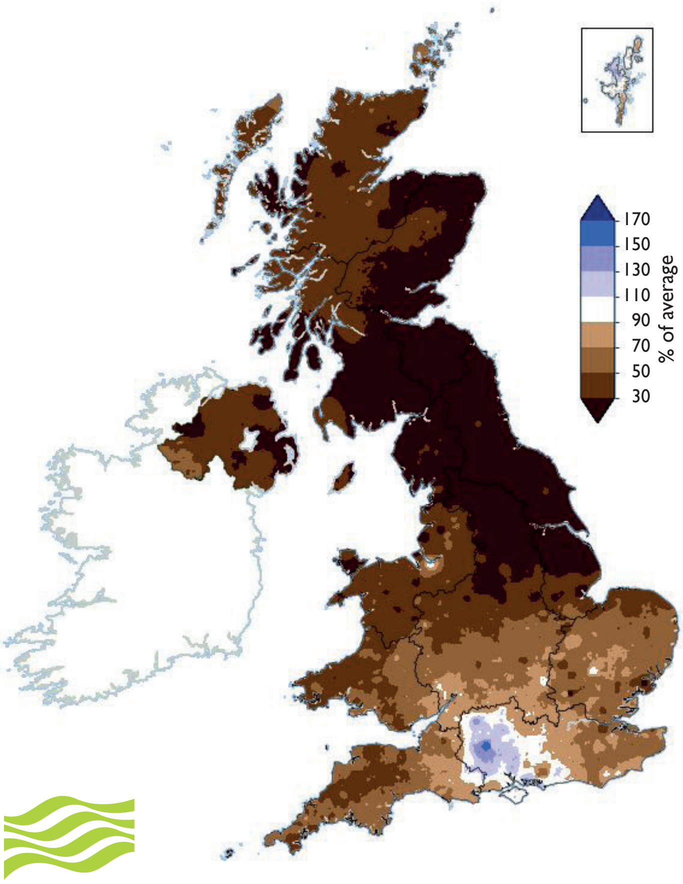
Region	Rainfall	Apr 2020	Mar20 – Apr20	RP	Nov19 – Apr20	RP	Aug19 – Apr20	RP	May19 – Apr20	RP
United	mm	**29**	107		694		1092		1357	
Kingdom	%	**41**	66	5-10	114	10-20	120	>100	120	>100
England	mm	**28**	77		522		837		1058	
	%	**48**	64	5-10	120	5-10	126	20-35	125	25-40
Scotland	mm	**28**	152		933		1440		1780	
	%	**33**	68	2-5	110	8-12	114	25-40	117	50-80
Wales	mm	**41**	135		919		1442		1703	
	%	**47**	67	2-5	117	5-10	124	30-50	120	15-25
Northern	mm	**26**	95		624		993		1251	
Ireland	%	**35**	56	8-12	105	2-5	109	10-20	110	10-15
England &	mm	**30**	85		577		920		1146	
Wales	%	**48**	65	5-10	119	5-10	126	25-40	124	25-40
North West	mm	**21**	107		753		1249		1564	
	%	**30**	63	5-10	117	8-12	126	70-100	127	80-120
Northumbria	mm	**5**	57		459		801		1067	
	%	**8**	45	15-25	102	2-5	118	8-12	122	15-25
Severn-Trent	mm	**26**	68		495		800		1059	
	%	**45**	59	5-10	127	8-12	133	40-60	135	>100
Yorkshire	mm	**10**	55		505		848		1091	
	%	**17**	44	15-25	116	5-10	129	15-25	129	30-50
Anglian	mm	**24**	46		334		547		744	
	%	**52**	52	8-12	113	2-5	117	5-10	119	8-12
Thames	mm	**41**	83		458		690		863	
	%	**79**	81	2-5	126	5-10	124	8-12	120	8-12
Southern	mm	**44**	96		553		803		970	
	%	**84**	87	2-5	130	8-12	125	8-12	121	8-12
Wessex	mm	**50**	107		587		916		1075	
	%	**85**	85	2-5	123	5-10	129	15-25	121	10-15
South West	mm	**41**	130		858		1318		1510	
	%	**53**	76	2-5	124	8-12	131	25-40	123	10-20
Welsh	mm	**41**	130		882		1388		1645	
	%	**49**	68	2-5	118	5-10	124	25-40	120	20-30
Highland	mm	**39**	206		1126		1685		2053	
	%	**39**	76	2-5	107	5-10	110	10-15	113	15-25
North East	mm	**18**	56		524		843		1162	
	%	**27**	39	>>100	101	2-5	105	2-5	115	8-12
Tay	mm	**22**	110		855		1282		1608	
	%	**29**	57	8-12	115	8-12	116	15-25	120	30-50
Forth	mm	**16**	107		773		1197		1506	
	%	**23**	62	5-10	120	20-30	123	80-120	125	>100
Tweed	mm	**9**	88		637		1022		1297	
	%	**14**	61	5-10	119	10-20	126	80-120	126	70-100
Solway	mm	**19**	120		886		1484		1793	
	%	**22**	56	5-10	110	5-10	121	>100	120	>100
Clyde	mm	**30**	191		1161		1812		2198	
	%	**30**	72	2-5	115	10-15	119	50-80	121	80-120

% = 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.

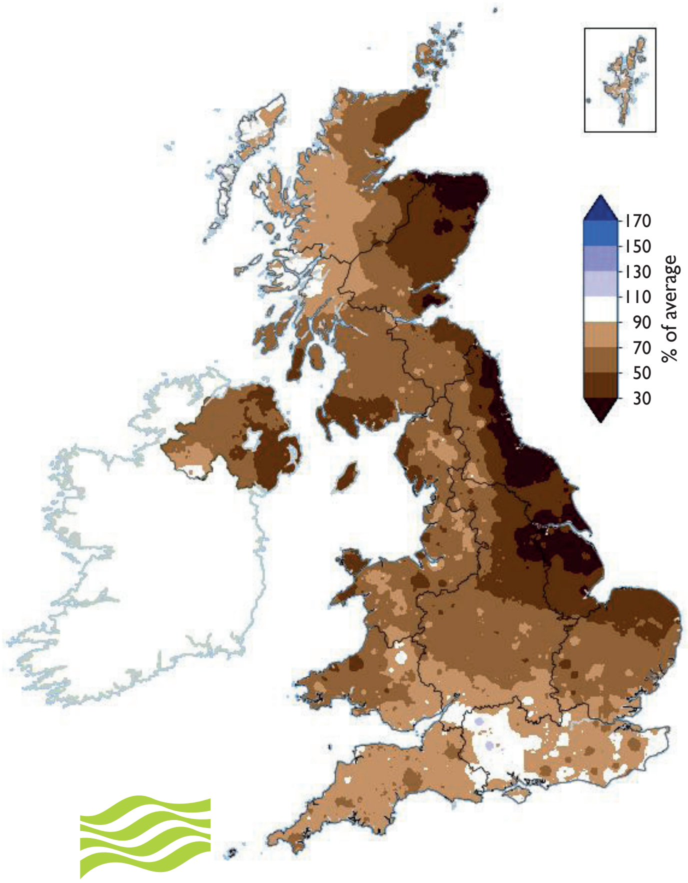
Rainfall . . . Rainfall . . .

April 2020 rainfall as % of 1981-2010 average



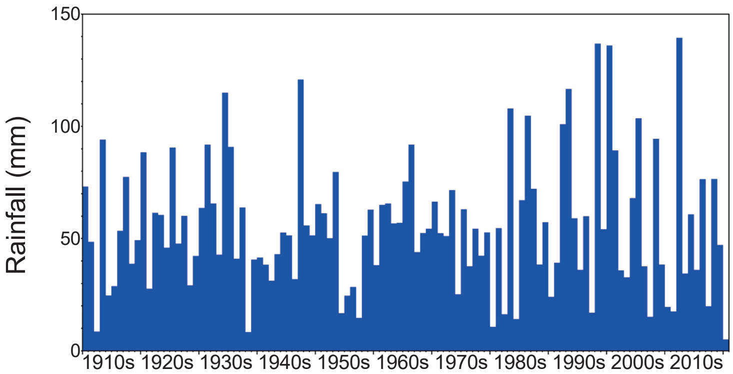
Met Office

March 2020 - April 2020 rainfall as % of 1981-2010 average

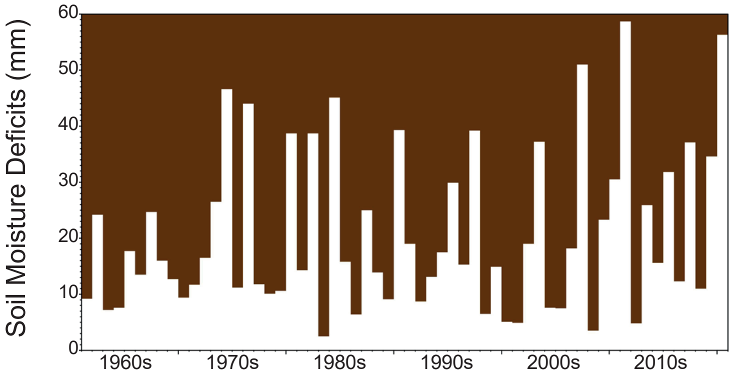


Met Office

April rainfall totals for the Northumbria region



End of April SMDs for the United Kingdom



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.

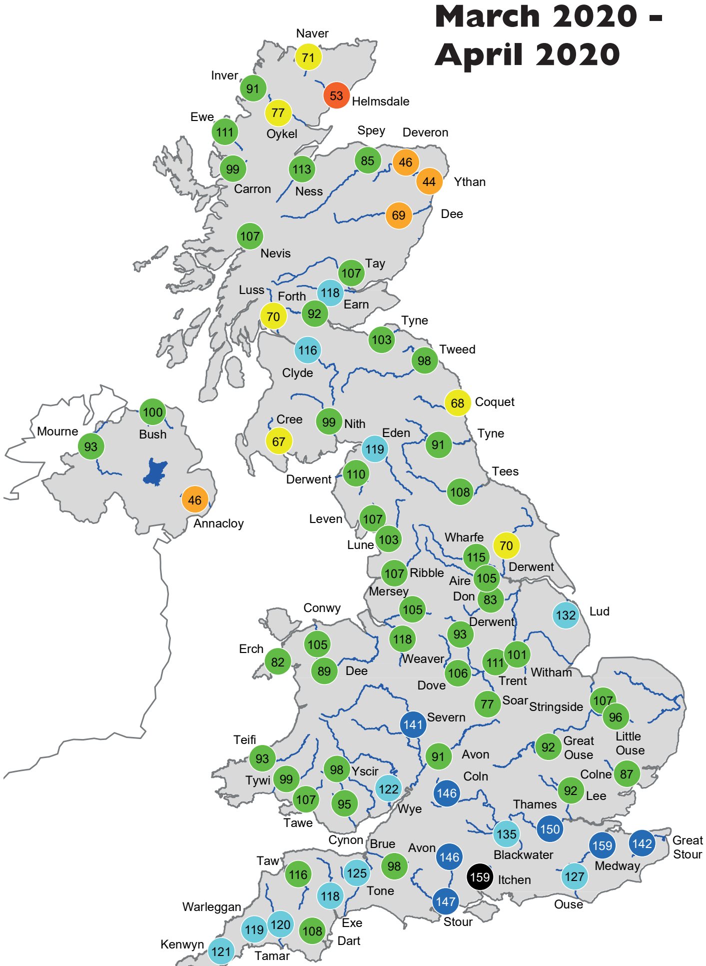
The complete version of the Hydrological Outlook UK can be found at: www.hydoutuk.net/latest-outlook/

Period: **from May 2020**
Issued: **11.05.2020**
using data to the end of April 2020

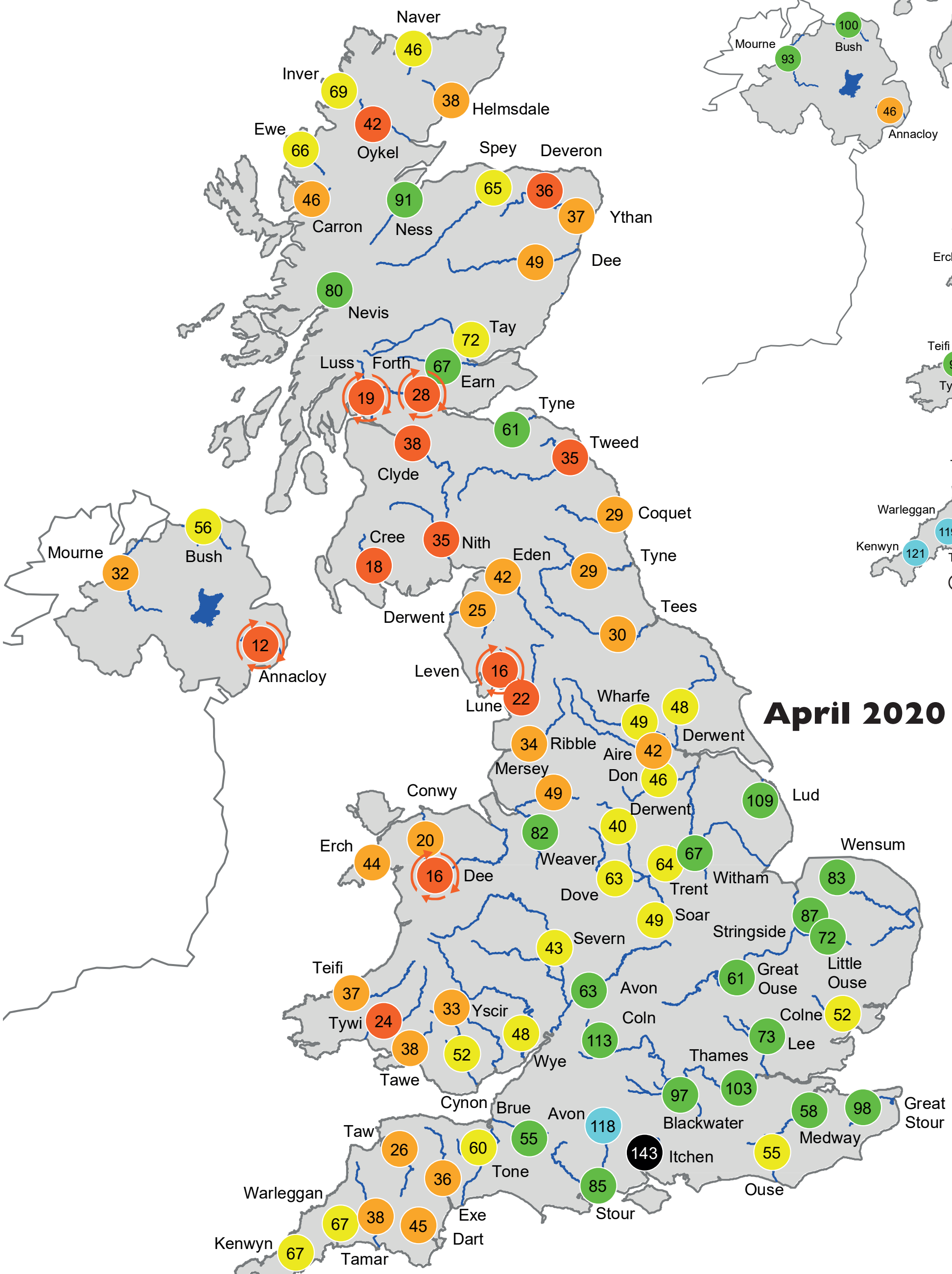
Following recent prolonged dry weather, river flows in northern and western parts of the UK are likely to be below normal in May, with exceptionally low flows likely in some areas. The three month outlook is similar, albeit with less confidence. Elsewhere, in parts of the Midlands and south-east England, flows are likely to be normal to below normal over the next three months, with the exception of parts of central southern England where normal to above normal flows are likely. Groundwater levels are likely to be normal to above normal in May across all aquifers, with a similar picture for the next three months but with more aquifers returning to the normal range.

River flow . . . River flow . . .

March 2020 - April 2020



April 2020



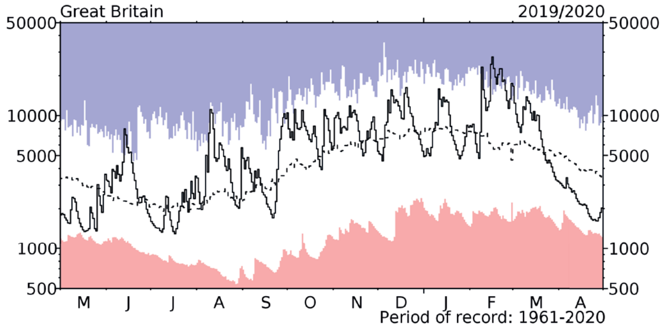
Key

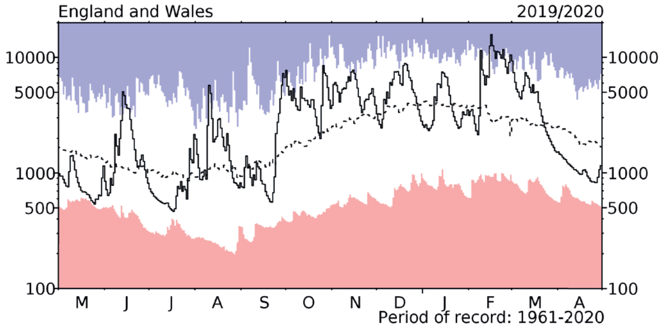
- 25 — % of long-term average (record figure when circled)
- Exceptionally high flow
- Notably high flow
- Above normal
- Normal range
- Below normal
- Notably low flow
- Exceptionally low flow

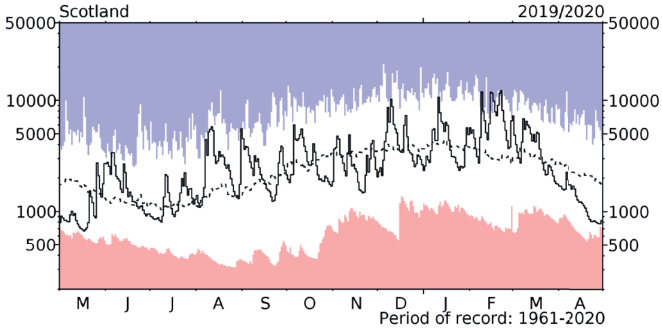
*Based on ranking of the monthly flow**

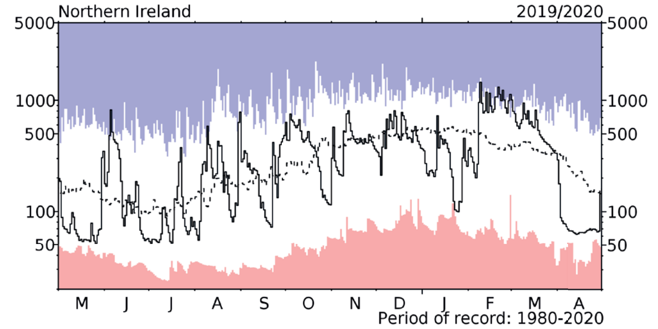
River flows

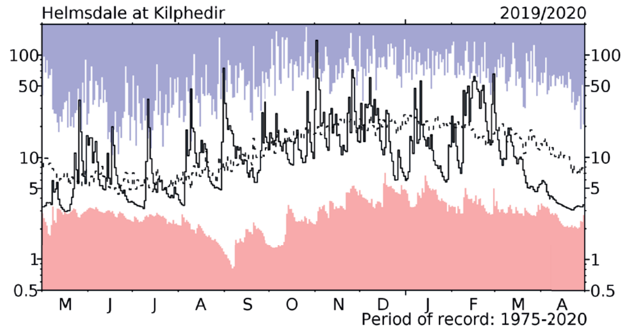
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much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

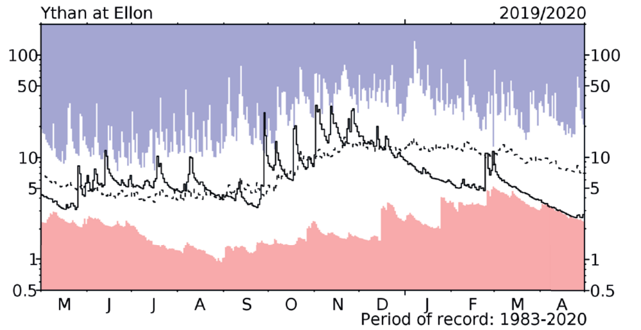


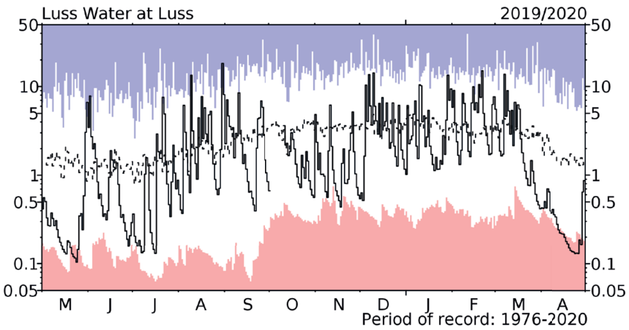


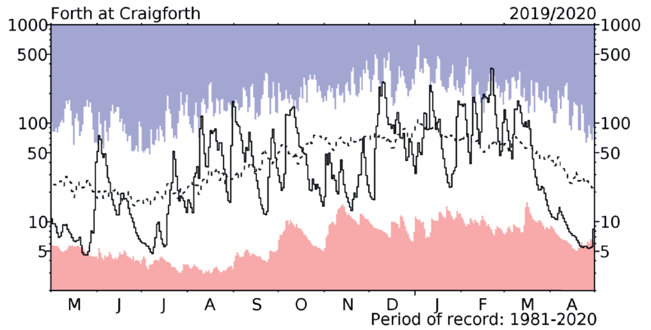


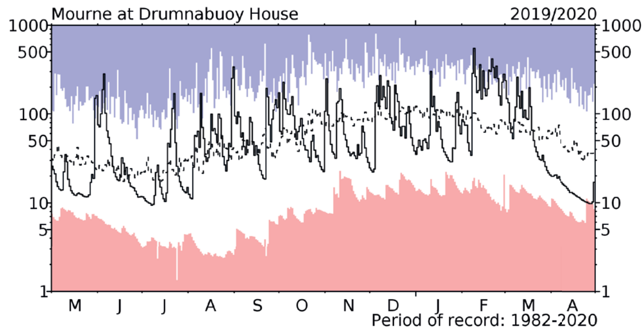


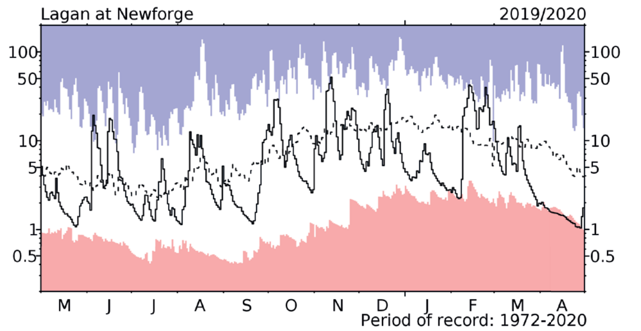








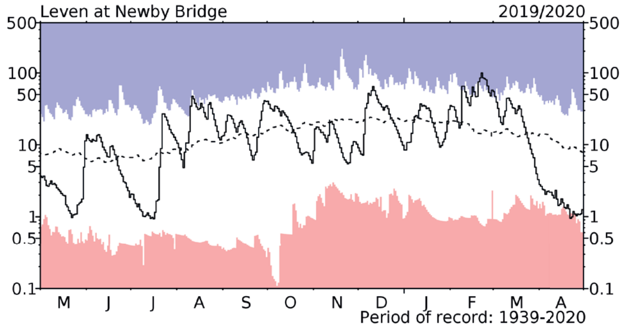




River flow hydrographs

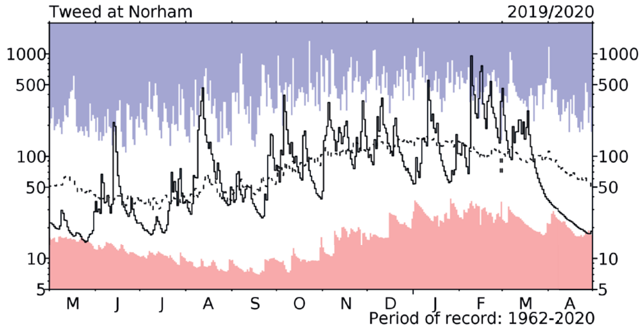
*The river flow hydrographs show the daily mean flows (measured in m^3s^{-1}) together with the maximum and minimum daily flows prior to May 2019 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas. The dashed line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

Leven at Newby Bridge 2019/2020



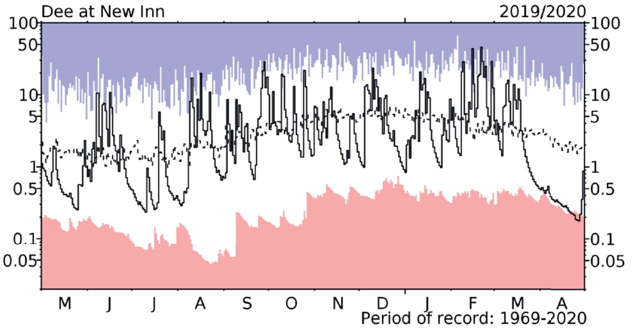
Period of record: 1939-2020

Tweed at Norham 2019/2020



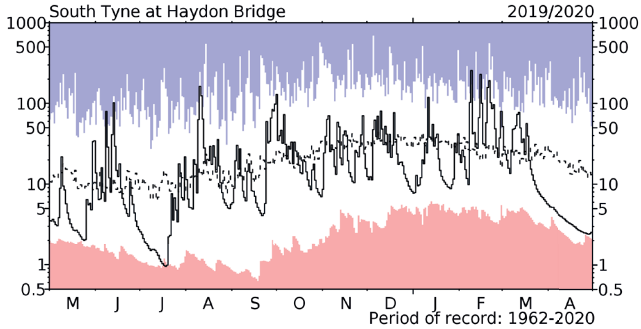
Period of record: 1962-2020

Dee at New Inn 2019/2020



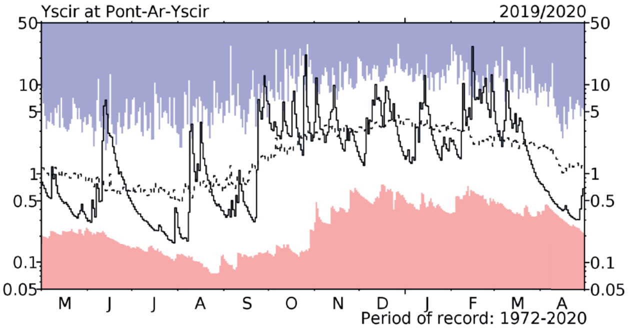
Period of record: 1969-2020

South Tyne at Haydon Bridge 2019/2020



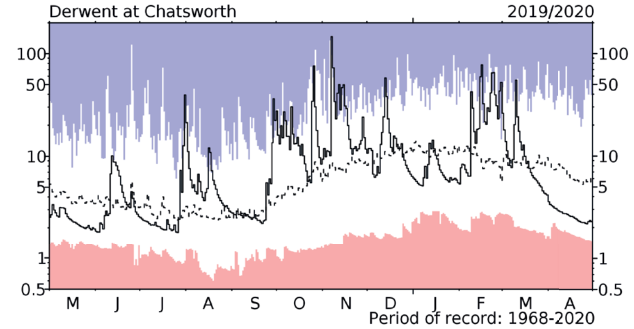
Period of record: 1962-2020

Yscir at Pont-Ar-Yscir 2019/2020



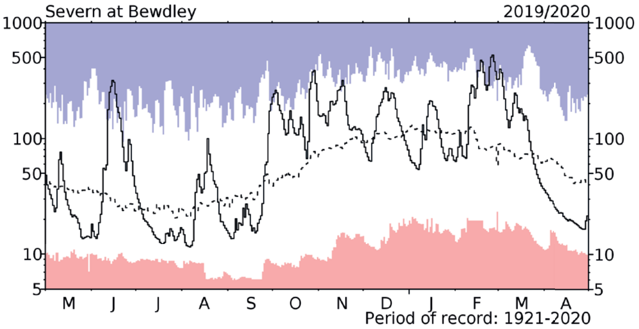
Period of record: 1972-2020

Derwent at Chatsworth 2019/2020



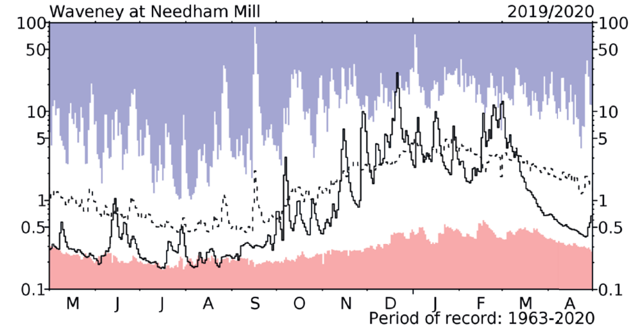
Period of record: 1968-2020

Severn at Bewdley 2019/2020



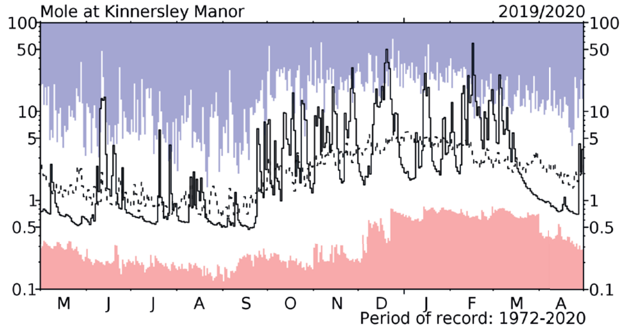
Period of record: 1921-2020

Waveney at Needham Mill 2019/2020



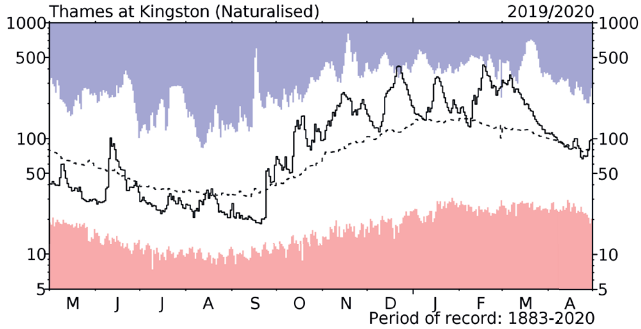
Period of record: 1963-2020

Mole at Kinnersley Manor 2019/2020



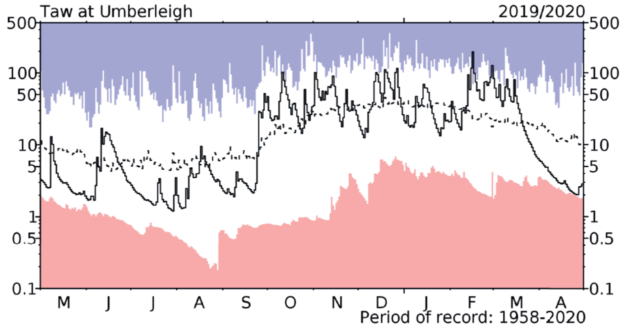
Period of record: 1972-2020

Thames at Kingston (Naturalised) 2019/2020



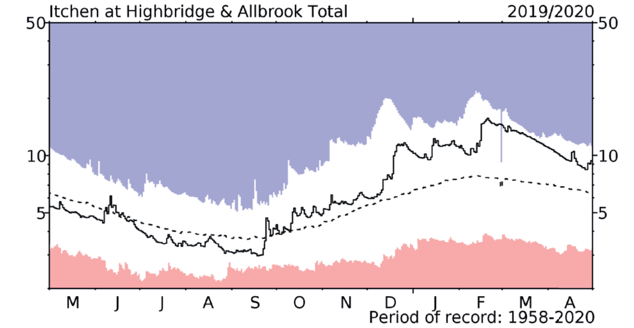
Period of record: 1883-2020

Taw at Umberleigh 2019/2020



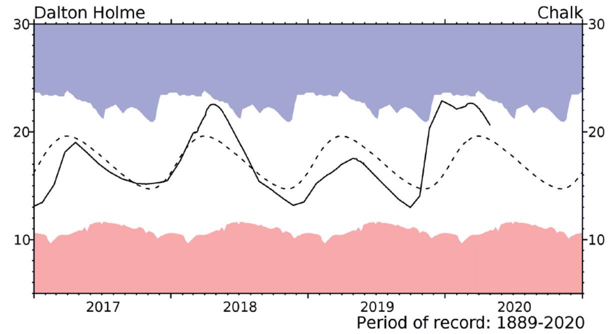
Period of record: 1958-2020

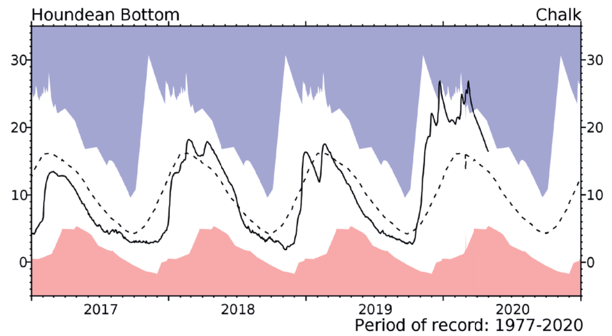
Itchen at Highbridge & Allbrook Total 2019/2020

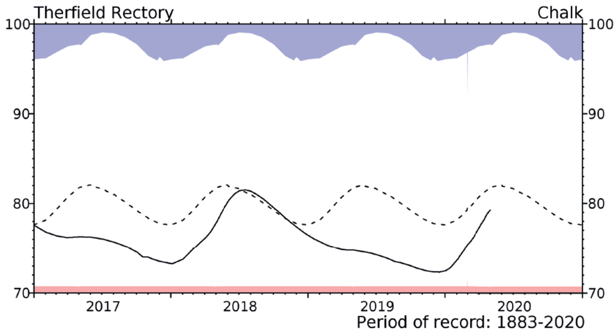


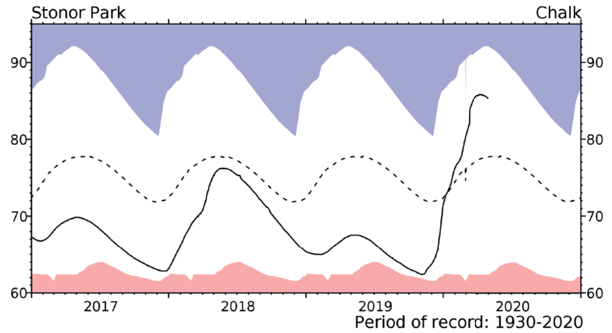
Period of record: 1958-2020

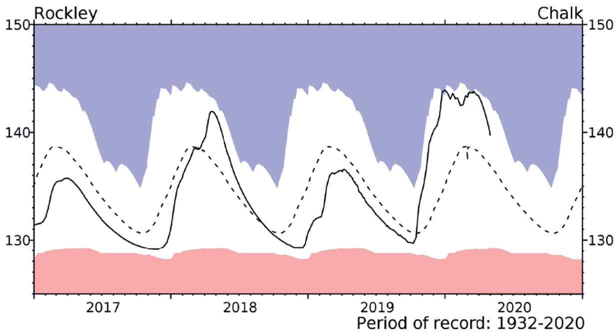
Groundwater . . . Groundwater

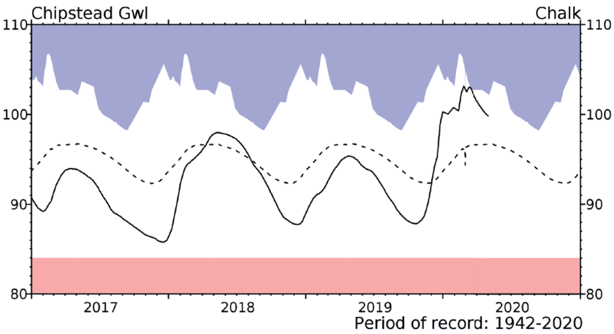


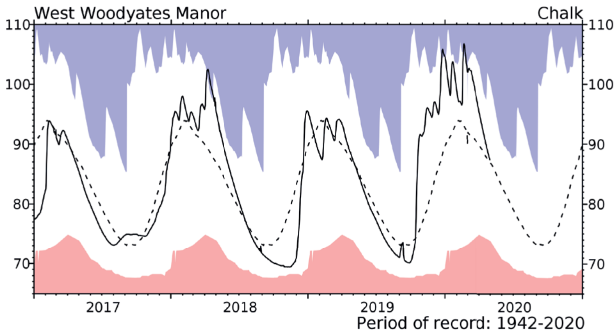


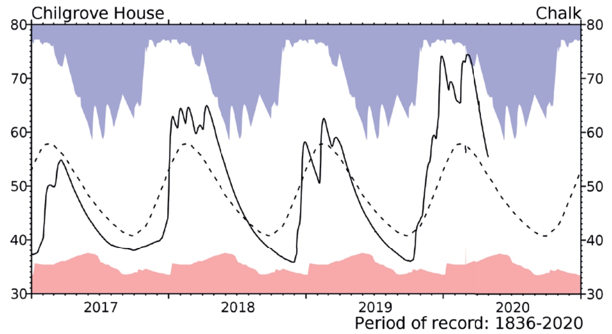


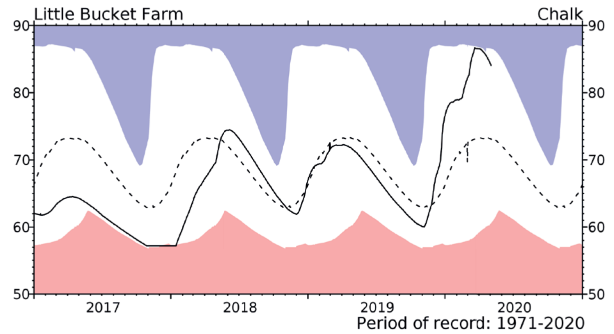


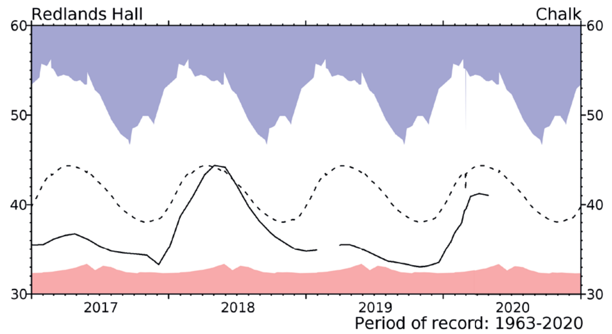




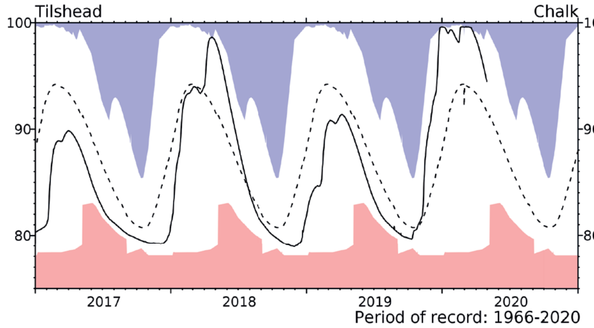


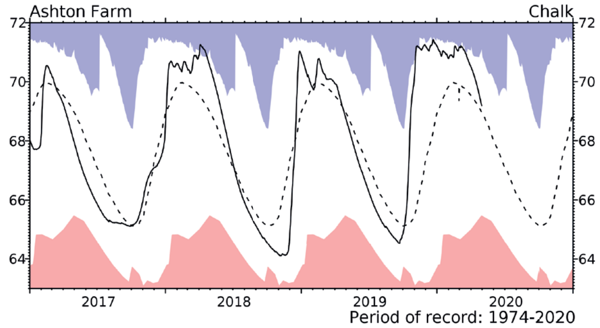


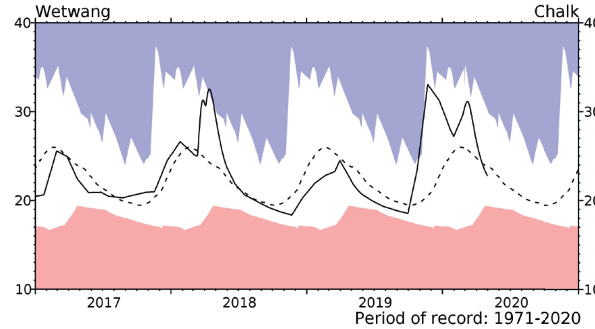


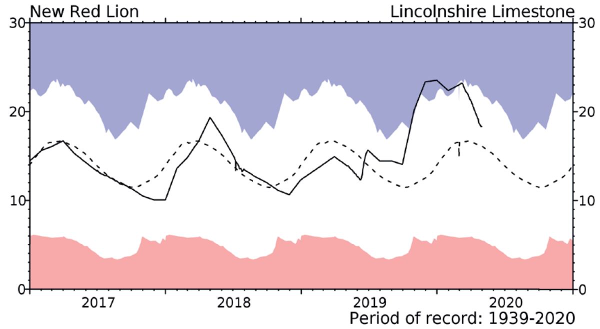


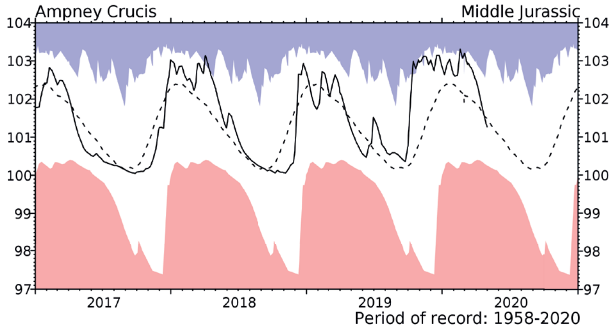
Groundwater levels (measured in metres above ordnance datum) normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is 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 displayed in a similar style to the river flow hydrographs. 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.

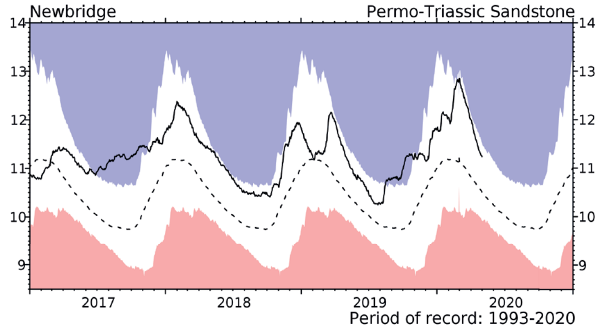

Tilshead
Chalk
100
90
80
2017
2018
2019
2020
Period of record: 1966-2020

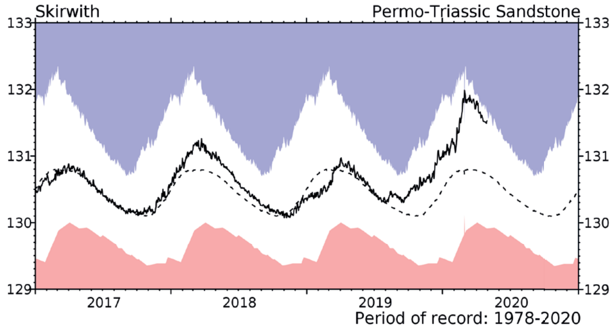

Ashton Farm
Chalk
72
70
68
66
64
2017
2018
2019
2020
Period of record: 1974-2020

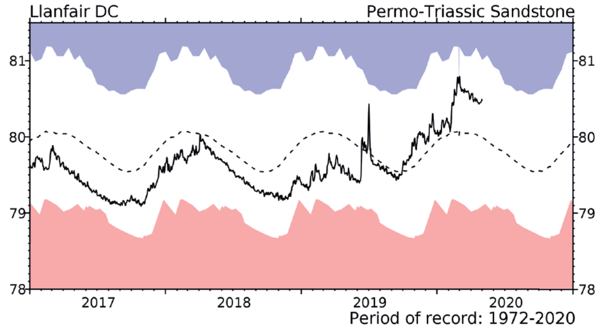

Wetwang
Chalk
40
30
20
10
2017
2018
2019
2020
Period of record: 1971-2020

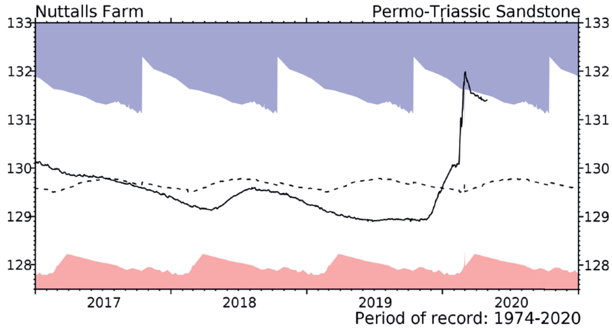

New Red Lion
Lincolnshire Limestone
30
20
10
0
2017
2018
2019
2020
Period of record: 1939-2020

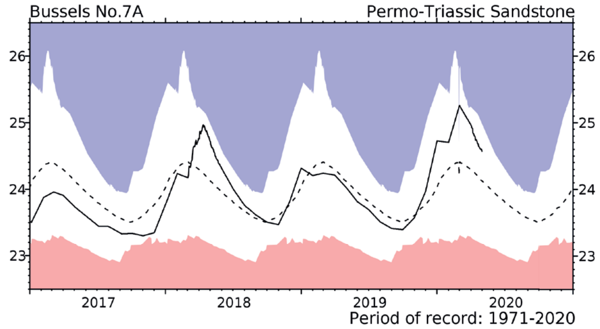

Ampney Crucis
Middle Jurassic
104
103
102
101
100
99
98
97
2017
2018
2019
2020
Period of record: 1958-2020

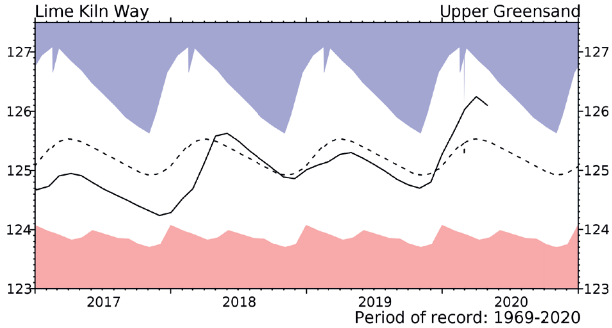

Newbridge
Permo-Triassic Sandstone
14
13
12
11
10
9
2017
2018
2019
2020
Period of record: 1993-2020

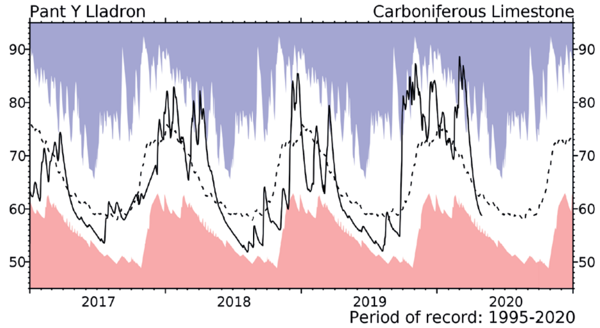

Skirwith
Permo-Triassic Sandstone
133
132
131
130
129
2017
2018
2019
2020
Period of record: 1978-2020


Llanfair DC
Permo-Triassic Sandstone
81
80
79
78
2017
2018
2019
2020
Period of record: 1972-2020

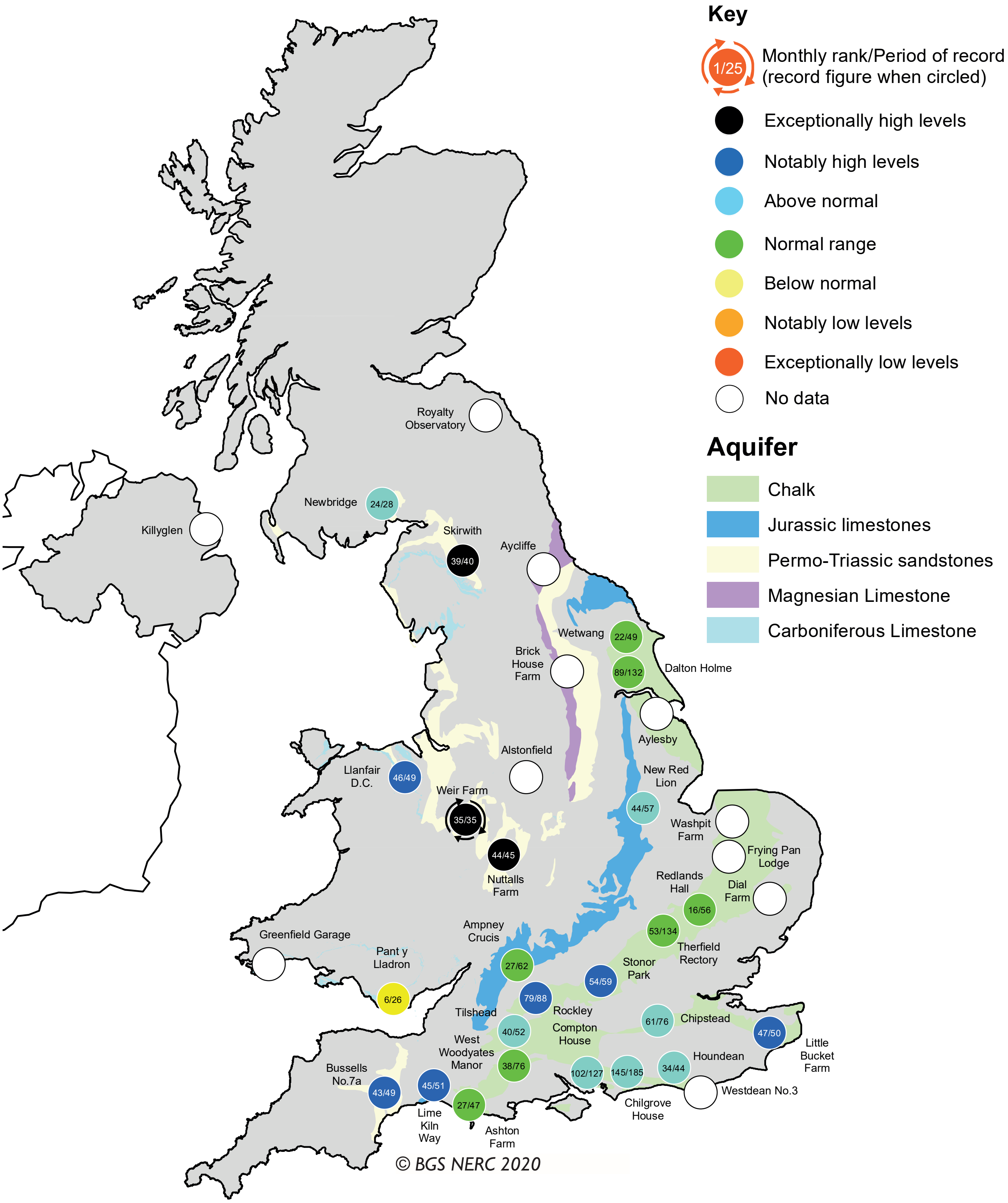

Nuttalls Farm
Permo-Triassic Sandstone
133
132
131
130
129
128
2017
2018
2019
2020
Period of record: 1974-2020


Bussels No.7A
Permo-Triassic Sandstone
26
25
24
23
2017
2018
2019
2020
Period of record: 1971-2020


Lime Kiln Way
Upper Greensand
127
126
125
124
123
2017
2018
2019
2020
Period of record: 1969-2020


Pant Y Lladron
Carboniferous Limestone
90
80
70
60
50
2017
2018
2019
2020
Period of record: 1995-2020

Groundwater...Groundwater

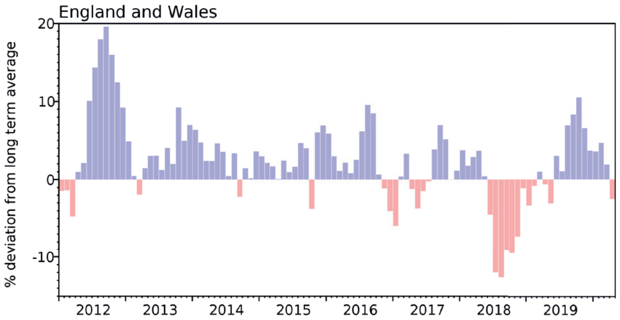


Groundwater levels - April 2020

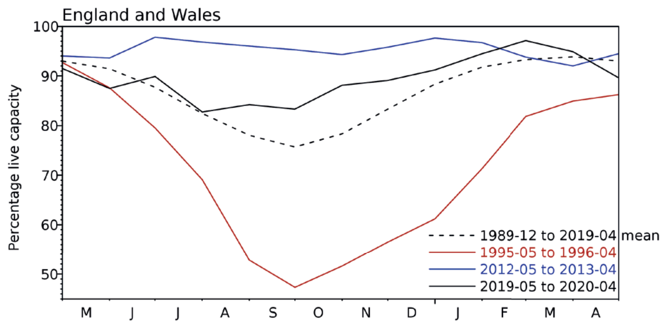
The calculation of ranking has been modified from that used in summaries published prior to October 2012. It is now based on a comparison between the most recent level and levels for the same date during previous years of record. Where appropriate, levels for earlier years may have been interpolated. 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.

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



Percentage live capacity of selected reservoirs at end of month

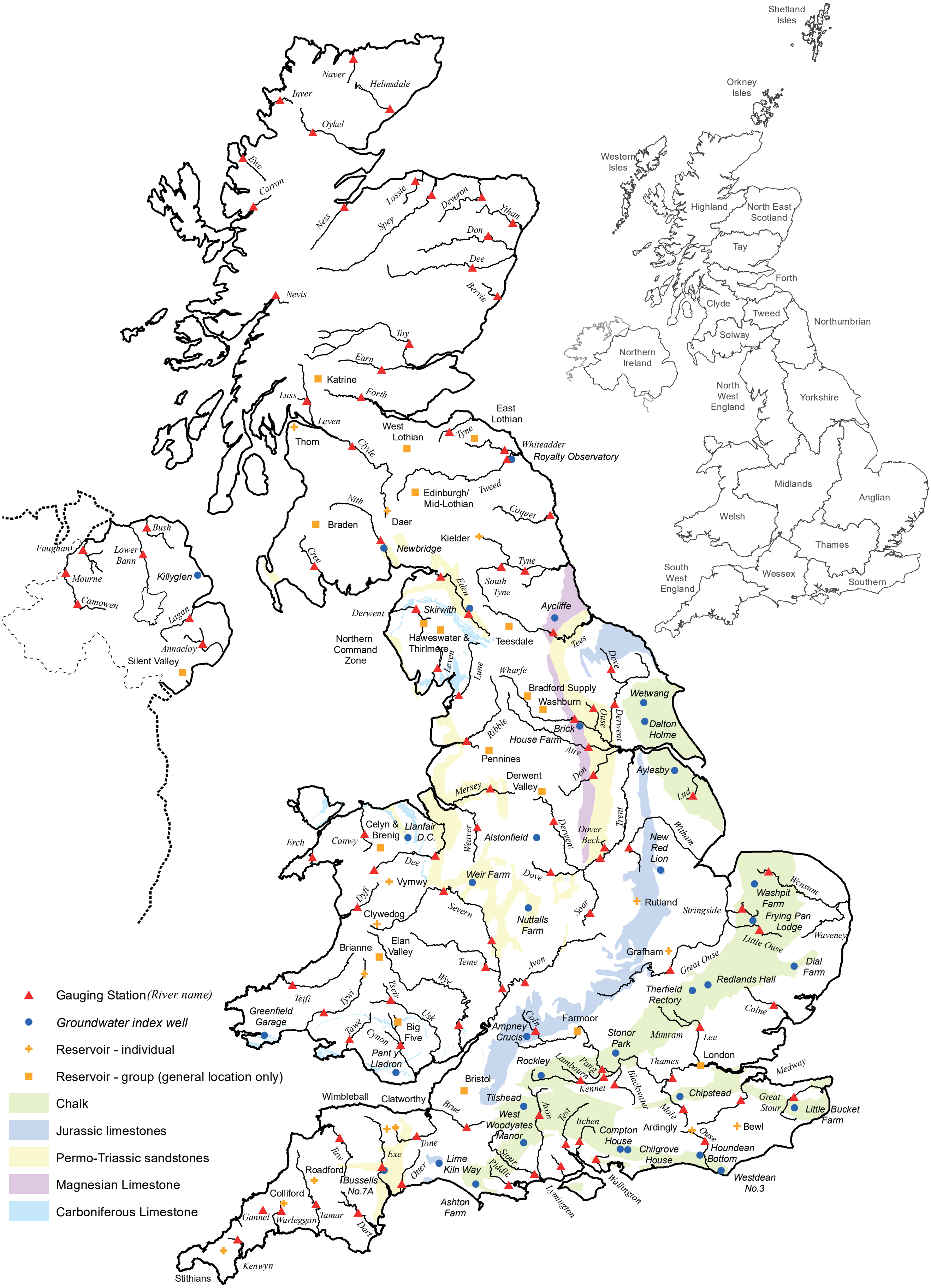
Area	Reservoir		Capacity (Ml)	2020 Feb	2020 Mar	2020 Apr	Apr Anom.	Min Apr	Year* of min	2019 Apr	Diff 20-19
North West	N Command Zone	•	124929	100	93	77	-10	65	1984	80	-2
	Vyrnwy		55146	100	98	90	-3	70	1996	100	-10
Northumbrian	Teesdale	•	87936	99	88	73	-18	73	2020	93	-20
	Kielder		(199175)	96	92	89	-2	85	1990	91	-2
Severn-Trent	Clywedog		49936	100	97	97	0	85	1988	100	-3
	Derwent Valley	•	46692	100	96	82	-10	54	1996	86	-4
Yorkshire	Washburn	•	23373	97	94	84	-6	76	1996	86	-3
	Bradford Supply	•	40942	100	97	85	-6	60	1996	77	8
Anglian	Grafham		(55490)	82	88	96	2	73	1997	91	5
	Rutland		(116580)	97	95	97	5	72	1997	95	1
Thames	London	•	202828	94	95	95	1	86	1990	90	5
	Farmoor	•	13822	97	99	98	1	81	2000	98	0
Southern	Bewl		31000	98	99	98	8	60	2012	97	1
	Ardingly		4685	100	100	100	1	69	2012	100	1
Wessex	Clatworthy		5662	100	100	90	-3	81	1990	91	-1
	Bristol	•	(38666)	99	98	95	1	83	2011	95	-1
South West	Colliford		28540	89	92	89	1	56	1997	88	1
	Roadford		34500	98	99	94	10	41	1996	76	19
	Wimbleball		21320	100	100	93	-2	79	1992	98	-5
	Stithians		4967	100	100	93	2	65	1992	97	-4
Welsh	Celyn & Brenig	•	131155	97	96	93	-5	75	1996	95	-2
	Brianne		62140	100	97	91	-6	86	1997	96	-5
	Big Five	•	69762	98	97	89	-4	85	2011	95	-6
	Elan Valley	•	99106	100	100	88	-8	83	2011	95	-7
Scotland(E)	Edinburgh/Mid-Lothian	•	97223	100	97	89	-4	62	1998	95	-6
	East Lothian	•	9317	100	100	100	1	89	1992	100	0
Scotland(W)	Loch Katrine	•	110326	100	95	83	-8	80	2010	91	-8
	Daer		22494	100	95	80	-13	78	2013	89	-9
	Loch Thom		10721	100	83	76	-19	76	2020	93	-17
Northern Ireland	Total+	•	56800	100	98	88	-1	77	2007	93	-6
	Silent Valley	•	20634	100	96	85	0	58	2000	93	-8

( ) 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
http://www.metoffice.gov.uk/climate/uk/about/methods

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.

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

05/2020

UK-SCAPE
UK Status, Change and Projections of the Environment

Natural Environment Research Council