Monthly water situation report

England

Summary – January 2020

England received below average rainfall during January at 88% of the 1961-90 long term average. The majority of catchments across England received normal rainfall for the time of year, with the exception of several catchments in north-east England and a small number of catchments in east and south-east England which received below normal rainfall. The highest rainfall totals were recorded in north-west England. By the end of January, soil moisture deficits were close to zero across the whole of England. Monthly mean river flows decreased at the majority of sites compared to December, but were normal for the time of year at the majority of sites. Groundwater levels increased at around two-thirds of sites during January and all but 2 sites were classed as normal or above by the end of the month. Total reservoir stocks across England increased during January and were at 93% of capacity by the end of the month.

Rainfall

The January rainfall total for England was 71 mm which is 88% of the 1961-90 January long term average (LTA) (86% of the 1981-2010 LTA). The highest rainfall totals were recorded in parts of north-west England (Figure 1.1).

January rainfall totals were normal in the majority of catchments in England, with the exception of several catchments in north-east England, and a small number of catchments in east and south-east England that were classed as below normal. In these catchments, rainfall totals as a percentage of the LTA ranged from 51% to 73%. The highest January rainfall total as a percentage of the LTA was recorded in the Derwent (North West) catchment at 125% LTA. The lowest January rainfall total as a percentage of the LTA was recorded in the Northumbria North Sea Tributaries catchment in Northumbria at 51% LTA. Cumulative rainfall totals for the past 6 months are exceptionally high within catchments in much of central England and parts of south-west, east and north-east England (Figure 1.2).

At a regional scale, January rainfall totals were normal for the time of year in all regions other than north-east England, where rainfall totals were below normal at 69% of the LTA. Rainfall totals in all regions were below average, ranging from 69% in north-east to 99% in north-west England. The last 6 months has been the 5th wettest (August to January) on record for central England and the 6th wettest for south-west England. The last 12 months has been the 3rd wettest 12 months (February to January) on record for central England (Figure 1.3).

Soil moisture deficit

By the end of January soil moisture deficits were close to zero across the whole of England. Compared to last month, soil moisture deficits have remained less than 10mm but have decreased or stayed the same across most of England, indicating that soils became wetter. Soils across the majority of England are close to the LTA with the exception of most of east England and some small parts of south-east, central and north-east England where soils are now wetter than average for the time of year (Figure 2.1).

At a regional scale, soils at the end of January were wetter than average in all regions. All regions now have soil moisture deficits less than 2mm (Figure 2.2).

River flows

Monthly mean river flows decreased across England relative to December (a wetter than average month) at the majority of sites. River flows increased at 6 sites within east, south-east and south-west England; the Burn at Burnham, the Ely Ouse at Denver, the Cam at Dernford, the Itchen at Allbrook and Highbridge, the Avon at Knapp Mill and the Ver at Hansteads (Figure 3.1).

Across England monthly mean river flows for January were normal at around 70% of rivers we report on. January monthly mean flows were generally normal or above normal in south-west, central, south-east and east England.

At the Itchen at Allbrook and Highbridge in south-east England monthly mean flows were classed as notably high at 152% of the LTA. Monthly mean river flows were classed as below normal at 4 sites within north-east and north-west England; the Swale at Crakehill Topcliffe (76% LTA), the Till at Heaton Mill (49% LTA), the Wharfe at Tadcaster (70% LTA) and the Mersey at Ashton Weir (74% LTA) (Figure 3.1).

At the regional index sites, monthly mean river flows at the Thames at Kingston were classed as above normal for the time of year. All other regional index sites were classed as normal for the time of year (Figure 3.2).

Groundwater levels

Groundwater levels increased during January at around two-thirds of the sites reported on. By the end of January, groundwater levels at all but 2 of the sites we report on were classed as normal or higher for the time of year; this is similar to the end of December. The Cam and Ely Ouse chalk aquifer at Redlands Hall and the Idle and Torne Sandstone aquifer at Crossley Hill were classed as below normal for the time of year at the end of January. However groundwater levels in Redlands Hall have increased relative to the end of December when this site was classed as notably low.

Groundwater levels at 6 sites we report on were classed as exceptionally high at the end of January. Of these, 3 had the highest January end of month values on record; the Northern Chalk aquifer at Grainsby (records since 1977), the sandstone aquifer at Weir Farm (records since 1983) and the West Cheshire Sandstone aquifer at Prior Heyes (records since 1972). Groundwater levels at some sites we report on within chalk aquifers have risen significantly during January, for example the South West Chilterns aquifer at Stonor Park and the East Chilterns Chalk aquifer at Ashley Green (Figures 4.1 and 4.2).

At the major aquifer index sites the end of month groundwater levels were classed as normal or above for all sites other than the Cam and Ely Ouse chalk aquifer at Redlands Hall in the east of England. End of the month groundwater levels in the sandstone aquifer at Weir Farm and the Hull and East Riding chalk aquifer at Dalton Holme, in central and north east England respectively, were both classed as exceptionally high.

Reservoir storage

Reservoir stocks increased at around 40% of reservoir and reservoir groups that we report on during January. The largest increases in reservoir stocks, as a proportion of total storage capacity, were seen at the Abberton reservoir and Hanningfied reservoir in east England, with a 13% and 10% increase respectively. At the end of January, reservoir stocks were classed as normal or higher at all but 1 of the sites we report on; the Dee system was below normal at 90% of total storage capacity (Figure 5.1).

At the end of January, around a third of sites we report on were classed as above normal, notably high or exceptionally high for the time of year.

Total reservoir stocks across England at the end of January were at 93% capacity. This is a slight increase from the end of December. At a regional scale, total reservoir stocks were above the long term average in all regions. Regional reservoir stocks ranged from 89% total capacity in east England to 96% in central England (Figure 5.2).

Forward look

During the first part of February, sunshine and showers are forecast across much of the country, along with strong winds, and frost and fog forming overnight. Towards the middle of the month it will become more unsettled; generally windy with spells of rain, interspersed with brighter but showery interludes. It may perhaps become more settled through late February, but confidence is low. Temperatures are expected to stay unseasonably mild, with any dry and cold interludes fairly brief.

For the 3 month period February to April, below average precipitation is slightly more likely than above average[1].

Projections for river flows at key sites[2]

Half of the modelled sites have a greater than expected chance of cumulative river flows being above normal or higher for the time of year by the end of March 2020. By the end of September 2020, two-thirds modelled sites have a greater than expected chance of river flows being normal or higher for the time of year.

For scenario based projections of cumulative river flows at key sites by March 2020 see Figure 6.1
For scenario based projections of cumulative river flows at key sites by September 2020 see Figure 6.2
For probabilistic ensemble projections of cumulative river flows at key sites by March 2020 see Figure 6.3

1 Source: Met Office
2 Information produced by the Water Situation Forward Look group led by Environment Agency in partnership with the Centre for Ecology and Hydrology, British Geological Survey, Met Office (www.hydoutuk.net).

For probabilistic ensemble projections of cumulative river flows at key sites by September 2020 see Figure 6.4

Projections for groundwater levels in key aquifers[2]

Half of modelled sites have a greater than expected chance of groundwater levels being notably high or higher for the time of year by the end of March 2020. By the end of September 2020, more than three quarters of modelled sites have a greater than expected chance of groundwater levels being normal or higher for the time of year.

For scenario based projections of groundwater levels in key aquifers in March 2020 see Figure 6.5
For scenario based projections of groundwater levels in key aquifers in September 2020 see Figure 6.6
For probabilistic ensemble projections of groundwater levels in key aquifers in March 2020 see Figure 6.7
For probabilistic ensemble projections of groundwater levels in key aquifers in September 2020 see Figure 6.8

Authors: National Water Resources Hydrology Team

Rainfall

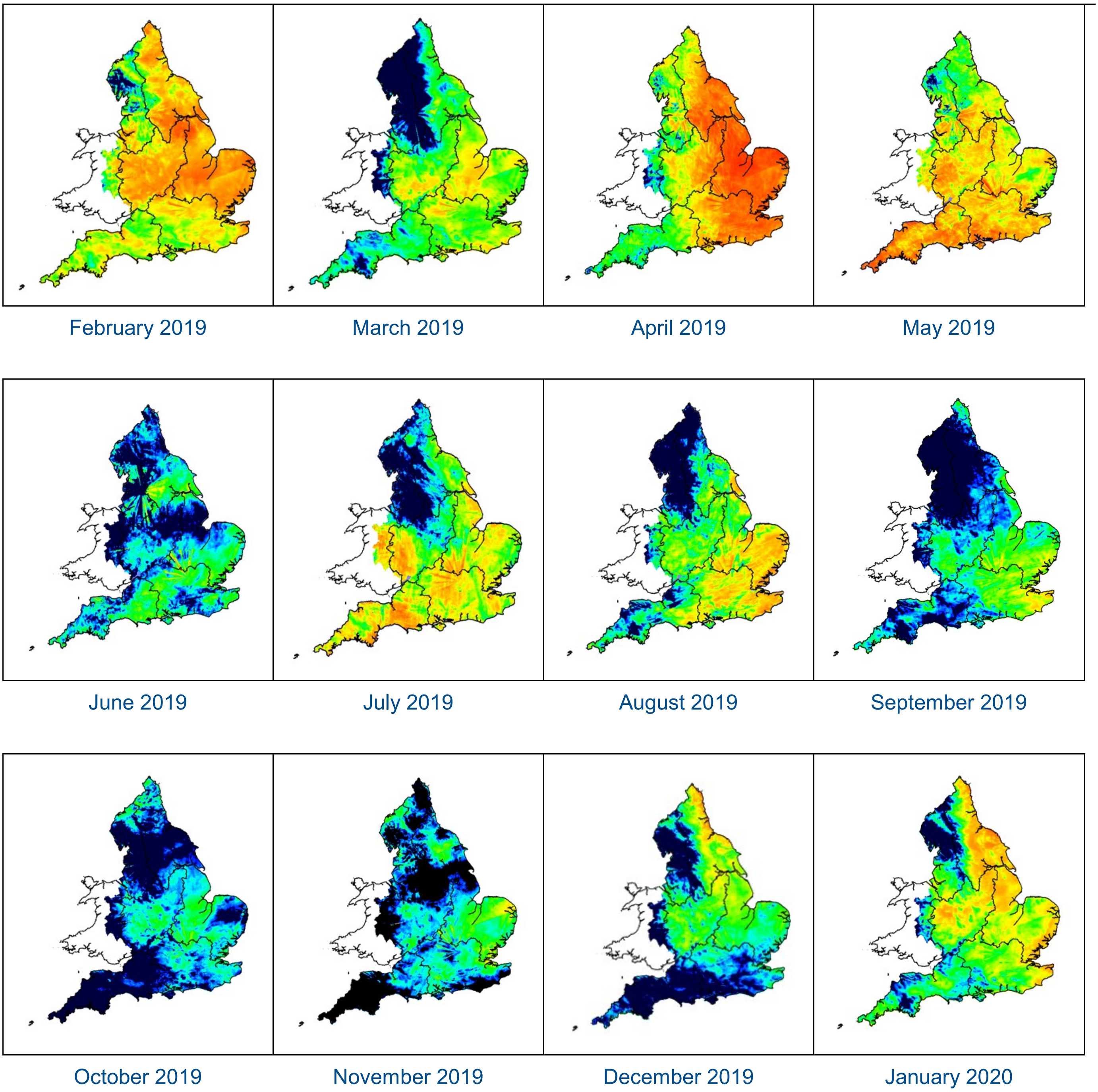
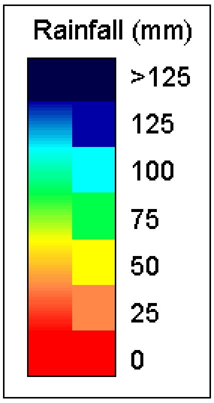


Figure 1.1: Monthly rainfall across England and Wales for the past 12 months. UKPP radar data (Source: Met Office © Crown Copyright, 2020). Note: Radar beam blockages in some regions may give anomalous totals in some areas. Crown copyright. All rights reserved. Environment Agency, 100024198, 2020.



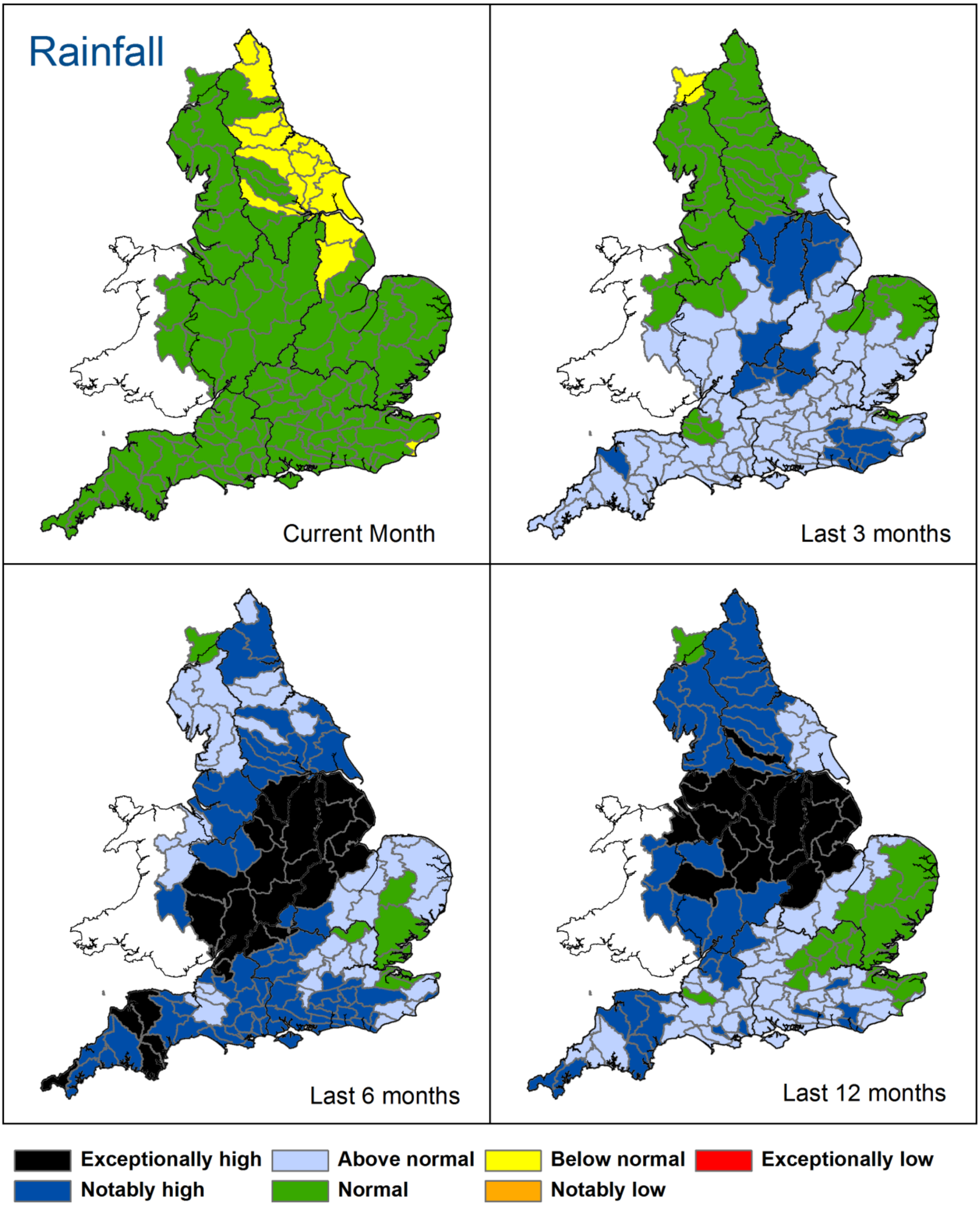


Figure 1.2: Total rainfall for hydrological areas across England for the current month (up to 31 January 2020), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges *(Source: Met Office © Crown Copyright, 2020)*. Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved. Environment Agency, 100024198, 2020.

Rainfall charts

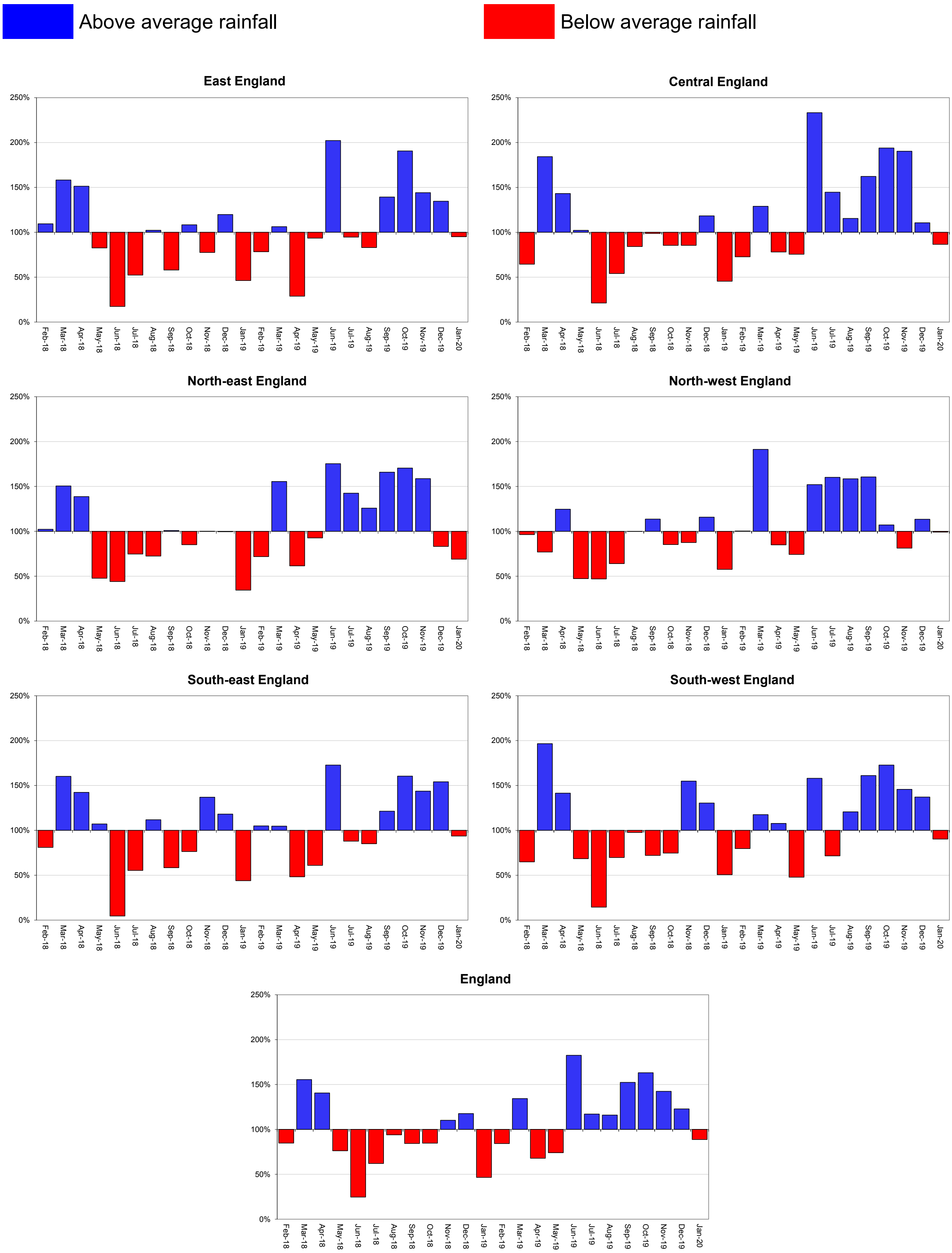


Figure 1.3: Monthly rainfall totals for the past 24 months as a percentage of the 1961 to 1990 long term average for each region and for England. HadUK rainfall data. (Source: Met Office © Crown Copyright, 2020).

Soil moisture deficit

End of December 2019[1]	End of January 2020[2]

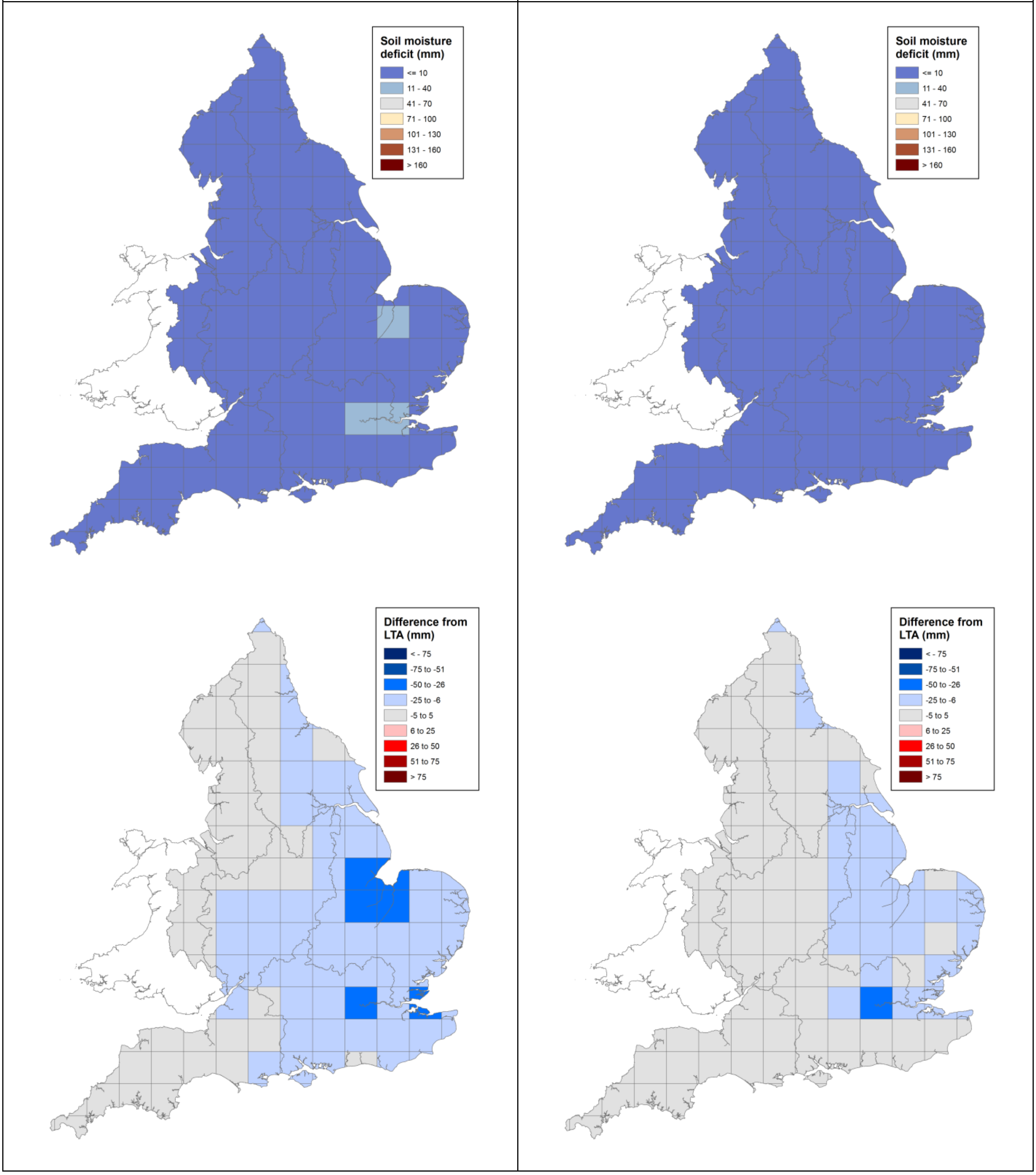
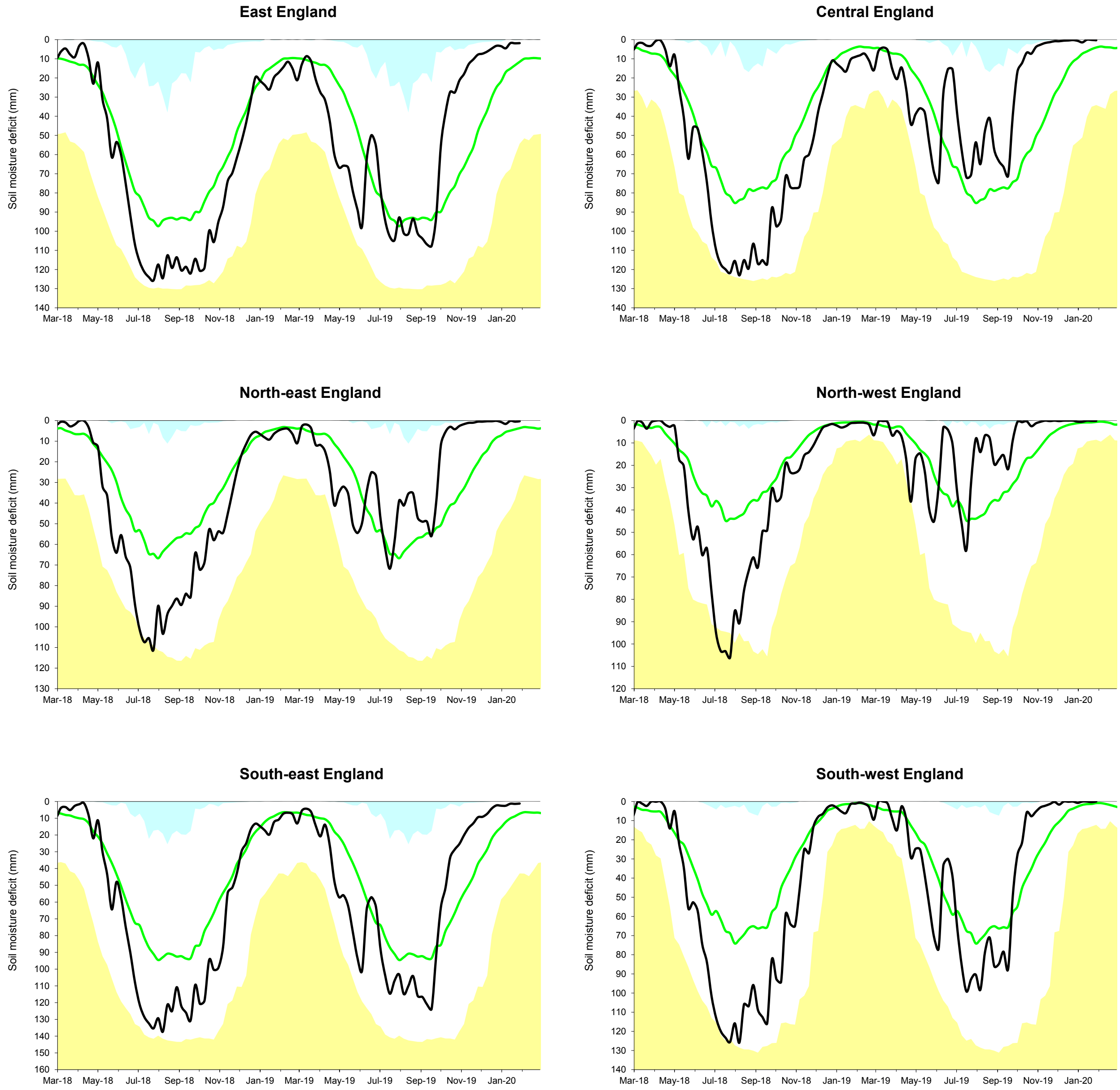


Figure 2.1: Soil moisture deficits for weeks ending 31 December 2019 [1] (left panel) and 28 January 2020 [2] (right panel). Top row shows actual soil moisture deficits (mm) and bottom row shows the difference (mm) of the actual from the 1961 to 90 long term average soil moisture deficits. MORECS data for real land use (Source: Met Office © Crown Copyright, 2020). Crown copyright. All rights reserved. Environment Agency, 100024198, 2020

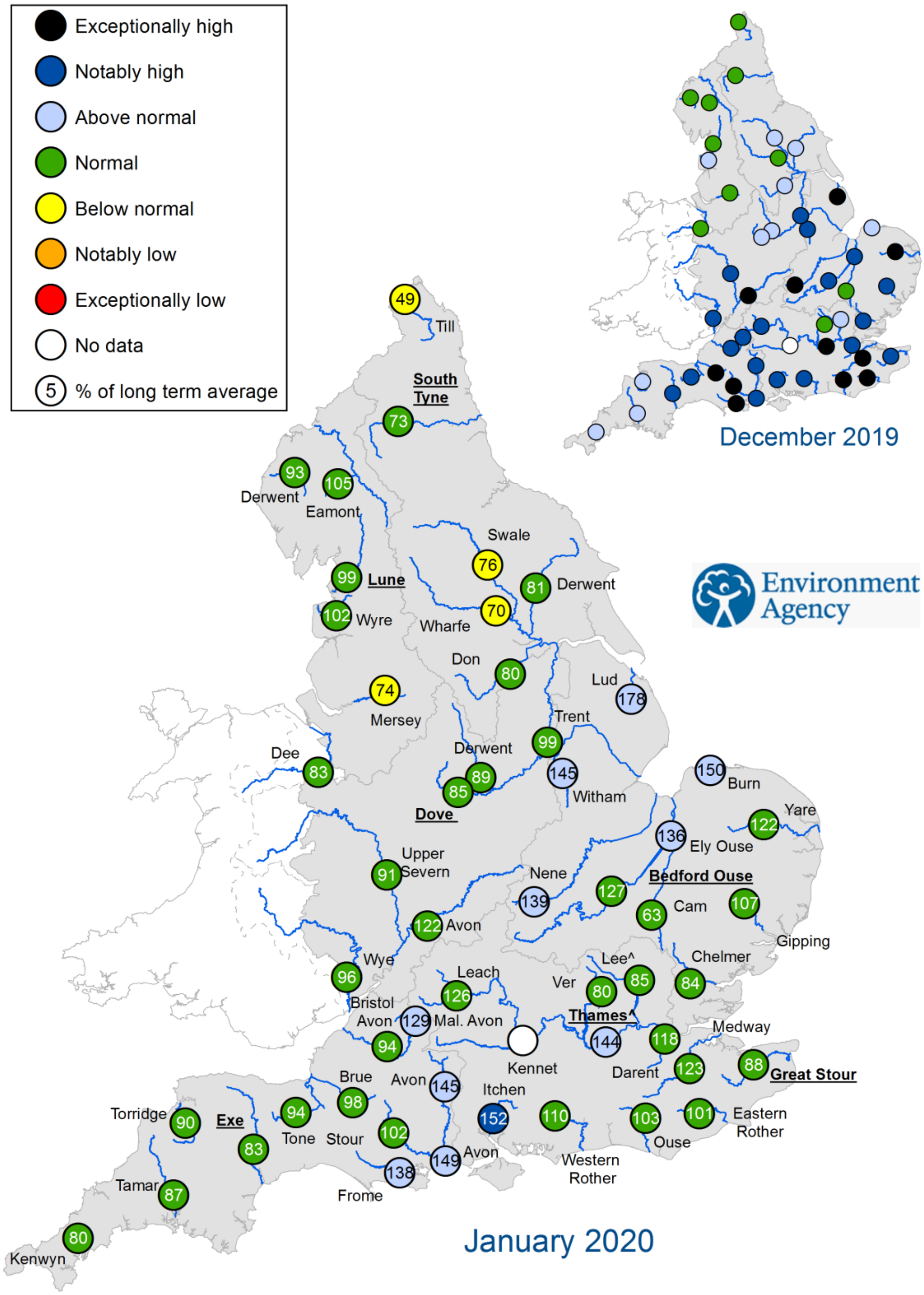
Soil moisture deficit charts



	Below minimum monthly level		Above maximum monthly level		Average		Latest data

Figure 2.2: Latest soil moisture deficits for all geographic regions compared to maximum, minimum and 1961 to 90 long term average. Weekly MORECS data for real land use. (Source: Met Office © Crown Copyright, 2020).

River flows



^ "Naturalised" flows are provided for the River Thames at Kingston and the River Lee at Feildes Weir

+/- Monthly mean flow is the highest/lowest on record for the current month (note that record length varies between sites)

Underlined sites are regional index sites and are shown on the hydrographs in Figure 3.2

Figure 3.1: Monthly mean river flow for indicator sites for December 2019 and January 2020, expressed as a percentage of the respective long term average and classed relative to an analysis of historic December and January monthly means (Source: Environment Agency).

River flow charts

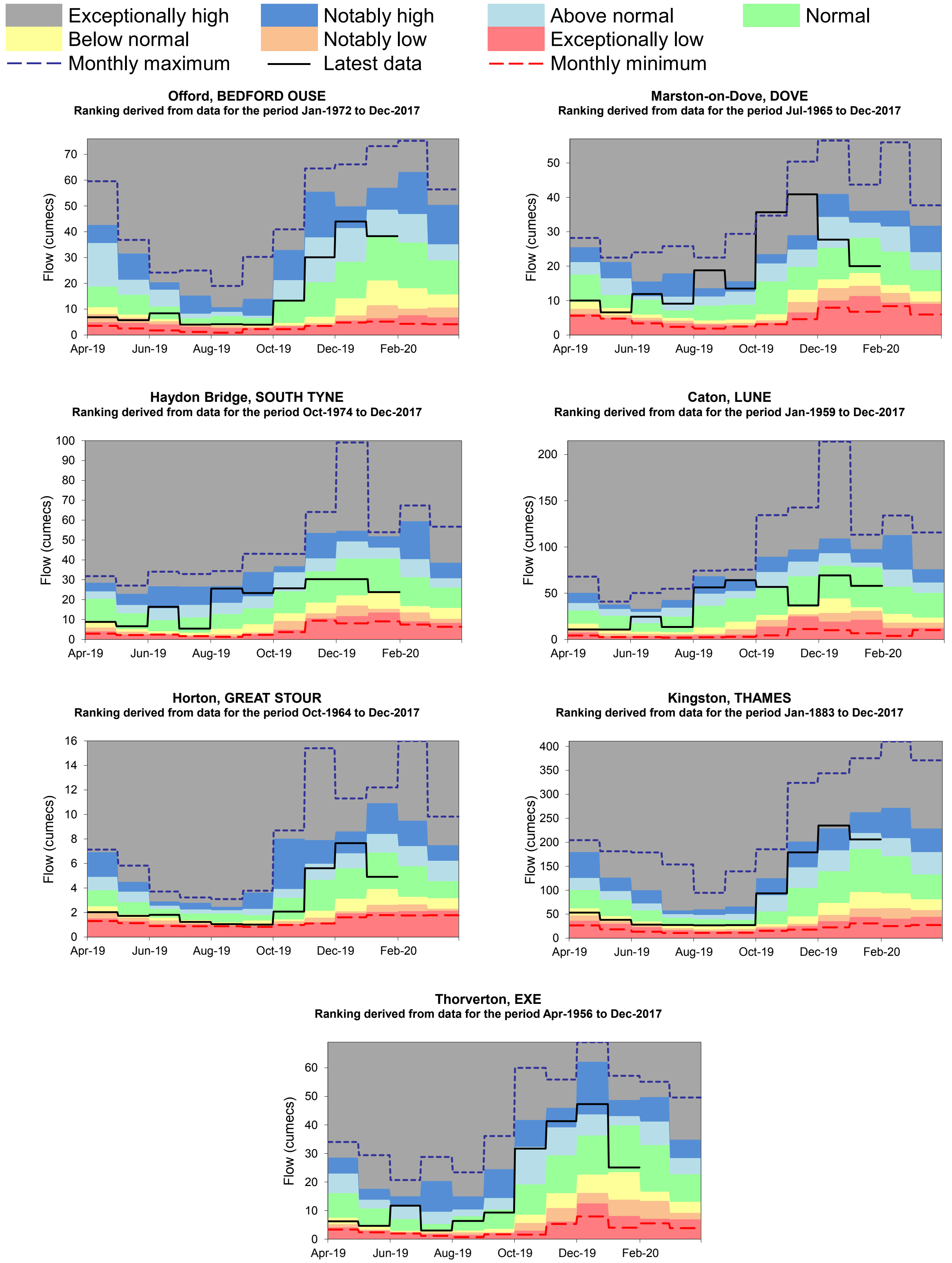
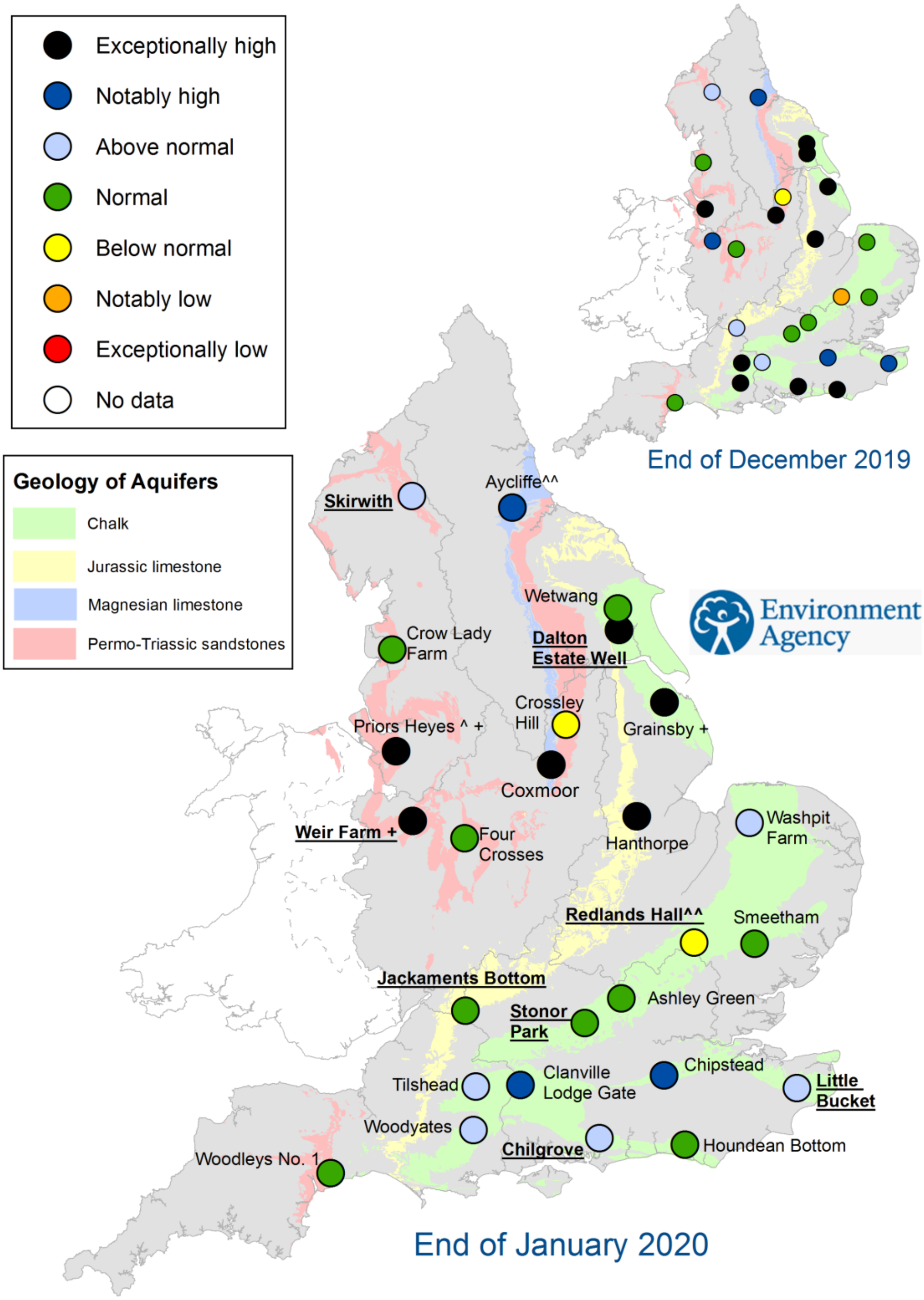


Figure 3.2: Index river flow sites for each geographic region. Monthly mean flow compared to an analysis of historic monthly mean flows, long term maximum and minimum flows. (Source: Environment Agency).

Groundwater levels



^ The level at Priors Heyes remains high compared to historic levels because the aquifer is recovering from the effects of historic abstraction
^^ Sites are manually dipped at different times during the month. They may not be fully representative of levels at the month end
\+ End of month groundwater level is the highest on record for the current month (note that record length varies between sites).
Underlined sites are major aquifer index sites and are shown in the groundwater level charts in Figure 4.2

Figure 4.1: Groundwater levels for indicator sites at the end of December 2019 and January 2020, classed relative to an analysis of respective historic December and January levels (Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2020.

Groundwater level charts

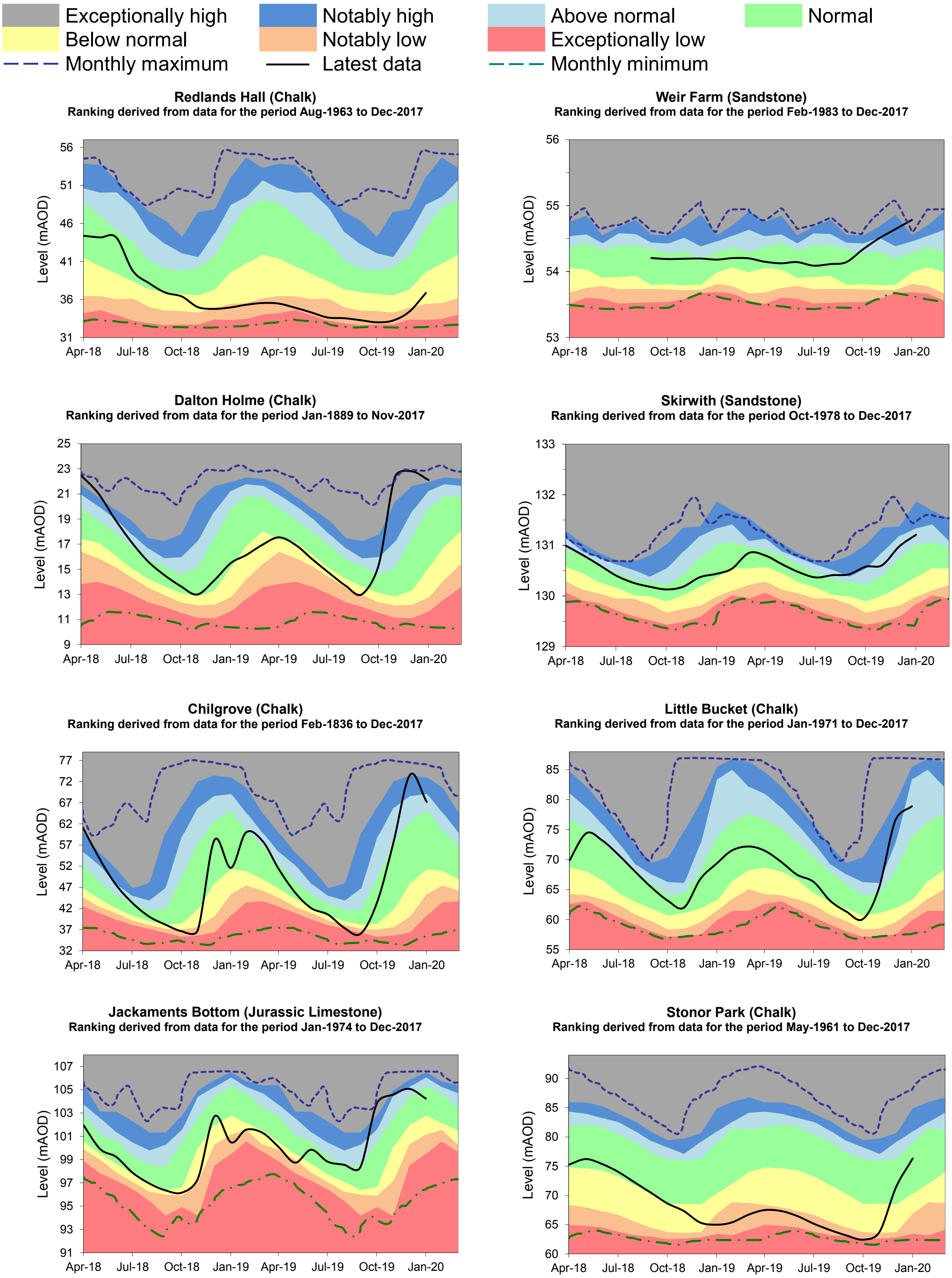
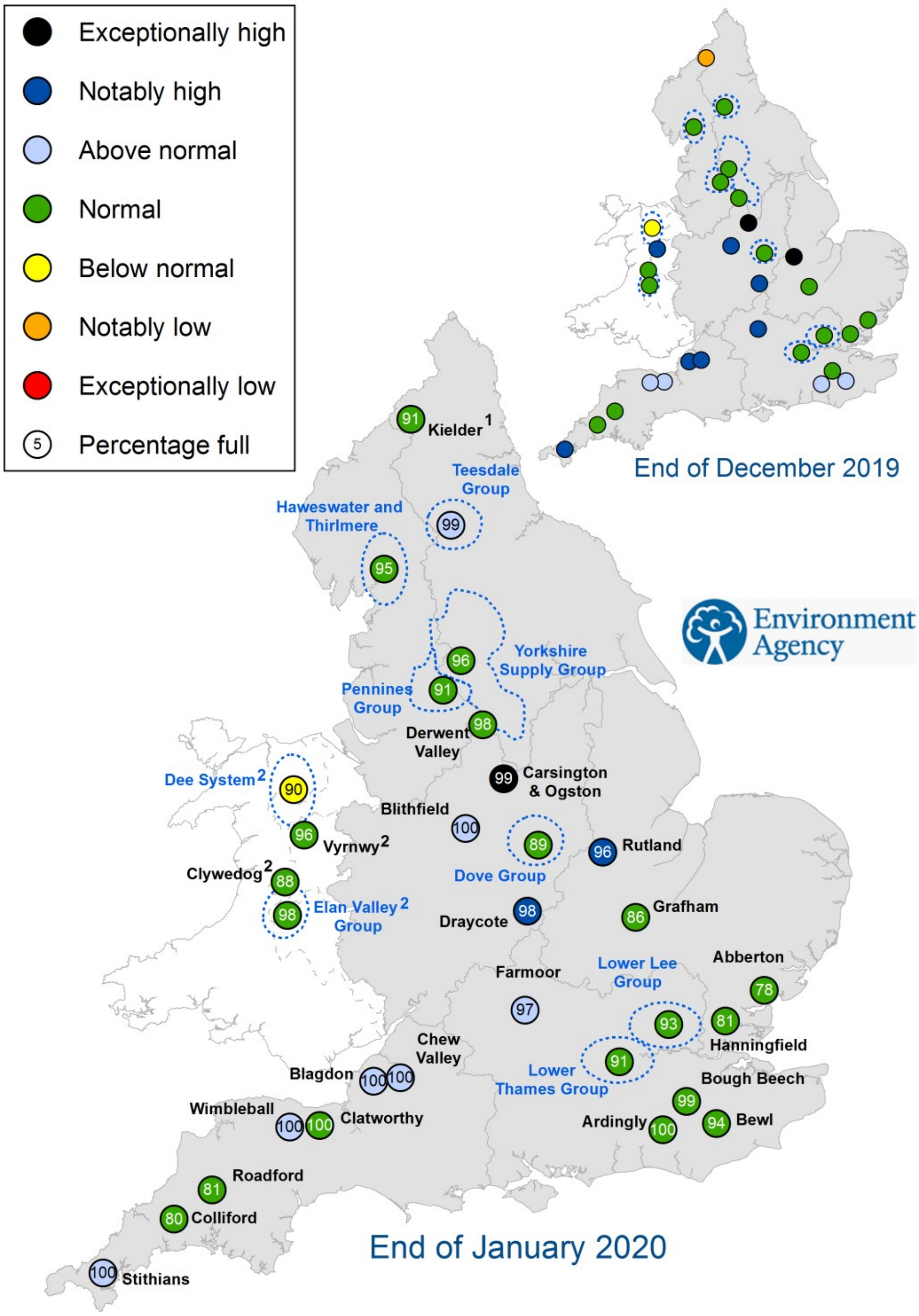


Figure 4.2: Index groundwater level sites for major aquifers. End of month groundwater levels months compared to an analysis of historic end of month levels and long term maximum and minimum levels. (Source: Environment Agency, 2020).

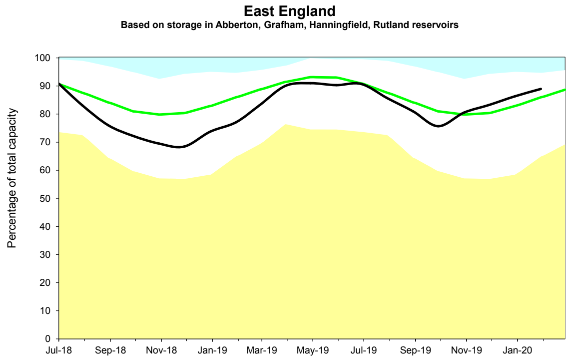
Reservoir storage

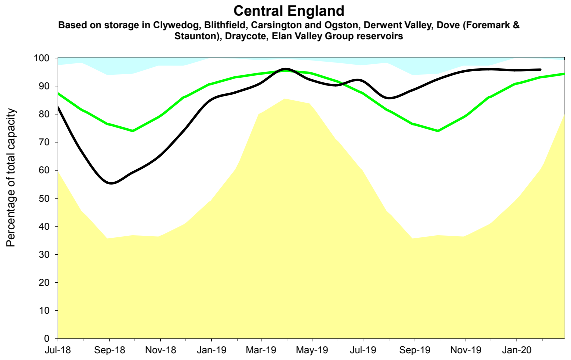


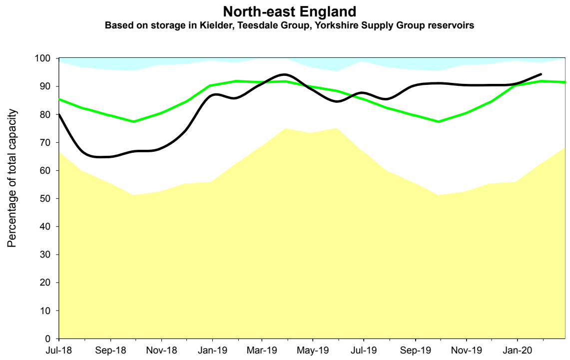
1. Current levels at Kielder are lower than historical levels due to the implementation of a new flood alleviation control curve
2. Vyrnwy, Clywedog and Elan Valley reservoirs are located in Wales but provide a water resource to Central and north-west England

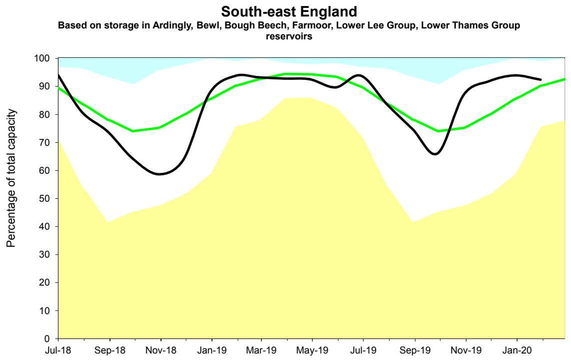
Figure 5.1: Reservoir stocks at key individual and groups of reservoirs at the end of December 2019 and January 2020 as a percentage of total capacity and classed relative to an analysis of historic December and January values respectively (Source: Water Companies). Note: Classes shown may not necessarily relate to control curves or triggers for drought actions. As well as for public water supply, some reservoirs are drawn down to provide flood storage, river compensation flows or for reservoir safety inspections. In some cases current reservoir operating rules may differ from historic ones. Crown copyright. All rights reserved. Environment Agency, 100024198, 2020.

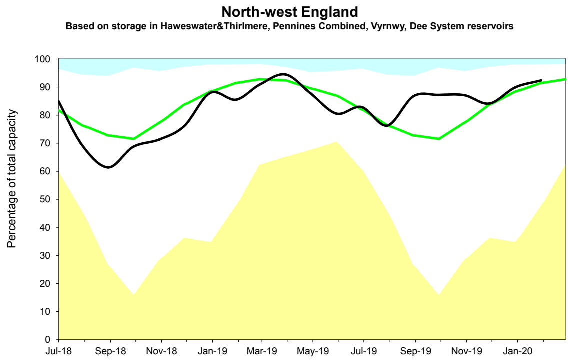
Reservoir storage charts

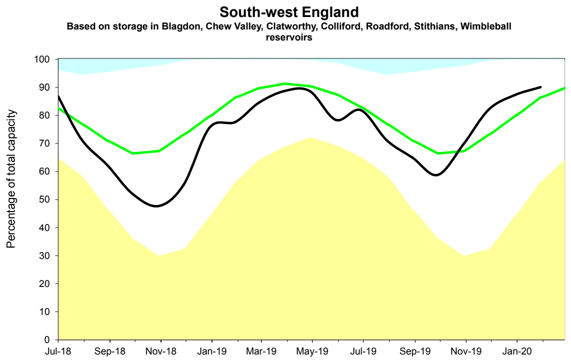


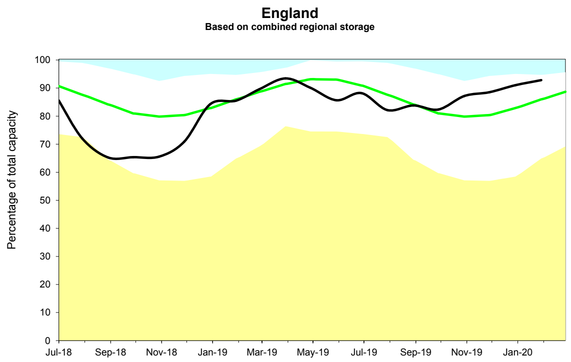












	Below minimum monthly level		Above maximum monthly level		Average		Latest data

Figure 5.2: Regional reservoir stocks. End of month reservoir stocks compared to long term maximum, minimum and average stocks (Source: Water Companies). Note: Historic records of individual reservoirs/reservoir groups making up the regional values vary in length.

Forward look: river flow

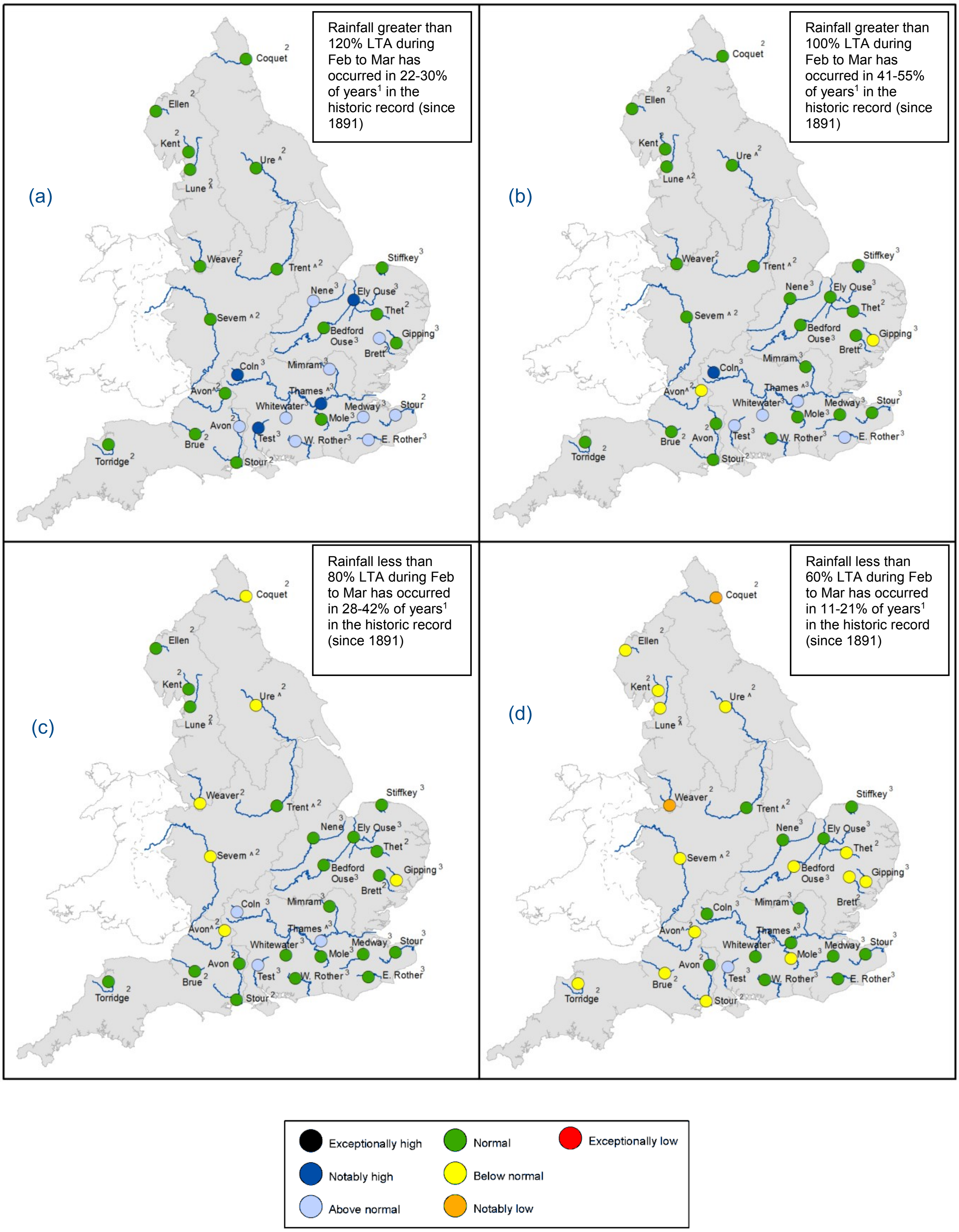


Figure 6.1: Projected river flows at key indicator sites up until the end of March 2020. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February 2020 and March 2020 (Source: Centre for Ecology and Hydrology, Environment Agency)

[1] This range of probabilities is a regional analysis
[2] Projections for these sites are produced by CEH
[3] Projections for these sites are produced by the Environment Agency
^ *"Naturalised" flows are projected for these sites*

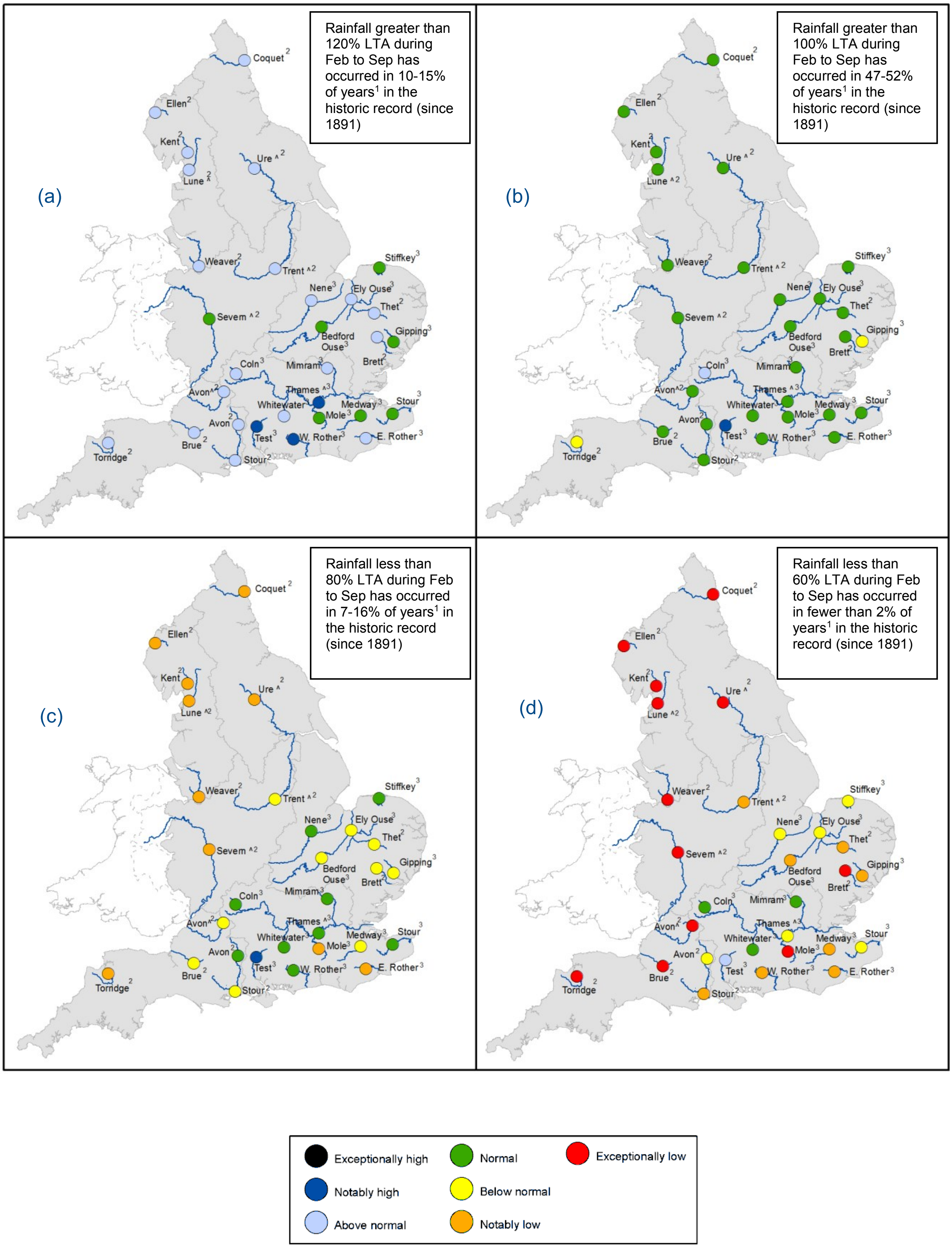


Figure 6.2: Projected river flows at key indicator sites up until the end of September 2020. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February 2020 and September 2020 (Source: Centre for Ecology and Hydrology, Environment Agency)

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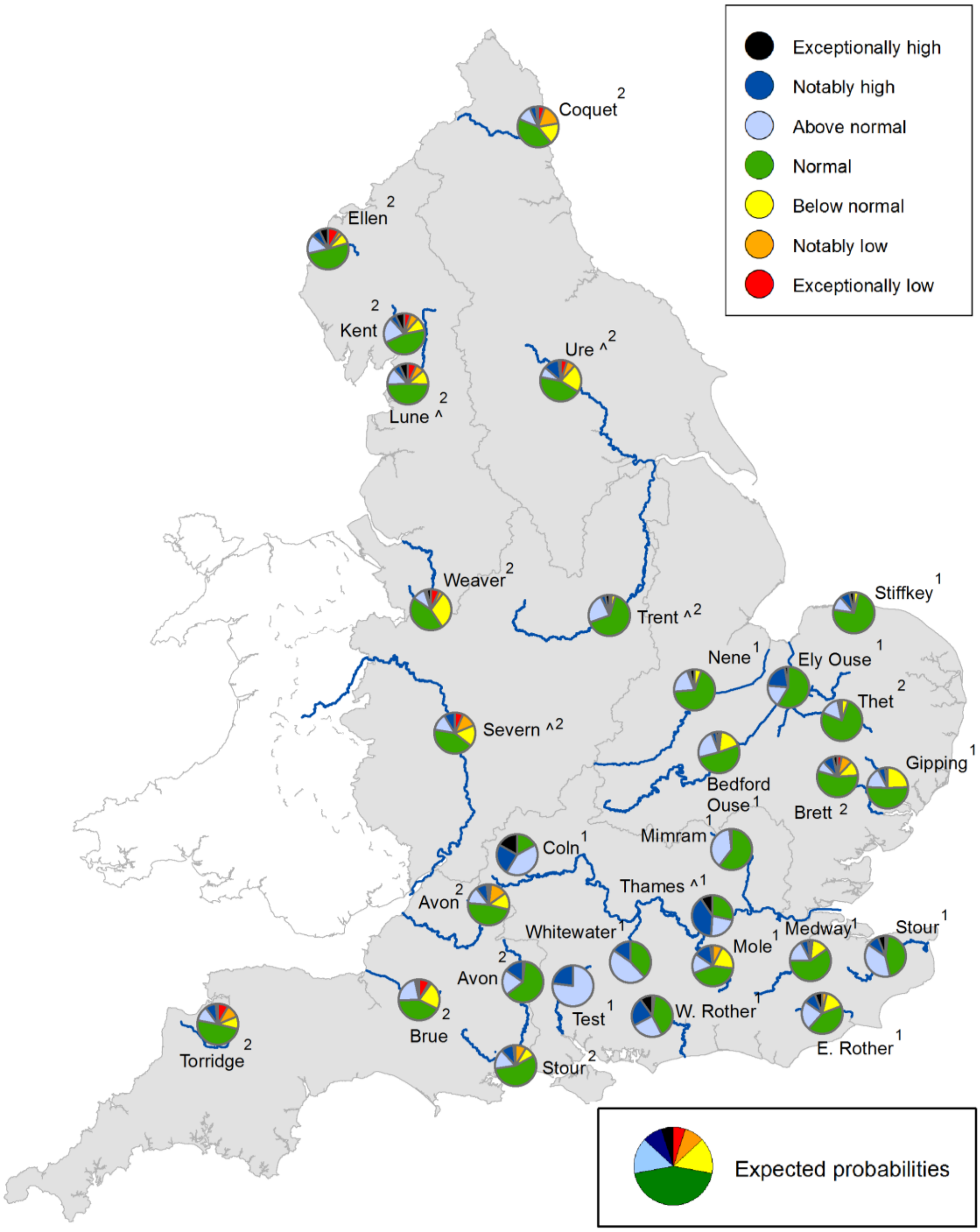

Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Figure 6.3: Probabilistic ensemble projections of river flows at key indicator sites up until the end of March 2020. Pie charts indicate probability, based on climatology, of the surface water flow at each site being e.g. exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency).

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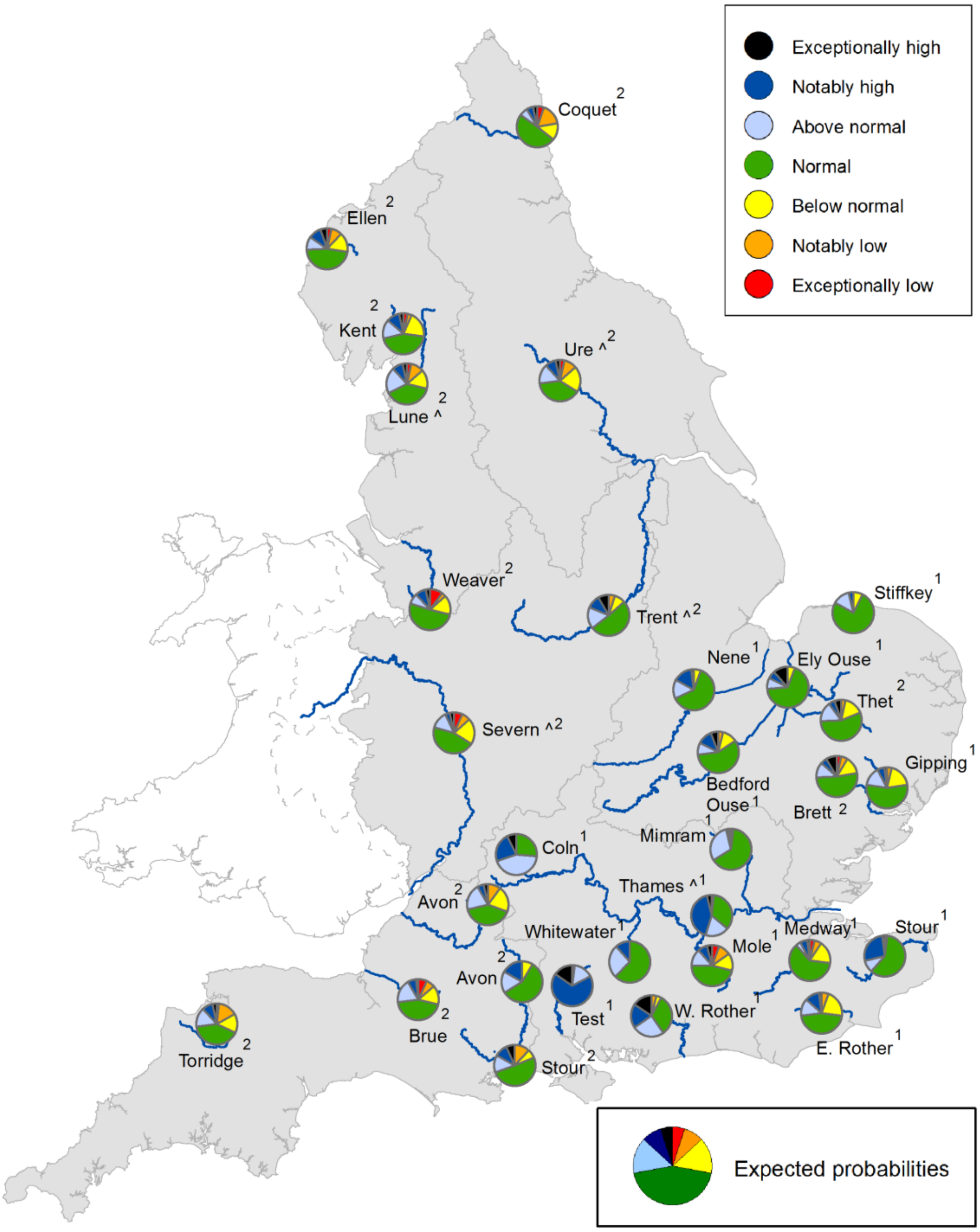
[2] Projections for these sites are produced by CEH
^"Naturalised" flows are projected for these sites



Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Figure 6.4: Probabilistic ensemble projections of river flows at key indicator sites up until the end of September 2020. Pie charts indicate probability, based on climatology, of the surface water flow at each site being e.g. exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency).

[1] Projections for these sites are produced by the Environment Agency
[2] Projections for these sites are produced by CEH
^"Naturalised" flows are projected for these sites

Forward look: groundwater

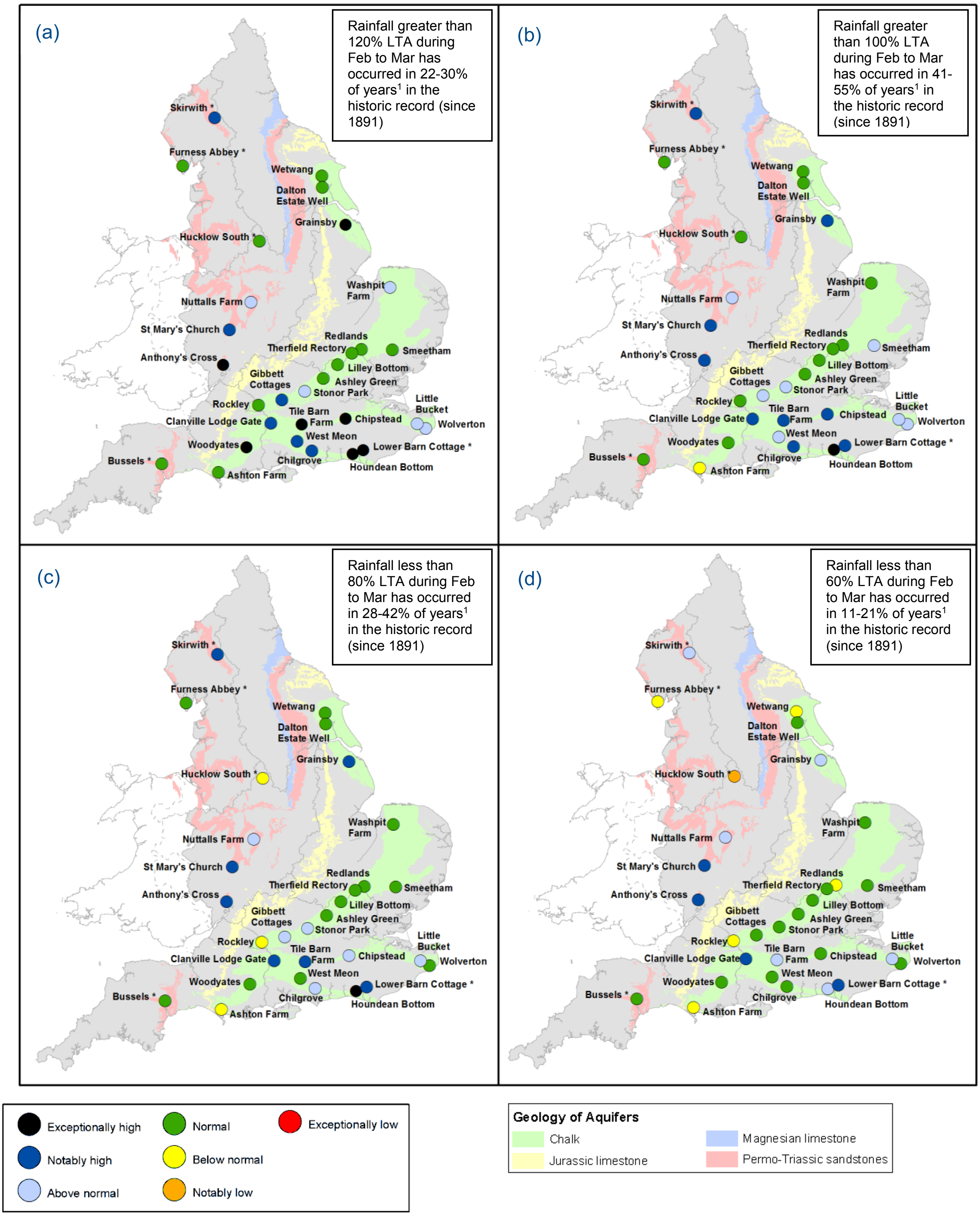


Figure 6.5: Projected groundwater levels at key indicator sites at the end of March 2020. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February 2020 and March 2020 (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC. Crown copyright all rights reserved. Environment Agency 100024198, 2020.

* Projections for these sites are produced by BGS
[1] This range of probabilities is a regional analysis

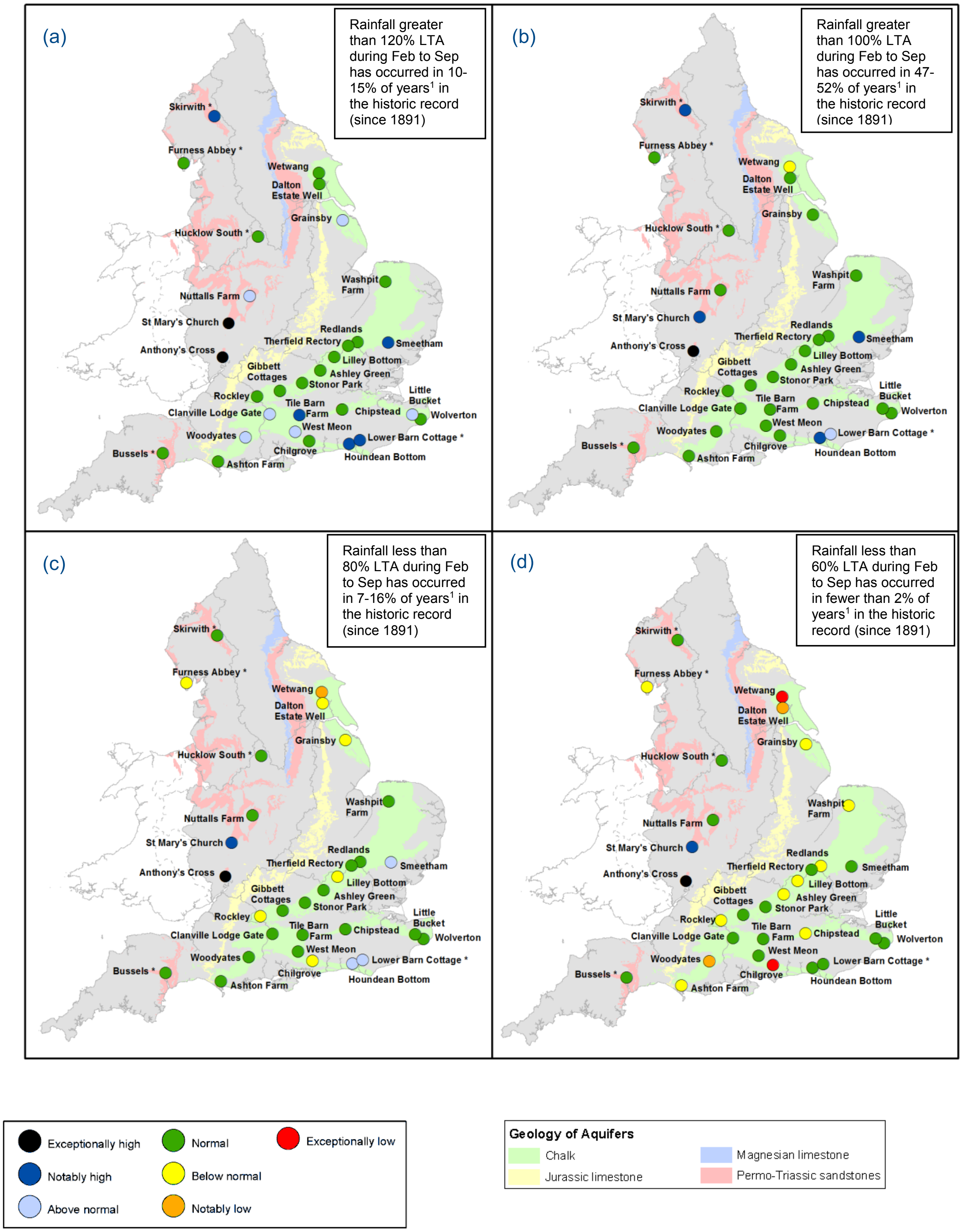
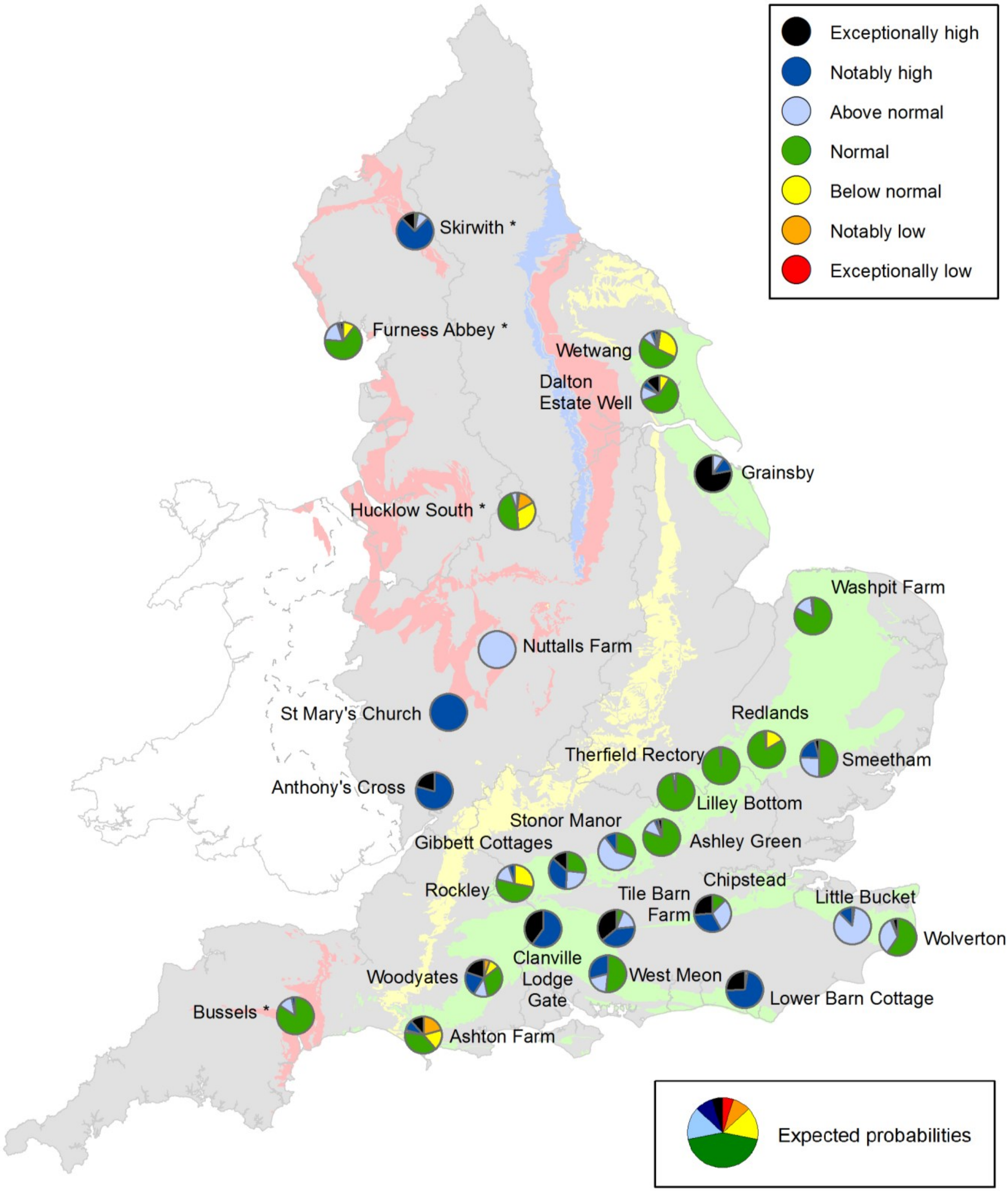


Figure 6.6: Projected groundwater levels at key indicator sites at the end of September 2020. Projections based on four scenarios: 120% (a), 100% (b), 80% (c) and 60% (d) of long term average rainfall between February 2020 and September 2020 (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum BGS © NERC Crown copyright. All rights reserved. Environment Agency 100024198 2020.

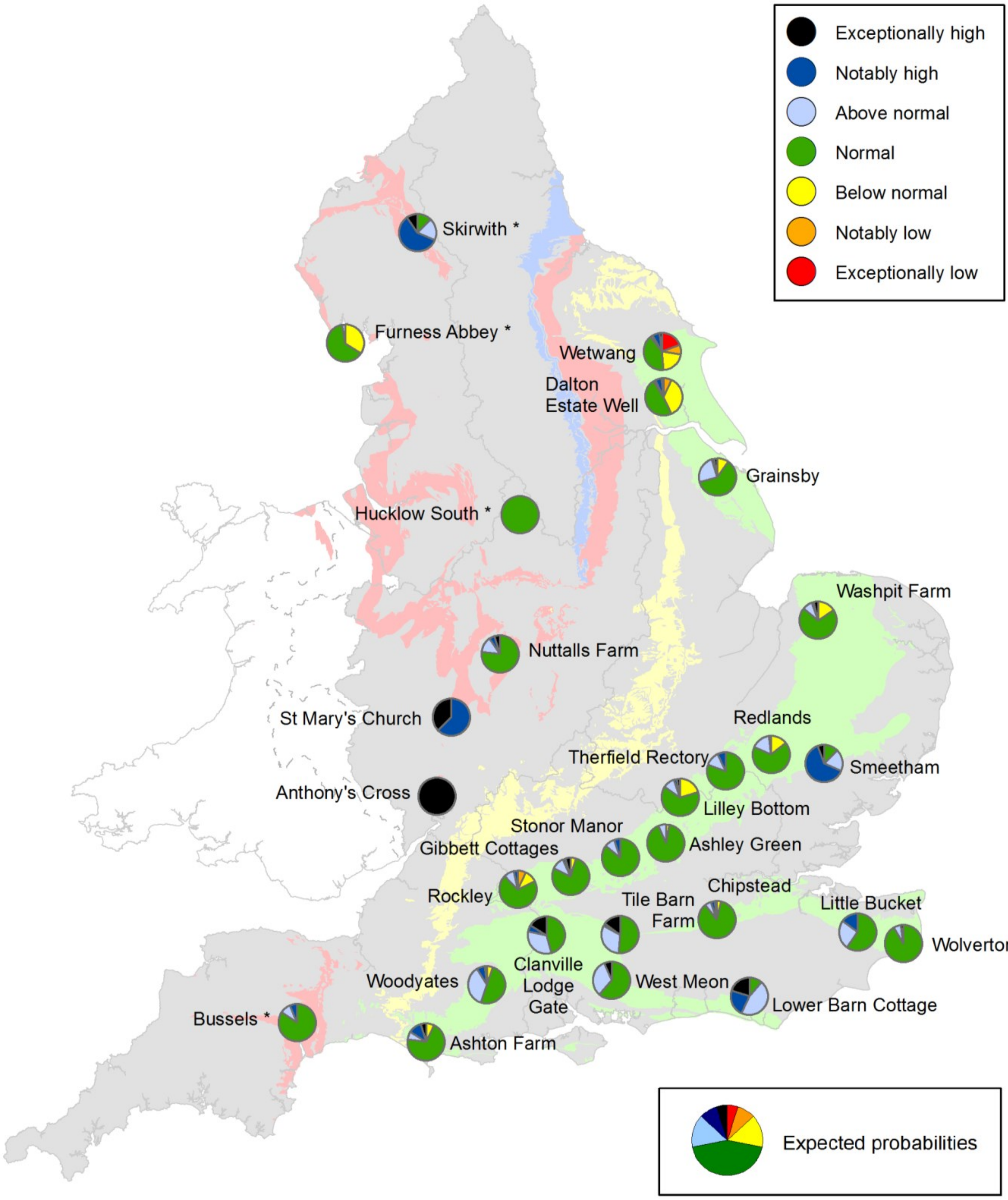
* Projections for these sites are produced by BGS
[1] This range of probabilities is a regional analysis



Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Figure 6.7: Probabilistic ensemble projections of groundwater levels at key indicator sites at the end of March 2020. Pie charts indicate probability, based on climatology, of the groundwater level at each site being e.g. exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2020.

** Projections for these sites are produced by BGS*



Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Figure 6.8: Probabilistic ensemble projections of groundwater levels at key indicator sites at the end of September 2020. Pie charts indicate probability, based on climatology, of the groundwater level at each site being e.g. exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2020.

* Projections for these sites are produced by BGS

Figure 7.1: Geographic regions

Glossary

Term	Definition
Aquifer	A geological formation able to store and transmit water.
Areal average rainfall	The estimated average depth of rainfall over a defined area. Expressed in depth of water (mm).
Artesian	The condition where the groundwater level is above ground surface but is prevented from rising to this level by an overlying continuous low permeability layer, such as clay.
Artesian borehole	Borehole where the level of groundwater is above the top of the borehole and groundwater flows out of the borehole when unsealed.
Cumecs	Cubic metres per second (m^3s^{-1})
Effective rainfall	The rainfall available to percolate into the soil or produce river flow. Expressed in depth of water (mm).
Flood Alert/Flood Warning	Three levels of warnings may be issued by the Environment Agency. Flood Alerts indicate flooding is possible. Flood Warnings indicate flooding is expected. Severe Flood Warnings indicate severe flooding.
Groundwater	The water found in an aquifer.
Long term average (LTA)	The arithmetic mean, calculated from the historic record. For rainfall and soil moisture deficit, the period refers to 1961 to 1990, unless otherwise stated. For other parameters, the period may vary according to data availability
mAOD	Metres Above Ordnance Datum (mean sea level at Newlyn Cornwall).
MORECS	Met Office Rainfall and Evaporation Calculation System. Met Office service providing real time calculation of evapotranspiration, soil moisture deficit and effective rainfall on a 40 x 40 km grid.
Naturalised flow	River flow with the impacts of artificial influences removed. Artificial influences may include abstractions, discharges, transfers, augmentation and impoundments.
NCIC	National Climate Information Centre. NCIC area monthly rainfall totals are derived using the Met Office 5 km gridded dataset, which uses rain gauge observations.
Recharge	The process of increasing the water stored in the saturated zone of an aquifer. Expressed in depth of water (mm).
Reservoir gross capacity	The total capacity of a reservoir.
Reservoir live capacity	The capacity of the reservoir that is normally usable for storage to meet established reservoir operating requirements. This excludes any capacity not available for use (e.g. storage held back for emergency services, operating agreements or physical restrictions). May also be referred to as 'net' or 'deployable' capacity.
Soil moisture deficit (SMD)	The difference between the amount of water actually in the soil and the amount of water the soil can hold. Expressed in depth of water (mm).

Categories

Exceptionally high	Value likely to fall within this band 5% of the time
Notably high	Value likely to fall within this band 8% of the time
Above normal	Value likely to fall within this band 15% of the time
Normal	Value likely to fall within this band 44% of the time
Below normal	Value likely to fall within this band 15% of the time
Notably low	Value likely to fall within this band 8% of the time
Exceptionally low	Value likely to fall within this band 5% of the time